PA Consulting Group

Xcel Energy

Process and Impact Evaluation for the Colorado Business Cooling Efficiency Program

FINAL REPORT

January 15, 2010

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Prepared for: Xcel Energy

PA Consulting Group
6410 Enterprise Lane
Suite 300
Madison, WI 53719
Tel: +1 608 316 3700
Fax: +1 608 661 5181
www.paconsulting.com

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1. EXECUTIVE SUMMARY

This report provides the process and impact evaluation results of Xcel Energy's Colorado Commercial and Industrial (CO C&I) Cooling Efficiency Program.

OVERVIEW OF THE PROGRAM

The Cooling Efficiency program, which Xcel Energy launched in 2006, provides rebates to non-residential customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Oversized cooling towers
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps

The program targets both new construction and existing buildings. The program further distinguishes between prescriptive and custom installations.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively. [1]

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has struggled to elicit small business customer participation.

The program leverages the trade ally infrastructure, along with Xcel Energy staff such as account managers and Business Solutions Center representatives, to provide program outreach. Understanding the importance of the trade allies' roles, the program has an assigned Trade Relations Manager who provides education and outreach to trade allies throughout the state.

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[1] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

1.1 METHODOLOGY

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make changes that should be made to technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and the Company's current processes, technical assumptions and NTG ratios.[2]"

The process evaluation was designed to provide Xcel Energy with a thorough understanding of process issues such as barriers to participation, satisfaction with customers, and opportunities for improvement. The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate net-to-gross ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are reasonable and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[3], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Data collection activities included in the evaluation are detailed below. These activities informed both the process and impact (e.g., net-to-gross) analysis.

Table 1-1. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[4]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

[2] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

[3] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes as well as the impact of the 2009 IECC standards on future program years instead of looking backward to codes that no longer apply.

[4] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

1.2 KEY FINDINGS

The 2009 program successfully achieved its energy savings goals even though it increased its savings goals from the 2008 program year. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent, and 106 percent of the goals respectively.

The evaluation found that while the program effectively engaged managed accounts, the program is not as effectively reaching small and/or non-managed customers. This key finding will not come as a surprise to program staff—the evaluation confirmed that it is an issue through database analysis and in-depth interviews. Interviews identified that there are unique barriers for small commercial customers particularly for chain accounts that occupy leased facilities.

The evaluation also found that leveraging trade allies is critical for programs such as Xcel Energy's Cooling Efficiency Program. Effectively reaching and integrating trade allies into the program's outreach and marketing campaign was identified in the benchmarking study as a best practice; program managers of mature and successful programs said they leverage trade allies successfully, although developing those relationships admittedly takes time. Xcel Energy's Cooling Efficiency Program is moving in the right direction by employing an assigned Trade Relations Manager to reach trade allies.

Although the trade ally infrastructure is key to program success, there is a need to continue to strengthen the demand of high efficiency cooling equipment from the customer. Interviews identified a need for continued education with customers and specific marketing materials for target groups.

The remainder of this key findings section organizes findings by research objectives detailed in the Xcel Energy Cooling Efficiency Request for Proposal. Research objectives relevant for each subsection are denoted in the footnotes. The process and impact evaluation chapters provide further support and documentation of these key findings.

1.3 PROCESS EVALUATION KEY FINDINGS

1.3.1 Program design and operations[5]

Program staff and trade allies commended the prescriptive programs' application process, commenting that the application form is relatively easy to complete with clear instructions. The custom application process did not receive such favorable reviews from respondents. Respondents found the application process difficult and commented on the rebate estimation and verification process as areas for improvement.

[5] **This section addresses the following objectives:**

1) Gauge efficiency of the application process and determine opportunities to improve the application process.

2) Identify areas where the program/processes/marketing can be improved to capture more customer participation.

Having an assigned Trade Relations Manager to communicate with trade allies is seen as a critical role by program staff. However, interviewees questioned whether one staff member was sufficient for the entire state. Additional support in reaching trade allies was identified by Xcel Energy staff as a means for capturing more customer participation.

The Business Solution Center (BSC) is also viewed favorably by program staff as a referral point for the non-managed and small business customers. However, interviews revealed that the BSC should be more involved in marketing to customers. BSC staff said they planned to proactively market to customers in the future, although they admitted to not having specific marketing materials for these customers.

As noted in the recommendations section, the program should consider developing targeted marketing materials and provide those materials to BSC staff. Other recommendations include increasing the rebate level to capture a group of nonparticipants that otherwise would not participate and provide education and training opportunities to customers.

1.3.2 Customer characteristics and experiences[6]

The program is primarily serving managed accounts. Consequently, the nonparticipant group is far more likely to be comprised of non-managed accounts than the participant group. Participants are also more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Other points of distinction between the participant and nonparticipant groups are variability in hours of operation by season and building ownership.

The majority of participants said there is typically more than one person involved in the decision of whether to purchase cooling equipment. The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. The age or condition of the old equipment was the most important factor.

Overall, program participants are satisfied with the Cooling Efficiency program and the various aspects of the program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied.

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[6] **These key findings address the following objectives:**

1) Identify characteristics and firmographics to help define current participants and target similar non-participants.
2) Assess customer decision-making processes regarding participating in the CO C&I Cooling Efficiency Program.
3) Gauge program participant satisfaction.

1.3.3 Target market for Xcel Energy's cooling efficiency program[7]

Trade ally interviews discussed the significant potential for the Cooling Efficiency Program in Colorado's commercial market. According to trade allies and Xcel Energy staff interviews, small commercial customers are underserved by the program, as documented in the program literature[8] and confirmed by trade allies and program staff in this program evaluation. These small commercial and non-managed organizations tend to be capital constrained and lease space. Therefore, they do not have ownership of the equipment installed but have to pay the energy bills. An effective suggestion for targeting these customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Additionally, large commercial customers are oftentimes opting to repair rather than replace failing equipment. The stock of cooling equipment is aging for these customers. Trade allies envision a significant need for cooling equipment replacement and an opportunity for the Cooling Efficiency program in the future.These factors, along with relatively low participation numbers since program inception, indicate that that there is significant opportunity for the program to provide cooling efficiency services to the commercial sector.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

1.3.4 Marketing and outreach[9]

The program employs a variety of resources to provide marketing and outreach to customers and trade allies. These resources include the BSC, Trade Relations Manager, and account managers, as well as direct mailings developed by Xcel Energy. Trade allies are particularly critical for reaching customers.

The participant surveys explored the effectiveness of these outreach efforts. Account managers followed by their HVAC vendors have been the most effective outreach channels for program participants.

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[7] **These key findings address the following objectives:**

1) Quantify program saturation in the market including untapped markets of non-participants and remaining markets for existing program participants.
2) Identify the most attractive target populations that currently participate in the program.
3) Identify the target population that currently do not participate in the program.

[8] *2009 Cooling Efficiency Marketing Plan.*

[9] **These key findings address the following objectives:**

1) Identify channels for information about the CO C&I Cooling Efficiency Program
2) Determine nonparticipants' awareness level of Colorado's C&I Cooling Efficiency Program
3) Identify preferred channels for information about the CO C&I Cooling Efficiency Program

Approximately a quarter of nonparticipants are aware of the program. The most common way nonparticipants heard about the program was through Xcel Energy direct mail. Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, followed by email. Trade ally and internal staff identified a need for these marketing materials to be more specific to target sectors, such as small commercial customers.

Trade allies appreciate receiving information through mail; however, the evaluation identified that personal contact is most effective for providing information about the program. Trade allies also requested that a dedicated website be established to communicate program information and tools.

1.3.5 Barriers to purchasing new equipment or participation[10]

The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital. Customers will contact trade allies when it is time to replace the equipment. Current economic conditions and costs were identified by participating and nonparticipating trade allies, and nonparticipating customers, as barriers to purchasing efficient cooling equipment. The barriers included the incremental cost of high efficiency cooling equipment as well as the first cost of cooling equipment.

Several trade allies differentiated the barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost. For larger customers, the main barrier was initial cost due to their need for larger cooling equipment. A number of these customers decide to repair rather than replace equipment. Another notable barrier was triple-net leases, which are reported as very common among commercial customers. Non-financial barriers for moving customers to higher efficiency cooling equipment include customers' lack of awareness and/or understanding of the benefits of high efficiency equipment.

Customers' financial constraints and tendency to replace equipment on failure reinforce the need for trade allies to be intimately familiar with the program and be provided with materials and tools so they can easily and quickly provide information to customers in these situations.

1.4 IMPACT EVALUATION KEY FINDINGS[11]

The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used

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[10] **These key findings address the following objectives:**

1) Identify barriers to participation

2) Determine reasons for not participating in the program

[11] **These key findings address the following objectives:**

1) Verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and vendor's own findings.

2) Calculate Net-to-Gross ratios including and identifying the effect from free riders, free drivers, and spillover.

for other programs. The values for peak load coincident factor (CF) and equivalent full load hours (EFLH) provided in the Calculator are appropriate.

More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. Based on the review of other programs and the engineering estimates, the recommendations include removal of VAV boxes from program offerings.

IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for both the 2009 and 2010 program years. The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the Package Terminal Air Conditioners (PTACs), which do not take into account variations in PTAC sizes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

The self-reported net-to-gross ratio for 2007–2009 participants using the California self-report methodology was is 0.7 for the Colorado Cooling Efficiency Program. Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program. The net-to-gross results identified through the benchmarking study are in line with the results from this Xcel Energy Cooling Efficiency evaluation, which used the California net-to-gross framework[12].

1.5 RECOMMENDATIONS

These recommendations are based on activities and key findings detailed within the report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

1.6 PROCESS RECOMMENDATIONS

1.6.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates

[12] The program has used a net-to-gross ratio of .94 through 2009 and per Xcel Energy recommendations from this evaluation will not be retroactively imposed on 2009 or prior program achievement but will be used moving forward beginning in 2010.

program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Relations Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to

pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

1.6.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

1.6.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program. .

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn't even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

1.7 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007–2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross

ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007–2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

2. INTRODUCTION

This report presents the results of the 2009 process and impact evaluation of the Xcel Energy Colorado Business Cooling Efficiency program. In this chapter, we discuss the program overview and logic model, study objectives, evaluation methodology, and organization of the report.

2.1 PROGRAM OVERVIEW AND LOGIC MODEL

2.1.1 Program overview

Cooling is the second highest use of electricity for most commercial buildings[13]. Xcel Energy began offering a Cooling Efficiency program for its Colorado commercial and industrial customers in 2006.

The Cooling Efficiency program offers rebates to eligible customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps.

The program targets both new construction and existing buildings and provides rebates for whole systems, as well as specific components. The incentives differ by the type of cooling equipment purchased. Variable Air Volume Boxes and Cooling Towers have a fixed rebate amount. All other equipment types have a base rebate per ton, and the rebate amount increases incrementally if the equipment exceeds the minimum efficiency requirements necessary to qualify for the base rebate amount.

The program further distinguishes between prescriptive and custom installations. The custom program requires that all projects be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification.

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has not been gaining broad acceptance with customers and vendors as quickly as anticipated. Small business participation is a known

[13] Commercial Building Energy Consumption Survey, 2007

challenge for the program, and the recent economic conditions have also hampered program acceptance.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively.[14]

Table 2-1 details the number of customers that participated in the program and related savings by year. While the program is still relatively young, the trend indicates the program has gained momentum. There was a significant increase in participation between 2006 and 2007; however, the participation numbers remained relatively constant between 2007 and 2008 while the savings decreased. The program experienced program design changes between 2008 and 2009. The baseline assumption and requirements for eligible equipment increased. In 2009, there was an increase in both participants and achieved savings, meeting the annual savings goals for the first time.

Table 2-1. Number of Customers and Related Savings by Year

Program Year	Number of Participating Customers	Marketing kW Achieved	Generator kW Achieved	MWh Savings Achieved
2006	49	903	693	1,417
2007	113	2,342	517	4,934
2008	123	1,998	1,176	3,540
2009	175	4,262	5,181	6,558

Source: Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

The program provides program outreach through a variety of sources including the trade ally infrastructure and Xcel Energy staff. Key Xcel Energy outreach staff includes the account managers as well as Business Solutions Center representatives whose role it is to provide outreach and services to non-managed accounts. Recognizing the importance of the trade allies' role, the program has an assigned Trade Ally Manager who provides education and outreach to trade allies throughout the state. The program also receives guidance from a trade Cooling Council which first began meeting in 2008.

2.1.2 Logic model

Xcel Energy's Colorado Cooling Efficiency Program undertakes a number of activities to capture both energy and demand savings with Xcel Energy's commercial customers as well as result in the long-term increased penetration of energy efficient cooling equipment among all business sectors of its commercial population in Colorado. Xcel Energy runs the program internally; therefore, the development and refinement of the program infrastructure is a major

[14] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

activity of the program. The other main activities include outreach to trade allies, customer communications, and rebating eligible equipment.

Figure 2-1 is the program's logic model that identifies program activities, targeted market actors, outputs, and expected outcomes. A well-designed logic model serves as a roadmap to understanding logical relationships among program interventions and potential issues and problems. It communicates a performance story about what the program is trying to achieve, through what interventions, and with respect to which market actors. This logic model was developed based on program materials, discussions at the start-up meeting, and interviews with Xcel Energy staff involved in program management and implementation.

Figure 2-1. Colorado Cooling Efficiency Program Logic Model

Inputs/ Resources	Sufficient budget is allocated Xcel Energy Cooling Efficiency Team* Outside technical resources	Marketing collateral, Program website Xcel Energy Cooling Efficiency Team Xcel Energy technical assistance	Marketing collateral, Program website Account managers, Business Service Center (BSC) and trade allies Xcel Energy technical assistance
Activities	**Develop Program Infrastructure** →	**Outreach to Trade Allies** →	**Customer Communications** →
Outputs	The Cooling Efficiency program has been in the CO market since 2006 Program measures, rebates and marketing strategy, technical assumptions developed, refined and documented. Internal website and training Tracking system developed (appropriate information is requested, captured and entered into Siebel)	Participate in events of local chapters of HVAC associations and market to their members, energy efficiency fairs Hold semi-annual trade Cooling Council meeting and ad-hoc meetings Involve trade allies in developing rebate structures and new products	Account managers, BSC representatives and trade allies refer customers to the program Targeted direct communications to business customers and other outreach such as newsletters, energy efficiency fairs Print and radio advertisement on Energy Efficiency Programs
Short to medium term outcomes	Improved energy efficiency program awareness and participation Xcel Energy staff knowledgeable about the program and its resources Refine Xcel Energy product offerings High customer satisfaction	Trade allies are knowledgeable about the rebate structure and program guidelines Trade allies regularly communicate the program to customers and include rebate with bids Trade allies receive technical assistance from Xcel Energy engineers	Program offering is meaningful, clear, and valuable to customers Business customers' awareness of and participation in the program increases significantly Business customers receive needed technical assistance from Xcel Energy engineers
Long term outcomes	Energy saving goals of the Cooling Efficiency program are achieved within budgetary constraints	Increased trade allies' stocking and sales of AC energy efficient technologies and increased participation of customers in the program	Increased awareness of and demand for energy efficiency equipment in all business segments

* Core members of the Xcel Energy Cooling Efficiency team include the product manager, energy efficiency management, marketing assistants, Trade Relations Manager, and energy efficiency engineer staff. Ancillary members of the Cooling Efficiency team include market research, account management, advertising, corporate communications, information services, regulatory affairs, rebate operations, Business Solutions Center (BSC), and legal.

2.2 STUDY OBJECTIVES

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make recommendations that should be made to

technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and Xcel Energy's current processes, technical assumptions and NTG ratios.[15]"

Xcel Energy identified several key evaluation objectives for both the process and impact evaluations. The process evaluation was designed to provide Xcel Energy with a thorough understanding of participating and nonparticipating commercial customers' and trade allies' awareness of the program, satisfaction with the program, barriers to participation, and opportunities for program improvements. It was also designed to provide information on how to target and market to various segments within the commercial population to increase participation.

The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate NTG ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering 2009 International Energy Conservation Code (IECC) standards, developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

2.3 EVALUATION METHODOLOGY

This section outlines the process and impact evaluation methodology, including data collection methods used to support the evaluation.

2.3.1 Process evaluation methodology

The evaluation included numerous activities in 2009 to directly address the process evaluation objectives. These activities included:

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[15] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

Table 2-2. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[16]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

Internal review. This activity included a project kick-off meeting; a review of existing program documentation, marketing materials, and the program tracking system; and in-depth interviews with ten Xcel Energy internal staff. PA interviewed the Cooling Efficiency program manager, two rebate processors, two Business Solutions Center (BSC) representatives, one Trade Relations Manager, two account managers, and the team lead energy efficiency engineer. These interviews were used to clarify the roles and responsibilities of staff and trade allies; program goals and successes/challenges in meeting those goals; the effectiveness of the programs' operations relative to the defined program goals and objectives; and reasons for variance in program performance by customer class (e.g., small business and other customer segments such as retail/office, food services).

Based on the internal review and project kick-off meeting, PA developed a detailed evaluation plan and program logic model.

Participating customer surveys. The participant survey collected information about participant characteristics and firmographics, equipment decision-making processes (including remaining markets for existing program participants), source(s) of program information, satisfaction with key aspects of the program and the application process, barriers to participation, the effect of the program on their decision to install qualifying equipment, and suggestions for program improvements. In addition to providing data to estimate a net-to-gross ratio, the survey addressed key assumptions to the savings algorithm such as hours of use and baseline (what would have been installed without the program).

PA completed telephone interviews with 54 businesses that participated in the Xcel Energy Cooling Efficiency Program ("participants") since the program started (2007–2009). Some businesses participated in the program at multiple locations. Forty-four unique respondents represented these 54 businesses.

A detailed response rate table for the participant (and nonparticipant) surveys can be found in Appendix C.

Nonparticipating customer surveys. The nonparticipant survey was designed to help characterize the market for energy efficient HVAC equipment in terms of the types of

[16] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

customers and decision-makers. The survey collected data on program awareness, preferred sources of information, market barriers to participation, equipment decision-making processes, and characteristics and firmographics.

PA completed telephone interviews with 116 customers who had not completed a project through the Xcel Energy Cooling Efficiency Program since the program began ("nonparticipants"). Eighty-nine of these businesses had commercial cooling equipment and paid cooling costs to Xcel Energy ("eligible nonparticipants"). Nineteen of these businesses had cooling costs included in their lease and eight businesses had swamp coolers as their only cooling equipment. These businesses completed a shortened version of the survey ("ineligible nonparticipants").

Customer-identified Influential Trade Allies. The participant customer surveys were also used to assess free-ridership and spillover using a California influenced (and Xcel Energy approved) free-ridership and spillover battery. When assessing free-ridership and spillover, it is critical to speak with the person or persons most involved in the decision-making process. As we have found through other HVAC free-ridership and spillover studies, the decision maker is often not the customer. Rather, select trade allies tend to be influential in the decision-making process. In cases where the customer identified the trade ally as being influential in the decision, we also attempted to speak with the trade ally. PA completed 11 surveys with influential trade allies to assess the influence of the program on that particular project.

Participating and nonparticipating trade ally interviews. The participating and nonparticipating trade ally interviews provided rich qualitative information regarding program design and program impacts. PA sampled a census of participating trade allies from the program database, including those with very little activity. We also received a list of nonparticipating trade allies to sample from.

PA conducted in-depth interviews with 17 participating and 13 nonparticipating trade allies. These trade allies included those that supplied, installed, and serviced cooling equipment, as well as an engineer and several equipment suppliers. The interviews probed on a variety of issues including type of business activities, awareness of the program and program offerings, source of program information, barriers to customer (particularly small business) and trade ally participation, and recommendation practices for efficient equipment and program influence in these practices. The interviews also explored trade allies' perception of the difference in purchasing and decision-making practices between different commercial customer segments (small, medium, large, national chain accounts vs. independently owned) and the impact of the economy on the trade allies' abilities to promote, stock, and sell program-qualifying equipment. In addition, the trade ally interviews also attempted to gather information that could be used to assess market affects or other program-related impacts such as free-ridership and spillover[17].

Peer utility program benchmarking review. This task included a literature review, Internet research, and program manager and program evaluator interviews for eight similar utility

[17] Free-ridership refers to customers who participate in programs and obtain incentives for actions they claim they would have taken without the incentive. Spillover refers to savings induced by the program but not achieved (and claimed) through other utility programs.

programs. The benchmarking was designed to identify standard approaches and best practices in programs that are similar in scope and objectives to Xcel Energy's Cooling Efficiency program in Colorado. Specifically, the review examined program goals, objectives, and scope; effectiveness of the program in meeting goals and objectives; key elements of program design; marketing and recruitment of customers; quantification of program impacts; rebate levels; product offerings; application process; trade ally incentives and/or Quality Installation requirements; and trade ally outreach (especially to small business).

2.3.2 Impact evaluation methodology

The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[18], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Verify baseline and technical assumptions. The impact evaluation reviewed the 2009 baseline and technical assumptions using information relevant to Xcel Energy's territory and made recommendations concerning any adjustments we believe Xcel Energy should make going forward. The review activities included: (1) tracking system review, (2) engineering assumption review, and (3) participant survey results and project file review.

Calculate gross savings with IECC 2006 codes. The impact evaluation focused on 2009 program participants and on future years rather than reviewing assumptions retroactively. PA reviewed tracking system data from the Program Year 2009 applications that had been used to estimate program savings (Colorado uses IECC 2006 codes as the 2009 program baseline). For Program Year 2010, Colorado will also be using IECC 2006. Future program years after 2010 may be shifting the baseline to the IECC 2009 codes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

Develop net-to-gross ratio. The net-to-gross ratio was calculated based on interviews with 1) 2008–2009 participating customers and influential vendors, 2) in-depth interviews with contractors, and 3) a literature review and benchmarking interviews with program managers of similar programs in the US.

2.4 ORGANIZATION OF THE REPORT

Section 3 of this report presents the findings from the various process evaluation activities, and Section 4 presents the findings from the impact evaluation activities. Section 5 provides suggested recommendations for program changes that could increase participation, reduce burden, and increase program impacts.

Appendix A contains the Technical Resource Manual review summary and Appendix B contains the IECC 2006 and IECC 2009 equipment analysis conducted as part of the impact

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[18] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes instead of looking backward to codes that no longer apply.

evaluation activities. Appendix C contains the response rates to the participant and nonparticipant customer surveys.

3. PROCESS EVALUATION FINDINGS

This chapter presents the results of the process evaluation based on interviews with internal program staff, participant and nonparticipant customer surveys, participant and nonparticipant trade allies, and the benchmarking review. These results are organized as follows:

- Key findings
- Program administration, processes, and resources
- Participating and nonparticipating customer characteristics
- Participating customer satisfaction with the program
- Customer awareness and marketing
- Customer decision making processes
- Trade ally results
- Benchmarking results
- Program potential
- Opportunities for improvement

3.1 KEY FINDINGS

Before discussing the results we present the overarching key process evaluation findings. Key findings are detailed by program design and operations, customer experiences, trade ally experiences, and barriers to new equipment purchases and program participation.

3.1.1 Program design and operations

- Program staff believe the Prescriptive component of the program is an area of the program that is working well. They have experienced frustration with the custom program and reported there have been trade allies and customers also frustrated with this component of the program. Trade ally interviews confirmed some level of frustration with the custom component of the program, although the issue did not arise through interviews with program participants who received services through the custom program. In fact, the post-inspection process, which was a point of contention raised in internal and trade ally interviews, received a high rating of satisfaction by custom program participants.
- Xcel Energy employs an assigned Trade Relations Manager to communicate and work directly with trade allies in Colorado. Having this assigned Trade Relations Manager was seen as a critical role by program staff, although having only one person fill this role for the entire state may mean that more rural or outlying areas are not being reached.
- The Business Solution Center (BSC) is viewed favorably by program staff as a referral point for the non-managed and small business customers. However, there is little direct marketing activity to small commercial customers through the BSC.
- Several program staff commented on the need to receive information regarding program changes in a more formal manner.

- Xcel Energy's Cooling Efficiency program is consistent with other programs as identified in the benchmarking study. Measures with incentives and other incentives are within range of or slightly lower than other programs.
- The benchmarking study attempted to identify net-to-gross ratios used by other programs. Some programs were able to provide their net-to-gross ratios based on evaluation efforts, although most program managers were unable to provide this information as either they use a deemed net-to-gross value or are not required to report net-to-gross ratios for their program. The primary and secondary data review provided context for the Xcel Energy net-to-gross results, indicating that the results are in line with other programs.
- The benchmarking study identified a variety of best practices for cooling programs.
  - Utilize key account representatives and trade allies as much as possible for program communication.
  - Become fully educated on trade associations when leveraging them to target customers. Identify all associations representing that particular market segment and have control mechanisms in place to scale down or ramp up depending on activity level.
  - Identify a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs.
  - Set effective rebate and efficiency levels. A comparison of rebate levels in other programs with Xcel Energy's found Xcel Energy's rebates are some of the lowest for air conditioning systems. Xcel Energy is also rebating a lower SEER rating for packaged and split AC units than other programs.
  - Streamline the application process.
  - Engage the customer early in their decision-making process to influence their choice of equipment.
  - Provide customer education and assistance as well as the rebate. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers.

3.1.2 Customer characteristics and experiences

- There are some differences in customer characteristics between participants and nonparticipants. Participants are more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Participants are also more likely to be managed accounts. Although the average operating hours do not differ between participants and nonparticipants, participants are significantly more likely to have hours that very by the season or operating cycle. Participants are also more likely to own their building, and are more likely to report having taken an action in the past few years to reduce energy use.
- Overall, program participants are satisfied with the Cooling Efficiency program. They were also satisfied with the various aspects of the program, such as the post-inspection process, type of equipment eligible, the contractor they worked with and the rebate application process. Both participants and non-participants were satisfied with Xcel Energy in general.

- Approximately one-fourth of nonparticipants are aware of the program. The most common way that aware nonparticipants heard about the program was through Xcel Energy direct mail or a HVAC vendor.
- Account managers have been the most effective outreach channel for program participants, cited by 55 percent of participants. Hearing about the program through a HVAC vendor was the next most common way of learning about the program. Provided a significant portion of the program population is managed accounts, it is not surprising that account managers were identified by customers as the most notable means for hearing about the program.
- Few customers mentioned marketing materials as a means for hearing about the program. Interviews with program staff identified that the marketing materials distributed to customers and available to program staff are fairly generic, although the customer sectors that the program serves are unique.
- The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment.

3.1.3 Trade ally experiences

- Nearly three-quarters of nonparticipating contractors are aware of the program; therefore, lack of general awareness does not seem to be a barrier to program participation (although deeper understanding of the program is important). Participating and nonparticipating trade allies heard about the program through Xcel Energy representatives, materials, events, customers, and other Xcel Energy programs.
- The primary program-related benefits noted by trade allies are: being more price competitive by including the Xcel Energy rebate, and the ability to communicate and educate customers on energy efficiency by promoting the program. Trade allies saw the benefits for customers as primarily the cost savings, although increased energy efficiency was also mentioned.
- While participating trade allies are generally optimistic that their participation in the program will increase in the next 12 months, their optimism does not extend to the high efficiency HVAC market in general. They project it will continue to be difficult to convince customers to adopt high efficiency equipment due to financial constraints.
- Trade allies commented that it is more difficult to sell high efficiency equipment in replace-on-failure situations where decisions need to be made quickly. Therefore, it is important for trade allies to not just be aware of the program, but be intimately familiar with the program so they can easily and quickly provide information to customers in these situations.

3.1.4 Barriers to purchasing new equipment or participation

- The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital, mentioned by almost two-thirds of nonparticipants. This is consistent with information received from the trade ally interviews. When nonparticipants do need to replace equipment, contractors will be their first contact point.
- Both participating and nonparticipating trade allies corroborated nonparticipating customers' perception of purchasing barriers and identified the economy, coupled with the incremental cost of high efficiency cooling equipment as well as the first cost of cooling

equipment, as primary barriers for purchasing new, high-efficiency equipment. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high efficiency equipment as are leased buildings.

- Several trade allies distinguished the differences in barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost—the difference between standard and high efficiency equipment. For larger customers, the main barrier was first cost—large equipment is expensive and customers tend to repair it instead of replace it as long as possible (especially in the current economy).
- Another notable barrier was triple-net leases, which are reported as very common among commercial customers. In these situations, the customer does not own the building, but is responsible for the mechanical equipment. Trade allies report these customers are less likely to make the investment in high efficiency cooling equipment as they are unsure of how long they will be in the building and therefore may not realize the payback of the higher efficiency equipment.
- Non-financial barriers for moving customers to higher efficiency cooling equipment included customers' lack of awareness, knowledge, and/or understanding of the benefits of high efficiency equipment. Trade allies expressed the need for tools to help sell high efficiency equipment, and the need for more direct communications with Xcel Energy staff to understand program benefits, requirements, and obtain information necessary to help them sell equipment through the program.
- Trade allies provided a variety of suggestions for overcoming barriers, which typically corresponded to their perception of the barriers for selling high efficiency equipment. Suggestions for overcoming barriers include increasing the rebate levels, better educating trade allies on the program, helping them to sell high efficiency equipment by providing tools to help with the sales process (e.g., savings calculator), making the custom component of the program less burdensome and more transparent for trade allies and customers, and directly marketing the program to customers. Participating trade allies also suggested that Xcel Energy have more personal communications with them to provide information about the program.

3.2 PROGRAM ADMINISTRATION, PROCESSES, AND RESOURCES

As documented throughout this report, program participants, trade allies, and program staff generally speak favorably about this program. The Prescriptive component of the program in particular was mentioned by all parties interviewed as a component of the program that is working well.

Interviews with program staff, customers, and trade allies investigated the effectiveness of program administration, processes, and resources. This section summarizes the results of those interviews.

3.2.1 The prescriptive program and application process

The Cooling Efficiency Prescriptive Program's application process received special kudos from respondents, especially when they were comparing the program to other Xcel Energy programs. They commented that the application was streamlined, clear, and relatively easy to complete and process. This is particularly important amongst larger customers who do not

have time to deal with convoluted program processes and paperwork. This is consistent with remarks made by trade allies regarding the prescriptive application process.

Program participants were also generally satisfied with the application process, rating the process an average of 8.5 on a 0- to 10-scale where 10 indicates they were extremely satisfied with the processes. A majority of these program participants (52 percent) reported filling out the rebate application themselves and 10 percent of applications were completed by the equipment vendor.

3.2.2 Role of assigned trade relations manager

Two groups were specifically discussed as potential targets for Xcel Energy's Cooling Efficiency Program at the kick-off meeting: the trade allies and the non-managed accounts. The program is attempting to reach these targeted groups through the use of an assigned Trade Relations Manager and the Business Solutions Center (BSC).

The assigned Trade Relations Manager's role is to communicate and work directly with the trade allies in Colorado. It was clear through the interviews, and from our experience, that the trade allies are an important group to reach and inform about the program. They are a primary marketing tool for the program as they are often the first point of customer contact, especially for small commercial customers. They also have the opportunity to steer customers toward program-qualifying equipment with an eye to program requirements. Therefore, having this assigned Trade Relations Manager was seen as a critical role, and a positive component of the Cooling Efficiency Program.

Various program staff discussed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification. The trade allies discussed earlier in this report also raised this as a need for the program. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

The Trade Relations Manager is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, but he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado. There is question about whether the single Trade Relations Manager is sufficient to reach trade allies given the expanse of the state and differences in region.

The BSC focuses on increasing the participation of the non-managed accounts. The BSC is primarily responsible for fielding calls to the non-managed accounts and will in the near future provide proactive outreach to these customers through their outbound call center (this was not yet happening at the time of the interviews). Account Managers and the Trade Relations Manager spoke favorably of having the BSC as a referral point for the non-managed and small business customers. They appreciate the ability to refer customers they meet that are not managed accounts to this call center.

3.2.3 Program communications

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes.

Currently the program employs several methods of communication to staff working on the Xcel Energy Cooling Efficiency Program. The company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates.

Several individuals interviewed commented on the need to receive information regarding program changes more formally. They recognize that they receive emails with these updates sent to them, but the emails tend to get buried in day-to-day activities. One individual said he found out about program changes from a vendor rather than through an Xcel Energy Communication. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effectively getting the information across.

Trade allies interviewed also commented that they would like to receive more information from Xcel Energy as discussed in the trade allies section. For example, one trade ally requested the development of a website specifically directed at trade allies to provide easy access to updates and program information.

3.2.4 Program marketing tools

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency.

The marketing materials distributed to customers and available to program staff are fairly generic. Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist amongst small business customers and commercial organizations that are in leased space.

Retailers were also identified by program staff as a difficult to serve group. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease space so they do not have ownership over the equipment installed (yet have to pay the energy bills).

Additionally, program staff identified an additional complexity of serving the common area. The common area in shopping malls consumes a significant amount of energy but depends on building owners to retrofit the equipment.

Little direct marketing activity is currently aimed at small commercial customers through the Business Solutions Center. At the time of the interviews they were only working reactively with

customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it appears there is little cross-referral between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

Program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

3.3 PARTICIPATING AND NONPARTICIPATING CUSTOMER CHARACTERISTICS

The evaluation reviewed businesses that participated in the Xcel Energy Cooling Efficiency program from its inception in 2006 through July 2009. A total of 285 businesses participated in the program during this time period.

Table 3-1 shows the distribution of the population of participants by SIC category, compared to the population of the nonparticipant population. The largest proportion of participants are in the services and retail trade sectors, accounting for almost two-thirds of all participants. When compared to the nonparticipant population, retail trade establishments are overrepresented in the participant population, while finance, insurance, and real estate establishments are underrepresented in the participant population.

Table 3-1. SIC Breakdown of Participants and Nonparticipants

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Services	34% (N=76)	30% (N=33,648)
Retail Trade	30% (N=67)	15% (N=16,602)
Finance, Insurance, And Real Estate	9% (N=21)	19% (N=20,812)
Public Administration	6% (N=14)	8% (N=8,968)
Manufacturing	5% (N=11)	4% (N=5,052)
Transportation, Communications, Electric, Gas, And Sanitary Services	2% (N=5)	5% (N=5,582)
Construction	1% (N=2)	5% (N=5,645)
Wholesale Trade	1% (N=2)	4% (N=5,003)
Ag, Forestry, and Fishing	0% (N=0)	2% (N=2,278)

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Mining	0% (N=1)	0% (N=349)
Not classified	10% (N=23)	7% (N=7,938)

Source: Xcel Energy Participant and Nonparticipant Population Databases

The program struggles with small business and non-managed account participation. Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. However, in the nonparticipant population, only 3.3 percent of businesses are managed accounts.

The below analysis further characterizes participants and nonparticipants in terms of their hours of operations, building characteristics, energy saving activities, and general satisfaction with Xcel Energy. The analysis distinguishes between eligible and non-eligible nonparticipants. Eligible nonparticipants are classified as businesses that have commercial cooling equipment and the cooling costs included in their electric bill to Xcel Energy. Ineligible nonparticipants either have their cooling costs included in their lease or have swamp/evaporative coolers as their commercial cooling equipment. Businesses that reported not having cooling equipment were not interviewed.

Statistically significant differences between participants and nonparticiants at the 90 percent confidence interval are noted in the text. Caution should be used when reviewing differences between different groups due to the small sample size of the participant group.

3.3.1 Building characteristics

Participating and nonparticipating customers primarily occupy free-standing buildings (70 percent participant, 65 percent eligible nonparticipant). Ineligible nonparticipants were least likely to occupy free-standing buildings (46 percent ineligible nonparticipants).

While the trade ally interviews discussed that renting a building was a barrier to participation, the survey results show that a large proportion of eligible nonparticipants actually own their building. Approximately one-half of participants and eligible nonparticipants reported owning their building. Only 24 percent of ineligible nonparticipants own their building. Participants were more likely than all nonparticipants to manage the property (19 percent versus. 3 percent).

3.3.2 Energy conservation activities

Businesses that participated in the Xcel Energy Cooling Efficiency program were more likely to report having taken an action in the past few years to reduce energy use than nonparticipants. Eighty three percent of participants said they made some change to reduce energy use, compared with 72 percent of eligible nonparticipants and 53 percent ineligible nonparticipants. These differences are statistically significant.

Of the changes discussed, the change that showed the largest difference between participant and nonparticipant responses was installing high efficiency lighting equipment. Fifty two percent of program participants that said they made a change also said they installed high-

efficiency lighting equipment in the past two years, compared with 27 percent of eligible nonparticipants and 11 percent of ineligible nonparticipants. Although not explored specifically in the survey, one explanation for the significant difference is that customers are being cross-referred to one program when they participate in the other.

3.3.3 Satisfaction with Xcel Energy

Overall, program participants and nonparticipants are very satisfied with Xcel Energy, with participants indicating the highest satisfaction. When asked to rate their satisfaction on a 0- to 10-scale, with 10 being very satisfied, 93 percent of participants rated their satisfaction with Xcel Energy as a 6 or higher compared with 89 percent of eligible nonparticipants and 74 percent of ineligible nonparticipants.

Sixty-four percent of participants said they were extremely satisfied with Xcel Energy by rating their satisfaction as 8 or higher, compared with 53 percent of eligible nonparticipants and 35 percent on ineligible nonparticipants.

3.4 PARTICIPATING CUSTOMER SATISFACTION WITH THE PROGRAM

Overall, program participants are very satisfied with the Xcel Energy Cooling Efficiency program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied. Some explanations from customers on why they rated their program satisfaction as nine or above are as follows:

> *"It gives us money to spend on energy efficient projects we wouldn't have had. I use the rebate program all the time." —program participant*

> *"We had a couple questions on the application and the representative was very helpful in answering our question and guiding us on how to complete the application" —program participant*

> *"We purchased an existing building so we had access to their utility bills. We know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and part of the reason we were able to make the investment was because of the Xcel program." —program participant*

> *"It has a pretty easy process and the rebates came quickly." —program participant*

In addition to being asked about their overall satisfaction with the Xcel Energy Cooling Efficiency program, participants were asked their satisfaction level with various aspects of the program (using the same scale with 0 being not at all satisfied and 10 being very satisfied). As shown in Table 3-2, the average rating for all aspects of the program was 7.5 or higher. Participants of the custom program were also satisfied with the program, specifically the post-inspection process which they rated 9.2. The three aspects of the program with the lowest satisfaction rating (less than 8 on the 10 point scale) were the amount of time it took to receive the rebate, the length of time it took from project start to end, and the requirements for equipment eligibility.

Table 3-2. Participant Satisfaction with Specific Aspects of the Program

Specific Aspects of the Program	Mean rating (0-10 scale)
Post-inspection process (n=5, custom only)	9.2
Type of equipment eligible for program (n=43)	8.7
Contractor who installed equipment (n=44)	8.5
Rebate application process (n=43)	8.5
Support you received from Xcel Energy (n=43)	8.1
Pre-approval process (n=5)	8.0
Program's handling of questions/complaints (n=42)	8.0
Amount of time it took to receive rebate (n=43)	7.9
Length of time it took from project start to end (n=4)	7.8
Requirements for equipment eligibility (n=43)	7.5

Source: Xcel Energy Participant Survey, SA6A-K

Consistent with the high satisfaction rating for the type of equipment eligible for the program (8.7), all respondents reported that the cooling equipment installed through the Xcel Energy Cooling Efficiency program is still installed at their business.

Participating customers were asked what features of the program, if any, they would like to see changed. As shown in Figure 3-2, 67 percent of participants said they would not change anything. This is another indication that overall, the program participants were very satisfied with the program.

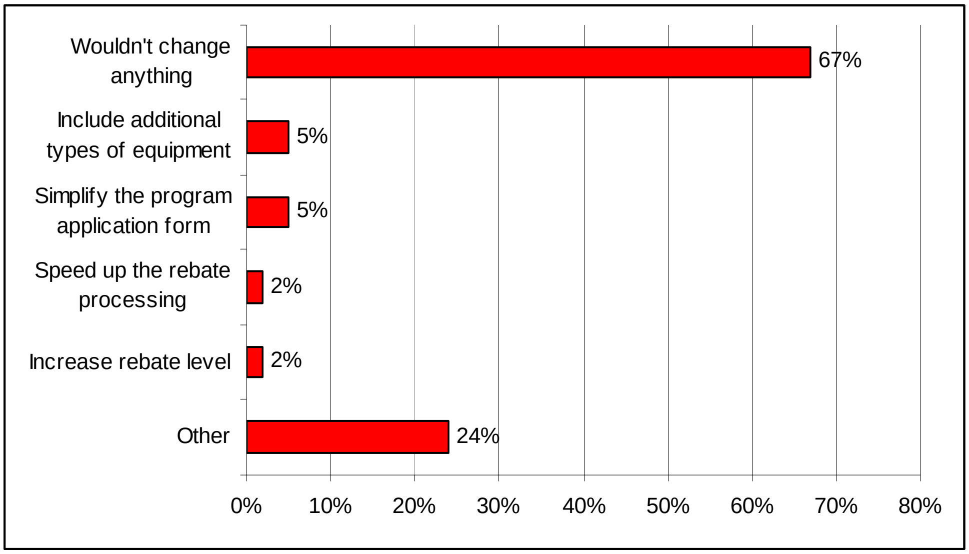
Those that did offer suggestions for improvements mentioned including additional types of equipment (five percent), simplifying the program application form (five percent), speeding up the rebate process (two percent), and increasing the rebate amount (two percent). These were consistent with the components of the program where participant satisfaction was lower. Some of the “other” suggestions mentioned included: communicate how the custom rebates are calculated (this was expressed in both internal staff and trade ally interviews as well as a source of frustration for some), include the option to submit the rebate application online, and provide a savings calculator to customers (this was also expressed in trade ally interviews as an area for improvement).

Below are quotes from a couple of participants on what features they would change with the program.

> *“It would be nice to get closer to instant responses on the rebate process. It seemed like there was a lot of back and forth.” —program participant*

> *“Specify what the unit is supposed to do and how to measure the savings.” —program participant*

Figure 3-1. Features of the Program Recommend Changing (n=42)



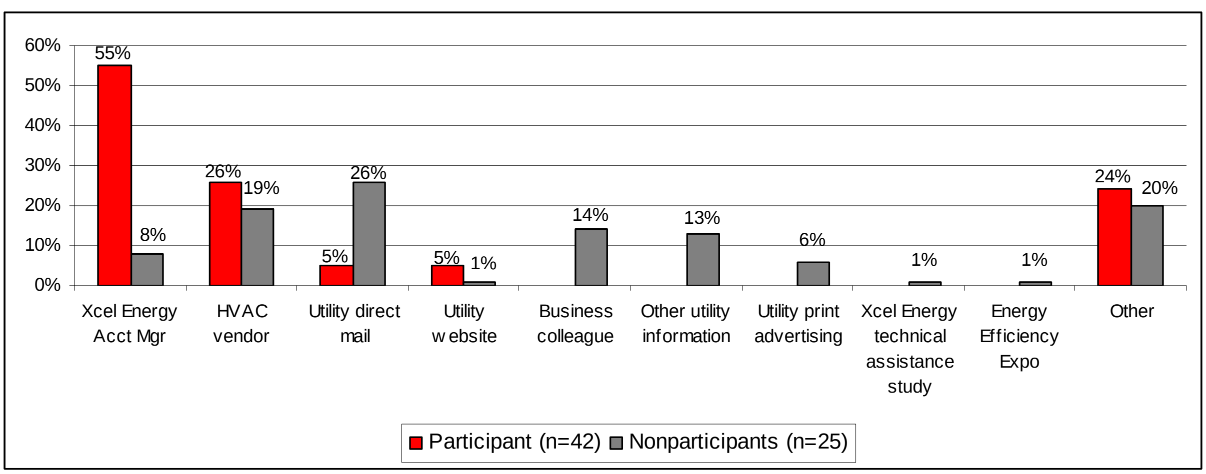
Source: Xcel Energy Participant Survey, SA7

3.5 CUSTOMER AWARENESS AND MARKETING

3.5.1 Participants

Account managers are the most noted outreach channel for program participants, followed by HVAC vendors*.* Program participants primarily heard about the Xcel Energy Cooling Efficiency program through their Xcel Energy account manager (55 percent). Of the managed accounts, 69 percent of participants mentioned that they heard about the program from their account manager. Hearing about the program through a Heating Ventilation and Air Conditioning (HVAC) vendor was the next most common way to find out about the program. Other ways participants heard about the program included: a contractor that worked on the building, an architect, or an engineer (Figure 3-3).

Figure 3-2. How Customer First Heard about Xcel Energy Cooling Efficiency Program



Source: Xcel Energy Participant and Nonparticipant Surveys, PA1 and A1

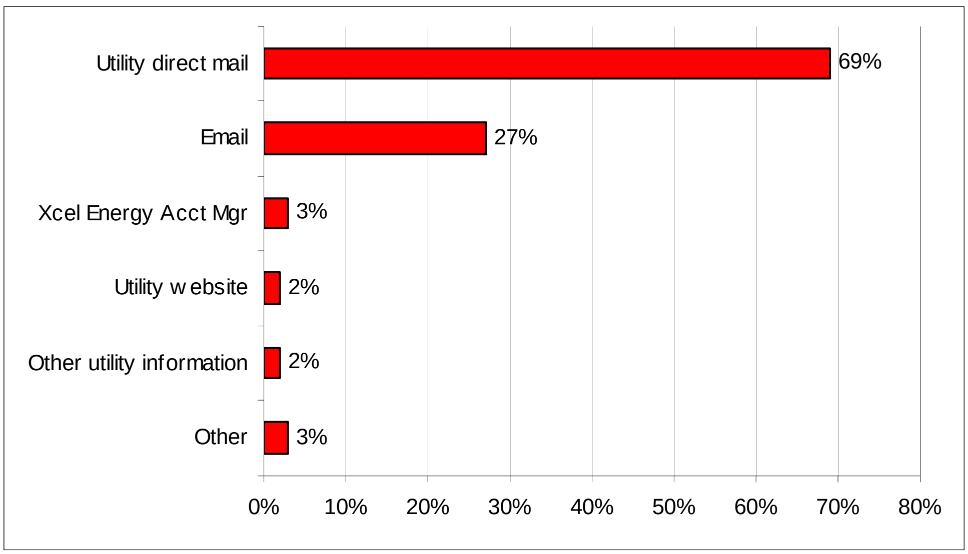
3.5.2 Nonparticipants

Approximately one-fourth of nonparticipants are aware of the program. Customers who have not participated in the Xcel Energy Cooling Efficiency program were asked if they had previously heard of the program. Of the nonparticipants who have cooling equipment and pay the costs for cooling, only 27 percent said they had heard of the program.

Unlike participants, the most common way for eligible nonparticipants to hear about the Xcel Energy Cooling Efficiency program was through Xcel Energy direct mail (26 percent). Another 19 percent heard about the program through their HVAC vendor, 14 percent through a business colleague, and 13 percent from other utility information.

Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, mentioned by 69 percent of nonparticipants. The second preferred way to receive information is through email, mentioned by 27 percent of eligible nonparticipants (Figure 3-4). A similar pattern was found for ineligible nonparticipants; 67 percent prefer to receive information from Xcel Energy by direct mail and 26 percent by email.

Figure 3-3. Prefer to Receive Information about Energy Efficiency Programs (n=88)



Source: Xcel Energy Nonparticipant Survey, A12

If a nonparticipant was interested in contacting a utility representative about an Xcel Energy program or service, 67 percent indicated they already had contact information. The 1-800 phone number was the most common means they would use to contact a utility representative (52 percent). A small percentage (five percent) mentioned the Business Services Center (BSC).

3.6 CUSTOMER DECISION MAKING PROCESSES

3.6.1 Participants

The introduction to the participant survey focused on identifying the key individual involved in the decision to install equipment through the program. In addition, the survey asked if others were involved in the decision. Two-thirds of the Cooling Efficiency program participants indicated there was more than one person involved in the decision of whether or not to

purchase cooling equipment through the program. Other company personnel involved in the decision to purchase equipment through the program included: business owner, maintenance supervisor, current tenant, property management department, Chief Financial Officer, architect, and the business services superintendent.

The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. Program participants were asked to rate the importance of various factors that might have influenced their decision to purchase the cooling equipment. The rating was done on a scale of 0 to 10, with 10 being very important and 0 being not at all important in their decision. The age or condition of the old equipment was the most important factor, which was rated 8.1. As shown in Table 3-3, two other factors for purchasing new cooling equipment was rated an average of 7.0 or higher: standard practice or corporate policy and the payback on investment.

Table 3-3. Importance Factor for Purchasing Cooling Equipment for Participants

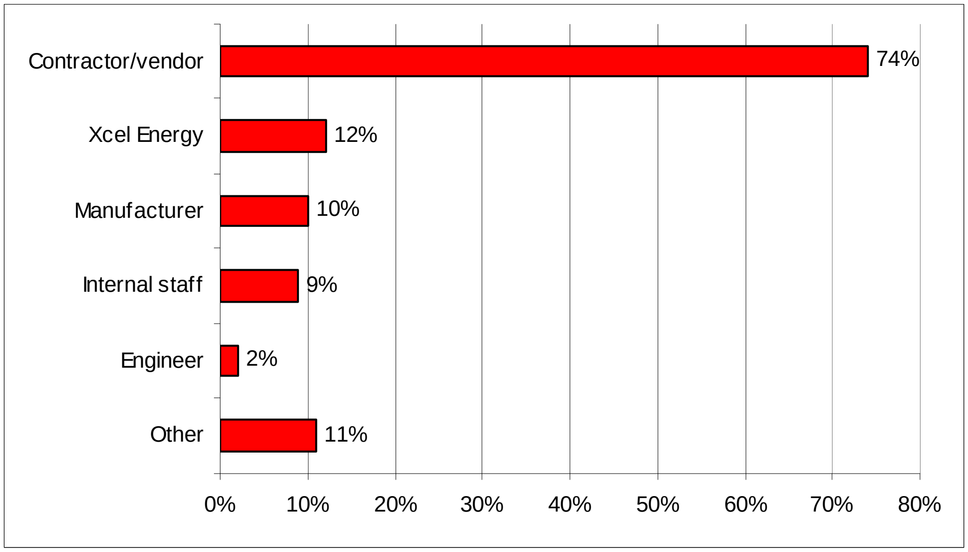
Importance Factor on Purchasing Decision	Mean rating on 0-10 scale
Age or condition of old equipment (N=50)	8.1
Standard practice or corporate policy (N=52)	7.2
Payback on investment (N=52)	7.2
General concerns about the environment (N=54)	6.6
Information provided through a Xcel Energy feasibility study (N=3)	6.3
Availability of program rebate (N=54)	6.0
Recommendation from a vendor/supplier (N=51)	6.0
Previous experience with the Cooling Efficiency program (N=43)	4.7
Endorsement or recommendation by Xcel Energy staff (N=52)	4.5
Information from the program marketing materials (N=52)	3.9
Information from the program training course (N=45)	2.8

Source: Xcel Energy Participant Survey, N3a-l

3.6.2 Nonparticipants

One factor when purchasing new equipment is deciding who to contact first to purchase the equipment. Almost all (74 percent) of eligible nonparticipants said that they would contact a contractor or vendor when purchasing cooling equipment. Contacting Xcel Energy or the equipment manufacturer were the other contacts mentioned by 12 percent and 10 percent respectively (Figure 3-5).

Figure 3-4. Preferred Contact Person when Purchasing New Cooling Equipment (n=84)



Source: Xcel Energy Nonparticipant Survey, I0

Twenty-two percent of eligible nonparticipants report that they have a policy that mandates the installation of energy efficient equipment when purchasing new equipment. When asked specifically what the company policy is for purchasing new equipment, respondents were unable to indicate a specific efficiency level or go into detail as to the company policy. Several businesses mentioned that they are trying to be as 'green' as possible and purchase efficient equipment. A couple respondents also mentioned that the equipment they purchase needs to be ENERGY STAR® rated.

The largest obstacle cited by nonparticipants when purchasing new equipment is the lack of capital, which was mentioned by 61 percent of eligible nonparticipants. This is consistent with information received from the trade ally interviews discussed later in this report. Other barriers that businesses face when considering purchasing new equipment include: the budgeting process (10 percent), lack of resources to implement (seven percent), time constraints (four percent), approval by board members (four percent), and the uncertainty of the return-on-investment (two percent).

3.7 PROGRAM POTENTIAL: NEEDS IDENTIFIED THROUGH NONPARTICIPANT INTERVIEWS

Of the population of existing nonparticipants, approximately three-fourths of this population could participate in the Cooling Efficiency Program (eligible nonparticipants). Ninety-seven percent of nonparticipating businesses contacted pay their electric bill to Xcel Energy[19]. Of those who pay their electric bill to Xcel Energy, 77 pay for cooling at their building.

The evaluation identified the lack of knowledge of the program among nonparticipants as a cause for lost opportunity among the program. When eligible nonparticipants were asked if they had purchased cooling equipment in the past two years, 33 percent reported that they

[19] The small percent that do not pay their electric bill to Xcel Energy are customers who rent/lease and the landlord pays the utility bill or property managers that report that tenants pay the cooling bills.

had. Only a small percentage (six percent) of those who had purchased or considered purchasing cooling equipment considered participating in the Xcel Energy Cooling Efficiency program. The primary reason they did not participate in the program was because they were not familiar with program requirements.

One key factor with a commercial cooling rebate program is for customers to understand the types of equipment customers currently have and the types of equipment they plan to purchase. Eighteen percent of nonparticipants who could participate in the program indicated that they are in the process of budgeting for or planning to purchase new cooling equipment. On average, eligible businesses expect to purchase the new equipment in 17 months.

Of the equipment installed, the greatest potential according to the nonparticipant surveys is roof-top units and condensing units. Roof-top units are the most common type of commercial cooling equipment used by eligible nonparticipants. Sixty-four percent of these nonparticipants have a roof-top unit installed and 30 percent of these nonparticipants plan to purchase a new roof-top unit. Condensing units are the other main type of commercial cooling, with 52 percent of businesses having a condensing unit installed and 29 percent of these planning on purchasing a condensing unit. Table 3-4 lists other common types of installed commercial cooling equipment and equipment that is planned for purchase.

Table 3-4. Type of Equipment Nonparticipants Have Installed and Plan to Purchase

Equipment	Installed Equipment at Business (n=80)	Currently Budgeting to Purchase Equipment (n=17)
Roof-top units	63.7%	30.4%
Condensing units	52.0%	28.7%
Split system air conditioners	23.9%	0.0%
Variable air volume boxes	13.7%	10.4%
Chillers	11.8%	3.4%
Packaged thermal air conditioners	8.2%	20.9%
Oversized cooling towers	7.6%	11.3%
Water source heat pumps	3.8%	17.3%
Other cooling equipment	10.8%	17.3%

Source: Xcel Energy Nonparticipant Survey, E1 and E5

One reason businesses plan to purchase new equipment is due to the age of their old equipment. Table 3-5 below shows the percent of each type of equipment that is 15 years old or older for eligible nonparticipants. This is consistent with some of the information gathered during the trade ally interviews where they said there is a market out there given the age of existing equipment

Table 3-5. Percent of Installed Equipment More than 15 Years Old among Nonparticipants

Equipment	Old Equipment More than 15 Years Old
Water source heat pumps (N=3)	33.3%
Variable air volume boxes (N=15)	28.2%
Oversized cooling towers (N=8)	25.0%
Roof-top units (N=48)	20.9%
Split system air conditioners (N=21)	16.5%
Condensing units (N=41)	10.5%
Chillers (N=15)	3.9%
Packaged thermal air conditioners (N=12)	3.2%
Other cooling equipment (N=9)	16.0%

Source: Xcel Energy Nonparticipant Survey, E3

For future cooling equipment purchases, eligible nonparticipating business customers demonstrated a level of interest in participating in the Xcel Energy Cooling Efficiency program. The average interest level was 7.27 on a 0- to 10-point scale, with 10 being very interested.

3.8 TRADE ALLY PARTICIPATION

We spoke with thirty trade allies as part of this program evaluation, 17 participating and 13 nonparticipating trade allies. This section summarizes the results of these interviews.

3.8.1 Characteristics of trade allies interviewed

Trade allies interviewed typically installed and serviced cooling equipment. PA also spoke with an engineer and several equipment suppliers. These trade allies work with a combination of planned replacement, new construction/major renovation, and replace-on-failure projects.

A significant portion of certain trade allies' work is replacement-on-equipment-failure. Nonparticipating trade allies were more likely than participating trade allies to report a higher percentage of their projects as replace-on-failure and a lower percentage of their projects as new construction/major renovation.

3.8.2 Trade ally awareness of Xcel Energy's cooling efficiency program

Nearly three quarters of nonparticipating trade allies (8 out of 11 that provided a response) said they were aware of Xcel Energy's Cooling Efficiency Program. Both participating and nonparticipating trade allies said they heard about the program through Xcel Energy staff, materials, seminars, their customers, or equipment suppliers.

One other source of program awareness is their participation in other residential programs provided by Xcel Energy. A number of trade allies interviewed also service residential customers and refer customers to Xcel Energy's residential efficiency programs. Through their

experience with these programs, they became familiar with the commercial program. This indicates the continued potential for Xcel Energy to cross-market the program through their other programs.

Trade allies report that it is more difficult to sell high efficiency equipment when there is a failure than when it is a planned project. These decisions need to be made quickly and efficiently. So while trade allies may be aware of the program, they may need a much better understanding of the benefits and offerings so they can more easily promote the program with their bid to the customers.

3.8.3 Benefits of the program for trade allies and customers

Participating trade allies were quick to comment that the program benefits both them and their customers. The ability to offer the incentive and make the purchase more cost-effective were the most commonly noted benefits of the program. However, the benefits go beyond just the incentive value. Trade allies mentioned that the program gives them an edge over their competitors, who are not taking the time to spec out bids with high efficiency options incorporating the rebate. Even if the customer chooses not to install high efficiency, the options give the appearance of the contractor taking the time to think through the alternatives for the customers' consideration.

The program also provides participating trade allies the opportunity to discuss energy efficiency with their customers. These trade allies are proponents of energy efficiency and enjoy the opportunity to promote high efficiency equipment. Because of the program, they are able to generate more conversation around the benefits of energy efficiency than they would have without the program.

According to participating trade allies, customers generally participate in the program because 1) they have a need for the equipment, 2) the program reduces the cost of the equipment, and 3) the equipment is more efficient and will result in longer-term savings. Several respondents also mentioned the desire or (in some cases) requirement for customers' buildings to be LEED certified; Xcel Energy's Cooling Efficiency Program helps them obtain this certification status more cost-effectively.

One trade ally specifically addressed the impact the program has on his sales. He said the Cooling Efficiency program, along with other initiatives such as LEED certification, has certainly impacted his ability to sell high efficiency cooling equipment. In fact, he said that without the program and these other initiatives he does not think he would have sold any energy efficient equipment this year.

3.8.4 Barriers to selling high efficiency equipment

One of the primary objectives of the interviews was to identify barriers for selling high efficiency equipment. Below we list the commonly mentioned barriers, the most notable being initial incremental costs of high efficiency equipment coupled with a weakened economy.

Economic downturn coupled with high incremental cost of high efficiency equipment. Economy was the buzzword throughout the trade ally interviews. One interviewer summed up the issue saying that activity now has little to do with the incentives available and more to do with the general economic environment. This respondent believed that absent a significantly higher incentive value to cover the incremental cost there will be less movement toward high

efficiency in the current economy. Other respondents provided similar philosophies by discussing the difficulty in encouraging their customers to install high efficiency equipment. When asked about the future of the cooling market, contractors often commented that customers would like to see trend toward increasing efficiency, thereby *uplifting the economy.*

Interviewees indicate the cost of high efficiency equipment is the primary barrier to moving forward on high efficiency purchases and installations across all commercial segments. However, for smaller commercial customers, several respondents commented that it is the relative incremental cost for smaller commercial customers. They reported that for smaller units, the incremental cost as a percentage of total cost is greater and the Xcel Energy rebate covers less of the incremental cost for smaller units.

Other respondents said that first cost is the biggest barrier for the larger commercial customers that use larger equipment. They reported that the cost of replacing that equipment is very significant. If they do replace it, the incremental cost is less and the Xcel Energy rebate covers more of the incremental cost of large equipment than for small equipment.

However, numerous respondents commented on the fact that these larger commercial customers are most likely to attempt to repair rather than replace the failing equipment. One respondent illustrated the point using the example of a customer whose repair of their old, inefficient rooftop unit cost about half the cost of installing new equipment. Although the newer more efficient equipment would yield savings within a three year payback and the contractor projected that the customer would need to replace the equipment within the next five years, they chose to go ahead with the repair instead of replacement. The capital investment of the new equipment was just too much for them to front if a repair for lower cost was possible.

Table 3-6 provides further qualitative evidence of trade allies' perception of the difficulty in selling high efficiency cooling equipment to their customers in this market. Participating and nonparticipating contractors were asked to rate their perceived level of difficulty in selling high efficiency cooling equipment to their customers on a one to five scale, where one was very difficult and five was not at all difficult.

As the table shows, the majority of participating trade allies rated the difficulty between a two and three although three respondents said selling high efficiency equipment was easy (rating of 4 or 5). Several trade allies mentioned that it is easier to sell the equipment to larger than smaller customers, quoting the large savings and increased payback as the reason. One respondent who rated it difficult to sell high efficiency said the rating would have been different in prior years when the economy was better; for these years, the sales of higher efficiency equipment was easier.

This analysis should be viewed with caution as it is based on very limited number of cases and cannot be extrapolated to the participating and nonparticipating trade ally population. However, the story it presents is compelling and shows the importance of reaching nonparticipating trade allies to help them promote high efficiency cooling equipment.

Table 3-6. Difficulty in Selling High Efficiency Cooling Equipment to Customers (1=very difficult, 5=not at all difficult)

Ratings												Average
Participating trade allies (n=11)	2	2	2	2.5	2.5	3	3	3	4	5	5	3.1
Nonparticipating trade allies (n=9)	1	1	1	1	2	2.5	3	3	3			1.9

There is some qualitative evidence that the program is helping to overcome the barrier of selling high efficiency cooling equipment. Nonparticipating trade allies were more likely to say selling high efficiency cooling equipment to customers is very difficult. Whereas no participating contractors rated the difficulty of selling high efficiency equipment a one, four nonparticipating contractors provided a rating of one. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary driver for their low ratings. Incidentally, these nonparticipating trade allies were also more likely to say they serve small business customers (under 500 kW), which may also be a driver of the increased perception of difficulty in selling high efficiency cooling equipment to their customers.

Relative low cost of energy. Several trade allies half jokingly commented that commercial customers would be more apt to participate and see greater value from the program if their energy rates were higher. One trade ally expanded on this discussion by saying that he has seen a distinct trend in the purchasing of high efficiency equipment with a higher cost of electricity. His perception was that since the economic shift, energy prices decreased which thereby decreased the demand for high efficiency equipment along with the reduced cash flow resulting from the poorer economy.

Customers' lack of knowledge and/or understanding of the benefits of energy efficiency. Another common theme heard throughout the interviews was the need for contractors to educate their customers on the benefits of high efficient equipment. Commercial customers may understand conceptually that there could be benefits to installing high rather than standard efficiency equipment; however, when faced with the incremental costs to install that equipment, customers may select the standard efficiency equipment to avoid the extra up-front expenditures. Contractors frequently commented on the need to educate these customers and help them understand the return-on-investment for them and how the installation of high efficiency equipment would positively impact the organization's cash flow. "*They don't understand life cycle costs, lease structures, and access to capital*."

Need for tools to help trade allies sell high efficiency cooling equipment to customers. Participating trade allies were asked what tools were available from Xcel Energy that helps them sell high efficiency cooling equipment. Of the thirteen individuals that answered this question, five said either they don't know what tools are available to them or they do not believe there are any tools available to them through the program to help them sell high efficiency cooling equipment.

As a follow-up to this question, trade allies were asked what tools they would like Xcel Energy to provide to help them sell high efficiency cooling equipment. Several respondents felt they had enough information in the rebate forms and brochures distributed to them by Xcel Energy.

However, several respondents did have recommendations for information or tools to help them promote equipment through the program. The most frequently cited request was for a tool to help trade allies calculate energy savings, payback, return-on-investment, and/or rebate values. While some respondents felt capable of doing these calculations on their own, others did not feel they had sufficient knowledge to do this. As one trade ally stated, "*We lack the software to be able to tell them what their payback is…we don't know the math*." Another respondent referred us to a tool through the Commercial Real Estate Energy Efficiency Program (CREE) website. This tool calculates return-on-investment of energy efficiency improvements. At a minimum, the program could promote this tool to trade allies.

Another respondent commented that he was able to calculate the energy savings and related rebates, but the rebate ended up being less than initially specified. He noted, "*If there was some way to automate that, to better calculate the rebate, that would be good."*

In terms of the materials provided by Xcel Energy, those who received the materials for the most part felt they were sufficient. Several respondents noted that they use the website often to obtain materials, although they would appreciate more hard copy materials for distribution to their customers. Another respondent said they would appreciate some verbiage from Xcel Energy on the benefits of the program and installing high efficiency equipment to include in their marketing materials.

Last, several trade allies said that it is difficult to see what is new in Xcel Energy's program through the website. They suggested that to make this process easier, perhaps Xcel Energy could have a website targeting only trade allies that clearly identifies program updates. This suggestion was also made in the internal interviews with Xcel Energy staff.

Need for more personal interaction with Xcel Energy staff. Building on the above point, five of the participating contractors said they did not recall receiving or were not provided with tools or information from Xcel Energy staff to help them sell high efficiency equipment. And one trade ally specifically mentioned the need for more personal interaction with staff to help arm him with the knowledge to better promote high efficiency cooling equipment.

Trade allies who do regularly interact with program staff were complimentary of their experience with these staff. They describe their interactions with Xcel Energy representatives as helpful, say they were excellent in interacting with the contractors and providing timely information. In general, they just want more of this interaction.

There is only one Xcel Energy staff member assigned to reaching out to contractors throughout the state of Colorado. He plans events for contractors, such as the workshops, seminars, and breakfast events to educate contractors about the program. Internal interviews identified that only having one trade ally representative may result in not personally reaching as many trade allies as desired, particularly in less populated areas.

3.8.5 Overcoming the barriers and increasing participation

Trade allies were encouraged to share their ideas regarding ways to overcome programmatic barriers and increase participation. These recommendations are detailed below.

a. INCREASE REBATE LEVELS

Not surprisingly, the most commonly noted recommendation was for the program to increase its rebate levels. It is not that trade allies felt the incentive levels were entirely too low, but that an increased incentive level would be beneficial in battling the incremental cost and reducing the payback period that plagues the ability for customers to install program-qualifying equipment. As found in the benchmarking review of rebate levels in other programs, Xcel Energy's rebates are some of the lowest for air conditioning systems.

b. EDUCATE TRADE ALLIES

Another recommendation made by several respondents was to better educate trade allies and make them more aware of the program benefits. These respondents discussed the need for Xcel Energy to make the process as easy and seamless as possible for trade allies—including marketing to customers using return-on-investment analysis. "*If it's not easy, we won't do it.*" One trade ally expanded on the need for more education noting the influx of new trade allies in the industry. He said that each time an HVAC contractor goes out of business, three more open up. This turnover increases the need for continual education and marketing from Xcel Energy among the trade ally groups. This recommendation is consistent with best practices found as part of the benchmark review of other programs.

c. IMPROVE THE CUSTOM PROCESS

Participating trade allies provided suggestions to make the custom program less burdensome for trade allies and customers. For the most part, participating trade allies thought the application and rebate processing requirements for the prescriptive component of the program were appropriate and not overly cumbersome. The distinction several respondents made, though, was between the prescriptive and custom program. These respondents said the administrative burden for completing the custom applications is high. One respondent compared the process to the prescriptive program which he described as not at all difficult to complete.

Another respondent described the custom program and its processes as a "*nightmare*." The time to complete the application and get Xcel Energy involved is significant and in some instances results in him losing the job. The trade ally expanded on this statement by saying that the rules for qualifying equipment do not seem to be transparent, which frustrates the trade ally and his customers.

One trade ally noted an additional complication in the custom process; his perceived inability to easily and quickly provide a rebate value to the customer. This trade ally said that he could calculate an incentive value based on manufacturer specifications and an understanding of the original equipment; however, he cannot provide the incentive level with enough certainty to make the customer comfortable with investing in the purchase.

This perception about the custom program and its application and project process is consistent with what we heard in the internal interviews. Account and trade representatives mentioned that the custom application process was significantly more cumbersome and involved than the prescriptive program process.

The reputation of the custom program reached trade allies that have not yet worked with a customer through that component of the program. One participating trade ally interviewed

commented on additional equipment he would like to see included in the program (evaporative coolers) and wondered if this measure could be promoted through the custom program. However, while this respondent recognized the usefulness of the custom program, he commented on the feasibility of going through the custom program, saying that there have been grumblings from others in the industry that the process is "*difficult and rigorous*."

d. MARKET DIRECTLY TO CUSTOMERS

Trade allies for the most part thought the program could more directly market to customers. Several respondents said the direct marketing should provide general information about the program and include analysis tools or information to illustrate the energy and/or financial savings from installing high efficiency equipment. This is not to say that customers are not receiving sufficient information about the program; the customer survey results will explore this issue more.

Trade ally responses varied considerably in their assessment of customers' awareness of the program. On average, participating trade allies said that almost one-half of their customers know about the program (sample size is only 10, so this information should be viewed as qualitative). One participating trade ally said that none of his customers were aware of the program and two trade allies said that all his customers were aware of the program. (Table 3-7). Nonparticipating trade allies were more likely to say that fewer of their customers were aware of the program.

Again, this information should be interpreted with caution given the sample sizes. The analysis represents the interviewed trade allies, not the trade ally population at large.

Table 3-7. Trade Ally Perception of Customers' Awareness of the Program

Percent											Average
Participating trade ally responses (n=10)	0%	10%	10%	10%	25%	30%	75%	95%	100%	100%	46%
Nonparticipating trade ally responses (n=5)	0%	13%	15%	50%	55%						27%

3.8.6 The future of the cooling market in Colorado

The majority of participating trade allies said they expect their involvement in the program to increase over the next twelve months. They project that customer demand will increase as they become more energy conscious and are more aware of energy efficiency based on federal initiatives and more stringent codes and standards. However, a number of these contractors caveat this optimism by saying it depends on the economy.

Additionally, several respondents commented on the aging cooling equipment in Denver as an indicator for increased opportunity for the program, particularly among larger commercial customers. As discussed earlier, because of the high capital investment in replacing cooling equipment, larger commercial customers are opting to repair versus replace the older equipment. This inefficient equipment will continue to fail and in time need to be replaced which will create further opportunity for the program.

While participating trade allies are optimistic that their participation in the program will increase in the next 12 months, their projection of the direction of the commercial cooling market in the next two years is mixed. The same is true for nonparticipating trade allies. Respondents from both groups of interviews said that unless there are government initiatives put in place, or stricter requirements, the high efficiency cooling market will stay the same or decrease. A number of these respondents again cited the incremental cost and perception that the benefits don't outweigh these costs; particularly given how constrained these companies are in their capital funding. "*I've got my fingers and toes crossed that we're going to come out of this recession and people will start purchasing high efficiency equipment*."

3.9 BENCHMARKING RESULTS

PA researched programs online for to characterize other cooling efficiency programs in terms of rebates or incentives available, eligible measures, eligible customers, required paperwork, and marketing. PA then conducted in-depth interviews with eight program staff and one evaluator for the following programs to obtain further insight into program operations. The utilities and programs reviewed are detailed below.

Table 3-8. Utilities and Programs Included in Benchmarking Study

Utility	Program
Ameren IL	Standard Business Incentives Program
Arizona Public Service	Solutions for Business: Prescriptive Incentives and Technical Assistance and Studies
Energy Trust of Oregon (Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas)	Existing Building Efficiency Program
Idaho Power	Building Efficiency for Commercial Construction and Easy Upgrades for Simple Retrofits
Pacific Gas & Electric (also includes SCE and SDG&E)	Non Residential Retrofit (previously Standard Performance Contract)
Platte River Power Authority (and four member utilities: Fort Collins Utilities, Longmont Power & Communications, Estes Park Light & Power, Loveland Water & Power)	Electric Efficiency Program (includes Cooling Rebate Program)
Puget Sound Energy	Commercial HVAC Rebate and Premium Service programs
Salt River Project	PowerWise Standard Business Solutions and PowerWise Custom Business Solutions

Programs varied from very new (only 1 year old) to fairly mature (up to 10 years old).

3.9.1 Program goals and challenge in meeting goals

Xcel Energy's goal for the Cooling Efficiency program is 6.9 mil kWh for 2009. However, information was not available from other programs on savings goals for cooling equipment only. For other business programs overall, savings goals ranged anywhere from 32.5 mil kWh to 160 mil kWh. Xcel Energy's total 2009 business goal is 103 mil kWh.

Most programs in the benchmarking study have been successful in meeting program goals despite the recent economic challenges. Many programs met or exceeded goals last year and are on track to come close to meeting targets this year. Several programs have higher goals set for this year than last year.

All programs are faced with the same primary challenge this year—the downturn in the economy. However, most have found a way to keep projects enrolling and continue to achieve energy savings. Mature programs are faring better which was reported to be a result of strong relationships with vendors and implementation contractors. It was also reported that it is important to be flexible and get involved with the customer early to influence their choice of equipment (as also discussed in the internal and trade ally interviews).

Several program managers reported bonus and timing adjustments their programs made in reaction to the downturn in the economy. One program offered a 10% bonus to customers and $500 gift cards to trade allies for projects with minimum size restrictions that were done before the end of May, 2009. Another program became more flexible with deadlines that were typically 18 months but would be extended if there were delays in the project timeline.

3.9.2 Key elements of program design

All programs offer prescriptive and custom options to business customers except for PG&E, which is custom only. Measures covered by prescriptive programs are similar across programs including air conditioning units, split and packaged units, air and water source heat pumps. Variations in measures offered include chillers, economizers, and controls. One program manager recommends more focus on controls and optimizers for retrofit to realize additional savings. Xcel Energy categorizes control-related projects within an Efficiency Controls program, rather than within the cooling program.

Most of the programs use outside firms to implement the program. One program manager appreciates that they have an implementation contractor who continuously works to improve their program.

Two programs manage the entire program internally as Xcel Energy does. This internal management includes the development of the infrastructure, outreach to trade allies, customer communication and setting and processing the rebates for eligible equipment. Internal staffing for the programs ranges from one person half-time to 6 business development staff handling specific customer segments.

3.9.3 Marketing and recruitment of customers

Depending on the program, either the implementation contractor or program staff market and provide outreach to customers. Marketing methods consist of general advertising in newspapers, through radio ads and mailings.

Marketing is not typically targeted to particular groups but to business customers in general. However, more targeted marketing through associations and business group meetings is favored by many program managers. These face-to-face meetings allow for a more tailored message (e.g. highlighting energy savings possible) and the opportunity to answer questions and build relationships. Associations targeted include ASHRAE, BOMA, Kiwanis, multiple trade organizations, and school groups.

Only one program, which is one of the more mature programs, uses targeted marketing. They have moved away from traditional marketing pieces, except for an overview, and are instead working with specific customer segments. They now concentrate on relationship building with customers, trade organizations, and equipment dealers.

Interviewees believe the most effective form of program communication is handled by key account representatives and trade allies. Trade allies know their markets well and are often in the best position to sell the higher efficiency to their customers. A couple of programs are also taking advantage of high bill inquiries and billing analysis to seek out possible participants.

One respondent shared that in their experience, a useful lesson is to become thoroughly educated on the different associations when using trade associations to target customers. The respondent felt this would identify and involve all associations representing that particular market segment. Without buy-in from particular association leaders, a utility could be kept out of a market. However, the program should be prepared for a potentially quick increase in projects. In order to handle abrupt increases or decreases in enrollment, have control mechanisms in place to scale down or ramp up depending on activity level.

3.9.4 Quantification of net program impacts

As PA has experienced with several other programs and the industry as a whole, there is much discussion around how to accurately calculate free-ridership and spillover to inform net-to-gross (NTG) factors for commercial cooling. In speaking with program managers, that uncertainty exists among all programs.

Table 3-9 summarizes net to gross information provided by the program managers or through the literature review. A few of the newer programs have not yet had the opportunity to evaluate their programs and estimate net-to-gross ratios and will likely review free-ridership and spillover measurement in later program years, according to program managers. In the meantime, they rely on either an average industry attribution rate of 0.80 to 0.85 or anecdotal information to provide qualitative context around program impacts (e.g. retrofits may be almost all free-riders but the nature of premium services would result in a very low free-ridership rate). And although some of the others have conducted evaluations, they have not measured free-ridership or spillover.

For those programs that have measured NTG and were able to provide us with the values, we see a range from 50 percent (when NTG only includes free-ridership, not spillover) to 80 percent NTG (when includes spillover). The NTG status for all programs reviewed is detailed in Table 3-9. In addition to speaking with program managers we also reviewed NTG estimates from the DEER database and measured NTG values from WI Focus on Energy Business Programs which are also included in the table below.

Table 3-9. NTG Summary Information

Sponsor	Program	NTG measurement status
WI Focus on Energy	Business Programs	Overall 2008 commercial NTG ratios were 69% kWh, 69% kW, and 33% therms.
Ameren (IL)	Standard Business Incentives	Measure free-ridership and spillover, but no NTG number available.
Arizona Public Service	Solutions for Business: Prescriptive Incentives	NTG calculated at the measure level using both free-ridership and spillover from self reports. Numbers not available at the time of the call.
Energy Trust of Oregon	Existing Building Efficiency Program	Influence rates of 80% for electric and 70% for gas for their HVAC program.
Idaho Power	Easy Upgrades for Simple Retrofits	Not currently measuring FR, SO or NTG.
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)	Measuring NTG but not final for 2006-2008 cycle. DEER database shows NTG from 2004-2005 was 50% for prescriptive HVAC and 54% for custom projects. DEER also indicates 50% NTG assumptions for prescriptive HVAC and 64% for custom for purposes of 2009-2001 planning.20
Platte River Power Authority	Cooling Rebate Program	.85 assumed.
Puget Sound Energy	Commercial HVAC Rebate	Not measuring NTG.
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	Measured NTG = .75 for Standard Business Solutions (not including adjustments for spillover).

3.9.5 Rebate levels and requirements

Rebate levels are similar across programs, although Xcel Energy's are some of the lowest for air conditioning systems (Table 3-10). Xcel Energy is also providing rebates for a lower SEER rating than the other programs reviewed. Most programs have done little to adjust their rebates over time, and any adjustments have been minor.

Minimum equipment efficiency to qualify for a rebate is typically decided based on CEE standards. Supplementing that decision is information from ASHRAE 90.1, ENERGY STAR®, and other market analysis. Rebates or incentives are typically offered for the efficiency above standard. Programs also have caps on the portion of the cost that will be paid, for example 50 percent or $10,000 maximum.

[20] Source: Updated DEER NTGR Values – 053008.xls

The requirements for receiving a rebate or incentive are similar among programs. Most programs have a pre-approval process or pre-application showing the efficiency the customer intends to install. Some programs skip this pre-application for projects below a certain rebate threshold ($1,000–$5,000). For one program, the pre-approval allows for a customer's incentive funds to be reserved for 90 days.

Once approved, the customer can have the work done. A few programs require inspections, although this is more common for custom projects or projects requesting a rebate over a certain threshold. Upon completion, customers are required to submit a final request for the rebate or incentive, accompanied by an invoice for the equipment purchased, and a cut sheet or other form showing the specifications for the energy efficient equipment. A few programs have 60-day or 90-day limits from time of project completion for submitting final rebate requests.

Table 3-10. Rebate Summary Information

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
CEE	Tier 1 standards	14 SEER (12.0 EER pkg, 11.6 EER split)	(11.5 EER, 11.5, 10.5, 9.7)	14.0 EER		14.0 EER			
CEE	Tier 2 standards	15 SEER (12.5 EER pkg, 12.0 EER split)	(12.0 EER, 12.0, 10.8, 10.2)	No specification s		No specification s			
Xcel Energy	Efficiency Cooling	13.5 SEER: $50/ton packaged, and $3/ton each adtl 0.1 SEER 14.0 SEER: $25/ton split, and $4/ton each adtl 0.1 SEER	$50/ton (EER of 11.0, 10.8, 9.8, 9.4)	Condensing 11.0 EER: $25/ton + incremental rebate: $3.00/ 0.1 EER		14.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	PTACs 11.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	$6-$12/ton See program for details	Boiler Tune-up: 25% of costs See program for details
Ameren (IL)	Standard Business Incentives	14 SEER: $15/ton 15 SEER: $30/ton	$15/ton (11.5 EER, 10.5, 9.7) $30/ton (12 EER, 10.8, 10.2)		$15/ton (14 SEER, 11.5 EER, 10.5, 9.7) $30/ton (15 SEER, 12 EER, 10.8, 10.2)		13.08–(0.02556*Btuh Capacity/ 1000) EER $15/ton	$20/ton (Air-cooled only)	Room Air Conditioners: $25-$35/ton Variable Frequency Drive on HVAC Motors: $45/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Arizona Public Service	Solutions for Business: Prescriptive Incentives	(1 Phase) 14 SEER & 11.5 SEER: $50-80/ton (3 Phase) 11.1 EER: $50-100/ton	11.4 EER $50-100/ton 11.2 EER $25-75/ton 10.4 EER $25-75/ton		(1-phase) 14 SEER & 11.5=$50-80/ton (3-phase) 11.1 EER= $50-100/ton 11.4 EER $50-100/ton 11.2 EER and 10.4 EER $25-75/ton		Both PTAC and PTHP 12.5-(0.213*cap/1000) EER $45-60/ton	Air cooled 1.15 kW per ton—IPLV = $7/ton Water cooled 0.57-0.68 kW per ton—IPLV = $7/ton	Economizer $15.ton
Energy Trust of Oregon	Existing Building Efficiency Program	$120-300 See program details	$120-300, See program details		$150-2,250/ton, See program for details	$200-4,000/ton, See program for details	$100/unit PTHP		Ground source heat pump $300-$3,000
Idaho Power	Easy Upgrades for Simple Retrofits	(1-phase) 14 SEER: $25/ton 15 SEER: $50/ton 16 SEER: $75/ton (3-phase) 13 SEER: $50/ton 14 SEER: $75/ton 15 SEER: $100/ton	$50/ton (EER of 11.0, 10.8, 10.0)				12 EER at $50/ton		Economizer $250/unit economizer controls $75/ton VSD for fan pump $60/hp program thermostat $60

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)								
Platte River Power Authority	Cooling Rebate Program	14 SEER/ 12 EER = $65/ton, $4 per ton for each 0.1 EER over 12.0	$50/ton (EER of 11.0, 10.8, 10.0), $4 per ton for each 0.1 EER over base				Both PTAC and PTHP 11.0 EER- $50/ton, $4 per ton for each 0.1 EER over 11.0		
Puget Sound Energy	Commercial HVAC Rebate		>= CEE Tier 1 = $30/ton						ECM on HVAC fan box- $.12/sq ft Boiler tune-up-up to $600 Program thermostat—up to $50 VSD on pumps and fans—$100/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	$75/ton (EER of 11.5, 10.5, 9.7) $100/ton (EER of 12.0, 10.8, 10.2)	14 EER: $75/ton	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	14.0 EER/4.6 COP: $75/ton	$50/ton See program for details	(Tons * $10/ton) + (Tons *$350 * (Minimum IPLV – Chiller IPLV))	VSDs for HVAC fan & pump: $55/ton

3.9.6 Trade ally relationships

Several programs rely heavily on trade allies to market the program to customers as well as provide quality service and have found them to be valuable outreach partners. It is important to have a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs. Most programs do not offer trade ally incentives at this point.

Interviewees report that training and communication are instrumental in the trade ally relationship. Many programs incorporating trade allies hold workshops or frequent meetings with vendors as updates, as well as to find out what type of equipment is selling. One program holds about 10 one-day technical sessions throughout the year for trade allies in their territory. They hire expert trainers to come in for those sessions to cover topics such as DOE motors, HVAC, chillers, RCx, and lighting.

A few programs are struggling with building up their trade ally networks. A program manager from one of the more mature programs tells us that building a reliable trade ally network takes time—often as much as two years.

3.9.7 Why customers enroll

The initial view is that customers will participate in a program if it provides monetary incentives. However, some programs have found that the incentive or rebate alone will not result in a successful program. A key element for these programs is customer education and assistance. One program found through their survey that the assistance they provide and the rebate are equally motivating for their customers. These programs educate customers on the energy savings resulting from the high efficiency equipment (sustaining impacts) using the rebate to reduce the first-cost of purchasing and installing the equipment.

This education may come in several forms. One program manager attends association meetings where she can present energy savings opportunities. Another program has a general tool available to all customers on their website to calculate energy savings for 30 of the most common energy efficiency measure for typical buildings. A third program provides an online self-audit tool so customers can gain a better understanding of their own facility, which improves the conversation once they are ready to work with a program representative. Coaching is particularly important for the first time participants.

We asked program managers which key customer segments have been more likely to participate this year. A few of the newer programs are not yet tracking participation by customer segment as there is not much need at this point. Others have seen greater participation recently from offices and schools. Medical facilities have also been active in some programs. One program has seen property owners taking advantage of retail space switching over to office to implement upgrades.

4. IMPACT EVALUATION FINDINGS

The activities conducted to support the impact evaluation included verifying baseline and technical assumptions, determining savings considering 2009 International Energy Conservation Code (IECC) standards, and estimating a net-to-gross ratio. This chapter summarizes the key impact evaluation findings followed by more detailed analysis resulting from each activity.

4.1 KEY FINDINGS

4.1.1 Engineering and IECC standards review

The engineering review identified the following key findings.

- The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used for other programs. Other than VAV boxes, the algorithms used in the deemed savings calculator (the Calculator) are also consistent with algorithms represented in other programs' TRMs.
- More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. In view of the uncertainty of energy savings found in the engineering review and high free-ridership results, Xcel Energy may want to consider removing VAV boxes as a program measure in the 2010 Colorado Cooling Efficiency Program.
- The Cooling Tower offering was removed from the program in January 2009. The impact evaluation supports this removal (as it does for VAV boxes) due to uncertainty of savings found in the engineering review as well as high free-ridership results.
- The value for peak load coincident factor (CF) of 0.9 used in the Calculator is appropriate to account for gross generator kW saving. The equivalent full load hours (EFLH) provided in the Calculator are also appropriate.
- IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for the program year 2009-2010. Changes from IECC 2006 to IECC 2009 baseline efficiency values will affect savings for rooftop units and chillers. The IECC 2006 and IECC 2009 use different coefficients for the adjustment factor algorithm to account for non-standard water-cooled chillers.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs which do not take into account variations in PTAC sizes.

4.1.2 Net-to-gross ratio

The net-to-gross analysis resulted in the following findings:

- The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 0.51. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 0.21. The resulting self-report net-to-gross ratio is 0.7 for the Colorado Cooling Efficiency Program in 2007–2009.

- Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program.
- Removing cooling towers and VAV boxes, which we recommend be removed from the program, the self reported net-to-gross ratio is 0.75. As this value is within the recommended net-to-gross range from a preponderance of evidence approach, we recommend that this net-to-gross ratio be applied for the 2010 program year.

4.2 VERIFY BASELINE AND TECHNICAL ASSUMPTIONS

Cooling is an energy intensive process and can consume as much as one third of building energy use. Therefore, the need for verification of assumptions and parameters used for determining net energy savings achieved from an efficient cooling measure over a standard (complying with a stipulated minimum code or a baseline) is paramount.

To support the impact evaluation of the Cooling Efficiency Program, we reviewed algorithms used for estimating the deemed energy savings for end-use C&I cooling measures. This was supported through a review of several recent “technical reference manuals” (TRMs). We also reviewed the values of parameters used in the algorithms to assess the industry practices and ascertain their similarity (or dissimilarity) with those currently used by the Xcel Energy’s Colorado C&I “Deemed Savings Technical Assumptions” tool/calculator (“the Calculator”).

We also reviewed TRMs adopted in different jurisdictions in the country to assess consistency in the use of technical assumptions and the underlying algorithms for calculating the energy savings achievable from efficient cooling measures. Each of these TRM sources are summarized in Appendix A. Specific TRMs reviewed include:

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report, 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey’s Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009.

Below we define variables used deemed savings review. Note that different TRMs use varying notations for variables, for example EER_b or EER_{base} for “baseline energy efficiency ratio” of a measure. We designate one notation for a variable, as shown in Table 4-1, regardless of the (different) symbols used for the same variable in different TRMs. This is done to avoid repetition of variable definitions. Also note that terms EFLH and FLH are, at times, used interchangeably among different TRMs. For example the “Efficiency Maine TRM uses the term FLH while other TRMs reference in this study used the EFLH.

Table 4-1. Definition of Variables Included in Deemed Savings Analysis

Variable	Definition
Capacity	Size of a cooling measure (1 Ton = 12,000 BTU/hr)
EER	Energy Efficiency Ratio (3.413* Coefficient of Performance (COP); kW/Ton = 12/EER
SEER	Seasonal Energy Efficiency Ratio (EER/0.85)
EER_b	Energy efficiency ratio of a baseline cooling measure
EER_e	Energy efficiency ratio of an efficient unit
$SEER_b$	Seasonal Energy efficiency ratio of a baseline equipment
$SEER_e$	Seasonal Energy efficiency ratio of an efficient unit
CF	Coincidence Factor: The percentage of the total cooling load during peak hours.
EFLH	Equivalent Full Load Hours: Measure of energy use by season during the on-peak and off peak periods. EFLH is the ratio of measured kWh use during the period divided by design capacity (kW) of equipment.
FLH	Full load hours in a year
PE_b	Peak efficiency of the baseline chiller (kW/ton)
PE_e	Peak efficiency of the energy efficient chiller (kW/ton)
$IPLV_b$	Integrated part load value of the baseline cooling equipment
$IPLV_e$	Integrated part load value of the efficient cooling equipment
CDD	Cooling Degree Days

Xcel Energy's deemed savings calculator for the C&I end-use cooling measures use the following algorithms for air conditioning systems, chillers and VAV boxes.

Rooftop Units, Water Source Heat Pumps, Split Systems, Condensing Units

Energy Savings (Customer kWh) = Capacity x (12/SEERb - 12/SEERe) x EFLH

Demand Savings (Customer kW) = Size x (12/EER_Standard - 12/EER_Eff)

Chillers

Energy Savings (Customer kWh) = Capacity x (IPLVb - IPLVe) x EFLH

Demand Savings (Customer kW) = Capacity x (FLVb - FLVe)

Centrifugal Chillers

FLVb = FLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

IPLVb = IPLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

Temperature Variable, T_var = Chiller Lift + CWTD

Variable Air Volume (VAV) Boxes

Energy Savings (Customer kWh) = #_of_fans x Savings x EFLH x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Demand Savings (Customer kW) = #_of_fans x Savings x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Electrical Energy Savings (Gross Generator kWh) = Customer kWh / (1-TDLF)

Electrical Demand Savings (Gross Generator kW) = Customer kW x CF / (1-TDLF)

Electrical Energy Savings (Net Generator kWh) = Gross Generator kWh x NTG

Electrical Demand Savings (Net Generator kW) = Gross Generator kW x NTG

The following conclusions were drawn from a review of technical reference manuals for algorithms to estimate the energy and demand savings of C&I end-use cooling measures and their related variables.

- The review of different TRMs for energy and demand savings algorithms for C&I end-use cooling measures shows a general consistency in use of the algorithms in different jurisdictions.
- Xcel Energy's Colorado C&I end-use measure deemed savings calculator ("Calculator") uses algorithms that are consistent with other TRMs for most cooling measures.
- The Calculator correctly captures the adjustment factor algorithm for non-standard centrifugal chillers [i.e. chillers not designed to AHRI Standard 550/590 test conditions (44^{o}F leaving chilled water temperature and 85^{o}F entering condenser water temperature with 3 gpm/ton condenser flow rate)]. Also, the Calculator applies the adjusted IPLV values when specifications for non-standard centrifugal chillers are inputted. The instructions on the Calculator show that these adjustments are for standard chillers. The Calculator should add instruction to capture the fact that the adjustment factor is applicable to non-standard centrifugal chillers.
- Accuracy of the algorithms used for estimating energy and demand savings for VAV boxes could not be confirmed by its originator referenced in the Calculator[21]. In addition, none of the TRMs reviewed provides savings algorithms for VAV boxes. In view of this methodological deficiency, we suggest the algorithm currently used by the Calculator as the default algorithm. *However, from the net to gross analysis, we find that free-ridership for VAV boxes is high, indicating reduced efficacy of program support for the measure.* Also, support for VAV boxes has been withdrawn from another Xcel Energy jurisdiction (Minnesota). In view of these, we suggest Xcel Energy consider excluding VAV boxes from the Colorado Cooling Efficiency Program.

[21] Telephone discussion with Mr. Eugene A. Scales, 12th October, 2009.

- The Calculator uses algorithms to determine the peak demand saving for both end-use (equipment) and gross generator level. It uses peak load coincident factor (CF) for generator gross kW saving and applies a value of 0.9. C&I cooling measures are likely to operate when the peak load hours are in effect for the Xcel Energy CO service territory. Therefore, use of a high peak load coincident factor would well capture the peak load savings from the utility perspective. Also, we recommend the need for more research for establishing different CFs for commercial and industrial segments as their end-use load shapes vary.
- Treatment of equivalent full load hours (EFLH) in different TRMs is opaque. Our extensive review of the TRMs shows lack of a clear methodology for estimating the EFLH. Based on our discussion with the representative of Xcel Energy CO Cooling Efficiency Program, we understand that the University of Arkansas had developed a methodology that establishes a linkage between EFLH and climatic variations (or cooling degree days [CDD]). We reviewed the work[22] and find (a) the algorithms are applicable to ground source heat exchangers and (b) no direct linkage with CDD. Also, an algorithm for EFLH for two locations in Arkansas are provided in the Arkansas Deemed Savings TRM that makes a direct relationship of EFLH with CDD through the following relation:

$$EFLH = A \times (CDD)^{b+1}$$

Where A and b are coefficients and their values are provided in the TRM for different building types.

The EFLH values developed for the Calculator are based on more advanced methodology that analyzed weather bins (based on dry bulb temperatures). Also, we understand from discussions with the Xcel Energy representatives that the market segment data for end-use cooling measures were used (along with occupancy and operational characteristics of the facilities).

Since there is a general methodological void in the estimation of EFLH in TRMs, and the Calculator uses EFLH values that are estimated using more robust methodology (as communicated by the Xcel Energy representatives), we recommend that the EFLH values currently applied in the Calculator are continued.

4.3 DETERMINE SAVINGS CONSIDERING 2009 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) STANDARDS

As part of the engineering review, we reviewed baseline efficiency values for C&I cooling measures based on the "International Energy Conservation Code 2006" (IECC 2006). We understand that for the program year 2009-2010, the Xcel Energy Colorado Cooling Efficiency Program will continue to use IECC 2006 codes for defining the baseline efficiency of cooling measures. We also conducted a forward-looking study in the event that Xcel Energy Colorado C&I cooling efficiency program replaces IECC 2006 stipulation by those of

[22] Sutton et al. (2002)a. An Algorithm for Approximating the Performance of Vertical Bore Heat Exchangers Installed in a Stratified Geological Regime. ASHRAE TRANSACTIONS 2002, V. 108. And

Sutton et al. (2002)b. Comparison of Multilayer Borefield Design Algorithm (MLBDA) to Available GCHP Benchmark Data. ASHRAE TRANSACTIONS 2002, V. 108, Pt. 2.

the IECC 2009 in the future. The tabulation of baseline efficiencies of end use measures that will result from adopting IECC 2009 stipulations are for informational purposes only.

We calculated the baseline efficiency of C&I cooling measures according to the IECC 2006 in Table 4-2 as the IECC 2006 codes will remain effective for the program years 2009 and 2010. Also, we provide IECC 2009 stipulations in Table 4-3 for any future use by the Xcel Energy Colorado C&I Cooling Efficiency Program. We compared the baseline measure efficiency values obtained from the IECC handbooks with those provided in the Calculator to identify any changes.

The Calculator converts the EER into SEER (and vice-versa) with a multiplier of 0.85. In addition, the Calculator shows the EER and IPLV values by deducting 0.2 to take into account the effect of heating section (other than electrical resistance heat). However, we do not apply these conversion factors to the baseline efficiency values.

The review of the baseline efficiency values for cooling measures from the IECC 2006 and IECC 2009 handbooks and the Calculator shows that:

- There is no change in the values of baseline efficiencies for Condensing units, PTACs and Water-source heat pumps for the IECC 2006 and IECC 2009.
- For Rooftop units, IECC 2009 baseline efficiency values are greater than those of the IECC 2006.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except that for the PTACs.
- The Calculator needs to modify the algorithm for calculation of baseline efficiencies for PTACs to take into account variations in PTAC sizes (in line with the algorithms provided in the IECC 2006 or IECC 2009).
- We are unable to confirm the baseline efficiency for VAV box used in calculator and suggest that the value used currently is the default. However, as discussed above, these may be removed from the 2010 program.
- For Chillers IECC 2009 stipulates measure baseline efficiencies for two paths i.e. Path A and B. The Path B is intended for part-load operation.
- The IECC 2006 and IECC 2009 use different coefficient for the adjustment factor algorithm to account for non-standard water cooled chillers to the baseline efficiency.

The analysis, by equipment type, is detailed in Appendix B.

Table 4-2. Baseline Efficiency of C&I Cooling Measures—IECC 2006

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	9.7		ARI 210/240
≥ 5.4 -11.3 tons		10.3	
≥11.3 -19.9 tons		9.7	ARI 340/360
≥ 19.9–63.3 tons		9.5 (ILPV: 9.7)	
> 63.3 tons		9.2 (ILPV: 9.4)	
Split Systems < 5.4 tons	10		ARI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	ARI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			ARI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

Table 4-3. Baseline Efficiency of C&I Cooling Measures—IECC 2009

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	13		AHRI 210/240
≥ 5.4 -11.3 tons		11.2	
≥11.3 -19.9 tons		11.0	AHRI 340/360
≥ 19.9–63.3 tons		10.0 (ILPV: 9.7)	
> 63.3 tons		9.7 (ILPV: 9.4)	
Split Systems < 5.4 tons	13		AHRI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	AHRI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			AHRI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

4.4 HOURS OF OPERATION

We compared the operating hours obtained through the survey of the program participants with those reported in the Commercial Business Energy Consumption Survey (CBECS) database. We understand from our interviews with Xcel Energy staff that the operating hours for different business types from the CBECs database were used to develop the effective full load hours for the Calculator (the C&I Cooling Efficiency Deemed Savings Calculator). As shown in the table below, the operating hours reported in the participant survey and those obtained from the CBECs database for different business segments are, in general, consistent.

Table 4-4. Comparison of Participant's Self-reported Operating Hours with CBECS database

Business Type	Operating Hours (Weekly)			
	Participants' Response	Survey sample (n)	CBECS Database	# of buildings (in '000)
Education	56	10	50	386
Lodging	168	2	167	142
Office	64	17	55	824
Retail	55	7	59	443

4.5 NET-TO-GROSS ANALYSIS

Program attribution (or the net-to-gross ratio) refers to energy impacts that can be confidently attributed to program efforts. As discussed at the start-up meeting, Xcel Energy needs an overall net-to-gross ratio for the program for their 2010 planning.

We estimated the net-to-gross ratio following the California self report framework for standard net-to-gross projects[23], which uses a preponderance of evidence approach. Our estimate is based on 1) interviews with 2007–2009 participating customers and influential vendors, 2) in-depth interviews with trade allies, 3) in-depth interviews with Xcel Energy account managers, and 4) literature review and benchmarking interviews with program managers of similar programs in the US.

4.5.1 Data collection and study methodology

An initial net-to-gross ratio was calculated based on customer self-reports. The standard net-to-gross analysis specified in the California framework uses three primary sources of information to estimate net-to-gross: program files and information, participant (decision-maker) survey, and vendor (participating trade ally) surveys. Our approach to using each of these information sources for estimating free-ridership and spillover is described in more detail below.

Table 4-4 shows the number of survey respondents by managed and non-managed account and measure type. The self-reported net-to-gross ratio was calculated from these respondents.

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[23] Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers, Prepared for the Energy Division, California Public Utilities Commission by the Nonresidential Net-To-Gross Ratio Working Group, Revised May 8, 2009. This method estimates net-to-gross directly rather than estimating 1 minus free-ridership.

Table 4-5. Breakdown of Respondents Used to Calculate the Net-to-Gross Ratio

		Unweighted Count
Account type	Managed	44
	Non-managed	10
	Total	**54**
Prescriptive measures	Chillers	7
	Condensing units	2
	Cooling Towers	1
	PTAC	3
	Rooftop	29
	Split Systems	3
	VAV Boxes	4
	Total	**49**
Custom measures	Chillers	2
	Install new PMZ3 units in lieu of multi-zone RTUs	1
	Plate and frame heat exchanger	1
	Replace old condensing unit with evaporative cooler	1
	Total	**5**

The decision-maker survey, targeted at participating customers, asked highly structured questions about actions that would have been taken in the absence of the program. The survey was guided by information in program files. Respondents were first asked a series of questions to establish project context. Next, they were asked to rate the importance of program influences vs. non-program influences. Third, they were asked to rate the significance of different factors and events that may have led to their decision to install the efficient equipment at the time they did, including questions on the age or condition of the equipment, type of project, recommendations received, and their business policies related to equipment purchases.

The decision-maker survey also collected information about what participants would have done in the absence of the program. Specifically, respondents were asked a number of questions to assess the impact the program had on the timing, quantity, and efficiency level of the measure installed:

- Did the program impact the timing of the decision to replace cooling equipment and, if so, by how many months/years?
- Did the program impact the quantity of equipment installed, and if so, by how much (partial free-ridership)?
- Did the program impact the efficiency of equipment installed and, if so, by how much (partial free-ridership)?

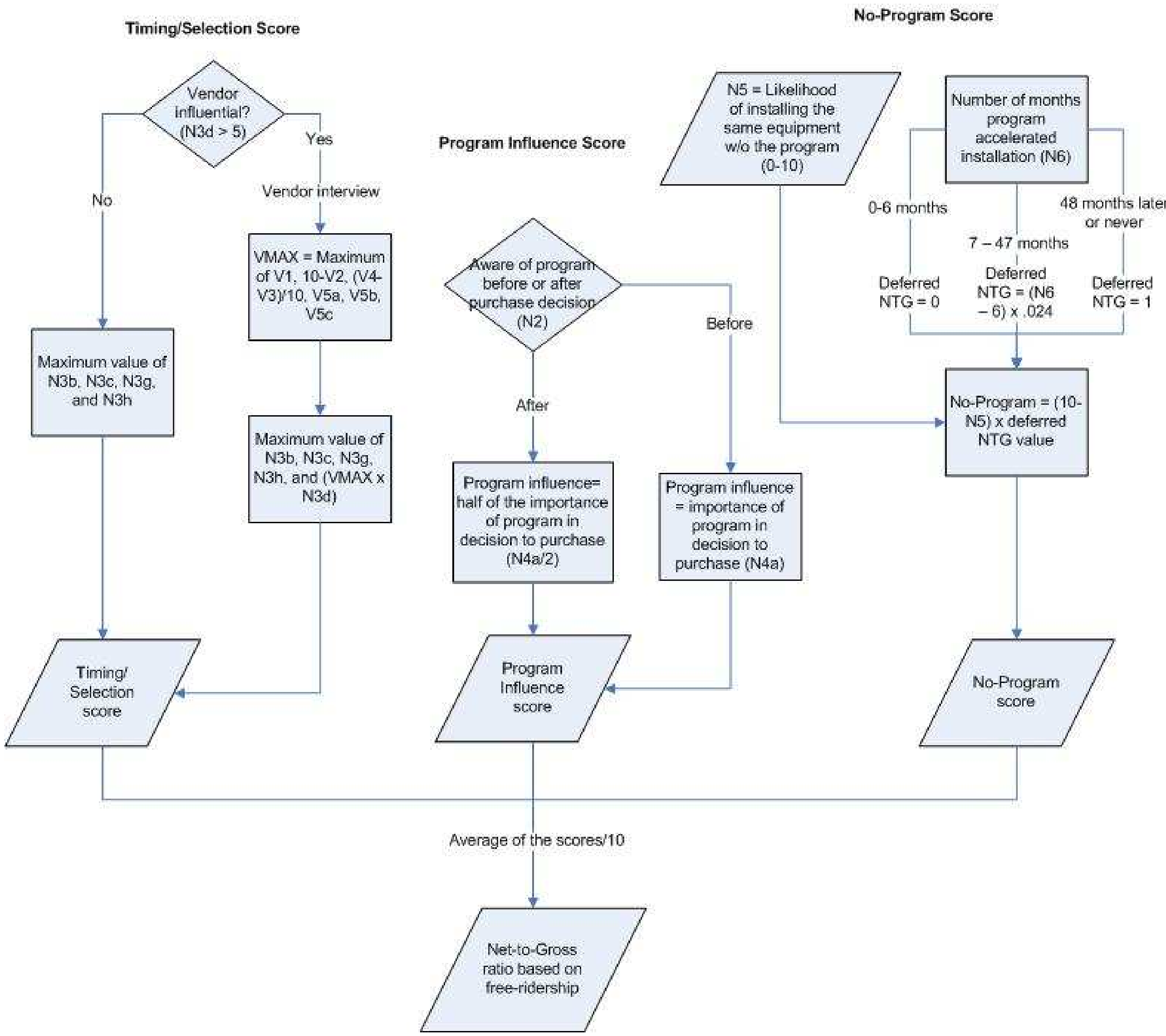
4.5.2 Measuring self-reported free-ridership

The calculation of the self-report-approach net-to-gross ratio based on free-ridership is summarized below in text and in Figure 4-1. In summary, the net-to-gross ratio based on free-ridership is calculated as an average of three scores representing responses to one or more questions about the decision to install a program measure:

1. A **timing and selection score** that captures the influence of the most important of various program and program-related elements in influencing the customer to select the specific program measure at this time. Program influence through vendor recommendations is also captured in this score when the customer says the vendor was influential in their decision. In these cases, the influential vendor was also interviewed and their responses were incorporated into the timing and selection score.
2. An overall **program influence** score that captures the perceived importance of the program (whether rebate, recommendation, or other information) in the decision to implement the specific measure that was eventually adopted or installed. The overall program influence score is reduced by half if the respondent says they learned about the program only after they decided to install the program qualifying measure.
3. A **no-program** score that captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. This score accounts for deferred free ridership by capturing the likelihood that the customer would have installed program qualifying measures at a later date if the program had not been available.

The core net-to-gross ratio is the average of these three scores divided by 10, as shown in Figure 4-1 below.

Figure 4-1. Net-to-Gross Ratio Flowchart Based on Self-report Free-ridership



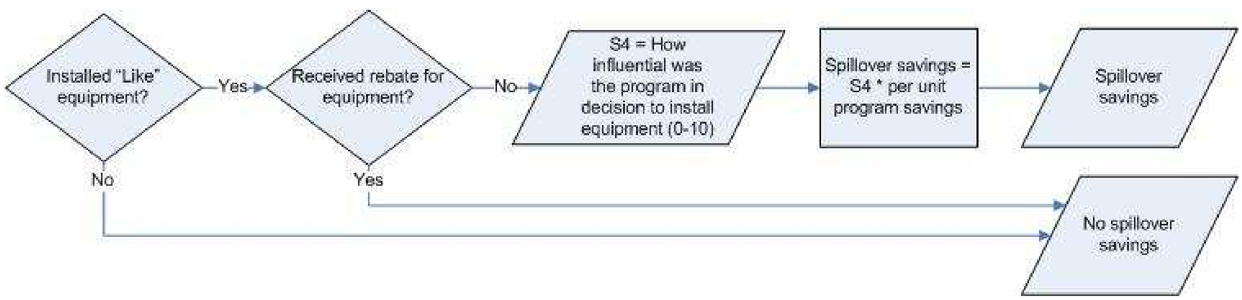
The California framework defines partial free-ridership as when, in the absence of the program, the participant would have installed something more efficient than the program-assumed baseline efficiency but not as efficient as the item actually installed as a result of the program. Of the 54 participants interviewed, five stated that, in absence of the program, they would have installed something more efficient than the standard equipment but less efficient than the equipment that was rebated through the program. For these cases, an adjustment should either be made to the net-to-gross ratio or to the gross savings. For all fives cases, we believe that the calculated net-to-gross ratio already accurately accounts for the impact of the program on these participants. Therefore, no further adjustment to the net-to-gross ratio was made.

4.5.3 Measuring self-reported spillover

The self-report protocol included a battery of questions to quantify spillover for use in estimating spillover. The spillover methodology uses a series of questions designed to measure "like" spillover. These questions ask about recent purchases (since program participation) of any additional energy-efficient equipment of the same type, installed through the program, made *without* any technical or financial assistance from the utility, but influenced by the program. A “like” spillover estimate is computed based on how much more of the same energy-efficient equipment the participant installed outside the program because of their positive experience with the program.

One of the issues with attempting to quantify spillover savings is how to value the savings of measures installed outside the program since we are relying on customer self-reports of the quantity and efficiency of any measures installed. We used a conservative approach and reported only those measures installed outside the program that were of exactly the same type and efficiency as the ones installed through the program (“like” spillover). Our conservative approach allowed customers to be more certain about whether the equipment they installed outside the program was the same type as the program equipment. This, in turn, made it possible for us to use the estimated program savings for that measure to calculate the customer’s “like” spillover savings. Figure 4-2 details the process for quantifying spillover savings.

Figure 4-2. Spillover Savings



We also attempted to measure the extent of free-drivers, or nonparticipant spillover. The data for this type of analysis could be collected from nonparticipants directly or from the design professionals and vendors who recommended, sold, and/or installed qualifying high efficiency equipment. We prefer to survey the design professionals and/or vendors primarily because they typically provide much more accurate information about the efficiency level of installed equipment than nonparticipants. Our experience has shown that customers cannot provide enough data about the new equipment they have installed to allow for accurate estimates of the energy savings achieved from the equipment. While they usually can report what type of equipment was installed, they typically cannot provide sufficient information about the quantity, size, efficiency, and/or operation of that equipment to allow us to determine whether the equipment is "program-eligible." On the other hand, design professionals and equipment vendors who have worked with the program are typically more knowledgeable about equipment and are familiar with what is and is not "program-eligible."

The in-depth interviews with participating vendors suggested little nonparticipant spillover due to the program at this time given the economy, the incremental cost of high efficiency cooling equipment, and the fact that this is only the third year of the program. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high

efficiency equipment. Therefore, there are no adjustments to the net-to-gross ratio based on free-drivers.

4.5.4 Self-report net-to-gross results

The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 51 percent. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 21 percent. The resulting self-report net-to-gross ratio is 0.7[24] for the Colorado Cooling Efficiency Program in 2007–2009.

We recommend Xcel Energy set a net-to-gross ratio in the range of 0.7 to 0.8 for the Colorado Cooling Efficiency Program, depending on program eligibility requirements. We recommend a net-to-gross range because as eligible program equipment changes (as it did between 2008 and 2009), we expect program attribution to change. Because we expect net-to-gross analysis will only be conducted periodically for the program, a realistic range allows Xcel Energy flexibility to set the net-to-gross ratio based on program eligibility requirements.

For example, PA Consulting has conducted biannual net-to-gross surveys for National Grid's commercial HVAC program. Prior to 2007, National Grid was using CEE Tier 1 eligibility standards for HVAC equipment. In 2002, the free-ridership rates for HVAC equipment ranged from 40 to 44 percent. In 2005, the free-ridership rates for HVAC equipment ranged from 41 to 56 percent. National Grid increased the eligibility standards to CEE Tier 2 in 2007. In 2007, with the higher eligibility requirements, free-ridership rates dropped significantly from 8 to 15 percent[25].

Results from the benchmarking review of HVAC programs that estimated a net-to-gross ratio ranged from 0.50 (when the net-to-gross ratio only includes free-ridership) to 0.85 (when the net-to-gross ratio includes spillover). This is in line with the self-report net-to-gross estimates from 2007–2009 Colorado Cooling Efficiency program participants discussed above.

There is also qualitative evidence from the 30 in-depth interviews with participating and nonparticipating trade allies which supports a net-to-gross range of 0.7 to 0.8. The qualitative results indicate that the program is helping to overcome barriers of selling high efficiency cooling equipment. In addition, the interviews suggest a medium level of spillover to customers of participating trade allies, supporting the medium to high level of spillover found in the customer survey. Nonparticipating trade allies were much more likely to say selling high efficiency cooling equipment to customers is very difficult. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary drivers for the difficulty rating they gave. They also mentioned lack of knowledge or education on the benefits of high efficiency equipment.

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[24] Net-to-gross = (1 - .51) + .21

[25] The Northeast has significantly higher electric rates than Colorado and National Grid's program is very mature, which has supported the success of moving to the higher CEE Tier levels. We are not recommending that this be done for the Xcel Energy Colorado Cooling Efficiency Program, but instead use it as an illustrative example of how changes in program eligibility affects program attribution.

Participants' self-report results substantiate the trade ally interview findings as participants with high net-to-gross ratios often stated that they were trying to achieve a good return-on-investment or that the rebate allowed them to purchase higher efficiency equipment.

> *"We purchased an existing building so we had access to their utility bills so we know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and (the rebate was) part of the reason we were able to make the investment."* (net-to-gross ratio = .79)

> *"We were doing upgrades anyway so it worked out to get rebates to help us get more efficient equipment."* (net-to-gross ratio = .83)

At the same time, there is qualitative evidence supporting a certain amount of program free-ridership—also found in the customer self-report calculations. Xcel Energy account managers discussed that larger accounts tend to have standard practices toward energy efficiency. Participants with low net-to-gross ratios often stated that the equipment they installed through the program was their only option or mandated by regulations, supporting the account managers' perspectives.

> *"[The equipment was] the only choice we had for a flat roof building for the tenant re-finish."* (net-to-gross ratio = .27)

> *"It's giving me money back for stuff I'm already going to do, stuff that I'm mandated to do."* (net-to-gross ratio = .25)

> *"We got money back on something we would have had to do anyway."* (net-to-gross ratio = .35)

For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program. This ratio excludes VAV boxes and cooling towers, which yielded lower net-to-gross ratios. We recommend VAV boxes be removed from the program based on the engineering review and net-to-gross analysis, and cooling towers were removed from the program in 2009.

5. RECOMMENDATIONS

This chapter outlines recommendations for Xcel Energy's consideration. These recommendations are based on activities and key findings detailed within this report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

5.1 PROCESS RECOMMENDATIONS

5.1.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to

reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Ally Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

5.1.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

5.1.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program.

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn't even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

5.2 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007-2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007-2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

APPENDIX A: TECHNICAL RESOURCE MANUAL REVIEW SUMMARY

This appendix summarizes the findings through the review of five programs' Technical Resource Manuals (TRMs).

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report; 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review; 2009.

A.1 EFFICIENCY MAINE TRM

The Efficiency Maine TRM provides algorithms for three categories of cooling measures, (a) small cooling measures with capacity less than 65,000 BTUh[26], (b) large cooling systems having capacity 65,000 BTUh or more[27,28], and (c) Electric Chillers.

Small Systems

Energy Saving (kWh) = Capacity (kBTU/hr) × (1/SEERb - 1/SEERe) × FLH

Demand Saving (kW) = Capacity (kBTU/hr) × (1.1/SEERb - 1.1/SEERe)

Large Systems

Energy Saving (kWh) = kBTU/hr × (1/EERb - 1/EERe) × FLH

Demand Saving (kW) = kBTU/hr × (1/EERb - 1/EERe)

Electric Chiller

Energy Saving (kWh) = Capacity (tons) × (PEb - PEe) × FLH

Demand Saving (kW) = Capacity (tons) × (PEb - PEe)

---

[26]Measures include small split system and single package air conditioners and heat pumps excluding room air conditioners PTACs, PTHPs, water source heat pumps and ground source heat pumps.

[27] Air conditioners, PTAC's, water-source heat pumps

[28]Although the TRM provides algorithm for electric chillers, it recommends energy saving calculations derived from detailed engineering analysis of the

The TRM uses 800 full load cooling hours (FLH) for small systems. We discuss the measure efficiency values (SEER, EER or PE) in Section 4.2 as part of the IECC 2006 and IECC 2009 baseline stipulations.

A.2 ARKANSAS DEEMED SAVINGS TRM

Two types of cooling measures included in the TRM are (a) Unitary air conditioners and (b) electric chillers. The algorithms used for quantifying the energy saving are as follows.

Unitary Air Conditioners:

Energy Saving (kWh) = Capacity (BTU/hr) x (1/1000) x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (BTU/hr) x (1/1000) x (1/EERb - 1/EERe)

The TRM uses IECC 2003 for defining the measure baseline efficiencies. The expression for the equivalent full load hours is:

$EFLH = A \times (CDD)^{b+1}$

For unitary systems the TRM provides calculated EFLH for two cities i.e. “Fort Smith (FS)” and “Little Rock (LR)” in Arkansas State as shown in Table A-1. However, the methodology used for calculating the EFLH values is not provided in the TRM.

Table A-1. Calculated EFLH for Unitary Cooling Equipment*

City	Stage	M-Fri, 7 a.m. to 5 p.m.	M-Fri, 7 a.m. to 7 p.m.	M-Fri, 9 a.m. to 10 p.m.; Sun, 11 a.m. to 6 p.m.	All week, 6 a.m. to 10 p.m.	All week, 6 a.m. to Midnight	All week, All day
Fort Smith	Single	1,207	1,444	2,033	2,520	2,739	3,230
	Dual	854	1,020	1,443	1,750	1,881	2,155
Little Rock	Single	1,177	1,383	1,948	2,419	2,627	3,137
	Dual	801	938	1,303	1,611	1,730	1,997

*Source: Arkansas Deemed Savings Quick Start Program Commercial Measures: Final Report (Page 2–25)

Electric Chillers:

Energy Saving (kWh) = Capacity (ton) x 3.517 x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (ton) x 3.517 x (1/COPb - 1/COPe), and

$EFLH = A \times (CDD)^{b+1}$

The coefficients A and B for calculating the EFLH for different building types are given in the TRM and shown in Table A-2.

Table A-2. Coefficients for calculating EFLH

Building Type	A	B
Education—Community College	327.83	-0.8835
Education—Secondary School	240.98	-0.9174
Education—University	512.11	-0.9148
Health/Medical—Clinic	313.54	-0.8437
Health/Medical—Hospital	730.76	-0.8836
Lodging	589.61	-0.8750
Office	657.91	-0.9437
Retail	404.00	-0.8645

The Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator also mentions use of the same methodology for estimating the EFLH. The EFLH estimates were developed by analyzing facility occupancy and operating hour distribution based on (a) Minnesota "occupation and employment statistics" data, (b) TMY2 data for Denver and Grand Junction and (c) building characteristics data from CBECS. This methodology would provide a better estimation of the EFLH values, although may always not be accurate. A detailed investigation of the methodology used for estimating the EFLH values currently being used for Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator is beyond the scope of the current study.

A.3 PENNSYLVANIA ENERGY EFFICIENCY AND CONSERVATION PROGRAM TRM

The TRM provides energy and demand saving algorithms for C&I cooling measures for room and central air conditioners split systems, packaged terminal systems, and water source heat pumps. Also, the TRM provides energy saving algorithms for electric chillers.

Air Conditioner:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b - 1/EER_e$) x EFLH

Demand Savings (kW) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b - 1/EER_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. A coincident factor (CF) of 0.67 is used in the demand savings calculations. The EFLH hours are obtained for seven locations within the state using the "Energy Star Calculator" of the Department of Energy[29].

[29] At the time of writing, we were unable to obtain the EFLH from the Energy Star Calculator hosted at the DOE website. The calculator needs input of the FLH or EFLH, else it uses a default value of 2000 Hrs.

Table A-3. EFLH for Seven Locations in Pennsylvania

Place	EFLH (hours)
Allentown	784
Erie	482
Harrisburg	929
Philadelphia	1032
Pittsburgh	737
Scranton	621
Williamsport	659

Electric Chillers

Energy Savings (kWh) = Tons X (kW/ton_b – kW/ton_e) X EFLH

Demand Savings (kW) = Tons X (kW/ton_b – kW/ton_e) X CF

The algorithms for estimating energy and demand saving are loosely linked to the equipment efficiency rating. The TRM uses the same CF and EFLH values as used for the air conditioning equipment.

A.4 CONNECTICUT CL&P AND UI PROGRAM SAVINGS TRM

The TRM provides algorithms for estimating the energy and demand savings for unitary air conditioners, as follows:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. The full load cooling hours are given for around sixty facility types ranging from 564 hours to 1308 hours (Table 2.0.0; page 246) also shown in Table 6.5 in this report. For demand saving estimation a peak load factor (CF) of 0.82 is recommended (Table 1.1.1; page 231).

For chillers the TRM recommends custom calculated energy savings based on specific equipment capacity, operational staging, operating profile, and load profile.

A.5 NEW JERSEY'S CLEAN ENERGY PROGRAM ENERGY IMPACT EVALUATION AND PROTOCOL REVIEW

This report is a well-researched TRM. It reviews energy and demand savings algorithms for end-use cooling (and other) measures from TRMs used in different jurisdictions. The report recommends algorithms for air conditioners and chillers. The air conditioning systems include unitary/split systems, PTACs, Water-source heat pumps etc.

Air Conditioners:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x (1/EER_b -1/EER_e) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x (1/EER_b -1/EER_e) x CF

Electric Chillers

Energy Savings (kWh) = Tons X (IPLVb - IPLVe) X EFLH

Demand Savings (kW) = Tons X (IPLVb - IPLVe) X CF

The TRM recommends a single value of 1360 hrs for EFLH and 0.67 for the CF (page 3-58).

Table A-4. Full load cooling hours by facility type*

Facility Type	Full Load Cooling Hours	Facility Type	Full Load Cooling Hours
Auto Related	837	Medical Offices	797
Bakery	681	Motion Picture Theaters	564
Banks, Financial centers	797	Multi-Family (Common Areas)	1306
Church	564	Museum	797
College-Cafeteria	1139	Nursing Homes	1069
College-Classes/Administrative	646	Office (General Office Types)	797
College-Dormitory	709	Office/Retail	797
Commercial Condos	837	Parking Garages & Lots	878
Convenience Stores	1139	Penitentiary	1022
Convention Centers	564	Performing Arts Theaters	646
Dining-Bar Lounge/Leisure	854	Police/Fire Stations (24 Hrs)	1306
Dining-Cafeteria/Fast Food	1149	Post Office	797
Dining-Family	854	Pump Stations	563
Entertainment	564	Refrigerated Warehouse	648
Exercise Center	1069	Religious Buildings	564
Fast Food Restaurants	1139	Residential (Except Nursing Homes)	709
Fire Station	564	Restaurants	854
Food Stores	837	Retail	837
Gymnasium	646	Schools/University	594
Hospitals	1308	Schools (Jr/Sr. High)	594
Hospital/Health Care	1307	Schools (Preschools/elementary)	594
Industrial- 1 Shift	681	Schools (Technical/Vocational)	594
Industrial-2 Shift	925	Small Services	798
Industrial- 3 Shift	1172	Sports Arena	564
Laundromats	837	Town Hall	797
Library	797	Transportation	1149
Light Manufacturers	681	Warehouse (Not Refrigerated)	648
Lodging (Hotels/Motels)	708	Waste Water Treatment Plant	1172
Mall Concourse	938	Warehouse	798
Manufacturing Facility	681		

*Source: New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009 (page 3-41).

APPENDIX B: IECC 2006 AND IECC 2009 EQIUPMENT ANALYSIS

B.1.1 Rooftop units

For all RTU sizes the EER (SEER and/or IPLV) values stipulated in the IECC 2009 are greater than those in IECC 2006. The measure baseline efficiency values used in the Calculator (reduced by 0.2 to account for the heating section) are consistent with the codes.

B.1.2 Water source heat pump

No change in EER values between IECC 2006 and IECC 2009. The Calculator and IECC 2006 values are consistent.

B.1.3 Condensing units

No change in EER values between IECC 2006 and IECC 2009. The Calculator uses EER value for air cooled condensing units only and this is in agreement with IECC 2006 value. The EER and (IPLV) values for water or evaporative cooled condensers are also provided in the Tables 6.7a and 6.7b.

B.1.4 Packaged Terminal Air Conditioners (PTAC)

No change in equipment baseline efficiencies between IECC 2006 and IECC 2009. Minimum energy efficiency ratio (EER) for PTACs according to both IECC 2006 and IECC 2009 is given by the following relation:

New Construction:

EER = 12.5 - (0.213*Capacity/1000)

Replacement:

EER = 10.9 - (0.213*Capacity/1000)

Code handbooks stipulate that for PTAC capacity less than 7,000 BTU/hr (0.58 ton) the equation should use default capacity value of 7000 BTU/hr to calculate the EER. Similarly, for equipment capacity over 15,000 BTU/hr the default capacity is 15,000 BTU/hr. Based on the above assumptions we calculate the EER values shown in Table 6.6a and 6.6b.

The Calculator uses a single EER value of 9.1 (excluding 0.2 for heating section); based on an average value of PTAC size obtained from the Xcel Energy CO market segment data. Plugging the EER value of 9.3 (9.1 + 0.2 for heating section) in above algorithms leads to PTAC sizes of about 15,000 BTU/hr and 7,000 BTU/hr for new construction and replacement units respectively. This does not capture the PTAC sizes that fall within the 15,000 BTU/hr and 7000 BTU/hr range. . We recommend that the Calculator applies the above algorithm to take into account the capacity variations for PTACs.

B.1.5 Electric chillers

In Table B-1 and B-2 we provide baseline measure efficiencies for electric chillers. The "Full Load Value (FLV) in kW/ton" and "Integrated Part Load Value (IPLV) in kW/ton" provided in the Calculator and the IECC 2006 handbook are consistent.

Table B-1. Baseline Efficiency of C&I Chillers—IECC 2006

Cooling Measures	IECC 2006		
	FLV (kW/ton)	IPLV (kW/ton)	Test Procedure
Scroll/Screw Chiller < 150 tons	0.79	0.78	ARI 550/590
Scroll/Screw Chiller ≥150 tons and < 300 tons	0.72	0.71	
Scroll/Screw Chiller ≥ 300 tons	0.64	0.63	
Centrifugal Chiller < 150 tons	0.65	0.65	
Centrifugal Chiller ≥150 ton and < 300 tons	0.63	0.63	
Centrifugal Chiller ≥ 300 tons	0.58	0.58	
Air-Cooled Chillers ≥ 150 tons	1.41	1.41	

Note: For non-standard centrifugal chillers (chillers not designed to standard ARI 550/590 test conditions) the IPLV is factored for adjustment (according to the algorithm well captured in the Calculator).

The IECC 2009 codes for water cooled chillers contain the amendments made by the ASHRAE 90.1—2007 standards. Two paths have been established—Paths A and B. Path B is intended for measure applications where significant time is expected at part load and all Path B chillers need demand-limiting controls.

Table B-2. Baseline Efficiency of C&I Chillers—IECC 2009

Measure	IECC 2009				
	Path A		Path B		
	FLV kW/ton	IPLV kW/ton	FLV kW/ton	IPLV kW/ton	Test Procedure
Scroll/Screw Chiller < 75 tons	≤0.78	≤0.63	≤0.0.80	≤0.60	AHRI 550/590
Scroll/Screw Chiller ≥75 and <150 tons	≤0.78	≤0.62	≤0.79	≤0.59	
Scroll/Screw Chiller ≥150 and <300 tons	≤0.68	≤0.58	≤0.72	≤0.54	
Scroll/Screw Chiller ≥ 300 tons	≤0.62	≤0.54	≤0.64	≤0.49	
Centrifugal Chillers < 150 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥150 and < 300 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥300 and < 600 tons	≤0.58	≤0.55	≤0.60	≤0.40	
Centrifugal Chillers ≥ 600 tons	≤0.57	≤0.54	≤0.59	≤0.40	
Air-Cooled Chillers ≥ 150 tons	≥9.6 EER	≥12.75 EER	NA	NA	

The adjustment factor for non-standard chillers is given by the following equation.

Adjusted NPLV = IPLV/K_{adj}

K_{adj} = 6.174722 – 0.303668(X) + 0.00629466 $(X)^2$ – 0.000045780 $(X)^3$

X = D_{std} + LIFT

D_{std} = (24 + FLV*6.83)/Flow rate

LIFT = CEWT – CLWT (^oF)

CEWT = Full load condenser entering water temperature (^oF)

CLWT = Full load leaving chilled water temperature (^oF)

Note that the coefficients of the equation for K_{adj} provided in the IECC 2009 are different from that in IECC 2006.

APPENDIX C: PARTICIPANT AND NONPARTICIPANT SURVEY RESPONSE RATES

Table C-1 presents the response rate and cooperation rate to the participant survey, and Table C-2 presents the same information for nonparticipants.

Table C-1. Cooling Efficiency Program Participant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**134**	**23**	**157**
Number not in service[4]	1	0	1
Non-working number[4]	0	3	3
Person not at number	7	0	7
Adjusted Sample Size	***126***	***20***	**146**
Hard Refusal	28	3	31
Soft Refusal[1]	0	0	0
Incompletes (partial interviews)	0	0	0
Unavailable for duration	3	2	5
Language barrier/non-English	0	0	0
Active[2]	***51***	***5***	**56**
Completed Surveys[5]	**44**	**10**	**54**
Cooperation Rate[3]	***34.9%***	***50.0%***	***42.5%***

[1] Attempts were made to convert all soft refusals
[2] An average of 16.7 contacts per active case were made to reach these still active cases
[3] Number of completed surveys divided by Adjusted Sample Size
[4] All bad numbers were traced with a telephone append service or directory assistance service
[5] Surveys were completed with 54 participants at 44 locations

Table C-2. Cooling Efficiency Program Nonparticipant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**156**	**572**	**728**
Temporarily disconnected[4]	1	5	6
Fax/data line[4]	4	3	7
Disconnected number[4]	1	30	31
Residential number	12	59	71
Ineligible—no commercial cooling	18	80	98
Ineligible—terminated during survey	12	77	89
Adjusted Sample Size	***108***	***318***	**426**
Hard Refusal	24	69	93
Soft Refusal[1]	0	2	2
Incompletes (partial interviews)	1	4	5
Unavailable for duration	3	14	17
Language barrier/non-English	0	2	2
Active[2]	***58***	***187***	**245**
Completed Surveys	**27**	**62**	**89**
Completed Surveys—Swamp Coolers Only	**1**	**7**	**8**
Completed Surveys—Doesn't Pay Cooling	**4**	**15**	**19**
Cooperation Rate[3]	29.6%	26.4%	***28.0%***

[1] Attempts were made to convert all soft refusals

[2] An average of 9.8 contacts per active case were made to reach these still active cases

[3] Number of completed surveys divided by Adjusted Sample Size

[4] All bad numbers were traced with a telephone append service or directory assistance service

PA Consulting Group

Xcel Energy

Process and Impact Evaluation for the Colorado Business Cooling Efficiency Program

FINAL REPORT

January 15, 2010

Xcel Energy

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Prepared for: Xcel Energy

PA Consulting Group
6410 Enterprise Lane
Suite 300
Madison, WI 53719
Tel: +1 608 316 3700
Fax: +1 608 661 5181
www.paconsulting.com

Version: 1.0

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1. EXECUTIVE SUMMARY

This report provides the process and impact evaluation results of Xcel Energy's Colorado Commercial and Industrial (CO C&I) Cooling Efficiency Program.

OVERVIEW OF THE PROGRAM

The Cooling Efficiency program, which Xcel Energy launched in 2006, provides rebates to non-residential customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Oversized cooling towers
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps

The program targets both new construction and existing buildings. The program further distinguishes between prescriptive and custom installations.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively. [1]

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has struggled to elicit small business customer participation.

The program leverages the trade ally infrastructure, along with Xcel Energy staff such as account managers and Business Solutions Center representatives, to provide program outreach. Understanding the importance of the trade allies' roles, the program has an assigned Trade Relations Manager who provides education and outreach to trade allies throughout the state.

[1] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

1.1 METHODOLOGY

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make changes that should be made to technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and the Company's current processes, technical assumptions and NTG ratios.[2]"

The process evaluation was designed to provide Xcel Energy with a thorough understanding of process issues such as barriers to participation, satisfaction with customers, and opportunities for improvement. The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate net-to-gross ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are reasonable and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[3], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Data collection activities included in the evaluation are detailed below. These activities informed both the process and impact (e.g., net-to-gross) analysis.

Table 1-1. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[4]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

[2] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

[3] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes as well as the impact of the 2009 IECC standards on future program years instead of looking backward to codes that no longer apply.

[4] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

1.2 KEY FINDINGS

The 2009 program successfully achieved its energy savings goals even though it increased its savings goals from the 2008 program year. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent, and 106 percent of the goals respectively.

The evaluation found that while the program effectively engaged managed accounts, the program is not as effectively reaching small and/or non-managed customers. This key finding will not come as a surprise to program staff—the evaluation confirmed that it is an issue through database analysis and in-depth interviews. Interviews identified that there are unique barriers for small commercial customers particularly for chain accounts that occupy leased facilities.

The evaluation also found that leveraging trade allies is critical for programs such as Xcel Energy's Cooling Efficiency Program. Effectively reaching and integrating trade allies into the program's outreach and marketing campaign was identified in the benchmarking study as a best practice; program managers of mature and successful programs said they leverage trade allies successfully, although developing those relationships admittedly takes time. Xcel Energy's Cooling Efficiency Program is moving in the right direction by employing an assigned Trade Relations Manager to reach trade allies.

Although the trade ally infrastructure is key to program success, there is a need to continue to strengthen the demand of high efficiency cooling equipment from the customer. Interviews identified a need for continued education with customers and specific marketing materials for target groups.

The remainder of this key findings section organizes findings by research objectives detailed in the Xcel Energy Cooling Efficiency Request for Proposal. Research objectives relevant for each subsection are denoted in the footnotes. The process and impact evaluation chapters provide further support and documentation of these key findings.

1.3 PROCESS EVALUATION KEY FINDINGS

1.3.1 Program design and operations[5]

Program staff and trade allies commended the prescriptive programs' application process, commenting that the application form is relatively easy to complete with clear instructions. The custom application process did not receive such favorable reviews from respondents. Respondents found the application process difficult and commented on the rebate estimation and verification process as areas for improvement.

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[5] **This section addresses the following objectives:**

1) Gauge efficiency of the application process and determine opportunities to improve the application process.

2) Identify areas where the program/processes/marketing can be improved to capture more customer participation.

Having an assigned Trade Relations Manager to communicate with trade allies is seen as a critical role by program staff. However, interviewees questioned whether one staff member was sufficient for the entire state. Additional support in reaching trade allies was identified by Xcel Energy staff as a means for capturing more customer participation.

The Business Solution Center (BSC) is also viewed favorably by program staff as a referral point for the non-managed and small business customers. However, interviews revealed that the BSC should be more involved in marketing to customers. BSC staff said they planned to proactively market to customers in the future, although they admitted to not having specific marketing materials for these customers.

As noted in the recommendations section, the program should consider developing targeted marketing materials and provide those materials to BSC staff. Other recommendations include increasing the rebate level to capture a group of nonparticipants that otherwise would not participate and provide education and training opportunities to customers.

1.3.2 Customer characteristics and experiences[6]

The program is primarily serving managed accounts. Consequently, the nonparticipant group is far more likely to be comprised of non-managed accounts than the participant group. Participants are also more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Other points of distinction between the participant and nonparticipant groups are variability in hours of operation by season and building ownership.

The majority of participants said there is typically more than one person involved in the decision of whether to purchase cooling equipment. The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. The age or condition of the old equipment was the most important factor.

Overall, program participants are satisfied with the Cooling Efficiency program and the various aspects of the program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied.

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[6] **These key findings address the following objectives:**

1) Identify characteristics and firmographics to help define current participants and target similar non-participants.
2) Assess customer decision-making processes regarding participating in the CO C&I Cooling Efficiency Program.
3) Gauge program participant satisfaction.

1.3.3 Target market for Xcel Energy's cooling efficiency program[7]

Trade ally interviews discussed the significant potential for the Cooling Efficiency Program in Colorado's commercial market. According to trade allies and Xcel Energy staff interviews, small commercial customers are underserved by the program, as documented in the program literature[8] and confirmed by trade allies and program staff in this program evaluation. These small commercial and non-managed organizations tend to be capital constrained and lease space. Therefore, they do not have ownership of the equipment installed but have to pay the energy bills. An effective suggestion for targeting these customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Additionally, large commercial customers are oftentimes opting to repair rather than replace failing equipment. The stock of cooling equipment is aging for these customers. Trade allies envision a significant need for cooling equipment replacement and an opportunity for the Cooling Efficiency program in the future.These factors, along with relatively low participation numbers since program inception, indicate that that there is significant opportunity for the program to provide cooling efficiency services to the commercial sector.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

1.3.4 Marketing and outreach[9]

The program employs a variety of resources to provide marketing and outreach to customers and trade allies. These resources include the BSC, Trade Relations Manager, and account managers, as well as direct mailings developed by Xcel Energy. Trade allies are particularly critical for reaching customers.

The participant surveys explored the effectiveness of these outreach efforts. Account managers followed by their HVAC vendors have been the most effective outreach channels for program participants.

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[7] **These key findings address the following objectives:**

1) Quantify program saturation in the market including untapped markets of non-participants and remaining markets for existing program participants.
2) Identify the most attractive target populations that currently participate in the program.
3) Identify the target population that currently do not participate in the program.

[8] *2009 Cooling Efficiency Marketing Plan.*

[9] **These key findings address the following objectives:**

1) Identify channels for information about the CO C&I Cooling Efficiency Program
2) Determine nonparticipants' awareness level of Colorado's C&I Cooling Efficiency Program
3) Identify preferred channels for information about the CO C&I Cooling Efficiency Program

Approximately a quarter of nonparticipants are aware of the program. The most common way nonparticipants heard about the program was through Xcel Energy direct mail. Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, followed by email. Trade ally and internal staff identified a need for these marketing materials to be more specific to target sectors, such as small commercial customers.

Trade allies appreciate receiving information through mail; however, the evaluation identified that personal contact is most effective for providing information about the program. Trade allies also requested that a dedicated website be established to communicate program information and tools.

1.3.5 Barriers to purchasing new equipment or participation[10]

The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital. Customers will contact trade allies when it is time to replace the equipment. Current economic conditions and costs were identified by participating and nonparticipating trade allies, and nonparticipating customers, as barriers to purchasing efficient cooling equipment. The barriers included the incremental cost of high efficiency cooling equipment as well as the first cost of cooling equipment.

Several trade allies differentiated the barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost. For larger customers, the main barrier was initial cost due to their need for larger cooling equipment. A number of these customers decide to repair rather than replace equipment. Another notable barrier was triple-net leases, which are reported as very common among commercial customers. Non-financial barriers for moving customers to higher efficiency cooling equipment include customers' lack of awareness and/or understanding of the benefits of high efficiency equipment.

Customers' financial constraints and tendency to replace equipment on failure reinforce the need for trade allies to be intimately familiar with the program and be provided with materials and tools so they can easily and quickly provide information to customers in these situations.

1.4 IMPACT EVALUATION KEY FINDINGS[11]

The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used

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[10] **These key findings address the following objectives:**

1) Identify barriers to participation

2) Determine reasons for not participating in the program

[11] **These key findings address the following objectives:**

1) Verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and vendor's own findings.

2) Calculate Net-to-Gross ratios including and identifying the effect from free riders, free drivers, and spillover.

for other programs. The values for peak load coincident factor (CF) and equivalent full load hours (EFLH) provided in the Calculator are appropriate.

More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. Based on the review of other programs and the engineering estimates, the recommendations include removal of VAV boxes from program offerings.

IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for both the 2009 and 2010 program years. The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the Package Terminal Air Conditioners (PTACs), which do not take into account variations in PTAC sizes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

The self-reported net-to-gross ratio for 2007–2009 participants using the California self-report methodology was is 0.7 for the Colorado Cooling Efficiency Program. Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program. The net-to-gross results identified through the benchmarking study are in line with the results from this Xcel Energy Cooling Efficiency evaluation, which used the California net-to-gross framework[12].

1.5 RECOMMENDATIONS

These recommendations are based on activities and key findings detailed within the report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

1.6 PROCESS RECOMMENDATIONS

1.6.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates

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[12] The program has used a net-to-gross ratio of .94 through 2009 and per Xcel Energy recommendations from this evaluation will not be retroactively imposed on 2009 or prior program achievement but will be used moving forward beginning in 2010.

program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Relations Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to

pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

1.6.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

1.6.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program. .

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn't even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

1.7 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007–2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross

ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007–2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

2. INTRODUCTION

This report presents the results of the 2009 process and impact evaluation of the Xcel Energy Colorado Business Cooling Efficiency program. In this chapter, we discuss the program overview and logic model, study objectives, evaluation methodology, and organization of the report.

2.1 PROGRAM OVERVIEW AND LOGIC MODEL

2.1.1 Program overview

Cooling is the second highest use of electricity for most commercial buildings[13]. Xcel Energy began offering a Cooling Efficiency program for its Colorado commercial and industrial customers in 2006.

The Cooling Efficiency program offers rebates to eligible customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps.

The program targets both new construction and existing buildings and provides rebates for whole systems, as well as specific components. The incentives differ by the type of cooling equipment purchased. Variable Air Volume Boxes and Cooling Towers have a fixed rebate amount. All other equipment types have a base rebate per ton, and the rebate amount increases incrementally if the equipment exceeds the minimum efficiency requirements necessary to qualify for the base rebate amount.

The program further distinguishes between prescriptive and custom installations. The custom program requires that all projects be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification.

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has not been gaining broad acceptance with customers and vendors as quickly as anticipated. Small business participation is a known

[13] Commercial Building Energy Consumption Survey, 2007

challenge for the program, and the recent economic conditions have also hampered program acceptance.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively.[14]

Table 2-1 details the number of customers that participated in the program and related savings by year. While the program is still relatively young, the trend indicates the program has gained momentum. There was a significant increase in participation between 2006 and 2007; however, the participation numbers remained relatively constant between 2007 and 2008 while the savings decreased. The program experienced program design changes between 2008 and 2009. The baseline assumption and requirements for eligible equipment increased. In 2009, there was an increase in both participants and achieved savings, meeting the annual savings goals for the first time.

Table 2-1. Number of Customers and Related Savings by Year

Program Year	Number of Participating Customers	Marketing kW Achieved	Generator kW Achieved	MWh Savings Achieved
2006	49	903	693	1,417
2007	113	2,342	517	4,934
2008	123	1,998	1,176	3,540
2009	175	4,262	5,181	6,558

Source: Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

The program provides program outreach through a variety of sources including the trade ally infrastructure and Xcel Energy staff. Key Xcel Energy outreach staff includes the account managers as well as Business Solutions Center representatives whose role it is to provide outreach and services to non-managed accounts. Recognizing the importance of the trade allies' role, the program has an assigned Trade Ally Manager who provides education and outreach to trade allies throughout the state. The program also receives guidance from a trade Cooling Council which first began meeting in 2008.

2.1.2 Logic model

Xcel Energy's Colorado Cooling Efficiency Program undertakes a number of activities to capture both energy and demand savings with Xcel Energy's commercial customers as well as result in the long-term increased penetration of energy efficient cooling equipment among all business sectors of its commercial population in Colorado. Xcel Energy runs the program internally; therefore, the development and refinement of the program infrastructure is a major

[14] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

activity of the program. The other main activities include outreach to trade allies, customer communications, and rebating eligible equipment.

Figure 2-1 is the program's logic model that identifies program activities, targeted market actors, outputs, and expected outcomes. A well-designed logic model serves as a roadmap to understanding logical relationships among program interventions and potential issues and problems. It communicates a performance story about what the program is trying to achieve, through what interventions, and with respect to which market actors. This logic model was developed based on program materials, discussions at the start-up meeting, and interviews with Xcel Energy staff involved in program management and implementation.

Figure 2-1. Colorado Cooling Efficiency Program Logic Model

Inputs/ Resources	Sufficient budget is allocated Xcel Energy Cooling Efficiency Team* Outside technical resources	Marketing collateral, Program website Xcel Energy Cooling Efficiency Team Xcel Energy technical assistance	Marketing collateral, Program website Account managers, Business Service Center (BSC) and trade allies Xcel Energy technical assistance
Activities	**Develop Program Infrastructure** →	**Outreach to Trade Allies** →	**Customer Communications** →
Outputs	The Cooling Efficiency program has been in the CO market since 2006 Program measures, rebates and marketing strategy, technical assumptions developed, refined and documented. Internal website and training Tracking system developed (appropriate information is requested, captured and entered into Siebel)	Participate in events of local chapters of HVAC associations and market to their members, energy efficiency fairs Hold semi-annual trade Cooling Council meeting and ad-hoc meetings Involve trade allies in developing rebate structures and new products	Account managers, BSC representatives and trade allies refer customers to the program Targeted direct communications to business customers and other outreach such as newsletters, energy efficiency fairs Print and radio advertisement on Energy Efficiency Programs
Short to medium term outcomes	Improved energy efficiency program awareness and participation Xcel Energy staff knowledgeable about the program and its resources Refine Xcel Energy product offerings High customer satisfaction	Trade allies are knowledgeable about the rebate structure and program guidelines Trade allies regularly communicate the program to customers and include rebate with bids Trade allies receive technical assistance from Xcel Energy engineers	Program offering is meaningful, clear, and valuable to customers Business customers' awareness of and participation in the program increases significantly Business customers receive needed technical assistance from Xcel Energy engineers
Long term outcomes	Energy saving goals of the Cooling Efficiency program are achieved within budgetary constraints	Increased trade allies' stocking and sales of AC energy efficient technologies and increased participation of customers in the program	Increased awareness of and demand for energy efficiency equipment in all business segments

* Core members of the Xcel Energy Cooling Efficiency team include the product manager, energy efficiency management, marketing assistants, Trade Relations Manager, and energy efficiency engineer staff. Ancillary members of the Cooling Efficiency team include market research, account management, advertising, corporate communications, information services, regulatory affairs, rebate operations, Business Solutions Center (BSC), and legal.

2.2 STUDY OBJECTIVES

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make recommendations that should be made to

technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and Xcel Energy's current processes, technical assumptions and NTG ratios.[15]"

Xcel Energy identified several key evaluation objectives for both the process and impact evaluations. The process evaluation was designed to provide Xcel Energy with a thorough understanding of participating and nonparticipating commercial customers' and trade allies' awareness of the program, satisfaction with the program, barriers to participation, and opportunities for program improvements. It was also designed to provide information on how to target and market to various segments within the commercial population to increase participation.

The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate NTG ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering 2009 International Energy Conservation Code (IECC) standards, developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

2.3 EVALUATION METHODOLOGY

This section outlines the process and impact evaluation methodology, including data collection methods used to support the evaluation.

2.3.1 Process evaluation methodology

The evaluation included numerous activities in 2009 to directly address the process evaluation objectives. These activities included:

[15] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

Table 2-2. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[16]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

Internal review. This activity included a project kick-off meeting; a review of existing program documentation, marketing materials, and the program tracking system; and in-depth interviews with ten Xcel Energy internal staff. PA interviewed the Cooling Efficiency program manager, two rebate processors, two Business Solutions Center (BSC) representatives, one Trade Relations Manager, two account managers, and the team lead energy efficiency engineer. These interviews were used to clarify the roles and responsibilities of staff and trade allies; program goals and successes/challenges in meeting those goals; the effectiveness of the programs' operations relative to the defined program goals and objectives; and reasons for variance in program performance by customer class (e.g., small business and other customer segments such as retail/office, food services).

Based on the internal review and project kick-off meeting, PA developed a detailed evaluation plan and program logic model.

Participating customer surveys. The participant survey collected information about participant characteristics and firmographics, equipment decision-making processes (including remaining markets for existing program participants), source(s) of program information, satisfaction with key aspects of the program and the application process, barriers to participation, the effect of the program on their decision to install qualifying equipment, and suggestions for program improvements. In addition to providing data to estimate a net-to-gross ratio, the survey addressed key assumptions to the savings algorithm such as hours of use and baseline (what would have been installed without the program).

PA completed telephone interviews with 54 businesses that participated in the Xcel Energy Cooling Efficiency Program ("participants") since the program started (2007–2009). Some businesses participated in the program at multiple locations. Forty-four unique respondents represented these 54 businesses.

A detailed response rate table for the participant (and nonparticipant) surveys can be found in Appendix C.

Nonparticipating customer surveys. The nonparticipant survey was designed to help characterize the market for energy efficient HVAC equipment in terms of the types of

[16] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

customers and decision-makers. The survey collected data on program awareness, preferred sources of information, market barriers to participation, equipment decision-making processes, and characteristics and firmographics.

PA completed telephone interviews with 116 customers who had not completed a project through the Xcel Energy Cooling Efficiency Program since the program began ("nonparticipants"). Eighty-nine of these businesses had commercial cooling equipment and paid cooling costs to Xcel Energy ("eligible nonparticipants"). Nineteen of these businesses had cooling costs included in their lease and eight businesses had swamp coolers as their only cooling equipment. These businesses completed a shortened version of the survey ("ineligible nonparticipants").

Customer-identified Influential Trade Allies. The participant customer surveys were also used to assess free-ridership and spillover using a California influenced (and Xcel Energy approved) free-ridership and spillover battery. When assessing free-ridership and spillover, it is critical to speak with the person or persons most involved in the decision-making process. As we have found through other HVAC free-ridership and spillover studies, the decision maker is often not the customer. Rather, select trade allies tend to be influential in the decision-making process. In cases where the customer identified the trade ally as being influential in the decision, we also attempted to speak with the trade ally. PA completed 11 surveys with influential trade allies to assess the influence of the program on that particular project.

Participating and nonparticipating trade ally interviews. The participating and nonparticipating trade ally interviews provided rich qualitative information regarding program design and program impacts. PA sampled a census of participating trade allies from the program database, including those with very little activity. We also received a list of nonparticipating trade allies to sample from.

PA conducted in-depth interviews with 17 participating and 13 nonparticipating trade allies. These trade allies included those that supplied, installed, and serviced cooling equipment, as well as an engineer and several equipment suppliers. The interviews probed on a variety of issues including type of business activities, awareness of the program and program offerings, source of program information, barriers to customer (particularly small business) and trade ally participation, and recommendation practices for efficient equipment and program influence in these practices. The interviews also explored trade allies' perception of the difference in purchasing and decision-making practices between different commercial customer segments (small, medium, large, national chain accounts vs. independently owned) and the impact of the economy on the trade allies' abilities to promote, stock, and sell program-qualifying equipment. In addition, the trade ally interviews also attempted to gather information that could be used to assess market affects or other program-related impacts such as free-ridership and spillover[17].

Peer utility program benchmarking review. This task included a literature review, Internet research, and program manager and program evaluator interviews for eight similar utility

[17] Free-ridership refers to customers who participate in programs and obtain incentives for actions they claim they would have taken without the incentive. Spillover refers to savings induced by the program but not achieved (and claimed) through other utility programs.

programs. The benchmarking was designed to identify standard approaches and best practices in programs that are similar in scope and objectives to Xcel Energy's Cooling Efficiency program in Colorado. Specifically, the review examined program goals, objectives, and scope; effectiveness of the program in meeting goals and objectives; key elements of program design; marketing and recruitment of customers; quantification of program impacts; rebate levels; product offerings; application process; trade ally incentives and/or Quality Installation requirements; and trade ally outreach (especially to small business).

2.3.2 Impact evaluation methodology

The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[18], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Verify baseline and technical assumptions. The impact evaluation reviewed the 2009 baseline and technical assumptions using information relevant to Xcel Energy's territory and made recommendations concerning any adjustments we believe Xcel Energy should make going forward. The review activities included: (1) tracking system review, (2) engineering assumption review, and (3) participant survey results and project file review.

Calculate gross savings with IECC 2006 codes. The impact evaluation focused on 2009 program participants and on future years rather than reviewing assumptions retroactively. PA reviewed tracking system data from the Program Year 2009 applications that had been used to estimate program savings (Colorado uses IECC 2006 codes as the 2009 program baseline). For Program Year 2010, Colorado will also be using IECC 2006. Future program years after 2010 may be shifting the baseline to the IECC 2009 codes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

Develop net-to-gross ratio. The net-to-gross ratio was calculated based on interviews with 1) 2008–2009 participating customers and influential vendors, 2) in-depth interviews with contractors, and 3) a literature review and benchmarking interviews with program managers of similar programs in the US.

2.4 ORGANIZATION OF THE REPORT

Section 3 of this report presents the findings from the various process evaluation activities, and Section 4 presents the findings from the impact evaluation activities. Section 5 provides suggested recommendations for program changes that could increase participation, reduce burden, and increase program impacts.

Appendix A contains the Technical Resource Manual review summary and Appendix B contains the IECC 2006 and IECC 2009 equipment analysis conducted as part of the impact

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[18] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes instead of looking backward to codes that no longer apply.

evaluation activities. Appendix C contains the response rates to the participant and nonparticipant customer surveys.

3. PROCESS EVALUATION FINDINGS

This chapter presents the results of the process evaluation based on interviews with internal program staff, participant and nonparticipant customer surveys, participant and nonparticipant trade allies, and the benchmarking review. These results are organized as follows:

- Key findings
- Program administration, processes, and resources
- Participating and nonparticipating customer characteristics
- Participating customer satisfaction with the program
- Customer awareness and marketing
- Customer decision making processes
- Trade ally results
- Benchmarking results
- Program potential
- Opportunities for improvement

3.1 KEY FINDINGS

Before discussing the results we present the overarching key process evaluation findings. Key findings are detailed by program design and operations, customer experiences, trade ally experiences, and barriers to new equipment purchases and program participation.

3.1.1 Program design and operations

- Program staff believe the Prescriptive component of the program is an area of the program that is working well. They have experienced frustration with the custom program and reported there have been trade allies and customers also frustrated with this component of the program. Trade ally interviews confirmed some level of frustration with the custom component of the program, although the issue did not arise through interviews with program participants who received services through the custom program. In fact, the post-inspection process, which was a point of contention raised in internal and trade ally interviews, received a high rating of satisfaction by custom program participants.
- Xcel Energy employs an assigned Trade Relations Manager to communicate and work directly with trade allies in Colorado. Having this assigned Trade Relations Manager was seen as a critical role by program staff, although having only one person fill this role for the entire state may mean that more rural or outlying areas are not being reached.
- The Business Solution Center (BSC) is viewed favorably by program staff as a referral point for the non-managed and small business customers. However, there is little direct marketing activity to small commercial customers through the BSC.
- Several program staff commented on the need to receive information regarding program changes in a more formal manner.

- Xcel Energy's Cooling Efficiency program is consistent with other programs as identified in the benchmarking study. Measures with incentives and other incentives are within range of or slightly lower than other programs.
- The benchmarking study attempted to identify net-to-gross ratios used by other programs. Some programs were able to provide their net-to-gross ratios based on evaluation efforts, although most program managers were unable to provide this information as either they use a deemed net-to-gross value or are not required to report net-to-gross ratios for their program. The primary and secondary data review provided context for the Xcel Energy net-to-gross results, indicating that the results are in line with other programs.
- The benchmarking study identified a variety of best practices for cooling programs.
  - Utilize key account representatives and trade allies as much as possible for program communication.
  - Become fully educated on trade associations when leveraging them to target customers. Identify all associations representing that particular market segment and have control mechanisms in place to scale down or ramp up depending on activity level.
  - Identify a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs.
  - Set effective rebate and efficiency levels. A comparison of rebate levels in other programs with Xcel Energy's found Xcel Energy's rebates are some of the lowest for air conditioning systems. Xcel Energy is also rebating a lower SEER rating for packaged and split AC units than other programs.
  - Streamline the application process.
  - Engage the customer early in their decision-making process to influence their choice of equipment.
  - Provide customer education and assistance as well as the rebate. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers.

3.1.2 Customer characteristics and experiences

- There are some differences in customer characteristics between participants and nonparticipants. Participants are more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Participants are also more likely to be managed accounts. Although the average operating hours do not differ between participants and nonparticipants, participants are significantly more likely to have hours that very by the season or operating cycle. Participants are also more likely to own their building, and are more likely to report having taken an action in the past few years to reduce energy use.
- Overall, program participants are satisfied with the Cooling Efficiency program. They were also satisfied with the various aspects of the program, such as the post-inspection process, type of equipment eligible, the contractor they worked with and the rebate application process. Both participants and non-participants were satisfied with Xcel Energy in general.

- Approximately one-fourth of nonparticipants are aware of the program. The most common way that aware nonparticipants heard about the program was through Xcel Energy direct mail or a HVAC vendor.
- Account managers have been the most effective outreach channel for program participants, cited by 55 percent of participants. Hearing about the program through a HVAC vendor was the next most common way of learning about the program. Provided a significant portion of the program population is managed accounts, it is not surprising that account managers were identified by customers as the most notable means for hearing about the program.
- Few customers mentioned marketing materials as a means for hearing about the program. Interviews with program staff identified that the marketing materials distributed to customers and available to program staff are fairly generic, although the customer sectors that the program serves are unique.
- The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment.

3.1.3 Trade ally experiences

- Nearly three-quarters of nonparticipating contractors are aware of the program; therefore, lack of general awareness does not seem to be a barrier to program participation (although deeper understanding of the program is important). Participating and nonparticipating trade allies heard about the program through Xcel Energy representatives, materials, events, customers, and other Xcel Energy programs.
- The primary program-related benefits noted by trade allies are: being more price competitive by including the Xcel Energy rebate, and the ability to communicate and educate customers on energy efficiency by promoting the program. Trade allies saw the benefits for customers as primarily the cost savings, although increased energy efficiency was also mentioned.
- While participating trade allies are generally optimistic that their participation in the program will increase in the next 12 months, their optimism does not extend to the high efficiency HVAC market in general. They project it will continue to be difficult to convince customers to adopt high efficiency equipment due to financial constraints.
- Trade allies commented that it is more difficult to sell high efficiency equipment in replace-on-failure situations where decisions need to be made quickly. Therefore, it is important for trade allies to not just be aware of the program, but be intimately familiar with the program so they can easily and quickly provide information to customers in these situations.

3.1.4 Barriers to purchasing new equipment or participation

- The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital, mentioned by almost two-thirds of nonparticipants. This is consistent with information received from the trade ally interviews. When nonparticipants do need to replace equipment, contractors will be their first contact point.
- Both participating and nonparticipating trade allies corroborated nonparticipating customers' perception of purchasing barriers and identified the economy, coupled with the incremental cost of high efficiency cooling equipment as well as the first cost of cooling

equipment, as primary barriers for purchasing new, high-efficiency equipment. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high efficiency equipment as are leased buildings.

- Several trade allies distinguished the differences in barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost—the difference between standard and high efficiency equipment. For larger customers, the main barrier was first cost—large equipment is expensive and customers tend to repair it instead of replace it as long as possible (especially in the current economy).
- Another notable barrier was triple-net leases, which are reported as very common among commercial customers. In these situations, the customer does not own the building, but is responsible for the mechanical equipment. Trade allies report these customers are less likely to make the investment in high efficiency cooling equipment as they are unsure of how long they will be in the building and therefore may not realize the payback of the higher efficiency equipment.
- Non-financial barriers for moving customers to higher efficiency cooling equipment included customers' lack of awareness, knowledge, and/or understanding of the benefits of high efficiency equipment. Trade allies expressed the need for tools to help sell high efficiency equipment, and the need for more direct communications with Xcel Energy staff to understand program benefits, requirements, and obtain information necessary to help them sell equipment through the program.
- Trade allies provided a variety of suggestions for overcoming barriers, which typically corresponded to their perception of the barriers for selling high efficiency equipment. Suggestions for overcoming barriers include increasing the rebate levels, better educating trade allies on the program, helping them to sell high efficiency equipment by providing tools to help with the sales process (e.g., savings calculator), making the custom component of the program less burdensome and more transparent for trade allies and customers, and directly marketing the program to customers. Participating trade allies also suggested that Xcel Energy have more personal communications with them to provide information about the program.

3.2 PROGRAM ADMINISTRATION, PROCESSES, AND RESOURCES

As documented throughout this report, program participants, trade allies, and program staff generally speak favorably about this program. The Prescriptive component of the program in particular was mentioned by all parties interviewed as a component of the program that is working well.

Interviews with program staff, customers, and trade allies investigated the effectiveness of program administration, processes, and resources. This section summarizes the results of those interviews.

3.2.1 The prescriptive program and application process

The Cooling Efficiency Prescriptive Program's application process received special kudos from respondents, especially when they were comparing the program to other Xcel Energy programs. They commented that the application was streamlined, clear, and relatively easy to complete and process. This is particularly important amongst larger customers who do not

have time to deal with convoluted program processes and paperwork. This is consistent with remarks made by trade allies regarding the prescriptive application process.

Program participants were also generally satisfied with the application process, rating the process an average of 8.5 on a 0- to 10-scale where 10 indicates they were extremely satisfied with the processes. A majority of these program participants (52 percent) reported filling out the rebate application themselves and 10 percent of applications were completed by the equipment vendor.

3.2.2 Role of assigned trade relations manager

Two groups were specifically discussed as potential targets for Xcel Energy's Cooling Efficiency Program at the kick-off meeting: the trade allies and the non-managed accounts. The program is attempting to reach these targeted groups through the use of an assigned Trade Relations Manager and the Business Solutions Center (BSC).

The assigned Trade Relations Manager's role is to communicate and work directly with the trade allies in Colorado. It was clear through the interviews, and from our experience, that the trade allies are an important group to reach and inform about the program. They are a primary marketing tool for the program as they are often the first point of customer contact, especially for small commercial customers. They also have the opportunity to steer customers toward program-qualifying equipment with an eye to program requirements. Therefore, having this assigned Trade Relations Manager was seen as a critical role, and a positive component of the Cooling Efficiency Program.

Various program staff discussed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification. The trade allies discussed earlier in this report also raised this as a need for the program. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

The Trade Relations Manager is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, but he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado. There is question about whether the single Trade Relations Manager is sufficient to reach trade allies given the expanse of the state and differences in region.

The BSC focuses on increasing the participation of the non-managed accounts. The BSC is primarily responsible for fielding calls to the non-managed accounts and will in the near future provide proactive outreach to these customers through their outbound call center (this was not yet happening at the time of the interviews). Account Managers and the Trade Relations Manager spoke favorably of having the BSC as a referral point for the non-managed and small business customers. They appreciate the ability to refer customers they meet that are not managed accounts to this call center.

3.2.3 Program communications

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes.

Currently the program employs several methods of communication to staff working on the Xcel Energy Cooling Efficiency Program. The company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates.

Several individuals interviewed commented on the need to receive information regarding program changes more formally. They recognize that they receive emails with these updates sent to them, but the emails tend to get buried in day-to-day activities. One individual said he found out about program changes from a vendor rather than through an Xcel Energy Communication. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effectively getting the information across.

Trade allies interviewed also commented that they would like to receive more information from Xcel Energy as discussed in the trade allies section. For example, one trade ally requested the development of a website specifically directed at trade allies to provide easy access to updates and program information.

3.2.4 Program marketing tools

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency.

The marketing materials distributed to customers and available to program staff are fairly generic. Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist amongst small business customers and commercial organizations that are in leased space.

Retailers were also identified by program staff as a difficult to serve group. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease space so they do not have ownership over the equipment installed (yet have to pay the energy bills).

Additionally, program staff identified an additional complexity of serving the common area. The common area in shopping malls consumes a significant amount of energy but depends on building owners to retrofit the equipment.

Little direct marketing activity is currently aimed at small commercial customers through the Business Solutions Center. At the time of the interviews they were only working reactively with

customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it appears there is little cross-referral between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

Program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

3.3 PARTICIPATING AND NONPARTICIPATING CUSTOMER CHARACTERISTICS

The evaluation reviewed businesses that participated in the Xcel Energy Cooling Efficiency program from its inception in 2006 through July 2009. A total of 285 businesses participated in the program during this time period.

Table 3-1 shows the distribution of the population of participants by SIC category, compared to the population of the nonparticipant population. The largest proportion of participants are in the services and retail trade sectors, accounting for almost two-thirds of all participants. When compared to the nonparticipant population, retail trade establishments are overrepresented in the participant population, while finance, insurance, and real estate establishments are underrepresented in the participant population.

Table 3-1. SIC Breakdown of Participants and Nonparticipants

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Services	34% (N=76)	30% (N=33,648)
Retail Trade	30% (N=67)	15% (N=16,602)
Finance, Insurance, And Real Estate	9% (N=21)	19% (N=20,812)
Public Administration	6% (N=14)	8% (N=8,968)
Manufacturing	5% (N=11)	4% (N=5,052)
Transportation, Communications, Electric, Gas, And Sanitary Services	2% (N=5)	5% (N=5,582)
Construction	1% (N=2)	5% (N=5,645)
Wholesale Trade	1% (N=2)	4% (N=5,003)
Ag, Forestry, and Fishing	0% (N=0)	2% (N=2,278)

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Mining	0% (N=1)	0% (N=349)
Not classified	10% (N=23)	7% (N=7,938)

Source: Xcel Energy Participant and Nonparticipant Population Databases

The program struggles with small business and non-managed account participation. Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. However, in the nonparticipant population, only 3.3 percent of businesses are managed accounts.

The below analysis further characterizes participants and nonparticipants in terms of their hours of operations, building characteristics, energy saving activities, and general satisfaction with Xcel Energy. The analysis distinguishes between eligible and non-eligible nonparticipants. Eligible nonparticipants are classified as businesses that have commercial cooling equipment and the cooling costs included in their electric bill to Xcel Energy. Ineligible nonparticipants either have their cooling costs included in their lease or have swamp/evaporative coolers as their commercial cooling equipment. Businesses that reported not having cooling equipment were not interviewed.

Statistically significant differences between participants and nonparticiants at the 90 percent confidence interval are noted in the text. Caution should be used when reviewing differences between different groups due to the small sample size of the participant group.

3.3.1 Building characteristics

Participating and nonparticipating customers primarily occupy free-standing buildings (70 percent participant, 65 percent eligible nonparticipant). Ineligible nonparticipants were least likely to occupy free-standing buildings (46 percent ineligible nonparticipants).

While the trade ally interviews discussed that renting a building was a barrier to participation, the survey results show that a large proportion of eligible nonparticipants actually own their building. Approximately one-half of participants and eligible nonparticipants reported owning their building. Only 24 percent of ineligible nonparticipants own their building. Participants were more likely than all nonparticipants to manage the property (19 percent versus. 3 percent).

3.3.2 Energy conservation activities

Businesses that participated in the Xcel Energy Cooling Efficiency program were more likely to report having taken an action in the past few years to reduce energy use than nonparticipants. Eighty three percent of participants said they made some change to reduce energy use, compared with 72 percent of eligible nonparticipants and 53 percent ineligible nonparticipants. These differences are statistically significant.

Of the changes discussed, the change that showed the largest difference between participant and nonparticipant responses was installing high efficiency lighting equipment. Fifty two percent of program participants that said they made a change also said they installed high-

efficiency lighting equipment in the past two years, compared with 27 percent of eligible nonparticipants and 11 percent of ineligible nonparticipants. Although not explored specifically in the survey, one explanation for the significant difference is that customers are being cross-referred to one program when they participate in the other.

3.3.3 Satisfaction with Xcel Energy

Overall, program participants and nonparticipants are very satisfied with Xcel Energy, with participants indicating the highest satisfaction. When asked to rate their satisfaction on a 0- to 10-scale, with 10 being very satisfied, 93 percent of participants rated their satisfaction with Xcel Energy as a 6 or higher compared with 89 percent of eligible nonparticipants and 74 percent of ineligible nonparticipants.

Sixty-four percent of participants said they were extremely satisfied with Xcel Energy by rating their satisfaction as 8 or higher, compared with 53 percent of eligible nonparticipants and 35 percent on ineligible nonparticipants.

3.4 PARTICIPATING CUSTOMER SATISFACTION WITH THE PROGRAM

Overall, program participants are very satisfied with the Xcel Energy Cooling Efficiency program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied. Some explanations from customers on why they rated their program satisfaction as nine or above are as follows:

> *"It gives us money to spend on energy efficient projects we wouldn't have had. I use the rebate program all the time." —program participant*

> *"We had a couple questions on the application and the representative was very helpful in answering our question and guiding us on how to complete the application" —program participant*

> *"We purchased an existing building so we had access to their utility bills. We know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and part of the reason we were able to make the investment was because of the Xcel program." —program participant*

> *"It has a pretty easy process and the rebates came quickly." —program participant*

In addition to being asked about their overall satisfaction with the Xcel Energy Cooling Efficiency program, participants were asked their satisfaction level with various aspects of the program (using the same scale with 0 being not at all satisfied and 10 being very satisfied). As shown in Table 3-2, the average rating for all aspects of the program was 7.5 or higher. Participants of the custom program were also satisfied with the program, specifically the post-inspection process which they rated 9.2. The three aspects of the program with the lowest satisfaction rating (less than 8 on the 10 point scale) were the amount of time it took to receive the rebate, the length of time it took from project start to end, and the requirements for equipment eligibility.

Table 3-2. Participant Satisfaction with Specific Aspects of the Program

Specific Aspects of the Program	Mean rating (0-10 scale)
Post-inspection process (n=5, custom only)	9.2
Type of equipment eligible for program (n=43)	8.7
Contractor who installed equipment (n=44)	8.5
Rebate application process (n=43)	8.5
Support you received from Xcel Energy (n=43)	8.1
Pre-approval process (n=5)	8.0
Program's handling of questions/complaints (n=42)	8.0
Amount of time it took to receive rebate (n=43)	7.9
Length of time it took from project start to end (n=4)	7.8
Requirements for equipment eligibility (n=43)	7.5

Source: Xcel Energy Participant Survey, SA6A-K

Consistent with the high satisfaction rating for the type of equipment eligible for the program (8.7), all respondents reported that the cooling equipment installed through the Xcel Energy Cooling Efficiency program is still installed at their business.

Participating customers were asked what features of the program, if any, they would like to see changed. As shown in Figure 3-2, 67 percent of participants said they would not change anything. This is another indication that overall, the program participants were very satisfied with the program.

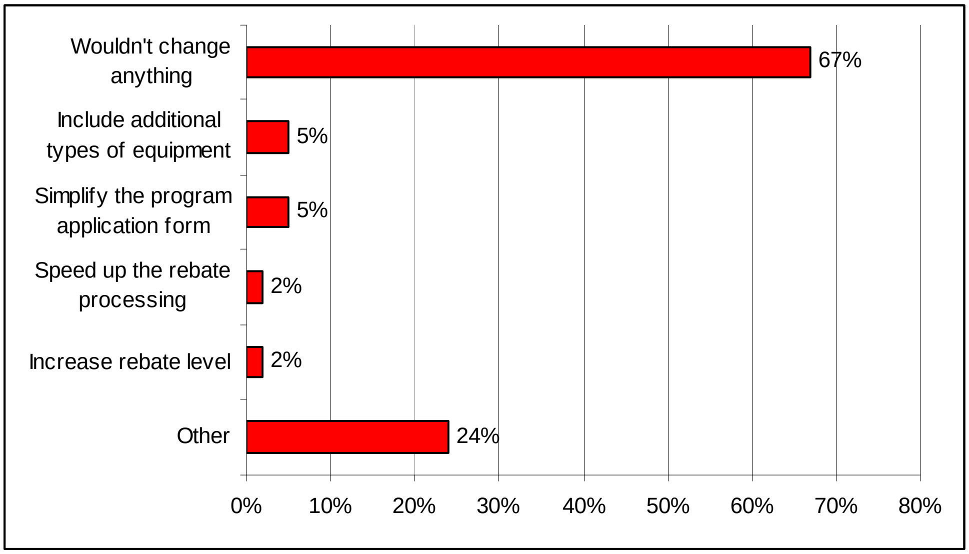
Those that did offer suggestions for improvements mentioned including additional types of equipment (five percent), simplifying the program application form (five percent), speeding up the rebate process (two percent), and increasing the rebate amount (two percent). These were consistent with the components of the program where participant satisfaction was lower. Some of the "other" suggestions mentioned included: communicate how the custom rebates are calculated (this was expressed in both internal staff and trade ally interviews as well as a source of frustration for some), include the option to submit the rebate application online, and provide a savings calculator to customers (this was also expressed in trade ally interviews as an area for improvement).

Below are quotes from a couple of participants on what features they would change with the program.

> *"It would be nice to get closer to instant responses on the rebate process. It seemed like there was a lot of back and forth." —program participant*

> *"Specify what the unit is supposed to do and how to measure the savings." —program participant*

Figure 3-1. Features of the Program Recommend Changing (n=42)



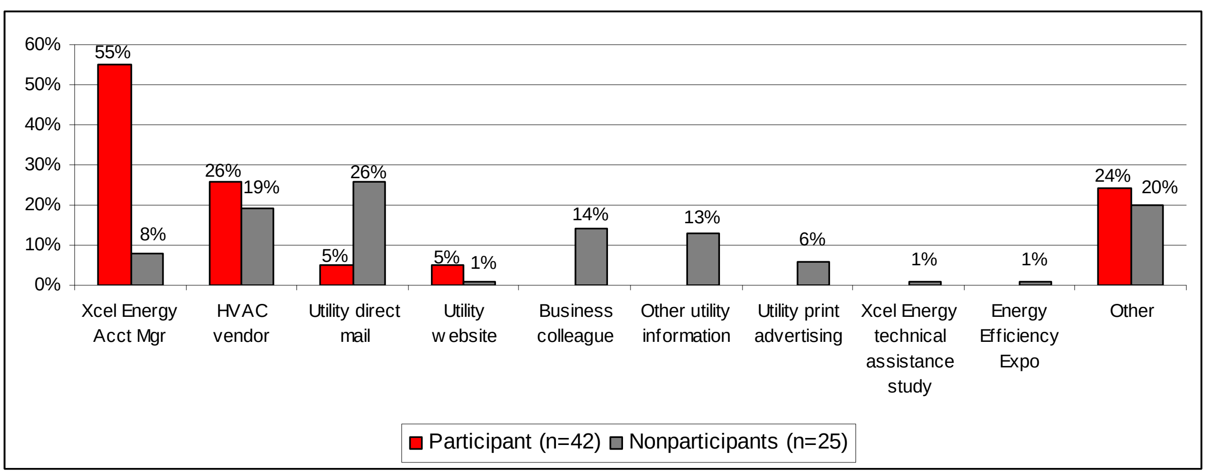
Source: Xcel Energy Participant Survey, SA7

3.5 CUSTOMER AWARENESS AND MARKETING

3.5.1 Participants

Account managers are the most noted outreach channel for program participants, followed by HVAC vendors. Program participants primarily heard about the Xcel Energy Cooling Efficiency program through their Xcel Energy account manager (55 percent). Of the managed accounts, 69 percent of participants mentioned that they heard about the program from their account manager. Hearing about the program through a Heating Ventilation and Air Conditioning (HVAC) vendor was the next most common way to find out about the program. Other ways participants heard about the program included: a contractor that worked on the building, an architect, or an engineer (Figure 3-3).

Figure 3-2. How Customer First Heard about Xcel Energy Cooling Efficiency Program



Source: Xcel Energy Participant and Nonparticipant Surveys, PA1 and A1

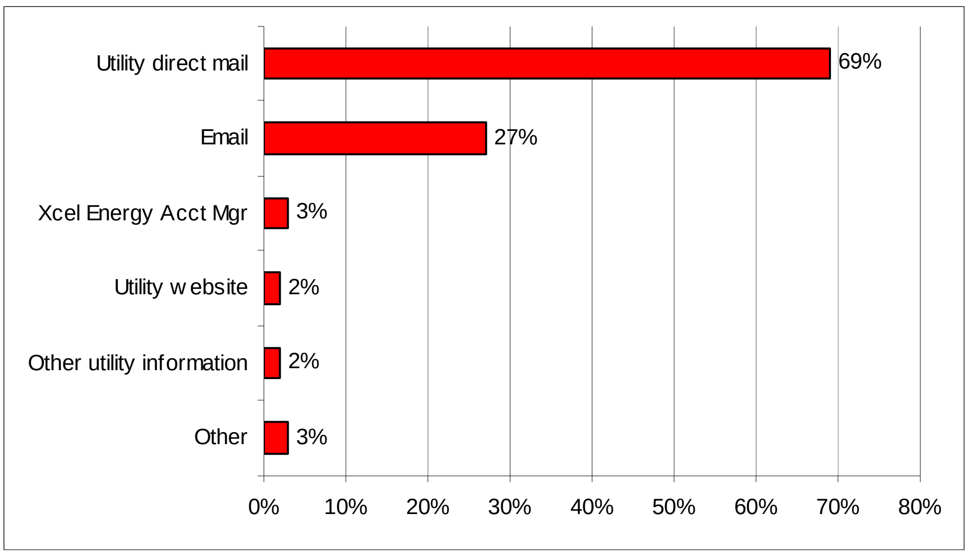
3.5.2 Nonparticipants

Approximately one-fourth of nonparticipants are aware of the program. Customers who have not participated in the Xcel Energy Cooling Efficiency program were asked if they had previously heard of the program. Of the nonparticipants who have cooling equipment and pay the costs for cooling, only 27 percent said they had heard of the program.

Unlike participants, the most common way for eligible nonparticipants to hear about the Xcel Energy Cooling Efficiency program was through Xcel Energy direct mail (26 percent). Another 19 percent heard about the program through their HVAC vendor, 14 percent through a business colleague, and 13 percent from other utility information.

Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, mentioned by 69 percent of nonparticipants. The second preferred way to receive information is through email, mentioned by 27 percent of eligible nonparticipants (Figure 3-4). A similar pattern was found for ineligible nonparticipants; 67 percent prefer to receive information from Xcel Energy by direct mail and 26 percent by email.

Figure 3-3. Prefer to Receive Information about Energy Efficiency Programs (n=88)



Source: Xcel Energy Nonparticipant Survey, A12

If a nonparticipant was interested in contacting a utility representative about an Xcel Energy program or service, 67 percent indicated they already had contact information. The 1-800 phone number was the most common means they would use to contact a utility representative (52 percent). A small percentage (five percent) mentioned the Business Services Center (BSC).

3.6 CUSTOMER DECISION MAKING PROCESSES

3.6.1 Participants

The introduction to the participant survey focused on identifying the key individual involved in the decision to install equipment through the program. In addition, the survey asked if others were involved in the decision. Two-thirds of the Cooling Efficiency program participants indicated there was more than one person involved in the decision of whether or not to

purchase cooling equipment through the program. Other company personnel involved in the decision to purchase equipment through the program included: business owner, maintenance supervisor, current tenant, property management department, Chief Financial Officer, architect, and the business services superintendent.

The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. Program participants were asked to rate the importance of various factors that might have influenced their decision to purchase the cooling equipment. The rating was done on a scale of 0 to 10, with 10 being very important and 0 being not at all important in their decision. The age or condition of the old equipment was the most important factor, which was rated 8.1. As shown in Table 3-3, two other factors for purchasing new cooling equipment was rated an average of 7.0 or higher: standard practice or corporate policy and the payback on investment.

Table 3-3. Importance Factor for Purchasing Cooling Equipment for Participants

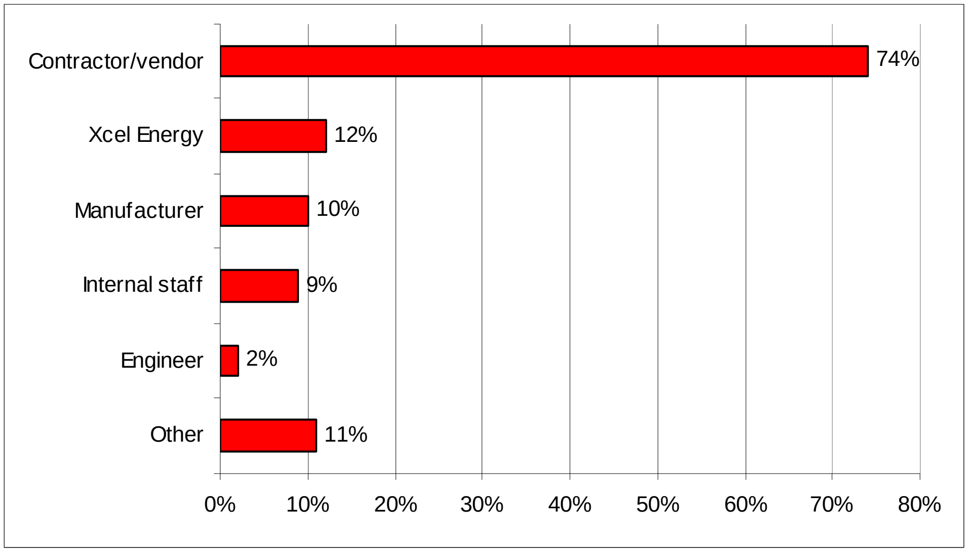
Importance Factor on Purchasing Decision	Mean rating on 0-10 scale
Age or condition of old equipment (N=50)	8.1
Standard practice or corporate policy (N=52)	7.2
Payback on investment (N=52)	7.2
General concerns about the environment (N=54)	6.6
Information provided through a Xcel Energy feasibility study (N=3)	6.3
Availability of program rebate (N=54)	6.0
Recommendation from a vendor/supplier (N=51)	6.0
Previous experience with the Cooling Efficiency program (N=43)	4.7
Endorsement or recommendation by Xcel Energy staff (N=52)	4.5
Information from the program marketing materials (N=52)	3.9
Information from the program training course (N=45)	2.8

Source: Xcel Energy Participant Survey, N3a-l

3.6.2 Nonparticipants

One factor when purchasing new equipment is deciding who to contact first to purchase the equipment. Almost all (74 percent) of eligible nonparticipants said that they would contact a contractor or vendor when purchasing cooling equipment. Contacting Xcel Energy or the equipment manufacturer were the other contacts mentioned by 12 percent and 10 percent respectively (Figure 3-5).

Figure 3-4. Preferred Contact Person when Purchasing New Cooling Equipment (n=84)



Source: Xcel Energy Nonparticipant Survey, I0

Twenty-two percent of eligible nonparticipants report that they have a policy that mandates the installation of energy efficient equipment when purchasing new equipment. When asked specifically what the company policy is for purchasing new equipment, respondents were unable to indicate a specific efficiency level or go into detail as to the company policy. Several businesses mentioned that they are trying to be as 'green' as possible and purchase efficient equipment. A couple respondents also mentioned that the equipment they purchase needs to be ENERGY STAR® rated.

The largest obstacle cited by nonparticipants when purchasing new equipment is the lack of capital, which was mentioned by 61 percent of eligible nonparticipants. This is consistent with information received from the trade ally interviews discussed later in this report. Other barriers that businesses face when considering purchasing new equipment include: the budgeting process (10 percent), lack of resources to implement (seven percent), time constraints (four percent), approval by board members (four percent), and the uncertainty of the return-on-investment (two percent).

3.7 PROGRAM POTENTIAL: NEEDS IDENTIFIED THROUGH NONPARTICIPANT INTERVIEWS

Of the population of existing nonparticipants, approximately three-fourths of this population could participate in the Cooling Efficiency Program (eligible nonparticipants). Ninety-seven percent of nonparticipating businesses contacted pay their electric bill to Xcel Energy[19]. Of those who pay their electric bill to Xcel Energy, 77 pay for cooling at their building.

The evaluation identified the lack of knowledge of the program among nonparticipants as a cause for lost opportunity among the program. When eligible nonparticipants were asked if they had purchased cooling equipment in the past two years, 33 percent reported that they

[19] The small percent that do not pay their electric bill to Xcel Energy are customers who rent/lease and the landlord pays the utility bill or property managers that report that tenants pay the cooling bills.

had. Only a small percentage (six percent) of those who had purchased or considered purchasing cooling equipment considered participating in the Xcel Energy Cooling Efficiency program. The primary reason they did not participate in the program was because they were not familiar with program requirements.

One key factor with a commercial cooling rebate program is for customers to understand the types of equipment customers currently have and the types of equipment they plan to purchase. Eighteen percent of nonparticipants who could participate in the program indicated that they are in the process of budgeting for or planning to purchase new cooling equipment. On average, eligible businesses expect to purchase the new equipment in 17 months.

Of the equipment installed, the greatest potential according to the nonparticipant surveys is roof-top units and condensing units. Roof-top units are the most common type of commercial cooling equipment used by eligible nonparticipants. Sixty-four percent of these nonparticipants have a roof-top unit installed and 30 percent of these nonparticipants plan to purchase a new roof-top unit. Condensing units are the other main type of commercial cooling, with 52 percent of businesses having a condensing unit installed and 29 percent of these planning on purchasing a condensing unit. Table 3-4 lists other common types of installed commercial cooling equipment and equipment that is planned for purchase.

Table 3-4. Type of Equipment Nonparticipants Have Installed and Plan to Purchase

Equipment	Installed Equipment at Business (n=80)	Currently Budgeting to Purchase Equipment (n=17)
Roof-top units	63.7%	30.4%
Condensing units	52.0%	28.7%
Split system air conditioners	23.9%	0.0%
Variable air volume boxes	13.7%	10.4%
Chillers	11.8%	3.4%
Packaged thermal air conditioners	8.2%	20.9%
Oversized cooling towers	7.6%	11.3%
Water source heat pumps	3.8%	17.3%
Other cooling equipment	10.8%	17.3%

Source: Xcel Energy Nonparticipant Survey, E1 and E5

One reason businesses plan to purchase new equipment is due to the age of their old equipment. Table 3-5 below shows the percent of each type of equipment that is 15 years old or older for eligible nonparticipants. This is consistent with some of the information gathered during the trade ally interviews where they said there is a market out there given the age of existing equipment

Table 3-5. Percent of Installed Equipment More than 15 Years Old among Nonparticipants

Equipment	Old Equipment More than 15 Years Old
Water source heat pumps (N=3)	33.3%
Variable air volume boxes (N=15)	28.2%
Oversized cooling towers (N=8)	25.0%
Roof-top units (N=48)	20.9%
Split system air conditioners (N=21)	16.5%
Condensing units (N=41)	10.5%
Chillers (N=15)	3.9%
Packaged thermal air conditioners (N=12)	3.2%
Other cooling equipment (N=9)	16.0%

Source: Xcel Energy Nonparticipant Survey, E3

For future cooling equipment purchases, eligible nonparticipating business customers demonstrated a level of interest in participating in the Xcel Energy Cooling Efficiency program. The average interest level was 7.27 on a 0- to 10-point scale, with 10 being very interested.

3.8 TRADE ALLY PARTICIPATION

We spoke with thirty trade allies as part of this program evaluation, 17 participating and 13 nonparticipating trade allies. This section summarizes the results of these interviews.

3.8.1 Characteristics of trade allies interviewed

Trade allies interviewed typically installed and serviced cooling equipment. PA also spoke with an engineer and several equipment suppliers. These trade allies work with a combination of planned replacement, new construction/major renovation, and replace-on-failure projects.

A significant portion of certain trade allies' work is replacement-on-equipment-failure. Nonparticipating trade allies were more likely than participating trade allies to report a higher percentage of their projects as replace-on-failure and a lower percentage of their projects as new construction/major renovation.

3.8.2 Trade ally awareness of Xcel Energy's cooling efficiency program

Nearly three quarters of nonparticipating trade allies (8 out of 11 that provided a response) said they were aware of Xcel Energy's Cooling Efficiency Program. Both participating and nonparticipating trade allies said they heard about the program through Xcel Energy staff, materials, seminars, their customers, or equipment suppliers.

One other source of program awareness is their participation in other residential programs provided by Xcel Energy. A number of trade allies interviewed also service residential customers and refer customers to Xcel Energy's residential efficiency programs. Through their

experience with these programs, they became familiar with the commercial program. This indicates the continued potential for Xcel Energy to cross-market the program through their other programs.

Trade allies report that it is more difficult to sell high efficiency equipment when there is a failure than when it is a planned project. These decisions need to be made quickly and efficiently. So while trade allies may be aware of the program, they may need a much better understanding of the benefits and offerings so they can more easily promote the program with their bid to the customers.

3.8.3 Benefits of the program for trade allies and customers

Participating trade allies were quick to comment that the program benefits both them and their customers. The ability to offer the incentive and make the purchase more cost-effective were the most commonly noted benefits of the program. However, the benefits go beyond just the incentive value. Trade allies mentioned that the program gives them an edge over their competitors, who are not taking the time to spec out bids with high efficiency options incorporating the rebate. Even if the customer chooses not to install high efficiency, the options give the appearance of the contractor taking the time to think through the alternatives for the customers' consideration.

The program also provides participating trade allies the opportunity to discuss energy efficiency with their customers. These trade allies are proponents of energy efficiency and enjoy the opportunity to promote high efficiency equipment. Because of the program, they are able to generate more conversation around the benefits of energy efficiency than they would have without the program.

According to participating trade allies, customers generally participate in the program because 1) they have a need for the equipment, 2) the program reduces the cost of the equipment, and 3) the equipment is more efficient and will result in longer-term savings. Several respondents also mentioned the desire or (in some cases) requirement for customers' buildings to be LEED certified; Xcel Energy's Cooling Efficiency Program helps them obtain this certification status more cost-effectively.

One trade ally specifically addressed the impact the program has on his sales. He said the Cooling Efficiency program, along with other initiatives such as LEED certification, has certainly impacted his ability to sell high efficiency cooling equipment. In fact, he said that without the program and these other initiatives he does not think he would have sold any energy efficient equipment this year.

3.8.4 Barriers to selling high efficiency equipment

One of the primary objectives of the interviews was to identify barriers for selling high efficiency equipment. Below we list the commonly mentioned barriers, the most notable being initial incremental costs of high efficiency equipment coupled with a weakened economy.

Economic downturn coupled with high incremental cost of high efficiency equipment. Economy was the buzzword throughout the trade ally interviews. One interviewer summed up the issue saying that activity now has little to do with the incentives available and more to do with the general economic environment. This respondent believed that absent a significantly higher incentive value to cover the incremental cost there will be less movement toward high

efficiency in the current economy. Other respondents provided similar philosophies by discussing the difficulty in encouraging their customers to install high efficiency equipment. When asked about the future of the cooling market, contractors often commented that customers would like to see trend toward increasing efficiency, thereby *uplifting the economy.*

Interviewees indicate the cost of high efficiency equipment is the primary barrier to moving forward on high efficiency purchases and installations across all commercial segments. However, for smaller commercial customers, several respondents commented that it is the relative incremental cost for smaller commercial customers. They reported that for smaller units, the incremental cost as a percentage of total cost is greater and the Xcel Energy rebate covers less of the incremental cost for smaller units.

Other respondents said that first cost is the biggest barrier for the larger commercial customers that use larger equipment. They reported that the cost of replacing that equipment is very significant. If they do replace it, the incremental cost is less and the Xcel Energy rebate covers more of the incremental cost of large equipment than for small equipment.

However, numerous respondents commented on the fact that these larger commercial customers are most likely to attempt to repair rather than replace the failing equipment. One respondent illustrated the point using the example of a customer whose repair of their old, inefficient rooftop unit cost about half the cost of installing new equipment. Although the newer more efficient equipment would yield savings within a three year payback and the contractor projected that the customer would need to replace the equipment within the next five years, they chose to go ahead with the repair instead of replacement. The capital investment of the new equipment was just too much for them to front if a repair for lower cost was possible.

Table 3-6 provides further qualitative evidence of trade allies' perception of the difficulty in selling high efficiency cooling equipment to their customers in this market. Participating and nonparticipating contractors were asked to rate their perceived level of difficulty in selling high efficiency cooling equipment to their customers on a one to five scale, where one was very difficult and five was not at all difficult.

As the table shows, the majority of participating trade allies rated the difficulty between a two and three although three respondents said selling high efficiency equipment was easy (rating of 4 or 5). Several trade allies mentioned that it is easier to sell the equipment to larger than smaller customers, quoting the large savings and increased payback as the reason. One respondent who rated it difficult to sell high efficiency said the rating would have been different in prior years when the economy was better; for these years, the sales of higher efficiency equipment was easier.

This analysis should be viewed with caution as it is based on very limited number of cases and cannot be extrapolated to the participating and nonparticipating trade ally population. However, the story it presents is compelling and shows the importance of reaching nonparticipating trade allies to help them promote high efficiency cooling equipment.

Table 3-6. Difficulty in Selling High Efficiency Cooling Equipment to Customers (1=very difficult, 5=not at all difficult)

Ratings												Average
Participating trade allies (n=11)	2	2	2	2.5	2.5	3	3	3	4	5	5	3.1
Nonparticipating trade allies (n=9)	1	1	1	1	2	2.5	3	3	3			1.9

There is some qualitative evidence that the program is helping to overcome the barrier of selling high efficiency cooling equipment. Nonparticipating trade allies were more likely to say selling high efficiency cooling equipment to customers is very difficult. Whereas no participating contractors rated the difficulty of selling high efficiency equipment a one, four nonparticipating contractors provided a rating of one. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary driver for their low ratings. Incidentally, these nonparticipating trade allies were also more likely to say they serve small business customers (under 500 kW), which may also be a driver of the increased perception of difficulty in selling high efficiency cooling equipment to their customers.

Relative low cost of energy. Several trade allies half jokingly commented that commercial customers would be more apt to participate and see greater value from the program if their energy rates were higher. One trade ally expanded on this discussion by saying that he has seen a distinct trend in the purchasing of high efficiency equipment with a higher cost of electricity. His perception was that since the economic shift, energy prices decreased which thereby decreased the demand for high efficiency equipment along with the reduced cash flow resulting from the poorer economy.

Customers' lack of knowledge and/or understanding of the benefits of energy efficiency. Another common theme heard throughout the interviews was the need for contractors to educate their customers on the benefits of high efficient equipment. Commercial customers may understand conceptually that there could be benefits to installing high rather than standard efficiency equipment; however, when faced with the incremental costs to install that equipment, customers may select the standard efficiency equipment to avoid the extra up-front expenditures. Contractors frequently commented on the need to educate these customers and help them understand the return-on-investment for them and how the installation of high efficiency equipment would positively impact the organization's cash flow. "*They don't understand life cycle costs, lease structures, and access to capital*."

Need for tools to help trade allies sell high efficiency cooling equipment to customers. Participating trade allies were asked what tools were available from Xcel Energy that helps them sell high efficiency cooling equipment. Of the thirteen individuals that answered this question, five said either they don't know what tools are available to them or they do not believe there are any tools available to them through the program to help them sell high efficiency cooling equipment.

As a follow-up to this question, trade allies were asked what tools they would like Xcel Energy to provide to help them sell high efficiency cooling equipment. Several respondents felt they had enough information in the rebate forms and brochures distributed to them by Xcel Energy.

However, several respondents did have recommendations for information or tools to help them promote equipment through the program. The most frequently cited request was for a tool to help trade allies calculate energy savings, payback, return-on-investment, and/or rebate values. While some respondents felt capable of doing these calculations on their own, others did not feel they had sufficient knowledge to do this. As one trade ally stated, "*We lack the software to be able to tell them what their payback is…we don't know the math*." Another respondent referred us to a tool through the Commercial Real Estate Energy Efficiency Program (CREE) website. This tool calculates return-on-investment of energy efficiency improvements. At a minimum, the program could promote this tool to trade allies.

Another respondent commented that he was able to calculate the energy savings and related rebates, but the rebate ended up being less than initially specified. He noted, "*If there was some way to automate that, to better calculate the rebate, that would be good."*

In terms of the materials provided by Xcel Energy, those who received the materials for the most part felt they were sufficient. Several respondents noted that they use the website often to obtain materials, although they would appreciate more hard copy materials for distribution to their customers. Another respondent said they would appreciate some verbiage from Xcel Energy on the benefits of the program and installing high efficiency equipment to include in their marketing materials.

Last, several trade allies said that it is difficult to see what is new in Xcel Energy's program through the website. They suggested that to make this process easier, perhaps Xcel Energy could have a website targeting only trade allies that clearly identifies program updates. This suggestion was also made in the internal interviews with Xcel Energy staff.

Need for more personal interaction with Xcel Energy staff. Building on the above point, five of the participating contractors said they did not recall receiving or were not provided with tools or information from Xcel Energy staff to help them sell high efficiency equipment. And one trade ally specifically mentioned the need for more personal interaction with staff to help arm him with the knowledge to better promote high efficiency cooling equipment.

Trade allies who do regularly interact with program staff were complimentary of their experience with these staff. They describe their interactions with Xcel Energy representatives as helpful, say they were excellent in interacting with the contractors and providing timely information. In general, they just want more of this interaction.

There is only one Xcel Energy staff member assigned to reaching out to contractors throughout the state of Colorado. He plans events for contractors, such as the workshops, seminars, and breakfast events to educate contractors about the program. Internal interviews identified that only having one trade ally representative may result in not personally reaching as many trade allies as desired, particularly in less populated areas.

3.8.5 Overcoming the barriers and increasing participation

Trade allies were encouraged to share their ideas regarding ways to overcome programmatic barriers and increase participation. These recommendations are detailed below.

a. INCREASE REBATE LEVELS

Not surprisingly, the most commonly noted recommendation was for the program to increase its rebate levels. It is not that trade allies felt the incentive levels were entirely too low, but that an increased incentive level would be beneficial in battling the incremental cost and reducing the payback period that plagues the ability for customers to install program-qualifying equipment. As found in the benchmarking review of rebate levels in other programs, Xcel Energy's rebates are some of the lowest for air conditioning systems.

b. EDUCATE TRADE ALLIES

Another recommendation made by several respondents was to better educate trade allies and make them more aware of the program benefits. These respondents discussed the need for Xcel Energy to make the process as easy and seamless as possible for trade allies—including marketing to customers using return-on-investment analysis. "*If it's not easy, we won't do it.*" One trade ally expanded on the need for more education noting the influx of new trade allies in the industry. He said that each time an HVAC contractor goes out of business, three more open up. This turnover increases the need for continual education and marketing from Xcel Energy among the trade ally groups. This recommendation is consistent with best practices found as part of the benchmark review of other programs.

c. IMPROVE THE CUSTOM PROCESS

Participating trade allies provided suggestions to make the custom program less burdensome for trade allies and customers. For the most part, participating trade allies thought the application and rebate processing requirements for the prescriptive component of the program were appropriate and not overly cumbersome. The distinction several respondents made, though, was between the prescriptive and custom program. These respondents said the administrative burden for completing the custom applications is high. One respondent compared the process to the prescriptive program which he described as not at all difficult to complete.

Another respondent described the custom program and its processes as a "*nightmare*." The time to complete the application and get Xcel Energy involved is significant and in some instances results in him losing the job. The trade ally expanded on this statement by saying that the rules for qualifying equipment do not seem to be transparent, which frustrates the trade ally and his customers.

One trade ally noted an additional complication in the custom process; his perceived inability to easily and quickly provide a rebate value to the customer. This trade ally said that he could calculate an incentive value based on manufacturer specifications and an understanding of the original equipment; however, he cannot provide the incentive level with enough certainty to make the customer comfortable with investing in the purchase.

This perception about the custom program and its application and project process is consistent with what we heard in the internal interviews. Account and trade representatives mentioned that the custom application process was significantly more cumbersome and involved than the prescriptive program process.

The reputation of the custom program reached trade allies that have not yet worked with a customer through that component of the program. One participating trade ally interviewed

commented on additional equipment he would like to see included in the program (evaporative coolers) and wondered if this measure could be promoted through the custom program. However, while this respondent recognized the usefulness of the custom program, he commented on the feasibility of going through the custom program, saying that there have been grumblings from others in the industry that the process is "*difficult and rigorous*."

d. MARKET DIRECTLY TO CUSTOMERS

Trade allies for the most part thought the program could more directly market to customers. Several respondents said the direct marketing should provide general information about the program and include analysis tools or information to illustrate the energy and/or financial savings from installing high efficiency equipment. This is not to say that customers are not receiving sufficient information about the program; the customer survey results will explore this issue more.

Trade ally responses varied considerably in their assessment of customers' awareness of the program. On average, participating trade allies said that almost one-half of their customers know about the program (sample size is only 10, so this information should be viewed as qualitative). One participating trade ally said that none of his customers were aware of the program and two trade allies said that all his customers were aware of the program. (Table 3-7). Nonparticipating trade allies were more likely to say that fewer of their customers were aware of the program.

Again, this information should be interpreted with caution given the sample sizes. The analysis represents the interviewed trade allies, not the trade ally population at large.

Table 3-7. Trade Ally Perception of Customers' Awareness of the Program

Percent											Average
Participating trade ally responses (n=10)	0%	10%	10%	10%	25%	30%	75%	95%	100%	100%	46%
Nonparticipating trade ally responses (n=5)	0%	13%	15%	50%	55%						27%

3.8.6 The future of the cooling market in Colorado

The majority of participating trade allies said they expect their involvement in the program to increase over the next twelve months. They project that customer demand will increase as they become more energy conscious and are more aware of energy efficiency based on federal initiatives and more stringent codes and standards. However, a number of these contractors caveat this optimism by saying it depends on the economy.

Additionally, several respondents commented on the aging cooling equipment in Denver as an indicator for increased opportunity for the program, particularly among larger commercial customers. As discussed earlier, because of the high capital investment in replacing cooling equipment, larger commercial customers are opting to repair versus replace the older equipment. This inefficient equipment will continue to fail and in time need to be replaced which will create further opportunity for the program.

While participating trade allies are optimistic that their participation in the program will increase in the next 12 months, their projection of the direction of the commercial cooling market in the next two years is mixed. The same is true for nonparticipating trade allies. Respondents from both groups of interviews said that unless there are government initiatives put in place, or stricter requirements, the high efficiency cooling market will stay the same or decrease. A number of these respondents again cited the incremental cost and perception that the benefits don't outweigh these costs; particularly given how constrained these companies are in their capital funding. "*I've got my fingers and toes crossed that we're going to come out of this recession and people will start purchasing high efficiency equipment*."

3.9 BENCHMARKING RESULTS

PA researched programs online for to characterize other cooling efficiency programs in terms of rebates or incentives available, eligible measures, eligible customers, required paperwork, and marketing. PA then conducted in-depth interviews with eight program staff and one evaluator for the following programs to obtain further insight into program operations. The utilities and programs reviewed are detailed below.

Table 3-8. Utilities and Programs Included in Benchmarking Study

Utility	Program
Ameren IL	Standard Business Incentives Program
Arizona Public Service	Solutions for Business: Prescriptive Incentives and Technical Assistance and Studies
Energy Trust of Oregon (Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas)	Existing Building Efficiency Program
Idaho Power	Building Efficiency for Commercial Construction and Easy Upgrades for Simple Retrofits
Pacific Gas & Electric (also includes SCE and SDG&E)	Non Residential Retrofit (previously Standard Performance Contract)
Platte River Power Authority (and four member utilities: Fort Collins Utilities, Longmont Power & Communications, Estes Park Light & Power, Loveland Water & Power)	Electric Efficiency Program (includes Cooling Rebate Program)
Puget Sound Energy	Commercial HVAC Rebate and Premium Service programs
Salt River Project	PowerWise Standard Business Solutions and PowerWise Custom Business Solutions

Programs varied from very new (only 1 year old) to fairly mature (up to 10 years old).

3.9.1 Program goals and challenge in meeting goals

Xcel Energy's goal for the Cooling Efficiency program is 6.9 mil kWh for 2009. However, information was not available from other programs on savings goals for cooling equipment only. For other business programs overall, savings goals ranged anywhere from 32.5 mil kWh to 160 mil kWh. Xcel Energy's total 2009 business goal is 103 mil kWh.

Most programs in the benchmarking study have been successful in meeting program goals despite the recent economic challenges. Many programs met or exceeded goals last year and are on track to come close to meeting targets this year. Several programs have higher goals set for this year than last year.

All programs are faced with the same primary challenge this year—the downturn in the economy. However, most have found a way to keep projects enrolling and continue to achieve energy savings. Mature programs are faring better which was reported to be a result of strong relationships with vendors and implementation contractors. It was also reported that it is important to be flexible and get involved with the customer early to influence their choice of equipment (as also discussed in the internal and trade ally interviews).

Several program managers reported bonus and timing adjustments their programs made in reaction to the downturn in the economy. One program offered a 10% bonus to customers and $500 gift cards to trade allies for projects with minimum size restrictions that were done before the end of May, 2009. Another program became more flexible with deadlines that were typically 18 months but would be extended if there were delays in the project timeline.

3.9.2 Key elements of program design

All programs offer prescriptive and custom options to business customers except for PG&E, which is custom only. Measures covered by prescriptive programs are similar across programs including air conditioning units, split and packaged units, air and water source heat pumps. Variations in measures offered include chillers, economizers, and controls. One program manager recommends more focus on controls and optimizers for retrofit to realize additional savings. Xcel Energy categorizes control-related projects within an Efficiency Controls program, rather than within the cooling program.

Most of the programs use outside firms to implement the program. One program manager appreciates that they have an implementation contractor who continuously works to improve their program.

Two programs manage the entire program internally as Xcel Energy does. This internal management includes the development of the infrastructure, outreach to trade allies, customer communication and setting and processing the rebates for eligible equipment. Internal staffing for the programs ranges from one person half-time to 6 business development staff handling specific customer segments.

3.9.3 Marketing and recruitment of customers

Depending on the program, either the implementation contractor or program staff market and provide outreach to customers. Marketing methods consist of general advertising in newspapers, through radio ads and mailings.

Marketing is not typically targeted to particular groups but to business customers in general. However, more targeted marketing through associations and business group meetings is favored by many program managers. These face-to-face meetings allow for a more tailored message (e.g. highlighting energy savings possible) and the opportunity to answer questions and build relationships. Associations targeted include ASHRAE, BOMA, Kiwanis, multiple trade organizations, and school groups.

Only one program, which is one of the more mature programs, uses targeted marketing. They have moved away from traditional marketing pieces, except for an overview, and are instead working with specific customer segments. They now concentrate on relationship building with customers, trade organizations, and equipment dealers.

Interviewees believe the most effective form of program communication is handled by key account representatives and trade allies. Trade allies know their markets well and are often in the best position to sell the higher efficiency to their customers. A couple of programs are also taking advantage of high bill inquiries and billing analysis to seek out possible participants.

One respondent shared that in their experience, a useful lesson is to become thoroughly educated on the different associations when using trade associations to target customers. The respondent felt this would identify and involve all associations representing that particular market segment. Without buy-in from particular association leaders, a utility could be kept out of a market. However, the program should be prepared for a potentially quick increase in projects. In order to handle abrupt increases or decreases in enrollment, have control mechanisms in place to scale down or ramp up depending on activity level.

3.9.4 Quantification of net program impacts

As PA has experienced with several other programs and the industry as a whole, there is much discussion around how to accurately calculate free-ridership and spillover to inform net-to-gross (NTG) factors for commercial cooling. In speaking with program managers, that uncertainty exists among all programs.

Table 3-9 summarizes net to gross information provided by the program managers or through the literature review. A few of the newer programs have not yet had the opportunity to evaluate their programs and estimate net-to-gross ratios and will likely review free-ridership and spillover measurement in later program years, according to program managers. In the meantime, they rely on either an average industry attribution rate of 0.80 to 0.85 or anecdotal information to provide qualitative context around program impacts (e.g. retrofits may be almost all free-riders but the nature of premium services would result in a very low free-ridership rate). And although some of the others have conducted evaluations, they have not measured free-ridership or spillover.

For those programs that have measured NTG and were able to provide us with the values, we see a range from 50 percent (when NTG only includes free-ridership, not spillover) to 80 percent NTG (when includes spillover). The NTG status for all programs reviewed is detailed in Table 3-9. In addition to speaking with program managers we also reviewed NTG estimates from the DEER database and measured NTG values from WI Focus on Energy Business Programs which are also included in the table below.

Table 3-9. NTG Summary Information

Sponsor	Program	NTG measurement status
WI Focus on Energy	Business Programs	Overall 2008 commercial NTG ratios were 69% kWh, 69% kW, and 33% therms.
Ameren (IL)	Standard Business Incentives	Measure free-ridership and spillover, but no NTG number available.
Arizona Public Service	Solutions for Business: Prescriptive Incentives	NTG calculated at the measure level using both free-ridership and spillover from self reports. Numbers not available at the time of the call.
Energy Trust of Oregon	Existing Building Efficiency Program	Influence rates of 80% for electric and 70% for gas for their HVAC program.
Idaho Power	Easy Upgrades for Simple Retrofits	Not currently measuring FR, SO or NTG.
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)	Measuring NTG but not final for 2006-2008 cycle. DEER database shows NTG from 2004-2005 was 50% for prescriptive HVAC and 54% for custom projects. DEER also indicates 50% NTG assumptions for prescriptive HVAC and 64% for custom for purposes of 2009-2001 planning.20
Platte River Power Authority	Cooling Rebate Program	.85 assumed.
Puget Sound Energy	Commercial HVAC Rebate	Not measuring NTG.
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	Measured NTG = .75 for Standard Business Solutions (not including adjustments for spillover).

3.9.5 Rebate levels and requirements

Rebate levels are similar across programs, although Xcel Energy's are some of the lowest for air conditioning systems (Table 3-10). Xcel Energy is also providing rebates for a lower SEER rating than the other programs reviewed. Most programs have done little to adjust their rebates over time, and any adjustments have been minor.

Minimum equipment efficiency to qualify for a rebate is typically decided based on CEE standards. Supplementing that decision is information from ASHRAE 90.1, ENERGY STAR®, and other market analysis. Rebates or incentives are typically offered for the efficiency above standard. Programs also have caps on the portion of the cost that will be paid, for example 50 percent or $10,000 maximum.

[20] Source: Updated DEER NTGR Values – 053008.xls

The requirements for receiving a rebate or incentive are similar among programs. Most programs have a pre-approval process or pre-application showing the efficiency the customer intends to install. Some programs skip this pre-application for projects below a certain rebate threshold ($1,000–$5,000). For one program, the pre-approval allows for a customer's incentive funds to be reserved for 90 days.

Once approved, the customer can have the work done. A few programs require inspections, although this is more common for custom projects or projects requesting a rebate over a certain threshold. Upon completion, customers are required to submit a final request for the rebate or incentive, accompanied by an invoice for the equipment purchased, and a cut sheet or other form showing the specifications for the energy efficient equipment. A few programs have 60-day or 90-day limits from time of project completion for submitting final rebate requests.

Table 3-10. Rebate Summary Information

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
CEE	Tier 1 standards	14 SEER (12.0 EER pkg, 11.6 EER split)	(11.5 EER, 11.5, 10.5, 9.7)	14.0 EER		14.0 EER			
CEE	Tier 2 standards	15 SEER (12.5 EER pkg, 12.0 EER split)	(12.0 EER, 12.0, 10.8, 10.2)	No specification s		No specification s			
Xcel Energy	Efficiency Cooling	13.5 SEER: $50/ton packaged, and $3/ton each adtl 0.1 SEER 14.0 SEER: $25/ton split, and $4/ton each adtl 0.1 SEER	$50/ton (EER of 11.0, 10.8, 9.8, 9.4)	Condensing 11.0 EER: $25/ton + incremental rebate: $3.00/ 0.1 EER		14.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	PTACs 11.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	$6-$12/ton See program for details	Boiler Tune-up: 25% of costs See program for details
Ameren (IL)	Standard Business Incentives	14 SEER: $15/ton 15 SEER: $30/ton	$15/ton (11.5 EER, 10.5, 9.7) $30/ton (12 EER, 10.8, 10.2)		$15/ton (14 SEER, 11.5 EER, 10.5, 9.7) $30/ton (15 SEER, 12 EER, 10.8, 10.2)		13.08–(0.02556*Btuh Capacity/ 1000) EER $15/ton	$20/ton (Air-cooled only)	Room Air Conditioners: $25-$35/ton Variable Frequency Drive on HVAC Motors: $45/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Arizona Public Service	Solutions for Business: Prescriptive Incentives	(1 Phase) 14 SEER & 11.5 SEER: $50-80/ton (3 Phase) 11.1 EER: $50-100/ton	11.4 EER $50-100/ton 11.2 EER $25-75/ton 10.4 EER $25-75/ton		(1-phase) 14 SEER & 11.5=$50-80/ton (3-phase) 11.1 EER= $50-100/ton 11.4 EER $50-100/ton 11.2 EER and 10.4 EER $25-75/ton		Both PTAC and PTHP 12.5-(0.213*cap/1000) EER $45-60/ton	Air cooled 1.15 kW per ton—IPLV = $7/ton Water cooled 0.57-0.68 kW per ton—IPLV = $7/ton	Economizer $15.ton
Energy Trust of Oregon	Existing Building Efficiency Program	$120-300 See program details	$120-300, See program details		$150-2,250/ton, See program for details	$200-4,000/ton, See program for details	$100/unit PTHP		Ground source heat pump $300-$3,000
Idaho Power	Easy Upgrades for Simple Retrofits	(1-phase) 14 SEER: $25/ton 15 SEER: $50/ton 16 SEER: $75/ton (3-phase) 13 SEER: $50/ton 14 SEER: $75/ton 15 SEER: $100/ton	$50/ton (EER of 11.0, 10.8, 10.0)				12 EER at $50/ton		Economizer $250/unit economizer controls $75/ton VSD for fan pump $60/hp program thermostat $60

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)								
Platte River Power Authority	Cooling Rebate Program	14 SEER/ 12 EER = $65/ton, $4 per ton for each 0.1 EER over 12.0	$50/ton (EER of 11.0, 10.8, 10.0), $4 per ton for each 0.1 EER over base				Both PTAC and PTHP 11.0 EER- $50/ton, $4 per ton for each 0.1 EER over 11.0		
Puget Sound Energy	Commercial HVAC Rebate		>= CEE Tier 1 = $30/ton						ECM on HVAC fan box- $.12/sq ft Boiler tune-up-up to $600 Program thermostat—up to $50 VSD on pumps and fans—$100/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	$75/ton (EER of 11.5, 10.5, 9.7) $100/ton (EER of 12.0, 10.8, 10.2)	14 EER: $75/ton	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	14.0 EER/4.6 COP: $75/ton	$50/ton See program for details	(Tons * $10/ton) + (Tons *$350 * (Minimum IPLV – Chiller IPLV))	VSDs for HVAC fan & pump: $55/ton

3.9.6 Trade ally relationships

Several programs rely heavily on trade allies to market the program to customers as well as provide quality service and have found them to be valuable outreach partners. It is important to have a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs. Most programs do not offer trade ally incentives at this point.

Interviewees report that training and communication are instrumental in the trade ally relationship. Many programs incorporating trade allies hold workshops or frequent meetings with vendors as updates, as well as to find out what type of equipment is selling. One program holds about 10 one-day technical sessions throughout the year for trade allies in their territory. They hire expert trainers to come in for those sessions to cover topics such as DOE motors, HVAC, chillers, RCx, and lighting.

A few programs are struggling with building up their trade ally networks. A program manager from one of the more mature programs tells us that building a reliable trade ally network takes time—often as much as two years.

3.9.7 Why customers enroll

The initial view is that customers will participate in a program if it provides monetary incentives. However, some programs have found that the incentive or rebate alone will not result in a successful program. A key element for these programs is customer education and assistance. One program found through their survey that the assistance they provide and the rebate are equally motivating for their customers. These programs educate customers on the energy savings resulting from the high efficiency equipment (sustaining impacts) using the rebate to reduce the first-cost of purchasing and installing the equipment.

This education may come in several forms. One program manager attends association meetings where she can present energy savings opportunities. Another program has a general tool available to all customers on their website to calculate energy savings for 30 of the most common energy efficiency measure for typical buildings. A third program provides an online self-audit tool so customers can gain a better understanding of their own facility, which improves the conversation once they are ready to work with a program representative. Coaching is particularly important for the first time participants.

We asked program managers which key customer segments have been more likely to participate this year. A few of the newer programs are not yet tracking participation by customer segment as there is not much need at this point. Others have seen greater participation recently from offices and schools. Medical facilities have also been active in some programs. One program has seen property owners taking advantage of retail space switching over to office to implement upgrades.

4. IMPACT EVALUATION FINDINGS

The activities conducted to support the impact evaluation included verifying baseline and technical assumptions, determining savings considering 2009 International Energy Conservation Code (IECC) standards, and estimating a net-to-gross ratio. This chapter summarizes the key impact evaluation findings followed by more detailed analysis resulting from each activity.

4.1 KEY FINDINGS

4.1.1 Engineering and IECC standards review

The engineering review identified the following key findings.

- The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used for other programs. Other than VAV boxes, the algorithms used in the deemed savings calculator (the Calculator) are also consistent with algorithms represented in other programs' TRMs.
- More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. In view of the uncertainty of energy savings found in the engineering review and high free-ridership results, Xcel Energy may want to consider removing VAV boxes as a program measure in the 2010 Colorado Cooling Efficiency Program.
- The Cooling Tower offering was removed from the program in January 2009. The impact evaluation supports this removal (as it does for VAV boxes) due to uncertainty of savings found in the engineering review as well as high free-ridership results.
- The value for peak load coincident factor (CF) of 0.9 used in the Calculator is appropriate to account for gross generator kW saving. The equivalent full load hours (EFLH) provided in the Calculator are also appropriate.
- IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for the program year 2009-2010. Changes from IECC 2006 to IECC 2009 baseline efficiency values will affect savings for rooftop units and chillers. The IECC 2006 and IECC 2009 use different coefficients for the adjustment factor algorithm to account for non-standard water-cooled chillers.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs which do not take into account variations in PTAC sizes.

4.1.2 Net-to-gross ratio

The net-to-gross analysis resulted in the following findings:

- The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 0.51. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 0.21. The resulting self-report net-to-gross ratio is 0.7 for the Colorado Cooling Efficiency Program in 2007–2009.

- Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program.
- Removing cooling towers and VAV boxes, which we recommend be removed from the program, the self reported net-to-gross ratio is 0.75. As this value is within the recommended net-to-gross range from a preponderance of evidence approach, we recommend that this net-to-gross ratio be applied for the 2010 program year.

4.2 VERIFY BASELINE AND TECHNICAL ASSUMPTIONS

Cooling is an energy intensive process and can consume as much as one third of building energy use. Therefore, the need for verification of assumptions and parameters used for determining net energy savings achieved from an efficient cooling measure over a standard (complying with a stipulated minimum code or a baseline) is paramount.

To support the impact evaluation of the Cooling Efficiency Program, we reviewed algorithms used for estimating the deemed energy savings for end-use C&I cooling measures. This was supported through a review of several recent “technical reference manuals” (TRMs). We also reviewed the values of parameters used in the algorithms to assess the industry practices and ascertain their similarity (or dissimilarity) with those currently used by the Xcel Energy’s Colorado C&I “Deemed Savings Technical Assumptions” tool/calculator (“the Calculator”).

We also reviewed TRMs adopted in different jurisdictions in the country to assess consistency in the use of technical assumptions and the underlying algorithms for calculating the energy savings achievable from efficient cooling measures. Each of these TRM sources are summarized in Appendix A. Specific TRMs reviewed include:

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report, 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey’s Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009.

Below we define variables used deemed savings review. Note that different TRMs use varying notations for variables, for example EER_b or EER_{base} for “baseline energy efficiency ratio” of a measure. We designate one notation for a variable, as shown in Table 4-1, regardless of the (different) symbols used for the same variable in different TRMs. This is done to avoid repetition of variable definitions. Also note that terms EFLH and FLH are, at times, used interchangeably among different TRMs. For example the “Efficiency Maine TRM uses the term FLH while other TRMs reference in this study used the EFLH.

Table 4-1. Definition of Variables Included in Deemed Savings Analysis

Variable	Definition
Capacity	Size of a cooling measure (1 Ton = 12,000 BTU/hr)
EER	Energy Efficiency Ratio (3.413* Coefficient of Performance (COP); kW/Ton = 12/EER
SEER	Seasonal Energy Efficiency Ratio (EER/0.85)
EER_b	Energy efficiency ratio of a baseline cooling measure
EER_e	Energy efficiency ratio of an efficient unit
$SEER_b$	Seasonal Energy efficiency ratio of a baseline equipment
$SEER_e$	Seasonal Energy efficiency ratio of an efficient unit
CF	Coincidence Factor: The percentage of the total cooling load during peak hours.
EFLH	Equivalent Full Load Hours: Measure of energy use by season during the on-peak and off peak periods. EFLH is the ratio of measured kWh use during the period divided by design capacity (kW) of equipment.
FLH	Full load hours in a year
PE_b	Peak efficiency of the baseline chiller (kW/ton)
PE_e	Peak efficiency of the energy efficient chiller (kW/ton)
$IPLV_b$	Integrated part load value of the baseline cooling equipment
$IPLV_e$	Integrated part load value of the efficient cooling equipment
CDD	Cooling Degree Days

Xcel Energy's deemed savings calculator for the C&I end-use cooling measures use the following algorithms for air conditioning systems, chillers and VAV boxes.

Rooftop Units, Water Source Heat Pumps, Split Systems, Condensing Units

Energy Savings (Customer kWh) = Capacity x (12/SEERb - 12/SEERe) x EFLH

Demand Savings (Customer kW) = Size x (12/EER_Standard - 12/EER_Eff)

Chillers

Energy Savings (Customer kWh) = Capacity x (IPLVb - IPLVe) x EFLH

Demand Savings (Customer kW) = Capacity x (FLVb - FLVe)

Centrifugal Chillers

FLVb = FLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

IPLVb = IPLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

Temperature Variable, T_var = Chiller Lift + CWTD

Variable Air Volume (VAV) Boxes

Energy Savings (Customer kWh) = #_of_fans x Savings x EFLH x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Demand Savings (Customer kW) = #_of_fans x Savings x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Electrical Energy Savings (Gross Generator kWh) = Customer kWh / (1-TDLF)

Electrical Demand Savings (Gross Generator kW) = Customer kW x CF / (1-TDLF)

Electrical Energy Savings (Net Generator kWh) = Gross Generator kWh x NTG

Electrical Demand Savings (Net Generator kW) = Gross Generator kW x NTG

The following conclusions were drawn from a review of technical reference manuals for algorithms to estimate the energy and demand savings of C&I end-use cooling measures and their related variables.

- The review of different TRMs for energy and demand savings algorithms for C&I end-use cooling measures shows a general consistency in use of the algorithms in different jurisdictions.
- Xcel Energy's Colorado C&I end-use measure deemed savings calculator ("Calculator") uses algorithms that are consistent with other TRMs for most cooling measures.
- The Calculator correctly captures the adjustment factor algorithm for non-standard centrifugal chillers [i.e. chillers not designed to AHRI Standard 550/590 test conditions (44^{o}F leaving chilled water temperature and 85^{o}F entering condenser water temperature with 3 gpm/ton condenser flow rate)]. Also, the Calculator applies the adjusted IPLV values when specifications for non-standard centrifugal chillers are inputted. The instructions on the Calculator show that these adjustments are for standard chillers. The Calculator should add instruction to capture the fact that the adjustment factor is applicable to non-standard centrifugal chillers.
- Accuracy of the algorithms used for estimating energy and demand savings for VAV boxes could not be confirmed by its originator referenced in the Calculator[21]. In addition, none of the TRMs reviewed provides savings algorithms for VAV boxes. In view of this methodological deficiency, we suggest the algorithm currently used by the Calculator as the default algorithm. *However, from the net to gross analysis, we find that free-ridership for VAV boxes is high, indicating reduced efficacy of program support for the measure.* Also, support for VAV boxes has been withdrawn from another Xcel Energy jurisdiction (Minnesota). In view of these, we suggest Xcel Energy consider excluding VAV boxes from the Colorado Cooling Efficiency Program.

[21] Telephone discussion with Mr. Eugene A. Scales, 12th October, 2009.

- The Calculator uses algorithms to determine the peak demand saving for both end-use (equipment) and gross generator level. It uses peak load coincident factor (CF) for generator gross kW saving and applies a value of 0.9. C&I cooling measures are likely to operate when the peak load hours are in effect for the Xcel Energy CO service territory. Therefore, use of a high peak load coincident factor would well capture the peak load savings from the utility perspective. Also, we recommend the need for more research for establishing different CFs for commercial and industrial segments as their end-use load shapes vary.

- Treatment of equivalent full load hours (EFLH) in different TRMs is opaque. Our extensive review of the TRMs shows lack of a clear methodology for estimating the EFLH. Based on our discussion with the representative of Xcel Energy CO Cooling Efficiency Program, we understand that the University of Arkansas had developed a methodology that establishes a linkage between EFLH and climatic variations (or cooling degree days [CDD]). We reviewed the work[22] and find (a) the algorithms are applicable to ground source heat exchangers and (b) no direct linkage with CDD. Also, an algorithm for EFLH for two locations in Arkansas are provided in the Arkansas Deemed Savings TRM that makes a direct relationship of EFLH with CDD through the following relation:

$$EFLH = A \times (CDD)^{b+1}$$

Where A and b are coefficients and their values are provided in the TRM for different building types.

The EFLH values developed for the Calculator are based on more advanced methodology that analyzed weather bins (based on dry bulb temperatures). Also, we understand from discussions with the Xcel Energy representatives that the market segment data for end-use cooling measures were used (along with occupancy and operational characteristics of the facilities).

Since there is a general methodological void in the estimation of EFLH in TRMs, and the Calculator uses EFLH values that are estimated using more robust methodology (as communicated by the Xcel Energy representatives), we recommend that the EFLH values currently applied in the Calculator are continued.

4.3 DETERMINE SAVINGS CONSIDERING 2009 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) STANDARDS

As part of the engineering review, we reviewed baseline efficiency values for C&I cooling measures based on the "International Energy Conservation Code 2006" (IECC 2006). We understand that for the program year 2009-2010, the Xcel Energy Colorado Cooling Efficiency Program will continue to use IECC 2006 codes for defining the baseline efficiency of cooling measures. We also conducted a forward-looking study in the event that Xcel Energy Colorado C&I cooling efficiency program replaces IECC 2006 stipulation by those of

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[22] Sutton et al. (2002)a. An Algorithm for Approximating the Performance of Vertical Bore Heat Exchangers Installed in a Stratified Geological Regime. ASHRAE TRANSACTIONS 2002, V. 108. And

Sutton et al. (2002)b. Comparison of Multilayer Borefield Design Algorithm (MLBDA) to Available GCHP Benchmark Data. ASHRAE TRANSACTIONS 2002, V. 108, Pt. 2.

the IECC 2009 in the future. The tabulation of baseline efficiencies of end use measures that will result from adopting IECC 2009 stipulations are for informational purposes only.

We calculated the baseline efficiency of C&I cooling measures according to the IECC 2006 in Table 4-2 as the IECC 2006 codes will remain effective for the program years 2009 and 2010. Also, we provide IECC 2009 stipulations in Table 4-3 for any future use by the Xcel Energy Colorado C&I Cooling Efficiency Program. We compared the baseline measure efficiency values obtained from the IECC handbooks with those provided in the Calculator to identify any changes.

The Calculator converts the EER into SEER (and vice-versa) with a multiplier of 0.85. In addition, the Calculator shows the EER and IPLV values by deducting 0.2 to take into account the effect of heating section (other than electrical resistance heat). However, we do not apply these conversion factors to the baseline efficiency values.

The review of the baseline efficiency values for cooling measures from the IECC 2006 and IECC 2009 handbooks and the Calculator shows that:

- There is no change in the values of baseline efficiencies for Condensing units, PTACs and Water-source heat pumps for the IECC 2006 and IECC 2009.
- For Rooftop units, IECC 2009 baseline efficiency values are greater than those of the IECC 2006.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except that for the PTACs.
- The Calculator needs to modify the algorithm for calculation of baseline efficiencies for PTACs to take into account variations in PTAC sizes (in line with the algorithms provided in the IECC 2006 or IECC 2009).
- We are unable to confirm the baseline efficiency for VAV box used in calculator and suggest that the value used currently is the default. However, as discussed above, these may be removed from the 2010 program.
- For Chillers IECC 2009 stipulates measure baseline efficiencies for two paths i.e. Path A and B. The Path B is intended for part-load operation.
- The IECC 2006 and IECC 2009 use different coefficient for the adjustment factor algorithm to account for non-standard water cooled chillers to the baseline efficiency.

The analysis, by equipment type, is detailed in Appendix B.

Table 4-2. Baseline Efficiency of C&I Cooling Measures—IECC 2006

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	9.7		ARI 210/240
≥ 5.4 -11.3 tons		10.3	
≥11.3 -19.9 tons		9.7	ARI 340/360
≥ 19.9–63.3 tons		9.5 (ILPV: 9.7)	
> 63.3 tons		9.2 (ILPV: 9.4)	
Split Systems < 5.4 tons	10		ARI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	ARI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			ARI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

Table 4-3. Baseline Efficiency of C&I Cooling Measures—IECC 2009

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	13		AHRI 210/240
≥ 5.4 -11.3 tons		11.2	
≥11.3 -19.9 tons		11.0	AHRI 340/360
≥ 19.9–63.3 tons		10.0 (ILPV: 9.7)	
> 63.3 tons		9.7 (ILPV: 9.4)	
Split Systems < 5.4 tons	13		AHRI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	AHRI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			AHRI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

4.4 HOURS OF OPERATION

We compared the operating hours obtained through the survey of the program participants with those reported in the Commercial Business Energy Consumption Survey (CBECS) database. We understand from our interviews with Xcel Energy staff that the operating hours for different business types from the CBECs database were used to develop the effective full load hours for the Calculator (the C&I Cooling Efficiency Deemed Savings Calculator). As shown in the table below, the operating hours reported in the participant survey and those obtained from the CBECs database for different business segments are, in general, consistent.

Table 4-4. Comparison of Participant's Self-reported Operating Hours with CBECS database

Business Type	Operating Hours (Weekly)			
	Participants' Response	Survey sample (n)	CBECS Database	# of buildings (in '000)
Education	56	10	50	386
Lodging	168	2	167	142
Office	64	17	55	824
Retail	55	7	59	443

4.5 NET-TO-GROSS ANALYSIS

Program attribution (or the net-to-gross ratio) refers to energy impacts that can be confidently attributed to program efforts. As discussed at the start-up meeting, Xcel Energy needs an overall net-to-gross ratio for the program for their 2010 planning.

We estimated the net-to-gross ratio following the California self report framework for standard net-to-gross projects[23], which uses a preponderance of evidence approach. Our estimate is based on 1) interviews with 2007–2009 participating customers and influential vendors, 2) in-depth interviews with trade allies, 3) in-depth interviews with Xcel Energy account managers, and 4) literature review and benchmarking interviews with program managers of similar programs in the US.

4.5.1 Data collection and study methodology

An initial net-to-gross ratio was calculated based on customer self-reports. The standard net-to-gross analysis specified in the California framework uses three primary sources of information to estimate net-to-gross: program files and information, participant (decision-maker) survey, and vendor (participating trade ally) surveys. Our approach to using each of these information sources for estimating free-ridership and spillover is described in more detail below.

Table 4-4 shows the number of survey respondents by managed and non-managed account and measure type. The self-reported net-to-gross ratio was calculated from these respondents.

[23] Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers, Prepared for the Energy Division, California Public Utilities Commission by the Nonresidential Net-To-Gross Ratio Working Group, Revised May 8, 2009. This method estimates net-to-gross directly rather than estimating 1 minus free-ridership.

Table 4-5. Breakdown of Respondents Used to Calculate the Net-to-Gross Ratio

		Unweighted Count
Account type	Managed	44
	Non-managed	10
	Total	**54**
Prescriptive measures	Chillers	7
	Condensing units	2
	Cooling Towers	1
	PTAC	3
	Rooftop	29
	Split Systems	3
	VAV Boxes	4
	Total	**49**
Custom measures	Chillers	2
	Install new PMZ3 units in lieu of multi-zone RTUs	1
	Plate and frame heat exchanger	1
	Replace old condensing unit with evaporative cooler	1
	Total	**5**

The decision-maker survey, targeted at participating customers, asked highly structured questions about actions that would have been taken in the absence of the program. The survey was guided by information in program files. Respondents were first asked a series of questions to establish project context. Next, they were asked to rate the importance of program influences vs. non-program influences. Third, they were asked to rate the significance of different factors and events that may have led to their decision to install the efficient equipment at the time they did, including questions on the age or condition of the equipment, type of project, recommendations received, and their business policies related to equipment purchases.

The decision-maker survey also collected information about what participants would have done in the absence of the program. Specifically, respondents were asked a number of questions to assess the impact the program had on the timing, quantity, and efficiency level of the measure installed:

- Did the program impact the timing of the decision to replace cooling equipment and, if so, by how many months/years?
- Did the program impact the quantity of equipment installed, and if so, by how much (partial free-ridership)?
- Did the program impact the efficiency of equipment installed and, if so, by how much (partial free-ridership)?

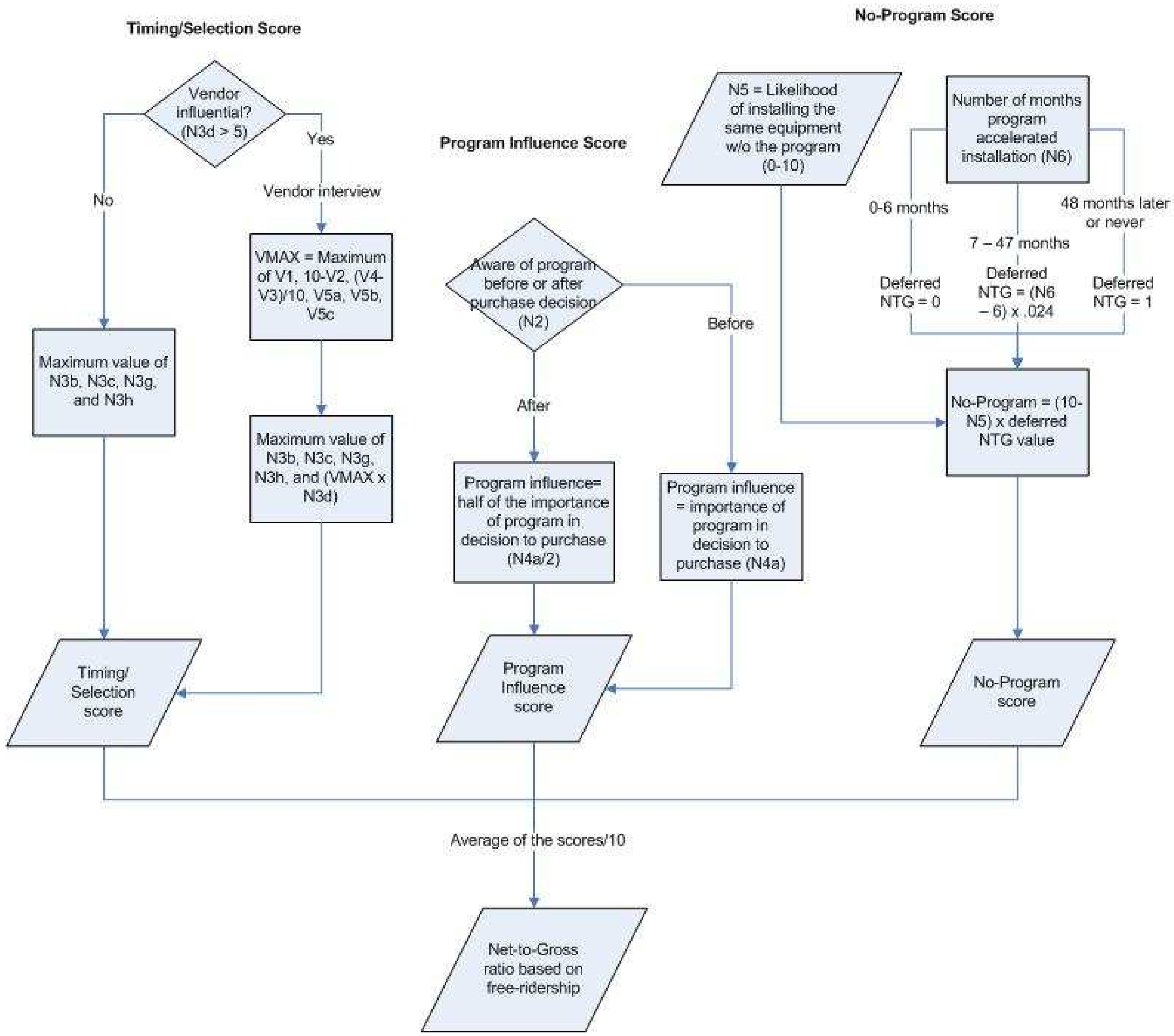
4.5.2 Measuring self-reported free-ridership

The calculation of the self-report-approach net-to-gross ratio based on free-ridership is summarized below in text and in Figure 4-1. In summary, the net-to-gross ratio based on free-ridership is calculated as an average of three scores representing responses to one or more questions about the decision to install a program measure:

1. A **timing and selection score** that captures the influence of the most important of various program and program-related elements in influencing the customer to select the specific program measure at this time. Program influence through vendor recommendations is also captured in this score when the customer says the vendor was influential in their decision. In these cases, the influential vendor was also interviewed and their responses were incorporated into the timing and selection score.
2. An overall **program influence** score that captures the perceived importance of the program (whether rebate, recommendation, or other information) in the decision to implement the specific measure that was eventually adopted or installed. The overall program influence score is reduced by half if the respondent says they learned about the program only after they decided to install the program qualifying measure.
3. A **no-program** score that captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. This score accounts for deferred free ridership by capturing the likelihood that the customer would have installed program qualifying measures at a later date if the program had not been available.

The core net-to-gross ratio is the average of these three scores divided by 10, as shown in Figure 4-1 below.

Figure 4-1. Net-to-Gross Ratio Flowchart Based on Self-report Free-ridership



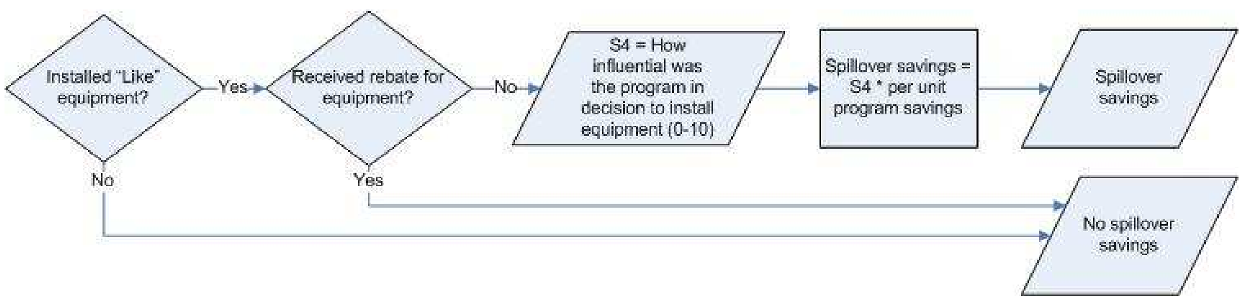
The California framework defines partial free-ridership as when, in the absence of the program, the participant would have installed something more efficient than the program-assumed baseline efficiency but not as efficient as the item actually installed as a result of the program. Of the 54 participants interviewed, five stated that, in absence of the program, they would have installed something more efficient than the standard equipment but less efficient than the equipment that was rebated through the program. For these cases, an adjustment should either be made to the net-to-gross ratio or to the gross savings. For all fives cases, we believe that the calculated net-to-gross ratio already accurately accounts for the impact of the program on these participants. Therefore, no further adjustment to the net-to-gross ratio was made.

4.5.3 Measuring self-reported spillover

The self-report protocol included a battery of questions to quantify spillover for use in estimating spillover. The spillover methodology uses a series of questions designed to measure "like" spillover. These questions ask about recent purchases (since program participation) of any additional energy-efficient equipment of the same type, installed through the program, made *without* any technical or financial assistance from the utility, but influenced by the program. A “like” spillover estimate is computed based on how much more of the same energy-efficient equipment the participant installed outside the program because of their positive experience with the program.

One of the issues with attempting to quantify spillover savings is how to value the savings of measures installed outside the program since we are relying on customer self-reports of the quantity and efficiency of any measures installed. We used a conservative approach and reported only those measures installed outside the program that were of exactly the same type and efficiency as the ones installed through the program (“like” spillover). Our conservative approach allowed customers to be more certain about whether the equipment they installed outside the program was the same type as the program equipment. This, in turn, made it possible for us to use the estimated program savings for that measure to calculate the customer’s “like” spillover savings. Figure 4-2 details the process for quantifying spillover savings.

Figure 4-2. Spillover Savings



We also attempted to measure the extent of free-drivers, or nonparticipant spillover. The data for this type of analysis could be collected from nonparticipants directly or from the design professionals and vendors who recommended, sold, and/or installed qualifying high efficiency equipment. We prefer to survey the design professionals and/or vendors primarily because they typically provide much more accurate information about the efficiency level of installed equipment than nonparticipants. Our experience has shown that customers cannot provide enough data about the new equipment they have installed to allow for accurate estimates of the energy savings achieved from the equipment. While they usually can report what type of equipment was installed, they typically cannot provide sufficient information about the quantity, size, efficiency, and/or operation of that equipment to allow us to determine whether the equipment is "program-eligible." On the other hand, design professionals and equipment vendors who have worked with the program are typically more knowledgeable about equipment and are familiar with what is and is not "program-eligible."

The in-depth interviews with participating vendors suggested little nonparticipant spillover due to the program at this time given the economy, the incremental cost of high efficiency cooling equipment, and the fact that this is only the third year of the program. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high

efficiency equipment. Therefore, there are no adjustments to the net-to-gross ratio based on free-drivers.

4.5.4 Self-report net-to-gross results

The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 51 percent. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 21 percent. The resulting self-report net-to-gross ratio is 0.7[24] for the Colorado Cooling Efficiency Program in 2007–2009.

We recommend Xcel Energy set a net-to-gross ratio in the range of 0.7 to 0.8 for the Colorado Cooling Efficiency Program, depending on program eligibility requirements. We recommend a net-to-gross range because as eligible program equipment changes (as it did between 2008 and 2009), we expect program attribution to change. Because we expect net-to-gross analysis will only be conducted periodically for the program, a realistic range allows Xcel Energy flexibility to set the net-to-gross ratio based on program eligibility requirements.

For example, PA Consulting has conducted biannual net-to-gross surveys for National Grid's commercial HVAC program. Prior to 2007, National Grid was using CEE Tier 1 eligibility standards for HVAC equipment. In 2002, the free-ridership rates for HVAC equipment ranged from 40 to 44 percent. In 2005, the free-ridership rates for HVAC equipment ranged from 41 to 56 percent. National Grid increased the eligibility standards to CEE Tier 2 in 2007. In 2007, with the higher eligibility requirements, free-ridership rates dropped significantly from 8 to 15 percent[25].

Results from the benchmarking review of HVAC programs that estimated a net-to-gross ratio ranged from 0.50 (when the net-to-gross ratio only includes free-ridership) to 0.85 (when the net-to-gross ratio includes spillover). This is in line with the self-report net-to-gross estimates from 2007–2009 Colorado Cooling Efficiency program participants discussed above.

There is also qualitative evidence from the 30 in-depth interviews with participating and nonparticipating trade allies which supports a net-to-gross range of 0.7 to 0.8. The qualitative results indicate that the program is helping to overcome barriers of selling high efficiency cooling equipment. In addition, the interviews suggest a medium level of spillover to customers of participating trade allies, supporting the medium to high level of spillover found in the customer survey. Nonparticipating trade allies were much more likely to say selling high efficiency cooling equipment to customers is very difficult. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary drivers for the difficulty rating they gave. They also mentioned lack of knowledge or education on the benefits of high efficiency equipment.

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[24] Net-to-gross = (1 - .51) + .21

[25] The Northeast has significantly higher electric rates than Colorado and National Grid's program is very mature, which has supported the success of moving to the higher CEE Tier levels. We are not recommending that this be done for the Xcel Energy Colorado Cooling Efficiency Program, but instead use it as an illustrative example of how changes in program eligibility affects program attribution.

Participants' self-report results substantiate the trade ally interview findings as participants with high net-to-gross ratios often stated that they were trying to achieve a good return-on-investment or that the rebate allowed them to purchase higher efficiency equipment.

> *"We purchased an existing building so we had access to their utility bills so we know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and (the rebate was) part of the reason we were able to make the investment."* (net-to-gross ratio = .79)

> *"We were doing upgrades anyway so it worked out to get rebates to help us get more efficient equipment."* (net-to-gross ratio = .83)

At the same time, there is qualitative evidence supporting a certain amount of program free-ridership—also found in the customer self-report calculations. Xcel Energy account managers discussed that larger accounts tend to have standard practices toward energy efficiency. Participants with low net-to-gross ratios often stated that the equipment they installed through the program was their only option or mandated by regulations, supporting the account managers' perspectives.

> *"[The equipment was] the only choice we had for a flat roof building for the tenant re-finish."* (net-to-gross ratio = .27)

> *"It's giving me money back for stuff I'm already going to do, stuff that I'm mandated to do."* (net-to-gross ratio = .25)

> *"We got money back on something we would have had to do anyway."* (net-to-gross ratio = .35)

For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program. This ratio excludes VAV boxes and cooling towers, which yielded lower net-to-gross ratios. We recommend VAV boxes be removed from the program based on the engineering review and net-to-gross analysis, and cooling towers were removed from the program in 2009.

5. RECOMMENDATIONS

This chapter outlines recommendations for Xcel Energy's consideration. These recommendations are based on activities and key findings detailed within this report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

5.1 PROCESS RECOMMENDATIONS

5.1.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to

reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Ally Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

5.1.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

5.1.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program.

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn’t even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

5.2 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007-2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007-2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

APPENDIX A: TECHNICAL RESOURCE MANUAL REVIEW SUMMARY

This appendix summarizes the findings through the review of five programs' Technical Resource Manuals (TRMs).

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report; 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review; 2009.

A.1 EFFICIENCY MAINE TRM

The Efficiency Maine TRM provides algorithms for three categories of cooling measures, (a) small cooling measures with capacity less than 65,000 BTUh[26], (b) large cooling systems having capacity 65,000 BTUh or more[27,28], and (c) Electric Chillers.

Small Systems

Energy Saving (kWh) = Capacity (kBTU/hr) × (1/SEERb - 1/SEERe) × FLH

Demand Saving (kW) = Capacity (kBTU/hr) × (1.1/SEERb - 1.1/SEERe)

Large Systems

Energy Saving (kWh) = kBTU/hr × (1/EERb - 1/EERe) × FLH

Demand Saving (kW) = kBTU/hr × (1/EERb - 1/EERe)

Electric Chiller

Energy Saving (kWh) = Capacity (tons) × (PEb - PEe) × FLH

Demand Saving (kW) = Capacity (tons) × (PEb - PEe)

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[26]Measures include small split system and single package air conditioners and heat pumps excluding room air conditioners PTACs, PTHPs, water source heat pumps and ground source heat pumps.

[27] Air conditioners, PTAC's, water-source heat pumps

[28]Although the TRM provides algorithm for electric chillers, it recommends energy saving calculations derived from detailed engineering analysis of the

The TRM uses 800 full load cooling hours (FLH) for small systems. We discuss the measure efficiency values (SEER, EER or PE) in Section 4.2 as part of the IECC 2006 and IECC 2009 baseline stipulations.

A.2 ARKANSAS DEEMED SAVINGS TRM

Two types of cooling measures included in the TRM are (a) Unitary air conditioners and (b) electric chillers. The algorithms used for quantifying the energy saving are as follows.

Unitary Air Conditioners:

Energy Saving (kWh) = Capacity (BTU/hr) x (1/1000) x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (BTU/hr) x (1/1000) x (1/EERb - 1/EERe)

The TRM uses IECC 2003 for defining the measure baseline efficiencies. The expression for the equivalent full load hours is:

EFLH = A x $(CDD)^{b+1}$

For unitary systems the TRM provides calculated EFLH for two cities i.e. “Fort Smith (FS)” and “Little Rock (LR)” in Arkansas State as shown in Table A-1. However, the methodology used for calculating the EFLH values is not provided in the TRM.

Table A-1. Calculated EFLH for Unitary Cooling Equipment*

City	Stage	M-Fri, 7 a.m. to 5 p.m.	M-Fri, 7 a.m. to 7 p.m.	M-Fri, 9 a.m. to 10 p.m.; Sun, 11 a.m. to 6 p.m.	All week, 6 a.m. to 10 p.m.	All week, 6 a.m. to Midnight	All week, All day
Fort Smith	Single	1,207	1,444	2,033	2,520	2,739	3,230
	Dual	854	1,020	1,443	1,750	1,881	2,155
Little Rock	Single	1,177	1,383	1,948	2,419	2,627	3,137
	Dual	801	938	1,303	1,611	1,730	1,997

*Source: Arkansas Deemed Savings Quick Start Program Commercial Measures: Final Report (Page 2–25)

Electric Chillers:

Energy Saving (kWh) = Capacity (ton) x 3.517 x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (ton) x 3.517 x (1/COPb - 1/COPe), and

EFLH = A x $(CDD)^{b+1}$

The coefficients A and B for calculating the EFLH for different building types are given in the TRM and shown in Table A-2.

Table A-2. Coefficients for calculating EFLH

Building Type	A	B
Education—Community College	327.83	-0.8835
Education—Secondary School	240.98	-0.9174
Education—University	512.11	-0.9148
Health/Medical—Clinic	313.54	-0.8437
Health/Medical—Hospital	730.76	-0.8836
Lodging	589.61	-0.8750
Office	657.91	-0.9437
Retail	404.00	-0.8645

The Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator also mentions use of the same methodology for estimating the EFLH. The EFLH estimates were developed by analyzing facility occupancy and operating hour distribution based on (a) Minnesota “occupation and employment statistics” data, (b) TMY2 data for Denver and Grand Junction and (c) building characteristics data from CBECS. This methodology would provide a better estimation of the EFLH values, although may always not be accurate. A detailed investigation of the methodology used for estimating the EFLH values currently being used for Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator is beyond the scope of the current study.

A.3 PENNSYLVANIA ENERGY EFFICIENCY AND CONSERVATION PROGRAM TRM

The TRM provides energy and demand saving algorithms for C&I cooling measures for room and central air conditioners split systems, packaged terminal systems, and water source heat pumps. Also, the TRM provides energy saving algorithms for electric chillers.

Air Conditioner:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b - 1/EER_e$) x EFLH

Demand Savings (kW) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b - 1/EER_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. A coincident factor (CF) of 0.67 is used in the demand savings calculations. The EFLH hours are obtained for seven locations within the state using the “Energy Star Calculator” of the Department of Energy[29].

[29] At the time of writing, we were unable to obtain the EFLH from the Energy Star Calculator hosted at the DOE website. The calculator needs input of the FLH or EFLH, else it uses a default value of 2000 Hrs.

Table A-3. EFLH for Seven Locations in Pennsylvania

Place	EFLH (hours)
Allentown	784
Erie	482
Harrisburg	929
Philadelphia	1032
Pittsburgh	737
Scranton	621
Williamsport	659

Electric Chillers

Energy Savings (kWh) = Tons X (kW/ton_b – kW/ton_e) X EFLH

Demand Savings (kW) = Tons X (kW/ton_b – kW/ton_e) X CF

The algorithms for estimating energy and demand saving are loosely linked to the equipment efficiency rating. The TRM uses the same CF and EFLH values as used for the air conditioning equipment.

A.4 CONNECTICUT CL&P AND UI PROGRAM SAVINGS TRM

The TRM provides algorithms for estimating the energy and demand savings for unitary air conditioners, as follows:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. The full load cooling hours are given for around sixty facility types ranging from 564 hours to 1308 hours (Table 2.0.0; page 246) also shown in Table 6.5 in this report. For demand saving estimation a peak load factor (CF) of 0.82 is recommended (Table 1.1.1; page 231).

For chillers the TRM recommends custom calculated energy savings based on specific equipment capacity, operational staging, operating profile, and load profile.

A.5 NEW JERSEY'S CLEAN ENERGY PROGRAM ENERGY IMPACT EVALUATION AND PROTOCOL REVIEW

This report is a well-researched TRM. It reviews energy and demand savings algorithms for end-use cooling (and other) measures from TRMs used in different jurisdictions. The report recommends algorithms for air conditioners and chillers. The air conditioning systems include unitary/split systems, PTACs, Water-source heat pumps etc.

Air Conditioners:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

Electric Chillers

Energy Savings (kWh) = Tons X (IPLVb - IPLVe) X EFLH

Demand Savings (kW) = Tons X (IPLVb - IPLVe) X CF

The TRM recommends a single value of 1360 hrs for EFLH and 0.67 for the CF (page 3-58).

Table A-4. Full load cooling hours by facility type*

Facility Type	Full Load Cooling Hours	Facility Type	Full Load Cooling Hours
Auto Related	837	Medical Offices	797
Bakery	681	Motion Picture Theaters	564
Banks, Financial centers	797	Multi-Family (Common Areas)	1306
Church	564	Museum	797
College-Cafeteria	1139	Nursing Homes	1069
College-Classes/Administrative	646	Office (General Office Types)	797
College-Dormitory	709	Office/Retail	797
Commercial Condos	837	Parking Garages & Lots	878
Convenience Stores	1139	Penitentiary	1022
Convention Centers	564	Performing Arts Theaters	646
Dining-Bar Lounge/Leisure	854	Police/Fire Stations (24 Hrs)	1306
Dining-Cafeteria/Fast Food	1149	Post Office	797
Dining-Family	854	Pump Stations	563
Entertainment	564	Refrigerated Warehouse	648
Exercise Center	1069	Religious Buildings	564
Fast Food Restaurants	1139	Residential (Except Nursing Homes)	709
Fire Station	564	Restaurants	854
Food Stores	837	Retail	837
Gymnasium	646	Schools/University	594
Hospitals	1308	Schools (Jr/Sr. High)	594
Hospital/Health Care	1307	Schools (Preschools/elementary)	594
Industrial- 1 Shift	681	Schools (Technical/Vocational)	594
Industrial-2 Shift	925	Small Services	798
Industrial- 3 Shift	1172	Sports Arena	564
Laundromats	837	Town Hall	797
Library	797	Transportation	1149
Light Manufacturers	681	Warehouse (Not Refrigerated)	648
Lodging (Hotels/Motels)	708	Waste Water Treatment Plant	1172
Mall Concourse	938	Warehouse	798
Manufacturing Facility	681		

*Source: New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009 (page 3-41).

APPENDIX B: IECC 2006 AND IECC 2009 EQIUPMENT ANALYSIS

B.1.1 Rooftop units

For all RTU sizes the EER (SEER and/or IPLV) values stipulated in the IECC 2009 are greater than those in IECC 2006. The measure baseline efficiency values used in the Calculator (reduced by 0.2 to account for the heating section) are consistent with the codes.

B.1.2 Water source heat pump

No change in EER values between IECC 2006 and IECC 2009. The Calculator and IECC 2006 values are consistent.

B.1.3 Condensing units

No change in EER values between IECC 2006 and IECC 2009. The Calculator uses EER value for air cooled condensing units only and this is in agreement with IECC 2006 value. The EER and (IPLV) values for water or evaporative cooled condensers are also provided in the Tables 6.7a and 6.7b.

B.1.4 Packaged Terminal Air Conditioners (PTAC)

No change in equipment baseline efficiencies between IECC 2006 and IECC 2009. Minimum energy efficiency ratio (EER) for PTACs according to both IECC 2006 and IECC 2009 is given by the following relation:

New Construction:

EER = 12.5 - (0.213*Capacity/1000)

Replacement:

EER = 10.9 - (0.213*Capacity/1000)

Code handbooks stipulate that for PTAC capacity less than 7,000 BTU/hr (0.58 ton) the equation should use default capacity value of 7000 BTU/hr to calculate the EER. Similarly, for equipment capacity over 15,000 BTU/hr the default capacity is 15,000 BTU/hr. Based on the above assumptions we calculate the EER values shown in Table 6.6a and 6.6b.

The Calculator uses a single EER value of 9.1 (excluding 0.2 for heating section); based on an average value of PTAC size obtained from the Xcel Energy CO market segment data. Plugging the EER value of 9.3 (9.1 + 0.2 for heating section) in above algorithms leads to PTAC sizes of about 15,000 BTU/hr and 7,000 BTU/hr for new construction and replacement units respectively. This does not capture the PTAC sizes that fall within the 15,000 BTU/hr and 7000 BTU/hr range. . We recommend that the Calculator applies the above algorithm to take into account the capacity variations for PTACs.

B.1.5 Electric chillers

In Table B-1 and B-2 we provide baseline measure efficiencies for electric chillers. The "Full Load Value (FLV) in kW/ton" and "Integrated Part Load Value (IPLV) in kW/ton" provided in the Calculator and the IECC 2006 handbook are consistent.

Table B-1. Baseline Efficiency of C&I Chillers—IECC 2006

Cooling Measures	IECC 2006		
	FLV (kW/ton)	IPLV (kW/ton)	Test Procedure
Scroll/Screw Chiller < 150 tons	0.79	0.78	ARI 550/590
Scroll/Screw Chiller ≥150 tons and < 300 tons	0.72	0.71	
Scroll/Screw Chiller ≥ 300 tons	0.64	0.63	
Centrifugal Chiller < 150 tons	0.65	0.65	
Centrifugal Chiller ≥150 ton and < 300 tons	0.63	0.63	
Centrifugal Chiller ≥ 300 tons	0.58	0.58	
Air-Cooled Chillers ≥ 150 tons	1.41	1.41	

Note: For non-standard centrifugal chillers (chillers not designed to standard ARI 550/590 test conditions) the IPLV is factored for adjustment (according to the algorithm well captured in the Calculator).

The IECC 2009 codes for water cooled chillers contain the amendments made by the ASHRAE 90.1—2007 standards. Two paths have been established—Paths A and B. Path B is intended for measure applications where significant time is expected at part load and all Path B chillers need demand-limiting controls.

Table B-2. Baseline Efficiency of C&I Chillers—IECC 2009

Measure	IECC 2009				
	Path A		Path B		
	FLV kW/ton	IPLV kW/ton	FLV kW/ton	IPLV kW/ton	Test Procedure
Scroll/Screw Chiller < 75 tons	≤0.78	≤0.63	≤0.0.80	≤0.60	AHRI 550/590
Scroll/Screw Chiller ≥75 and <150 tons	≤0.78	≤0.62	≤0.79	≤0.59	
Scroll/Screw Chiller ≥150 and <300 tons	≤0.68	≤0.58	≤0.72	≤0.54	
Scroll/Screw Chiller ≥ 300 tons	≤0.62	≤0.54	≤0.64	≤0.49	
Centrifugal Chillers < 150 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥150 and < 300 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥300 and < 600 tons	≤0.58	≤0.55	≤0.60	≤0.40	
Centrifugal Chillers ≥ 600 tons	≤0.57	≤0.54	≤0.59	≤0.40	
Air-Cooled Chillers ≥ 150 tons	≥9.6 EER	≥12.75 EER	NA	NA	

The adjustment factor for non-standard chillers is given by the following equation.

Adjusted NPLV = IPLV/K_{adj}

K_{adj} = 6.174722 – 0.303668(X) + 0.00629466 $(X)^2$ – 0.000045780 $(X)^3$

X = D_{std} + LIFT

D_{std} = (24 + FLV*6.83)/Flow rate

LIFT = CEWT – CLWT (^oF)

CEWT = Full load condenser entering water temperature (^oF)

CLWT = Full load leaving chilled water temperature (^oF)

Note that the coefficients of the equation for K_{adj} provided in the IECC 2009 are different from that in IECC 2006.

APPENDIX C: PARTICIPANT AND NONPARTICIPANT SURVEY RESPONSE RATES

Table C-1 presents the response rate and cooperation rate to the participant survey, and Table C-2 presents the same information for nonparticipants.

Table C-1. Cooling Efficiency Program Participant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**134**	**23**	**157**
Number not in service[4]	1	0	1
Non-working number[4]	0	3	3
Person not at number	7	0	7
Adjusted Sample Size	***126***	***20***	**146**
Hard Refusal	28	3	31
Soft Refusal[1]	0	0	0
Incompletes (partial interviews)	0	0	0
Unavailable for duration	3	2	5
Language barrier/non-English	0	0	0
Active[2]	***51***	***5***	**56**
Completed Surveys[5]	**44**	**10**	**54**
Cooperation Rate[3]	***34.9%***	***50.0%***	***42.5%***

[1] Attempts were made to convert all soft refusals
[2] An average of 16.7 contacts per active case were made to reach these still active cases
[3] Number of completed surveys divided by Adjusted Sample Size
[4] All bad numbers were traced with a telephone append service or directory assistance service
[5] Surveys were completed with 54 participants at 44 locations

Table C-2. Cooling Efficiency Program Nonparticipant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**156**	**572**	**728**
Temporarily disconnected[4]	1	5	6
Fax/data line[4]	4	3	7
Disconnected number[4]	1	30	31
Residential number	12	59	71
Ineligible—no commercial cooling	18	80	98
Ineligible—terminated during survey	12	77	89
Adjusted Sample Size	***108***	***318***	**426**
Hard Refusal	24	69	93
Soft Refusal[1]	0	2	2
Incompletes (partial interviews)	1	4	5
Unavailable for duration	3	14	17
Language barrier/non-English	0	2	2
Active[2]	***58***	***187***	**245**
Completed Surveys	**27**	**62**	**89**
Completed Surveys—Swamp Coolers Only	**1**	**7**	**8**
Completed Surveys—Doesn't Pay Cooling	**4**	**15**	**19**
Cooperation Rate[3]	29.6%	26.4%	***28.0%***

[1] Attempts were made to convert all soft refusals

[2] An average of 9.8 contacts per active case were made to reach these still active cases

[3] Number of completed surveys divided by Adjusted Sample Size

[4] All bad numbers were traced with a telephone append service or directory assistance service

Xcel Energy

Process and Impact Evaluation for the Colorado Business Cooling Efficiency Program

FINAL REPORT

January 15, 2010

Xcel Energy

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Prepared for: Xcel Energy

PA Consulting Group
6410 Enterprise Lane
Suite 300
Madison, WI 53719
Tel: +1 608 316 3700
Fax: +1 608 661 5181
www.paconsulting.com

Version: 1.0

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1. EXECUTIVE SUMMARY

This report provides the process and impact evaluation results of Xcel Energy's Colorado Commercial and Industrial (CO C&I) Cooling Efficiency Program.

OVERVIEW OF THE PROGRAM

The Cooling Efficiency program, which Xcel Energy launched in 2006, provides rebates to non-residential customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Oversized cooling towers
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps

The program targets both new construction and existing buildings. The program further distinguishes between prescriptive and custom installations.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively. [1]

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has struggled to elicit small business customer participation.

The program leverages the trade ally infrastructure, along with Xcel Energy staff such as account managers and Business Solutions Center representatives, to provide program outreach. Understanding the importance of the trade allies' roles, the program has an assigned Trade Relations Manager who provides education and outreach to trade allies throughout the state.

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[1] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

1.1 METHODOLOGY

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make changes that should be made to technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and the Company's current processes, technical assumptions and NTG ratios.[2]"

The process evaluation was designed to provide Xcel Energy with a thorough understanding of process issues such as barriers to participation, satisfaction with customers, and opportunities for improvement. The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate net-to-gross ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are reasonable and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[3], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Data collection activities included in the evaluation are detailed below. These activities informed both the process and impact (e.g., net-to-gross) analysis.

Table 1-1. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[4]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

[2] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

[3] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes as well as the impact of the 2009 IECC standards on future program years instead of looking backward to codes that no longer apply.

[4] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

1.2 KEY FINDINGS

The 2009 program successfully achieved its energy savings goals even though it increased its savings goals from the 2008 program year. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent, and 106 percent of the goals respectively.

The evaluation found that while the program effectively engaged managed accounts, the program is not as effectively reaching small and/or non-managed customers. This key finding will not come as a surprise to program staff—the evaluation confirmed that it is an issue through database analysis and in-depth interviews. Interviews identified that there are unique barriers for small commercial customers particularly for chain accounts that occupy leased facilities.

The evaluation also found that leveraging trade allies is critical for programs such as Xcel Energy's Cooling Efficiency Program. Effectively reaching and integrating trade allies into the program's outreach and marketing campaign was identified in the benchmarking study as a best practice; program managers of mature and successful programs said they leverage trade allies successfully, although developing those relationships admittedly takes time. Xcel Energy's Cooling Efficiency Program is moving in the right direction by employing an assigned Trade Relations Manager to reach trade allies.

Although the trade ally infrastructure is key to program success, there is a need to continue to strengthen the demand of high efficiency cooling equipment from the customer. Interviews identified a need for continued education with customers and specific marketing materials for target groups.

The remainder of this key findings section organizes findings by research objectives detailed in the Xcel Energy Cooling Efficiency Request for Proposal. Research objectives relevant for each subsection are denoted in the footnotes. The process and impact evaluation chapters provide further support and documentation of these key findings.

1.3 PROCESS EVALUATION KEY FINDINGS

1.3.1 Program design and operations[5]

Program staff and trade allies commended the prescriptive programs' application process, commenting that the application form is relatively easy to complete with clear instructions. The custom application process did not receive such favorable reviews from respondents. Respondents found the application process difficult and commented on the rebate estimation and verification process as areas for improvement.

[5] **This section addresses the following objectives:**

1) Gauge efficiency of the application process and determine opportunities to improve the application process.
2) Identify areas where the program/processes/marketing can be improved to capture more customer participation.

Having an assigned Trade Relations Manager to communicate with trade allies is seen as a critical role by program staff. However, interviewees questioned whether one staff member was sufficient for the entire state. Additional support in reaching trade allies was identified by Xcel Energy staff as a means for capturing more customer participation.

The Business Solution Center (BSC) is also viewed favorably by program staff as a referral point for the non-managed and small business customers. However, interviews revealed that the BSC should be more involved in marketing to customers. BSC staff said they planned to proactively market to customers in the future, although they admitted to not having specific marketing materials for these customers.

As noted in the recommendations section, the program should consider developing targeted marketing materials and provide those materials to BSC staff. Other recommendations include increasing the rebate level to capture a group of nonparticipants that otherwise would not participate and provide education and training opportunities to customers.

1.3.2 Customer characteristics and experiences[6]

The program is primarily serving managed accounts. Consequently, the nonparticipant group is far more likely to be comprised of non-managed accounts than the participant group. Participants are also more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Other points of distinction between the participant and nonparticipant groups are variability in hours of operation by season and building ownership.

The majority of participants said there is typically more than one person involved in the decision of whether to purchase cooling equipment. The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. The age or condition of the old equipment was the most important factor.

Overall, program participants are satisfied with the Cooling Efficiency program and the various aspects of the program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied.

[6] **These key findings address the following objectives:**

1) Identify characteristics and firmographics to help define current participants and target similar non-participants.
2) Assess customer decision-making processes regarding participating in the CO C&I Cooling Efficiency Program.
3) Gauge program participant satisfaction.

1.3.3 Target market for Xcel Energy's cooling efficiency program[7]

Trade ally interviews discussed the significant potential for the Cooling Efficiency Program in Colorado's commercial market. According to trade allies and Xcel Energy staff interviews, small commercial customers are underserved by the program, as documented in the program literature[8] and confirmed by trade allies and program staff in this program evaluation. These small commercial and non-managed organizations tend to be capital constrained and lease space. Therefore, they do not have ownership of the equipment installed but have to pay the energy bills. An effective suggestion for targeting these customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Additionally, large commercial customers are oftentimes opting to repair rather than replace failing equipment. The stock of cooling equipment is aging for these customers. Trade allies envision a significant need for cooling equipment replacement and an opportunity for the Cooling Efficiency program in the future.These factors, along with relatively low participation numbers since program inception, indicate that that there is significant opportunity for the program to provide cooling efficiency services to the commercial sector.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

1.3.4 Marketing and outreach[9]

The program employs a variety of resources to provide marketing and outreach to customers and trade allies. These resources include the BSC, Trade Relations Manager, and account managers, as well as direct mailings developed by Xcel Energy. Trade allies are particularly critical for reaching customers.

The participant surveys explored the effectiveness of these outreach efforts. Account managers followed by their HVAC vendors have been the most effective outreach channels for program participants.

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[7] **These key findings address the following objectives:**

1) Quantify program saturation in the market including untapped markets of non-participants and remaining markets for existing program participants.
2) Identify the most attractive target populations that currently participate in the program.
3) Identify the target population that currently do not participate in the program.

[8] *2009 Cooling Efficiency Marketing Plan.*

[9] **These key findings address the following objectives:**

1) Identify channels for information about the CO C&I Cooling Efficiency Program
2) Determine nonparticipants' awareness level of Colorado's C&I Cooling Efficiency Program
3) Identify preferred channels for information about the CO C&I Cooling Efficiency Program

Approximately a quarter of nonparticipants are aware of the program. The most common way nonparticipants heard about the program was through Xcel Energy direct mail. Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, followed by email. Trade ally and internal staff identified a need for these marketing materials to be more specific to target sectors, such as small commercial customers.

Trade allies appreciate receiving information through mail; however, the evaluation identified that personal contact is most effective for providing information about the program. Trade allies also requested that a dedicated website be established to communicate program information and tools.

1.3.5 Barriers to purchasing new equipment or participation[10]

The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital. Customers will contact trade allies when it is time to replace the equipment. Current economic conditions and costs were identified by participating and nonparticipating trade allies, and nonparticipating customers, as barriers to purchasing efficient cooling equipment. The barriers included the incremental cost of high efficiency cooling equipment as well as the first cost of cooling equipment.

Several trade allies differentiated the barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost. For larger customers, the main barrier was initial cost due to their need for larger cooling equipment. A number of these customers decide to repair rather than replace equipment. Another notable barrier was triple-net leases, which are reported as very common among commercial customers. Non-financial barriers for moving customers to higher efficiency cooling equipment include customers' lack of awareness and/or understanding of the benefits of high efficiency equipment.

Customers' financial constraints and tendency to replace equipment on failure reinforce the need for trade allies to be intimately familiar with the program and be provided with materials and tools so they can easily and quickly provide information to customers in these situations.

1.4 IMPACT EVALUATION KEY FINDINGS[11]

The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used

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[10] **These key findings address the following objectives:**

1) Identify barriers to participation

2) Determine reasons for not participating in the program

[11] **These key findings address the following objectives:**

1) Verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and vendor's own findings.

2) Calculate Net-to-Gross ratios including and identifying the effect from free riders, free drivers, and spillover.

for other programs. The values for peak load coincident factor (CF) and equivalent full load hours (EFLH) provided in the Calculator are appropriate.

More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. Based on the review of other programs and the engineering estimates, the recommendations include removal of VAV boxes from program offerings.

IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for both the 2009 and 2010 program years. The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the Package Terminal Air Conditioners (PTACs), which do not take into account variations in PTAC sizes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

The self-reported net-to-gross ratio for 2007–2009 participants using the California self-report methodology was is 0.7 for the Colorado Cooling Efficiency Program. Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program. The net-to-gross results identified through the benchmarking study are in line with the results from this Xcel Energy Cooling Efficiency evaluation, which used the California net-to-gross framework[12].

1.5 RECOMMENDATIONS

These recommendations are based on activities and key findings detailed within the report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

1.6 PROCESS RECOMMENDATIONS

1.6.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates

[12] The program has used a net-to-gross ratio of .94 through 2009 and per Xcel Energy recommendations from this evaluation will not be retroactively imposed on 2009 or prior program achievement but will be used moving forward beginning in 2010.

program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Relations Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to

pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

1.6.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

1.6.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program. .

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn't even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

1.7 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007–2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross

ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007–2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

2. INTRODUCTION

This report presents the results of the 2009 process and impact evaluation of the Xcel Energy Colorado Business Cooling Efficiency program. In this chapter, we discuss the program overview and logic model, study objectives, evaluation methodology, and organization of the report.

2.1 PROGRAM OVERVIEW AND LOGIC MODEL

2.1.1 Program overview

Cooling is the second highest use of electricity for most commercial buildings[13]. Xcel Energy began offering a Cooling Efficiency program for its Colorado commercial and industrial customers in 2006.

The Cooling Efficiency program offers rebates to eligible customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps.

The program targets both new construction and existing buildings and provides rebates for whole systems, as well as specific components. The incentives differ by the type of cooling equipment purchased. Variable Air Volume Boxes and Cooling Towers have a fixed rebate amount. All other equipment types have a base rebate per ton, and the rebate amount increases incrementally if the equipment exceeds the minimum efficiency requirements necessary to qualify for the base rebate amount.

The program further distinguishes between prescriptive and custom installations. The custom program requires that all projects be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification.

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has not been gaining broad acceptance with customers and vendors as quickly as anticipated. Small business participation is a known

[13] Commercial Building Energy Consumption Survey, 2007

challenge for the program, and the recent economic conditions have also hampered program acceptance.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively.[14]

Table 2-1 details the number of customers that participated in the program and related savings by year. While the program is still relatively young, the trend indicates the program has gained momentum. There was a significant increase in participation between 2006 and 2007; however, the participation numbers remained relatively constant between 2007 and 2008 while the savings decreased. The program experienced program design changes between 2008 and 2009. The baseline assumption and requirements for eligible equipment increased. In 2009, there was an increase in both participants and achieved savings, meeting the annual savings goals for the first time.

Table 2-1. Number of Customers and Related Savings by Year

Program Year	Number of Participating Customers	Marketing kW Achieved	Generator kW Achieved	MWh Savings Achieved
2006	49	903	693	1,417
2007	113	2,342	517	4,934
2008	123	1,998	1,176	3,540
2009	175	4,262	5,181	6,558

Source: Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

The program provides program outreach through a variety of sources including the trade ally infrastructure and Xcel Energy staff. Key Xcel Energy outreach staff includes the account managers as well as Business Solutions Center representatives whose role it is to provide outreach and services to non-managed accounts. Recognizing the importance of the trade allies' role, the program has an assigned Trade Ally Manager who provides education and outreach to trade allies throughout the state. The program also receives guidance from a trade Cooling Council which first began meeting in 2008.

2.1.2 Logic model

Xcel Energy's Colorado Cooling Efficiency Program undertakes a number of activities to capture both energy and demand savings with Xcel Energy's commercial customers as well as result in the long-term increased penetration of energy efficient cooling equipment among all business sectors of its commercial population in Colorado. Xcel Energy runs the program internally; therefore, the development and refinement of the program infrastructure is a major

[14] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

activity of the program. The other main activities include outreach to trade allies, customer communications, and rebating eligible equipment.

Figure 2-1 is the program's logic model that identifies program activities, targeted market actors, outputs, and expected outcomes. A well-designed logic model serves as a roadmap to understanding logical relationships among program interventions and potential issues and problems. It communicates a performance story about what the program is trying to achieve, through what interventions, and with respect to which market actors. This logic model was developed based on program materials, discussions at the start-up meeting, and interviews with Xcel Energy staff involved in program management and implementation.

Figure 2-1. Colorado Cooling Efficiency Program Logic Model

Inputs/ Resources	Sufficient budget is allocated Xcel Energy Cooling Efficiency Team* Outside technical resources	Marketing collateral, Program website Xcel Energy Cooling Efficiency Team Xcel Energy technical assistance	Marketing collateral, Program website Account managers, Business Service Center (BSC) and trade allies Xcel Energy technical assistance
Activities	**Develop Program Infrastructure** →	**Outreach to Trade Allies** →	**Customer Communications** →
Outputs	The Cooling Efficiency program has been in the CO market since 2006 Program measures, rebates and marketing strategy, technical assumptions developed, refined and documented. Internal website and training Tracking system developed (appropriate information is requested, captured and entered into Siebel)	Participate in events of local chapters of HVAC associations and market to their members, energy efficiency fairs Hold semi-annual trade Cooling Council meeting and ad-hoc meetings Involve trade allies in developing rebate structures and new products	Account managers, BSC representatives and trade allies refer customers to the program Targeted direct communications to business customers and other outreach such as newsletters, energy efficiency fairs Print and radio advertisement on Energy Efficiency Programs
Short to medium term outcomes	Improved energy efficiency program awareness and participation Xcel Energy staff knowledgeable about the program and its resources Refine Xcel Energy product offerings High customer satisfaction	Trade allies are knowledgeable about the rebate structure and program guidelines Trade allies regularly communicate the program to customers and include rebate with bids Trade allies receive technical assistance from Xcel Energy engineers	Program offering is meaningful, clear, and valuable to customers Business customers' awareness of and participation in the program increases significantly Business customers receive needed technical assistance from Xcel Energy engineers
Long term outcomes	Energy saving goals of the Cooling Efficiency program are achieved within budgetary constraints	Increased trade allies' stocking and sales of AC energy efficient technologies and increased participation of customers in the program	Increased awareness of and demand for energy efficiency equipment in all business segments

* Core members of the Xcel Energy Cooling Efficiency team include the product manager, energy efficiency management, marketing assistants, Trade Relations Manager, and energy efficiency engineer staff. Ancillary members of the Cooling Efficiency team include market research, account management, advertising, corporate communications, information services, regulatory affairs, rebate operations, Business Solutions Center (BSC), and legal.

2.2 STUDY OBJECTIVES

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make recommendations that should be made to

technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and Xcel Energy's current processes, technical assumptions and NTG ratios.[15]"

Xcel Energy identified several key evaluation objectives for both the process and impact evaluations. The process evaluation was designed to provide Xcel Energy with a thorough understanding of participating and nonparticipating commercial customers' and trade allies' awareness of the program, satisfaction with the program, barriers to participation, and opportunities for program improvements. It was also designed to provide information on how to target and market to various segments within the commercial population to increase participation.

The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate NTG ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering 2009 International Energy Conservation Code (IECC) standards, developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

2.3 EVALUATION METHODOLOGY

This section outlines the process and impact evaluation methodology, including data collection methods used to support the evaluation.

2.3.1 Process evaluation methodology

The evaluation included numerous activities in 2009 to directly address the process evaluation objectives. These activities included:

[15] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

Table 2-2. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[16]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

Internal review. This activity included a project kick-off meeting; a review of existing program documentation, marketing materials, and the program tracking system; and in-depth interviews with ten Xcel Energy internal staff. PA interviewed the Cooling Efficiency program manager, two rebate processors, two Business Solutions Center (BSC) representatives, one Trade Relations Manager, two account managers, and the team lead energy efficiency engineer. These interviews were used to clarify the roles and responsibilities of staff and trade allies; program goals and successes/challenges in meeting those goals; the effectiveness of the programs' operations relative to the defined program goals and objectives; and reasons for variance in program performance by customer class (e.g., small business and other customer segments such as retail/office, food services).

Based on the internal review and project kick-off meeting, PA developed a detailed evaluation plan and program logic model.

Participating customer surveys. The participant survey collected information about participant characteristics and firmographics, equipment decision-making processes (including remaining markets for existing program participants), source(s) of program information, satisfaction with key aspects of the program and the application process, barriers to participation, the effect of the program on their decision to install qualifying equipment, and suggestions for program improvements. In addition to providing data to estimate a net-to-gross ratio, the survey addressed key assumptions to the savings algorithm such as hours of use and baseline (what would have been installed without the program).

PA completed telephone interviews with 54 businesses that participated in the Xcel Energy Cooling Efficiency Program ("participants") since the program started (2007–2009). Some businesses participated in the program at multiple locations. Forty-four unique respondents represented these 54 businesses.

A detailed response rate table for the participant (and nonparticipant) surveys can be found in Appendix C.

Nonparticipating customer surveys. The nonparticipant survey was designed to help characterize the market for energy efficient HVAC equipment in terms of the types of

[16] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

customers and decision-makers. The survey collected data on program awareness, preferred sources of information, market barriers to participation, equipment decision-making processes, and characteristics and firmographics.

PA completed telephone interviews with 116 customers who had not completed a project through the Xcel Energy Cooling Efficiency Program since the program began ("nonparticipants"). Eighty-nine of these businesses had commercial cooling equipment and paid cooling costs to Xcel Energy ("eligible nonparticipants"). Nineteen of these businesses had cooling costs included in their lease and eight businesses had swamp coolers as their only cooling equipment. These businesses completed a shortened version of the survey ("ineligible nonparticipants").

Customer-identified Influential Trade Allies. The participant customer surveys were also used to assess free-ridership and spillover using a California influenced (and Xcel Energy approved) free-ridership and spillover battery. When assessing free-ridership and spillover, it is critical to speak with the person or persons most involved in the decision-making process. As we have found through other HVAC free-ridership and spillover studies, the decision maker is often not the customer. Rather, select trade allies tend to be influential in the decision-making process. In cases where the customer identified the trade ally as being influential in the decision, we also attempted to speak with the trade ally. PA completed 11 surveys with influential trade allies to assess the influence of the program on that particular project.

Participating and nonparticipating trade ally interviews. The participating and nonparticipating trade ally interviews provided rich qualitative information regarding program design and program impacts. PA sampled a census of participating trade allies from the program database, including those with very little activity. We also received a list of nonparticipating trade allies to sample from.

PA conducted in-depth interviews with 17 participating and 13 nonparticipating trade allies. These trade allies included those that supplied, installed, and serviced cooling equipment, as well as an engineer and several equipment suppliers. The interviews probed on a variety of issues including type of business activities, awareness of the program and program offerings, source of program information, barriers to customer (particularly small business) and trade ally participation, and recommendation practices for efficient equipment and program influence in these practices. The interviews also explored trade allies' perception of the difference in purchasing and decision-making practices between different commercial customer segments (small, medium, large, national chain accounts vs. independently owned) and the impact of the economy on the trade allies' abilities to promote, stock, and sell program-qualifying equipment. In addition, the trade ally interviews also attempted to gather information that could be used to assess market affects or other program-related impacts such as free-ridership and spillover[17].

Peer utility program benchmarking review. This task included a literature review, Internet research, and program manager and program evaluator interviews for eight similar utility

[17] Free-ridership refers to customers who participate in programs and obtain incentives for actions they claim they would have taken without the incentive. Spillover refers to savings induced by the program but not achieved (and claimed) through other utility programs.

programs. The benchmarking was designed to identify standard approaches and best practices in programs that are similar in scope and objectives to Xcel Energy's Cooling Efficiency program in Colorado. Specifically, the review examined program goals, objectives, and scope; effectiveness of the program in meeting goals and objectives; key elements of program design; marketing and recruitment of customers; quantification of program impacts; rebate levels; product offerings; application process; trade ally incentives and/or Quality Installation requirements; and trade ally outreach (especially to small business).

2.3.2 Impact evaluation methodology

The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[18], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Verify baseline and technical assumptions. The impact evaluation reviewed the 2009 baseline and technical assumptions using information relevant to Xcel Energy's territory and made recommendations concerning any adjustments we believe Xcel Energy should make going forward. The review activities included: (1) tracking system review, (2) engineering assumption review, and (3) participant survey results and project file review.

Calculate gross savings with IECC 2006 codes. The impact evaluation focused on 2009 program participants and on future years rather than reviewing assumptions retroactively. PA reviewed tracking system data from the Program Year 2009 applications that had been used to estimate program savings (Colorado uses IECC 2006 codes as the 2009 program baseline). For Program Year 2010, Colorado will also be using IECC 2006. Future program years after 2010 may be shifting the baseline to the IECC 2009 codes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

Develop net-to-gross ratio. The net-to-gross ratio was calculated based on interviews with 1) 2008–2009 participating customers and influential vendors, 2) in-depth interviews with contractors, and 3) a literature review and benchmarking interviews with program managers of similar programs in the US.

2.4 ORGANIZATION OF THE REPORT

Section 3 of this report presents the findings from the various process evaluation activities, and Section 4 presents the findings from the impact evaluation activities. Section 5 provides suggested recommendations for program changes that could increase participation, reduce burden, and increase program impacts.

Appendix A contains the Technical Resource Manual review summary and Appendix B contains the IECC 2006 and IECC 2009 equipment analysis conducted as part of the impact

[18] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes instead of looking backward to codes that no longer apply.

evaluation activities. Appendix C contains the response rates to the participant and nonparticipant customer surveys.

3. PROCESS EVALUATION FINDINGS

This chapter presents the results of the process evaluation based on interviews with internal program staff, participant and nonparticipant customer surveys, participant and nonparticipant trade allies, and the benchmarking review. These results are organized as follows:

- Key findings
- Program administration, processes, and resources
- Participating and nonparticipating customer characteristics
- Participating customer satisfaction with the program
- Customer awareness and marketing
- Customer decision making processes
- Trade ally results
- Benchmarking results
- Program potential
- Opportunities for improvement

3.1 KEY FINDINGS

Before discussing the results we present the overarching key process evaluation findings. Key findings are detailed by program design and operations, customer experiences, trade ally experiences, and barriers to new equipment purchases and program participation.

3.1.1 Program design and operations

- Program staff believe the Prescriptive component of the program is an area of the program that is working well. They have experienced frustration with the custom program and reported there have been trade allies and customers also frustrated with this component of the program. Trade ally interviews confirmed some level of frustration with the custom component of the program, although the issue did not arise through interviews with program participants who received services through the custom program. In fact, the post-inspection process, which was a point of contention raised in internal and trade ally interviews, received a high rating of satisfaction by custom program participants.
- Xcel Energy employs an assigned Trade Relations Manager to communicate and work directly with trade allies in Colorado. Having this assigned Trade Relations Manager was seen as a critical role by program staff, although having only one person fill this role for the entire state may mean that more rural or outlying areas are not being reached.
- The Business Solution Center (BSC) is viewed favorably by program staff as a referral point for the non-managed and small business customers. However, there is little direct marketing activity to small commercial customers through the BSC.
- Several program staff commented on the need to receive information regarding program changes in a more formal manner.

- Xcel Energy's Cooling Efficiency program is consistent with other programs as identified in the benchmarking study. Measures with incentives and other incentives are within range of or slightly lower than other programs.
- The benchmarking study attempted to identify net-to-gross ratios used by other programs. Some programs were able to provide their net-to-gross ratios based on evaluation efforts, although most program managers were unable to provide this information as either they use a deemed net-to-gross value or are not required to report net-to-gross ratios for their program. The primary and secondary data review provided context for the Xcel Energy net-to-gross results, indicating that the results are in line with other programs.
- The benchmarking study identified a variety of best practices for cooling programs.
    - Utilize key account representatives and trade allies as much as possible for program communication.
    - Become fully educated on trade associations when leveraging them to target customers. Identify all associations representing that particular market segment and have control mechanisms in place to scale down or ramp up depending on activity level.
    - Identify a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs.
    - Set effective rebate and efficiency levels. A comparison of rebate levels in other programs with Xcel Energy’s found Xcel Energy’s rebates are some of the lowest for air conditioning systems. Xcel Energy is also rebating a lower SEER rating for packaged and split AC units than other programs.
    - Streamline the application process.
    - Engage the customer early in their decision-making process to influence their choice of equipment.
    - Provide customer education and assistance as well as the rebate. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers.

3.1.2 Customer characteristics and experiences

- There are some differences in customer characteristics between participants and nonparticipants. Participants are more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Participants are also more likely to be managed accounts. Although the average operating hours do not differ between participants and nonparticipants, participants are significantly more likely to have hours that very by the season or operating cycle. Participants are also more likely to own their building, and are more likely to report having taken an action in the past few years to reduce energy use.
- Overall, program participants are satisfied with the Cooling Efficiency program. They were also satisfied with the various aspects of the program, such as the post-inspection process, type of equipment eligible, the contractor they worked with and the rebate application process. Both participants and non-participants were satisfied with Xcel Energy in general.

- Approximately one-fourth of nonparticipants are aware of the program. The most common way that aware nonparticipants heard about the program was through Xcel Energy direct mail or a HVAC vendor.
- Account managers have been the most effective outreach channel for program participants, cited by 55 percent of participants. Hearing about the program through a HVAC vendor was the next most common way of learning about the program. Provided a significant portion of the program population is managed accounts, it is not surprising that account managers were identified by customers as the most notable means for hearing about the program.
- Few customers mentioned marketing materials as a means for hearing about the program. Interviews with program staff identified that the marketing materials distributed to customers and available to program staff are fairly generic, although the customer sectors that the program serves are unique.
- The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment.

3.1.3 Trade ally experiences

- Nearly three-quarters of nonparticipating contractors are aware of the program; therefore, lack of general awareness does not seem to be a barrier to program participation (although deeper understanding of the program is important). Participating and nonparticipating trade allies heard about the program through Xcel Energy representatives, materials, events, customers, and other Xcel Energy programs.
- The primary program-related benefits noted by trade allies are: being more price competitive by including the Xcel Energy rebate, and the ability to communicate and educate customers on energy efficiency by promoting the program. Trade allies saw the benefits for customers as primarily the cost savings, although increased energy efficiency was also mentioned.
- While participating trade allies are generally optimistic that their participation in the program will increase in the next 12 months, their optimism does not extend to the high efficiency HVAC market in general. They project it will continue to be difficult to convince customers to adopt high efficiency equipment due to financial constraints.
- Trade allies commented that it is more difficult to sell high efficiency equipment in replace-on-failure situations where decisions need to be made quickly. Therefore, it is important for trade allies to not just be aware of the program, but be intimately familiar with the program so they can easily and quickly provide information to customers in these situations.

3.1.4 Barriers to purchasing new equipment or participation

- The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital, mentioned by almost two-thirds of nonparticipants. This is consistent with information received from the trade ally interviews. When nonparticipants do need to replace equipment, contractors will be their first contact point.
- Both participating and nonparticipating trade allies corroborated nonparticipating customers' perception of purchasing barriers and identified the economy, coupled with the incremental cost of high efficiency cooling equipment as well as the first cost of cooling

equipment, as primary barriers for purchasing new, high-efficiency equipment. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high efficiency equipment as are leased buildings.

- Several trade allies distinguished the differences in barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost—the difference between standard and high efficiency equipment. For larger customers, the main barrier was first cost—large equipment is expensive and customers tend to repair it instead of replace it as long as possible (especially in the current economy).
- Another notable barrier was triple-net leases, which are reported as very common among commercial customers. In these situations, the customer does not own the building, but is responsible for the mechanical equipment. Trade allies report these customers are less likely to make the investment in high efficiency cooling equipment as they are unsure of how long they will be in the building and therefore may not realize the payback of the higher efficiency equipment.
- Non-financial barriers for moving customers to higher efficiency cooling equipment included customers' lack of awareness, knowledge, and/or understanding of the benefits of high efficiency equipment. Trade allies expressed the need for tools to help sell high efficiency equipment, and the need for more direct communications with Xcel Energy staff to understand program benefits, requirements, and obtain information necessary to help them sell equipment through the program.
- Trade allies provided a variety of suggestions for overcoming barriers, which typically corresponded to their perception of the barriers for selling high efficiency equipment. Suggestions for overcoming barriers include increasing the rebate levels, better educating trade allies on the program, helping them to sell high efficiency equipment by providing tools to help with the sales process (e.g., savings calculator), making the custom component of the program less burdensome and more transparent for trade allies and customers, and directly marketing the program to customers. Participating trade allies also suggested that Xcel Energy have more personal communications with them to provide information about the program.

3.2 PROGRAM ADMINISTRATION, PROCESSES, AND RESOURCES

As documented throughout this report, program participants, trade allies, and program staff generally speak favorably about this program. The Prescriptive component of the program in particular was mentioned by all parties interviewed as a component of the program that is working well.

Interviews with program staff, customers, and trade allies investigated the effectiveness of program administration, processes, and resources. This section summarizes the results of those interviews.

3.2.1 The prescriptive program and application process

The Cooling Efficiency Prescriptive Program's application process received special kudos from respondents, especially when they were comparing the program to other Xcel Energy programs. They commented that the application was streamlined, clear, and relatively easy to complete and process. This is particularly important amongst larger customers who do not

have time to deal with convoluted program processes and paperwork. This is consistent with remarks made by trade allies regarding the prescriptive application process.

Program participants were also generally satisfied with the application process, rating the process an average of 8.5 on a 0- to 10-scale where 10 indicates they were extremely satisfied with the processes. A majority of these program participants (52 percent) reported filling out the rebate application themselves and 10 percent of applications were completed by the equipment vendor.

3.2.2 Role of assigned trade relations manager

Two groups were specifically discussed as potential targets for Xcel Energy's Cooling Efficiency Program at the kick-off meeting: the trade allies and the non-managed accounts. The program is attempting to reach these targeted groups through the use of an assigned Trade Relations Manager and the Business Solutions Center (BSC).

The assigned Trade Relations Manager's role is to communicate and work directly with the trade allies in Colorado. It was clear through the interviews, and from our experience, that the trade allies are an important group to reach and inform about the program. They are a primary marketing tool for the program as they are often the first point of customer contact, especially for small commercial customers. They also have the opportunity to steer customers toward program-qualifying equipment with an eye to program requirements. Therefore, having this assigned Trade Relations Manager was seen as a critical role, and a positive component of the Cooling Efficiency Program.

Various program staff discussed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification. The trade allies discussed earlier in this report also raised this as a need for the program. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

The Trade Relations Manager is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, but he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado. There is question about whether the single Trade Relations Manager is sufficient to reach trade allies given the expanse of the state and differences in region.

The BSC focuses on increasing the participation of the non-managed accounts. The BSC is primarily responsible for fielding calls to the non-managed accounts and will in the near future provide proactive outreach to these customers through their outbound call center (this was not yet happening at the time of the interviews). Account Managers and the Trade Relations Manager spoke favorably of having the BSC as a referral point for the non-managed and small business customers. They appreciate the ability to refer customers they meet that are not managed accounts to this call center.

3.2.3 Program communications

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes.

Currently the program employs several methods of communication to staff working on the Xcel Energy Cooling Efficiency Program. The company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates.

Several individuals interviewed commented on the need to receive information regarding program changes more formally. They recognize that they receive emails with these updates sent to them, but the emails tend to get buried in day-to-day activities. One individual said he found out about program changes from a vendor rather than through an Xcel Energy Communication. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effectively getting the information across.

Trade allies interviewed also commented that they would like to receive more information from Xcel Energy as discussed in the trade allies section. For example, one trade ally requested the development of a website specifically directed at trade allies to provide easy access to updates and program information.

3.2.4 Program marketing tools

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency.

The marketing materials distributed to customers and available to program staff are fairly generic. Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist amongst small business customers and commercial organizations that are in leased space.

Retailers were also identified by program staff as a difficult to serve group. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease space so they do not have ownership over the equipment installed (yet have to pay the energy bills).

Additionally, program staff identified an additional complexity of serving the common area. The common area in shopping malls consumes a significant amount of energy but depends on building owners to retrofit the equipment.

Little direct marketing activity is currently aimed at small commercial customers through the Business Solutions Center. At the time of the interviews they were only working reactively with

customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it appears there is little cross-referral between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

Program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

3.3 PARTICIPATING AND NONPARTICIPATING CUSTOMER CHARACTERISTICS

The evaluation reviewed businesses that participated in the Xcel Energy Cooling Efficiency program from its inception in 2006 through July 2009. A total of 285 businesses participated in the program during this time period.

Table 3-1 shows the distribution of the population of participants by SIC category, compared to the population of the nonparticipant population. The largest proportion of participants are in the services and retail trade sectors, accounting for almost two-thirds of all participants. When compared to the nonparticipant population, retail trade establishments are overrepresented in the participant population, while finance, insurance, and real estate establishments are underrepresented in the participant population.

Table 3-1. SIC Breakdown of Participants and Nonparticipants

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Services	34% (N=76)	30% (N=33,648)
Retail Trade	30% (N=67)	15% (N=16,602)
Finance, Insurance, And Real Estate	9% (N=21)	19% (N=20,812)
Public Administration	6% (N=14)	8% (N=8,968)
Manufacturing	5% (N=11)	4% (N=5,052)
Transportation, Communications, Electric, Gas, And Sanitary Services	2% (N=5)	5% (N=5,582)
Construction	1% (N=2)	5% (N=5,645)
Wholesale Trade	1% (N=2)	4% (N=5,003)
Ag, Forestry, and Fishing	0% (N=0)	2% (N=2,278)

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Mining	0% (N=1)	0% (N=349)
Not classified	10% (N=23)	7% (N=7,938)

Source: Xcel Energy Participant and Nonparticipant Population Databases

The program struggles with small business and non-managed account participation. Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. However, in the nonparticipant population, only 3.3 percent of businesses are managed accounts.

The below analysis further characterizes participants and nonparticipants in terms of their hours of operations, building characteristics, energy saving activities, and general satisfaction with Xcel Energy. The analysis distinguishes between eligible and non-eligible nonparticipants. Eligible nonparticipants are classified as businesses that have commercial cooling equipment and the cooling costs included in their electric bill to Xcel Energy. Ineligible nonparticipants either have their cooling costs included in their lease or have swamp/evaporative coolers as their commercial cooling equipment. Businesses that reported not having cooling equipment were not interviewed.

Statistically significant differences between participants and nonparticiants at the 90 percent confidence interval are noted in the text. Caution should be used when reviewing differences between different groups due to the small sample size of the participant group.

3.3.1 Building characteristics

Participating and nonparticipating customers primarily occupy free-standing buildings (70 percent participant, 65 percent eligible nonparticipant). Ineligible nonparticipants were least likely to occupy free-standing buildings (46 percent ineligible nonparticipants).

While the trade ally interviews discussed that renting a building was a barrier to participation, the survey results show that a large proportion of eligible nonparticipants actually own their building. Approximately one-half of participants and eligible nonparticipants reported owning their building. Only 24 percent of ineligible nonparticipants own their building. Participants were more likely than all nonparticipants to manage the property (19 percent versus. 3 percent).

3.3.2 Energy conservation activities

Businesses that participated in the Xcel Energy Cooling Efficiency program were more likely to report having taken an action in the past few years to reduce energy use than nonparticipants. Eighty three percent of participants said they made some change to reduce energy use, compared with 72 percent of eligible nonparticipants and 53 percent ineligible nonparticipants. These differences are statistically significant.

Of the changes discussed, the change that showed the largest difference between participant and nonparticipant responses was installing high efficiency lighting equipment. Fifty two percent of program participants that said they made a change also said they installed high-

efficiency lighting equipment in the past two years, compared with 27 percent of eligible nonparticipants and 11 percent of ineligible nonparticipants. Although not explored specifically in the survey, one explanation for the significant difference is that customers are being cross-referred to one program when they participate in the other.

3.3.3 Satisfaction with Xcel Energy

Overall, program participants and nonparticipants are very satisfied with Xcel Energy, with participants indicating the highest satisfaction. When asked to rate their satisfaction on a 0- to 10-scale, with 10 being very satisfied, 93 percent of participants rated their satisfaction with Xcel Energy as a 6 or higher compared with 89 percent of eligible nonparticipants and 74 percent of ineligible nonparticipants.

Sixty-four percent of participants said they were extremely satisfied with Xcel Energy by rating their satisfaction as 8 or higher, compared with 53 percent of eligible nonparticipants and 35 percent on ineligible nonparticipants.

3.4 PARTICIPATING CUSTOMER SATISFACTION WITH THE PROGRAM

Overall, program participants are very satisfied with the Xcel Energy Cooling Efficiency program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied. Some explanations from customers on why they rated their program satisfaction as nine or above are as follows:

> *"It gives us money to spend on energy efficient projects we wouldn't have had. I use the rebate program all the time." —program participant*
>
> *"We had a couple questions on the application and the representative was very helpful in answering our question and guiding us on how to complete the application" —program participant*
>
> *"We purchased an existing building so we had access to their utility bills. We know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and part of the reason we were able to make the investment was because of the Xcel program." —program participant*
>
> *"It has a pretty easy process and the rebates came quickly." —program participant*

In addition to being asked about their overall satisfaction with the Xcel Energy Cooling Efficiency program, participants were asked their satisfaction level with various aspects of the program (using the same scale with 0 being not at all satisfied and 10 being very satisfied). As shown in Table 3-2, the average rating for all aspects of the program was 7.5 or higher. Participants of the custom program were also satisfied with the program, specifically the post-inspection process which they rated 9.2. The three aspects of the program with the lowest satisfaction rating (less than 8 on the 10 point scale) were the amount of time it took to receive the rebate, the length of time it took from project start to end, and the requirements for equipment eligibility.

Table 3-2. Participant Satisfaction with Specific Aspects of the Program

Specific Aspects of the Program	Mean rating (0-10 scale)
Post-inspection process (n=5, custom only)	9.2
Type of equipment eligible for program (n=43)	8.7
Contractor who installed equipment (n=44)	8.5
Rebate application process (n=43)	8.5
Support you received from Xcel Energy (n=43)	8.1
Pre-approval process (n=5)	8.0
Program's handling of questions/complaints (n=42)	8.0
Amount of time it took to receive rebate (n=43)	7.9
Length of time it took from project start to end (n=4)	7.8
Requirements for equipment eligibility (n=43)	7.5

Source: Xcel Energy Participant Survey, SA6A-K

Consistent with the high satisfaction rating for the type of equipment eligible for the program (8.7), all respondents reported that the cooling equipment installed through the Xcel Energy Cooling Efficiency program is still installed at their business.

Participating customers were asked what features of the program, if any, they would like to see changed. As shown in Figure 3-2, 67 percent of participants said they would not change anything. This is another indication that overall, the program participants were very satisfied with the program.

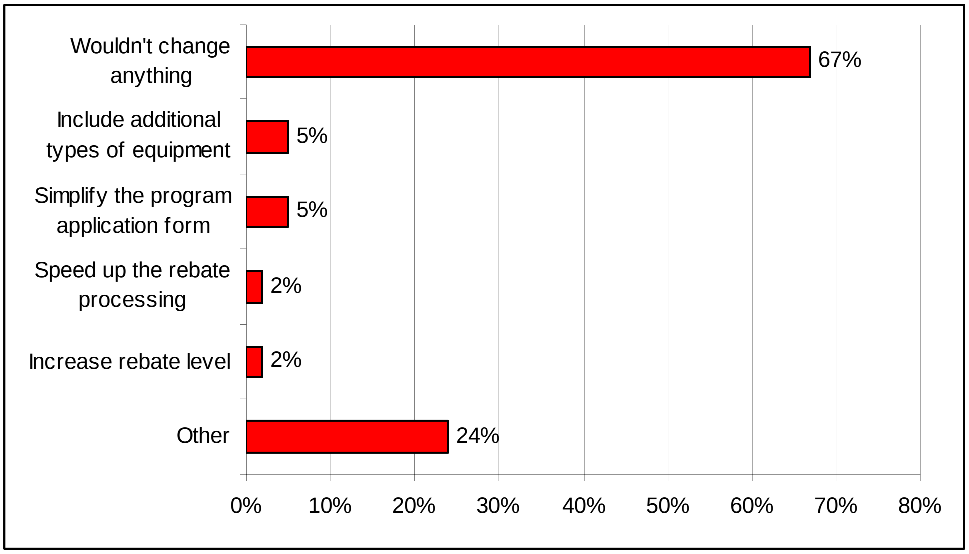
Those that did offer suggestions for improvements mentioned including additional types of equipment (five percent), simplifying the program application form (five percent), speeding up the rebate process (two percent), and increasing the rebate amount (two percent). These were consistent with the components of the program where participant satisfaction was lower. Some of the "other" suggestions mentioned included: communicate how the custom rebates are calculated (this was expressed in both internal staff and trade ally interviews as well as a source of frustration for some), include the option to submit the rebate application online, and provide a savings calculator to customers (this was also expressed in trade ally interviews as an area for improvement).

Below are quotes from a couple of participants on what features they would change with the program.

> *"It would be nice to get closer to instant responses on the rebate process. It seemed like there was a lot of back and forth." —program participant*

> *"Specify what the unit is supposed to do and how to measure the savings." —program participant*

Figure 3-1. Features of the Program Recommend Changing (n=42)



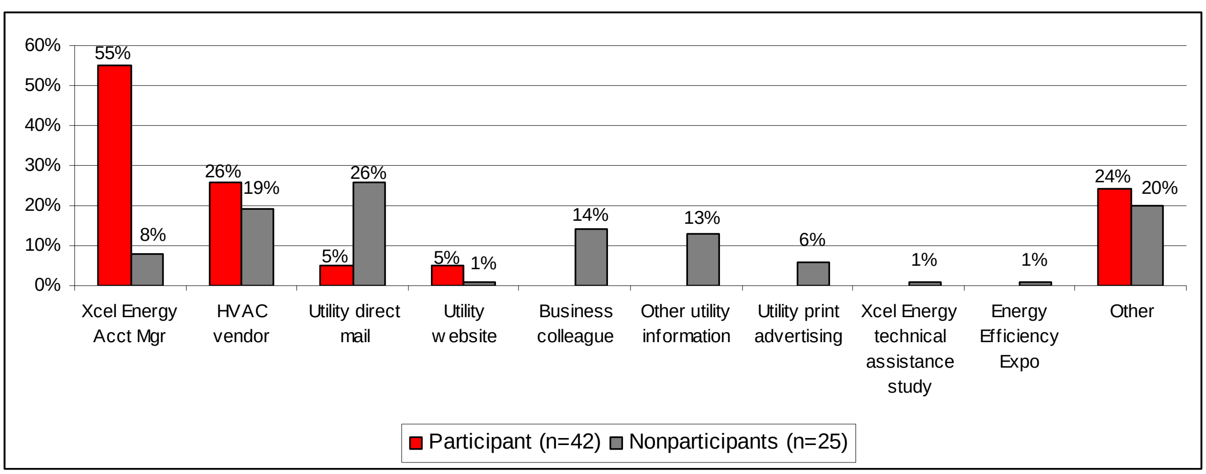
Source: Xcel Energy Participant Survey, SA7

3.5 CUSTOMER AWARENESS AND MARKETING

3.5.1 Participants

Account managers are the most noted outreach channel for program participants, followed by HVAC vendors. Program participants primarily heard about the Xcel Energy Cooling Efficiency program through their Xcel Energy account manager (55 percent). Of the managed accounts, 69 percent of participants mentioned that they heard about the program from their account manager. Hearing about the program through a Heating Ventilation and Air Conditioning (HVAC) vendor was the next most common way to find out about the program. Other ways participants heard about the program included: a contractor that worked on the building, an architect, or an engineer (Figure 3-3).

Figure 3-2. How Customer First Heard about Xcel Energy Cooling Efficiency Program



Source: Xcel Energy Participant and Nonparticipant Surveys, PA1 and A1

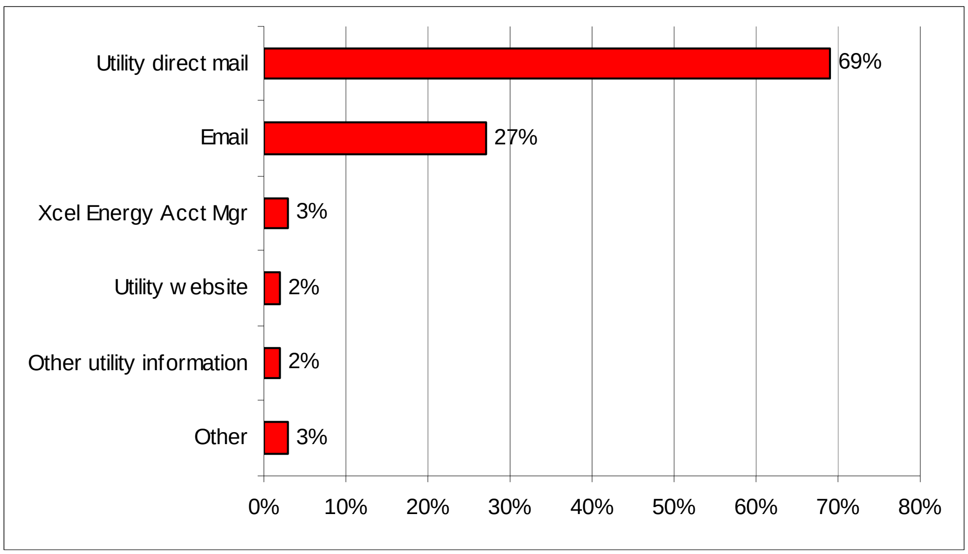
3.5.2 Nonparticipants

Approximately one-fourth of nonparticipants are aware of the program. Customers who have not participated in the Xcel Energy Cooling Efficiency program were asked if they had previously heard of the program. Of the nonparticipants who have cooling equipment and pay the costs for cooling, only 27 percent said they had heard of the program.

Unlike participants, the most common way for eligible nonparticipants to hear about the Xcel Energy Cooling Efficiency program was through Xcel Energy direct mail (26 percent). Another 19 percent heard about the program through their HVAC vendor, 14 percent through a business colleague, and 13 percent from other utility information.

Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, mentioned by 69 percent of nonparticipants. The second preferred way to receive information is through email, mentioned by 27 percent of eligible nonparticipants (Figure 3-4). A similar pattern was found for ineligible nonparticipants; 67 percent prefer to receive information from Xcel Energy by direct mail and 26 percent by email.

Figure 3-3. Prefer to Receive Information about Energy Efficiency Programs (n=88)



Source: Xcel Energy Nonparticipant Survey, A12

If a nonparticipant was interested in contacting a utility representative about an Xcel Energy program or service, 67 percent indicated they already had contact information. The 1-800 phone number was the most common means they would use to contact a utility representative (52 percent). A small percentage (five percent) mentioned the Business Services Center (BSC).

3.6 CUSTOMER DECISION MAKING PROCESSES

3.6.1 Participants

The introduction to the participant survey focused on identifying the key individual involved in the decision to install equipment through the program. In addition, the survey asked if others were involved in the decision. Two-thirds of the Cooling Efficiency program participants indicated there was more than one person involved in the decision of whether or not to

purchase cooling equipment through the program. Other company personnel involved in the decision to purchase equipment through the program included: business owner, maintenance supervisor, current tenant, property management department, Chief Financial Officer, architect, and the business services superintendent.

The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. Program participants were asked to rate the importance of various factors that might have influenced their decision to purchase the cooling equipment. The rating was done on a scale of 0 to 10, with 10 being very important and 0 being not at all important in their decision. The age or condition of the old equipment was the most important factor, which was rated 8.1. As shown in Table 3-3, two other factors for purchasing new cooling equipment was rated an average of 7.0 or higher: standard practice or corporate policy and the payback on investment.

Table 3-3. Importance Factor for Purchasing Cooling Equipment for Participants

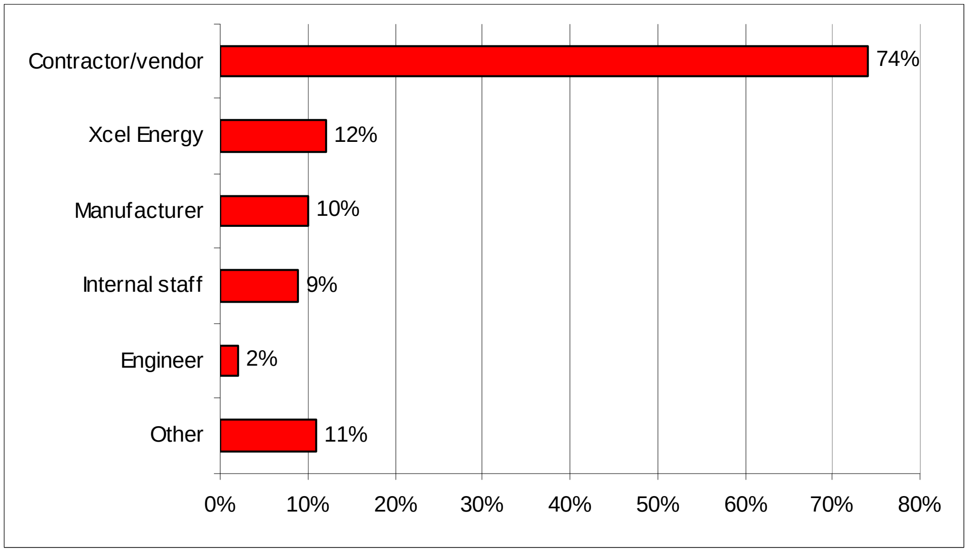
Importance Factor on Purchasing Decision	Mean rating on 0-10 scale
Age or condition of old equipment (N=50)	8.1
Standard practice or corporate policy (N=52)	7.2
Payback on investment (N=52)	7.2
General concerns about the environment (N=54)	6.6
Information provided through a Xcel Energy feasibility study (N=3)	6.3
Availability of program rebate (N=54)	6.0
Recommendation from a vendor/supplier (N=51)	6.0
Previous experience with the Cooling Efficiency program (N=43)	4.7
Endorsement or recommendation by Xcel Energy staff (N=52)	4.5
Information from the program marketing materials (N=52)	3.9
Information from the program training course (N=45)	2.8

Source: Xcel Energy Participant Survey, N3a-l

3.6.2 Nonparticipants

One factor when purchasing new equipment is deciding who to contact first to purchase the equipment. Almost all (74 percent) of eligible nonparticipants said that they would contact a contractor or vendor when purchasing cooling equipment. Contacting Xcel Energy or the equipment manufacturer were the other contacts mentioned by 12 percent and 10 percent respectively (Figure 3-5).

Figure 3-4. Preferred Contact Person when Purchasing New Cooling Equipment (n=84)



Source: Xcel Energy Nonparticipant Survey, I0

Twenty-two percent of eligible nonparticipants report that they have a policy that mandates the installation of energy efficient equipment when purchasing new equipment. When asked specifically what the company policy is for purchasing new equipment, respondents were unable to indicate a specific efficiency level or go into detail as to the company policy. Several businesses mentioned that they are trying to be as 'green' as possible and purchase efficient equipment. A couple respondents also mentioned that the equipment they purchase needs to be ENERGY STAR® rated.

The largest obstacle cited by nonparticipants when purchasing new equipment is the lack of capital, which was mentioned by 61 percent of eligible nonparticipants. This is consistent with information received from the trade ally interviews discussed later in this report. Other barriers that businesses face when considering purchasing new equipment include: the budgeting process (10 percent), lack of resources to implement (seven percent), time constraints (four percent), approval by board members (four percent), and the uncertainty of the return-on-investment (two percent).

3.7 PROGRAM POTENTIAL: NEEDS IDENTIFIED THROUGH NONPARTICIPANT INTERVIEWS

Of the population of existing nonparticipants, approximately three-fourths of this population could participate in the Cooling Efficiency Program (eligible nonparticipants). Ninety-seven percent of nonparticipating businesses contacted pay their electric bill to Xcel Energy[19]. Of those who pay their electric bill to Xcel Energy, 77 pay for cooling at their building.

The evaluation identified the lack of knowledge of the program among nonparticipants as a cause for lost opportunity among the program. When eligible nonparticipants were asked if they had purchased cooling equipment in the past two years, 33 percent reported that they

[19] The small percent that do not pay their electric bill to Xcel Energy are customers who rent/lease and the landlord pays the utility bill or property managers that report that tenants pay the cooling bills.

had. Only a small percentage (six percent) of those who had purchased or considered purchasing cooling equipment considered participating in the Xcel Energy Cooling Efficiency program. The primary reason they did not participate in the program was because they were not familiar with program requirements.

One key factor with a commercial cooling rebate program is for customers to understand the types of equipment customers currently have and the types of equipment they plan to purchase. Eighteen percent of nonparticipants who could participate in the program indicated that they are in the process of budgeting for or planning to purchase new cooling equipment. On average, eligible businesses expect to purchase the new equipment in 17 months.

Of the equipment installed, the greatest potential according to the nonparticipant surveys is roof-top units and condensing units. Roof-top units are the most common type of commercial cooling equipment used by eligible nonparticipants. Sixty-four percent of these nonparticipants have a roof-top unit installed and 30 percent of these nonparticipants plan to purchase a new roof-top unit. Condensing units are the other main type of commercial cooling, with 52 percent of businesses having a condensing unit installed and 29 percent of these planning on purchasing a condensing unit. Table 3-4 lists other common types of installed commercial cooling equipment and equipment that is planned for purchase.

Table 3-4. Type of Equipment Nonparticipants Have Installed and Plan to Purchase

Equipment	Installed Equipment at Business (n=80)	Currently Budgeting to Purchase Equipment (n=17)
Roof-top units	63.7%	30.4%
Condensing units	52.0%	28.7%
Split system air conditioners	23.9%	0.0%
Variable air volume boxes	13.7%	10.4%
Chillers	11.8%	3.4%
Packaged thermal air conditioners	8.2%	20.9%
Oversized cooling towers	7.6%	11.3%
Water source heat pumps	3.8%	17.3%
Other cooling equipment	10.8%	17.3%

Source: Xcel Energy Nonparticipant Survey, E1 and E5

One reason businesses plan to purchase new equipment is due to the age of their old equipment. Table 3-5 below shows the percent of each type of equipment that is 15 years old or older for eligible nonparticipants. This is consistent with some of the information gathered during the trade ally interviews where they said there is a market out there given the age of existing equipment

Table 3-5. Percent of Installed Equipment More than 15 Years Old among Nonparticipants

Equipment	Old Equipment More than 15 Years Old
Water source heat pumps (N=3)	33.3%
Variable air volume boxes (N=15)	28.2%
Oversized cooling towers (N=8)	25.0%
Roof-top units (N=48)	20.9%
Split system air conditioners (N=21)	16.5%
Condensing units (N=41)	10.5%
Chillers (N=15)	3.9%
Packaged thermal air conditioners (N=12)	3.2%
Other cooling equipment (N=9)	16.0%

Source: Xcel Energy Nonparticipant Survey, E3

For future cooling equipment purchases, eligible nonparticipating business customers demonstrated a level of interest in participating in the Xcel Energy Cooling Efficiency program. The average interest level was 7.27 on a 0- to 10-point scale, with 10 being very interested.

3.8 TRADE ALLY PARTICIPATION

We spoke with thirty trade allies as part of this program evaluation, 17 participating and 13 nonparticipating trade allies. This section summarizes the results of these interviews.

3.8.1 Characteristics of trade allies interviewed

Trade allies interviewed typically installed and serviced cooling equipment. PA also spoke with an engineer and several equipment suppliers. These trade allies work with a combination of planned replacement, new construction/major renovation, and replace-on-failure projects.

A significant portion of certain trade allies' work is replacement-on-equipment-failure. Nonparticipating trade allies were more likely than participating trade allies to report a higher percentage of their projects as replace-on-failure and a lower percentage of their projects as new construction/major renovation.

3.8.2 Trade ally awareness of Xcel Energy's cooling efficiency program

Nearly three quarters of nonparticipating trade allies (8 out of 11 that provided a response) said they were aware of Xcel Energy's Cooling Efficiency Program. Both participating and nonparticipating trade allies said they heard about the program through Xcel Energy staff, materials, seminars, their customers, or equipment suppliers.

One other source of program awareness is their participation in other residential programs provided by Xcel Energy. A number of trade allies interviewed also service residential customers and refer customers to Xcel Energy's residential efficiency programs. Through their

experience with these programs, they became familiar with the commercial program. This indicates the continued potential for Xcel Energy to cross-market the program through their other programs.

Trade allies report that it is more difficult to sell high efficiency equipment when there is a failure than when it is a planned project. These decisions need to be made quickly and efficiently. So while trade allies may be aware of the program, they may need a much better understanding of the benefits and offerings so they can more easily promote the program with their bid to the customers.

3.8.3 Benefits of the program for trade allies and customers

Participating trade allies were quick to comment that the program benefits both them and their customers. The ability to offer the incentive and make the purchase more cost-effective were the most commonly noted benefits of the program. However, the benefits go beyond just the incentive value. Trade allies mentioned that the program gives them an edge over their competitors, who are not taking the time to spec out bids with high efficiency options incorporating the rebate. Even if the customer chooses not to install high efficiency, the options give the appearance of the contractor taking the time to think through the alternatives for the customers' consideration.

The program also provides participating trade allies the opportunity to discuss energy efficiency with their customers. These trade allies are proponents of energy efficiency and enjoy the opportunity to promote high efficiency equipment. Because of the program, they are able to generate more conversation around the benefits of energy efficiency than they would have without the program.

According to participating trade allies, customers generally participate in the program because 1) they have a need for the equipment, 2) the program reduces the cost of the equipment, and 3) the equipment is more efficient and will result in longer-term savings. Several respondents also mentioned the desire or (in some cases) requirement for customers' buildings to be LEED certified; Xcel Energy's Cooling Efficiency Program helps them obtain this certification status more cost-effectively.

One trade ally specifically addressed the impact the program has on his sales. He said the Cooling Efficiency program, along with other initiatives such as LEED certification, has certainly impacted his ability to sell high efficiency cooling equipment. In fact, he said that without the program and these other initiatives he does not think he would have sold any energy efficient equipment this year.

3.8.4 Barriers to selling high efficiency equipment

One of the primary objectives of the interviews was to identify barriers for selling high efficiency equipment. Below we list the commonly mentioned barriers, the most notable being initial incremental costs of high efficiency equipment coupled with a weakened economy.

Economic downturn coupled with high incremental cost of high efficiency equipment. Economy was the buzzword throughout the trade ally interviews. One interviewer summed up the issue saying that activity now has little to do with the incentives available and more to do with the general economic environment. This respondent believed that absent a significantly higher incentive value to cover the incremental cost there will be less movement toward high

efficiency in the current economy. Other respondents provided similar philosophies by discussing the difficulty in encouraging their customers to install high efficiency equipment. When asked about the future of the cooling market, contractors often commented that customers would like to see trend toward increasing efficiency, thereby *uplifting the economy.*

Interviewees indicate the cost of high efficiency equipment is the primary barrier to moving forward on high efficiency purchases and installations across all commercial segments. However, for smaller commercial customers, several respondents commented that it is the relative incremental cost for smaller commercial customers. They reported that for smaller units, the incremental cost as a percentage of total cost is greater and the Xcel Energy rebate covers less of the incremental cost for smaller units.

Other respondents said that first cost is the biggest barrier for the larger commercial customers that use larger equipment. They reported that the cost of replacing that equipment is very significant. If they do replace it, the incremental cost is less and the Xcel Energy rebate covers more of the incremental cost of large equipment than for small equipment.

However, numerous respondents commented on the fact that these larger commercial customers are most likely to attempt to repair rather than replace the failing equipment. One respondent illustrated the point using the example of a customer whose repair of their old, inefficient rooftop unit cost about half the cost of installing new equipment. Although the newer more efficient equipment would yield savings within a three year payback and the contractor projected that the customer would need to replace the equipment within the next five years, they chose to go ahead with the repair instead of replacement. The capital investment of the new equipment was just too much for them to front if a repair for lower cost was possible.

Table 3-6 provides further qualitative evidence of trade allies' perception of the difficulty in selling high efficiency cooling equipment to their customers in this market. Participating and nonparticipating contractors were asked to rate their perceived level of difficulty in selling high efficiency cooling equipment to their customers on a one to five scale, where one was very difficult and five was not at all difficult.

As the table shows, the majority of participating trade allies rated the difficulty between a two and three although three respondents said selling high efficiency equipment was easy (rating of 4 or 5). Several trade allies mentioned that it is easier to sell the equipment to larger than smaller customers, quoting the large savings and increased payback as the reason. One respondent who rated it difficult to sell high efficiency said the rating would have been different in prior years when the economy was better; for these years, the sales of higher efficiency equipment was easier.

This analysis should be viewed with caution as it is based on very limited number of cases and cannot be extrapolated to the participating and nonparticipating trade ally population. However, the story it presents is compelling and shows the importance of reaching nonparticipating trade allies to help them promote high efficiency cooling equipment.

Table 3-6. Difficulty in Selling High Efficiency Cooling Equipment to Customers (1=very difficult, 5=not at all difficult)

Ratings												Average
Participating trade allies (n=11)	2	2	2	2.5	2.5	3	3	3	4	5	5	3.1
Nonparticipating trade allies (n=9)	1	1	1	1	2	2.5	3	3	3			1.9

There is some qualitative evidence that the program is helping to overcome the barrier of selling high efficiency cooling equipment. Nonparticipating trade allies were more likely to say selling high efficiency cooling equipment to customers is very difficult. Whereas no participating contractors rated the difficulty of selling high efficiency equipment a one, four nonparticipating contractors provided a rating of one. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary driver for their low ratings. Incidentally, these nonparticipating trade allies were also more likely to say they serve small business customers (under 500 kW), which may also be a driver of the increased perception of difficulty in selling high efficiency cooling equipment to their customers.

Relative low cost of energy. Several trade allies half jokingly commented that commercial customers would be more apt to participate and see greater value from the program if their energy rates were higher. One trade ally expanded on this discussion by saying that he has seen a distinct trend in the purchasing of high efficiency equipment with a higher cost of electricity. His perception was that since the economic shift, energy prices decreased which thereby decreased the demand for high efficiency equipment along with the reduced cash flow resulting from the poorer economy.

Customers' lack of knowledge and/or understanding of the benefits of energy efficiency. Another common theme heard throughout the interviews was the need for contractors to educate their customers on the benefits of high efficient equipment. Commercial customers may understand conceptually that there could be benefits to installing high rather than standard efficiency equipment; however, when faced with the incremental costs to install that equipment, customers may select the standard efficiency equipment to avoid the extra up-front expenditures. Contractors frequently commented on the need to educate these customers and help them understand the return-on-investment for them and how the installation of high efficiency equipment would positively impact the organization's cash flow. "*They don't understand life cycle costs, lease structures, and access to capital*."

Need for tools to help trade allies sell high efficiency cooling equipment to customers. Participating trade allies were asked what tools were available from Xcel Energy that helps them sell high efficiency cooling equipment. Of the thirteen individuals that answered this question, five said either they don't know what tools are available to them or they do not believe there are any tools available to them through the program to help them sell high efficiency cooling equipment.

As a follow-up to this question, trade allies were asked what tools they would like Xcel Energy to provide to help them sell high efficiency cooling equipment. Several respondents felt they had enough information in the rebate forms and brochures distributed to them by Xcel Energy.

However, several respondents did have recommendations for information or tools to help them promote equipment through the program. The most frequently cited request was for a tool to help trade allies calculate energy savings, payback, return-on-investment, and/or rebate values. While some respondents felt capable of doing these calculations on their own, others did not feel they had sufficient knowledge to do this. As one trade ally stated, "*We lack the software to be able to tell them what their payback is…we don't know the math*." Another respondent referred us to a tool through the Commercial Real Estate Energy Efficiency Program (CREE) website. This tool calculates return-on-investment of energy efficiency improvements. At a minimum, the program could promote this tool to trade allies.

Another respondent commented that he was able to calculate the energy savings and related rebates, but the rebate ended up being less than initially specified. He noted, "*If there was some way to automate that, to better calculate the rebate, that would be good."*

In terms of the materials provided by Xcel Energy, those who received the materials for the most part felt they were sufficient. Several respondents noted that they use the website often to obtain materials, although they would appreciate more hard copy materials for distribution to their customers. Another respondent said they would appreciate some verbiage from Xcel Energy on the benefits of the program and installing high efficiency equipment to include in their marketing materials.

Last, several trade allies said that it is difficult to see what is new in Xcel Energy's program through the website. They suggested that to make this process easier, perhaps Xcel Energy could have a website targeting only trade allies that clearly identifies program updates. This suggestion was also made in the internal interviews with Xcel Energy staff.

Need for more personal interaction with Xcel Energy staff. Building on the above point, five of the participating contractors said they did not recall receiving or were not provided with tools or information from Xcel Energy staff to help them sell high efficiency equipment. And one trade ally specifically mentioned the need for more personal interaction with staff to help arm him with the knowledge to better promote high efficiency cooling equipment.

Trade allies who do regularly interact with program staff were complimentary of their experience with these staff. They describe their interactions with Xcel Energy representatives as helpful, say they were excellent in interacting with the contractors and providing timely information. In general, they just want more of this interaction.

There is only one Xcel Energy staff member assigned to reaching out to contractors throughout the state of Colorado. He plans events for contractors, such as the workshops, seminars, and breakfast events to educate contractors about the program. Internal interviews identified that only having one trade ally representative may result in not personally reaching as many trade allies as desired, particularly in less populated areas.

3.8.5 Overcoming the barriers and increasing participation

Trade allies were encouraged to share their ideas regarding ways to overcome programmatic barriers and increase participation. These recommendations are detailed below.

a. INCREASE REBATE LEVELS

Not surprisingly, the most commonly noted recommendation was for the program to increase its rebate levels. It is not that trade allies felt the incentive levels were entirely too low, but that an increased incentive level would be beneficial in battling the incremental cost and reducing the payback period that plagues the ability for customers to install program-qualifying equipment. As found in the benchmarking review of rebate levels in other programs, Xcel Energy's rebates are some of the lowest for air conditioning systems.

b. EDUCATE TRADE ALLIES

Another recommendation made by several respondents was to better educate trade allies and make them more aware of the program benefits. These respondents discussed the need for Xcel Energy to make the process as easy and seamless as possible for trade allies—including marketing to customers using return-on-investment analysis. "*If it's not easy, we won't do it.*" One trade ally expanded on the need for more education noting the influx of new trade allies in the industry. He said that each time an HVAC contractor goes out of business, three more open up. This turnover increases the need for continual education and marketing from Xcel Energy among the trade ally groups. This recommendation is consistent with best practices found as part of the benchmark review of other programs.

c. IMPROVE THE CUSTOM PROCESS

Participating trade allies provided suggestions to make the custom program less burdensome for trade allies and customers. For the most part, participating trade allies thought the application and rebate processing requirements for the prescriptive component of the program were appropriate and not overly cumbersome. The distinction several respondents made, though, was between the prescriptive and custom program. These respondents said the administrative burden for completing the custom applications is high. One respondent compared the process to the prescriptive program which he described as not at all difficult to complete.

Another respondent described the custom program and its processes as a "*nightmare*." The time to complete the application and get Xcel Energy involved is significant and in some instances results in him losing the job. The trade ally expanded on this statement by saying that the rules for qualifying equipment do not seem to be transparent, which frustrates the trade ally and his customers.

One trade ally noted an additional complication in the custom process; his perceived inability to easily and quickly provide a rebate value to the customer. This trade ally said that he could calculate an incentive value based on manufacturer specifications and an understanding of the original equipment; however, he cannot provide the incentive level with enough certainty to make the customer comfortable with investing in the purchase.

This perception about the custom program and its application and project process is consistent with what we heard in the internal interviews. Account and trade representatives mentioned that the custom application process was significantly more cumbersome and involved than the prescriptive program process.

The reputation of the custom program reached trade allies that have not yet worked with a customer through that component of the program. One participating trade ally interviewed

commented on additional equipment he would like to see included in the program (evaporative coolers) and wondered if this measure could be promoted through the custom program. However, while this respondent recognized the usefulness of the custom program, he commented on the feasibility of going through the custom program, saying that there have been grumblings from others in the industry that the process is "*difficult and rigorous*."

d. MARKET DIRECTLY TO CUSTOMERS

Trade allies for the most part thought the program could more directly market to customers. Several respondents said the direct marketing should provide general information about the program and include analysis tools or information to illustrate the energy and/or financial savings from installing high efficiency equipment. This is not to say that customers are not receiving sufficient information about the program; the customer survey results will explore this issue more.

Trade ally responses varied considerably in their assessment of customers' awareness of the program. On average, participating trade allies said that almost one-half of their customers know about the program (sample size is only 10, so this information should be viewed as qualitative). One participating trade ally said that none of his customers were aware of the program and two trade allies said that all his customers were aware of the program. (Table 3-7). Nonparticipating trade allies were more likely to say that fewer of their customers were aware of the program.

Again, this information should be interpreted with caution given the sample sizes. The analysis represents the interviewed trade allies, not the trade ally population at large.

Table 3-7. Trade Ally Perception of Customers' Awareness of the Program

Percent											Average
Participating trade ally responses (n=10)	0%	10%	10%	10%	25%	30%	75%	95%	100%	100%	46%
Nonparticipating trade ally responses (n=5)	0%	13%	15%	50%	55%						27%

3.8.6 The future of the cooling market in Colorado

The majority of participating trade allies said they expect their involvement in the program to increase over the next twelve months. They project that customer demand will increase as they become more energy conscious and are more aware of energy efficiency based on federal initiatives and more stringent codes and standards. However, a number of these contractors caveat this optimism by saying it depends on the economy.

Additionally, several respondents commented on the aging cooling equipment in Denver as an indicator for increased opportunity for the program, particularly among larger commercial customers. As discussed earlier, because of the high capital investment in replacing cooling equipment, larger commercial customers are opting to repair versus replace the older equipment. This inefficient equipment will continue to fail and in time need to be replaced which will create further opportunity for the program.

While participating trade allies are optimistic that their participation in the program will increase in the next 12 months, their projection of the direction of the commercial cooling market in the next two years is mixed. The same is true for nonparticipating trade allies. Respondents from both groups of interviews said that unless there are government initiatives put in place, or stricter requirements, the high efficiency cooling market will stay the same or decrease. A number of these respondents again cited the incremental cost and perception that the benefits don't outweigh these costs; particularly given how constrained these companies are in their capital funding. "*I've got my fingers and toes crossed that we're going to come out of this recession and people will start purchasing high efficiency equipment*."

3.9 BENCHMARKING RESULTS

PA researched programs online for to characterize other cooling efficiency programs in terms of rebates or incentives available, eligible measures, eligible customers, required paperwork, and marketing. PA then conducted in-depth interviews with eight program staff and one evaluator for the following programs to obtain further insight into program operations. The utilities and programs reviewed are detailed below.

Table 3-8. Utilities and Programs Included in Benchmarking Study

Utility	Program
Ameren IL	Standard Business Incentives Program
Arizona Public Service	Solutions for Business: Prescriptive Incentives and Technical Assistance and Studies
Energy Trust of Oregon (Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas)	Existing Building Efficiency Program
Idaho Power	Building Efficiency for Commercial Construction and Easy Upgrades for Simple Retrofits
Pacific Gas & Electric (also includes SCE and SDG&E)	Non Residential Retrofit (previously Standard Performance Contract)
Platte River Power Authority (and four member utilities: Fort Collins Utilities, Longmont Power & Communications, Estes Park Light & Power, Loveland Water & Power)	Electric Efficiency Program (includes Cooling Rebate Program)
Puget Sound Energy	Commercial HVAC Rebate and Premium Service programs
Salt River Project	PowerWise Standard Business Solutions and PowerWise Custom Business Solutions

Programs varied from very new (only 1 year old) to fairly mature (up to 10 years old).

3.9.1 Program goals and challenge in meeting goals

Xcel Energy's goal for the Cooling Efficiency program is 6.9 mil kWh for 2009. However, information was not available from other programs on savings goals for cooling equipment only. For other business programs overall, savings goals ranged anywhere from 32.5 mil kWh to 160 mil kWh. Xcel Energy's total 2009 business goal is 103 mil kWh.

Most programs in the benchmarking study have been successful in meeting program goals despite the recent economic challenges. Many programs met or exceeded goals last year and are on track to come close to meeting targets this year. Several programs have higher goals set for this year than last year.

All programs are faced with the same primary challenge this year—the downturn in the economy. However, most have found a way to keep projects enrolling and continue to achieve energy savings. Mature programs are faring better which was reported to be a result of strong relationships with vendors and implementation contractors. It was also reported that it is important to be flexible and get involved with the customer early to influence their choice of equipment (as also discussed in the internal and trade ally interviews).

Several program managers reported bonus and timing adjustments their programs made in reaction to the downturn in the economy. One program offered a 10% bonus to customers and $500 gift cards to trade allies for projects with minimum size restrictions that were done before the end of May, 2009. Another program became more flexible with deadlines that were typically 18 months but would be extended if there were delays in the project timeline.

3.9.2 Key elements of program design

All programs offer prescriptive and custom options to business customers except for PG&E, which is custom only. Measures covered by prescriptive programs are similar across programs including air conditioning units, split and packaged units, air and water source heat pumps. Variations in measures offered include chillers, economizers, and controls. One program manager recommends more focus on controls and optimizers for retrofit to realize additional savings. Xcel Energy categorizes control-related projects within an Efficiency Controls program, rather than within the cooling program.

Most of the programs use outside firms to implement the program. One program manager appreciates that they have an implementation contractor who continuously works to improve their program.

Two programs manage the entire program internally as Xcel Energy does. This internal management includes the development of the infrastructure, outreach to trade allies, customer communication and setting and processing the rebates for eligible equipment. Internal staffing for the programs ranges from one person half-time to 6 business development staff handling specific customer segments.

3.9.3 Marketing and recruitment of customers

Depending on the program, either the implementation contractor or program staff market and provide outreach to customers. Marketing methods consist of general advertising in newspapers, through radio ads and mailings.

Marketing is not typically targeted to particular groups but to business customers in general. However, more targeted marketing through associations and business group meetings is favored by many program managers. These face-to-face meetings allow for a more tailored message (e.g. highlighting energy savings possible) and the opportunity to answer questions and build relationships. Associations targeted include ASHRAE, BOMA, Kiwanis, multiple trade organizations, and school groups.

Only one program, which is one of the more mature programs, uses targeted marketing. They have moved away from traditional marketing pieces, except for an overview, and are instead working with specific customer segments. They now concentrate on relationship building with customers, trade organizations, and equipment dealers.

Interviewees believe the most effective form of program communication is handled by key account representatives and trade allies. Trade allies know their markets well and are often in the best position to sell the higher efficiency to their customers. A couple of programs are also taking advantage of high bill inquiries and billing analysis to seek out possible participants.

One respondent shared that in their experience, a useful lesson is to become thoroughly educated on the different associations when using trade associations to target customers. The respondent felt this would identify and involve all associations representing that particular market segment. Without buy-in from particular association leaders, a utility could be kept out of a market. However, the program should be prepared for a potentially quick increase in projects. In order to handle abrupt increases or decreases in enrollment, have control mechanisms in place to scale down or ramp up depending on activity level.

3.9.4 Quantification of net program impacts

As PA has experienced with several other programs and the industry as a whole, there is much discussion around how to accurately calculate free-ridership and spillover to inform net-to-gross (NTG) factors for commercial cooling. In speaking with program managers, that uncertainty exists among all programs.

Table 3-9 summarizes net to gross information provided by the program managers or through the literature review. A few of the newer programs have not yet had the opportunity to evaluate their programs and estimate net-to-gross ratios and will likely review free-ridership and spillover measurement in later program years, according to program managers. In the meantime, they rely on either an average industry attribution rate of 0.80 to 0.85 or anecdotal information to provide qualitative context around program impacts (e.g. retrofits may be almost all free-riders but the nature of premium services would result in a very low free-ridership rate). And although some of the others have conducted evaluations, they have not measured free-ridership or spillover.

For those programs that have measured NTG and were able to provide us with the values, we see a range from 50 percent (when NTG only includes free-ridership, not spillover) to 80 percent NTG (when includes spillover). The NTG status for all programs reviewed is detailed in Table 3-9. In addition to speaking with program managers we also reviewed NTG estimates from the DEER database and measured NTG values from WI Focus on Energy Business Programs which are also included in the table below.

Table 3-9. NTG Summary Information

Sponsor	Program	NTG measurement status
WI Focus on Energy	Business Programs	Overall 2008 commercial NTG ratios were 69% kWh, 69% kW, and 33% therms.
Ameren (IL)	Standard Business Incentives	Measure free-ridership and spillover, but no NTG number available.
Arizona Public Service	Solutions for Business: Prescriptive Incentives	NTG calculated at the measure level using both free-ridership and spillover from self reports. Numbers not available at the time of the call.
Energy Trust of Oregon	Existing Building Efficiency Program	Influence rates of 80% for electric and 70% for gas for their HVAC program.
Idaho Power	Easy Upgrades for Simple Retrofits	Not currently measuring FR, SO or NTG.
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)	Measuring NTG but not final for 2006-2008 cycle. DEER database shows NTG from 2004-2005 was 50% for prescriptive HVAC and 54% for custom projects. DEER also indicates 50% NTG assumptions for prescriptive HVAC and 64% for custom for purposes of 2009-2001 planning.20
Platte River Power Authority	Cooling Rebate Program	.85 assumed.
Puget Sound Energy	Commercial HVAC Rebate	Not measuring NTG.
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	Measured NTG = .75 for Standard Business Solutions (not including adjustments for spillover).

3.9.5 Rebate levels and requirements

Rebate levels are similar across programs, although Xcel Energy's are some of the lowest for air conditioning systems (Table 3-10). Xcel Energy is also providing rebates for a lower SEER rating than the other programs reviewed. Most programs have done little to adjust their rebates over time, and any adjustments have been minor.

Minimum equipment efficiency to qualify for a rebate is typically decided based on CEE standards. Supplementing that decision is information from ASHRAE 90.1, ENERGY STAR®, and other market analysis. Rebates or incentives are typically offered for the efficiency above standard. Programs also have caps on the portion of the cost that will be paid, for example 50 percent or $10,000 maximum.

[20] Source: Updated DEER NTGR Values – 053008.xls

The requirements for receiving a rebate or incentive are similar among programs. Most programs have a pre-approval process or pre-application showing the efficiency the customer intends to install. Some programs skip this pre-application for projects below a certain rebate threshold ($1,000–$5,000). For one program, the pre-approval allows for a customer's incentive funds to be reserved for 90 days.

Once approved, the customer can have the work done. A few programs require inspections, although this is more common for custom projects or projects requesting a rebate over a certain threshold. Upon completion, customers are required to submit a final request for the rebate or incentive, accompanied by an invoice for the equipment purchased, and a cut sheet or other form showing the specifications for the energy efficient equipment. A few programs have 60-day or 90-day limits from time of project completion for submitting final rebate requests.

Table 3-10. Rebate Summary Information

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
CEE	Tier 1 standards	14 SEER (12.0 EER pkg, 11.6 EER split)	(11.5 EER, 11.5, 10.5, 9.7)	14.0 EER		14.0 EER			
CEE	Tier 2 standards	15 SEER (12.5 EER pkg, 12.0 EER split)	(12.0 EER, 12.0, 10.8, 10.2)	No specification s		No specification s			
Xcel Energy	Efficiency Cooling	13.5 SEER: $50/ton packaged, and $3/ton each adtl 0.1 SEER 14.0 SEER: $25/ton split, and $4/ton each adtl 0.1 SEER	$50/ton (EER of 11.0, 10.8, 9.8, 9.4)	Condensing 11.0 EER: $25/ton + incremental rebate: $3.00/ 0.1 EER		14.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	PTACs 11.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	$6-$12/ton See program for details	Boiler Tune-up: 25% of costs See program for details
Ameren (IL)	Standard Business Incentives	14 SEER: $15/ton 15 SEER: $30/ton	$15/ton (11.5 EER, 10.5, 9.7) $30/ton (12 EER, 10.8, 10.2)		$15/ton (14 SEER, 11.5 EER, 10.5, 9.7) $30/ton (15 SEER, 12 EER, 10.8, 10.2)		13.08–(0.02556*Btuh Capacity/ 1000) EER $15/ton	$20/ton (Air-cooled only)	Room Air Conditioners: $25-$35/ton Variable Frequency Drive on HVAC Motors: $45/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Arizona Public Service	Solutions for Business: Prescriptive Incentives	(1 Phase) 14 SEER & 11.5 SEER: $50-80/ton (3 Phase) 11.1 EER: $50-100/ton	11.4 EER $50-100/ton 11.2 EER $25-75/ton 10.4 EER $25-75/ton		(1-phase) 14 SEER & 11.5=$50-80/ton (3-phase) 11.1 EER= $50-100/ton 11.4 EER $50-100/ton 11.2 EER and 10.4 EER $25-75/ton		Both PTAC and PTHP 12.5-(0.213*cap/1000) EER $45-60/ton	Air cooled 1.15 kW per ton—IPLV = $7/ton Water cooled 0.57-0.68 kW per ton—IPLV = $7/ton	Economizer $15.ton
Energy Trust of Oregon	Existing Building Efficiency Program	$120-300 See program details	$120-300, See program details		$150-2,250/ton, See program for details	$200-4,000/ton, See program for details	$100/unit PTHP		Ground source heat pump $300-$3,000
Idaho Power	Easy Upgrades for Simple Retrofits	(1-phase) 14 SEER: $25/ton 15 SEER: $50/ton 16 SEER: $75/ton (3-phase) 13 SEER: $50/ton 14 SEER: $75/ton 15 SEER: $100/ton	$50/ton (EER of 11.0, 10.8, 10.0)				12 EER at $50/ton		Economizer $250/unit economizer controls $75/ton VSD for fan pump $60/hp program thermostat $60

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)								
Platte River Power Authority	Cooling Rebate Program	14 SEER/ 12 EER = $65/ton, $4 per ton for each 0.1 EER over 12.0	$50/ton (EER of 11.0, 10.8, 10.0), $4 per ton for each 0.1 EER over base				Both PTAC and PTHP 11.0 EER- $50/ton, $4 per ton for each 0.1 EER over 11.0		
Puget Sound Energy	Commercial HVAC Rebate		>= CEE Tier 1 = $30/ton						ECM on HVAC fan box- $.12/sq ft Boiler tune-up-up to $600 Program thermostat—up to $50 VSD on pumps and fans—$100/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	$75/ton (EER of 11.5, 10.5, 9.7) $100/ton (EER of 12.0, 10.8, 10.2)	14 EER: $75/ton	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	14.0 EER/4.6 COP: $75/ton	$50/ton See program for details	(Tons * $10/ton) + (Tons *$350 * (Minimum IPLV – Chiller IPLV))	VSDs for HVAC fan & pump: $55/ton

3.9.6 Trade ally relationships

Several programs rely heavily on trade allies to market the program to customers as well as provide quality service and have found them to be valuable outreach partners. It is important to have a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs. Most programs do not offer trade ally incentives at this point.

Interviewees report that training and communication are instrumental in the trade ally relationship. Many programs incorporating trade allies hold workshops or frequent meetings with vendors as updates, as well as to find out what type of equipment is selling. One program holds about 10 one-day technical sessions throughout the year for trade allies in their territory. They hire expert trainers to come in for those sessions to cover topics such as DOE motors, HVAC, chillers, RCx, and lighting.

A few programs are struggling with building up their trade ally networks. A program manager from one of the more mature programs tells us that building a reliable trade ally network takes time—often as much as two years.

3.9.7 Why customers enroll

The initial view is that customers will participate in a program if it provides monetary incentives. However, some programs have found that the incentive or rebate alone will not result in a successful program. A key element for these programs is customer education and assistance. One program found through their survey that the assistance they provide and the rebate are equally motivating for their customers. These programs educate customers on the energy savings resulting from the high efficiency equipment (sustaining impacts) using the rebate to reduce the first-cost of purchasing and installing the equipment.

This education may come in several forms. One program manager attends association meetings where she can present energy savings opportunities. Another program has a general tool available to all customers on their website to calculate energy savings for 30 of the most common energy efficiency measure for typical buildings. A third program provides an online self-audit tool so customers can gain a better understanding of their own facility, which improves the conversation once they are ready to work with a program representative. Coaching is particularly important for the first time participants.

We asked program managers which key customer segments have been more likely to participate this year. A few of the newer programs are not yet tracking participation by customer segment as there is not much need at this point. Others have seen greater participation recently from offices and schools. Medical facilities have also been active in some programs. One program has seen property owners taking advantage of retail space switching over to office to implement upgrades.

4. IMPACT EVALUATION FINDINGS

The activities conducted to support the impact evaluation included verifying baseline and technical assumptions, determining savings considering 2009 International Energy Conservation Code (IECC) standards, and estimating a net-to-gross ratio. This chapter summarizes the key impact evaluation findings followed by more detailed analysis resulting from each activity.

4.1 KEY FINDINGS

4.1.1 Engineering and IECC standards review

The engineering review identified the following key findings.

- The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used for other programs. Other than VAV boxes, the algorithms used in the deemed savings calculator (the Calculator) are also consistent with algorithms represented in other programs' TRMs.
- More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. In view of the uncertainty of energy savings found in the engineering review and high free-ridership results, Xcel Energy may want to consider removing VAV boxes as a program measure in the 2010 Colorado Cooling Efficiency Program.
- The Cooling Tower offering was removed from the program in January 2009. The impact evaluation supports this removal (as it does for VAV boxes) due to uncertainty of savings found in the engineering review as well as high free-ridership results.
- The value for peak load coincident factor (CF) of 0.9 used in the Calculator is appropriate to account for gross generator kW saving. The equivalent full load hours (EFLH) provided in the Calculator are also appropriate.
- IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for the program year 2009-2010. Changes from IECC 2006 to IECC 2009 baseline efficiency values will affect savings for rooftop units and chillers. The IECC 2006 and IECC 2009 use different coefficients for the adjustment factor algorithm to account for non-standard water-cooled chillers.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs which do not take into account variations in PTAC sizes.

4.1.2 Net-to-gross ratio

The net-to-gross analysis resulted in the following findings:

- The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 0.51. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 0.21. The resulting self-report net-to-gross ratio is 0.7 for the Colorado Cooling Efficiency Program in 2007–2009.

- Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program.
- Removing cooling towers and VAV boxes, which we recommend be removed from the program, the self reported net-to-gross ratio is 0.75. As this value is within the recommended net-to-gross range from a preponderance of evidence approach, we recommend that this net-to-gross ratio be applied for the 2010 program year.

4.2 VERIFY BASELINE AND TECHNICAL ASSUMPTIONS

Cooling is an energy intensive process and can consume as much as one third of building energy use. Therefore, the need for verification of assumptions and parameters used for determining net energy savings achieved from an efficient cooling measure over a standard (complying with a stipulated minimum code or a baseline) is paramount.

To support the impact evaluation of the Cooling Efficiency Program, we reviewed algorithms used for estimating the deemed energy savings for end-use C&I cooling measures. This was supported through a review of several recent “technical reference manuals” (TRMs). We also reviewed the values of parameters used in the algorithms to assess the industry practices and ascertain their similarity (or dissimilarity) with those currently used by the Xcel Energy’s Colorado C&I “Deemed Savings Technical Assumptions” tool/calculator (“the Calculator”).

We also reviewed TRMs adopted in different jurisdictions in the country to assess consistency in the use of technical assumptions and the underlying algorithms for calculating the energy savings achievable from efficient cooling measures. Each of these TRM sources are summarized in Appendix A. Specific TRMs reviewed include:

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report, 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey’s Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009.

Below we define variables used deemed savings review. Note that different TRMs use varying notations for variables, for example EER_b or EER_{base} for “baseline energy efficiency ratio” of a measure. We designate one notation for a variable, as shown in Table 4-1, regardless of the (different) symbols used for the same variable in different TRMs. This is done to avoid repetition of variable definitions. Also note that terms EFLH and FLH are, at times, used interchangeably among different TRMs. For example the “Efficiency Maine TRM uses the term FLH while other TRMs reference in this study used the EFLH.

Table 4-1. Definition of Variables Included in Deemed Savings Analysis

Variable	Definition
Capacity	Size of a cooling measure (1 Ton = 12,000 BTU/hr)
EER	Energy Efficiency Ratio (3.413* Coefficient of Performance (COP); kW/Ton = 12/EER
SEER	Seasonal Energy Efficiency Ratio (EER/0.85)
EER_b	Energy efficiency ratio of a baseline cooling measure
EER_e	Energy efficiency ratio of an efficient unit
$SEER_b$	Seasonal Energy efficiency ratio of a baseline equipment
$SEER_e$	Seasonal Energy efficiency ratio of an efficient unit
CF	Coincidence Factor: The percentage of the total cooling load during peak hours.
EFLH	Equivalent Full Load Hours: Measure of energy use by season during the on-peak and off peak periods. EFLH is the ratio of measured kWh use during the period divided by design capacity (kW) of equipment.
FLH	Full load hours in a year
PE_b	Peak efficiency of the baseline chiller (kW/ton)
PE_e	Peak efficiency of the energy efficient chiller (kW/ton)
$IPLV_b$	Integrated part load value of the baseline cooling equipment
$IPLV_e$	Integrated part load value of the efficient cooling equipment
CDD	Cooling Degree Days

Xcel Energy's deemed savings calculator for the C&I end-use cooling measures use the following algorithms for air conditioning systems, chillers and VAV boxes.

Rooftop Units, Water Source Heat Pumps, Split Systems, Condensing Units

Energy Savings (Customer kWh) = Capacity x (12/SEERb - 12/SEERe) x EFLH

Demand Savings (Customer kW) = Size x (12/EER_Standard - 12/EER_Eff)

Chillers

Energy Savings (Customer kWh) = Capacity x (IPLVb - IPLVe) x EFLH

Demand Savings (Customer kW) = Capacity x (FLVb - FLVe)

Centrifugal Chillers

FLVb = FLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

IPLVb = IPLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

Temperature Variable, T_var = Chiller Lift + CWTD

Variable Air Volume (VAV) Boxes

Energy Savings (Customer kWh) = #_of_fans x Savings x EFLH x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Demand Savings (Customer kW) = #_of_fans x Savings x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Electrical Energy Savings (Gross Generator kWh) = Customer kWh / (1-TDLF)

Electrical Demand Savings (Gross Generator kW) = Customer kW x CF / (1-TDLF)

Electrical Energy Savings (Net Generator kWh) = Gross Generator kWh x NTG

Electrical Demand Savings (Net Generator kW) = Gross Generator kW x NTG

The following conclusions were drawn from a review of technical reference manuals for algorithms to estimate the energy and demand savings of C&I end-use cooling measures and their related variables.

- The review of different TRMs for energy and demand savings algorithms for C&I end-use cooling measures shows a general consistency in use of the algorithms in different jurisdictions.
- Xcel Energy's Colorado C&I end-use measure deemed savings calculator ("Calculator") uses algorithms that are consistent with other TRMs for most cooling measures.
- The Calculator correctly captures the adjustment factor algorithm for non-standard centrifugal chillers [i.e. chillers not designed to AHRI Standard 550/590 test conditions (44^{o}F leaving chilled water temperature and 85^{o}F entering condenser water temperature with 3 gpm/ton condenser flow rate)]. Also, the Calculator applies the adjusted IPLV values when specifications for non-standard centrifugal chillers are inputted. The instructions on the Calculator show that these adjustments are for standard chillers. The Calculator should add instruction to capture the fact that the adjustment factor is applicable to non-standard centrifugal chillers.
- Accuracy of the algorithms used for estimating energy and demand savings for VAV boxes could not be confirmed by its originator referenced in the Calculator[21]. In addition, none of the TRMs reviewed provides savings algorithms for VAV boxes. In view of this methodological deficiency, we suggest the algorithm currently used by the Calculator as the default algorithm. *However, from the net to gross analysis, we find that free-ridership for VAV boxes is high, indicating reduced efficacy of program support for the measure.* Also, support for VAV boxes has been withdrawn from another Xcel Energy jurisdiction (Minnesota). In view of these, we suggest Xcel Energy consider excluding VAV boxes from the Colorado Cooling Efficiency Program.

[21]Telephone discussion with Mr. Eugene A. Scales, 12th October, 2009.

- The Calculator uses algorithms to determine the peak demand saving for both end-use (equipment) and gross generator level. It uses peak load coincident factor (CF) for generator gross kW saving and applies a value of 0.9. C&I cooling measures are likely to operate when the peak load hours are in effect for the Xcel Energy CO service territory. Therefore, use of a high peak load coincident factor would well capture the peak load savings from the utility perspective. Also, we recommend the need for more research for establishing different CFs for commercial and industrial segments as their end-use load shapes vary.

- Treatment of equivalent full load hours (EFLH) in different TRMs is opaque. Our extensive review of the TRMs shows lack of a clear methodology for estimating the EFLH. Based on our discussion with the representative of Xcel Energy CO Cooling Efficiency Program, we understand that the University of Arkansas had developed a methodology that establishes a linkage between EFLH and climatic variations (or cooling degree days [CDD]). We reviewed the work[22] and find (a) the algorithms are applicable to ground source heat exchangers and (b) no direct linkage with CDD. Also, an algorithm for EFLH for two locations in Arkansas are provided in the Arkansas Deemed Savings TRM that makes a direct relationship of EFLH with CDD through the following relation:

$$\text{EFLH} = \text{A x (CDD)}^{b+1}$$

Where A and b are coefficients and their values are provided in the TRM for different building types.

The EFLH values developed for the Calculator are based on more advanced methodology that analyzed weather bins (based on dry bulb temperatures). Also, we understand from discussions with the Xcel Energy representatives that the market segment data for end-use cooling measures were used (along with occupancy and operational characteristics of the facilities).

Since there is a general methodological void in the estimation of EFLH in TRMs, and the Calculator uses EFLH values that are estimated using more robust methodology (as communicated by the Xcel Energy representatives), we recommend that the EFLH values currently applied in the Calculator are continued.

4.3 DETERMINE SAVINGS CONSIDERING 2009 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) STANDARDS

As part of the engineering review, we reviewed baseline efficiency values for C&I cooling measures based on the "International Energy Conservation Code 2006" (IECC 2006). We understand that for the program year 2009-2010, the Xcel Energy Colorado Cooling Efficiency Program will continue to use IECC 2006 codes for defining the baseline efficiency of cooling measures. We also conducted a forward-looking study in the event that Xcel Energy Colorado C&I cooling efficiency program replaces IECC 2006 stipulation by those of

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[22] Sutton et al. (2002)a. An Algorithm for Approximating the Performance of Vertical Bore Heat Exchangers Installed in a Stratified Geological Regime. ASHRAE TRANSACTIONS 2002, V. 108. And

Sutton et al. (2002)b. Comparison of Multilayer Borefield Design Algorithm (MLBDA) to Available GCHP Benchmark Data. ASHRAE TRANSACTIONS 2002, V. 108, Pt. 2.

the IECC 2009 in the future. The tabulation of baseline efficiencies of end use measures that will result from adopting IECC 2009 stipulations are for informational purposes only.

We calculated the baseline efficiency of C&I cooling measures according to the IECC 2006 in Table 4-2 as the IECC 2006 codes will remain effective for the program years 2009 and 2010. Also, we provide IECC 2009 stipulations in Table 4-3 for any future use by the Xcel Energy Colorado C&I Cooling Efficiency Program. We compared the baseline measure efficiency values obtained from the IECC handbooks with those provided in the Calculator to identify any changes.

The Calculator converts the EER into SEER (and vice-versa) with a multiplier of 0.85. In addition, the Calculator shows the EER and IPLV values by deducting 0.2 to take into account the effect of heating section (other than electrical resistance heat). However, we do not apply these conversion factors to the baseline efficiency values.

The review of the baseline efficiency values for cooling measures from the IECC 2006 and IECC 2009 handbooks and the Calculator shows that:

- There is no change in the values of baseline efficiencies for Condensing units, PTACs and Water-source heat pumps for the IECC 2006 and IECC 2009.
- For Rooftop units, IECC 2009 baseline efficiency values are greater than those of the IECC 2006.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except that for the PTACs.
- The Calculator needs to modify the algorithm for calculation of baseline efficiencies for PTACs to take into account variations in PTAC sizes (in line with the algorithms provided in the IECC 2006 or IECC 2009).
- We are unable to confirm the baseline efficiency for VAV box used in calculator and suggest that the value used currently is the default. However, as discussed above, these may be removed from the 2010 program.
- For Chillers IECC 2009 stipulates measure baseline efficiencies for two paths i.e. Path A and B. The Path B is intended for part-load operation.
- The IECC 2006 and IECC 2009 use different coefficient for the adjustment factor algorithm to account for non-standard water cooled chillers to the baseline efficiency.

The analysis, by equipment type, is detailed in Appendix B.

Table 4-2. Baseline Efficiency of C&I Cooling Measures—IECC 2006

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	9.7		ARI 210/240
≥ 5.4 -11.3 tons		10.3	
≥11.3 -19.9 tons		9.7	ARI 340/360
≥ 19.9–63.3 tons		9.5 (ILPV: 9.7)	
> 63.3 tons		9.2 (ILPV: 9.4)	
Split Systems < 5.4 tons	10		ARI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	ARI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			ARI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

Table 4-3. Baseline Efficiency of C&I Cooling Measures—IECC 2009

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	13		AHRI 210/240
≥ 5.4 -11.3 tons		11.2	
≥11.3 -19.9 tons		11.0	AHRI 340/360
≥ 19.9–63.3 tons		10.0 (ILPV: 9.7)	
> 63.3 tons		9.7 (ILPV: 9.4)	
Split Systems < 5.4 tons	13		AHRI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	AHRI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			AHRI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

4.4 HOURS OF OPERATION

We compared the operating hours obtained through the survey of the program participants with those reported in the Commercial Business Energy Consumption Survey (CBECS) database. We understand from our interviews with Xcel Energy staff that the operating hours for different business types from the CBECs database were used to develop the effective full load hours for the Calculator (the C&I Cooling Efficiency Deemed Savings Calculator). As shown in the table below, the operating hours reported in the participant survey and those obtained from the CBECs database for different business segments are, in general, consistent.

Table 4-4. Comparison of Participant's Self-reported Operating Hours with CBECS database

Business Type	Operating Hours (Weekly)			
	Participants' Response	Survey sample (n)	CBECS Database	# of buildings (in '000)
Education	56	10	50	386
Lodging	168	2	167	142
Office	64	17	55	824
Retail	55	7	59	443

4.5 NET-TO-GROSS ANALYSIS

Program attribution (or the net-to-gross ratio) refers to energy impacts that can be confidently attributed to program efforts. As discussed at the start-up meeting, Xcel Energy needs an overall net-to-gross ratio for the program for their 2010 planning.

We estimated the net-to-gross ratio following the California self report framework for standard net-to-gross projects[23], which uses a preponderance of evidence approach. Our estimate is based on 1) interviews with 2007–2009 participating customers and influential vendors, 2) in-depth interviews with trade allies, 3) in-depth interviews with Xcel Energy account managers, and 4) literature review and benchmarking interviews with program managers of similar programs in the US.

4.5.1 Data collection and study methodology

An initial net-to-gross ratio was calculated based on customer self-reports. The standard net-to-gross analysis specified in the California framework uses three primary sources of information to estimate net-to-gross: program files and information, participant (decision-maker) survey, and vendor (participating trade ally) surveys. Our approach to using each of these information sources for estimating free-ridership and spillover is described in more detail below.

Table 4-4 shows the number of survey respondents by managed and non-managed account and measure type. The self-reported net-to-gross ratio was calculated from these respondents.

[23] Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers, Prepared for the Energy Division, California Public Utilities Commission by the Nonresidential Net-To-Gross Ratio Working Group, Revised May 8, 2009. This method estimates net-to-gross directly rather than estimating 1 minus free-ridership.

Table 4-5. Breakdown of Respondents Used to Calculate the Net-to-Gross Ratio

		Unweighted Count
Account type	Managed	44
	Non-managed	10
	Total	**54**
Prescriptive measures	Chillers	7
	Condensing units	2
	Cooling Towers	1
	PTAC	3
	Rooftop	29
	Split Systems	3
	VAV Boxes	4
	Total	**49**
Custom measures	Chillers	2
	Install new PMZ3 units in lieu of multi-zone RTUs	1
	Plate and frame heat exchanger	1
	Replace old condensing unit with evaporative cooler	1
	Total	**5**

The decision-maker survey, targeted at participating customers, asked highly structured questions about actions that would have been taken in the absence of the program. The survey was guided by information in program files. Respondents were first asked a series of questions to establish project context. Next, they were asked to rate the importance of program influences vs. non-program influences. Third, they were asked to rate the significance of different factors and events that may have led to their decision to install the efficient equipment at the time they did, including questions on the age or condition of the equipment, type of project, recommendations received, and their business policies related to equipment purchases.

The decision-maker survey also collected information about what participants would have done in the absence of the program. Specifically, respondents were asked a number of questions to assess the impact the program had on the timing, quantity, and efficiency level of the measure installed:

- Did the program impact the timing of the decision to replace cooling equipment and, if so, by how many months/years?
- Did the program impact the quantity of equipment installed, and if so, by how much (partial free-ridership)?
- Did the program impact the efficiency of equipment installed and, if so, by how much (partial free-ridership)?

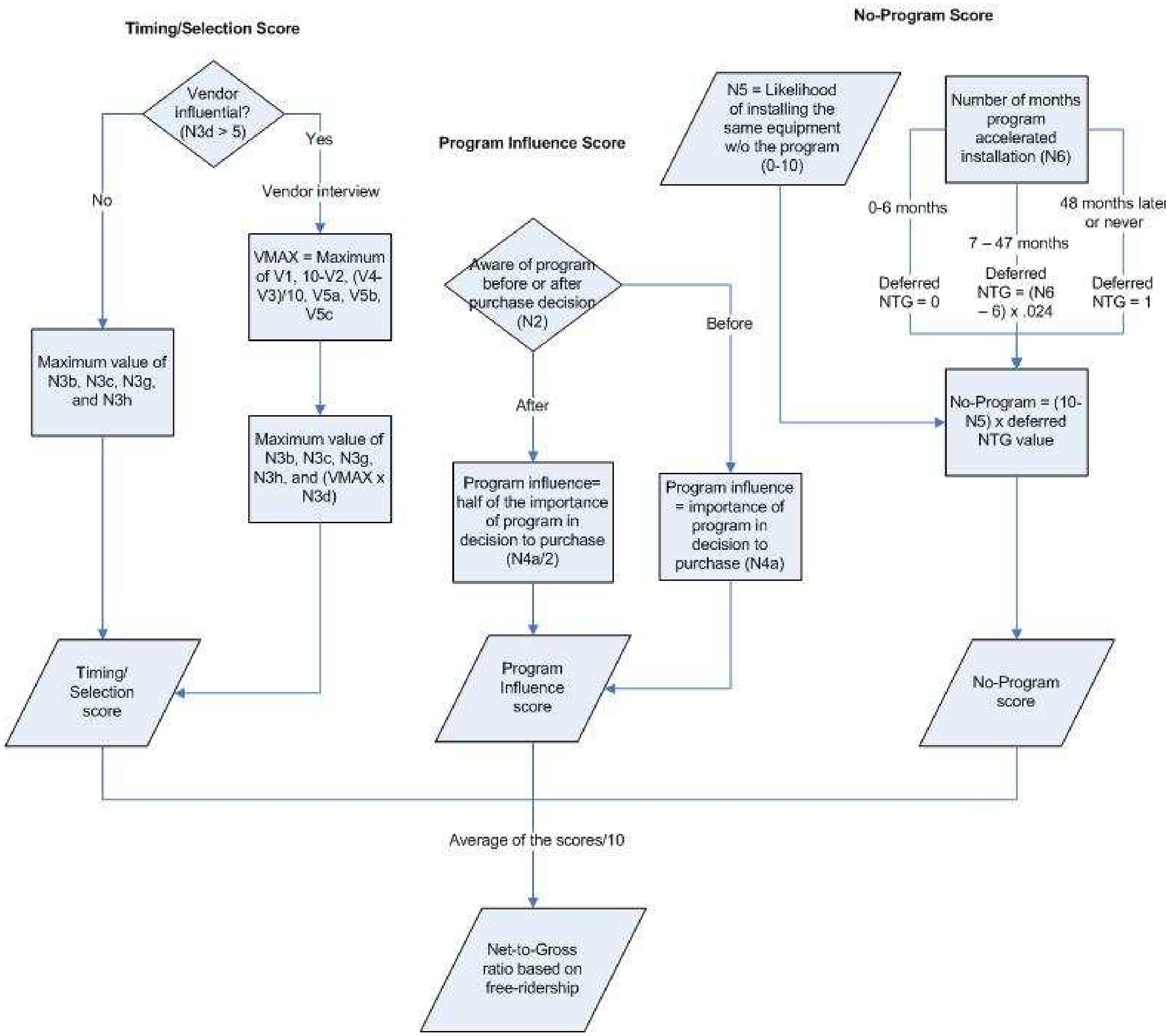
4.5.2 Measuring self-reported free-ridership

The calculation of the self-report-approach net-to-gross ratio based on free-ridership is summarized below in text and in Figure 4-1. In summary, the net-to-gross ratio based on free-ridership is calculated as an average of three scores representing responses to one or more questions about the decision to install a program measure:

1. A **timing and selection score** that captures the influence of the most important of various program and program-related elements in influencing the customer to select the specific program measure at this time. Program influence through vendor recommendations is also captured in this score when the customer says the vendor was influential in their decision. In these cases, the influential vendor was also interviewed and their responses were incorporated into the timing and selection score.
2. An overall **program influence** score that captures the perceived importance of the program (whether rebate, recommendation, or other information) in the decision to implement the specific measure that was eventually adopted or installed. The overall program influence score is reduced by half if the respondent says they learned about the program only after they decided to install the program qualifying measure.
3. A **no-program** score that captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. This score accounts for deferred free ridership by capturing the likelihood that the customer would have installed program qualifying measures at a later date if the program had not been available.

The core net-to-gross ratio is the average of these three scores divided by 10, as shown in Figure 4-1 below.

Figure 4-1. Net-to-Gross Ratio Flowchart Based on Self-report Free-ridership



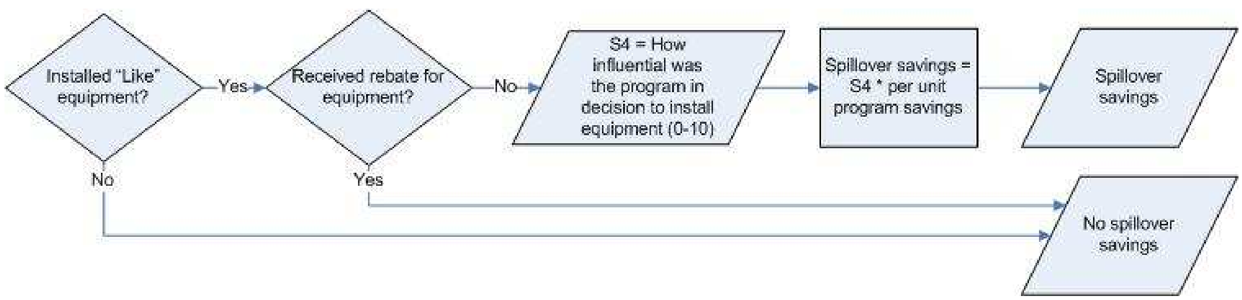
The California framework defines partial free-ridership as when, in the absence of the program, the participant would have installed something more efficient than the program-assumed baseline efficiency but not as efficient as the item actually installed as a result of the program. Of the 54 participants interviewed, five stated that, in absence of the program, they would have installed something more efficient than the standard equipment but less efficient than the equipment that was rebated through the program. For these cases, an adjustment should either be made to the net-to-gross ratio or to the gross savings. For all fives cases, we believe that the calculated net-to-gross ratio already accurately accounts for the impact of the program on these participants. Therefore, no further adjustment to the net-to-gross ratio was made.

4.5.3 Measuring self-reported spillover

The self-report protocol included a battery of questions to quantify spillover for use in estimating spillover. The spillover methodology uses a series of questions designed to measure "like" spillover. These questions ask about recent purchases (since program participation) of any additional energy-efficient equipment of the same type, installed through the program, made *without* any technical or financial assistance from the utility, but influenced by the program. A “like” spillover estimate is computed based on how much more of the same energy-efficient equipment the participant installed outside the program because of their positive experience with the program.

One of the issues with attempting to quantify spillover savings is how to value the savings of measures installed outside the program since we are relying on customer self-reports of the quantity and efficiency of any measures installed. We used a conservative approach and reported only those measures installed outside the program that were of exactly the same type and efficiency as the ones installed through the program (“like” spillover). Our conservative approach allowed customers to be more certain about whether the equipment they installed outside the program was the same type as the program equipment. This, in turn, made it possible for us to use the estimated program savings for that measure to calculate the customer’s “like” spillover savings. Figure 4-2 details the process for quantifying spillover savings.

Figure 4-2. Spillover Savings



We also attempted to measure the extent of free-drivers, or nonparticipant spillover. The data for this type of analysis could be collected from nonparticipants directly or from the design professionals and vendors who recommended, sold, and/or installed qualifying high efficiency equipment. We prefer to survey the design professionals and/or vendors primarily because they typically provide much more accurate information about the efficiency level of installed equipment than nonparticipants. Our experience has shown that customers cannot provide enough data about the new equipment they have installed to allow for accurate estimates of the energy savings achieved from the equipment. While they usually can report what type of equipment was installed, they typically cannot provide sufficient information about the quantity, size, efficiency, and/or operation of that equipment to allow us to determine whether the equipment is "program-eligible." On the other hand, design professionals and equipment vendors who have worked with the program are typically more knowledgeable about equipment and are familiar with what is and is not "program-eligible."

The in-depth interviews with participating vendors suggested little nonparticipant spillover due to the program at this time given the economy, the incremental cost of high efficiency cooling equipment, and the fact that this is only the third year of the program. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high

efficiency equipment. Therefore, there are no adjustments to the net-to-gross ratio based on free-drivers.

4.5.4 Self-report net-to-gross results

The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 51 percent. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 21 percent. The resulting self-report net-to-gross ratio is 0.7[24] for the Colorado Cooling Efficiency Program in 2007–2009*.*

We recommend Xcel Energy set a net-to-gross ratio in the range of 0.7 to 0.8 for the Colorado Cooling Efficiency Program, depending on program eligibility requirements. We recommend a net-to-gross range because as eligible program equipment changes (as it did between 2008 and 2009), we expect program attribution to change. Because we expect net-to-gross analysis will only be conducted periodically for the program, a realistic range allows Xcel Energy flexibility to set the net-to-gross ratio based on program eligibility requirements.

For example, PA Consulting has conducted biannual net-to-gross surveys for National Grid's commercial HVAC program. Prior to 2007, National Grid was using CEE Tier 1 eligibility standards for HVAC equipment. In 2002, the free-ridership rates for HVAC equipment ranged from 40 to 44 percent. In 2005, the free-ridership rates for HVAC equipment ranged from 41 to 56 percent. National Grid increased the eligibility standards to CEE Tier 2 in 2007. In 2007, with the higher eligibility requirements, free-ridership rates dropped significantly from 8 to 15 percent[25].

Results from the benchmarking review of HVAC programs that estimated a net-to-gross ratio ranged from 0.50 (when the net-to-gross ratio only includes free-ridership) to 0.85 (when the net-to-gross ratio includes spillover). This is in line with the self-report net-to-gross estimates from 2007–2009 Colorado Cooling Efficiency program participants discussed above.

There is also qualitative evidence from the 30 in-depth interviews with participating and nonparticipating trade allies which supports a net-to-gross range of 0.7 to 0.8. The qualitative results indicate that the program is helping to overcome barriers of selling high efficiency cooling equipment. In addition, the interviews suggest a medium level of spillover to customers of participating trade allies, supporting the medium to high level of spillover found in the customer survey. Nonparticipating trade allies were much more likely to say selling high efficiency cooling equipment to customers is very difficult. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary drivers for the difficulty rating they gave. They also mentioned lack of knowledge or education on the benefits of high efficiency equipment.

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[24] Net-to-gross = (1 - .51) + .21

[25] The Northeast has significantly higher electric rates than Colorado and National Grid's program is very mature, which has supported the success of moving to the higher CEE Tier levels. We are not recommending that this be done for the Xcel Energy Colorado Cooling Efficiency Program, but instead use it as an illustrative example of how changes in program eligibility affects program attribution.

Participants' self-report results substantiate the trade ally interview findings as participants with high net-to-gross ratios often stated that they were trying to achieve a good return-on-investment or that the rebate allowed them to purchase higher efficiency equipment.

> *"We purchased an existing building so we had access to their utility bills so we know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and (the rebate was) part of the reason we were able to make the investment."* (net-to-gross ratio = .79)

> *"We were doing upgrades anyway so it worked out to get rebates to help us get more efficient equipment."* (net-to-gross ratio = .83)

At the same time, there is qualitative evidence supporting a certain amount of program free-ridership—also found in the customer self-report calculations. Xcel Energy account managers discussed that larger accounts tend to have standard practices toward energy efficiency. Participants with low net-to-gross ratios often stated that the equipment they installed through the program was their only option or mandated by regulations, supporting the account managers' perspectives.

> *"[The equipment was] the only choice we had for a flat roof building for the tenant re-finish."* (net-to-gross ratio = .27)

> *"It's giving me money back for stuff I'm already going to do, stuff that I'm mandated to do."* (net-to-gross ratio = .25)

> *"We got money back on something we would have had to do anyway."* (net-to-gross ratio = .35)

For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program. This ratio excludes VAV boxes and cooling towers, which yielded lower net-to-gross ratios. We recommend VAV boxes be removed from the program based on the engineering review and net-to-gross analysis, and cooling towers were removed from the program in 2009.

5. RECOMMENDATIONS

This chapter outlines recommendations for Xcel Energy's consideration. These recommendations are based on activities and key findings detailed within this report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

5.1 PROCESS RECOMMENDATIONS

5.1.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to

reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Ally Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

5.1.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

5.1.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program.

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn’t even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

5.2 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007-2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007-2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

APPENDIX A: TECHNICAL RESOURCE MANUAL REVIEW SUMMARY

This appendix summarizes the findings through the review of five programs' Technical Resource Manuals (TRMs).

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report; 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review; 2009.

A.1 EFFICIENCY MAINE TRM

The Efficiency Maine TRM provides algorithms for three categories of cooling measures, (a) small cooling measures with capacity less than 65,000 BTUh[26], (b) large cooling systems having capacity 65,000 BTUh or more[27,28], and (c) Electric Chillers.

Small Systems

Energy Saving (kWh) = Capacity (kBTU/hr) × (1/SEERb - 1/SEERe) × FLH

Demand Saving (kW) = Capacity (kBTU/hr) × (1.1/SEERb - 1.1/SEERe)

Large Systems

Energy Saving (kWh) = kBTU/hr × (1/EERb - 1/EERe) × FLH

Demand Saving (kW) = kBTU/hr × (1/EERb - 1/EERe)

Electric Chiller

Energy Saving (kWh) = Capacity (tons) × (PEb - PEe) × FLH

Demand Saving (kW) = Capacity (tons) × (PEb - PEe)

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[26]Measures include small split system and single package air conditioners and heat pumps excluding room air conditioners PTACs, PTHPs, water source heat pumps and ground source heat pumps.

[27] Air conditioners, PTAC's, water-source heat pumps

[28]Although the TRM provides algorithm for electric chillers, it recommends energy saving calculations derived from detailed engineering analysis of the

The TRM uses 800 full load cooling hours (FLH) for small systems. We discuss the measure efficiency values (SEER, EER or PE) in Section 4.2 as part of the IECC 2006 and IECC 2009 baseline stipulations.

A.2 ARKANSAS DEEMED SAVINGS TRM

Two types of cooling measures included in the TRM are (a) Unitary air conditioners and (b) electric chillers. The algorithms used for quantifying the energy saving are as follows.

Unitary Air Conditioners:

Energy Saving (kWh) = Capacity (BTU/hr) x (1/1000) x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (BTU/hr) x (1/1000) x (1/EERb - 1/EERe)

The TRM uses IECC 2003 for defining the measure baseline efficiencies. The expression for the equivalent full load hours is:

$EFLH = A \times (CDD)^{b+1}$

For unitary systems the TRM provides calculated EFLH for two cities i.e. “Fort Smith (FS)” and “Little Rock (LR)” in Arkansas State as shown in Table A-1. However, the methodology used for calculating the EFLH values is not provided in the TRM.

Table A-1. Calculated EFLH for Unitary Cooling Equipment*

City	Stage	M-Fri, 7 a.m. to 5 p.m.	M-Fri, 7 a.m. to 7 p.m.	M-Fri, 9 a.m. to 10 p.m.; Sun, 11 a.m. to 6 p.m.	All week, 6 a.m. to 10 p.m.	All week, 6 a.m. to Midnight	All week, All day
Fort Smith	Single	1,207	1,444	2,033	2,520	2,739	3,230
	Dual	854	1,020	1,443	1,750	1,881	2,155
Little Rock	Single	1,177	1,383	1,948	2,419	2,627	3,137
	Dual	801	938	1,303	1,611	1,730	1,997

*Source: Arkansas Deemed Savings Quick Start Program Commercial Measures: Final Report (Page 2–25)

Electric Chillers:

Energy Saving (kWh) = Capacity (ton) x 3.517 x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (ton) x 3.517 x (1/COPb - 1/COPe), and

$EFLH = A \times (CDD)^{b+1}$

The coefficients A and B for calculating the EFLH for different building types are given in the TRM and shown in Table A-2.

Table A-2. Coefficients for calculating EFLH

Building Type	A	B
Education—Community College	327.83	-0.8835
Education—Secondary School	240.98	-0.9174
Education—University	512.11	-0.9148
Health/Medical—Clinic	313.54	-0.8437
Health/Medical—Hospital	730.76	-0.8836
Lodging	589.61	-0.8750
Office	657.91	-0.9437
Retail	404.00	-0.8645

The Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator also mentions use of the same methodology for estimating the EFLH. The EFLH estimates were developed by analyzing facility occupancy and operating hour distribution based on (a) Minnesota "occupation and employment statistics" data, (b) TMY2 data for Denver and Grand Junction and (c) building characteristics data from CBECS. This methodology would provide a better estimation of the EFLH values, although may always not be accurate. A detailed investigation of the methodology used for estimating the EFLH values currently being used for Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator is beyond the scope of the current study.

A.3 PENNSYLVANIA ENERGY EFFICIENCY AND CONSERVATION PROGRAM TRM

The TRM provides energy and demand saving algorithms for C&I cooling measures for room and central air conditioners split systems, packaged terminal systems, and water source heat pumps. Also, the TRM provides energy saving algorithms for electric chillers.

Air Conditioner:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. A coincident factor (CF) of 0.67 is used in the demand savings calculations. The EFLH hours are obtained for seven locations within the state using the "Energy Star Calculator" of the Department of Energy[29].

[29]At the time of writing, we were unable to obtain the EFLH from the Energy Star Calculator hosted at the DOE website. The calculator needs input of the FLH or EFLH, else it uses a default value of 2000 Hrs.

Table A-3. EFLH for Seven Locations in Pennsylvania

Place	EFLH (hours)
Allentown	784
Erie	482
Harrisburg	929
Philadelphia	1032
Pittsburgh	737
Scranton	621
Williamsport	659

Electric Chillers

Energy Savings (kWh) = Tons X (kW/ton_b – kW/ton_e) X EFLH

Demand Savings (kW) = Tons X (kW/ton_b – kW/ton_e) X CF

The algorithms for estimating energy and demand saving are loosely linked to the equipment efficiency rating. The TRM uses the same CF and EFLH values as used for the air conditioning equipment.

A.4 CONNECTICUT CL&P AND UI PROGRAM SAVINGS TRM

The TRM provides algorithms for estimating the energy and demand savings for unitary air conditioners, as follows:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. The full load cooling hours are given for around sixty facility types ranging from 564 hours to 1308 hours (Table 2.0.0; page 246) also shown in Table 6.5 in this report. For demand saving estimation a peak load factor (CF) of 0.82 is recommended (Table 1.1.1; page 231).

For chillers the TRM recommends custom calculated energy savings based on specific equipment capacity, operational staging, operating profile, and load profile.

A.5 NEW JERSEY'S CLEAN ENERGY PROGRAM ENERGY IMPACT EVALUATION AND PROTOCOL REVIEW

This report is a well-researched TRM. It reviews energy and demand savings algorithms for end-use cooling (and other) measures from TRMs used in different jurisdictions. The report recommends algorithms for air conditioners and chillers. The air conditioning systems include unitary/split systems, PTACs, Water-source heat pumps etc.

Air Conditioners:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

Electric Chillers

Energy Savings (kWh) = Tons X (IPLVb - IPLVe) X EFLH

Demand Savings (kW) = Tons X (IPLVb - IPLVe) X CF

The TRM recommends a single value of 1360 hrs for EFLH and 0.67 for the CF (page 3-58).

Table A-4. Full load cooling hours by facility type*

Facility Type	Full Load Cooling Hours	Facility Type	Full Load Cooling Hours
Auto Related	837	Medical Offices	797
Bakery	681	Motion Picture Theaters	564
Banks, Financial centers	797	Multi-Family (Common Areas)	1306
Church	564	Museum	797
College-Cafeteria	1139	Nursing Homes	1069
College-Classes/Administrative	646	Office (General Office Types)	797
College-Dormitory	709	Office/Retail	797
Commercial Condos	837	Parking Garages & Lots	878
Convenience Stores	1139	Penitentiary	1022
Convention Centers	564	Performing Arts Theaters	646
Dining-Bar Lounge/Leisure	854	Police/Fire Stations (24 Hrs)	1306
Dining-Cafeteria/Fast Food	1149	Post Office	797
Dining-Family	854	Pump Stations	563
Entertainment	564	Refrigerated Warehouse	648
Exercise Center	1069	Religious Buildings	564
Fast Food Restaurants	1139	Residential (Except Nursing Homes)	709
Fire Station	564	Restaurants	854
Food Stores	837	Retail	837
Gymnasium	646	Schools/University	594
Hospitals	1308	Schools (Jr/Sr. High)	594
Hospital/Health Care	1307	Schools (Preschools/elementary)	594
Industrial- 1 Shift	681	Schools (Technical/Vocational)	594
Industrial-2 Shift	925	Small Services	798
Industrial- 3 Shift	1172	Sports Arena	564
Laundromats	837	Town Hall	797
Library	797	Transportation	1149
Light Manufacturers	681	Warehouse (Not Refrigerated)	648
Lodging (Hotels/Motels)	708	Waste Water Treatment Plant	1172
Mall Concourse	938	Warehouse	798
Manufacturing Facility	681		

*Source: New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009 (page 3-41).

B.1.1 Rooftop units

For all RTU sizes the EER (SEER and/or IPLV) values stipulated in the IECC 2009 are greater than those in IECC 2006. The measure baseline efficiency values used in the Calculator (reduced by 0.2 to account for the heating section) are consistent with the codes.

B.1.2 Water source heat pump

No change in EER values between IECC 2006 and IECC 2009. The Calculator and IECC 2006 values are consistent.

B.1.3 Condensing units

No change in EER values between IECC 2006 and IECC 2009. The Calculator uses EER value for air cooled condensing units only and this is in agreement with IECC 2006 value. The EER and (IPLV) values for water or evaporative cooled condensers are also provided in the Tables 6.7a and 6.7b.

B.1.4 Packaged Terminal Air Conditioners (PTAC)

No change in equipment baseline efficiencies between IECC 2006 and IECC 2009. Minimum energy efficiency ratio (EER) for PTACs according to both IECC 2006 and IECC 2009 is given by the following relation:

New Construction:

EER = 12.5 - (0.213*Capacity/1000)

Replacement:

EER = 10.9 - (0.213*Capacity/1000)

Code handbooks stipulate that for PTAC capacity less than 7,000 BTU/hr (0.58 ton) the equation should use default capacity value of 7000 BTU/hr to calculate the EER. Similarly, for equipment capacity over 15,000 BTU/hr the default capacity is 15,000 BTU/hr. Based on the above assumptions we calculate the EER values shown in Table 6.6a and 6.6b.

The Calculator uses a single EER value of 9.1 (excluding 0.2 for heating section); based on an average value of PTAC size obtained from the Xcel Energy CO market segment data. Plugging the EER value of 9.3 (9.1 + 0.2 for heating section) in above algorithms leads to PTAC sizes of about 15,000 BTU/hr and 7,000 BTU/hr for new construction and replacement units respectively. This does not capture the PTAC sizes that fall within the 15,000 BTU/hr and 7000 BTU/hr range. . We recommend that the Calculator applies the above algorithm to take into account the capacity variations for PTACs.

B.1.5 Electric chillers

In Table B-1 and B-2 we provide baseline measure efficiencies for electric chillers. The "Full Load Value (FLV) in kW/ton" and "Integrated Part Load Value (IPLV) in kW/ton" provided in the Calculator and the IECC 2006 handbook are consistent.

Table B-1. Baseline Efficiency of C&I Chillers—IECC 2006

Cooling Measures	IECC 2006		
	FLV (kW/ton)	IPLV (kW/ton)	Test Procedure
Scroll/Screw Chiller < 150 tons	0.79	0.78	ARI 550/590
Scroll/Screw Chiller ≥150 tons and < 300 tons	0.72	0.71	
Scroll/Screw Chiller ≥ 300 tons	0.64	0.63	
Centrifugal Chiller < 150 tons	0.65	0.65	
Centrifugal Chiller ≥150 ton and < 300 tons	0.63	0.63	
Centrifugal Chiller ≥ 300 tons	0.58	0.58	
Air-Cooled Chillers ≥ 150 tons	1.41	1.41	

Note: For non-standard centrifugal chillers (chillers not designed to standard ARI 550/590 test conditions) the IPLV is factored for adjustment (according to the algorithm well captured in the Calculator).

The IECC 2009 codes for water cooled chillers contain the amendments made by the ASHRAE 90.1—2007 standards. Two paths have been established—Paths A and B. Path B is intended for measure applications where significant time is expected at part load and all Path B chillers need demand-limiting controls.

Table B-2. Baseline Efficiency of C&I Chillers—IECC 2009

Measure	IECC 2009				
	Path A		Path B		
	FLV kW/ton	IPLV kW/ton	FLV kW/ton	IPLV kW/ton	Test Procedure
Scroll/Screw Chiller < 75 tons	≤0.78	≤0.63	≤0.0.80	≤0.60	AHRI 550/590
Scroll/Screw Chiller ≥75 and <150 tons	≤0.78	≤0.62	≤0.79	≤0.59	
Scroll/Screw Chiller ≥150 and <300 tons	≤0.68	≤0.58	≤0.72	≤0.54	
Scroll/Screw Chiller ≥ 300 tons	≤0.62	≤0.54	≤0.64	≤0.49	
Centrifugal Chillers < 150 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥150 and < 300 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥300 and < 600 tons	≤0.58	≤0.55	≤0.60	≤0.40	
Centrifugal Chillers ≥ 600 tons	≤0.57	≤0.54	≤0.59	≤0.40	
Air-Cooled Chillers ≥ 150 tons	≥9.6 EER	≥12.75 EER	NA	NA	

The adjustment factor for non-standard chillers is given by the following equation.

Adjusted NPLV = IPLV/K_{adj}

K_{adj} = 6.174722 – 0.303668(X) + 0.00629466 $(X)^2$ – 0.000045780 $(X)^3$

X = D_{std} + LIFT

D_{std} = (24 + FLV*6.83)/Flow rate

LIFT = CEWT – CLWT (^{o}F)

CEWT = Full load condenser entering water temperature (^{o}F)

CLWT = Full load leaving chilled water temperature (^{o}F)

Note that the coefficients of the equation for K_{adj} provided in the IECC 2009 are different from that in IECC 2006.

APPENDIX C: PARTICIPANT AND NONPARTICIPANT SURVEY RESPONSE RATES

Table C-1 presents the response rate and cooperation rate to the participant survey, and Table C-2 presents the same information for nonparticipants.

Table C-1. Cooling Efficiency Program Participant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**134**	**23**	**157**
Number not in service[4]	1	0	1
Non-working number[4]	0	3	3
Person not at number	7	0	7
Adjusted Sample Size	***126***	***20***	**146**
Hard Refusal	28	3	31
Soft Refusal[1]	0	0	0
Incompletes (partial interviews)	0	0	0
Unavailable for duration	3	2	5
Language barrier/non-English	0	0	0
Active[2]	***51***	***5***	**56**
Completed Surveys[5]	**44**	**10**	**54**
Cooperation Rate[3]	***34.9%***	***50.0%***	***42.5%***

[1] Attempts were made to convert all soft refusals
[2] An average of 16.7 contacts per active case were made to reach these still active cases
[3] Number of completed surveys divided by Adjusted Sample Size
[4] All bad numbers were traced with a telephone append service or directory assistance service
[5] Surveys were completed with 54 participants at 44 locations

Table C-2. Cooling Efficiency Program Nonparticipant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**156**	**572**	**728**
Temporarily disconnected[4]	1	5	6
Fax/data line[4]	4	3	7
Disconnected number[4]	1	30	31
Residential number	12	59	71
Ineligible—no commercial cooling	18	80	98
Ineligible—terminated during survey	12	77	89
Adjusted Sample Size	***108***	***318***	**426**
Hard Refusal	24	69	93
Soft Refusal[1]	0	2	2
Incompletes (partial interviews)	1	4	5
Unavailable for duration	3	14	17
Language barrier/non-English	0	2	2
Active[2]	***58***	***187***	**245**
Completed Surveys	**27**	**62**	**89**
Completed Surveys—Swamp Coolers Only	**1**	**7**	**8**
Completed Surveys—Doesn't Pay Cooling	**4**	**15**	**19**
Cooperation Rate[3]	29.6%	26.4%	***28.0%***

[1] Attempts were made to convert all soft refusals

[2] An average of 9.8 contacts per active case were made to reach these still active cases

[3] Number of completed surveys divided by Adjusted Sample Size

[4] All bad numbers were traced with a telephone append service or directory assistance service

PA Consulting Group

Xcel Energy

Process and Impact Evaluation for the Colorado Business Cooling Efficiency Program

FINAL REPORT

January 15, 2010

PA

Xcel Energy

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Prepared for: Xcel Energy

PA Consulting Group
6410 Enterprise Lane
Suite 300
Madison, WI 53719
Tel: +1 608 316 3700
Fax: +1 608 661 5181
www.paconsulting.com

Version: 1.0

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1. EXECUTIVE SUMMARY

This report provides the process and impact evaluation results of Xcel Energy's Colorado Commercial and Industrial (CO C&I) Cooling Efficiency Program.

OVERVIEW OF THE PROGRAM

The Cooling Efficiency program, which Xcel Energy launched in 2006, provides rebates to non-residential customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Oversized cooling towers
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps

The program targets both new construction and existing buildings. The program further distinguishes between prescriptive and custom installations.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively. [1]

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has struggled to elicit small business customer participation.

The program leverages the trade ally infrastructure, along with Xcel Energy staff such as account managers and Business Solutions Center representatives, to provide program outreach. Understanding the importance of the trade allies' roles, the program has an assigned Trade Relations Manager who provides education and outreach to trade allies throughout the state.

[1] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

1.1 METHODOLOGY

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make changes that should be made to technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and the Company's current processes, technical assumptions and NTG ratios.[2]"

The process evaluation was designed to provide Xcel Energy with a thorough understanding of process issues such as barriers to participation, satisfaction with customers, and opportunities for improvement. The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate net-to-gross ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are reasonable and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[3], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Data collection activities included in the evaluation are detailed below. These activities informed both the process and impact (e.g., net-to-gross) analysis.

Table 1-1. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[4]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

[2] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

[3] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes as well as the impact of the 2009 IECC standards on future program years instead of looking backward to codes that no longer apply.

[4] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

1.2 KEY FINDINGS

The 2009 program successfully achieved its energy savings goals even though it increased its savings goals from the 2008 program year. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent, and 106 percent of the goals respectively.

The evaluation found that while the program effectively engaged managed accounts, the program is not as effectively reaching small and/or non-managed customers. This key finding will not come as a surprise to program staff—the evaluation confirmed that it is an issue through database analysis and in-depth interviews. Interviews identified that there are unique barriers for small commercial customers particularly for chain accounts that occupy leased facilities.

The evaluation also found that leveraging trade allies is critical for programs such as Xcel Energy's Cooling Efficiency Program. Effectively reaching and integrating trade allies into the program's outreach and marketing campaign was identified in the benchmarking study as a best practice; program managers of mature and successful programs said they leverage trade allies successfully, although developing those relationships admittedly takes time. Xcel Energy's Cooling Efficiency Program is moving in the right direction by employing an assigned Trade Relations Manager to reach trade allies.

Although the trade ally infrastructure is key to program success, there is a need to continue to strengthen the demand of high efficiency cooling equipment from the customer. Interviews identified a need for continued education with customers and specific marketing materials for target groups.

The remainder of this key findings section organizes findings by research objectives detailed in the Xcel Energy Cooling Efficiency Request for Proposal. Research objectives relevant for each subsection are denoted in the footnotes. The process and impact evaluation chapters provide further support and documentation of these key findings.

1.3 PROCESS EVALUATION KEY FINDINGS

1.3.1 Program design and operations[5]

Program staff and trade allies commended the prescriptive programs' application process, commenting that the application form is relatively easy to complete with clear instructions. The custom application process did not receive such favorable reviews from respondents. Respondents found the application process difficult and commented on the rebate estimation and verification process as areas for improvement.

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[5] **This section addresses the following objectives:**

1) Gauge efficiency of the application process and determine opportunities to improve the application process.

2) Identify areas where the program/processes/marketing can be improved to capture more customer participation.

Having an assigned Trade Relations Manager to communicate with trade allies is seen as a critical role by program staff. However, interviewees questioned whether one staff member was sufficient for the entire state. Additional support in reaching trade allies was identified by Xcel Energy staff as a means for capturing more customer participation.

The Business Solution Center (BSC) is also viewed favorably by program staff as a referral point for the non-managed and small business customers. However, interviews revealed that the BSC should be more involved in marketing to customers. BSC staff said they planned to proactively market to customers in the future, although they admitted to not having specific marketing materials for these customers.

As noted in the recommendations section, the program should consider developing targeted marketing materials and provide those materials to BSC staff. Other recommendations include increasing the rebate level to capture a group of nonparticipants that otherwise would not participate and provide education and training opportunities to customers.

1.3.2 Customer characteristics and experiences[6]

The program is primarily serving managed accounts. Consequently, the nonparticipant group is far more likely to be comprised of non-managed accounts than the participant group. Participants are also more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Other points of distinction between the participant and nonparticipant groups are variability in hours of operation by season and building ownership.

The majority of participants said there is typically more than one person involved in the decision of whether to purchase cooling equipment. The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. The age or condition of the old equipment was the most important factor.

Overall, program participants are satisfied with the Cooling Efficiency program and the various aspects of the program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied.

[6] **These key findings address the following objectives:**

1) Identify characteristics and firmographics to help define current participants and target similar non-participants.
2) Assess customer decision-making processes regarding participating in the CO C&I Cooling Efficiency Program.
3) Gauge program participant satisfaction.

1.3.3 Target market for Xcel Energy's cooling efficiency program[7]

Trade ally interviews discussed the significant potential for the Cooling Efficiency Program in Colorado's commercial market. According to trade allies and Xcel Energy staff interviews, small commercial customers are underserved by the program, as documented in the program literature[8] and confirmed by trade allies and program staff in this program evaluation. These small commercial and non-managed organizations tend to be capital constrained and lease space. Therefore, they do not have ownership of the equipment installed but have to pay the energy bills. An effective suggestion for targeting these customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Additionally, large commercial customers are oftentimes opting to repair rather than replace failing equipment. The stock of cooling equipment is aging for these customers. Trade allies envision a significant need for cooling equipment replacement and an opportunity for the Cooling Efficiency program in the future.These factors, along with relatively low participation numbers since program inception, indicate that that there is significant opportunity for the program to provide cooling efficiency services to the commercial sector.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

1.3.4 Marketing and outreach[9]

The program employs a variety of resources to provide marketing and outreach to customers and trade allies. These resources include the BSC, Trade Relations Manager, and account managers, as well as direct mailings developed by Xcel Energy. Trade allies are particularly critical for reaching customers.

The participant surveys explored the effectiveness of these outreach efforts. Account managers followed by their HVAC vendors have been the most effective outreach channels for program participants.

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[7] **These key findings address the following objectives:**

1) Quantify program saturation in the market including untapped markets of non-participants and remaining markets for existing program participants.
2) Identify the most attractive target populations that currently participate in the program.
3) Identify the target population that currently do not participate in the program.

[8] *2009 Cooling Efficiency Marketing Plan.*

[9] **These key findings address the following objectives:**

1) Identify channels for information about the CO C&I Cooling Efficiency Program
2) Determine nonparticipants' awareness level of Colorado's C&I Cooling Efficiency Program
3) Identify preferred channels for information about the CO C&I Cooling Efficiency Program

Approximately a quarter of nonparticipants are aware of the program. The most common way nonparticipants heard about the program was through Xcel Energy direct mail. Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, followed by email. Trade ally and internal staff identified a need for these marketing materials to be more specific to target sectors, such as small commercial customers.

Trade allies appreciate receiving information through mail; however, the evaluation identified that personal contact is most effective for providing information about the program. Trade allies also requested that a dedicated website be established to communicate program information and tools.

1.3.5 Barriers to purchasing new equipment or participation[10]

The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital. Customers will contact trade allies when it is time to replace the equipment. Current economic conditions and costs were identified by participating and nonparticipating trade allies, and nonparticipating customers, as barriers to purchasing efficient cooling equipment. The barriers included the incremental cost of high efficiency cooling equipment as well as the first cost of cooling equipment.

Several trade allies differentiated the barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost. For larger customers, the main barrier was initial cost due to their need for larger cooling equipment. A number of these customers decide to repair rather than replace equipment. Another notable barrier was triple-net leases, which are reported as very common among commercial customers. Non-financial barriers for moving customers to higher efficiency cooling equipment include customers' lack of awareness and/or understanding of the benefits of high efficiency equipment.

Customers' financial constraints and tendency to replace equipment on failure reinforce the need for trade allies to be intimately familiar with the program and be provided with materials and tools so they can easily and quickly provide information to customers in these situations.

1.4 IMPACT EVALUATION KEY FINDINGS[11]

The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used

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[10] **These key findings address the following objectives:**

1) Identify barriers to participation

2) Determine reasons for not participating in the program

[11] **These key findings address the following objectives:**

1) Verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and vendor's own findings.

2) Calculate Net-to-Gross ratios including and identifying the effect from free riders, free drivers, and spillover.

for other programs. The values for peak load coincident factor (CF) and equivalent full load hours (EFLH) provided in the Calculator are appropriate.

More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. Based on the review of other programs and the engineering estimates, the recommendations include removal of VAV boxes from program offerings.

IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for both the 2009 and 2010 program years. The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the Package Terminal Air Conditioners (PTACs), which do not take into account variations in PTAC sizes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

The self-reported net-to-gross ratio for 2007–2009 participants using the California self-report methodology was is 0.7 for the Colorado Cooling Efficiency Program. Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program. The net-to-gross results identified through the benchmarking study are in line with the results from this Xcel Energy Cooling Efficiency evaluation, which used the California net-to-gross framework[12].

1.5 RECOMMENDATIONS

These recommendations are based on activities and key findings detailed within the report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

1.6 PROCESS RECOMMENDATIONS

1.6.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates

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[12] The program has used a net-to-gross ratio of .94 through 2009 and per Xcel Energy recommendations from this evaluation will not be retroactively imposed on 2009 or prior program achievement but will be used moving forward beginning in 2010.

program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Relations Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to

pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

1.6.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

1.6.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program. .

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn't even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

1.7 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007–2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross

ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007–2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

2. INTRODUCTION

This report presents the results of the 2009 process and impact evaluation of the Xcel Energy Colorado Business Cooling Efficiency program. In this chapter, we discuss the program overview and logic model, study objectives, evaluation methodology, and organization of the report.

2.1 PROGRAM OVERVIEW AND LOGIC MODEL

2.1.1 Program overview

Cooling is the second highest use of electricity for most commercial buildings[13]. Xcel Energy began offering a Cooling Efficiency program for its Colorado commercial and industrial customers in 2006.

The Cooling Efficiency program offers rebates to eligible customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps.

The program targets both new construction and existing buildings and provides rebates for whole systems, as well as specific components. The incentives differ by the type of cooling equipment purchased. Variable Air Volume Boxes and Cooling Towers have a fixed rebate amount. All other equipment types have a base rebate per ton, and the rebate amount increases incrementally if the equipment exceeds the minimum efficiency requirements necessary to qualify for the base rebate amount.

The program further distinguishes between prescriptive and custom installations. The custom program requires that all projects be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification.

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has not been gaining broad acceptance with customers and vendors as quickly as anticipated. Small business participation is a known

[13] Commercial Building Energy Consumption Survey, 2007

challenge for the program, and the recent economic conditions have also hampered program acceptance.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively.[14]

Table 2-1 details the number of customers that participated in the program and related savings by year. While the program is still relatively young, the trend indicates the program has gained momentum. There was a significant increase in participation between 2006 and 2007; however, the participation numbers remained relatively constant between 2007 and 2008 while the savings decreased. The program experienced program design changes between 2008 and 2009. The baseline assumption and requirements for eligible equipment increased. In 2009, there was an increase in both participants and achieved savings, meeting the annual savings goals for the first time.

Table 2-1. Number of Customers and Related Savings by Year

Program Year	Number of Participating Customers	Marketing kW Achieved	Generator kW Achieved	MWh Savings Achieved
2006	49	903	693	1,417
2007	113	2,342	517	4,934
2008	123	1,998	1,176	3,540
2009	175	4,262	5,181	6,558

Source: Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

The program provides program outreach through a variety of sources including the trade ally infrastructure and Xcel Energy staff. Key Xcel Energy outreach staff includes the account managers as well as Business Solutions Center representatives whose role it is to provide outreach and services to non-managed accounts. Recognizing the importance of the trade allies' role, the program has an assigned Trade Ally Manager who provides education and outreach to trade allies throughout the state. The program also receives guidance from a trade Cooling Council which first began meeting in 2008.

2.1.2 Logic model

Xcel Energy's Colorado Cooling Efficiency Program undertakes a number of activities to capture both energy and demand savings with Xcel Energy's commercial customers as well as result in the long-term increased penetration of energy efficient cooling equipment among all business sectors of its commercial population in Colorado. Xcel Energy runs the program internally; therefore, the development and refinement of the program infrastructure is a major

[14] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

activity of the program. The other main activities include outreach to trade allies, customer communications, and rebating eligible equipment.

Figure 2-1 is the program's logic model that identifies program activities, targeted market actors, outputs, and expected outcomes. A well-designed logic model serves as a roadmap to understanding logical relationships among program interventions and potential issues and problems. It communicates a performance story about what the program is trying to achieve, through what interventions, and with respect to which market actors. This logic model was developed based on program materials, discussions at the start-up meeting, and interviews with Xcel Energy staff involved in program management and implementation.

Figure 2-1. Colorado Cooling Efficiency Program Logic Model

Inputs/ Resources	Sufficient budget is allocated Xcel Energy Cooling Efficiency Team* Outside technical resources	Marketing collateral, Program website Xcel Energy Cooling Efficiency Team Xcel Energy technical assistance	Marketing collateral, Program website Account managers, Business Service Center (BSC) and trade allies Xcel Energy technical assistance
Activities	**Develop Program Infrastructure** →	**Outreach to Trade Allies** →	**Customer Communications** →
Outputs	The Cooling Efficiency program has been in the CO market since 2006 Program measures, rebates and marketing strategy, technical assumptions developed, refined and documented. Internal website and training Tracking system developed (appropriate information is requested, captured and entered into Siebel)	Participate in events of local chapters of HVAC associations and market to their members, energy efficiency fairs Hold semi-annual trade Cooling Council meeting and ad-hoc meetings Involve trade allies in developing rebate structures and new products	Account managers, BSC representatives and trade allies refer customers to the program Targeted direct communications to business customers and other outreach such as newsletters, energy efficiency fairs Print and radio advertisement on Energy Efficiency Programs
Short to medium term outcomes	Improved energy efficiency program awareness and participation Xcel Energy staff knowledgeable about the program and its resources Refine Xcel Energy product offerings High customer satisfaction	Trade allies are knowledgeable about the rebate structure and program guidelines Trade allies regularly communicate the program to customers and include rebate with bids Trade allies receive technical assistance from Xcel Energy engineers	Program offering is meaningful, clear, and valuable to customers Business customers' awareness of and participation in the program increases significantly Business customers receive needed technical assistance from Xcel Energy engineers
Long term outcomes	Energy saving goals of the Cooling Efficiency program are achieved within budgetary constraints	Increased trade allies' stocking and sales of AC energy efficient technologies and increased participation of customers in the program	Increased awareness of and demand for energy efficiency equipment in all business segments

* Core members of the Xcel Energy Cooling Efficiency team include the product manager, energy efficiency management, marketing assistants, Trade Relations Manager, and energy efficiency engineer staff. Ancillary members of the Cooling Efficiency team include market research, account management, advertising, corporate communications, information services, regulatory affairs, rebate operations, Business Solutions Center (BSC), and legal.

2.2 STUDY OBJECTIVES

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make recommendations that should be made to

technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and Xcel Energy's current processes, technical assumptions and NTG ratios.[15]"

Xcel Energy identified several key evaluation objectives for both the process and impact evaluations. The process evaluation was designed to provide Xcel Energy with a thorough understanding of participating and nonparticipating commercial customers' and trade allies' awareness of the program, satisfaction with the program, barriers to participation, and opportunities for program improvements. It was also designed to provide information on how to target and market to various segments within the commercial population to increase participation.

The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate NTG ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering 2009 International Energy Conservation Code (IECC) standards, developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

2.3 EVALUATION METHODOLOGY

This section outlines the process and impact evaluation methodology, including data collection methods used to support the evaluation.

2.3.1 Process evaluation methodology

The evaluation included numerous activities in 2009 to directly address the process evaluation objectives. These activities included:

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[15] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

Table 2-2. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[16]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

Internal review. This activity included a project kick-off meeting; a review of existing program documentation, marketing materials, and the program tracking system; and in-depth interviews with ten Xcel Energy internal staff. PA interviewed the Cooling Efficiency program manager, two rebate processors, two Business Solutions Center (BSC) representatives, one Trade Relations Manager, two account managers, and the team lead energy efficiency engineer. These interviews were used to clarify the roles and responsibilities of staff and trade allies; program goals and successes/challenges in meeting those goals; the effectiveness of the programs' operations relative to the defined program goals and objectives; and reasons for variance in program performance by customer class (e.g., small business and other customer segments such as retail/office, food services).

Based on the internal review and project kick-off meeting, PA developed a detailed evaluation plan and program logic model.

Participating customer surveys. The participant survey collected information about participant characteristics and firmographics, equipment decision-making processes (including remaining markets for existing program participants), source(s) of program information, satisfaction with key aspects of the program and the application process, barriers to participation, the effect of the program on their decision to install qualifying equipment, and suggestions for program improvements. In addition to providing data to estimate a net-to-gross ratio, the survey addressed key assumptions to the savings algorithm such as hours of use and baseline (what would have been installed without the program).

PA completed telephone interviews with 54 businesses that participated in the Xcel Energy Cooling Efficiency Program ("participants") since the program started (2007–2009). Some businesses participated in the program at multiple locations. Forty-four unique respondents represented these 54 businesses.

A detailed response rate table for the participant (and nonparticipant) surveys can be found in Appendix C.

Nonparticipating customer surveys. The nonparticipant survey was designed to help characterize the market for energy efficient HVAC equipment in terms of the types of

[16] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

customers and decision-makers. The survey collected data on program awareness, preferred sources of information, market barriers to participation, equipment decision-making processes, and characteristics and firmographics.

PA completed telephone interviews with 116 customers who had not completed a project through the Xcel Energy Cooling Efficiency Program since the program began ("nonparticipants"). Eighty-nine of these businesses had commercial cooling equipment and paid cooling costs to Xcel Energy ("eligible nonparticipants"). Nineteen of these businesses had cooling costs included in their lease and eight businesses had swamp coolers as their only cooling equipment. These businesses completed a shortened version of the survey ("ineligible nonparticipants").

Customer-identified Influential Trade Allies. The participant customer surveys were also used to assess free-ridership and spillover using a California influenced (and Xcel Energy approved) free-ridership and spillover battery. When assessing free-ridership and spillover, it is critical to speak with the person or persons most involved in the decision-making process. As we have found through other HVAC free-ridership and spillover studies, the decision maker is often not the customer. Rather, select trade allies tend to be influential in the decision-making process. In cases where the customer identified the trade ally as being influential in the decision, we also attempted to speak with the trade ally. PA completed 11 surveys with influential trade allies to assess the influence of the program on that particular project.

Participating and nonparticipating trade ally interviews. The participating and nonparticipating trade ally interviews provided rich qualitative information regarding program design and program impacts. PA sampled a census of participating trade allies from the program database, including those with very little activity. We also received a list of nonparticipating trade allies to sample from.

PA conducted in-depth interviews with 17 participating and 13 nonparticipating trade allies. These trade allies included those that supplied, installed, and serviced cooling equipment, as well as an engineer and several equipment suppliers. The interviews probed on a variety of issues including type of business activities, awareness of the program and program offerings, source of program information, barriers to customer (particularly small business) and trade ally participation, and recommendation practices for efficient equipment and program influence in these practices. The interviews also explored trade allies' perception of the difference in purchasing and decision-making practices between different commercial customer segments (small, medium, large, national chain accounts vs. independently owned) and the impact of the economy on the trade allies' abilities to promote, stock, and sell program-qualifying equipment. In addition, the trade ally interviews also attempted to gather information that could be used to assess market affects or other program-related impacts such as free-ridership and spillover[17].

Peer utility program benchmarking review. This task included a literature review, Internet research, and program manager and program evaluator interviews for eight similar utility

[17] Free-ridership refers to customers who participate in programs and obtain incentives for actions they claim they would have taken without the incentive. Spillover refers to savings induced by the program but not achieved (and claimed) through other utility programs.

programs. The benchmarking was designed to identify standard approaches and best practices in programs that are similar in scope and objectives to Xcel Energy's Cooling Efficiency program in Colorado. Specifically, the review examined program goals, objectives, and scope; effectiveness of the program in meeting goals and objectives; key elements of program design; marketing and recruitment of customers; quantification of program impacts; rebate levels; product offerings; application process; trade ally incentives and/or Quality Installation requirements; and trade ally outreach (especially to small business).

2.3.2 Impact evaluation methodology

The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[18], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Verify baseline and technical assumptions. The impact evaluation reviewed the 2009 baseline and technical assumptions using information relevant to Xcel Energy's territory and made recommendations concerning any adjustments we believe Xcel Energy should make going forward. The review activities included: (1) tracking system review, (2) engineering assumption review, and (3) participant survey results and project file review.

Calculate gross savings with IECC 2006 codes. The impact evaluation focused on 2009 program participants and on future years rather than reviewing assumptions retroactively. PA reviewed tracking system data from the Program Year 2009 applications that had been used to estimate program savings (Colorado uses IECC 2006 codes as the 2009 program baseline). For Program Year 2010, Colorado will also be using IECC 2006. Future program years after 2010 may be shifting the baseline to the IECC 2009 codes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

Develop net-to-gross ratio. The net-to-gross ratio was calculated based on interviews with 1) 2008–2009 participating customers and influential vendors, 2) in-depth interviews with contractors, and 3) a literature review and benchmarking interviews with program managers of similar programs in the US.

2.4 ORGANIZATION OF THE REPORT

Section 3 of this report presents the findings from the various process evaluation activities, and Section 4 presents the findings from the impact evaluation activities. Section 5 provides suggested recommendations for program changes that could increase participation, reduce burden, and increase program impacts.

Appendix A contains the Technical Resource Manual review summary and Appendix B contains the IECC 2006 and IECC 2009 equipment analysis conducted as part of the impact

[18] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes instead of looking backward to codes that no longer apply.

evaluation activities. Appendix C contains the response rates to the participant and nonparticipant customer surveys.

3. PROCESS EVALUATION FINDINGS

This chapter presents the results of the process evaluation based on interviews with internal program staff, participant and nonparticipant customer surveys, participant and nonparticipant trade allies, and the benchmarking review. These results are organized as follows:

- Key findings
- Program administration, processes, and resources
- Participating and nonparticipating customer characteristics
- Participating customer satisfaction with the program
- Customer awareness and marketing
- Customer decision making processes
- Trade ally results
- Benchmarking results
- Program potential
- Opportunities for improvement

3.1 KEY FINDINGS

Before discussing the results we present the overarching key process evaluation findings. Key findings are detailed by program design and operations, customer experiences, trade ally experiences, and barriers to new equipment purchases and program participation.

3.1.1 Program design and operations

- Program staff believe the Prescriptive component of the program is an area of the program that is working well. They have experienced frustration with the custom program and reported there have been trade allies and customers also frustrated with this component of the program. Trade ally interviews confirmed some level of frustration with the custom component of the program, although the issue did not arise through interviews with program participants who received services through the custom program. In fact, the post-inspection process, which was a point of contention raised in internal and trade ally interviews, received a high rating of satisfaction by custom program participants.
- Xcel Energy employs an assigned Trade Relations Manager to communicate and work directly with trade allies in Colorado. Having this assigned Trade Relations Manager was seen as a critical role by program staff, although having only one person fill this role for the entire state may mean that more rural or outlying areas are not being reached.
- The Business Solution Center (BSC) is viewed favorably by program staff as a referral point for the non-managed and small business customers. However, there is little direct marketing activity to small commercial customers through the BSC.
- Several program staff commented on the need to receive information regarding program changes in a more formal manner.

- Xcel Energy's Cooling Efficiency program is consistent with other programs as identified in the benchmarking study. Measures with incentives and other incentives are within range of or slightly lower than other programs.
- The benchmarking study attempted to identify net-to-gross ratios used by other programs. Some programs were able to provide their net-to-gross ratios based on evaluation efforts, although most program managers were unable to provide this information as either they use a deemed net-to-gross value or are not required to report net-to-gross ratios for their program. The primary and secondary data review provided context for the Xcel Energy net-to-gross results, indicating that the results are in line with other programs.
- The benchmarking study identified a variety of best practices for cooling programs.
  - Utilize key account representatives and trade allies as much as possible for program communication.
  - Become fully educated on trade associations when leveraging them to target customers. Identify all associations representing that particular market segment and have control mechanisms in place to scale down or ramp up depending on activity level.
  - Identify a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs.
  - Set effective rebate and efficiency levels. A comparison of rebate levels in other programs with Xcel Energy's found Xcel Energy's rebates are some of the lowest for air conditioning systems. Xcel Energy is also rebating a lower SEER rating for packaged and split AC units than other programs.
  - Streamline the application process.
  - Engage the customer early in their decision-making process to influence their choice of equipment.
  - Provide customer education and assistance as well as the rebate. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers.

3.1.2 Customer characteristics and experiences

- There are some differences in customer characteristics between participants and nonparticipants. Participants are more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Participants are also more likely to be managed accounts. Although the average operating hours do not differ between participants and nonparticipants, participants are significantly more likely to have hours that very by the season or operating cycle. Participants are also more likely to own their building, and are more likely to report having taken an action in the past few years to reduce energy use.
- Overall, program participants are satisfied with the Cooling Efficiency program. They were also satisfied with the various aspects of the program, such as the post-inspection process, type of equipment eligible, the contractor they worked with and the rebate application process. Both participants and non-participants were satisfied with Xcel Energy in general.

- Approximately one-fourth of nonparticipants are aware of the program. The most common way that aware nonparticipants heard about the program was through Xcel Energy direct mail or a HVAC vendor.
- Account managers have been the most effective outreach channel for program participants, cited by 55 percent of participants. Hearing about the program through a HVAC vendor was the next most common way of learning about the program. Provided a significant portion of the program population is managed accounts, it is not surprising that account managers were identified by customers as the most notable means for hearing about the program.
- Few customers mentioned marketing materials as a means for hearing about the program. Interviews with program staff identified that the marketing materials distributed to customers and available to program staff are fairly generic, although the customer sectors that the program serves are unique.
- The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment.

3.1.3 Trade ally experiences

- Nearly three-quarters of nonparticipating contractors are aware of the program; therefore, lack of general awareness does not seem to be a barrier to program participation (although deeper understanding of the program is important). Participating and nonparticipating trade allies heard about the program through Xcel Energy representatives, materials, events, customers, and other Xcel Energy programs.
- The primary program-related benefits noted by trade allies are: being more price competitive by including the Xcel Energy rebate, and the ability to communicate and educate customers on energy efficiency by promoting the program. Trade allies saw the benefits for customers as primarily the cost savings, although increased energy efficiency was also mentioned.
- While participating trade allies are generally optimistic that their participation in the program will increase in the next 12 months, their optimism does not extend to the high efficiency HVAC market in general. They project it will continue to be difficult to convince customers to adopt high efficiency equipment due to financial constraints.
- Trade allies commented that it is more difficult to sell high efficiency equipment in replace-on-failure situations where decisions need to be made quickly. Therefore, it is important for trade allies to not just be aware of the program, but be intimately familiar with the program so they can easily and quickly provide information to customers in these situations.

3.1.4 Barriers to purchasing new equipment or participation

- The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital, mentioned by almost two-thirds of nonparticipants. This is consistent with information received from the trade ally interviews. When nonparticipants do need to replace equipment, contractors will be their first contact point.
- Both participating and nonparticipating trade allies corroborated nonparticipating customers' perception of purchasing barriers and identified the economy, coupled with the incremental cost of high efficiency cooling equipment as well as the first cost of cooling

equipment, as primary barriers for purchasing new, high-efficiency equipment. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high efficiency equipment as are leased buildings.

- Several trade allies distinguished the differences in barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost—the difference between standard and high efficiency equipment. For larger customers, the main barrier was first cost—large equipment is expensive and customers tend to repair it instead of replace it as long as possible (especially in the current economy).
- Another notable barrier was triple-net leases, which are reported as very common among commercial customers. In these situations, the customer does not own the building, but is responsible for the mechanical equipment. Trade allies report these customers are less likely to make the investment in high efficiency cooling equipment as they are unsure of how long they will be in the building and therefore may not realize the payback of the higher efficiency equipment.
- Non-financial barriers for moving customers to higher efficiency cooling equipment included customers' lack of awareness, knowledge, and/or understanding of the benefits of high efficiency equipment. Trade allies expressed the need for tools to help sell high efficiency equipment, and the need for more direct communications with Xcel Energy staff to understand program benefits, requirements, and obtain information necessary to help them sell equipment through the program.
- Trade allies provided a variety of suggestions for overcoming barriers, which typically corresponded to their perception of the barriers for selling high efficiency equipment. Suggestions for overcoming barriers include increasing the rebate levels, better educating trade allies on the program, helping them to sell high efficiency equipment by providing tools to help with the sales process (e.g., savings calculator), making the custom component of the program less burdensome and more transparent for trade allies and customers, and directly marketing the program to customers. Participating trade allies also suggested that Xcel Energy have more personal communications with them to provide information about the program.

3.2 PROGRAM ADMINISTRATION, PROCESSES, AND RESOURCES

As documented throughout this report, program participants, trade allies, and program staff generally speak favorably about this program. The Prescriptive component of the program in particular was mentioned by all parties interviewed as a component of the program that is working well.

Interviews with program staff, customers, and trade allies investigated the effectiveness of program administration, processes, and resources. This section summarizes the results of those interviews.

3.2.1 The prescriptive program and application process

The Cooling Efficiency Prescriptive Program's application process received special kudos from respondents, especially when they were comparing the program to other Xcel Energy programs. They commented that the application was streamlined, clear, and relatively easy to complete and process. This is particularly important amongst larger customers who do not

have time to deal with convoluted program processes and paperwork. This is consistent with remarks made by trade allies regarding the prescriptive application process.

Program participants were also generally satisfied with the application process, rating the process an average of 8.5 on a 0- to 10-scale where 10 indicates they were extremely satisfied with the processes. A majority of these program participants (52 percent) reported filling out the rebate application themselves and 10 percent of applications were completed by the equipment vendor.

3.2.2 Role of assigned trade relations manager

Two groups were specifically discussed as potential targets for Xcel Energy's Cooling Efficiency Program at the kick-off meeting: the trade allies and the non-managed accounts. The program is attempting to reach these targeted groups through the use of an assigned Trade Relations Manager and the Business Solutions Center (BSC).

The assigned Trade Relations Manager's role is to communicate and work directly with the trade allies in Colorado. It was clear through the interviews, and from our experience, that the trade allies are an important group to reach and inform about the program. They are a primary marketing tool for the program as they are often the first point of customer contact, especially for small commercial customers. They also have the opportunity to steer customers toward program-qualifying equipment with an eye to program requirements. Therefore, having this assigned Trade Relations Manager was seen as a critical role, and a positive component of the Cooling Efficiency Program.

Various program staff discussed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification. The trade allies discussed earlier in this report also raised this as a need for the program. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

The Trade Relations Manager is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, but he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado. There is question about whether the single Trade Relations Manager is sufficient to reach trade allies given the expanse of the state and differences in region.

The BSC focuses on increasing the participation of the non-managed accounts. The BSC is primarily responsible for fielding calls to the non-managed accounts and will in the near future provide proactive outreach to these customers through their outbound call center (this was not yet happening at the time of the interviews). Account Managers and the Trade Relations Manager spoke favorably of having the BSC as a referral point for the non-managed and small business customers. They appreciate the ability to refer customers they meet that are not managed accounts to this call center.

3.2.3 Program communications

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes.

Currently the program employs several methods of communication to staff working on the Xcel Energy Cooling Efficiency Program. The company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates.

Several individuals interviewed commented on the need to receive information regarding program changes more formally. They recognize that they receive emails with these updates sent to them, but the emails tend to get buried in day-to-day activities. One individual said he found out about program changes from a vendor rather than through an Xcel Energy Communication. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effectively getting the information across.

Trade allies interviewed also commented that they would like to receive more information from Xcel Energy as discussed in the trade allies section. For example, one trade ally requested the development of a website specifically directed at trade allies to provide easy access to updates and program information.

3.2.4 Program marketing tools

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency.

The marketing materials distributed to customers and available to program staff are fairly generic. Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist amongst small business customers and commercial organizations that are in leased space.

Retailers were also identified by program staff as a difficult to serve group. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease space so they do not have ownership over the equipment installed (yet have to pay the energy bills).

Additionally, program staff identified an additional complexity of serving the common area. The common area in shopping malls consumes a significant amount of energy but depends on building owners to retrofit the equipment.

Little direct marketing activity is currently aimed at small commercial customers through the Business Solutions Center. At the time of the interviews they were only working reactively with

customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it appears there is little cross-referral between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

Program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

3.3 PARTICIPATING AND NONPARTICIPATING CUSTOMER CHARACTERISTICS

The evaluation reviewed businesses that participated in the Xcel Energy Cooling Efficiency program from its inception in 2006 through July 2009. A total of 285 businesses participated in the program during this time period.

Table 3-1 shows the distribution of the population of participants by SIC category, compared to the population of the nonparticipant population. The largest proportion of participants are in the services and retail trade sectors, accounting for almost two-thirds of all participants. When compared to the nonparticipant population, retail trade establishments are overrepresented in the participant population, while finance, insurance, and real estate establishments are underrepresented in the participant population.

Table 3-1. SIC Breakdown of Participants and Nonparticipants

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Services	34% (N=76)	30% (N=33,648)
Retail Trade	30% (N=67)	15% (N=16,602)
Finance, Insurance, And Real Estate	9% (N=21)	19% (N=20,812)
Public Administration	6% (N=14)	8% (N=8,968)
Manufacturing	5% (N=11)	4% (N=5,052)
Transportation, Communications, Electric, Gas, And Sanitary Services	2% (N=5)	5% (N=5,582)
Construction	1% (N=2)	5% (N=5,645)
Wholesale Trade	1% (N=2)	4% (N=5,003)
Ag, Forestry, and Fishing	0% (N=0)	2% (N=2,278)

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Mining	0% (N=1)	0% (N=349)
Not classified	10% (N=23)	7% (N=7,938)

Source: Xcel Energy Participant and Nonparticipant Population Databases

The program struggles with small business and non-managed account participation. Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. However, in the nonparticipant population, only 3.3 percent of businesses are managed accounts.

The below analysis further characterizes participants and nonparticipants in terms of their hours of operations, building characteristics, energy saving activities, and general satisfaction with Xcel Energy. The analysis distinguishes between eligible and non-eligible nonparticipants. Eligible nonparticipants are classified as businesses that have commercial cooling equipment and the cooling costs included in their electric bill to Xcel Energy. Ineligible nonparticipants either have their cooling costs included in their lease or have swamp/evaporative coolers as their commercial cooling equipment. Businesses that reported not having cooling equipment were not interviewed.

Statistically significant differences between participants and nonparticiants at the 90 percent confidence interval are noted in the text. Caution should be used when reviewing differences between different groups due to the small sample size of the participant group.

3.3.1 Building characteristics

Participating and nonparticipating customers primarily occupy free-standing buildings (70 percent participant, 65 percent eligible nonparticipant). Ineligible nonparticipants were least likely to occupy free-standing buildings (46 percent ineligible nonparticipants).

While the trade ally interviews discussed that renting a building was a barrier to participation, the survey results show that a large proportion of eligible nonparticipants actually own their building. Approximately one-half of participants and eligible nonparticipants reported owning their building. Only 24 percent of ineligible nonparticipants own their building. Participants were more likely than all nonparticipants to manage the property (19 percent versus. 3 percent).

3.3.2 Energy conservation activities

Businesses that participated in the Xcel Energy Cooling Efficiency program were more likely to report having taken an action in the past few years to reduce energy use than nonparticipants. Eighty three percent of participants said they made some change to reduce energy use, compared with 72 percent of eligible nonparticipants and 53 percent ineligible nonparticipants. These differences are statistically significant.

Of the changes discussed, the change that showed the largest difference between participant and nonparticipant responses was installing high efficiency lighting equipment. Fifty two percent of program participants that said they made a change also said they installed high-

efficiency lighting equipment in the past two years, compared with 27 percent of eligible nonparticipants and 11 percent of ineligible nonparticipants. Although not explored specifically in the survey, one explanation for the significant difference is that customers are being cross-referred to one program when they participate in the other.

3.3.3 Satisfaction with Xcel Energy

Overall, program participants and nonparticipants are very satisfied with Xcel Energy, with participants indicating the highest satisfaction. When asked to rate their satisfaction on a 0- to 10-scale, with 10 being very satisfied, 93 percent of participants rated their satisfaction with Xcel Energy as a 6 or higher compared with 89 percent of eligible nonparticipants and 74 percent of ineligible nonparticipants.

Sixty-four percent of participants said they were extremely satisfied with Xcel Energy by rating their satisfaction as 8 or higher, compared with 53 percent of eligible nonparticipants and 35 percent on ineligible nonparticipants.

3.4 PARTICIPATING CUSTOMER SATISFACTION WITH THE PROGRAM

Overall, program participants are very satisfied with the Xcel Energy Cooling Efficiency program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied. Some explanations from customers on why they rated their program satisfaction as nine or above are as follows:

> *"It gives us money to spend on energy efficient projects we wouldn't have had. I use the rebate program all the time." —program participant*

> *"We had a couple questions on the application and the representative was very helpful in answering our question and guiding us on how to complete the application" —program participant*

> *"We purchased an existing building so we had access to their utility bills. We know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and part of the reason we were able to make the investment was because of the Xcel program." —program participant*

> *"It has a pretty easy process and the rebates came quickly." —program participant*

In addition to being asked about their overall satisfaction with the Xcel Energy Cooling Efficiency program, participants were asked their satisfaction level with various aspects of the program (using the same scale with 0 being not at all satisfied and 10 being very satisfied). As shown in Table 3-2, the average rating for all aspects of the program was 7.5 or higher. Participants of the custom program were also satisfied with the program, specifically the post-inspection process which they rated 9.2. The three aspects of the program with the lowest satisfaction rating (less than 8 on the 10 point scale) were the amount of time it took to receive the rebate, the length of time it took from project start to end, and the requirements for equipment eligibility.

Table 3-2. Participant Satisfaction with Specific Aspects of the Program

Specific Aspects of the Program	Mean rating (0-10 scale)
Post-inspection process (n=5, custom only)	9.2
Type of equipment eligible for program (n=43)	8.7
Contractor who installed equipment (n=44)	8.5
Rebate application process (n=43)	8.5
Support you received from Xcel Energy (n=43)	8.1
Pre-approval process (n=5)	8.0
Program's handling of questions/complaints (n=42)	8.0
Amount of time it took to receive rebate (n=43)	7.9
Length of time it took from project start to end (n=4)	7.8
Requirements for equipment eligibility (n=43)	7.5

Source: Xcel Energy Participant Survey, SA6A-K

Consistent with the high satisfaction rating for the type of equipment eligible for the program (8.7), all respondents reported that the cooling equipment installed through the Xcel Energy Cooling Efficiency program is still installed at their business.

Participating customers were asked what features of the program, if any, they would like to see changed. As shown in Figure 3-2, 67 percent of participants said they would not change anything. This is another indication that overall, the program participants were very satisfied with the program.

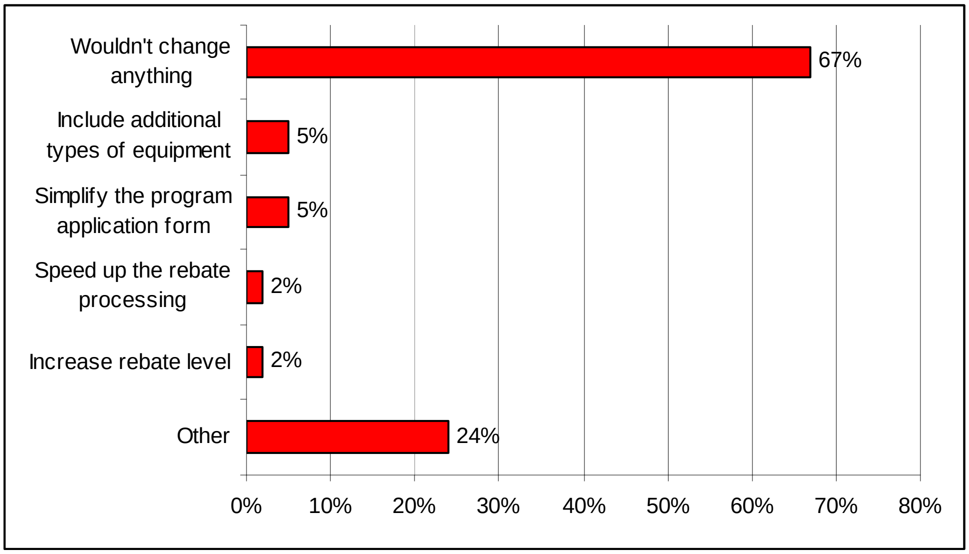
Those that did offer suggestions for improvements mentioned including additional types of equipment (five percent), simplifying the program application form (five percent), speeding up the rebate process (two percent), and increasing the rebate amount (two percent). These were consistent with the components of the program where participant satisfaction was lower. Some of the “other” suggestions mentioned included: communicate how the custom rebates are calculated (this was expressed in both internal staff and trade ally interviews as well as a source of frustration for some), include the option to submit the rebate application online, and provide a savings calculator to customers (this was also expressed in trade ally interviews as an area for improvement).

Below are quotes from a couple of participants on what features they would change with the program.

> *“It would be nice to get closer to instant responses on the rebate process. It seemed like there was a lot of back and forth.” —program participant*

> *“Specify what the unit is supposed to do and how to measure the savings.” —program participant*

Figure 3-1. Features of the Program Recommend Changing (n=42)



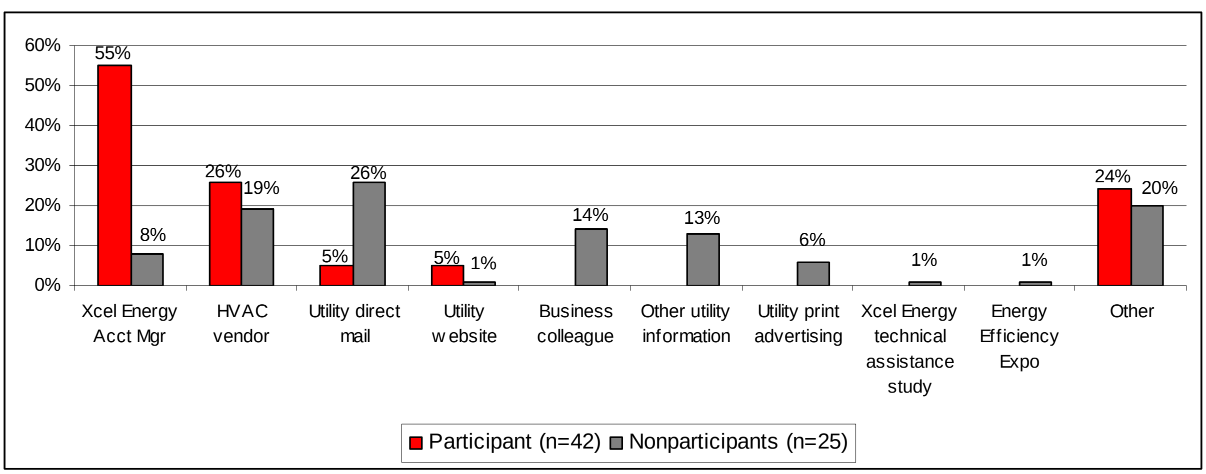
Source: Xcel Energy Participant Survey, SA7

3.5 CUSTOMER AWARENESS AND MARKETING

3.5.1 Participants

Account managers are the most noted outreach channel for program participants, followed by HVAC vendors. Program participants primarily heard about the Xcel Energy Cooling Efficiency program through their Xcel Energy account manager (55 percent). Of the managed accounts, 69 percent of participants mentioned that they heard about the program from their account manager. Hearing about the program through a Heating Ventilation and Air Conditioning (HVAC) vendor was the next most common way to find out about the program. Other ways participants heard about the program included: a contractor that worked on the building, an architect, or an engineer (Figure 3-3).

Figure 3-2. How Customer First Heard about Xcel Energy Cooling Efficiency Program



Source: Xcel Energy Participant and Nonparticipant Surveys, PA1 and A1

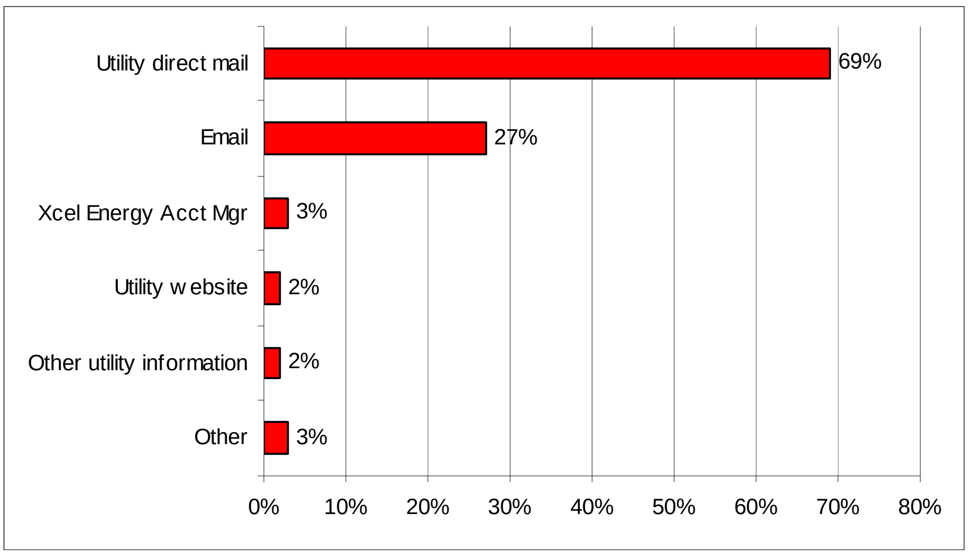
3.5.2 Nonparticipants

Approximately one-fourth of nonparticipants are aware of the program. Customers who have not participated in the Xcel Energy Cooling Efficiency program were asked if they had previously heard of the program. Of the nonparticipants who have cooling equipment and pay the costs for cooling, only 27 percent said they had heard of the program.

Unlike participants, the most common way for eligible nonparticipants to hear about the Xcel Energy Cooling Efficiency program was through Xcel Energy direct mail (26 percent). Another 19 percent heard about the program through their HVAC vendor, 14 percent through a business colleague, and 13 percent from other utility information.

Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, mentioned by 69 percent of nonparticipants. The second preferred way to receive information is through email, mentioned by 27 percent of eligible nonparticipants (Figure 3-4). A similar pattern was found for ineligible nonparticipants; 67 percent prefer to receive information from Xcel Energy by direct mail and 26 percent by email.

Figure 3-3. Prefer to Receive Information about Energy Efficiency Programs (n=88)



Source: Xcel Energy Nonparticipant Survey, A12

If a nonparticipant was interested in contacting a utility representative about an Xcel Energy program or service, 67 percent indicated they already had contact information. The 1-800 phone number was the most common means they would use to contact a utility representative (52 percent). A small percentage (five percent) mentioned the Business Services Center (BSC).

3.6 CUSTOMER DECISION MAKING PROCESSES

3.6.1 Participants

The introduction to the participant survey focused on identifying the key individual involved in the decision to install equipment through the program. In addition, the survey asked if others were involved in the decision. Two-thirds of the Cooling Efficiency program participants indicated there was more than one person involved in the decision of whether or not to

purchase cooling equipment through the program. Other company personnel involved in the decision to purchase equipment through the program included: business owner, maintenance supervisor, current tenant, property management department, Chief Financial Officer, architect, and the business services superintendent.

The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. Program participants were asked to rate the importance of various factors that might have influenced their decision to purchase the cooling equipment. The rating was done on a scale of 0 to 10, with 10 being very important and 0 being not at all important in their decision. The age or condition of the old equipment was the most important factor, which was rated 8.1. As shown in Table 3-3, two other factors for purchasing new cooling equipment was rated an average of 7.0 or higher: standard practice or corporate policy and the payback on investment.

Table 3-3. Importance Factor for Purchasing Cooling Equipment for Participants

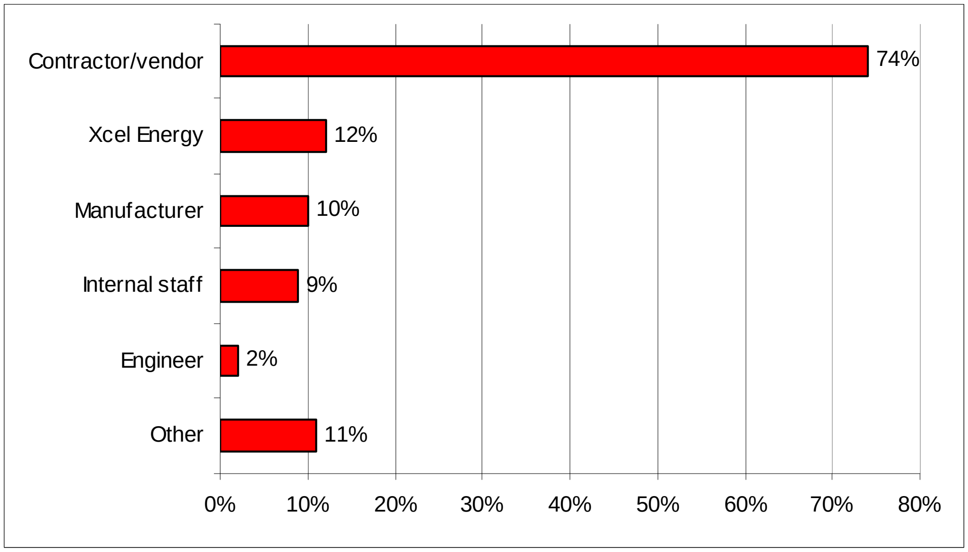
Importance Factor on Purchasing Decision	Mean rating on 0-10 scale
Age or condition of old equipment (N=50)	8.1
Standard practice or corporate policy (N=52)	7.2
Payback on investment (N=52)	7.2
General concerns about the environment (N=54)	6.6
Information provided through a Xcel Energy feasibility study (N=3)	6.3
Availability of program rebate (N=54)	6.0
Recommendation from a vendor/supplier (N=51)	6.0
Previous experience with the Cooling Efficiency program (N=43)	4.7
Endorsement or recommendation by Xcel Energy staff (N=52)	4.5
Information from the program marketing materials (N=52)	3.9
Information from the program training course (N=45)	2.8

Source: Xcel Energy Participant Survey, N3a-l

3.6.2 Nonparticipants

One factor when purchasing new equipment is deciding who to contact first to purchase the equipment. Almost all (74 percent) of eligible nonparticipants said that they would contact a contractor or vendor when purchasing cooling equipment. Contacting Xcel Energy or the equipment manufacturer were the other contacts mentioned by 12 percent and 10 percent respectively (Figure 3-5).

Figure 3-4. Preferred Contact Person when Purchasing New Cooling Equipment (n=84)



Source: Xcel Energy Nonparticipant Survey, I0

Twenty-two percent of eligible nonparticipants report that they have a policy that mandates the installation of energy efficient equipment when purchasing new equipment. When asked specifically what the company policy is for purchasing new equipment, respondents were unable to indicate a specific efficiency level or go into detail as to the company policy. Several businesses mentioned that they are trying to be as 'green' as possible and purchase efficient equipment. A couple respondents also mentioned that the equipment they purchase needs to be ENERGY STAR® rated.

The largest obstacle cited by nonparticipants when purchasing new equipment is the lack of capital, which was mentioned by 61 percent of eligible nonparticipants. This is consistent with information received from the trade ally interviews discussed later in this report. Other barriers that businesses face when considering purchasing new equipment include: the budgeting process (10 percent), lack of resources to implement (seven percent), time constraints (four percent), approval by board members (four percent), and the uncertainty of the return-on-investment (two percent).

3.7 PROGRAM POTENTIAL: NEEDS IDENTIFIED THROUGH NONPARTICIPANT INTERVIEWS

Of the population of existing nonparticipants, approximately three-fourths of this population could participate in the Cooling Efficiency Program (eligible nonparticipants). Ninety-seven percent of nonparticipating businesses contacted pay their electric bill to Xcel Energy[19]. Of those who pay their electric bill to Xcel Energy, 77 pay for cooling at their building.

The evaluation identified the lack of knowledge of the program among nonparticipants as a cause for lost opportunity among the program. When eligible nonparticipants were asked if they had purchased cooling equipment in the past two years, 33 percent reported that they

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[19] The small percent that do not pay their electric bill to Xcel Energy are customers who rent/lease and the landlord pays the utility bill or property managers that report that tenants pay the cooling bills.

had. Only a small percentage (six percent) of those who had purchased or considered purchasing cooling equipment considered participating in the Xcel Energy Cooling Efficiency program. The primary reason they did not participate in the program was because they were not familiar with program requirements.

One key factor with a commercial cooling rebate program is for customers to understand the types of equipment customers currently have and the types of equipment they plan to purchase. Eighteen percent of nonparticipants who could participate in the program indicated that they are in the process of budgeting for or planning to purchase new cooling equipment. On average, eligible businesses expect to purchase the new equipment in 17 months.

Of the equipment installed, the greatest potential according to the nonparticipant surveys is roof-top units and condensing units. Roof-top units are the most common type of commercial cooling equipment used by eligible nonparticipants. Sixty-four percent of these nonparticipants have a roof-top unit installed and 30 percent of these nonparticipants plan to purchase a new roof-top unit. Condensing units are the other main type of commercial cooling, with 52 percent of businesses having a condensing unit installed and 29 percent of these planning on purchasing a condensing unit. Table 3-4 lists other common types of installed commercial cooling equipment and equipment that is planned for purchase.

Table 3-4. Type of Equipment Nonparticipants Have Installed and Plan to Purchase

Equipment	Installed Equipment at Business (n=80)	Currently Budgeting to Purchase Equipment (n=17)
Roof-top units	63.7%	30.4%
Condensing units	52.0%	28.7%
Split system air conditioners	23.9%	0.0%
Variable air volume boxes	13.7%	10.4%
Chillers	11.8%	3.4%
Packaged thermal air conditioners	8.2%	20.9%
Oversized cooling towers	7.6%	11.3%
Water source heat pumps	3.8%	17.3%
Other cooling equipment	10.8%	17.3%

Source: Xcel Energy Nonparticipant Survey, E1 and E5

One reason businesses plan to purchase new equipment is due to the age of their old equipment. Table 3-5 below shows the percent of each type of equipment that is 15 years old or older for eligible nonparticipants. This is consistent with some of the information gathered during the trade ally interviews where they said there is a market out there given the age of existing equipment

Table 3-5. Percent of Installed Equipment More than 15 Years Old among Nonparticipants

Equipment	Old Equipment More than 15 Years Old
Water source heat pumps (N=3)	33.3%
Variable air volume boxes (N=15)	28.2%
Oversized cooling towers (N=8)	25.0%
Roof-top units (N=48)	20.9%
Split system air conditioners (N=21)	16.5%
Condensing units (N=41)	10.5%
Chillers (N=15)	3.9%
Packaged thermal air conditioners (N=12)	3.2%
Other cooling equipment (N=9)	16.0%

Source: Xcel Energy Nonparticipant Survey, E3

For future cooling equipment purchases, eligible nonparticipating business customers demonstrated a level of interest in participating in the Xcel Energy Cooling Efficiency program. The average interest level was 7.27 on a 0- to 10-point scale, with 10 being very interested.

3.8 TRADE ALLY PARTICIPATION

We spoke with thirty trade allies as part of this program evaluation, 17 participating and 13 nonparticipating trade allies. This section summarizes the results of these interviews.

3.8.1 Characteristics of trade allies interviewed

Trade allies interviewed typically installed and serviced cooling equipment. PA also spoke with an engineer and several equipment suppliers. These trade allies work with a combination of planned replacement, new construction/major renovation, and replace-on-failure projects.

A significant portion of certain trade allies' work is replacement-on-equipment-failure. Nonparticipating trade allies were more likely than participating trade allies to report a higher percentage of their projects as replace-on-failure and a lower percentage of their projects as new construction/major renovation.

3.8.2 Trade ally awareness of Xcel Energy's cooling efficiency program

Nearly three quarters of nonparticipating trade allies (8 out of 11 that provided a response) said they were aware of Xcel Energy's Cooling Efficiency Program. Both participating and nonparticipating trade allies said they heard about the program through Xcel Energy staff, materials, seminars, their customers, or equipment suppliers.

One other source of program awareness is their participation in other residential programs provided by Xcel Energy. A number of trade allies interviewed also service residential customers and refer customers to Xcel Energy's residential efficiency programs. Through their

experience with these programs, they became familiar with the commercial program. This indicates the continued potential for Xcel Energy to cross-market the program through their other programs.

Trade allies report that it is more difficult to sell high efficiency equipment when there is a failure than when it is a planned project. These decisions need to be made quickly and efficiently. So while trade allies may be aware of the program, they may need a much better understanding of the benefits and offerings so they can more easily promote the program with their bid to the customers.

3.8.3 Benefits of the program for trade allies and customers

Participating trade allies were quick to comment that the program benefits both them and their customers. The ability to offer the incentive and make the purchase more cost-effective were the most commonly noted benefits of the program. However, the benefits go beyond just the incentive value. Trade allies mentioned that the program gives them an edge over their competitors, who are not taking the time to spec out bids with high efficiency options incorporating the rebate. Even if the customer chooses not to install high efficiency, the options give the appearance of the contractor taking the time to think through the alternatives for the customers' consideration.

The program also provides participating trade allies the opportunity to discuss energy efficiency with their customers. These trade allies are proponents of energy efficiency and enjoy the opportunity to promote high efficiency equipment. Because of the program, they are able to generate more conversation around the benefits of energy efficiency than they would have without the program.

According to participating trade allies, customers generally participate in the program because 1) they have a need for the equipment, 2) the program reduces the cost of the equipment, and 3) the equipment is more efficient and will result in longer-term savings. Several respondents also mentioned the desire or (in some cases) requirement for customers' buildings to be LEED certified; Xcel Energy's Cooling Efficiency Program helps them obtain this certification status more cost-effectively.

One trade ally specifically addressed the impact the program has on his sales. He said the Cooling Efficiency program, along with other initiatives such as LEED certification, has certainly impacted his ability to sell high efficiency cooling equipment. In fact, he said that without the program and these other initiatives he does not think he would have sold any energy efficient equipment this year.

3.8.4 Barriers to selling high efficiency equipment

One of the primary objectives of the interviews was to identify barriers for selling high efficiency equipment. Below we list the commonly mentioned barriers, the most notable being initial incremental costs of high efficiency equipment coupled with a weakened economy.

Economic downturn coupled with high incremental cost of high efficiency equipment. Economy was the buzzword throughout the trade ally interviews. One interviewer summed up the issue saying that activity now has little to do with the incentives available and more to do with the general economic environment. This respondent believed that absent a significantly higher incentive value to cover the incremental cost there will be less movement toward high

efficiency in the current economy. Other respondents provided similar philosophies by discussing the difficulty in encouraging their customers to install high efficiency equipment. When asked about the future of the cooling market, contractors often commented that customers would like to see trend toward increasing efficiency, thereby *uplifting the economy.*

Interviewees indicate the cost of high efficiency equipment is the primary barrier to moving forward on high efficiency purchases and installations across all commercial segments. However, for smaller commercial customers, several respondents commented that it is the relative incremental cost for smaller commercial customers. They reported that for smaller units, the incremental cost as a percentage of total cost is greater and the Xcel Energy rebate covers less of the incremental cost for smaller units.

Other respondents said that first cost is the biggest barrier for the larger commercial customers that use larger equipment. They reported that the cost of replacing that equipment is very significant. If they do replace it, the incremental cost is less and the Xcel Energy rebate covers more of the incremental cost of large equipment than for small equipment.

However, numerous respondents commented on the fact that these larger commercial customers are most likely to attempt to repair rather than replace the failing equipment. One respondent illustrated the point using the example of a customer whose repair of their old, inefficient rooftop unit cost about half the cost of installing new equipment. Although the newer more efficient equipment would yield savings within a three year payback and the contractor projected that the customer would need to replace the equipment within the next five years, they chose to go ahead with the repair instead of replacement. The capital investment of the new equipment was just too much for them to front if a repair for lower cost was possible.

Table 3-6 provides further qualitative evidence of trade allies' perception of the difficulty in selling high efficiency cooling equipment to their customers in this market. Participating and nonparticipating contractors were asked to rate their perceived level of difficulty in selling high efficiency cooling equipment to their customers on a one to five scale, where one was very difficult and five was not at all difficult.

As the table shows, the majority of participating trade allies rated the difficulty between a two and three although three respondents said selling high efficiency equipment was easy (rating of 4 or 5). Several trade allies mentioned that it is easier to sell the equipment to larger than smaller customers, quoting the large savings and increased payback as the reason. One respondent who rated it difficult to sell high efficiency said the rating would have been different in prior years when the economy was better; for these years, the sales of higher efficiency equipment was easier.

This analysis should be viewed with caution as it is based on very limited number of cases and cannot be extrapolated to the participating and nonparticipating trade ally population. However, the story it presents is compelling and shows the importance of reaching nonparticipating trade allies to help them promote high efficiency cooling equipment.

Table 3-6. Difficulty in Selling High Efficiency Cooling Equipment to Customers (1=very difficult, 5=not at all difficult)

Ratings												Average
Participating trade allies (n=11)	2	2	2	2.5	2.5	3	3	3	4	5	5	3.1
Nonparticipating trade allies (n=9)	1	1	1	1	2	2.5	3	3	3			1.9

There is some qualitative evidence that the program is helping to overcome the barrier of selling high efficiency cooling equipment. Nonparticipating trade allies were more likely to say selling high efficiency cooling equipment to customers is very difficult. Whereas no participating contractors rated the difficulty of selling high efficiency equipment a one, four nonparticipating contractors provided a rating of one. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary driver for their low ratings. Incidentally, these nonparticipating trade allies were also more likely to say they serve small business customers (under 500 kW), which may also be a driver of the increased perception of difficulty in selling high efficiency cooling equipment to their customers.

Relative low cost of energy. Several trade allies half jokingly commented that commercial customers would be more apt to participate and see greater value from the program if their energy rates were higher. One trade ally expanded on this discussion by saying that he has seen a distinct trend in the purchasing of high efficiency equipment with a higher cost of electricity. His perception was that since the economic shift, energy prices decreased which thereby decreased the demand for high efficiency equipment along with the reduced cash flow resulting from the poorer economy.

Customers' lack of knowledge and/or understanding of the benefits of energy efficiency. Another common theme heard throughout the interviews was the need for contractors to educate their customers on the benefits of high efficient equipment. Commercial customers may understand conceptually that there could be benefits to installing high rather than standard efficiency equipment; however, when faced with the incremental costs to install that equipment, customers may select the standard efficiency equipment to avoid the extra up-front expenditures. Contractors frequently commented on the need to educate these customers and help them understand the return-on-investment for them and how the installation of high efficiency equipment would positively impact the organization's cash flow. "*They don't understand life cycle costs, lease structures, and access to capital*."

Need for tools to help trade allies sell high efficiency cooling equipment to customers. Participating trade allies were asked what tools were available from Xcel Energy that helps them sell high efficiency cooling equipment. Of the thirteen individuals that answered this question, five said either they don't know what tools are available to them or they do not believe there are any tools available to them through the program to help them sell high efficiency cooling equipment.

As a follow-up to this question, trade allies were asked what tools they would like Xcel Energy to provide to help them sell high efficiency cooling equipment. Several respondents felt they had enough information in the rebate forms and brochures distributed to them by Xcel Energy.

However, several respondents did have recommendations for information or tools to help them promote equipment through the program. The most frequently cited request was for a tool to help trade allies calculate energy savings, payback, return-on-investment, and/or rebate values. While some respondents felt capable of doing these calculations on their own, others did not feel they had sufficient knowledge to do this. As one trade ally stated, "*We lack the software to be able to tell them what their payback is…we don't know the math*." Another respondent referred us to a tool through the Commercial Real Estate Energy Efficiency Program (CREE) website. This tool calculates return-on-investment of energy efficiency improvements. At a minimum, the program could promote this tool to trade allies.

Another respondent commented that he was able to calculate the energy savings and related rebates, but the rebate ended up being less than initially specified. He noted, "*If there was some way to automate that, to better calculate the rebate, that would be good."*

In terms of the materials provided by Xcel Energy, those who received the materials for the most part felt they were sufficient. Several respondents noted that they use the website often to obtain materials, although they would appreciate more hard copy materials for distribution to their customers. Another respondent said they would appreciate some verbiage from Xcel Energy on the benefits of the program and installing high efficiency equipment to include in their marketing materials.

Last, several trade allies said that it is difficult to see what is new in Xcel Energy's program through the website. They suggested that to make this process easier, perhaps Xcel Energy could have a website targeting only trade allies that clearly identifies program updates. This suggestion was also made in the internal interviews with Xcel Energy staff.

Need for more personal interaction with Xcel Energy staff. Building on the above point, five of the participating contractors said they did not recall receiving or were not provided with tools or information from Xcel Energy staff to help them sell high efficiency equipment. And one trade ally specifically mentioned the need for more personal interaction with staff to help arm him with the knowledge to better promote high efficiency cooling equipment.

Trade allies who do regularly interact with program staff were complimentary of their experience with these staff. They describe their interactions with Xcel Energy representatives as helpful, say they were excellent in interacting with the contractors and providing timely information. In general, they just want more of this interaction.

There is only one Xcel Energy staff member assigned to reaching out to contractors throughout the state of Colorado. He plans events for contractors, such as the workshops, seminars, and breakfast events to educate contractors about the program. Internal interviews identified that only having one trade ally representative may result in not personally reaching as many trade allies as desired, particularly in less populated areas.

3.8.5 Overcoming the barriers and increasing participation

Trade allies were encouraged to share their ideas regarding ways to overcome programmatic barriers and increase participation. These recommendations are detailed below.

a. INCREASE REBATE LEVELS

Not surprisingly, the most commonly noted recommendation was for the program to increase its rebate levels. It is not that trade allies felt the incentive levels were entirely too low, but that an increased incentive level would be beneficial in battling the incremental cost and reducing the payback period that plagues the ability for customers to install program-qualifying equipment. As found in the benchmarking review of rebate levels in other programs, Xcel Energy's rebates are some of the lowest for air conditioning systems.

b. EDUCATE TRADE ALLIES

Another recommendation made by several respondents was to better educate trade allies and make them more aware of the program benefits. These respondents discussed the need for Xcel Energy to make the process as easy and seamless as possible for trade allies—including marketing to customers using return-on-investment analysis. "*If it's not easy, we won't do it.*" One trade ally expanded on the need for more education noting the influx of new trade allies in the industry. He said that each time an HVAC contractor goes out of business, three more open up. This turnover increases the need for continual education and marketing from Xcel Energy among the trade ally groups. This recommendation is consistent with best practices found as part of the benchmark review of other programs.

c. IMPROVE THE CUSTOM PROCESS

Participating trade allies provided suggestions to make the custom program less burdensome for trade allies and customers. For the most part, participating trade allies thought the application and rebate processing requirements for the prescriptive component of the program were appropriate and not overly cumbersome. The distinction several respondents made, though, was between the prescriptive and custom program. These respondents said the administrative burden for completing the custom applications is high. One respondent compared the process to the prescriptive program which he described as not at all difficult to complete.

Another respondent described the custom program and its processes as a "*nightmare*." The time to complete the application and get Xcel Energy involved is significant and in some instances results in him losing the job. The trade ally expanded on this statement by saying that the rules for qualifying equipment do not seem to be transparent, which frustrates the trade ally and his customers.

One trade ally noted an additional complication in the custom process; his perceived inability to easily and quickly provide a rebate value to the customer. This trade ally said that he could calculate an incentive value based on manufacturer specifications and an understanding of the original equipment; however, he cannot provide the incentive level with enough certainty to make the customer comfortable with investing in the purchase.

This perception about the custom program and its application and project process is consistent with what we heard in the internal interviews. Account and trade representatives mentioned that the custom application process was significantly more cumbersome and involved than the prescriptive program process.

The reputation of the custom program reached trade allies that have not yet worked with a customer through that component of the program. One participating trade ally interviewed

commented on additional equipment he would like to see included in the program (evaporative coolers) and wondered if this measure could be promoted through the custom program. However, while this respondent recognized the usefulness of the custom program, he commented on the feasibility of going through the custom program, saying that there have been grumblings from others in the industry that the process is "*difficult and rigorous*."

d. MARKET DIRECTLY TO CUSTOMERS

Trade allies for the most part thought the program could more directly market to customers. Several respondents said the direct marketing should provide general information about the program and include analysis tools or information to illustrate the energy and/or financial savings from installing high efficiency equipment. This is not to say that customers are not receiving sufficient information about the program; the customer survey results will explore this issue more.

Trade ally responses varied considerably in their assessment of customers' awareness of the program. On average, participating trade allies said that almost one-half of their customers know about the program (sample size is only 10, so this information should be viewed as qualitative). One participating trade ally said that none of his customers were aware of the program and two trade allies said that all his customers were aware of the program. (Table 3-7). Nonparticipating trade allies were more likely to say that fewer of their customers were aware of the program.

Again, this information should be interpreted with caution given the sample sizes. The analysis represents the interviewed trade allies, not the trade ally population at large.

Table 3-7. Trade Ally Perception of Customers' Awareness of the Program

Percent											Average
Participating trade ally responses (n=10)	0%	10%	10%	10%	25%	30%	75%	95%	100%	100%	46%
Nonparticipating trade ally responses (n=5)	0%	13%	15%	50%	55%						27%

3.8.6 The future of the cooling market in Colorado

The majority of participating trade allies said they expect their involvement in the program to increase over the next twelve months. They project that customer demand will increase as they become more energy conscious and are more aware of energy efficiency based on federal initiatives and more stringent codes and standards. However, a number of these contractors caveat this optimism by saying it depends on the economy.

Additionally, several respondents commented on the aging cooling equipment in Denver as an indicator for increased opportunity for the program, particularly among larger commercial customers. As discussed earlier, because of the high capital investment in replacing cooling equipment, larger commercial customers are opting to repair versus replace the older equipment. This inefficient equipment will continue to fail and in time need to be replaced which will create further opportunity for the program.

While participating trade allies are optimistic that their participation in the program will increase in the next 12 months, their projection of the direction of the commercial cooling market in the next two years is mixed. The same is true for nonparticipating trade allies. Respondents from both groups of interviews said that unless there are government initiatives put in place, or stricter requirements, the high efficiency cooling market will stay the same or decrease. A number of these respondents again cited the incremental cost and perception that the benefits don't outweigh these costs; particularly given how constrained these companies are in their capital funding. "*I've got my fingers and toes crossed that we're going to come out of this recession and people will start purchasing high efficiency equipment*."

3.9 BENCHMARKING RESULTS

PA researched programs online for to characterize other cooling efficiency programs in terms of rebates or incentives available, eligible measures, eligible customers, required paperwork, and marketing. PA then conducted in-depth interviews with eight program staff and one evaluator for the following programs to obtain further insight into program operations. The utilities and programs reviewed are detailed below.

Table 3-8. Utilities and Programs Included in Benchmarking Study

Utility	Program
Ameren IL	Standard Business Incentives Program
Arizona Public Service	Solutions for Business: Prescriptive Incentives and Technical Assistance and Studies
Energy Trust of Oregon (Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas)	Existing Building Efficiency Program
Idaho Power	Building Efficiency for Commercial Construction and Easy Upgrades for Simple Retrofits
Pacific Gas & Electric (also includes SCE and SDG&E)	Non Residential Retrofit (previously Standard Performance Contract)
Platte River Power Authority (and four member utilities: Fort Collins Utilities, Longmont Power & Communications, Estes Park Light & Power, Loveland Water & Power)	Electric Efficiency Program (includes Cooling Rebate Program)
Puget Sound Energy	Commercial HVAC Rebate and Premium Service programs
Salt River Project	PowerWise Standard Business Solutions and PowerWise Custom Business Solutions

Programs varied from very new (only 1 year old) to fairly mature (up to 10 years old).

3.9.1 Program goals and challenge in meeting goals

Xcel Energy's goal for the Cooling Efficiency program is 6.9 mil kWh for 2009. However, information was not available from other programs on savings goals for cooling equipment only. For other business programs overall, savings goals ranged anywhere from 32.5 mil kWh to 160 mil kWh. Xcel Energy's total 2009 business goal is 103 mil kWh.

Most programs in the benchmarking study have been successful in meeting program goals despite the recent economic challenges. Many programs met or exceeded goals last year and are on track to come close to meeting targets this year. Several programs have higher goals set for this year than last year.

All programs are faced with the same primary challenge this year—the downturn in the economy. However, most have found a way to keep projects enrolling and continue to achieve energy savings. Mature programs are faring better which was reported to be a result of strong relationships with vendors and implementation contractors. It was also reported that it is important to be flexible and get involved with the customer early to influence their choice of equipment (as also discussed in the internal and trade ally interviews).

Several program managers reported bonus and timing adjustments their programs made in reaction to the downturn in the economy. One program offered a 10% bonus to customers and $500 gift cards to trade allies for projects with minimum size restrictions that were done before the end of May, 2009. Another program became more flexible with deadlines that were typically 18 months but would be extended if there were delays in the project timeline.

3.9.2 Key elements of program design

All programs offer prescriptive and custom options to business customers except for PG&E, which is custom only. Measures covered by prescriptive programs are similar across programs including air conditioning units, split and packaged units, air and water source heat pumps. Variations in measures offered include chillers, economizers, and controls. One program manager recommends more focus on controls and optimizers for retrofit to realize additional savings. Xcel Energy categorizes control-related projects within an Efficiency Controls program, rather than within the cooling program.

Most of the programs use outside firms to implement the program. One program manager appreciates that they have an implementation contractor who continuously works to improve their program.

Two programs manage the entire program internally as Xcel Energy does. This internal management includes the development of the infrastructure, outreach to trade allies, customer communication and setting and processing the rebates for eligible equipment. Internal staffing for the programs ranges from one person half-time to 6 business development staff handling specific customer segments.

3.9.3 Marketing and recruitment of customers

Depending on the program, either the implementation contractor or program staff market and provide outreach to customers. Marketing methods consist of general advertising in newspapers, through radio ads and mailings.

Marketing is not typically targeted to particular groups but to business customers in general. However, more targeted marketing through associations and business group meetings is favored by many program managers. These face-to-face meetings allow for a more tailored message (e.g. highlighting energy savings possible) and the opportunity to answer questions and build relationships. Associations targeted include ASHRAE, BOMA, Kiwanis, multiple trade organizations, and school groups.

Only one program, which is one of the more mature programs, uses targeted marketing. They have moved away from traditional marketing pieces, except for an overview, and are instead working with specific customer segments. They now concentrate on relationship building with customers, trade organizations, and equipment dealers.

Interviewees believe the most effective form of program communication is handled by key account representatives and trade allies. Trade allies know their markets well and are often in the best position to sell the higher efficiency to their customers. A couple of programs are also taking advantage of high bill inquiries and billing analysis to seek out possible participants.

One respondent shared that in their experience, a useful lesson is to become thoroughly educated on the different associations when using trade associations to target customers. The respondent felt this would identify and involve all associations representing that particular market segment. Without buy-in from particular association leaders, a utility could be kept out of a market. However, the program should be prepared for a potentially quick increase in projects. In order to handle abrupt increases or decreases in enrollment, have control mechanisms in place to scale down or ramp up depending on activity level.

3.9.4 Quantification of net program impacts

As PA has experienced with several other programs and the industry as a whole, there is much discussion around how to accurately calculate free-ridership and spillover to inform net-to-gross (NTG) factors for commercial cooling. In speaking with program managers, that uncertainty exists among all programs.

Table 3-9 summarizes net to gross information provided by the program managers or through the literature review. A few of the newer programs have not yet had the opportunity to evaluate their programs and estimate net-to-gross ratios and will likely review free-ridership and spillover measurement in later program years, according to program managers. In the meantime, they rely on either an average industry attribution rate of 0.80 to 0.85 or anecdotal information to provide qualitative context around program impacts (e.g. retrofits may be almost all free-riders but the nature of premium services would result in a very low free-ridership rate). And although some of the others have conducted evaluations, they have not measured free-ridership or spillover.

For those programs that have measured NTG and were able to provide us with the values, we see a range from 50 percent (when NTG only includes free-ridership, not spillover) to 80 percent NTG (when includes spillover). The NTG status for all programs reviewed is detailed in Table 3-9. In addition to speaking with program managers we also reviewed NTG estimates from the DEER database and measured NTG values from WI Focus on Energy Business Programs which are also included in the table below.

Table 3-9. NTG Summary Information

Sponsor	Program	NTG measurement status
WI Focus on Energy	Business Programs	Overall 2008 commercial NTG ratios were 69% kWh, 69% kW, and 33% therms.
Ameren (IL)	Standard Business Incentives	Measure free-ridership and spillover, but no NTG number available.
Arizona Public Service	Solutions for Business: Prescriptive Incentives	NTG calculated at the measure level using both free-ridership and spillover from self reports. Numbers not available at the time of the call.
Energy Trust of Oregon	Existing Building Efficiency Program	Influence rates of 80% for electric and 70% for gas for their HVAC program.
Idaho Power	Easy Upgrades for Simple Retrofits	Not currently measuring FR, SO or NTG.
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)	Measuring NTG but not final for 2006-2008 cycle. DEER database shows NTG from 2004-2005 was 50% for prescriptive HVAC and 54% for custom projects. DEER also indicates 50% NTG assumptions for prescriptive HVAC and 64% for custom for purposes of 2009-2001 planning.20
Platte River Power Authority	Cooling Rebate Program	.85 assumed.
Puget Sound Energy	Commercial HVAC Rebate	Not measuring NTG.
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	Measured NTG = .75 for Standard Business Solutions (not including adjustments for spillover).

3.9.5 Rebate levels and requirements

Rebate levels are similar across programs, although Xcel Energy's are some of the lowest for air conditioning systems (Table 3-10). Xcel Energy is also providing rebates for a lower SEER rating than the other programs reviewed. Most programs have done little to adjust their rebates over time, and any adjustments have been minor.

Minimum equipment efficiency to qualify for a rebate is typically decided based on CEE standards. Supplementing that decision is information from ASHRAE 90.1, ENERGY STAR®, and other market analysis. Rebates or incentives are typically offered for the efficiency above standard. Programs also have caps on the portion of the cost that will be paid, for example 50 percent or $10,000 maximum.

[20] Source: Updated DEER NTGR Values – 053008.xls

The requirements for receiving a rebate or incentive are similar among programs. Most programs have a pre-approval process or pre-application showing the efficiency the customer intends to install. Some programs skip this pre-application for projects below a certain rebate threshold ($1,000–$5,000). For one program, the pre-approval allows for a customer's incentive funds to be reserved for 90 days.

Once approved, the customer can have the work done. A few programs require inspections, although this is more common for custom projects or projects requesting a rebate over a certain threshold. Upon completion, customers are required to submit a final request for the rebate or incentive, accompanied by an invoice for the equipment purchased, and a cut sheet or other form showing the specifications for the energy efficient equipment. A few programs have 60-day or 90-day limits from time of project completion for submitting final rebate requests.

Table 3-10. Rebate Summary Information

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
CEE	Tier 1 standards	14 SEER (12.0 EER pkg, 11.6 EER split)	(11.5 EER, 11.5, 10.5, 9.7)	14.0 EER		14.0 EER			
CEE	Tier 2 standards	15 SEER (12.5 EER pkg, 12.0 EER split)	(12.0 EER, 12.0, 10.8, 10.2)	No specification s		No specification s			
Xcel Energy	Efficiency Cooling	13.5 SEER: $50/ton packaged, and $3/ton each adtl 0.1 SEER 14.0 SEER: $25/ton split, and $4/ton each adtl 0.1 SEER	$50/ton (EER of 11.0, 10.8, 9.8, 9.4)	Condensing 11.0 EER: $25/ton + incremental rebate: $3.00/ 0.1 EER		14.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	PTACs 11.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	$6-$12/ton See program for details	Boiler Tune-up: 25% of costs See program for details
Ameren (IL)	Standard Business Incentives	14 SEER: $15/ton 15 SEER: $30/ton	$15/ton (11.5 EER, 10.5, 9.7) $30/ton (12 EER, 10.8, 10.2)		$15/ton (14 SEER, 11.5 EER, 10.5, 9.7) $30/ton (15 SEER, 12 EER, 10.8, 10.2)		13.08–(0.02556*Btuh Capacity/ 1000) EER $15/ton	$20/ton (Air-cooled only)	Room Air Conditioners: $25-$35/ton Variable Frequency Drive on HVAC Motors: $45/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Arizona Public Service	Solutions for Business: Prescriptive Incentives	(1 Phase) 14 SEER & 11.5 SEER: $50-80/ton (3 Phase) 11.1 EER: $50-100/ton	11.4 EER $50-100/ton 11.2 EER $25-75/ton 10.4 EER $25-75/ton		(1-phase) 14 SEER & 11.5=$50-80/ton (3-phase) 11.1 EER= $50-100/ton 11.4 EER $50-100/ton 11.2 EER and 10.4 EER $25-75/ton		Both PTAC and PTHP 12.5-(0.213*cap/1000) EER $45-60/ton	Air cooled 1.15 kW per ton—IPLV = $7/ton Water cooled 0.57-0.68 kW per ton—IPLV = $7/ton	Economizer $15.ton
Energy Trust of Oregon	Existing Building Efficiency Program	$120-300 See program details	$120-300, See program details		$150-2,250/ton, See program for details	$200-4,000/ton, See program for details	$100/unit PTHP		Ground source heat pump $300-$3,000
Idaho Power	Easy Upgrades for Simple Retrofits	(1-phase) 14 SEER: $25/ton 15 SEER: $50/ton 16 SEER: $75/ton (3-phase) 13 SEER: $50/ton 14 SEER: $75/ton 15 SEER: $100/ton	$50/ton (EER of 11.0, 10.8, 10.0)				12 EER at $50/ton		Economizer $250/unit economizer controls $75/ton VSD for fan pump $60/hp program thermostat $60

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)								
Platte River Power Authority	Cooling Rebate Program	14 SEER/ 12 EER = $65/ton, $4 per ton for each 0.1 EER over 12.0	$50/ton (EER of 11.0, 10.8, 10.0), $4 per ton for each 0.1 EER over base				Both PTAC and PTHP 11.0 EER- $50/ton, $4 per ton for each 0.1 EER over 11.0		
Puget Sound Energy	Commercial HVAC Rebate		>= CEE Tier 1 = $30/ton						ECM on HVAC fan box- $.12/sq ft Boiler tune-up-up to $600 Program thermostat—up to $50 VSD on pumps and fans—$100/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	$75/ton (EER of 11.5, 10.5, 9.7) $100/ton (EER of 12.0, 10.8, 10.2)	14 EER: $75/ton	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	14.0 EER/4.6 COP: $75/ton	$50/ton See program for details	(Tons * $10/ton) + (Tons *$350 * (Minimum IPLV – Chiller IPLV))	VSDs for HVAC fan & pump: $55/ton

3.9.6 Trade ally relationships

Several programs rely heavily on trade allies to market the program to customers as well as provide quality service and have found them to be valuable outreach partners. It is important to have a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs. Most programs do not offer trade ally incentives at this point.

Interviewees report that training and communication are instrumental in the trade ally relationship. Many programs incorporating trade allies hold workshops or frequent meetings with vendors as updates, as well as to find out what type of equipment is selling. One program holds about 10 one-day technical sessions throughout the year for trade allies in their territory. They hire expert trainers to come in for those sessions to cover topics such as DOE motors, HVAC, chillers, RCx, and lighting.

A few programs are struggling with building up their trade ally networks. A program manager from one of the more mature programs tells us that building a reliable trade ally network takes time—often as much as two years.

3.9.7 Why customers enroll

The initial view is that customers will participate in a program if it provides monetary incentives. However, some programs have found that the incentive or rebate alone will not result in a successful program. A key element for these programs is customer education and assistance. One program found through their survey that the assistance they provide and the rebate are equally motivating for their customers. These programs educate customers on the energy savings resulting from the high efficiency equipment (sustaining impacts) using the rebate to reduce the first-cost of purchasing and installing the equipment.

This education may come in several forms. One program manager attends association meetings where she can present energy savings opportunities. Another program has a general tool available to all customers on their website to calculate energy savings for 30 of the most common energy efficiency measure for typical buildings. A third program provides an online self-audit tool so customers can gain a better understanding of their own facility, which improves the conversation once they are ready to work with a program representative. Coaching is particularly important for the first time participants.

We asked program managers which key customer segments have been more likely to participate this year. A few of the newer programs are not yet tracking participation by customer segment as there is not much need at this point. Others have seen greater participation recently from offices and schools. Medical facilities have also been active in some programs. One program has seen property owners taking advantage of retail space switching over to office to implement upgrades.

4. IMPACT EVALUATION FINDINGS

The activities conducted to support the impact evaluation included verifying baseline and technical assumptions, determining savings considering 2009 International Energy Conservation Code (IECC) standards, and estimating a net-to-gross ratio. This chapter summarizes the key impact evaluation findings followed by more detailed analysis resulting from each activity.

4.1 KEY FINDINGS

4.1.1 Engineering and IECC standards review

The engineering review identified the following key findings.

- The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used for other programs. Other than VAV boxes, the algorithms used in the deemed savings calculator (the Calculator) are also consistent with algorithms represented in other programs' TRMs.
- More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. In view of the uncertainty of energy savings found in the engineering review and high free-ridership results, Xcel Energy may want to consider removing VAV boxes as a program measure in the 2010 Colorado Cooling Efficiency Program.
- The Cooling Tower offering was removed from the program in January 2009. The impact evaluation supports this removal (as it does for VAV boxes) due to uncertainty of savings found in the engineering review as well as high free-ridership results.
- The value for peak load coincident factor (CF) of 0.9 used in the Calculator is appropriate to account for gross generator kW saving. The equivalent full load hours (EFLH) provided in the Calculator are also appropriate.
- IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for the program year 2009-2010. Changes from IECC 2006 to IECC 2009 baseline efficiency values will affect savings for rooftop units and chillers. The IECC 2006 and IECC 2009 use different coefficients for the adjustment factor algorithm to account for non-standard water-cooled chillers.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs which do not take into account variations in PTAC sizes.

4.1.2 Net-to-gross ratio

The net-to-gross analysis resulted in the following findings:

- The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 0.51. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 0.21. The resulting self-report net-to-gross ratio is 0.7 for the Colorado Cooling Efficiency Program in 2007–2009.

- Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program.
- Removing cooling towers and VAV boxes, which we recommend be removed from the program, the self reported net-to-gross ratio is 0.75. As this value is within the recommended net-to-gross range from a preponderance of evidence approach, we recommend that this net-to-gross ratio be applied for the 2010 program year.

4.2 VERIFY BASELINE AND TECHNICAL ASSUMPTIONS

Cooling is an energy intensive process and can consume as much as one third of building energy use. Therefore, the need for verification of assumptions and parameters used for determining net energy savings achieved from an efficient cooling measure over a standard (complying with a stipulated minimum code or a baseline) is paramount.

To support the impact evaluation of the Cooling Efficiency Program, we reviewed algorithms used for estimating the deemed energy savings for end-use C&I cooling measures. This was supported through a review of several recent “technical reference manuals” (TRMs). We also reviewed the values of parameters used in the algorithms to assess the industry practices and ascertain their similarity (or dissimilarity) with those currently used by the Xcel Energy’s Colorado C&I “Deemed Savings Technical Assumptions” tool/calculator (“the Calculator”).

We also reviewed TRMs adopted in different jurisdictions in the country to assess consistency in the use of technical assumptions and the underlying algorithms for calculating the energy savings achievable from efficient cooling measures. Each of these TRM sources are summarized in Appendix A. Specific TRMs reviewed include:

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report, 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey’s Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009.

Below we define variables used deemed savings review. Note that different TRMs use varying notations for variables, for example EER_b or EER_{base} for “baseline energy efficiency ratio” of a measure. We designate one notation for a variable, as shown in Table 4-1, regardless of the (different) symbols used for the same variable in different TRMs. This is done to avoid repetition of variable definitions. Also note that terms EFLH and FLH are, at times, used interchangeably among different TRMs. For example the “Efficiency Maine TRM uses the term FLH while other TRMs reference in this study used the EFLH.

Table 4-1. Definition of Variables Included in Deemed Savings Analysis

Variable	Definition
Capacity	Size of a cooling measure (1 Ton = 12,000 BTU/hr)
EER	Energy Efficiency Ratio (3.413* Coefficient of Performance (COP); kW/Ton = 12/EER
SEER	Seasonal Energy Efficiency Ratio (EER/0.85)
EER_b	Energy efficiency ratio of a baseline cooling measure
EER_e	Energy efficiency ratio of an efficient unit
$SEER_b$	Seasonal Energy efficiency ratio of a baseline equipment
$SEER_e$	Seasonal Energy efficiency ratio of an efficient unit
CF	Coincidence Factor: The percentage of the total cooling load during peak hours.
EFLH	Equivalent Full Load Hours: Measure of energy use by season during the on-peak and off peak periods. EFLH is the ratio of measured kWh use during the period divided by design capacity (kW) of equipment.
FLH	Full load hours in a year
PE_b	Peak efficiency of the baseline chiller (kW/ton)
PE_e	Peak efficiency of the energy efficient chiller (kW/ton)
$IPLV_b$	Integrated part load value of the baseline cooling equipment
$IPLV_e$	Integrated part load value of the efficient cooling equipment
CDD	Cooling Degree Days

Xcel Energy's deemed savings calculator for the C&I end-use cooling measures use the following algorithms for air conditioning systems, chillers and VAV boxes.

Rooftop Units, Water Source Heat Pumps, Split Systems, Condensing Units

Energy Savings (Customer kWh) = Capacity x (12/SEERb - 12/SEERe) x EFLH

Demand Savings (Customer kW) = Size x (12/EER_Standard - 12/EER_Eff)

Chillers

Energy Savings (Customer kWh) = Capacity x (IPLVb - IPLVe) x EFLH

Demand Savings (Customer kW) = Capacity x (FLVb - FLVe)

Centrifugal Chillers

FLVb = FLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

IPLVb = IPLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

Temperature Variable, T_var = Chiller Lift + CWTD

Variable Air Volume (VAV) Boxes

Energy Savings (Customer kWh) = #_of_fans x Savings x EFLH x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Demand Savings (Customer kW) = #_of_fans x Savings x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Electrical Energy Savings (Gross Generator kWh) = Customer kWh / (1-TDLF)

Electrical Demand Savings (Gross Generator kW) = Customer kW x CF / (1-TDLF)

Electrical Energy Savings (Net Generator kWh) = Gross Generator kWh x NTG

Electrical Demand Savings (Net Generator kW) = Gross Generator kW x NTG

The following conclusions were drawn from a review of technical reference manuals for algorithms to estimate the energy and demand savings of C&I end-use cooling measures and their related variables.

- The review of different TRMs for energy and demand savings algorithms for C&I end-use cooling measures shows a general consistency in use of the algorithms in different jurisdictions.
- Xcel Energy's Colorado C&I end-use measure deemed savings calculator ("Calculator") uses algorithms that are consistent with other TRMs for most cooling measures.
- The Calculator correctly captures the adjustment factor algorithm for non-standard centrifugal chillers [i.e. chillers not designed to AHRI Standard 550/590 test conditions (44^{o}F leaving chilled water temperature and 85^{o}F entering condenser water temperature with 3 gpm/ton condenser flow rate)]. Also, the Calculator applies the adjusted IPLV values when specifications for non-standard centrifugal chillers are inputted. The instructions on the Calculator show that these adjustments are for standard chillers. The Calculator should add instruction to capture the fact that the adjustment factor is applicable to non-standard centrifugal chillers.
- Accuracy of the algorithms used for estimating energy and demand savings for VAV boxes could not be confirmed by its originator referenced in the Calculator[21]. In addition, none of the TRMs reviewed provides savings algorithms for VAV boxes. In view of this methodological deficiency, we suggest the algorithm currently used by the Calculator as the default algorithm. *However, from the net to gross analysis, we find that free-ridership for VAV boxes is high, indicating reduced efficacy of program support for the measure.* Also, support for VAV boxes has been withdrawn from another Xcel Energy jurisdiction (Minnesota). In view of these, we suggest Xcel Energy consider excluding VAV boxes from the Colorado Cooling Efficiency Program.

[21]Telephone discussion with Mr. Eugene A. Scales, 12th October, 2009.

- The Calculator uses algorithms to determine the peak demand saving for both end-use (equipment) and gross generator level. It uses peak load coincident factor (CF) for generator gross kW saving and applies a value of 0.9. C&I cooling measures are likely to operate when the peak load hours are in effect for the Xcel Energy CO service territory. Therefore, use of a high peak load coincident factor would well capture the peak load savings from the utility perspective. Also, we recommend the need for more research for establishing different CFs for commercial and industrial segments as their end-use load shapes vary.

- Treatment of equivalent full load hours (EFLH) in different TRMs is opaque. Our extensive review of the TRMs shows lack of a clear methodology for estimating the EFLH. Based on our discussion with the representative of Xcel Energy CO Cooling Efficiency Program, we understand that the University of Arkansas had developed a methodology that establishes a linkage between EFLH and climatic variations (or cooling degree days [CDD]). We reviewed the work[22] and find (a) the algorithms are applicable to ground source heat exchangers and (b) no direct linkage with CDD. Also, an algorithm for EFLH for two locations in Arkansas are provided in the Arkansas Deemed Savings TRM that makes a direct relationship of EFLH with CDD through the following relation:

$$EFLH = A \times (CDD)^{b+1}$$

Where A and b are coefficients and their values are provided in the TRM for different building types.

The EFLH values developed for the Calculator are based on more advanced methodology that analyzed weather bins (based on dry bulb temperatures). Also, we understand from discussions with the Xcel Energy representatives that the market segment data for end-use cooling measures were used (along with occupancy and operational characteristics of the facilities).

Since there is a general methodological void in the estimation of EFLH in TRMs, and the Calculator uses EFLH values that are estimated using more robust methodology (as communicated by the Xcel Energy representatives), we recommend that the EFLH values currently applied in the Calculator are continued.

4.3 DETERMINE SAVINGS CONSIDERING 2009 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) STANDARDS

As part of the engineering review, we reviewed baseline efficiency values for C&I cooling measures based on the "International Energy Conservation Code 2006" (IECC 2006). We understand that for the program year 2009-2010, the Xcel Energy Colorado Cooling Efficiency Program will continue to use IECC 2006 codes for defining the baseline efficiency of cooling measures. We also conducted a forward-looking study in the event that Xcel Energy Colorado C&I cooling efficiency program replaces IECC 2006 stipulation by those of

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[22] Sutton et al. (2002)a. An Algorithm for Approximating the Performance of Vertical Bore Heat Exchangers Installed in a Stratified Geological Regime. ASHRAE TRANSACTIONS 2002, V. 108. And

Sutton et al. (2002)b. Comparison of Multilayer Borefield Design Algorithm (MLBDA) to Available GCHP Benchmark Data. ASHRAE TRANSACTIONS 2002, V. 108, Pt. 2.

the IECC 2009 in the future. The tabulation of baseline efficiencies of end use measures that will result from adopting IECC 2009 stipulations are for informational purposes only.

We calculated the baseline efficiency of C&I cooling measures according to the IECC 2006 in Table 4-2 as the IECC 2006 codes will remain effective for the program years 2009 and 2010. Also, we provide IECC 2009 stipulations in Table 4-3 for any future use by the Xcel Energy Colorado C&I Cooling Efficiency Program. We compared the baseline measure efficiency values obtained from the IECC handbooks with those provided in the Calculator to identify any changes.

The Calculator converts the EER into SEER (and vice-versa) with a multiplier of 0.85. In addition, the Calculator shows the EER and IPLV values by deducting 0.2 to take into account the effect of heating section (other than electrical resistance heat). However, we do not apply these conversion factors to the baseline efficiency values.

The review of the baseline efficiency values for cooling measures from the IECC 2006 and IECC 2009 handbooks and the Calculator shows that:

- There is no change in the values of baseline efficiencies for Condensing units, PTACs and Water-source heat pumps for the IECC 2006 and IECC 2009.
- For Rooftop units, IECC 2009 baseline efficiency values are greater than those of the IECC 2006.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except that for the PTACs.
- The Calculator needs to modify the algorithm for calculation of baseline efficiencies for PTACs to take into account variations in PTAC sizes (in line with the algorithms provided in the IECC 2006 or IECC 2009).
- We are unable to confirm the baseline efficiency for VAV box used in calculator and suggest that the value used currently is the default. However, as discussed above, these may be removed from the 2010 program.
- For Chillers IECC 2009 stipulates measure baseline efficiencies for two paths i.e. Path A and B. The Path B is intended for part-load operation.
- The IECC 2006 and IECC 2009 use different coefficient for the adjustment factor algorithm to account for non-standard water cooled chillers to the baseline efficiency.

The analysis, by equipment type, is detailed in Appendix B.

Table 4-2. Baseline Efficiency of C&I Cooling Measures—IECC 2006

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	9.7		ARI 210/240
≥ 5.4 -11.3 tons		10.3	
≥11.3 -19.9 tons		9.7	ARI 340/360
≥ 19.9–63.3 tons		9.5 (ILPV: 9.7)	
> 63.3 tons		9.2 (ILPV: 9.4)	
Split Systems < 5.4 tons	10		ARI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	ARI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			ARI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

Table 4-3. Baseline Efficiency of C&I Cooling Measures—IECC 2009

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	13		AHRI 210/240
≥ 5.4 -11.3 tons		11.2	
≥11.3 -19.9 tons		11.0	AHRI 340/360
≥ 19.9–63.3 tons		10.0 (ILPV: 9.7)	
> 63.3 tons		9.7 (ILPV: 9.4)	
Split Systems < 5.4 tons	13		AHRI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	AHRI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			AHRI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

4.4 HOURS OF OPERATION

We compared the operating hours obtained through the survey of the program participants with those reported in the Commercial Business Energy Consumption Survey (CBECS) database. We understand from our interviews with Xcel Energy staff that the operating hours for different business types from the CBECs database were used to develop the effective full load hours for the Calculator (the C&I Cooling Efficiency Deemed Savings Calculator). As shown in the table below, the operating hours reported in the participant survey and those obtained from the CBECs database for different business segments are, in general, consistent.

Table 4-4. Comparison of Participant's Self-reported Operating Hours with CBECS database

Business Type	Operating Hours (Weekly)			
	Participants' Response	Survey sample (n)	CBECS Database	# of buildings (in '000)
Education	56	10	50	386
Lodging	168	2	167	142
Office	64	17	55	824
Retail	55	7	59	443

4.5 NET-TO-GROSS ANALYSIS

Program attribution (or the net-to-gross ratio) refers to energy impacts that can be confidently attributed to program efforts. As discussed at the start-up meeting, Xcel Energy needs an overall net-to-gross ratio for the program for their 2010 planning.

We estimated the net-to-gross ratio following the California self report framework for standard net-to-gross projects[23], which uses a preponderance of evidence approach. Our estimate is based on 1) interviews with 2007–2009 participating customers and influential vendors, 2) in-depth interviews with trade allies, 3) in-depth interviews with Xcel Energy account managers, and 4) literature review and benchmarking interviews with program managers of similar programs in the US.

4.5.1 Data collection and study methodology

An initial net-to-gross ratio was calculated based on customer self-reports. The standard net-to-gross analysis specified in the California framework uses three primary sources of information to estimate net-to-gross: program files and information, participant (decision-maker) survey, and vendor (participating trade ally) surveys. Our approach to using each of these information sources for estimating free-ridership and spillover is described in more detail below.

Table 4-4 shows the number of survey respondents by managed and non-managed account and measure type. The self-reported net-to-gross ratio was calculated from these respondents.

[23] Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers, Prepared for the Energy Division, California Public Utilities Commission by the Nonresidential Net-To-Gross Ratio Working Group, Revised May 8, 2009. This method estimates net-to-gross directly rather than estimating 1 minus free-ridership.

Table 4-5. Breakdown of Respondents Used to Calculate the Net-to-Gross Ratio

		Unweighted Count
Account type	Managed	44
	Non-managed	10
	Total	**54**
Prescriptive measures	Chillers	7
	Condensing units	2
	Cooling Towers	1
	PTAC	3
	Rooftop	29
	Split Systems	3
	VAV Boxes	4
	Total	**49**
Custom measures	Chillers	2
	Install new PMZ3 units in lieu of multi-zone RTUs	1
	Plate and frame heat exchanger	1
	Replace old condensing unit with evaporative cooler	1
	Total	**5**

The decision-maker survey, targeted at participating customers, asked highly structured questions about actions that would have been taken in the absence of the program. The survey was guided by information in program files. Respondents were first asked a series of questions to establish project context. Next, they were asked to rate the importance of program influences vs. non-program influences. Third, they were asked to rate the significance of different factors and events that may have led to their decision to install the efficient equipment at the time they did, including questions on the age or condition of the equipment, type of project, recommendations received, and their business policies related to equipment purchases.

The decision-maker survey also collected information about what participants would have done in the absence of the program. Specifically, respondents were asked a number of questions to assess the impact the program had on the timing, quantity, and efficiency level of the measure installed:

- Did the program impact the timing of the decision to replace cooling equipment and, if so, by how many months/years?
- Did the program impact the quantity of equipment installed, and if so, by how much (partial free-ridership)?
- Did the program impact the efficiency of equipment installed and, if so, by how much (partial free-ridership)?

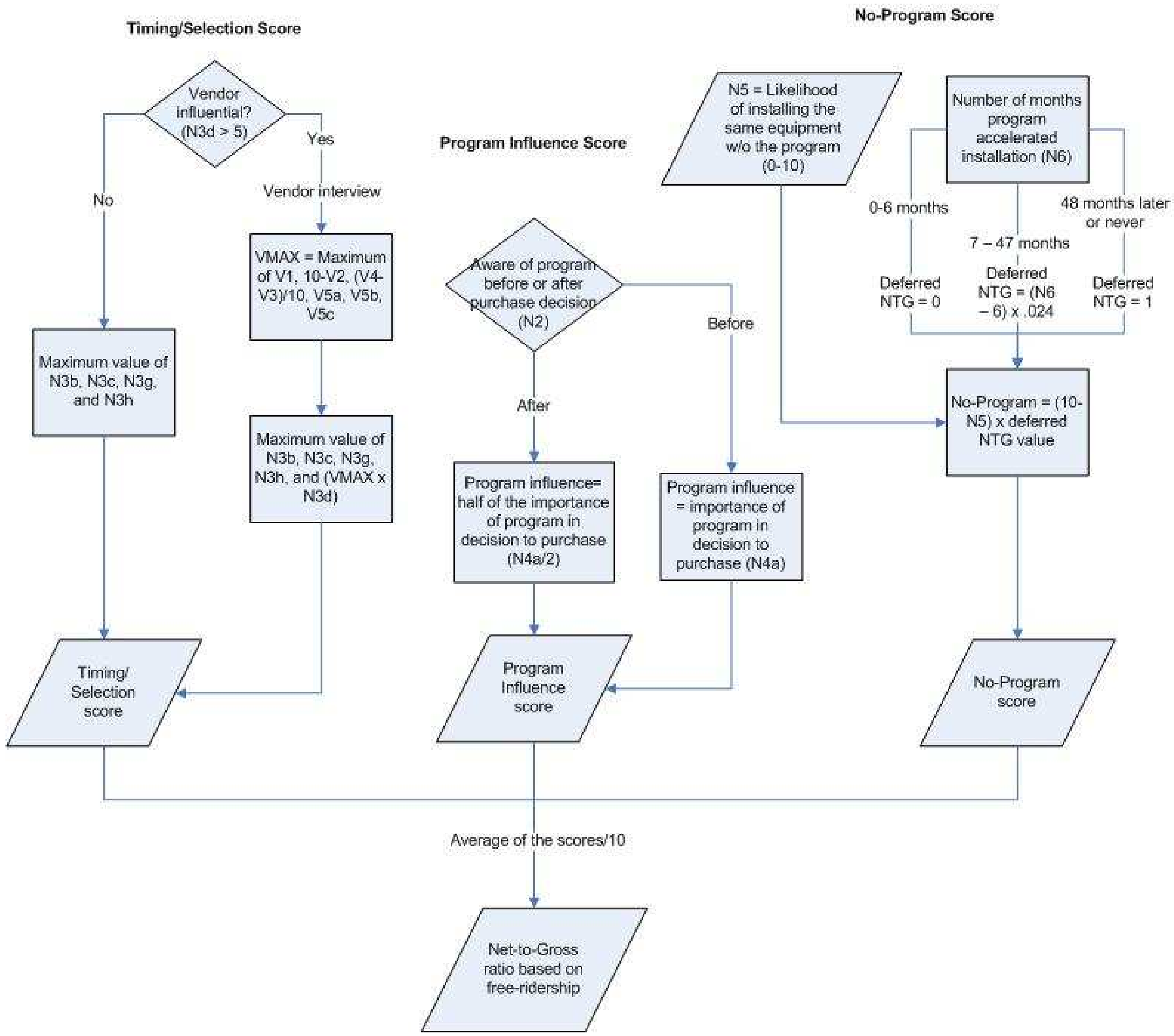
4.5.2 Measuring self-reported free-ridership

The calculation of the self-report-approach net-to-gross ratio based on free-ridership is summarized below in text and in Figure 4-1. In summary, the net-to-gross ratio based on free-ridership is calculated as an average of three scores representing responses to one or more questions about the decision to install a program measure:

1. A **timing and selection score** that captures the influence of the most important of various program and program-related elements in influencing the customer to select the specific program measure at this time. Program influence through vendor recommendations is also captured in this score when the customer says the vendor was influential in their decision. In these cases, the influential vendor was also interviewed and their responses were incorporated into the timing and selection score.
2. An overall **program influence** score that captures the perceived importance of the program (whether rebate, recommendation, or other information) in the decision to implement the specific measure that was eventually adopted or installed. The overall program influence score is reduced by half if the respondent says they learned about the program only after they decided to install the program qualifying measure.
3. A **no-program** score that captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. This score accounts for deferred free ridership by capturing the likelihood that the customer would have installed program qualifying measures at a later date if the program had not been available.

The core net-to-gross ratio is the average of these three scores divided by 10, as shown in Figure 4-1 below.

Figure 4-1. Net-to-Gross Ratio Flowchart Based on Self-report Free-ridership



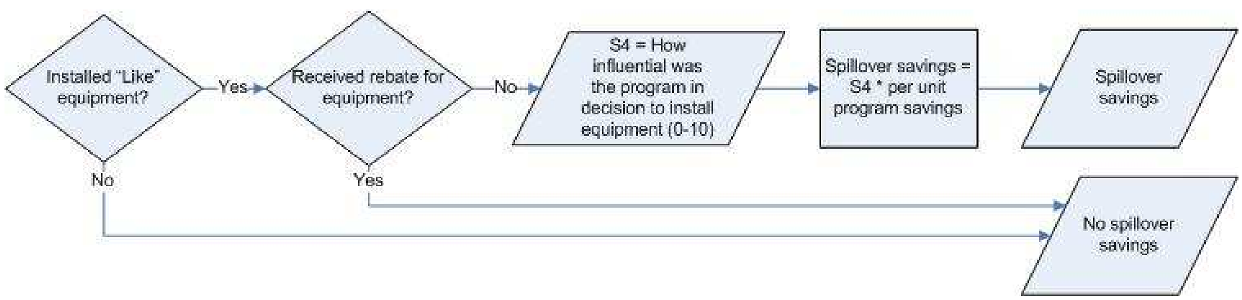
The California framework defines partial free-ridership as when, in the absence of the program, the participant would have installed something more efficient than the program-assumed baseline efficiency but not as efficient as the item actually installed as a result of the program. Of the 54 participants interviewed, five stated that, in absence of the program, they would have installed something more efficient than the standard equipment but less efficient than the equipment that was rebated through the program. For these cases, an adjustment should either be made to the net-to-gross ratio or to the gross savings. For all fives cases, we believe that the calculated net-to-gross ratio already accurately accounts for the impact of the program on these participants. Therefore, no further adjustment to the net-to-gross ratio was made.

4.5.3 Measuring self-reported spillover

The self-report protocol included a battery of questions to quantify spillover for use in estimating spillover. The spillover methodology uses a series of questions designed to measure "like" spillover. These questions ask about recent purchases (since program participation) of any additional energy-efficient equipment of the same type, installed through the program, made *without* any technical or financial assistance from the utility, but influenced by the program. A “like” spillover estimate is computed based on how much more of the same energy-efficient equipment the participant installed outside the program because of their positive experience with the program.

One of the issues with attempting to quantify spillover savings is how to value the savings of measures installed outside the program since we are relying on customer self-reports of the quantity and efficiency of any measures installed. We used a conservative approach and reported only those measures installed outside the program that were of exactly the same type and efficiency as the ones installed through the program (“like” spillover). Our conservative approach allowed customers to be more certain about whether the equipment they installed outside the program was the same type as the program equipment. This, in turn, made it possible for us to use the estimated program savings for that measure to calculate the customer’s “like” spillover savings. Figure 4-2 details the process for quantifying spillover savings.

Figure 4-2. Spillover Savings



We also attempted to measure the extent of free-drivers, or nonparticipant spillover. The data for this type of analysis could be collected from nonparticipants directly or from the design professionals and vendors who recommended, sold, and/or installed qualifying high efficiency equipment. We prefer to survey the design professionals and/or vendors primarily because they typically provide much more accurate information about the efficiency level of installed equipment than nonparticipants. Our experience has shown that customers cannot provide enough data about the new equipment they have installed to allow for accurate estimates of the energy savings achieved from the equipment. While they usually can report what type of equipment was installed, they typically cannot provide sufficient information about the quantity, size, efficiency, and/or operation of that equipment to allow us to determine whether the equipment is "program-eligible." On the other hand, design professionals and equipment vendors who have worked with the program are typically more knowledgeable about equipment and are familiar with what is and is not "program-eligible."

The in-depth interviews with participating vendors suggested little nonparticipant spillover due to the program at this time given the economy, the incremental cost of high efficiency cooling equipment, and the fact that this is only the third year of the program. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high

efficiency equipment. Therefore, there are no adjustments to the net-to-gross ratio based on free-drivers.

4.5.4 Self-report net-to-gross results

The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 51 percent. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 21 percent. The resulting self-report net-to-gross ratio is 0.7[24] for the Colorado Cooling Efficiency Program in 2007–2009.

We recommend Xcel Energy set a net-to-gross ratio in the range of 0.7 to 0.8 for the Colorado Cooling Efficiency Program, depending on program eligibility requirements. We recommend a net-to-gross range because as eligible program equipment changes (as it did between 2008 and 2009), we expect program attribution to change. Because we expect net-to-gross analysis will only be conducted periodically for the program, a realistic range allows Xcel Energy flexibility to set the net-to-gross ratio based on program eligibility requirements.

For example, PA Consulting has conducted biannual net-to-gross surveys for National Grid's commercial HVAC program. Prior to 2007, National Grid was using CEE Tier 1 eligibility standards for HVAC equipment. In 2002, the free-ridership rates for HVAC equipment ranged from 40 to 44 percent. In 2005, the free-ridership rates for HVAC equipment ranged from 41 to 56 percent. National Grid increased the eligibility standards to CEE Tier 2 in 2007. In 2007, with the higher eligibility requirements, free-ridership rates dropped significantly from 8 to 15 percent[25].

Results from the benchmarking review of HVAC programs that estimated a net-to-gross ratio ranged from 0.50 (when the net-to-gross ratio only includes free-ridership) to 0.85 (when the net-to-gross ratio includes spillover). This is in line with the self-report net-to-gross estimates from 2007–2009 Colorado Cooling Efficiency program participants discussed above.

There is also qualitative evidence from the 30 in-depth interviews with participating and nonparticipating trade allies which supports a net-to-gross range of 0.7 to 0.8. The qualitative results indicate that the program is helping to overcome barriers of selling high efficiency cooling equipment. In addition, the interviews suggest a medium level of spillover to customers of participating trade allies, supporting the medium to high level of spillover found in the customer survey. Nonparticipating trade allies were much more likely to say selling high efficiency cooling equipment to customers is very difficult. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary drivers for the difficulty rating they gave. They also mentioned lack of knowledge or education on the benefits of high efficiency equipment.

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[24] Net-to-gross = (1 - .51) + .21

[25] The Northeast has significantly higher electric rates than Colorado and National Grid's program is very mature, which has supported the success of moving to the higher CEE Tier levels. We are not recommending that this be done for the Xcel Energy Colorado Cooling Efficiency Program, but instead use it as an illustrative example of how changes in program eligibility affects program attribution.

Participants' self-report results substantiate the trade ally interview findings as participants with high net-to-gross ratios often stated that they were trying to achieve a good return-on-investment or that the rebate allowed them to purchase higher efficiency equipment.

> *"We purchased an existing building so we had access to their utility bills so we know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and (the rebate was) part of the reason we were able to make the investment."* (net-to-gross ratio = .79)
>
> *"We were doing upgrades anyway so it worked out to get rebates to help us get more efficient equipment."* (net-to-gross ratio = .83)

At the same time, there is qualitative evidence supporting a certain amount of program free-ridership—also found in the customer self-report calculations. Xcel Energy account managers discussed that larger accounts tend to have standard practices toward energy efficiency. Participants with low net-to-gross ratios often stated that the equipment they installed through the program was their only option or mandated by regulations, supporting the account managers' perspectives.

> *"[The equipment was] the only choice we had for a flat roof building for the tenant re-finish."* (net-to-gross ratio = .27)
>
> *"It's giving me money back for stuff I'm already going to do, stuff that I'm mandated to do."* (net-to-gross ratio = .25)
>
> *"We got money back on something we would have had to do anyway."* (net-to-gross ratio = .35)

For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program. This ratio excludes VAV boxes and cooling towers, which yielded lower net-to-gross ratios. We recommend VAV boxes be removed from the program based on the engineering review and net-to-gross analysis, and cooling towers were removed from the program in 2009.

5. RECOMMENDATIONS

This chapter outlines recommendations for Xcel Energy's consideration. These recommendations are based on activities and key findings detailed within this report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

5.1 PROCESS RECOMMENDATIONS

5.1.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to

reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Ally Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

5.1.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

5.1.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program.

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn't even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

5.2 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007-2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007-2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

APPENDIX A: TECHNICAL RESOURCE MANUAL REVIEW SUMMARY

This appendix summarizes the findings through the review of five programs' Technical Resource Manuals (TRMs).

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report; 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review; 2009.

A.1 EFFICIENCY MAINE TRM

The Efficiency Maine TRM provides algorithms for three categories of cooling measures, (a) small cooling measures with capacity less than 65,000 BTUh[26], (b) large cooling systems having capacity 65,000 BTUh or more[27,28], and (c) Electric Chillers.

Small Systems

Energy Saving (kWh) = Capacity (kBTU/hr) × (1/SEERb - 1/SEERe) × FLH

Demand Saving (kW) = Capacity (kBTU/hr) × (1.1/SEERb - 1.1/SEERe)

Large Systems

Energy Saving (kWh) = kBTU/hr × (1/EERb - 1/EERe) × FLH

Demand Saving (kW) = kBTU/hr × (1/EERb - 1/EERe)

Electric Chiller

Energy Saving (kWh) = Capacity (tons) × (PEb - PEe) × FLH

Demand Saving (kW) = Capacity (tons) × (PEb - PEe)

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[26]Measures include small split system and single package air conditioners and heat pumps excluding room air conditioners PTACs, PTHPs, water source heat pumps and ground source heat pumps.

[27] Air conditioners, PTAC's, water-source heat pumps

[28]Although the TRM provides algorithm for electric chillers, it recommends energy saving calculations derived from detailed engineering analysis of the

The TRM uses 800 full load cooling hours (FLH) for small systems. We discuss the measure efficiency values (SEER, EER or PE) in Section 4.2 as part of the IECC 2006 and IECC 2009 baseline stipulations.

A.2 ARKANSAS DEEMED SAVINGS TRM

Two types of cooling measures included in the TRM are (a) Unitary air conditioners and (b) electric chillers. The algorithms used for quantifying the energy saving are as follows.

Unitary Air Conditioners:

Energy Saving (kWh) = Capacity (BTU/hr) x (1/1000) x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (BTU/hr) x (1/1000) x (1/EERb - 1/EERe)

The TRM uses IECC 2003 for defining the measure baseline efficiencies. The expression for the equivalent full load hours is:

$EFLH = A \times (CDD)^{b+1}$

For unitary systems the TRM provides calculated EFLH for two cities i.e. "Fort Smith (FS)" and "Little Rock (LR)" in Arkansas State as shown in Table A-1. However, the methodology used for calculating the EFLH values is not provided in the TRM.

Table A-1. Calculated EFLH for Unitary Cooling Equipment*

City	Stage	M-Fri, 7 a.m. to 5 p.m.	M-Fri, 7 a.m. to 7 p.m.	M-Fri, 9 a.m. to 10 p.m.; Sun, 11 a.m. to 6 p.m.	All week, 6 a.m. to 10 p.m.	All week, 6 a.m. to Midnight	All week, All day
Fort Smith	Single	1,207	1,444	2,033	2,520	2,739	3,230
	Dual	854	1,020	1,443	1,750	1,881	2,155
Little Rock	Single	1,177	1,383	1,948	2,419	2,627	3,137
	Dual	801	938	1,303	1,611	1,730	1,997

*Source: Arkansas Deemed Savings Quick Start Program Commercial Measures: Final Report (Page 2–25)

Electric Chillers:

Energy Saving (kWh) = Capacity (ton) x 3.517 x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (ton) x 3.517 x (1/COPb - 1/COPe), and

$EFLH = A \times (CDD)^{b+1}$

The coefficients A and B for calculating the EFLH for different building types are given in the TRM and shown in Table A-2.

Table A-2. Coefficients for calculating EFLH

Building Type	A	B
Education—Community College	327.83	-0.8835
Education—Secondary School	240.98	-0.9174
Education—University	512.11	-0.9148
Health/Medical—Clinic	313.54	-0.8437
Health/Medical—Hospital	730.76	-0.8836
Lodging	589.61	-0.8750
Office	657.91	-0.9437
Retail	404.00	-0.8645

The Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator also mentions use of the same methodology for estimating the EFLH. The EFLH estimates were developed by analyzing facility occupancy and operating hour distribution based on (a) Minnesota “occupation and employment statistics” data, (b) TMY2 data for Denver and Grand Junction and (c) building characteristics data from CBECS. This methodology would provide a better estimation of the EFLH values, although may always not be accurate. A detailed investigation of the methodology used for estimating the EFLH values currently being used for Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator is beyond the scope of the current study.

A.3 PENNSYLVANIA ENERGY EFFICIENCY AND CONSERVATION PROGRAM TRM

The TRM provides energy and demand saving algorithms for C&I cooling measures for room and central air conditioners split systems, packaged terminal systems, and water source heat pumps. Also, the TRM provides energy saving algorithms for electric chillers.

Air Conditioner:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ - $1/EER_e$) x EFLH

Demand Savings (kW) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ - $1/EER_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. A coincident factor (CF) of 0.67 is used in the demand savings calculations. The EFLH hours are obtained for seven locations within the state using the “Energy Star Calculator” of the Department of Energy[29].

[29]At the time of writing, we were unable to obtain the EFLH from the Energy Star Calculator hosted at the DOE website. The calculator needs input of the FLH or EFLH, else it uses a default value of 2000 Hrs.

Table A-3. EFLH for Seven Locations in Pennsylvania

Place	EFLH (hours)
Allentown	784
Erie	482
Harrisburg	929
Philadelphia	1032
Pittsburgh	737
Scranton	621
Williamsport	659

Electric Chillers

Energy Savings (kWh) = Tons X (kW/ton_b – kW/ton_e) X EFLH

Demand Savings (kW) = Tons X (kW/ton_b – kW/ton_e) X CF

The algorithms for estimating energy and demand saving are loosely linked to the equipment efficiency rating. The TRM uses the same CF and EFLH values as used for the air conditioning equipment.

A.4 CONNECTICUT CL&P AND UI PROGRAM SAVINGS TRM

The TRM provides algorithms for estimating the energy and demand savings for unitary air conditioners, as follows:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. The full load cooling hours are given for around sixty facility types ranging from 564 hours to 1308 hours (Table 2.0.0; page 246) also shown in Table 6.5 in this report. For demand saving estimation a peak load factor (CF) of 0.82 is recommended (Table 1.1.1; page 231).

For chillers the TRM recommends custom calculated energy savings based on specific equipment capacity, operational staging, operating profile, and load profile.

A.5 NEW JERSEY'S CLEAN ENERGY PROGRAM ENERGY IMPACT EVALUATION AND PROTOCOL REVIEW

This report is a well-researched TRM. It reviews energy and demand savings algorithms for end-use cooling (and other) measures from TRMs used in different jurisdictions. The report recommends algorithms for air conditioners and chillers. The air conditioning systems include unitary/split systems, PTACs, Water-source heat pumps etc.

Air Conditioners:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

Electric Chillers

Energy Savings (kWh) = Tons X (IPLVb - IPLVe) X EFLH

Demand Savings (kW) = Tons X (IPLVb - IPLVe) X CF

The TRM recommends a single value of 1360 hrs for EFLH and 0.67 for the CF (page 3-58).

Table A-4. Full load cooling hours by facility type*

Facility Type	Full Load Cooling Hours	Facility Type	Full Load Cooling Hours
Auto Related	837	Medical Offices	797
Bakery	681	Motion Picture Theaters	564
Banks, Financial centers	797	Multi-Family (Common Areas)	1306
Church	564	Museum	797
College-Cafeteria	1139	Nursing Homes	1069
College-Classes/Administrative	646	Office (General Office Types)	797
College-Dormitory	709	Office/Retail	797
Commercial Condos	837	Parking Garages & Lots	878
Convenience Stores	1139	Penitentiary	1022
Convention Centers	564	Performing Arts Theaters	646
Dining-Bar Lounge/Leisure	854	Police/Fire Stations (24 Hrs)	1306
Dining-Cafeteria/Fast Food	1149	Post Office	797
Dining-Family	854	Pump Stations	563
Entertainment	564	Refrigerated Warehouse	648
Exercise Center	1069	Religious Buildings	564
Fast Food Restaurants	1139	Residential (Except Nursing Homes)	709
Fire Station	564	Restaurants	854
Food Stores	837	Retail	837
Gymnasium	646	Schools/University	594
Hospitals	1308	Schools (Jr/Sr. High)	594
Hospital/Health Care	1307	Schools (Preschools/elementary)	594
Industrial- 1 Shift	681	Schools (Technical/Vocational)	594
Industrial-2 Shift	925	Small Services	798
Industrial- 3 Shift	1172	Sports Arena	564
Laundromats	837	Town Hall	797
Library	797	Transportation	1149
Light Manufacturers	681	Warehouse (Not Refrigerated)	648
Lodging (Hotels/Motels)	708	Waste Water Treatment Plant	1172
Mall Concourse	938	Warehouse	798
Manufacturing Facility	681		

*Source: New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009 (page 3-41).

APPENDIX B: IECC 2006 AND IECC 2009 EQIUPMENT ANALYSIS

B.1.1 Rooftop units

For all RTU sizes the EER (SEER and/or IPLV) values stipulated in the IECC 2009 are greater than those in IECC 2006. The measure baseline efficiency values used in the Calculator (reduced by 0.2 to account for the heating section) are consistent with the codes.

B.1.2 Water source heat pump

No change in EER values between IECC 2006 and IECC 2009. The Calculator and IECC 2006 values are consistent.

B.1.3 Condensing units

No change in EER values between IECC 2006 and IECC 2009. The Calculator uses EER value for air cooled condensing units only and this is in agreement with IECC 2006 value. The EER and (IPLV) values for water or evaporative cooled condensers are also provided in the Tables 6.7a and 6.7b.

B.1.4 Packaged Terminal Air Conditioners (PTAC)

No change in equipment baseline efficiencies between IECC 2006 and IECC 2009. Minimum energy efficiency ratio (EER) for PTACs according to both IECC 2006 and IECC 2009 is given by the following relation:

New Construction:

EER = 12.5 - (0.213*Capacity/1000)

Replacement:

EER = 10.9 - (0.213*Capacity/1000)

Code handbooks stipulate that for PTAC capacity less than 7,000 BTU/hr (0.58 ton) the equation should use default capacity value of 7000 BTU/hr to calculate the EER. Similarly, for equipment capacity over 15,000 BTU/hr the default capacity is 15,000 BTU/hr. Based on the above assumptions we calculate the EER values shown in Table 6.6a and 6.6b.

The Calculator uses a single EER value of 9.1 (excluding 0.2 for heating section); based on an average value of PTAC size obtained from the Xcel Energy CO market segment data. Plugging the EER value of 9.3 (9.1 + 0.2 for heating section) in above algorithms leads to PTAC sizes of about 15,000 BTU/hr and 7,000 BTU/hr for new construction and replacement units respectively. This does not capture the PTAC sizes that fall within the 15,000 BTU/hr and 7000 BTU/hr range. . We recommend that the Calculator applies the above algorithm to take into account the capacity variations for PTACs.

B.1.5 Electric chillers

In Table B-1 and B-2 we provide baseline measure efficiencies for electric chillers. The "Full Load Value (FLV) in kW/ton" and "Integrated Part Load Value (IPLV) in kW/ton" provided in the Calculator and the IECC 2006 handbook are consistent.

Table B-1. Baseline Efficiency of C&I Chillers—IECC 2006

Cooling Measures	IECC 2006		
	FLV (kW/ton)	IPLV (kW/ton)	Test Procedure
Scroll/Screw Chiller < 150 tons	0.79	0.78	ARI 550/590
Scroll/Screw Chiller ≥150 tons and < 300 tons	0.72	0.71	
Scroll/Screw Chiller ≥ 300 tons	0.64	0.63	
Centrifugal Chiller < 150 tons	0.65	0.65	
Centrifugal Chiller ≥150 ton and < 300 tons	0.63	0.63	
Centrifugal Chiller ≥ 300 tons	0.58	0.58	
Air-Cooled Chillers ≥ 150 tons	1.41	1.41	

Note: For non-standard centrifugal chillers (chillers not designed to standard ARI 550/590 test conditions) the IPLV is factored for adjustment (according to the algorithm well captured in the Calculator).

The IECC 2009 codes for water cooled chillers contain the amendments made by the ASHRAE 90.1—2007 standards. Two paths have been established—Paths A and B. Path B is intended for measure applications where significant time is expected at part load and all Path B chillers need demand-limiting controls.

Table B-2. Baseline Efficiency of C&I Chillers—IECC 2009

Measure	IECC 2009				
	Path A		Path B		
	FLV kW/ton	IPLV kW/ton	FLV kW/ton	IPLV kW/ton	Test Procedure
Scroll/Screw Chiller < 75 tons	≤0.78	≤0.63	≤0.0.80	≤0.60	AHRI 550/590
Scroll/Screw Chiller ≥75 and <150 tons	≤0.78	≤0.62	≤0.79	≤0.59	
Scroll/Screw Chiller ≥150 and <300 tons	≤0.68	≤0.58	≤0.72	≤0.54	
Scroll/Screw Chiller ≥ 300 tons	≤0.62	≤0.54	≤0.64	≤0.49	
Centrifugal Chillers < 150 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥150 and < 300 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥300 and < 600 tons	≤0.58	≤0.55	≤0.60	≤0.40	
Centrifugal Chillers ≥ 600 tons	≤0.57	≤0.54	≤0.59	≤0.40	
Air-Cooled Chillers ≥ 150 tons	≥9.6 EER	≥12.75 EER	NA	NA	

The adjustment factor for non-standard chillers is given by the following equation.

Adjusted NPLV = IPLV/K_{adj}

K_{adj} = 6.174722 – 0.303668(X) + 0.00629466 $(X)^2$ – 0.000045780 $(X)^3$

X = D_{std} + LIFT

D_{std} = (24 + FLV*6.83)/Flow rate

LIFT = CEWT – CLWT (^oF)

CEWT = Full load condenser entering water temperature (^oF)

CLWT = Full load leaving chilled water temperature (^oF)

Note that the coefficients of the equation for K_{adj} provided in the IECC 2009 are different from that in IECC 2006.

APPENDIX C: PARTICIPANT AND NONPARTICIPANT SURVEY RESPONSE RATES

Table C-1 presents the response rate and cooperation rate to the participant survey, and Table C-2 presents the same information for nonparticipants.

Table C-1. Cooling Efficiency Program Participant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**134**	**23**	**157**
Number not in service[4]	1	0	1
Non-working number[4]	0	3	3
Person not at number	7	0	7
Adjusted Sample Size	***126***	***20***	**146**
Hard Refusal	28	3	31
Soft Refusal[1]	0	0	0
Incompletes (partial interviews)	0	0	0
Unavailable for duration	3	2	5
Language barrier/non-English	0	0	0
Active[2]	***51***	***5***	**56**
Completed Surveys[5]	**44**	**10**	**54**
Cooperation Rate[3]	***34.9%***	***50.0%***	***42.5%***

[1] Attempts were made to convert all soft refusals

[2] An average of 16.7 contacts per active case were made to reach these still active cases

[3] Number of completed surveys divided by Adjusted Sample Size

[4] All bad numbers were traced with a telephone append service or directory assistance service

[5] Surveys were completed with 54 participants at 44 locations

Table C-2. Cooling Efficiency Program Nonparticipant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**156**	**572**	**728**
Temporarily disconnected[4]	1	5	6
Fax/data line[4]	4	3	7
Disconnected number[4]	1	30	31
Residential number	12	59	71
Ineligible—no commercial cooling	18	80	98
Ineligible—terminated during survey	12	77	89
Adjusted Sample Size	***108***	***318***	**426**
Hard Refusal	24	69	93
Soft Refusal[1]	0	2	2
Incompletes (partial interviews)	1	4	5
Unavailable for duration	3	14	17
Language barrier/non-English	0	2	2
Active[2]	***58***	***187***	**245**
Completed Surveys	**27**	**62**	**89**
Completed Surveys—Swamp Coolers Only	**1**	**7**	**8**
Completed Surveys—Doesn't Pay Cooling	**4**	**15**	**19**
Cooperation Rate[3]	29.6%	26.4%	***28.0%***

[1] Attempts were made to convert all soft refusals

[2] An average of 9.8 contacts per active case were made to reach these still active cases

[3] Number of completed surveys divided by Adjusted Sample Size

[4] All bad numbers were traced with a telephone append service or directory assistance service

PA Consulting Group

Xcel Energy

Process and Impact Evaluation for the Colorado Business Cooling Efficiency Program

FINAL REPORT

January 15, 2010

Xcel Energy

Process and Impact Evaluation for the Colorado Business Cooling Efficiency Program

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Prepared for: Xcel Energy

PA Consulting Group
6410 Enterprise Lane
Suite 300
Madison, WI 53719
Tel: +1 608 316 3700
Fax: +1 608 661 5181
www.paconsulting.com

Version: 1.0

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1. EXECUTIVE SUMMARY

This report provides the process and impact evaluation results of Xcel Energy's Colorado Commercial and Industrial (CO C&I) Cooling Efficiency Program.

OVERVIEW OF THE PROGRAM

The Cooling Efficiency program, which Xcel Energy launched in 2006, provides rebates to non-residential customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Oversized cooling towers
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps

The program targets both new construction and existing buildings. The program further distinguishes between prescriptive and custom installations.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively. [1]

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has struggled to elicit small business customer participation.

The program leverages the trade ally infrastructure, along with Xcel Energy staff such as account managers and Business Solutions Center representatives, to provide program outreach. Understanding the importance of the trade allies' roles, the program has an assigned Trade Relations Manager who provides education and outreach to trade allies throughout the state.

[1] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

1.1 METHODOLOGY

The purpose of the process and impact evaluation were to “assess customer satisfaction with the program being evaluated, and to make changes that should be made to technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator’s own research as well as through review of industry-wide and the Company’s current processes, technical assumptions and NTG ratios.[2]”

The process evaluation was designed to provide Xcel Energy with a thorough understanding of process issues such as barriers to participation, satisfaction with customers, and opportunities for improvement. The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate net-to-gross ratios. The impact evaluation also set out to verify that Xcel Energy’s baseline and technical assumptions of efficiency measures used for calculating gross and net savings are reasonable and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[3], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Data collection activities included in the evaluation are detailed below. These activities informed both the process and impact (e.g., net-to-gross) analysis.

Table 1-1. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[4]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

[2] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

[3] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes as well as the impact of the 2009 IECC standards on future program years instead of looking backward to codes that no longer apply.

[4] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

1.2 KEY FINDINGS

The 2009 program successfully achieved its energy savings goals even though it increased its savings goals from the 2008 program year. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent, and 106 percent of the goals respectively.

The evaluation found that while the program effectively engaged managed accounts, the program is not as effectively reaching small and/or non-managed customers. This key finding will not come as a surprise to program staff—the evaluation confirmed that it is an issue through database analysis and in-depth interviews. Interviews identified that there are unique barriers for small commercial customers particularly for chain accounts that occupy leased facilities.

The evaluation also found that leveraging trade allies is critical for programs such as Xcel Energy's Cooling Efficiency Program. Effectively reaching and integrating trade allies into the program's outreach and marketing campaign was identified in the benchmarking study as a best practice; program managers of mature and successful programs said they leverage trade allies successfully, although developing those relationships admittedly takes time. Xcel Energy's Cooling Efficiency Program is moving in the right direction by employing an assigned Trade Relations Manager to reach trade allies.

Although the trade ally infrastructure is key to program success, there is a need to continue to strengthen the demand of high efficiency cooling equipment from the customer. Interviews identified a need for continued education with customers and specific marketing materials for target groups.

The remainder of this key findings section organizes findings by research objectives detailed in the Xcel Energy Cooling Efficiency Request for Proposal. Research objectives relevant for each subsection are denoted in the footnotes. The process and impact evaluation chapters provide further support and documentation of these key findings.

1.3 PROCESS EVALUATION KEY FINDINGS

1.3.1 Program design and operations[5]

Program staff and trade allies commended the prescriptive programs' application process, commenting that the application form is relatively easy to complete with clear instructions. The custom application process did not receive such favorable reviews from respondents. Respondents found the application process difficult and commented on the rebate estimation and verification process as areas for improvement.

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[5] **This section addresses the following objectives:**

1) Gauge efficiency of the application process and determine opportunities to improve the application process.

2) Identify areas where the program/processes/marketing can be improved to capture more customer participation.

Having an assigned Trade Relations Manager to communicate with trade allies is seen as a critical role by program staff. However, interviewees questioned whether one staff member was sufficient for the entire state. Additional support in reaching trade allies was identified by Xcel Energy staff as a means for capturing more customer participation.

The Business Solution Center (BSC) is also viewed favorably by program staff as a referral point for the non-managed and small business customers. However, interviews revealed that the BSC should be more involved in marketing to customers. BSC staff said they planned to proactively market to customers in the future, although they admitted to not having specific marketing materials for these customers.

As noted in the recommendations section, the program should consider developing targeted marketing materials and provide those materials to BSC staff. Other recommendations include increasing the rebate level to capture a group of nonparticipants that otherwise would not participate and provide education and training opportunities to customers.

1.3.2 Customer characteristics and experiences[6]

The program is primarily serving managed accounts. Consequently, the nonparticipant group is far more likely to be comprised of non-managed accounts than the participant group. Participants are also more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Other points of distinction between the participant and nonparticipant groups are variability in hours of operation by season and building ownership.

The majority of participants said there is typically more than one person involved in the decision of whether to purchase cooling equipment. The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. The age or condition of the old equipment was the most important factor.

Overall, program participants are satisfied with the Cooling Efficiency program and the various aspects of the program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied.

[6] **These key findings address the following objectives:**

1) Identify characteristics and firmographics to help define current participants and target similar non-participants.
2) Assess customer decision-making processes regarding participating in the CO C&I Cooling Efficiency Program.
3) Gauge program participant satisfaction.

1.3.3 Target market for Xcel Energy's cooling efficiency program[7]

Trade ally interviews discussed the significant potential for the Cooling Efficiency Program in Colorado's commercial market. According to trade allies and Xcel Energy staff interviews, small commercial customers are underserved by the program, as documented in the program literature[8] and confirmed by trade allies and program staff in this program evaluation. These small commercial and non-managed organizations tend to be capital constrained and lease space. Therefore, they do not have ownership of the equipment installed but have to pay the energy bills. An effective suggestion for targeting these customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Additionally, large commercial customers are oftentimes opting to repair rather than replace failing equipment. The stock of cooling equipment is aging for these customers. Trade allies envision a significant need for cooling equipment replacement and an opportunity for the Cooling Efficiency program in the future.These factors, along with relatively low participation numbers since program inception, indicate that that there is significant opportunity for the program to provide cooling efficiency services to the commercial sector.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

1.3.4 Marketing and outreach[9]

The program employs a variety of resources to provide marketing and outreach to customers and trade allies. These resources include the BSC, Trade Relations Manager, and account managers, as well as direct mailings developed by Xcel Energy. Trade allies are particularly critical for reaching customers.

The participant surveys explored the effectiveness of these outreach efforts. Account managers followed by their HVAC vendors have been the most effective outreach channels for program participants.

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[7] **These key findings address the following objectives:**

1) Quantify program saturation in the market including untapped markets of non-participants and remaining markets for existing program participants.
2) Identify the most attractive target populations that currently participate in the program.
3) Identify the target population that currently do not participate in the program.

[8] *2009 Cooling Efficiency Marketing Plan.*

[9] **These key findings address the following objectives:**

1) Identify channels for information about the CO C&I Cooling Efficiency Program
2) Determine nonparticipants' awareness level of Colorado's C&I Cooling Efficiency Program
3) Identify preferred channels for information about the CO C&I Cooling Efficiency Program

Approximately a quarter of nonparticipants are aware of the program. The most common way nonparticipants heard about the program was through Xcel Energy direct mail. Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, followed by email. Trade ally and internal staff identified a need for these marketing materials to be more specific to target sectors, such as small commercial customers.

Trade allies appreciate receiving information through mail; however, the evaluation identified that personal contact is most effective for providing information about the program. Trade allies also requested that a dedicated website be established to communicate program information and tools.

1.3.5 Barriers to purchasing new equipment or participation[10]

The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital. Customers will contact trade allies when it is time to replace the equipment. Current economic conditions and costs were identified by participating and nonparticipating trade allies, and nonparticipating customers, as barriers to purchasing efficient cooling equipment. The barriers included the incremental cost of high efficiency cooling equipment as well as the first cost of cooling equipment.

Several trade allies differentiated the barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost. For larger customers, the main barrier was initial cost due to their need for larger cooling equipment. A number of these customers decide to repair rather than replace equipment. Another notable barrier was triple-net leases, which are reported as very common among commercial customers. Non-financial barriers for moving customers to higher efficiency cooling equipment include customers' lack of awareness and/or understanding of the benefits of high efficiency equipment.

Customers' financial constraints and tendency to replace equipment on failure reinforce the need for trade allies to be intimately familiar with the program and be provided with materials and tools so they can easily and quickly provide information to customers in these situations.

1.4 IMPACT EVALUATION KEY FINDINGS[11]

The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used

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[10] **These key findings address the following objectives:**

1) Identify barriers to participation

2) Determine reasons for not participating in the program

[11] **These key findings address the following objectives:**

1) Verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and vendor's own findings.

2) Calculate Net-to-Gross ratios including and identifying the effect from free riders, free drivers, and spillover.

for other programs. The values for peak load coincident factor (CF) and equivalent full load hours (EFLH) provided in the Calculator are appropriate.

More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. Based on the review of other programs and the engineering estimates, the recommendations include removal of VAV boxes from program offerings.

IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for both the 2009 and 2010 program years. The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the Package Terminal Air Conditioners (PTACs), which do not take into account variations in PTAC sizes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

The self-reported net-to-gross ratio for 2007–2009 participants using the California self-report methodology was is 0.7 for the Colorado Cooling Efficiency Program. Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program. The net-to-gross results identified through the benchmarking study are in line with the results from this Xcel Energy Cooling Efficiency evaluation, which used the California net-to-gross framework[12].

1.5 RECOMMENDATIONS

These recommendations are based on activities and key findings detailed within the report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

1.6 PROCESS RECOMMENDATIONS

1.6.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates

[12] The program has used a net-to-gross ratio of .94 through 2009 and per Xcel Energy recommendations from this evaluation will not be retroactively imposed on 2009 or prior program achievement but will be used moving forward beginning in 2010.

program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Relations Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to

pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

1.6.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

1.6.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program. .

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn't even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

1.7 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007–2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross

ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007–2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

2. INTRODUCTION

This report presents the results of the 2009 process and impact evaluation of the Xcel Energy Colorado Business Cooling Efficiency program. In this chapter, we discuss the program overview and logic model, study objectives, evaluation methodology, and organization of the report.

2.1 PROGRAM OVERVIEW AND LOGIC MODEL

2.1.1 Program overview

Cooling is the second highest use of electricity for most commercial buildings[13]. Xcel Energy began offering a Cooling Efficiency program for its Colorado commercial and industrial customers in 2006.

The Cooling Efficiency program offers rebates to eligible customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps.

The program targets both new construction and existing buildings and provides rebates for whole systems, as well as specific components. The incentives differ by the type of cooling equipment purchased. Variable Air Volume Boxes and Cooling Towers have a fixed rebate amount. All other equipment types have a base rebate per ton, and the rebate amount increases incrementally if the equipment exceeds the minimum efficiency requirements necessary to qualify for the base rebate amount.

The program further distinguishes between prescriptive and custom installations. The custom program requires that all projects be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification.

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has not been gaining broad acceptance with customers and vendors as quickly as anticipated. Small business participation is a known

[13] Commercial Building Energy Consumption Survey, 2007

challenge for the program, and the recent economic conditions have also hampered program acceptance.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively.[14]

Table 2-1 details the number of customers that participated in the program and related savings by year. While the program is still relatively young, the trend indicates the program has gained momentum. There was a significant increase in participation between 2006 and 2007; however, the participation numbers remained relatively constant between 2007 and 2008 while the savings decreased. The program experienced program design changes between 2008 and 2009. The baseline assumption and requirements for eligible equipment increased. In 2009, there was an increase in both participants and achieved savings, meeting the annual savings goals for the first time.

Table 2-1. Number of Customers and Related Savings by Year

Program Year	Number of Participating Customers	Marketing kW Achieved	Generator kW Achieved	MWh Savings Achieved
2006	49	903	693	1,417
2007	113	2,342	517	4,934
2008	123	1,998	1,176	3,540
2009	175	4,262	5,181	6,558

Source: Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

The program provides program outreach through a variety of sources including the trade ally infrastructure and Xcel Energy staff. Key Xcel Energy outreach staff includes the account managers as well as Business Solutions Center representatives whose role it is to provide outreach and services to non-managed accounts. Recognizing the importance of the trade allies' role, the program has an assigned Trade Ally Manager who provides education and outreach to trade allies throughout the state. The program also receives guidance from a trade Cooling Council which first began meeting in 2008.

2.1.2 Logic model

Xcel Energy's Colorado Cooling Efficiency Program undertakes a number of activities to capture both energy and demand savings with Xcel Energy's commercial customers as well as result in the long-term increased penetration of energy efficient cooling equipment among all business sectors of its commercial population in Colorado. Xcel Energy runs the program internally; therefore, the development and refinement of the program infrastructure is a major

[14] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

activity of the program. The other main activities include outreach to trade allies, customer communications, and rebating eligible equipment.

Figure 2-1 is the program's logic model that identifies program activities, targeted market actors, outputs, and expected outcomes. A well-designed logic model serves as a roadmap to understanding logical relationships among program interventions and potential issues and problems. It communicates a performance story about what the program is trying to achieve, through what interventions, and with respect to which market actors. This logic model was developed based on program materials, discussions at the start-up meeting, and interviews with Xcel Energy staff involved in program management and implementation.

Figure 2-1. Colorado Cooling Efficiency Program Logic Model

Inputs/ Resources	Sufficient budget is allocated Xcel Energy Cooling Efficiency Team* Outside technical resources	Marketing collateral, Program website Xcel Energy Cooling Efficiency Team Xcel Energy technical assistance	Marketing collateral, Program website Account managers, Business Service Center (BSC) and trade allies Xcel Energy technical assistance
Activities	**Develop Program Infrastructure** →	**Outreach to Trade Allies** →	**Customer Communications** →
Outputs	The Cooling Efficiency program has been in the CO market since 2006 Program measures, rebates and marketing strategy, technical assumptions developed, refined and documented. Internal website and training Tracking system developed (appropriate information is requested, captured and entered into Siebel)	Participate in events of local chapters of HVAC associations and market to their members, energy efficiency fairs Hold semi-annual trade Cooling Council meeting and ad-hoc meetings Involve trade allies in developing rebate structures and new products	Account managers, BSC representatives and trade allies refer customers to the program Targeted direct communications to business customers and other outreach such as newsletters, energy efficiency fairs Print and radio advertisement on Energy Efficiency Programs
Short to medium term outcomes	Improved energy efficiency program awareness and participation Xcel Energy staff knowledgeable about the program and its resources Refine Xcel Energy product offerings High customer satisfaction	Trade allies are knowledgeable about the rebate structure and program guidelines Trade allies regularly communicate the program to customers and include rebate with bids Trade allies receive technical assistance from Xcel Energy engineers	Program offering is meaningful, clear, and valuable to customers Business customers' awareness of and participation in the program increases significantly Business customers receive needed technical assistance from Xcel Energy engineers
Long term outcomes	Energy saving goals of the Cooling Efficiency program are achieved within budgetary constraints	Increased trade allies' stocking and sales of AC energy efficient technologies and increased participation of customers in the program	Increased awareness of and demand for energy efficiency equipment in all business segments

* Core members of the Xcel Energy Cooling Efficiency team include the product manager, energy efficiency management, marketing assistants, Trade Relations Manager, and energy efficiency engineer staff. Ancillary members of the Cooling Efficiency team include market research, account management, advertising, corporate communications, information services, regulatory affairs, rebate operations, Business Solutions Center (BSC), and legal.

2.2 STUDY OBJECTIVES

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make recommendations that should be made to

technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and Xcel Energy's current processes, technical assumptions and NTG ratios.[15]"

Xcel Energy identified several key evaluation objectives for both the process and impact evaluations. The process evaluation was designed to provide Xcel Energy with a thorough understanding of participating and nonparticipating commercial customers' and trade allies' awareness of the program, satisfaction with the program, barriers to participation, and opportunities for program improvements. It was also designed to provide information on how to target and market to various segments within the commercial population to increase participation.

The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate NTG ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering 2009 International Energy Conservation Code (IECC) standards, developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

2.3 EVALUATION METHODOLOGY

This section outlines the process and impact evaluation methodology, including data collection methods used to support the evaluation.

2.3.1 Process evaluation methodology

The evaluation included numerous activities in 2009 to directly address the process evaluation objectives. These activities included:

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[15] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

Table 2-2. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[16]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

Internal review. This activity included a project kick-off meeting; a review of existing program documentation, marketing materials, and the program tracking system; and in-depth interviews with ten Xcel Energy internal staff. PA interviewed the Cooling Efficiency program manager, two rebate processors, two Business Solutions Center (BSC) representatives, one Trade Relations Manager, two account managers, and the team lead energy efficiency engineer. These interviews were used to clarify the roles and responsibilities of staff and trade allies; program goals and successes/challenges in meeting those goals; the effectiveness of the programs' operations relative to the defined program goals and objectives; and reasons for variance in program performance by customer class (e.g., small business and other customer segments such as retail/office, food services).

Based on the internal review and project kick-off meeting, PA developed a detailed evaluation plan and program logic model.

Participating customer surveys. The participant survey collected information about participant characteristics and firmographics, equipment decision-making processes (including remaining markets for existing program participants), source(s) of program information, satisfaction with key aspects of the program and the application process, barriers to participation, the effect of the program on their decision to install qualifying equipment, and suggestions for program improvements. In addition to providing data to estimate a net-to-gross ratio, the survey addressed key assumptions to the savings algorithm such as hours of use and baseline (what would have been installed without the program).

PA completed telephone interviews with 54 businesses that participated in the Xcel Energy Cooling Efficiency Program ("participants") since the program started (2007–2009). Some businesses participated in the program at multiple locations. Forty-four unique respondents represented these 54 businesses.

A detailed response rate table for the participant (and nonparticipant) surveys can be found in Appendix C.

Nonparticipating customer surveys. The nonparticipant survey was designed to help characterize the market for energy efficient HVAC equipment in terms of the types of

[16] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

customers and decision-makers. The survey collected data on program awareness, preferred sources of information, market barriers to participation, equipment decision-making processes, and characteristics and firmographics.

PA completed telephone interviews with 116 customers who had not completed a project through the Xcel Energy Cooling Efficiency Program since the program began ("nonparticipants"). Eighty-nine of these businesses had commercial cooling equipment and paid cooling costs to Xcel Energy ("eligible nonparticipants"). Nineteen of these businesses had cooling costs included in their lease and eight businesses had swamp coolers as their only cooling equipment. These businesses completed a shortened version of the survey ("ineligible nonparticipants").

Customer-identified Influential Trade Allies. The participant customer surveys were also used to assess free-ridership and spillover using a California influenced (and Xcel Energy approved) free-ridership and spillover battery. When assessing free-ridership and spillover, it is critical to speak with the person or persons most involved in the decision-making process. As we have found through other HVAC free-ridership and spillover studies, the decision maker is often not the customer. Rather, select trade allies tend to be influential in the decision-making process. In cases where the customer identified the trade ally as being influential in the decision, we also attempted to speak with the trade ally. PA completed 11 surveys with influential trade allies to assess the influence of the program on that particular project.

Participating and nonparticipating trade ally interviews. The participating and nonparticipating trade ally interviews provided rich qualitative information regarding program design and program impacts. PA sampled a census of participating trade allies from the program database, including those with very little activity. We also received a list of nonparticipating trade allies to sample from.

PA conducted in-depth interviews with 17 participating and 13 nonparticipating trade allies. These trade allies included those that supplied, installed, and serviced cooling equipment, as well as an engineer and several equipment suppliers. The interviews probed on a variety of issues including type of business activities, awareness of the program and program offerings, source of program information, barriers to customer (particularly small business) and trade ally participation, and recommendation practices for efficient equipment and program influence in these practices. The interviews also explored trade allies' perception of the difference in purchasing and decision-making practices between different commercial customer segments (small, medium, large, national chain accounts vs. independently owned) and the impact of the economy on the trade allies' abilities to promote, stock, and sell program-qualifying equipment. In addition, the trade ally interviews also attempted to gather information that could be used to assess market affects or other program-related impacts such as free-ridership and spillover[17].

Peer utility program benchmarking review. This task included a literature review, Internet research, and program manager and program evaluator interviews for eight similar utility

[17] Free-ridership refers to customers who participate in programs and obtain incentives for actions they claim they would have taken without the incentive. Spillover refers to savings induced by the program but not achieved (and claimed) through other utility programs.

programs. The benchmarking was designed to identify standard approaches and best practices in programs that are similar in scope and objectives to Xcel Energy's Cooling Efficiency program in Colorado. Specifically, the review examined program goals, objectives, and scope; effectiveness of the program in meeting goals and objectives; key elements of program design; marketing and recruitment of customers; quantification of program impacts; rebate levels; product offerings; application process; trade ally incentives and/or Quality Installation requirements; and trade ally outreach (especially to small business).

2.3.2 Impact evaluation methodology

The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[18], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Verify baseline and technical assumptions. The impact evaluation reviewed the 2009 baseline and technical assumptions using information relevant to Xcel Energy's territory and made recommendations concerning any adjustments we believe Xcel Energy should make going forward. The review activities included: (1) tracking system review, (2) engineering assumption review, and (3) participant survey results and project file review.

Calculate gross savings with IECC 2006 codes. The impact evaluation focused on 2009 program participants and on future years rather than reviewing assumptions retroactively. PA reviewed tracking system data from the Program Year 2009 applications that had been used to estimate program savings (Colorado uses IECC 2006 codes as the 2009 program baseline). For Program Year 2010, Colorado will also be using IECC 2006. Future program years after 2010 may be shifting the baseline to the IECC 2009 codes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

Develop net-to-gross ratio. The net-to-gross ratio was calculated based on interviews with 1) 2008–2009 participating customers and influential vendors, 2) in-depth interviews with contractors, and 3) a literature review and benchmarking interviews with program managers of similar programs in the US.

2.4 ORGANIZATION OF THE REPORT

Section 3 of this report presents the findings from the various process evaluation activities, and Section 4 presents the findings from the impact evaluation activities. Section 5 provides suggested recommendations for program changes that could increase participation, reduce burden, and increase program impacts.

Appendix A contains the Technical Resource Manual review summary and Appendix B contains the IECC 2006 and IECC 2009 equipment analysis conducted as part of the impact

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[18] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes instead of looking backward to codes that no longer apply.

evaluation activities. Appendix C contains the response rates to the participant and nonparticipant customer surveys.

3. PROCESS EVALUATION FINDINGS

This chapter presents the results of the process evaluation based on interviews with internal program staff, participant and nonparticipant customer surveys, participant and nonparticipant trade allies, and the benchmarking review. These results are organized as follows:

- Key findings
- Program administration, processes, and resources
- Participating and nonparticipating customer characteristics
- Participating customer satisfaction with the program
- Customer awareness and marketing
- Customer decision making processes
- Trade ally results
- Benchmarking results
- Program potential
- Opportunities for improvement

3.1 KEY FINDINGS

Before discussing the results we present the overarching key process evaluation findings. Key findings are detailed by program design and operations, customer experiences, trade ally experiences, and barriers to new equipment purchases and program participation.

3.1.1 Program design and operations

- Program staff believe the Prescriptive component of the program is an area of the program that is working well. They have experienced frustration with the custom program and reported there have been trade allies and customers also frustrated with this component of the program. Trade ally interviews confirmed some level of frustration with the custom component of the program, although the issue did not arise through interviews with program participants who received services through the custom program. In fact, the post-inspection process, which was a point of contention raised in internal and trade ally interviews, received a high rating of satisfaction by custom program participants.
- Xcel Energy employs an assigned Trade Relations Manager to communicate and work directly with trade allies in Colorado. Having this assigned Trade Relations Manager was seen as a critical role by program staff, although having only one person fill this role for the entire state may mean that more rural or outlying areas are not being reached.
- The Business Solution Center (BSC) is viewed favorably by program staff as a referral point for the non-managed and small business customers. However, there is little direct marketing activity to small commercial customers through the BSC.
- Several program staff commented on the need to receive information regarding program changes in a more formal manner.

- Xcel Energy's Cooling Efficiency program is consistent with other programs as identified in the benchmarking study. Measures with incentives and other incentives are within range of or slightly lower than other programs.

- The benchmarking study attempted to identify net-to-gross ratios used by other programs. Some programs were able to provide their net-to-gross ratios based on evaluation efforts, although most program managers were unable to provide this information as either they use a deemed net-to-gross value or are not required to report net-to-gross ratios for their program. The primary and secondary data review provided context for the Xcel Energy net-to-gross results, indicating that the results are in line with other programs.

- The benchmarking study identified a variety of best practices for cooling programs.
  - Utilize key account representatives and trade allies as much as possible for program communication.
  - Become fully educated on trade associations when leveraging them to target customers. Identify all associations representing that particular market segment and have control mechanisms in place to scale down or ramp up depending on activity level.
  - Identify a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs.
  - Set effective rebate and efficiency levels. A comparison of rebate levels in other programs with Xcel Energy’s found Xcel Energy’s rebates are some of the lowest for air conditioning systems. Xcel Energy is also rebating a lower SEER rating for packaged and split AC units than other programs.
  - Streamline the application process.
  - Engage the customer early in their decision-making process to influence their choice of equipment.
  - Provide customer education and assistance as well as the rebate. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers.

3.1.2 Customer characteristics and experiences

- There are some differences in customer characteristics between participants and nonparticipants. Participants are more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Participants are also more likely to be managed accounts. Although the average operating hours do not differ between participants and nonparticipants, participants are significantly more likely to have hours that very by the season or operating cycle. Participants are also more likely to own their building, and are more likely to report having taken an action in the past few years to reduce energy use.

- Overall, program participants are satisfied with the Cooling Efficiency program. They were also satisfied with the various aspects of the program, such as the post-inspection process, type of equipment eligible, the contractor they worked with and the rebate application process. Both participants and non-participants were satisfied with Xcel Energy in general.

- Approximately one-fourth of nonparticipants are aware of the program. The most common way that aware nonparticipants heard about the program was through Xcel Energy direct mail or a HVAC vendor.
- Account managers have been the most effective outreach channel for program participants, cited by 55 percent of participants. Hearing about the program through a HVAC vendor was the next most common way of learning about the program. Provided a significant portion of the program population is managed accounts, it is not surprising that account managers were identified by customers as the most notable means for hearing about the program.
- Few customers mentioned marketing materials as a means for hearing about the program. Interviews with program staff identified that the marketing materials distributed to customers and available to program staff are fairly generic, although the customer sectors that the program serves are unique.
- The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment.

3.1.3 Trade ally experiences

- Nearly three-quarters of nonparticipating contractors are aware of the program; therefore, lack of general awareness does not seem to be a barrier to program participation (although deeper understanding of the program is important). Participating and nonparticipating trade allies heard about the program through Xcel Energy representatives, materials, events, customers, and other Xcel Energy programs.
- The primary program-related benefits noted by trade allies are: being more price competitive by including the Xcel Energy rebate, and the ability to communicate and educate customers on energy efficiency by promoting the program. Trade allies saw the benefits for customers as primarily the cost savings, although increased energy efficiency was also mentioned.
- While participating trade allies are generally optimistic that their participation in the program will increase in the next 12 months, their optimism does not extend to the high efficiency HVAC market in general. They project it will continue to be difficult to convince customers to adopt high efficiency equipment due to financial constraints.
- Trade allies commented that it is more difficult to sell high efficiency equipment in replace-on-failure situations where decisions need to be made quickly. Therefore, it is important for trade allies to not just be aware of the program, but be intimately familiar with the program so they can easily and quickly provide information to customers in these situations.

3.1.4 Barriers to purchasing new equipment or participation

- The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital, mentioned by almost two-thirds of nonparticipants. This is consistent with information received from the trade ally interviews. When nonparticipants do need to replace equipment, contractors will be their first contact point.
- Both participating and nonparticipating trade allies corroborated nonparticipating customers' perception of purchasing barriers and identified the economy, coupled with the incremental cost of high efficiency cooling equipment as well as the first cost of cooling

equipment, as primary barriers for purchasing new, high-efficiency equipment. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high efficiency equipment as are leased buildings.

- Several trade allies distinguished the differences in barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost—the difference between standard and high efficiency equipment. For larger customers, the main barrier was first cost—large equipment is expensive and customers tend to repair it instead of replace it as long as possible (especially in the current economy).
- Another notable barrier was triple-net leases, which are reported as very common among commercial customers. In these situations, the customer does not own the building, but is responsible for the mechanical equipment. Trade allies report these customers are less likely to make the investment in high efficiency cooling equipment as they are unsure of how long they will be in the building and therefore may not realize the payback of the higher efficiency equipment.
- Non-financial barriers for moving customers to higher efficiency cooling equipment included customers' lack of awareness, knowledge, and/or understanding of the benefits of high efficiency equipment. Trade allies expressed the need for tools to help sell high efficiency equipment, and the need for more direct communications with Xcel Energy staff to understand program benefits, requirements, and obtain information necessary to help them sell equipment through the program.
- Trade allies provided a variety of suggestions for overcoming barriers, which typically corresponded to their perception of the barriers for selling high efficiency equipment. Suggestions for overcoming barriers include increasing the rebate levels, better educating trade allies on the program, helping them to sell high efficiency equipment by providing tools to help with the sales process (e.g., savings calculator), making the custom component of the program less burdensome and more transparent for trade allies and customers, and directly marketing the program to customers. Participating trade allies also suggested that Xcel Energy have more personal communications with them to provide information about the program.

3.2 PROGRAM ADMINISTRATION, PROCESSES, AND RESOURCES

As documented throughout this report, program participants, trade allies, and program staff generally speak favorably about this program. The Prescriptive component of the program in particular was mentioned by all parties interviewed as a component of the program that is working well.

Interviews with program staff, customers, and trade allies investigated the effectiveness of program administration, processes, and resources. This section summarizes the results of those interviews.

3.2.1 The prescriptive program and application process

The Cooling Efficiency Prescriptive Program's application process received special kudos from respondents, especially when they were comparing the program to other Xcel Energy programs. They commented that the application was streamlined, clear, and relatively easy to complete and process. This is particularly important amongst larger customers who do not

have time to deal with convoluted program processes and paperwork. This is consistent with remarks made by trade allies regarding the prescriptive application process.

Program participants were also generally satisfied with the application process, rating the process an average of 8.5 on a 0- to 10-scale where 10 indicates they were extremely satisfied with the processes. A majority of these program participants (52 percent) reported filling out the rebate application themselves and 10 percent of applications were completed by the equipment vendor.

3.2.2 Role of assigned trade relations manager

Two groups were specifically discussed as potential targets for Xcel Energy's Cooling Efficiency Program at the kick-off meeting: the trade allies and the non-managed accounts. The program is attempting to reach these targeted groups through the use of an assigned Trade Relations Manager and the Business Solutions Center (BSC).

The assigned Trade Relations Manager's role is to communicate and work directly with the trade allies in Colorado. It was clear through the interviews, and from our experience, that the trade allies are an important group to reach and inform about the program. They are a primary marketing tool for the program as they are often the first point of customer contact, especially for small commercial customers. They also have the opportunity to steer customers toward program-qualifying equipment with an eye to program requirements. Therefore, having this assigned Trade Relations Manager was seen as a critical role, and a positive component of the Cooling Efficiency Program.

Various program staff discussed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification. The trade allies discussed earlier in this report also raised this as a need for the program. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

The Trade Relations Manager is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, but he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado. There is question about whether the single Trade Relations Manager is sufficient to reach trade allies given the expanse of the state and differences in region.

The BSC focuses on increasing the participation of the non-managed accounts. The BSC is primarily responsible for fielding calls to the non-managed accounts and will in the near future provide proactive outreach to these customers through their outbound call center (this was not yet happening at the time of the interviews). Account Managers and the Trade Relations Manager spoke favorably of having the BSC as a referral point for the non-managed and small business customers. They appreciate the ability to refer customers they meet that are not managed accounts to this call center.

3.2.3 Program communications

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes.

Currently the program employs several methods of communication to staff working on the Xcel Energy Cooling Efficiency Program. The company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates.

Several individuals interviewed commented on the need to receive information regarding program changes more formally. They recognize that they receive emails with these updates sent to them, but the emails tend to get buried in day-to-day activities. One individual said he found out about program changes from a vendor rather than through an Xcel Energy Communication. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effectively getting the information across.

Trade allies interviewed also commented that they would like to receive more information from Xcel Energy as discussed in the trade allies section. For example, one trade ally requested the development of a website specifically directed at trade allies to provide easy access to updates and program information.

3.2.4 Program marketing tools

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency.

The marketing materials distributed to customers and available to program staff are fairly generic. Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist amongst small business customers and commercial organizations that are in leased space.

Retailers were also identified by program staff as a difficult to serve group. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease space so they do not have ownership over the equipment installed (yet have to pay the energy bills).

Additionally, program staff identified an additional complexity of serving the common area. The common area in shopping malls consumes a significant amount of energy but depends on building owners to retrofit the equipment.

Little direct marketing activity is currently aimed at small commercial customers through the Business Solutions Center. At the time of the interviews they were only working reactively with

customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it appears there is little cross-referral between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

Program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

3.3 PARTICIPATING AND NONPARTICIPATING CUSTOMER CHARACTERISTICS

The evaluation reviewed businesses that participated in the Xcel Energy Cooling Efficiency program from its inception in 2006 through July 2009. A total of 285 businesses participated in the program during this time period.

Table 3-1 shows the distribution of the population of participants by SIC category, compared to the population of the nonparticipant population. The largest proportion of participants are in the services and retail trade sectors, accounting for almost two-thirds of all participants. When compared to the nonparticipant population, retail trade establishments are overrepresented in the participant population, while finance, insurance, and real estate establishments are underrepresented in the participant population.

Table 3-1. SIC Breakdown of Participants and Nonparticipants

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Services	34% (N=76)	30% (N=33,648)
Retail Trade	30% (N=67)	15% (N=16,602)
Finance, Insurance, And Real Estate	9% (N=21)	19% (N=20,812)
Public Administration	6% (N=14)	8% (N=8,968)
Manufacturing	5% (N=11)	4% (N=5,052)
Transportation, Communications, Electric, Gas, And Sanitary Services	2% (N=5)	5% (N=5,582)
Construction	1% (N=2)	5% (N=5,645)
Wholesale Trade	1% (N=2)	4% (N=5,003)
Ag, Forestry, and Fishing	0% (N=0)	2% (N=2,278)

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Mining	0% (N=1)	0% (N=349)
Not classified	10% (N=23)	7% (N=7,938)

Source: Xcel Energy Participant and Nonparticipant Population Databases

The program struggles with small business and non-managed account participation. Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. However, in the nonparticipant population, only 3.3 percent of businesses are managed accounts.

The below analysis further characterizes participants and nonparticipants in terms of their hours of operations, building characteristics, energy saving activities, and general satisfaction with Xcel Energy. The analysis distinguishes between eligible and non-eligible nonparticipants. Eligible nonparticipants are classified as businesses that have commercial cooling equipment and the cooling costs included in their electric bill to Xcel Energy. Ineligible nonparticipants either have their cooling costs included in their lease or have swamp/evaporative coolers as their commercial cooling equipment. Businesses that reported not having cooling equipment were not interviewed.

Statistically significant differences between participants and nonparticiants at the 90 percent confidence interval are noted in the text. Caution should be used when reviewing differences between different groups due to the small sample size of the participant group.

3.3.1 Building characteristics

Participating and nonparticipating customers primarily occupy free-standing buildings (70 percent participant, 65 percent eligible nonparticipant). Ineligible nonparticipants were least likely to occupy free-standing buildings (46 percent ineligible nonparticipants).

While the trade ally interviews discussed that renting a building was a barrier to participation, the survey results show that a large proportion of eligible nonparticipants actually own their building. Approximately one-half of participants and eligible nonparticipants reported owning their building. Only 24 percent of ineligible nonparticipants own their building. Participants were more likely than all nonparticipants to manage the property (19 percent versus. 3 percent).

3.3.2 Energy conservation activities

Businesses that participated in the Xcel Energy Cooling Efficiency program were more likely to report having taken an action in the past few years to reduce energy use than nonparticipants. Eighty three percent of participants said they made some change to reduce energy use, compared with 72 percent of eligible nonparticipants and 53 percent ineligible nonparticipants. These differences are statistically significant.

Of the changes discussed, the change that showed the largest difference between participant and nonparticipant responses was installing high efficiency lighting equipment. Fifty two percent of program participants that said they made a change also said they installed high-

efficiency lighting equipment in the past two years, compared with 27 percent of eligible nonparticipants and 11 percent of ineligible nonparticipants. Although not explored specifically in the survey, one explanation for the significant difference is that customers are being cross-referred to one program when they participate in the other.

3.3.3 Satisfaction with Xcel Energy

Overall, program participants and nonparticipants are very satisfied with Xcel Energy, with participants indicating the highest satisfaction. When asked to rate their satisfaction on a 0- to 10-scale, with 10 being very satisfied, 93 percent of participants rated their satisfaction with Xcel Energy as a 6 or higher compared with 89 percent of eligible nonparticipants and 74 percent of ineligible nonparticipants.

Sixty-four percent of participants said they were extremely satisfied with Xcel Energy by rating their satisfaction as 8 or higher, compared with 53 percent of eligible nonparticipants and 35 percent on ineligible nonparticipants.

3.4 PARTICIPATING CUSTOMER SATISFACTION WITH THE PROGRAM

Overall, program participants are very satisfied with the Xcel Energy Cooling Efficiency program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied. Some explanations from customers on why they rated their program satisfaction as nine or above are as follows:

> *"It gives us money to spend on energy efficient projects we wouldn't have had. I use the rebate program all the time." —program participant*

> *"We had a couple questions on the application and the representative was very helpful in answering our question and guiding us on how to complete the application" —program participant*

> *"We purchased an existing building so we had access to their utility bills. We know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and part of the reason we were able to make the investment was because of the Xcel program." —program participant*

> *"It has a pretty easy process and the rebates came quickly." —program participant*

In addition to being asked about their overall satisfaction with the Xcel Energy Cooling Efficiency program, participants were asked their satisfaction level with various aspects of the program (using the same scale with 0 being not at all satisfied and 10 being very satisfied). As shown in Table 3-2, the average rating for all aspects of the program was 7.5 or higher. Participants of the custom program were also satisfied with the program, specifically the post-inspection process which they rated 9.2. The three aspects of the program with the lowest satisfaction rating (less than 8 on the 10 point scale) were the amount of time it took to receive the rebate, the length of time it took from project start to end, and the requirements for equipment eligibility.

Table 3-2. Participant Satisfaction with Specific Aspects of the Program

Specific Aspects of the Program	Mean rating (0-10 scale)
Post-inspection process (n=5, custom only)	9.2
Type of equipment eligible for program (n=43)	8.7
Contractor who installed equipment (n=44)	8.5
Rebate application process (n=43)	8.5
Support you received from Xcel Energy (n=43)	8.1
Pre-approval process (n=5)	8.0
Program's handling of questions/complaints (n=42)	8.0
Amount of time it took to receive rebate (n=43)	7.9
Length of time it took from project start to end (n=4)	7.8
Requirements for equipment eligibility (n=43)	7.5

Source: Xcel Energy Participant Survey, SA6A-K

Consistent with the high satisfaction rating for the type of equipment eligible for the program (8.7), all respondents reported that the cooling equipment installed through the Xcel Energy Cooling Efficiency program is still installed at their business.

Participating customers were asked what features of the program, if any, they would like to see changed. As shown in Figure 3-2, 67 percent of participants said they would not change anything. This is another indication that overall, the program participants were very satisfied with the program.

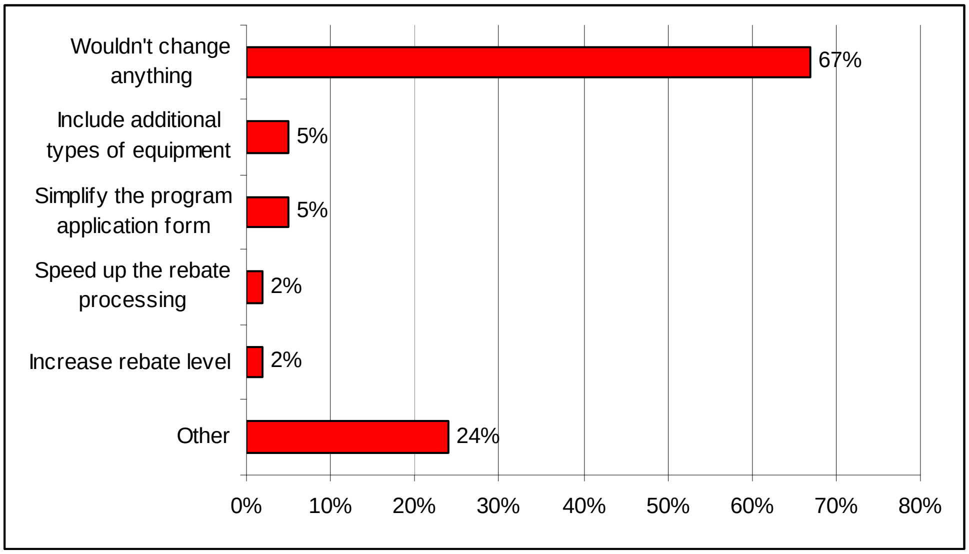
Those that did offer suggestions for improvements mentioned including additional types of equipment (five percent), simplifying the program application form (five percent), speeding up the rebate process (two percent), and increasing the rebate amount (two percent). These were consistent with the components of the program where participant satisfaction was lower. Some of the "other" suggestions mentioned included: communicate how the custom rebates are calculated (this was expressed in both internal staff and trade ally interviews as well as a source of frustration for some), include the option to submit the rebate application online, and provide a savings calculator to customers (this was also expressed in trade ally interviews as an area for improvement).

Below are quotes from a couple of participants on what features they would change with the program.

> *"It would be nice to get closer to instant responses on the rebate process. It seemed like there was a lot of back and forth." —program participant*

> *"Specify what the unit is supposed to do and how to measure the savings." —program participant*

Figure 3-1. Features of the Program Recommend Changing (n=42)



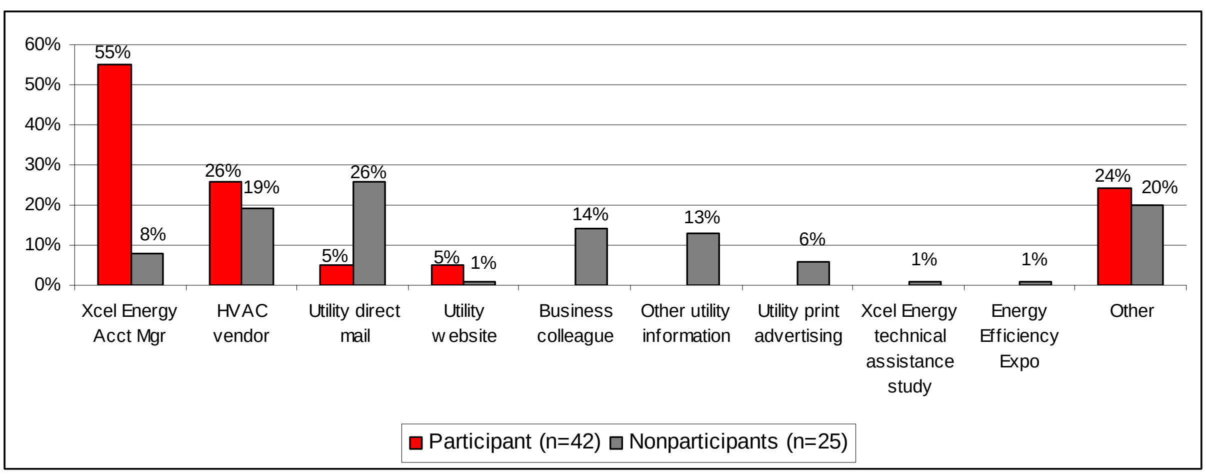
Source: Xcel Energy Participant Survey, SA7

3.5 CUSTOMER AWARENESS AND MARKETING

3.5.1 Participants

Account managers are the most noted outreach channel for program participants, followed by HVAC vendors. Program participants primarily heard about the Xcel Energy Cooling Efficiency program through their Xcel Energy account manager (55 percent). Of the managed accounts, 69 percent of participants mentioned that they heard about the program from their account manager. Hearing about the program through a Heating Ventilation and Air Conditioning (HVAC) vendor was the next most common way to find out about the program. Other ways participants heard about the program included: a contractor that worked on the building, an architect, or an engineer (Figure 3-3).

Figure 3-2. How Customer First Heard about Xcel Energy Cooling Efficiency Program



Source: Xcel Energy Participant and Nonparticipant Surveys, PA1 and A1

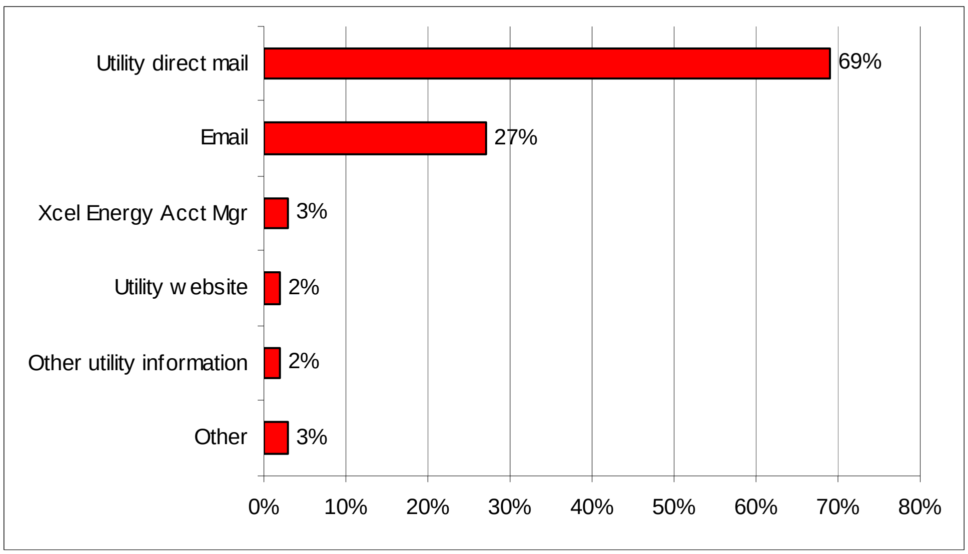
3.5.2 Nonparticipants

Approximately one-fourth of nonparticipants are aware of the program. Customers who have not participated in the Xcel Energy Cooling Efficiency program were asked if they had previously heard of the program. Of the nonparticipants who have cooling equipment and pay the costs for cooling, only 27 percent said they had heard of the program.

Unlike participants, the most common way for eligible nonparticipants to hear about the Xcel Energy Cooling Efficiency program was through Xcel Energy direct mail (26 percent). Another 19 percent heard about the program through their HVAC vendor, 14 percent through a business colleague, and 13 percent from other utility information.

Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, mentioned by 69 percent of nonparticipants. The second preferred way to receive information is through email, mentioned by 27 percent of eligible nonparticipants (Figure 3-4). A similar pattern was found for ineligible nonparticipants; 67 percent prefer to receive information from Xcel Energy by direct mail and 26 percent by email.

Figure 3-3. Prefer to Receive Information about Energy Efficiency Programs (n=88)



Source: Xcel Energy Nonparticipant Survey, A12

If a nonparticipant was interested in contacting a utility representative about an Xcel Energy program or service, 67 percent indicated they already had contact information. The 1-800 phone number was the most common means they would use to contact a utility representative (52 percent). A small percentage (five percent) mentioned the Business Services Center (BSC).

3.6 CUSTOMER DECISION MAKING PROCESSES

3.6.1 Participants

The introduction to the participant survey focused on identifying the key individual involved in the decision to install equipment through the program. In addition, the survey asked if others were involved in the decision. Two-thirds of the Cooling Efficiency program participants indicated there was more than one person involved in the decision of whether or not to

purchase cooling equipment through the program. Other company personnel involved in the decision to purchase equipment through the program included: business owner, maintenance supervisor, current tenant, property management department, Chief Financial Officer, architect, and the business services superintendent.

The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. Program participants were asked to rate the importance of various factors that might have influenced their decision to purchase the cooling equipment. The rating was done on a scale of 0 to 10, with 10 being very important and 0 being not at all important in their decision. The age or condition of the old equipment was the most important factor, which was rated 8.1. As shown in Table 3-3, two other factors for purchasing new cooling equipment was rated an average of 7.0 or higher: standard practice or corporate policy and the payback on investment.

Table 3-3. Importance Factor for Purchasing Cooling Equipment for Participants

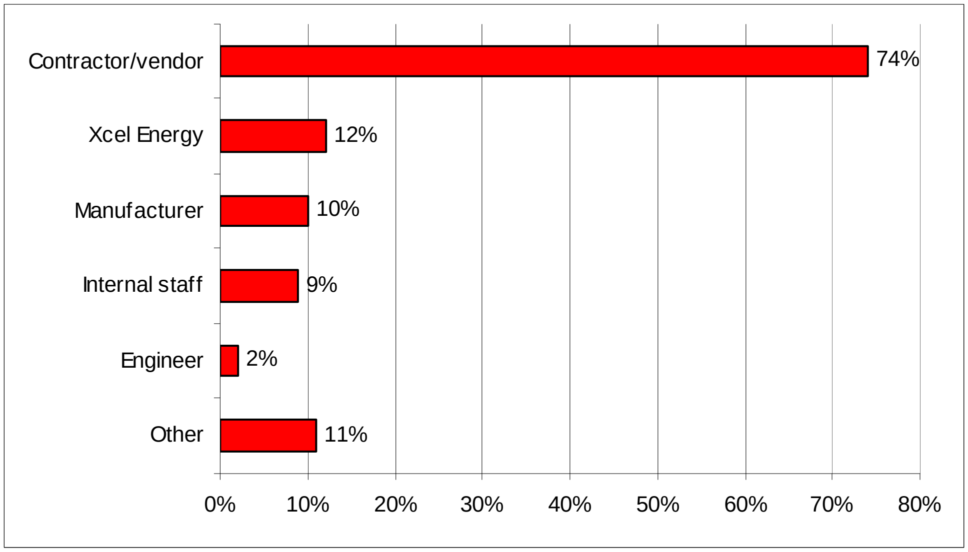
Importance Factor on Purchasing Decision	Mean rating on 0-10 scale
Age or condition of old equipment (N=50)	8.1
Standard practice or corporate policy (N=52)	7.2
Payback on investment (N=52)	7.2
General concerns about the environment (N=54)	6.6
Information provided through a Xcel Energy feasibility study (N=3)	6.3
Availability of program rebate (N=54)	6.0
Recommendation from a vendor/supplier (N=51)	6.0
Previous experience with the Cooling Efficiency program (N=43)	4.7
Endorsement or recommendation by Xcel Energy staff (N=52)	4.5
Information from the program marketing materials (N=52)	3.9
Information from the program training course (N=45)	2.8

Source: Xcel Energy Participant Survey, N3a-l

3.6.2 Nonparticipants

One factor when purchasing new equipment is deciding who to contact first to purchase the equipment. Almost all (74 percent) of eligible nonparticipants said that they would contact a contractor or vendor when purchasing cooling equipment. Contacting Xcel Energy or the equipment manufacturer were the other contacts mentioned by 12 percent and 10 percent respectively (Figure 3-5).

Figure 3-4. Preferred Contact Person when Purchasing New Cooling Equipment (n=84)



Source: Xcel Energy Nonparticipant Survey, I0

Twenty-two percent of eligible nonparticipants report that they have a policy that mandates the installation of energy efficient equipment when purchasing new equipment. When asked specifically what the company policy is for purchasing new equipment, respondents were unable to indicate a specific efficiency level or go into detail as to the company policy. Several businesses mentioned that they are trying to be as 'green' as possible and purchase efficient equipment. A couple respondents also mentioned that the equipment they purchase needs to be ENERGY STAR® rated.

The largest obstacle cited by nonparticipants when purchasing new equipment is the lack of capital, which was mentioned by 61 percent of eligible nonparticipants. This is consistent with information received from the trade ally interviews discussed later in this report. Other barriers that businesses face when considering purchasing new equipment include: the budgeting process (10 percent), lack of resources to implement (seven percent), time constraints (four percent), approval by board members (four percent), and the uncertainty of the return-on-investment (two percent).

3.7 PROGRAM POTENTIAL: NEEDS IDENTIFIED THROUGH NONPARTICIPANT INTERVIEWS

Of the population of existing nonparticipants, approximately three-fourths of this population could participate in the Cooling Efficiency Program (eligible nonparticipants). Ninety-seven percent of nonparticipating businesses contacted pay their electric bill to Xcel Energy[19]. Of those who pay their electric bill to Xcel Energy, 77 pay for cooling at their building.

The evaluation identified the lack of knowledge of the program among nonparticipants as a cause for lost opportunity among the program. When eligible nonparticipants were asked if they had purchased cooling equipment in the past two years, 33 percent reported that they

[19] The small percent that do not pay their electric bill to Xcel Energy are customers who rent/lease and the landlord pays the utility bill or property managers that report that tenants pay the cooling bills.

had. Only a small percentage (six percent) of those who had purchased or considered purchasing cooling equipment considered participating in the Xcel Energy Cooling Efficiency program. The primary reason they did not participate in the program was because they were not familiar with program requirements.

One key factor with a commercial cooling rebate program is for customers to understand the types of equipment customers currently have and the types of equipment they plan to purchase. Eighteen percent of nonparticipants who could participate in the program indicated that they are in the process of budgeting for or planning to purchase new cooling equipment. On average, eligible businesses expect to purchase the new equipment in 17 months.

Of the equipment installed, the greatest potential according to the nonparticipant surveys is roof-top units and condensing units. Roof-top units are the most common type of commercial cooling equipment used by eligible nonparticipants. Sixty-four percent of these nonparticipants have a roof-top unit installed and 30 percent of these nonparticipants plan to purchase a new roof-top unit. Condensing units are the other main type of commercial cooling, with 52 percent of businesses having a condensing unit installed and 29 percent of these planning on purchasing a condensing unit. Table 3-4 lists other common types of installed commercial cooling equipment and equipment that is planned for purchase.

Table 3-4. Type of Equipment Nonparticipants Have Installed and Plan to Purchase

Equipment	Installed Equipment at Business (n=80)	Currently Budgeting to Purchase Equipment (n=17)
Roof-top units	63.7%	30.4%
Condensing units	52.0%	28.7%
Split system air conditioners	23.9%	0.0%
Variable air volume boxes	13.7%	10.4%
Chillers	11.8%	3.4%
Packaged thermal air conditioners	8.2%	20.9%
Oversized cooling towers	7.6%	11.3%
Water source heat pumps	3.8%	17.3%
Other cooling equipment	10.8%	17.3%

Source: Xcel Energy Nonparticipant Survey, E1 and E5

One reason businesses plan to purchase new equipment is due to the age of their old equipment. Table 3-5 below shows the percent of each type of equipment that is 15 years old or older for eligible nonparticipants. This is consistent with some of the information gathered during the trade ally interviews where they said there is a market out there given the age of existing equipment

Table 3-5. Percent of Installed Equipment More than 15 Years Old among Nonparticipants

Equipment	Old Equipment More than 15 Years Old
Water source heat pumps (N=3)	33.3%
Variable air volume boxes (N=15)	28.2%
Oversized cooling towers (N=8)	25.0%
Roof-top units (N=48)	20.9%
Split system air conditioners (N=21)	16.5%
Condensing units (N=41)	10.5%
Chillers (N=15)	3.9%
Packaged thermal air conditioners (N=12)	3.2%
Other cooling equipment (N=9)	16.0%

Source: Xcel Energy Nonparticipant Survey, E3

For future cooling equipment purchases, eligible nonparticipating business customers demonstrated a level of interest in participating in the Xcel Energy Cooling Efficiency program. The average interest level was 7.27 on a 0- to 10-point scale, with 10 being very interested.

3.8 TRADE ALLY PARTICIPATION

We spoke with thirty trade allies as part of this program evaluation, 17 participating and 13 nonparticipating trade allies. This section summarizes the results of these interviews.

3.8.1 Characteristics of trade allies interviewed

Trade allies interviewed typically installed and serviced cooling equipment. PA also spoke with an engineer and several equipment suppliers. These trade allies work with a combination of planned replacement, new construction/major renovation, and replace-on-failure projects.

A significant portion of certain trade allies' work is replacement-on-equipment-failure. Nonparticipating trade allies were more likely than participating trade allies to report a higher percentage of their projects as replace-on-failure and a lower percentage of their projects as new construction/major renovation.

3.8.2 Trade ally awareness of Xcel Energy's cooling efficiency program

Nearly three quarters of nonparticipating trade allies (8 out of 11 that provided a response) said they were aware of Xcel Energy's Cooling Efficiency Program. Both participating and nonparticipating trade allies said they heard about the program through Xcel Energy staff, materials, seminars, their customers, or equipment suppliers.

One other source of program awareness is their participation in other residential programs provided by Xcel Energy. A number of trade allies interviewed also service residential customers and refer customers to Xcel Energy's residential efficiency programs. Through their

experience with these programs, they became familiar with the commercial program. This indicates the continued potential for Xcel Energy to cross-market the program through their other programs.

Trade allies report that it is more difficult to sell high efficiency equipment when there is a failure than when it is a planned project. These decisions need to be made quickly and efficiently. So while trade allies may be aware of the program, they may need a much better understanding of the benefits and offerings so they can more easily promote the program with their bid to the customers.

3.8.3 Benefits of the program for trade allies and customers

Participating trade allies were quick to comment that the program benefits both them and their customers. The ability to offer the incentive and make the purchase more cost-effective were the most commonly noted benefits of the program. However, the benefits go beyond just the incentive value. Trade allies mentioned that the program gives them an edge over their competitors, who are not taking the time to spec out bids with high efficiency options incorporating the rebate. Even if the customer chooses not to install high efficiency, the options give the appearance of the contractor taking the time to think through the alternatives for the customers' consideration.

The program also provides participating trade allies the opportunity to discuss energy efficiency with their customers. These trade allies are proponents of energy efficiency and enjoy the opportunity to promote high efficiency equipment. Because of the program, they are able to generate more conversation around the benefits of energy efficiency than they would have without the program.

According to participating trade allies, customers generally participate in the program because 1) they have a need for the equipment, 2) the program reduces the cost of the equipment, and 3) the equipment is more efficient and will result in longer-term savings. Several respondents also mentioned the desire or (in some cases) requirement for customers' buildings to be LEED certified; Xcel Energy's Cooling Efficiency Program helps them obtain this certification status more cost-effectively.

One trade ally specifically addressed the impact the program has on his sales. He said the Cooling Efficiency program, along with other initiatives such as LEED certification, has certainly impacted his ability to sell high efficiency cooling equipment. In fact, he said that without the program and these other initiatives he does not think he would have sold any energy efficient equipment this year.

3.8.4 Barriers to selling high efficiency equipment

One of the primary objectives of the interviews was to identify barriers for selling high efficiency equipment. Below we list the commonly mentioned barriers, the most notable being initial incremental costs of high efficiency equipment coupled with a weakened economy.

Economic downturn coupled with high incremental cost of high efficiency equipment. Economy was the buzzword throughout the trade ally interviews. One interviewer summed up the issue saying that activity now has little to do with the incentives available and more to do with the general economic environment. This respondent believed that absent a significantly higher incentive value to cover the incremental cost there will be less movement toward high

efficiency in the current economy. Other respondents provided similar philosophies by discussing the difficulty in encouraging their customers to install high efficiency equipment. When asked about the future of the cooling market, contractors often commented that customers would like to see trend toward increasing efficiency, thereby *uplifting the economy.*

Interviewees indicate the cost of high efficiency equipment is the primary barrier to moving forward on high efficiency purchases and installations across all commercial segments. However, for smaller commercial customers, several respondents commented that it is the relative incremental cost for smaller commercial customers. They reported that for smaller units, the incremental cost as a percentage of total cost is greater and the Xcel Energy rebate covers less of the incremental cost for smaller units.

Other respondents said that first cost is the biggest barrier for the larger commercial customers that use larger equipment. They reported that the cost of replacing that equipment is very significant. If they do replace it, the incremental cost is less and the Xcel Energy rebate covers more of the incremental cost of large equipment than for small equipment.

However, numerous respondents commented on the fact that these larger commercial customers are most likely to attempt to repair rather than replace the failing equipment. One respondent illustrated the point using the example of a customer whose repair of their old, inefficient rooftop unit cost about half the cost of installing new equipment. Although the newer more efficient equipment would yield savings within a three year payback and the contractor projected that the customer would need to replace the equipment within the next five years, they chose to go ahead with the repair instead of replacement. The capital investment of the new equipment was just too much for them to front if a repair for lower cost was possible.

Table 3-6 provides further qualitative evidence of trade allies' perception of the difficulty in selling high efficiency cooling equipment to their customers in this market. Participating and nonparticipating contractors were asked to rate their perceived level of difficulty in selling high efficiency cooling equipment to their customers on a one to five scale, where one was very difficult and five was not at all difficult.

As the table shows, the majority of participating trade allies rated the difficulty between a two and three although three respondents said selling high efficiency equipment was easy (rating of 4 or 5). Several trade allies mentioned that it is easier to sell the equipment to larger than smaller customers, quoting the large savings and increased payback as the reason. One respondent who rated it difficult to sell high efficiency said the rating would have been different in prior years when the economy was better; for these years, the sales of higher efficiency equipment was easier.

This analysis should be viewed with caution as it is based on very limited number of cases and cannot be extrapolated to the participating and nonparticipating trade ally population. However, the story it presents is compelling and shows the importance of reaching nonparticipating trade allies to help them promote high efficiency cooling equipment.

Table 3-6. Difficulty in Selling High Efficiency Cooling Equipment to Customers (1=very difficult, 5=not at all difficult)

Ratings												Average
Participating trade allies (n=11)	2	2	2	2.5	2.5	3	3	3	4	5	5	3.1
Nonparticipating trade allies (n=9)	1	1	1	1	2	2.5	3	3	3			1.9

There is some qualitative evidence that the program is helping to overcome the barrier of selling high efficiency cooling equipment. Nonparticipating trade allies were more likely to say selling high efficiency cooling equipment to customers is very difficult. Whereas no participating contractors rated the difficulty of selling high efficiency equipment a one, four nonparticipating contractors provided a rating of one. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary driver for their low ratings. Incidentally, these nonparticipating trade allies were also more likely to say they serve small business customers (under 500 kW), which may also be a driver of the increased perception of difficulty in selling high efficiency cooling equipment to their customers.

Relative low cost of energy. Several trade allies half jokingly commented that commercial customers would be more apt to participate and see greater value from the program if their energy rates were higher. One trade ally expanded on this discussion by saying that he has seen a distinct trend in the purchasing of high efficiency equipment with a higher cost of electricity. His perception was that since the economic shift, energy prices decreased which thereby decreased the demand for high efficiency equipment along with the reduced cash flow resulting from the poorer economy.

Customers' lack of knowledge and/or understanding of the benefits of energy efficiency. Another common theme heard throughout the interviews was the need for contractors to educate their customers on the benefits of high efficient equipment. Commercial customers may understand conceptually that there could be benefits to installing high rather than standard efficiency equipment; however, when faced with the incremental costs to install that equipment, customers may select the standard efficiency equipment to avoid the extra up-front expenditures. Contractors frequently commented on the need to educate these customers and help them understand the return-on-investment for them and how the installation of high efficiency equipment would positively impact the organization's cash flow. "*They don't understand life cycle costs, lease structures, and access to capital*."

Need for tools to help trade allies sell high efficiency cooling equipment to customers. Participating trade allies were asked what tools were available from Xcel Energy that helps them sell high efficiency cooling equipment. Of the thirteen individuals that answered this question, five said either they don't know what tools are available to them or they do not believe there are any tools available to them through the program to help them sell high efficiency cooling equipment.

As a follow-up to this question, trade allies were asked what tools they would like Xcel Energy to provide to help them sell high efficiency cooling equipment. Several respondents felt they had enough information in the rebate forms and brochures distributed to them by Xcel Energy.

However, several respondents did have recommendations for information or tools to help them promote equipment through the program. The most frequently cited request was for a tool to help trade allies calculate energy savings, payback, return-on-investment, and/or rebate values. While some respondents felt capable of doing these calculations on their own, others did not feel they had sufficient knowledge to do this. As one trade ally stated, "*We lack the software to be able to tell them what their payback is…we don't know the math*." Another respondent referred us to a tool through the Commercial Real Estate Energy Efficiency Program (CREE) website. This tool calculates return-on-investment of energy efficiency improvements. At a minimum, the program could promote this tool to trade allies.

Another respondent commented that he was able to calculate the energy savings and related rebates, but the rebate ended up being less than initially specified. He noted, "*If there was some way to automate that, to better calculate the rebate, that would be good."*

In terms of the materials provided by Xcel Energy, those who received the materials for the most part felt they were sufficient. Several respondents noted that they use the website often to obtain materials, although they would appreciate more hard copy materials for distribution to their customers. Another respondent said they would appreciate some verbiage from Xcel Energy on the benefits of the program and installing high efficiency equipment to include in their marketing materials.

Last, several trade allies said that it is difficult to see what is new in Xcel Energy's program through the website. They suggested that to make this process easier, perhaps Xcel Energy could have a website targeting only trade allies that clearly identifies program updates. This suggestion was also made in the internal interviews with Xcel Energy staff.

Need for more personal interaction with Xcel Energy staff. Building on the above point, five of the participating contractors said they did not recall receiving or were not provided with tools or information from Xcel Energy staff to help them sell high efficiency equipment. And one trade ally specifically mentioned the need for more personal interaction with staff to help arm him with the knowledge to better promote high efficiency cooling equipment.

Trade allies who do regularly interact with program staff were complimentary of their experience with these staff. They describe their interactions with Xcel Energy representatives as helpful, say they were excellent in interacting with the contractors and providing timely information. In general, they just want more of this interaction.

There is only one Xcel Energy staff member assigned to reaching out to contractors throughout the state of Colorado. He plans events for contractors, such as the workshops, seminars, and breakfast events to educate contractors about the program. Internal interviews identified that only having one trade ally representative may result in not personally reaching as many trade allies as desired, particularly in less populated areas.

3.8.5 Overcoming the barriers and increasing participation

Trade allies were encouraged to share their ideas regarding ways to overcome programmatic barriers and increase participation. These recommendations are detailed below.

a. INCREASE REBATE LEVELS

Not surprisingly, the most commonly noted recommendation was for the program to increase its rebate levels. It is not that trade allies felt the incentive levels were entirely too low, but that an increased incentive level would be beneficial in battling the incremental cost and reducing the payback period that plagues the ability for customers to install program-qualifying equipment. As found in the benchmarking review of rebate levels in other programs, Xcel Energy's rebates are some of the lowest for air conditioning systems.

b. EDUCATE TRADE ALLIES

Another recommendation made by several respondents was to better educate trade allies and make them more aware of the program benefits. These respondents discussed the need for Xcel Energy to make the process as easy and seamless as possible for trade allies—including marketing to customers using return-on-investment analysis. "*If it's not easy, we won't do it.*" One trade ally expanded on the need for more education noting the influx of new trade allies in the industry. He said that each time an HVAC contractor goes out of business, three more open up. This turnover increases the need for continual education and marketing from Xcel Energy among the trade ally groups. This recommendation is consistent with best practices found as part of the benchmark review of other programs.

c. IMPROVE THE CUSTOM PROCESS

Participating trade allies provided suggestions to make the custom program less burdensome for trade allies and customers. For the most part, participating trade allies thought the application and rebate processing requirements for the prescriptive component of the program were appropriate and not overly cumbersome. The distinction several respondents made, though, was between the prescriptive and custom program. These respondents said the administrative burden for completing the custom applications is high. One respondent compared the process to the prescriptive program which he described as not at all difficult to complete.

Another respondent described the custom program and its processes as a "*nightmare*." The time to complete the application and get Xcel Energy involved is significant and in some instances results in him losing the job. The trade ally expanded on this statement by saying that the rules for qualifying equipment do not seem to be transparent, which frustrates the trade ally and his customers.

One trade ally noted an additional complication in the custom process; his perceived inability to easily and quickly provide a rebate value to the customer. This trade ally said that he could calculate an incentive value based on manufacturer specifications and an understanding of the original equipment; however, he cannot provide the incentive level with enough certainty to make the customer comfortable with investing in the purchase.

This perception about the custom program and its application and project process is consistent with what we heard in the internal interviews. Account and trade representatives mentioned that the custom application process was significantly more cumbersome and involved than the prescriptive program process.

The reputation of the custom program reached trade allies that have not yet worked with a customer through that component of the program. One participating trade ally interviewed

commented on additional equipment he would like to see included in the program (evaporative coolers) and wondered if this measure could be promoted through the custom program. However, while this respondent recognized the usefulness of the custom program, he commented on the feasibility of going through the custom program, saying that there have been grumblings from others in the industry that the process is "*difficult and rigorous*."

d. MARKET DIRECTLY TO CUSTOMERS

Trade allies for the most part thought the program could more directly market to customers. Several respondents said the direct marketing should provide general information about the program and include analysis tools or information to illustrate the energy and/or financial savings from installing high efficiency equipment. This is not to say that customers are not receiving sufficient information about the program; the customer survey results will explore this issue more.

Trade ally responses varied considerably in their assessment of customers' awareness of the program. On average, participating trade allies said that almost one-half of their customers know about the program (sample size is only 10, so this information should be viewed as qualitative). One participating trade ally said that none of his customers were aware of the program and two trade allies said that all his customers were aware of the program. (Table 3-7). Nonparticipating trade allies were more likely to say that fewer of their customers were aware of the program.

Again, this information should be interpreted with caution given the sample sizes. The analysis represents the interviewed trade allies, not the trade ally population at large.

Table 3-7. Trade Ally Perception of Customers' Awareness of the Program

Percent											Average
Participating trade ally responses (n=10)	0%	10%	10%	10%	25%	30%	75%	95%	100%	100%	46%
Nonparticipating trade ally responses (n=5)	0%	13%	15%	50%	55%						27%

3.8.6 The future of the cooling market in Colorado

The majority of participating trade allies said they expect their involvement in the program to increase over the next twelve months. They project that customer demand will increase as they become more energy conscious and are more aware of energy efficiency based on federal initiatives and more stringent codes and standards. However, a number of these contractors caveat this optimism by saying it depends on the economy.

Additionally, several respondents commented on the aging cooling equipment in Denver as an indicator for increased opportunity for the program, particularly among larger commercial customers. As discussed earlier, because of the high capital investment in replacing cooling equipment, larger commercial customers are opting to repair versus replace the older equipment. This inefficient equipment will continue to fail and in time need to be replaced which will create further opportunity for the program.

While participating trade allies are optimistic that their participation in the program will increase in the next 12 months, their projection of the direction of the commercial cooling market in the next two years is mixed. The same is true for nonparticipating trade allies. Respondents from both groups of interviews said that unless there are government initiatives put in place, or stricter requirements, the high efficiency cooling market will stay the same or decrease. A number of these respondents again cited the incremental cost and perception that the benefits don't outweigh these costs; particularly given how constrained these companies are in their capital funding. "*I've got my fingers and toes crossed that we're going to come out of this recession and people will start purchasing high efficiency equipment*."

3.9 BENCHMARKING RESULTS

PA researched programs online for to characterize other cooling efficiency programs in terms of rebates or incentives available, eligible measures, eligible customers, required paperwork, and marketing. PA then conducted in-depth interviews with eight program staff and one evaluator for the following programs to obtain further insight into program operations. The utilities and programs reviewed are detailed below.

Table 3-8. Utilities and Programs Included in Benchmarking Study

Utility	Program
Ameren IL	Standard Business Incentives Program
Arizona Public Service	Solutions for Business: Prescriptive Incentives and Technical Assistance and Studies
Energy Trust of Oregon (Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas)	Existing Building Efficiency Program
Idaho Power	Building Efficiency for Commercial Construction and Easy Upgrades for Simple Retrofits
Pacific Gas & Electric (also includes SCE and SDG&E)	Non Residential Retrofit (previously Standard Performance Contract)
Platte River Power Authority (and four member utilities: Fort Collins Utilities, Longmont Power & Communications, Estes Park Light & Power, Loveland Water & Power)	Electric Efficiency Program (includes Cooling Rebate Program)
Puget Sound Energy	Commercial HVAC Rebate and Premium Service programs
Salt River Project	PowerWise Standard Business Solutions and PowerWise Custom Business Solutions

Programs varied from very new (only 1 year old) to fairly mature (up to 10 years old).

3.9.1 Program goals and challenge in meeting goals

Xcel Energy's goal for the Cooling Efficiency program is 6.9 mil kWh for 2009. However, information was not available from other programs on savings goals for cooling equipment only. For other business programs overall, savings goals ranged anywhere from 32.5 mil kWh to 160 mil kWh. Xcel Energy's total 2009 business goal is 103 mil kWh.

Most programs in the benchmarking study have been successful in meeting program goals despite the recent economic challenges. Many programs met or exceeded goals last year and are on track to come close to meeting targets this year. Several programs have higher goals set for this year than last year.

All programs are faced with the same primary challenge this year—the downturn in the economy. However, most have found a way to keep projects enrolling and continue to achieve energy savings. Mature programs are faring better which was reported to be a result of strong relationships with vendors and implementation contractors. It was also reported that it is important to be flexible and get involved with the customer early to influence their choice of equipment (as also discussed in the internal and trade ally interviews).

Several program managers reported bonus and timing adjustments their programs made in reaction to the downturn in the economy. One program offered a 10% bonus to customers and $500 gift cards to trade allies for projects with minimum size restrictions that were done before the end of May, 2009. Another program became more flexible with deadlines that were typically 18 months but would be extended if there were delays in the project timeline.

3.9.2 Key elements of program design

All programs offer prescriptive and custom options to business customers except for PG&E, which is custom only. Measures covered by prescriptive programs are similar across programs including air conditioning units, split and packaged units, air and water source heat pumps. Variations in measures offered include chillers, economizers, and controls. One program manager recommends more focus on controls and optimizers for retrofit to realize additional savings. Xcel Energy categorizes control-related projects within an Efficiency Controls program, rather than within the cooling program.

Most of the programs use outside firms to implement the program. One program manager appreciates that they have an implementation contractor who continuously works to improve their program.

Two programs manage the entire program internally as Xcel Energy does. This internal management includes the development of the infrastructure, outreach to trade allies, customer communication and setting and processing the rebates for eligible equipment. Internal staffing for the programs ranges from one person half-time to 6 business development staff handling specific customer segments.

3.9.3 Marketing and recruitment of customers

Depending on the program, either the implementation contractor or program staff market and provide outreach to customers. Marketing methods consist of general advertising in newspapers, through radio ads and mailings.

Marketing is not typically targeted to particular groups but to business customers in general. However, more targeted marketing through associations and business group meetings is favored by many program managers. These face-to-face meetings allow for a more tailored message (e.g. highlighting energy savings possible) and the opportunity to answer questions and build relationships. Associations targeted include ASHRAE, BOMA, Kiwanis, multiple trade organizations, and school groups.

Only one program, which is one of the more mature programs, uses targeted marketing. They have moved away from traditional marketing pieces, except for an overview, and are instead working with specific customer segments. They now concentrate on relationship building with customers, trade organizations, and equipment dealers.

Interviewees believe the most effective form of program communication is handled by key account representatives and trade allies. Trade allies know their markets well and are often in the best position to sell the higher efficiency to their customers. A couple of programs are also taking advantage of high bill inquiries and billing analysis to seek out possible participants.

One respondent shared that in their experience, a useful lesson is to become thoroughly educated on the different associations when using trade associations to target customers. The respondent felt this would identify and involve all associations representing that particular market segment. Without buy-in from particular association leaders, a utility could be kept out of a market. However, the program should be prepared for a potentially quick increase in projects. In order to handle abrupt increases or decreases in enrollment, have control mechanisms in place to scale down or ramp up depending on activity level.

3.9.4 Quantification of net program impacts

As PA has experienced with several other programs and the industry as a whole, there is much discussion around how to accurately calculate free-ridership and spillover to inform net-to-gross (NTG) factors for commercial cooling. In speaking with program managers, that uncertainty exists among all programs.

Table 3-9 summarizes net to gross information provided by the program managers or through the literature review. A few of the newer programs have not yet had the opportunity to evaluate their programs and estimate net-to-gross ratios and will likely review free-ridership and spillover measurement in later program years, according to program managers. In the meantime, they rely on either an average industry attribution rate of 0.80 to 0.85 or anecdotal information to provide qualitative context around program impacts (e.g. retrofits may be almost all free-riders but the nature of premium services would result in a very low free-ridership rate). And although some of the others have conducted evaluations, they have not measured free-ridership or spillover.

For those programs that have measured NTG and were able to provide us with the values, we see a range from 50 percent (when NTG only includes free-ridership, not spillover) to 80 percent NTG (when includes spillover). The NTG status for all programs reviewed is detailed in Table 3-9. In addition to speaking with program managers we also reviewed NTG estimates from the DEER database and measured NTG values from WI Focus on Energy Business Programs which are also included in the table below.

Table 3-9. NTG Summary Information

Sponsor	Program	NTG measurement status
WI Focus on Energy	Business Programs	Overall 2008 commercial NTG ratios were 69% kWh, 69% kW, and 33% therms.
Ameren (IL)	Standard Business Incentives	Measure free-ridership and spillover, but no NTG number available.
Arizona Public Service	Solutions for Business: Prescriptive Incentives	NTG calculated at the measure level using both free-ridership and spillover from self reports. Numbers not available at the time of the call.
Energy Trust of Oregon	Existing Building Efficiency Program	Influence rates of 80% for electric and 70% for gas for their HVAC program.
Idaho Power	Easy Upgrades for Simple Retrofits	Not currently measuring FR, SO or NTG.
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)	Measuring NTG but not final for 2006-2008 cycle. DEER database shows NTG from 2004-2005 was 50% for prescriptive HVAC and 54% for custom projects. DEER also indicates 50% NTG assumptions for prescriptive HVAC and 64% for custom for purposes of 2009-2001 planning.20
Platte River Power Authority	Cooling Rebate Program	.85 assumed.
Puget Sound Energy	Commercial HVAC Rebate	Not measuring NTG.
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	Measured NTG = .75 for Standard Business Solutions (not including adjustments for spillover).

3.9.5 Rebate levels and requirements

Rebate levels are similar across programs, although Xcel Energy's are some of the lowest for air conditioning systems (Table 3-10). Xcel Energy is also providing rebates for a lower SEER rating than the other programs reviewed. Most programs have done little to adjust their rebates over time, and any adjustments have been minor.

Minimum equipment efficiency to qualify for a rebate is typically decided based on CEE standards. Supplementing that decision is information from ASHRAE 90.1, ENERGY STAR®, and other market analysis. Rebates or incentives are typically offered for the efficiency above standard. Programs also have caps on the portion of the cost that will be paid, for example 50 percent or $10,000 maximum.

[20] Source: Updated DEER NTGR Values – 053008.xls

The requirements for receiving a rebate or incentive are similar among programs. Most programs have a pre-approval process or pre-application showing the efficiency the customer intends to install. Some programs skip this pre-application for projects below a certain rebate threshold ($1,000–$5,000). For one program, the pre-approval allows for a customer's incentive funds to be reserved for 90 days.

Once approved, the customer can have the work done. A few programs require inspections, although this is more common for custom projects or projects requesting a rebate over a certain threshold. Upon completion, customers are required to submit a final request for the rebate or incentive, accompanied by an invoice for the equipment purchased, and a cut sheet or other form showing the specifications for the energy efficient equipment. A few programs have 60-day or 90-day limits from time of project completion for submitting final rebate requests.

Table 3-10. Rebate Summary Information

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
CEE	Tier 1 standards	14 SEER (12.0 EER pkg, 11.6 EER split)	(11.5 EER, 11.5, 10.5, 9.7)	14.0 EER		14.0 EER			
CEE	Tier 2 standards	15 SEER (12.5 EER pkg, 12.0 EER split)	(12.0 EER, 12.0, 10.8, 10.2)	No specification s		No specification s			
Xcel Energy	Efficiency Cooling	13.5 SEER: $50/ton packaged, and $3/ton each adtl 0.1 SEER 14.0 SEER: $25/ton split, and $4/ton each adtl 0.1 SEER	$50/ton (EER of 11.0, 10.8, 9.8, 9.4)	Condensing 11.0 EER: $25/ton + incremental rebate: $3.00/ 0.1 EER		14.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	PTACs 11.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	$6-$12/ton See program for details	Boiler Tune-up: 25% of costs See program for details
Ameren (IL)	Standard Business Incentives	14 SEER: $15/ton 15 SEER: $30/ton	$15/ton (11.5 EER, 10.5, 9.7) $30/ton (12 EER, 10.8, 10.2)		$15/ton (14 SEER, 11.5 EER, 10.5, 9.7) $30/ton (15 SEER, 12 EER, 10.8, 10.2)		13.08–(0.02556*Btuh Capacity/ 1000) EER $15/ton	$20/ton (Air-cooled only)	Room Air Conditioners: $25-$35/ton Variable Frequency Drive on HVAC Motors: $45/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Arizona Public Service	Solutions for Business: Prescriptive Incentives	(1 Phase) 14 SEER & 11.5 SEER: $50-80/ton (3 Phase) 11.1 EER: $50-100/ton	11.4 EER $50-100/ton 11.2 EER $25-75/ton 10.4 EER $25-75/ton		(1-phase) 14 SEER & 11.5=$50-80/ton (3-phase) 11.1 EER= $50-100/ton 11.4 EER $50-100/ton 11.2 EER and 10.4 EER $25-75/ton		Both PTAC and PTHP 12.5-(0.213*cap/1000) EER $45-60/ton	Air cooled 1.15 kW per ton—IPLV = $7/ton Water cooled 0.57-0.68 kW per ton—IPLV = $7/ton	Economizer $15.ton
Energy Trust of Oregon	Existing Building Efficiency Program	$120-300 See program details	$120-300, See program details		$150-2,250/ton, See program for details	$200-4,000/ton, See program for details	$100/unit PTHP		Ground source heat pump $300-$3,000
Idaho Power	Easy Upgrades for Simple Retrofits	(1-phase) 14 SEER: $25/ton 15 SEER: $50/ton 16 SEER: $75/ton (3-phase) 13 SEER: $50/ton 14 SEER: $75/ton 15 SEER: $100/ton	$50/ton (EER of 11.0, 10.8, 10.0)				12 EER at $50/ton		Economizer $250/unit economizer controls $75/ton VSD for fan pump $60/hp program thermostat $60

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)								
Platte River Power Authority	Cooling Rebate Program	14 SEER/ 12 EER = $65/ton, $4 per ton for each 0.1 EER over 12.0	$50/ton (EER of 11.0, 10.8, 10.0), $4 per ton for each 0.1 EER over base				Both PTAC and PTHP 11.0 EER- $50/ton, $4 per ton for each 0.1 EER over 11.0		
Puget Sound Energy	Commercial HVAC Rebate		>= CEE Tier 1 = $30/ton						ECM on HVAC fan box- $.12/sq ft Boiler tune-up-up to $600 Program thermostat—up to $50 VSD on pumps and fans—$100/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	$75/ton (EER of 11.5, 10.5, 9.7) $100/ton (EER of 12.0, 10.8, 10.2)	14 EER: $75/ton	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	14.0 EER/4.6 COP: $75/ton	$50/ton See program for details	(Tons * $10/ton) + (Tons *$350 * (Minimum IPLV – Chiller IPLV))	VSDs for HVAC fan & pump: $55/ton

3.9.6 Trade ally relationships

Several programs rely heavily on trade allies to market the program to customers as well as provide quality service and have found them to be valuable outreach partners. It is important to have a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs. Most programs do not offer trade ally incentives at this point.

Interviewees report that training and communication are instrumental in the trade ally relationship. Many programs incorporating trade allies hold workshops or frequent meetings with vendors as updates, as well as to find out what type of equipment is selling. One program holds about 10 one-day technical sessions throughout the year for trade allies in their territory. They hire expert trainers to come in for those sessions to cover topics such as DOE motors, HVAC, chillers, RCx, and lighting.

A few programs are struggling with building up their trade ally networks. A program manager from one of the more mature programs tells us that building a reliable trade ally network takes time—often as much as two years.

3.9.7 Why customers enroll

The initial view is that customers will participate in a program if it provides monetary incentives. However, some programs have found that the incentive or rebate alone will not result in a successful program. A key element for these programs is customer education and assistance. One program found through their survey that the assistance they provide and the rebate are equally motivating for their customers. These programs educate customers on the energy savings resulting from the high efficiency equipment (sustaining impacts) using the rebate to reduce the first-cost of purchasing and installing the equipment.

This education may come in several forms. One program manager attends association meetings where she can present energy savings opportunities. Another program has a general tool available to all customers on their website to calculate energy savings for 30 of the most common energy efficiency measure for typical buildings. A third program provides an online self-audit tool so customers can gain a better understanding of their own facility, which improves the conversation once they are ready to work with a program representative. Coaching is particularly important for the first time participants.

We asked program managers which key customer segments have been more likely to participate this year. A few of the newer programs are not yet tracking participation by customer segment as there is not much need at this point. Others have seen greater participation recently from offices and schools. Medical facilities have also been active in some programs. One program has seen property owners taking advantage of retail space switching over to office to implement upgrades.

4. IMPACT EVALUATION FINDINGS

The activities conducted to support the impact evaluation included verifying baseline and technical assumptions, determining savings considering 2009 International Energy Conservation Code (IECC) standards, and estimating a net-to-gross ratio. This chapter summarizes the key impact evaluation findings followed by more detailed analysis resulting from each activity.

4.1 KEY FINDINGS

4.1.1 Engineering and IECC standards review

The engineering review identified the following key findings.

- The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used for other programs. Other than VAV boxes, the algorithms used in the deemed savings calculator (the Calculator) are also consistent with algorithms represented in other programs' TRMs.
- More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. In view of the uncertainty of energy savings found in the engineering review and high free-ridership results, Xcel Energy may want to consider removing VAV boxes as a program measure in the 2010 Colorado Cooling Efficiency Program.
- The Cooling Tower offering was removed from the program in January 2009. The impact evaluation supports this removal (as it does for VAV boxes) due to uncertainty of savings found in the engineering review as well as high free-ridership results.
- The value for peak load coincident factor (CF) of 0.9 used in the Calculator is appropriate to account for gross generator kW saving. The equivalent full load hours (EFLH) provided in the Calculator are also appropriate.
- IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for the program year 2009-2010. Changes from IECC 2006 to IECC 2009 baseline efficiency values will affect savings for rooftop units and chillers. The IECC 2006 and IECC 2009 use different coefficients for the adjustment factor algorithm to account for non-standard water-cooled chillers.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs which do not take into account variations in PTAC sizes.

4.1.2 Net-to-gross ratio

The net-to-gross analysis resulted in the following findings:

- The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 0.51. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 0.21. The resulting self-report net-to-gross ratio is 0.7 for the Colorado Cooling Efficiency Program in 2007–2009.

- Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program.
- Removing cooling towers and VAV boxes, which we recommend be removed from the program, the self reported net-to-gross ratio is 0.75. As this value is within the recommended net-to-gross range from a preponderance of evidence approach, we recommend that this net-to-gross ratio be applied for the 2010 program year.

4.2 VERIFY BASELINE AND TECHNICAL ASSUMPTIONS

Cooling is an energy intensive process and can consume as much as one third of building energy use. Therefore, the need for verification of assumptions and parameters used for determining net energy savings achieved from an efficient cooling measure over a standard (complying with a stipulated minimum code or a baseline) is paramount.

To support the impact evaluation of the Cooling Efficiency Program, we reviewed algorithms used for estimating the deemed energy savings for end-use C&I cooling measures. This was supported through a review of several recent “technical reference manuals” (TRMs). We also reviewed the values of parameters used in the algorithms to assess the industry practices and ascertain their similarity (or dissimilarity) with those currently used by the Xcel Energy’s Colorado C&I “Deemed Savings Technical Assumptions” tool/calculator (“the Calculator”).

We also reviewed TRMs adopted in different jurisdictions in the country to assess consistency in the use of technical assumptions and the underlying algorithms for calculating the energy savings achievable from efficient cooling measures. Each of these TRM sources are summarized in Appendix A. Specific TRMs reviewed include:

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report, 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey’s Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009.

Below we define variables used deemed savings review. Note that different TRMs use varying notations for variables, for example EER_b or EER_{base} for “baseline energy efficiency ratio” of a measure. We designate one notation for a variable, as shown in Table 4-1, regardless of the (different) symbols used for the same variable in different TRMs. This is done to avoid repetition of variable definitions. Also note that terms EFLH and FLH are, at times, used interchangeably among different TRMs. For example the “Efficiency Maine TRM uses the term FLH while other TRMs reference in this study used the EFLH.

Table 4-1. Definition of Variables Included in Deemed Savings Analysis

Variable	Definition
Capacity	Size of a cooling measure (1 Ton = 12,000 BTU/hr)
EER	Energy Efficiency Ratio (3.413* Coefficient of Performance (COP); kW/Ton = 12/EER
SEER	Seasonal Energy Efficiency Ratio (EER/0.85)
EER_b	Energy efficiency ratio of a baseline cooling measure
EER_e	Energy efficiency ratio of an efficient unit
$SEER_b$	Seasonal Energy efficiency ratio of a baseline equipment
$SEER_e$	Seasonal Energy efficiency ratio of an efficient unit
CF	Coincidence Factor: The percentage of the total cooling load during peak hours.
EFLH	Equivalent Full Load Hours: Measure of energy use by season during the on-peak and off peak periods. EFLH is the ratio of measured kWh use during the period divided by design capacity (kW) of equipment.
FLH	Full load hours in a year
PE_b	Peak efficiency of the baseline chiller (kW/ton)
PE_e	Peak efficiency of the energy efficient chiller (kW/ton)
$IPLV_b$	Integrated part load value of the baseline cooling equipment
$IPLV_e$	Integrated part load value of the efficient cooling equipment
CDD	Cooling Degree Days

Xcel Energy's deemed savings calculator for the C&I end-use cooling measures use the following algorithms for air conditioning systems, chillers and VAV boxes.

Rooftop Units, Water Source Heat Pumps, Split Systems, Condensing Units

Energy Savings (Customer kWh) = Capacity x (12/SEERb - 12/SEERe) x EFLH

Demand Savings (Customer kW) = Size x (12/EER_Standard - 12/EER_Eff)

Chillers

Energy Savings (Customer kWh) = Capacity x (IPLVb - IPLVe) x EFLH

Demand Savings (Customer kW) = Capacity x (FLVb - FLVe)

Centrifugal Chillers

FLVb = FLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

IPLVb = IPLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

Temperature Variable, T_var = Chiller Lift + CWTD

Variable Air Volume (VAV) Boxes

Energy Savings (Customer kWh) = #_of_fans x Savings x EFLH x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Demand Savings (Customer kW) = #_of_fans x Savings x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Electrical Energy Savings (Gross Generator kWh) = Customer kWh / (1-TDLF)

Electrical Demand Savings (Gross Generator kW) = Customer kW x CF / (1-TDLF)

Electrical Energy Savings (Net Generator kWh) = Gross Generator kWh x NTG

Electrical Demand Savings (Net Generator kW) = Gross Generator kW x NTG

The following conclusions were drawn from a review of technical reference manuals for algorithms to estimate the energy and demand savings of C&I end-use cooling measures and their related variables.

- The review of different TRMs for energy and demand savings algorithms for C&I end-use cooling measures shows a general consistency in use of the algorithms in different jurisdictions.
- Xcel Energy's Colorado C&I end-use measure deemed savings calculator ("Calculator") uses algorithms that are consistent with other TRMs for most cooling measures.
- The Calculator correctly captures the adjustment factor algorithm for non-standard centrifugal chillers [i.e. chillers not designed to AHRI Standard 550/590 test conditions (44°F leaving chilled water temperature and 85°F entering condenser water temperature with 3 gpm/ton condenser flow rate)]. Also, the Calculator applies the adjusted IPLV values when specifications for non-standard centrifugal chillers are inputted. The instructions on the Calculator show that these adjustments are for standard chillers. The Calculator should add instruction to capture the fact that the adjustment factor is applicable to non-standard centrifugal chillers.
- Accuracy of the algorithms used for estimating energy and demand savings for VAV boxes could not be confirmed by its originator referenced in the Calculator[21]. In addition, none of the TRMs reviewed provides savings algorithms for VAV boxes. In view of this methodological deficiency, we suggest the algorithm currently used by the Calculator as the default algorithm. *However, from the net to gross analysis, we find that free-ridership for VAV boxes is high, indicating reduced efficacy of program support for the measure.* Also, support for VAV boxes has been withdrawn from another Xcel Energy jurisdiction (Minnesota). In view of these, we suggest Xcel Energy consider excluding VAV boxes from the Colorado Cooling Efficiency Program.

[21]Telephone discussion with Mr. Eugene A. Scales, 12th October, 2009.

- The Calculator uses algorithms to determine the peak demand saving for both end-use (equipment) and gross generator level. It uses peak load coincident factor (CF) for generator gross kW saving and applies a value of 0.9. C&I cooling measures are likely to operate when the peak load hours are in effect for the Xcel Energy CO service territory. Therefore, use of a high peak load coincident factor would well capture the peak load savings from the utility perspective. Also, we recommend the need for more research for establishing different CFs for commercial and industrial segments as their end-use load shapes vary.

- Treatment of equivalent full load hours (EFLH) in different TRMs is opaque. Our extensive review of the TRMs shows lack of a clear methodology for estimating the EFLH. Based on our discussion with the representative of Xcel Energy CO Cooling Efficiency Program, we understand that the University of Arkansas had developed a methodology that establishes a linkage between EFLH and climatic variations (or cooling degree days [CDD]). We reviewed the work[22] and find (a) the algorithms are applicable to ground source heat exchangers and (b) no direct linkage with CDD. Also, an algorithm for EFLH for two locations in Arkansas are provided in the Arkansas Deemed Savings TRM that makes a direct relationship of EFLH with CDD through the following relation:

$$EFLH = A \times (CDD)^{b+1}$$

Where A and b are coefficients and their values are provided in the TRM for different building types.

The EFLH values developed for the Calculator are based on more advanced methodology that analyzed weather bins (based on dry bulb temperatures). Also, we understand from discussions with the Xcel Energy representatives that the market segment data for end-use cooling measures were used (along with occupancy and operational characteristics of the facilities).

Since there is a general methodological void in the estimation of EFLH in TRMs, and the Calculator uses EFLH values that are estimated using more robust methodology (as communicated by the Xcel Energy representatives), we recommend that the EFLH values currently applied in the Calculator are continued.

4.3 DETERMINE SAVINGS CONSIDERING 2009 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) STANDARDS

As part of the engineering review, we reviewed baseline efficiency values for C&I cooling measures based on the “International Energy Conservation Code 2006” (IECC 2006). We understand that for the program year 2009-2010, the Xcel Energy Colorado Cooling Efficiency Program will continue to use IECC 2006 codes for defining the baseline efficiency of cooling measures. We also conducted a forward-looking study in the event that Xcel Energy Colorado C&I cooling efficiency program replaces IECC 2006 stipulation by those of

[22] Sutton et al. (2002)a. An Algorithm for Approximating the Performance of Vertical Bore Heat Exchangers Installed in a Stratified Geological Regime. ASHRAE TRANSACTIONS 2002, V. 108. And

Sutton et al. (2002)b. Comparison of Multilayer Borefield Design Algorithm (MLBDA) to Available GCHP Benchmark Data. ASHRAE TRANSACTIONS 2002, V. 108, Pt. 2.

the IECC 2009 in the future. The tabulation of baseline efficiencies of end use measures that will result from adopting IECC 2009 stipulations are for informational purposes only.

We calculated the baseline efficiency of C&I cooling measures according to the IECC 2006 in Table 4-2 as the IECC 2006 codes will remain effective for the program years 2009 and 2010. Also, we provide IECC 2009 stipulations in Table 4-3 for any future use by the Xcel Energy Colorado C&I Cooling Efficiency Program. We compared the baseline measure efficiency values obtained from the IECC handbooks with those provided in the Calculator to identify any changes.

The Calculator converts the EER into SEER (and vice-versa) with a multiplier of 0.85. In addition, the Calculator shows the EER and IPLV values by deducting 0.2 to take into account the effect of heating section (other than electrical resistance heat). However, we do not apply these conversion factors to the baseline efficiency values.

The review of the baseline efficiency values for cooling measures from the IECC 2006 and IECC 2009 handbooks and the Calculator shows that:

- There is no change in the values of baseline efficiencies for Condensing units, PTACs and Water-source heat pumps for the IECC 2006 and IECC 2009.
- For Rooftop units, IECC 2009 baseline efficiency values are greater than those of the IECC 2006.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except that for the PTACs.
- The Calculator needs to modify the algorithm for calculation of baseline efficiencies for PTACs to take into account variations in PTAC sizes (in line with the algorithms provided in the IECC 2006 or IECC 2009).
- We are unable to confirm the baseline efficiency for VAV box used in calculator and suggest that the value used currently is the default. However, as discussed above, these may be removed from the 2010 program.
- For Chillers IECC 2009 stipulates measure baseline efficiencies for two paths i.e. Path A and B. The Path B is intended for part-load operation.
- The IECC 2006 and IECC 2009 use different coefficient for the adjustment factor algorithm to account for non-standard water cooled chillers to the baseline efficiency.

The analysis, by equipment type, is detailed in Appendix B.

Table 4-2. Baseline Efficiency of C&I Cooling Measures—IECC 2006

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	9.7		ARI 210/240
≥ 5.4 -11.3 tons		10.3	
≥11.3 -19.9 tons		9.7	ARI 340/360
≥ 19.9–63.3 tons		9.5 (ILPV: 9.7)	
> 63.3 tons		9.2 (ILPV: 9.4)	
Split Systems < 5.4 tons	10		ARI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	ARI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			ARI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

Table 4-3. Baseline Efficiency of C&I Cooling Measures—IECC 2009

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	13		AHRI 210/240
≥ 5.4 -11.3 tons		11.2	
≥11.3 -19.9 tons		11.0	AHRI 340/360
≥ 19.9–63.3 tons		10.0 (ILPV: 9.7)	
> 63.3 tons		9.7 (ILPV: 9.4)	
Split Systems < 5.4 tons	13		AHRI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	AHRI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			AHRI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

4.4 HOURS OF OPERATION

We compared the operating hours obtained through the survey of the program participants with those reported in the Commercial Business Energy Consumption Survey (CBECS) database. We understand from our interviews with Xcel Energy staff that the operating hours for different business types from the CBECs database were used to develop the effective full load hours for the Calculator (the C&I Cooling Efficiency Deemed Savings Calculator). As shown in the table below, the operating hours reported in the participant survey and those obtained from the CBECs database for different business segments are, in general, consistent.

Table 4-4. Comparison of Participant's Self-reported Operating Hours with CBECS database

Business Type	Operating Hours (Weekly)			
	Participants' Response	Survey sample (n)	CBECS Database	# of buildings (in '000)
Education	56	10	50	386
Lodging	168	2	167	142
Office	64	17	55	824
Retail	55	7	59	443

4.5 NET-TO-GROSS ANALYSIS

Program attribution (or the net-to-gross ratio) refers to energy impacts that can be confidently attributed to program efforts. As discussed at the start-up meeting, Xcel Energy needs an overall net-to-gross ratio for the program for their 2010 planning.

We estimated the net-to-gross ratio following the California self report framework for standard net-to-gross projects[23], which uses a preponderance of evidence approach. Our estimate is based on 1) interviews with 2007–2009 participating customers and influential vendors, 2) in-depth interviews with trade allies, 3) in-depth interviews with Xcel Energy account managers, and 4) literature review and benchmarking interviews with program managers of similar programs in the US.

4.5.1 Data collection and study methodology

An initial net-to-gross ratio was calculated based on customer self-reports. The standard net-to-gross analysis specified in the California framework uses three primary sources of information to estimate net-to-gross: program files and information, participant (decision-maker) survey, and vendor (participating trade ally) surveys. Our approach to using each of these information sources for estimating free-ridership and spillover is described in more detail below.

Table 4-4 shows the number of survey respondents by managed and non-managed account and measure type. The self-reported net-to-gross ratio was calculated from these respondents.

[23] Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers, Prepared for the Energy Division, California Public Utilities Commission by the Nonresidential Net-To-Gross Ratio Working Group, Revised May 8, 2009. This method estimates net-to-gross directly rather than estimating 1 minus free-ridership.

Table 4-5. Breakdown of Respondents Used to Calculate the Net-to-Gross Ratio

		Unweighted Count
Account type	Managed	44
	Non-managed	10
	Total	**54**
Prescriptive measures	Chillers	7
	Condensing units	2
	Cooling Towers	1
	PTAC	3
	Rooftop	29
	Split Systems	3
	VAV Boxes	4
	Total	**49**
Custom measures	Chillers	2
	Install new PMZ3 units in lieu of multi-zone RTUs	1
	Plate and frame heat exchanger	1
	Replace old condensing unit with evaporative cooler	1
	Total	**5**

The decision-maker survey, targeted at participating customers, asked highly structured questions about actions that would have been taken in the absence of the program. The survey was guided by information in program files. Respondents were first asked a series of questions to establish project context. Next, they were asked to rate the importance of program influences vs. non-program influences. Third, they were asked to rate the significance of different factors and events that may have led to their decision to install the efficient equipment at the time they did, including questions on the age or condition of the equipment, type of project, recommendations received, and their business policies related to equipment purchases.

The decision-maker survey also collected information about what participants would have done in the absence of the program. Specifically, respondents were asked a number of questions to assess the impact the program had on the timing, quantity, and efficiency level of the measure installed:

- Did the program impact the timing of the decision to replace cooling equipment and, if so, by how many months/years?
- Did the program impact the quantity of equipment installed, and if so, by how much (partial free-ridership)?
- Did the program impact the efficiency of equipment installed and, if so, by how much (partial free-ridership)?

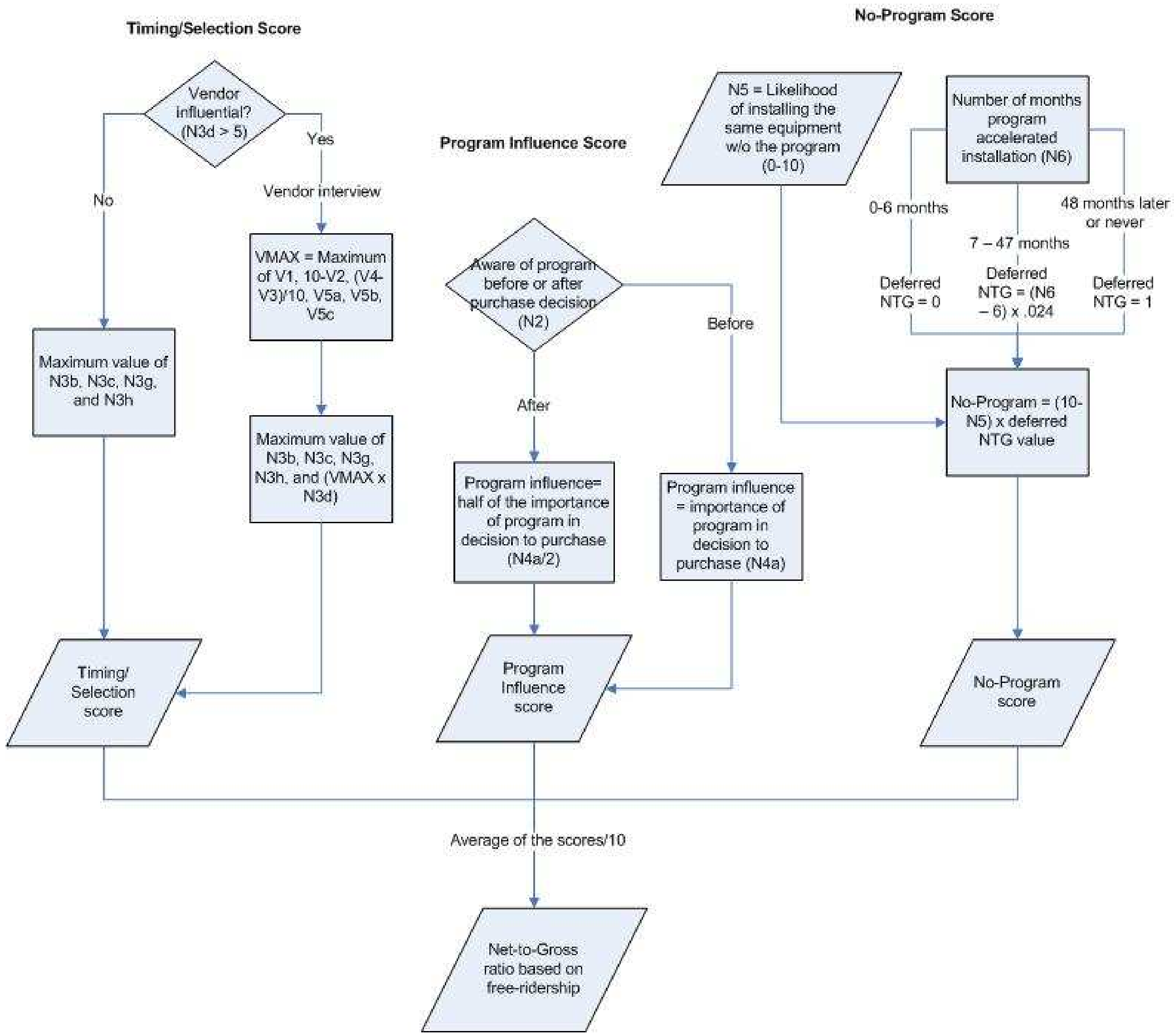
4.5.2 Measuring self-reported free-ridership

The calculation of the self-report-approach net-to-gross ratio based on free-ridership is summarized below in text and in Figure 4-1. In summary, the net-to-gross ratio based on free-ridership is calculated as an average of three scores representing responses to one or more questions about the decision to install a program measure:

1. A **timing and selection score** that captures the influence of the most important of various program and program-related elements in influencing the customer to select the specific program measure at this time. Program influence through vendor recommendations is also captured in this score when the customer says the vendor was influential in their decision. In these cases, the influential vendor was also interviewed and their responses were incorporated into the timing and selection score.
2. An overall **program influence** score that captures the perceived importance of the program (whether rebate, recommendation, or other information) in the decision to implement the specific measure that was eventually adopted or installed. The overall program influence score is reduced by half if the respondent says they learned about the program only after they decided to install the program qualifying measure.
3. A **no-program** score that captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. This score accounts for deferred free ridership by capturing the likelihood that the customer would have installed program qualifying measures at a later date if the program had not been available.

The core net-to-gross ratio is the average of these three scores divided by 10, as shown in Figure 4-1 below.

Figure 4-1. Net-to-Gross Ratio Flowchart Based on Self-report Free-ridership



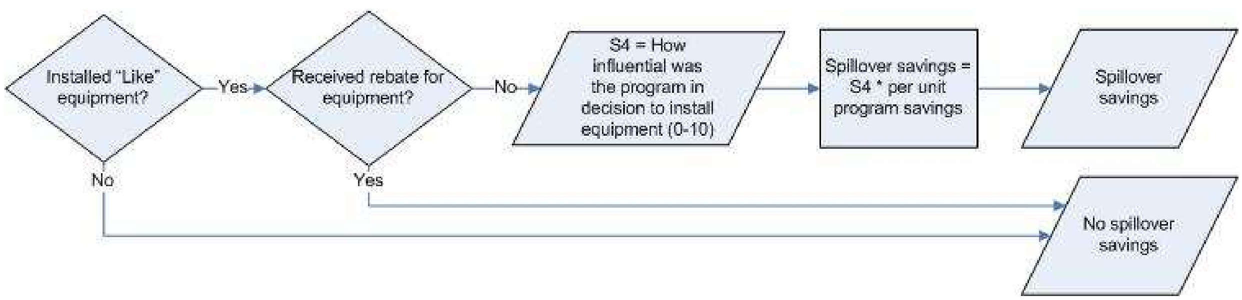
The California framework defines partial free-ridership as when, in the absence of the program, the participant would have installed something more efficient than the program-assumed baseline efficiency but not as efficient as the item actually installed as a result of the program. Of the 54 participants interviewed, five stated that, in absence of the program, they would have installed something more efficient than the standard equipment but less efficient than the equipment that was rebated through the program. For these cases, an adjustment should either be made to the net-to-gross ratio or to the gross savings. For all fives cases, we believe that the calculated net-to-gross ratio already accurately accounts for the impact of the program on these participants. Therefore, no further adjustment to the net-to-gross ratio was made.

4.5.3 Measuring self-reported spillover

The self-report protocol included a battery of questions to quantify spillover for use in estimating spillover. The spillover methodology uses a series of questions designed to measure "like" spillover. These questions ask about recent purchases (since program participation) of any additional energy-efficient equipment of the same type, installed through the program, made *without* any technical or financial assistance from the utility, but influenced by the program. A “like” spillover estimate is computed based on how much more of the same energy-efficient equipment the participant installed outside the program because of their positive experience with the program.

One of the issues with attempting to quantify spillover savings is how to value the savings of measures installed outside the program since we are relying on customer self-reports of the quantity and efficiency of any measures installed. We used a conservative approach and reported only those measures installed outside the program that were of exactly the same type and efficiency as the ones installed through the program (“like” spillover). Our conservative approach allowed customers to be more certain about whether the equipment they installed outside the program was the same type as the program equipment. This, in turn, made it possible for us to use the estimated program savings for that measure to calculate the customer’s “like” spillover savings. Figure 4-2 details the process for quantifying spillover savings.

Figure 4-2. Spillover Savings



We also attempted to measure the extent of free-drivers, or nonparticipant spillover. The data for this type of analysis could be collected from nonparticipants directly or from the design professionals and vendors who recommended, sold, and/or installed qualifying high efficiency equipment. We prefer to survey the design professionals and/or vendors primarily because they typically provide much more accurate information about the efficiency level of installed equipment than nonparticipants. Our experience has shown that customers cannot provide enough data about the new equipment they have installed to allow for accurate estimates of the energy savings achieved from the equipment. While they usually can report what type of equipment was installed, they typically cannot provide sufficient information about the quantity, size, efficiency, and/or operation of that equipment to allow us to determine whether the equipment is "program-eligible." On the other hand, design professionals and equipment vendors who have worked with the program are typically more knowledgeable about equipment and are familiar with what is and is not "program-eligible."

The in-depth interviews with participating vendors suggested little nonparticipant spillover due to the program at this time given the economy, the incremental cost of high efficiency cooling equipment, and the fact that this is only the third year of the program. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high

efficiency equipment. Therefore, there are no adjustments to the net-to-gross ratio based on free-drivers.

4.5.4 Self-report net-to-gross results

The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 51 percent. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 21 percent. The resulting self-report net-to-gross ratio is 0.7[24] for the Colorado Cooling Efficiency Program in 2007–2009*.*

We recommend Xcel Energy set a net-to-gross ratio in the range of 0.7 to 0.8 for the Colorado Cooling Efficiency Program, depending on program eligibility requirements. We recommend a net-to-gross range because as eligible program equipment changes (as it did between 2008 and 2009), we expect program attribution to change. Because we expect net-to-gross analysis will only be conducted periodically for the program, a realistic range allows Xcel Energy flexibility to set the net-to-gross ratio based on program eligibility requirements.

For example, PA Consulting has conducted biannual net-to-gross surveys for National Grid's commercial HVAC program. Prior to 2007, National Grid was using CEE Tier 1 eligibility standards for HVAC equipment. In 2002, the free-ridership rates for HVAC equipment ranged from 40 to 44 percent. In 2005, the free-ridership rates for HVAC equipment ranged from 41 to 56 percent. National Grid increased the eligibility standards to CEE Tier 2 in 2007. In 2007, with the higher eligibility requirements, free-ridership rates dropped significantly from 8 to 15 percent[25].

Results from the benchmarking review of HVAC programs that estimated a net-to-gross ratio ranged from 0.50 (when the net-to-gross ratio only includes free-ridership) to 0.85 (when the net-to-gross ratio includes spillover). This is in line with the self-report net-to-gross estimates from 2007–2009 Colorado Cooling Efficiency program participants discussed above.

There is also qualitative evidence from the 30 in-depth interviews with participating and nonparticipating trade allies which supports a net-to-gross range of 0.7 to 0.8. The qualitative results indicate that the program is helping to overcome barriers of selling high efficiency cooling equipment. In addition, the interviews suggest a medium level of spillover to customers of participating trade allies, supporting the medium to high level of spillover found in the customer survey. Nonparticipating trade allies were much more likely to say selling high efficiency cooling equipment to customers is very difficult. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary drivers for the difficulty rating they gave. They also mentioned lack of knowledge or education on the benefits of high efficiency equipment.

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[24] Net-to-gross = (1 - .51) + .21

[25] The Northeast has significantly higher electric rates than Colorado and National Grid's program is very mature, which has supported the success of moving to the higher CEE Tier levels. We are not recommending that this be done for the Xcel Energy Colorado Cooling Efficiency Program, but instead use it as an illustrative example of how changes in program eligibility affects program attribution.

Participants' self-report results substantiate the trade ally interview findings as participants with high net-to-gross ratios often stated that they were trying to achieve a good return-on-investment or that the rebate allowed them to purchase higher efficiency equipment.

> *"We purchased an existing building so we had access to their utility bills so we know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and (the rebate was) part of the reason we were able to make the investment."* (net-to-gross ratio = .79)
>
> *"We were doing upgrades anyway so it worked out to get rebates to help us get more efficient equipment."* (net-to-gross ratio = .83)

At the same time, there is qualitative evidence supporting a certain amount of program free-ridership—also found in the customer self-report calculations. Xcel Energy account managers discussed that larger accounts tend to have standard practices toward energy efficiency. Participants with low net-to-gross ratios often stated that the equipment they installed through the program was their only option or mandated by regulations, supporting the account managers' perspectives.

> *"[The equipment was] the only choice we had for a flat roof building for the tenant re-finish."* (net-to-gross ratio = .27)
>
> *"It's giving me money back for stuff I'm already going to do, stuff that I'm mandated to do."* (net-to-gross ratio = .25)
>
> *"We got money back on something we would have had to do anyway."* (net-to-gross ratio = .35)

For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program. This ratio excludes VAV boxes and cooling towers, which yielded lower net-to-gross ratios. We recommend VAV boxes be removed from the program based on the engineering review and net-to-gross analysis, and cooling towers were removed from the program in 2009.

5. RECOMMENDATIONS

This chapter outlines recommendations for Xcel Energy's consideration. These recommendations are based on activities and key findings detailed within this report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

5.1 PROCESS RECOMMENDATIONS

5.1.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to

reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Ally Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

5.1.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

5.1.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program.

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn’t even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

5.2 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007-2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007-2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

APPENDIX A: TECHNICAL RESOURCE MANUAL REVIEW SUMMARY

This appendix summarizes the findings through the review of five programs' Technical Resource Manuals (TRMs).

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report; 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review; 2009.

A.1 EFFICIENCY MAINE TRM

The Efficiency Maine TRM provides algorithms for three categories of cooling measures, (a) small cooling measures with capacity less than 65,000 BTUh[26], (b) large cooling systems having capacity 65,000 BTUh or more[27,28], and (c) Electric Chillers.

Small Systems

Energy Saving (kWh) = Capacity (kBTU/hr) × (1/SEERb - 1/SEERe) × FLH

Demand Saving (kW) = Capacity (kBTU/hr) × (1.1/SEERb - 1.1/SEERe)

Large Systems

Energy Saving (kWh) = kBTU/hr × (1/EERb - 1/EERe) × FLH

Demand Saving (kW) = kBTU/hr × (1/EERb - 1/EERe)

Electric Chiller

Energy Saving (kWh) = Capacity (tons) × (PEb - PEe) × FLH

Demand Saving (kW) = Capacity (tons) × (PEb - PEe)

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[26]Measures include small split system and single package air conditioners and heat pumps excluding room air conditioners PTACs, PTHPs, water source heat pumps and ground source heat pumps.

[27] Air conditioners, PTAC's, water-source heat pumps

[28]Although the TRM provides algorithm for electric chillers, it recommends energy saving calculations derived from detailed engineering analysis of the

The TRM uses 800 full load cooling hours (FLH) for small systems. We discuss the measure efficiency values (SEER, EER or PE) in Section 4.2 as part of the IECC 2006 and IECC 2009 baseline stipulations.

A.2 ARKANSAS DEEMED SAVINGS TRM

Two types of cooling measures included in the TRM are (a) Unitary air conditioners and (b) electric chillers. The algorithms used for quantifying the energy saving are as follows.

Unitary Air Conditioners:

Energy Saving (kWh) = Capacity (BTU/hr) x (1/1000) x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (BTU/hr) x (1/1000) x (1/EERb - 1/EERe)

The TRM uses IECC 2003 for defining the measure baseline efficiencies. The expression for the equivalent full load hours is:

EFLH = A x $(CDD)^{b+1}$

For unitary systems the TRM provides calculated EFLH for two cities i.e. “Fort Smith (FS)” and “Little Rock (LR)” in Arkansas State as shown in Table A-1. However, the methodology used for calculating the EFLH values is not provided in the TRM.

Table A-1. Calculated EFLH for Unitary Cooling Equipment*

City	Stage	M-Fri, 7 a.m. to 5 p.m.	M-Fri, 7 a.m. to 7 p.m.	M-Fri, 9 a.m. to 10 p.m.; Sun, 11 a.m. to 6 p.m.	All week, 6 a.m. to 10 p.m.	All week, 6 a.m. to Midnight	All week, All day
Fort Smith	Single	1,207	1,444	2,033	2,520	2,739	3,230
	Dual	854	1,020	1,443	1,750	1,881	2,155
Little Rock	Single	1,177	1,383	1,948	2,419	2,627	3,137
	Dual	801	938	1,303	1,611	1,730	1,997

*Source: Arkansas Deemed Savings Quick Start Program Commercial Measures: Final Report (Page 2–25)

Electric Chillers:

Energy Saving (kWh) = Capacity (ton) x 3.517 x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (ton) x 3.517 x (1/COPb - 1/COPe), and

EFLH = A x $(CDD)^{b+1}$

The coefficients A and B for calculating the EFLH for different building types are given in the TRM and shown in Table A-2.

Table A-2. Coefficients for calculating EFLH

Building Type	A	B
Education—Community College	327.83	-0.8835
Education—Secondary School	240.98	-0.9174
Education—University	512.11	-0.9148
Health/Medical—Clinic	313.54	-0.8437
Health/Medical—Hospital	730.76	-0.8836
Lodging	589.61	-0.8750
Office	657.91	-0.9437
Retail	404.00	-0.8645

The Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator also mentions use of the same methodology for estimating the EFLH. The EFLH estimates were developed by analyzing facility occupancy and operating hour distribution based on (a) Minnesota “occupation and employment statistics” data, (b) TMY2 data for Denver and Grand Junction and (c) building characteristics data from CBECS. This methodology would provide a better estimation of the EFLH values, although may always not be accurate. A detailed investigation of the methodology used for estimating the EFLH values currently being used for Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator is beyond the scope of the current study.

A.3 PENNSYLVANIA ENERGY EFFICIENCY AND CONSERVATION PROGRAM TRM

The TRM provides energy and demand saving algorithms for C&I cooling measures for room and central air conditioners split systems, packaged terminal systems, and water source heat pumps. Also, the TRM provides energy saving algorithms for electric chillers.

Air Conditioner:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x (1/EER_b -1/EER_e) x EFLH

Demand Savings (kW) = Capacity (Btu/hr) x (1/1000) x (1/EER_b -1/EER_e) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. A coincident factor (CF) of 0.67 is used in the demand savings calculations. The EFLH hours are obtained for seven locations within the state using the “Energy Star Calculator” of the Department of Energy[29].

[29]At the time of writing, we were unable to obtain the EFLH from the Energy Star Calculator hosted at the DOE website. The calculator needs input of the FLH or EFLH, else it uses a default value of 2000 Hrs.

Table A-3. EFLH for Seven Locations in Pennsylvania

Place	EFLH (hours)
Allentown	784
Erie	482
Harrisburg	929
Philadelphia	1032
Pittsburgh	737
Scranton	621
Williamsport	659

Electric Chillers

Energy Savings (kWh) = Tons X (kW/ton$_b$ – kW/ton$_e$) X EFLH

Demand Savings (kW) = Tons X (kW/ton$_b$ – kW/ton$_e$) X CF

The algorithms for estimating energy and demand saving are loosely linked to the equipment efficiency rating. The TRM uses the same CF and EFLH values as used for the air conditioning equipment.

A.4 CONNECTICUT CL&P AND UI PROGRAM SAVINGS TRM

The TRM provides algorithms for estimating the energy and demand savings for unitary air conditioners, as follows:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x (1/EER$_b$ -1/EER$_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x (1/EER$_b$ -1/EER$_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. The full load cooling hours are given for around sixty facility types ranging from 564 hours to 1308 hours (Table 2.0.0; page 246) also shown in Table 6.5 in this report. For demand saving estimation a peak load factor (CF) of 0.82 is recommended (Table 1.1.1; page 231).

For chillers the TRM recommends custom calculated energy savings based on specific equipment capacity, operational staging, operating profile, and load profile.

A.5 NEW JERSEY'S CLEAN ENERGY PROGRAM ENERGY IMPACT EVALUATION AND PROTOCOL REVIEW

This report is a well-researched TRM. It reviews energy and demand savings algorithms for end-use cooling (and other) measures from TRMs used in different jurisdictions. The report recommends algorithms for air conditioners and chillers. The air conditioning systems include unitary/split systems, PTACs, Water-source heat pumps etc.

Air Conditioners:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x (1/EER_b -1/EER_e) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x (1/EER_b -1/EER_e) x CF

Electric Chillers

Energy Savings (kWh) = Tons X (IPLVb - IPLVe) X EFLH

Demand Savings (kW) = Tons X (IPLVb - IPLVe) X CF

The TRM recommends a single value of 1360 hrs for EFLH and 0.67 for the CF (page 3-58).

Table A-4. Full load cooling hours by facility type*

Facility Type	Full Load Cooling Hours	Facility Type	Full Load Cooling Hours
Auto Related	837	Medical Offices	797
Bakery	681	Motion Picture Theaters	564
Banks, Financial centers	797	Multi-Family (Common Areas)	1306
Church	564	Museum	797
College-Cafeteria	1139	Nursing Homes	1069
College-Classes/Administrative	646	Office (General Office Types)	797
College-Dormitory	709	Office/Retail	797
Commercial Condos	837	Parking Garages & Lots	878
Convenience Stores	1139	Penitentiary	1022
Convention Centers	564	Performing Arts Theaters	646
Dining-Bar Lounge/Leisure	854	Police/Fire Stations (24 Hrs)	1306
Dining-Cafeteria/Fast Food	1149	Post Office	797
Dining-Family	854	Pump Stations	563
Entertainment	564	Refrigerated Warehouse	648
Exercise Center	1069	Religious Buildings	564
Fast Food Restaurants	1139	Residential (Except Nursing Homes)	709
Fire Station	564	Restaurants	854
Food Stores	837	Retail	837
Gymnasium	646	Schools/University	594
Hospitals	1308	Schools (Jr/Sr. High)	594
Hospital/Health Care	1307	Schools (Preschools/elementary)	594
Industrial- 1 Shift	681	Schools (Technical/Vocational)	594
Industrial-2 Shift	925	Small Services	798
Industrial- 3 Shift	1172	Sports Arena	564
Laundromats	837	Town Hall	797
Library	797	Transportation	1149
Light Manufacturers	681	Warehouse (Not Refrigerated)	648
Lodging (Hotels/Motels)	708	Waste Water Treatment Plant	1172
Mall Concourse	938	Warehouse	798
Manufacturing Facility	681		

*Source: New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009 (page 3-41).

APPENDIX B: IECC 2006 AND IECC 2009 EQIUPMENT ANALYSIS

B.1.1 Rooftop units

For all RTU sizes the EER (SEER and/or IPLV) values stipulated in the IECC 2009 are greater than those in IECC 2006. The measure baseline efficiency values used in the Calculator (reduced by 0.2 to account for the heating section) are consistent with the codes.

B.1.2 Water source heat pump

No change in EER values between IECC 2006 and IECC 2009. The Calculator and IECC 2006 values are consistent.

B.1.3 Condensing units

No change in EER values between IECC 2006 and IECC 2009. The Calculator uses EER value for air cooled condensing units only and this is in agreement with IECC 2006 value. The EER and (IPLV) values for water or evaporative cooled condensers are also provided in the Tables 6.7a and 6.7b.

B.1.4 Packaged Terminal Air Conditioners (PTAC)

No change in equipment baseline efficiencies between IECC 2006 and IECC 2009. Minimum energy efficiency ratio (EER) for PTACs according to both IECC 2006 and IECC 2009 is given by the following relation:

New Construction:

EER = 12.5 - (0.213*Capacity/1000)

Replacement:

EER = 10.9 - (0.213*Capacity/1000)

Code handbooks stipulate that for PTAC capacity less than 7,000 BTU/hr (0.58 ton) the equation should use default capacity value of 7000 BTU/hr to calculate the EER. Similarly, for equipment capacity over 15,000 BTU/hr the default capacity is 15,000 BTU/hr. Based on the above assumptions we calculate the EER values shown in Table 6.6a and 6.6b.

The Calculator uses a single EER value of 9.1 (excluding 0.2 for heating section); based on an average value of PTAC size obtained from the Xcel Energy CO market segment data. Plugging the EER value of 9.3 (9.1 + 0.2 for heating section) in above algorithms leads to PTAC sizes of about 15,000 BTU/hr and 7,000 BTU/hr for new construction and replacement units respectively. This does not capture the PTAC sizes that fall within the 15,000 BTU/hr and 7000 BTU/hr range. . We recommend that the Calculator applies the above algorithm to take into account the capacity variations for PTACs.

B.1.5 Electric chillers

In Table B-1 and B-2 we provide baseline measure efficiencies for electric chillers. The “Full Load Value (FLV) in kW/ton” and “Integrated Part Load Value (IPLV) in kW/ton” provided in the Calculator and the IECC 2006 handbook are consistent.

Table B-1. Baseline Efficiency of C&I Chillers—IECC 2006

Cooling Measures	IECC 2006		
	FLV (kW/ton)	IPLV (kW/ton)	Test Procedure
Scroll/Screw Chiller < 150 tons	0.79	0.78	ARI 550/590
Scroll/Screw Chiller ≥150 tons and < 300 tons	0.72	0.71	
Scroll/Screw Chiller ≥ 300 tons	0.64	0.63	
Centrifugal Chiller < 150 tons	0.65	0.65	
Centrifugal Chiller ≥150 ton and < 300 tons	0.63	0.63	
Centrifugal Chiller ≥ 300 tons	0.58	0.58	
Air-Cooled Chillers ≥ 150 tons	1.41	1.41	

Note: For non-standard centrifugal chillers (chillers not designed to standard ARI 550/590 test conditions) the IPLV is factored for adjustment (according to the algorithm well captured in the Calculator).

The IECC 2009 codes for water cooled chillers contain the amendments made by the ASHRAE 90.1—2007 standards. Two paths have been established—Paths A and B. Path B is intended for measure applications where significant time is expected at part load and all Path B chillers need demand-limiting controls.

Table B-2. Baseline Efficiency of C&I Chillers—IECC 2009

Measure	IECC 2009				
	Path A		Path B		
	FLV kW/ton	IPLV kW/ton	FLV kW/ton	IPLV kW/ton	Test Procedure
Scroll/Screw Chiller < 75 tons	≤0.78	≤0.63	≤0.0.80	≤0.60	AHRI 550/590
Scroll/Screw Chiller ≥75 and <150 tons	≤0.78	≤0.62	≤0.79	≤0.59	
Scroll/Screw Chiller ≥150 and <300 tons	≤0.68	≤0.58	≤0.72	≤0.54	
Scroll/Screw Chiller ≥ 300 tons	≤0.62	≤0.54	≤0.64	≤0.49	
Centrifugal Chillers < 150 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥150 and < 300 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥300 and < 600 tons	≤0.58	≤0.55	≤0.60	≤0.40	
Centrifugal Chillers ≥ 600 tons	≤0.57	≤0.54	≤0.59	≤0.40	
Air-Cooled Chillers ≥ 150 tons	≥9.6 EER	≥12.75 EER	NA	NA	

The adjustment factor for non-standard chillers is given by the following equation.

Adjusted NPLV = IPLV/K_{adj}

K_{adj} = 6.174722 – 0.303668(X) + 0.00629466 $(X)^2$ – 0.000045780 $(X)^3$

X = D_{std} + LIFT

D_{std} = (24 + FLV*6.83)/Flow rate

LIFT = CEWT – CLWT (^oF)

CEWT = Full load condenser entering water temperature (^oF)

CLWT = Full load leaving chilled water temperature (^oF)

Note that the coefficients of the equation for K_{adj} provided in the IECC 2009 are different from that in IECC 2006.

APPENDIX C: PARTICIPANT AND NONPARTICIPANT SURVEY RESPONSE RATES

Table C-1 presents the response rate and cooperation rate to the participant survey, and Table C-2 presents the same information for nonparticipants.

Table C-1. Cooling Efficiency Program Participant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**134**	**23**	**157**
Number not in service[4]	1	0	1
Non-working number[4]	0	3	3
Person not at number	7	0	7
Adjusted Sample Size	***126***	***20***	**146**
Hard Refusal	28	3	31
Soft Refusal[1]	0	0	0
Incompletes (partial interviews)	0	0	0
Unavailable for duration	3	2	5
Language barrier/non-English	0	0	0
Active[2]	***51***	***5***	**56**
Completed Surveys[5]	**44**	**10**	**54**
Cooperation Rate[3]	***34.9%***	***50.0%***	***42.5%***

[1] Attempts were made to convert all soft refusals

[2] An average of 16.7 contacts per active case were made to reach these still active cases

[3] Number of completed surveys divided by Adjusted Sample Size

[4] All bad numbers were traced with a telephone append service or directory assistance service

[5] Surveys were completed with 54 participants at 44 locations

Table C-2. Cooling Efficiency Program Nonparticipant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**156**	**572**	**728**
Temporarily disconnected[4]	1	5	6
Fax/data line[4]	4	3	7
Disconnected number[4]	1	30	31
Residential number	12	59	71
Ineligible—no commercial cooling	18	80	98
Ineligible—terminated during survey	12	77	89
Adjusted Sample Size	***108***	***318***	**426**
Hard Refusal	24	69	93
Soft Refusal[1]	0	2	2
Incompletes (partial interviews)	1	4	5
Unavailable for duration	3	14	17
Language barrier/non-English	0	2	2
Active[2]	***58***	***187***	**245**
Completed Surveys	**27**	**62**	**89**
Completed Surveys—Swamp Coolers Only	**1**	**7**	**8**
Completed Surveys—Doesn't Pay Cooling	**4**	**15**	**19**
Cooperation Rate[3]	29.6%	26.4%	***28.0%***

[1] Attempts were made to convert all soft refusals

[2] An average of 9.8 contacts per active case were made to reach these still active cases

[3] Number of completed surveys divided by Adjusted Sample Size

[4] All bad numbers were traced with a telephone append service or directory assistance service

Xcel Energy

Process and Impact Evaluation for the Colorado Business Cooling Efficiency Program

FINAL REPORT

January 15, 2010

PA

Xcel Energy

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Prepared for: Xcel Energy

PA Consulting Group
6410 Enterprise Lane
Suite 300
Madison, WI 53719
Tel: +1 608 316 3700
Fax: +1 608 661 5181
www.paconsulting.com

Version: 1.0

PA

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1. EXECUTIVE SUMMARY

This report provides the process and impact evaluation results of Xcel Energy's Colorado Commercial and Industrial (CO C&I) Cooling Efficiency Program.

OVERVIEW OF THE PROGRAM

The Cooling Efficiency program, which Xcel Energy launched in 2006, provides rebates to non-residential customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Oversized cooling towers
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps

The program targets both new construction and existing buildings. The program further distinguishes between prescriptive and custom installations.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively. [1]

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has struggled to elicit small business customer participation.

The program leverages the trade ally infrastructure, along with Xcel Energy staff such as account managers and Business Solutions Center representatives, to provide program outreach. Understanding the importance of the trade allies' roles, the program has an assigned Trade Relations Manager who provides education and outreach to trade allies throughout the state.

[1] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

1.1 METHODOLOGY

The purpose of the process and impact evaluation were to “assess customer satisfaction with the program being evaluated, and to make changes that should be made to technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator’s own research as well as through review of industry-wide and the Company’s current processes, technical assumptions and NTG ratios.[2]”

The process evaluation was designed to provide Xcel Energy with a thorough understanding of process issues such as barriers to participation, satisfaction with customers, and opportunities for improvement. The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate net-to-gross ratios. The impact evaluation also set out to verify that Xcel Energy’s baseline and technical assumptions of efficiency measures used for calculating gross and net savings are reasonable and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[3], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Data collection activities included in the evaluation are detailed below. These activities informed both the process and impact (e.g., net-to-gross) analysis.

Table 1-1. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[4]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

[2] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

[3] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes as well as the impact of the 2009 IECC standards on future program years instead of looking backward to codes that no longer apply.

[4] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

1.2 KEY FINDINGS

The 2009 program successfully achieved its energy savings goals even though it increased its savings goals from the 2008 program year. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent, and 106 percent of the goals respectively.

The evaluation found that while the program effectively engaged managed accounts, the program is not as effectively reaching small and/or non-managed customers. This key finding will not come as a surprise to program staff—the evaluation confirmed that it is an issue through database analysis and in-depth interviews. Interviews identified that there are unique barriers for small commercial customers particularly for chain accounts that occupy leased facilities.

The evaluation also found that leveraging trade allies is critical for programs such as Xcel Energy's Cooling Efficiency Program. Effectively reaching and integrating trade allies into the program's outreach and marketing campaign was identified in the benchmarking study as a best practice; program managers of mature and successful programs said they leverage trade allies successfully, although developing those relationships admittedly takes time. Xcel Energy's Cooling Efficiency Program is moving in the right direction by employing an assigned Trade Relations Manager to reach trade allies.

Although the trade ally infrastructure is key to program success, there is a need to continue to strengthen the demand of high efficiency cooling equipment from the customer. Interviews identified a need for continued education with customers and specific marketing materials for target groups.

The remainder of this key findings section organizes findings by research objectives detailed in the Xcel Energy Cooling Efficiency Request for Proposal. Research objectives relevant for each subsection are denoted in the footnotes. The process and impact evaluation chapters provide further support and documentation of these key findings.

1.3 PROCESS EVALUATION KEY FINDINGS

1.3.1 Program design and operations[5]

Program staff and trade allies commended the prescriptive programs' application process, commenting that the application form is relatively easy to complete with clear instructions. The custom application process did not receive such favorable reviews from respondents. Respondents found the application process difficult and commented on the rebate estimation and verification process as areas for improvement.

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[5] **This section addresses the following objectives:**

1) Gauge efficiency of the application process and determine opportunities to improve the application process.
2) Identify areas where the program/processes/marketing can be improved to capture more customer participation.

Having an assigned Trade Relations Manager to communicate with trade allies is seen as a critical role by program staff. However, interviewees questioned whether one staff member was sufficient for the entire state. Additional support in reaching trade allies was identified by Xcel Energy staff as a means for capturing more customer participation.

The Business Solution Center (BSC) is also viewed favorably by program staff as a referral point for the non-managed and small business customers. However, interviews revealed that the BSC should be more involved in marketing to customers. BSC staff said they planned to proactively market to customers in the future, although they admitted to not having specific marketing materials for these customers.

As noted in the recommendations section, the program should consider developing targeted marketing materials and provide those materials to BSC staff. Other recommendations include increasing the rebate level to capture a group of nonparticipants that otherwise would not participate and provide education and training opportunities to customers.

1.3.2 Customer characteristics and experiences[6]

The program is primarily serving managed accounts. Consequently, the nonparticipant group is far more likely to be comprised of non-managed accounts than the participant group. Participants are also more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Other points of distinction between the participant and nonparticipant groups are variability in hours of operation by season and building ownership.

The majority of participants said there is typically more than one person involved in the decision of whether to purchase cooling equipment. The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. The age or condition of the old equipment was the most important factor.

Overall, program participants are satisfied with the Cooling Efficiency program and the various aspects of the program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied.

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[6] **These key findings address the following objectives:**

1) Identify characteristics and firmographics to help define current participants and target similar non-participants.
2) Assess customer decision-making processes regarding participating in the CO C&I Cooling Efficiency Program.
3) Gauge program participant satisfaction.

1.3.3 Target market for Xcel Energy's cooling efficiency program[7]

Trade ally interviews discussed the significant potential for the Cooling Efficiency Program in Colorado's commercial market. According to trade allies and Xcel Energy staff interviews, small commercial customers are underserved by the program, as documented in the program literature[8] and confirmed by trade allies and program staff in this program evaluation. These small commercial and non-managed organizations tend to be capital constrained and lease space. Therefore, they do not have ownership of the equipment installed but have to pay the energy bills. An effective suggestion for targeting these customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Additionally, large commercial customers are oftentimes opting to repair rather than replace failing equipment. The stock of cooling equipment is aging for these customers. Trade allies envision a significant need for cooling equipment replacement and an opportunity for the Cooling Efficiency program in the future.These factors, along with relatively low participation numbers since program inception, indicate that that there is significant opportunity for the program to provide cooling efficiency services to the commercial sector.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

1.3.4 Marketing and outreach[9]

The program employs a variety of resources to provide marketing and outreach to customers and trade allies. These resources include the BSC, Trade Relations Manager, and account managers, as well as direct mailings developed by Xcel Energy. Trade allies are particularly critical for reaching customers.

The participant surveys explored the effectiveness of these outreach efforts. Account managers followed by their HVAC vendors have been the most effective outreach channels for program participants.

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[7] **These key findings address the following objectives:**

1) Quantify program saturation in the market including untapped markets of non-participants and remaining markets for existing program participants.
2) Identify the most attractive target populations that currently participate in the program.
3) Identify the target population that currently do not participate in the program.

[8] *2009 Cooling Efficiency Marketing Plan.*

[9] **These key findings address the following objectives:**

1) Identify channels for information about the CO C&I Cooling Efficiency Program
2) Determine nonparticipants' awareness level of Colorado's C&I Cooling Efficiency Program
3) Identify preferred channels for information about the CO C&I Cooling Efficiency Program

Approximately a quarter of nonparticipants are aware of the program. The most common way nonparticipants heard about the program was through Xcel Energy direct mail. Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, followed by email. Trade ally and internal staff identified a need for these marketing materials to be more specific to target sectors, such as small commercial customers.

Trade allies appreciate receiving information through mail; however, the evaluation identified that personal contact is most effective for providing information about the program. Trade allies also requested that a dedicated website be established to communicate program information and tools.

1.3.5 Barriers to purchasing new equipment or participation[10]

The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital. Customers will contact trade allies when it is time to replace the equipment. Current economic conditions and costs were identified by participating and nonparticipating trade allies, and nonparticipating customers, as barriers to purchasing efficient cooling equipment. The barriers included the incremental cost of high efficiency cooling equipment as well as the first cost of cooling equipment.

Several trade allies differentiated the barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost. For larger customers, the main barrier was initial cost due to their need for larger cooling equipment. A number of these customers decide to repair rather than replace equipment. Another notable barrier was triple-net leases, which are reported as very common among commercial customers. Non-financial barriers for moving customers to higher efficiency cooling equipment include customers' lack of awareness and/or understanding of the benefits of high efficiency equipment.

Customers' financial constraints and tendency to replace equipment on failure reinforce the need for trade allies to be intimately familiar with the program and be provided with materials and tools so they can easily and quickly provide information to customers in these situations.

1.4 IMPACT EVALUATION KEY FINDINGS[11]

The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used

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[10] **These key findings address the following objectives:**

1) Identify barriers to participation

2) Determine reasons for not participating in the program

[11] **These key findings address the following objectives:**

1) Verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and vendor's own findings.

2) Calculate Net-to-Gross ratios including and identifying the effect from free riders, free drivers, and spillover.

for other programs. The values for peak load coincident factor (CF) and equivalent full load hours (EFLH) provided in the Calculator are appropriate.

More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. Based on the review of other programs and the engineering estimates, the recommendations include removal of VAV boxes from program offerings.

IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for both the 2009 and 2010 program years. The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the Package Terminal Air Conditioners (PTACs), which do not take into account variations in PTAC sizes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

The self-reported net-to-gross ratio for 2007–2009 participants using the California self-report methodology was is 0.7 for the Colorado Cooling Efficiency Program. Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program. The net-to-gross results identified through the benchmarking study are in line with the results from this Xcel Energy Cooling Efficiency evaluation, which used the California net-to-gross framework[12].

1.5 RECOMMENDATIONS

These recommendations are based on activities and key findings detailed within the report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

1.6 PROCESS RECOMMENDATIONS

1.6.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates

[12] The program has used a net-to-gross ratio of .94 through 2009 and per Xcel Energy recommendations from this evaluation will not be retroactively imposed on 2009 or prior program achievement but will be used moving forward beginning in 2010.

program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Relations Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to

pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

1.6.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

1.6.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program. .

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn't even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

1.7 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007–2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross

ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007–2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

2. INTRODUCTION

This report presents the results of the 2009 process and impact evaluation of the Xcel Energy Colorado Business Cooling Efficiency program. In this chapter, we discuss the program overview and logic model, study objectives, evaluation methodology, and organization of the report.

2.1 PROGRAM OVERVIEW AND LOGIC MODEL

2.1.1 Program overview

Cooling is the second highest use of electricity for most commercial buildings[13]. Xcel Energy began offering a Cooling Efficiency program for its Colorado commercial and industrial customers in 2006.

The Cooling Efficiency program offers rebates to eligible customers for a range of qualifying equipment in order to lower the up-front costs and decrease the payback period of efficient equipment. Eligible equipment includes:

- Chillers
- Condensing units
- Packaged terminal air conditioners
- Rooftop units
- Split systems
- Variable air volume boxes
- Water source heat pumps.

The program targets both new construction and existing buildings and provides rebates for whole systems, as well as specific components. The incentives differ by the type of cooling equipment purchased. Variable Air Volume Boxes and Cooling Towers have a fixed rebate amount. All other equipment types have a base rebate per ton, and the rebate amount increases incrementally if the equipment exceeds the minimum efficiency requirements necessary to qualify for the base rebate amount.

The program further distinguishes between prescriptive and custom installations. The custom program requires that all projects be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification.

Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. The program has not been gaining broad acceptance with customers and vendors as quickly as anticipated. Small business participation is a known

[13] Commercial Building Energy Consumption Survey, 2007

challenge for the program, and the recent economic conditions have also hampered program acceptance.

The 2009 program increased its savings goals from the 2008 program year, while recognizing the potential difficulty engaging commercial customers due to the economic downturn. The 2009 program goals were 4,198 Marketing kW, 3,035 Generator kW, and 6,169 MWh (increased from 3,545 kW, 3,331 kW, and 5,750 MWh in 2008). Despite the economic downturn, the program exceeded both kW and MWh goals in 2009, achieving 102 percent, 171 percent and 106 percent of the goals respectively.[14]

Table 2-1 details the number of customers that participated in the program and related savings by year. While the program is still relatively young, the trend indicates the program has gained momentum. There was a significant increase in participation between 2006 and 2007; however, the participation numbers remained relatively constant between 2007 and 2008 while the savings decreased. The program experienced program design changes between 2008 and 2009. The baseline assumption and requirements for eligible equipment increased. In 2009, there was an increase in both participants and achieved savings, meeting the annual savings goals for the first time.

Table 2-1. Number of Customers and Related Savings by Year

Program Year	Number of Participating Customers	Marketing kW Achieved	Generator kW Achieved	MWh Savings Achieved
2006	49	903	693	1,417
2007	113	2,342	517	4,934
2008	123	1,998	1,176	3,540
2009	175	4,262	5,181	6,558

Source: Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

The program provides program outreach through a variety of sources including the trade ally infrastructure and Xcel Energy staff. Key Xcel Energy outreach staff includes the account managers as well as Business Solutions Center representatives whose role it is to provide outreach and services to non-managed accounts. Recognizing the importance of the trade allies' role, the program has an assigned Trade Ally Manager who provides education and outreach to trade allies throughout the state. The program also receives guidance from a trade Cooling Council which first began meeting in 2008.

2.1.2 Logic model

Xcel Energy's Colorado Cooling Efficiency Program undertakes a number of activities to capture both energy and demand savings with Xcel Energy's commercial customers as well as result in the long-term increased penetration of energy efficient cooling equipment among all business sectors of its commercial population in Colorado. Xcel Energy runs the program internally; therefore, the development and refinement of the program infrastructure is a major

[14] Data provided by Megan Scheller, Product Portfolio Manager for the CO Cooling Efficiency program.

activity of the program. The other main activities include outreach to trade allies, customer communications, and rebating eligible equipment.

Figure 2-1 is the program's logic model that identifies program activities, targeted market actors, outputs, and expected outcomes. A well-designed logic model serves as a roadmap to understanding logical relationships among program interventions and potential issues and problems. It communicates a performance story about what the program is trying to achieve, through what interventions, and with respect to which market actors. This logic model was developed based on program materials, discussions at the start-up meeting, and interviews with Xcel Energy staff involved in program management and implementation.

Figure 2-1. Colorado Cooling Efficiency Program Logic Model

Inputs/ Resources	Sufficient budget is allocated Xcel Energy Cooling Efficiency Team* Outside technical resources	Marketing collateral, Program website Xcel Energy Cooling Efficiency Team Xcel Energy technical assistance	Marketing collateral, Program website Account managers, Business Service Center (BSC) and trade allies Xcel Energy technical assistance
Activities	**Develop Program Infrastructure** →	**Outreach to Trade Allies** →	**Customer Communications** →
Outputs	The Cooling Efficiency program has been in the CO market since 2006 Program measures, rebates and marketing strategy, technical assumptions developed, refined and documented. Internal website and training Tracking system developed (appropriate information is requested, captured and entered into Siebel)	Participate in events of local chapters of HVAC associations and market to their members, energy efficiency fairs Hold semi-annual trade Cooling Council meeting and ad-hoc meetings Involve trade allies in developing rebate structures and new products	Account managers, BSC representatives and trade allies refer customers to the program Targeted direct communications to business customers and other outreach such as newsletters, energy efficiency fairs Print and radio advertisement on Energy Efficiency Programs
Short to medium term outcomes	Improved energy efficiency program awareness and participation Xcel Energy staff knowledgeable about the program and its resources Refine Xcel Energy product offerings High customer satisfaction	Trade allies are knowledgeable about the rebate structure and program guidelines Trade allies regularly communicate the program to customers and include rebate with bids Trade allies receive technical assistance from Xcel Energy engineers	Program offering is meaningful, clear, and valuable to customers Business customers' awareness of and participation in the program increases significantly Business customers receive needed technical assistance from Xcel Energy engineers
Long term outcomes	Energy saving goals of the Cooling Efficiency program are achieved within budgetary constraints	Increased trade allies' stocking and sales of AC energy efficient technologies and increased participation of customers in the program	Increased awareness of and demand for energy efficiency equipment in all business segments

* Core members of the Xcel Energy Cooling Efficiency team include the product manager, energy efficiency management, marketing assistants, Trade Relations Manager, and energy efficiency engineer staff. Ancillary members of the Cooling Efficiency team include market research, account management, advertising, corporate communications, information services, regulatory affairs, rebate operations, Business Solutions Center (BSC), and legal.

2.2 STUDY OBJECTIVES

The purpose of the process and impact evaluation were to "assess customer satisfaction with the program being evaluated, and to make recommendations that should be made to

technical assumptions, net-to-gross (NTG) ratios and program processes based on the evaluator's own research as well as through review of industry-wide and Xcel Energy's current processes, technical assumptions and NTG ratios.[15]"

Xcel Energy identified several key evaluation objectives for both the process and impact evaluations. The process evaluation was designed to provide Xcel Energy with a thorough understanding of participating and nonparticipating commercial customers' and trade allies' awareness of the program, satisfaction with the program, barriers to participation, and opportunities for program improvements. It was also designed to provide information on how to target and market to various segments within the commercial population to increase participation.

The impact evaluation objectives were to calculate gross and net savings associated with the program and calculate NTG ratios. The impact evaluation also set out to verify that Xcel Energy's baseline and technical assumptions of efficiency measures used for calculating gross and net savings are correct and in line with other similar programs and the evaluation findings.

The evaluation consisted of nine evaluation tasks. The tasks that addressed the process evaluation objectives are the internal review, participant and nonparticipant surveys, trade ally interviews, and a peer utility program benchmarking review. The tasks that supported the impact evaluation are determining savings considering 2009 International Energy Conservation Code (IECC) standards, developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

2.3 EVALUATION METHODOLOGY

This section outlines the process and impact evaluation methodology, including data collection methods used to support the evaluation.

2.3.1 Process evaluation methodology

The evaluation included numerous activities in 2009 to directly address the process evaluation objectives. These activities included:

[15] Public Utilities Commission of Colorado Settlement Agreement Docket # 08A-366EG.

Table 2-2. Evaluation Activities

Activity	Completed Surveys
Internal Review	N/A
Participating customer surveys[16]	54
Nonparticipating customer surveys	116
Influential trade ally surveys	11
Participating and nonparticipating trade ally in-depth interviews	30
Peer utility program benchmarking review.	N/A

Internal review. This activity included a project kick-off meeting; a review of existing program documentation, marketing materials, and the program tracking system; and in-depth interviews with ten Xcel Energy internal staff. PA interviewed the Cooling Efficiency program manager, two rebate processors, two Business Solutions Center (BSC) representatives, one Trade Relations Manager, two account managers, and the team lead energy efficiency engineer. These interviews were used to clarify the roles and responsibilities of staff and trade allies; program goals and successes/challenges in meeting those goals; the effectiveness of the programs' operations relative to the defined program goals and objectives; and reasons for variance in program performance by customer class (e.g., small business and other customer segments such as retail/office, food services).

Based on the internal review and project kick-off meeting, PA developed a detailed evaluation plan and program logic model.

Participating customer surveys. The participant survey collected information about participant characteristics and firmographics, equipment decision-making processes (including remaining markets for existing program participants), source(s) of program information, satisfaction with key aspects of the program and the application process, barriers to participation, the effect of the program on their decision to install qualifying equipment, and suggestions for program improvements. In addition to providing data to estimate a net-to-gross ratio, the survey addressed key assumptions to the savings algorithm such as hours of use and baseline (what would have been installed without the program).

PA completed telephone interviews with 54 businesses that participated in the Xcel Energy Cooling Efficiency Program ("participants") since the program started (2007–2009). Some businesses participated in the program at multiple locations. Forty-four unique respondents represented these 54 businesses.

A detailed response rate table for the participant (and nonparticipant) surveys can be found in Appendix C.

Nonparticipating customer surveys. The nonparticipant survey was designed to help characterize the market for energy efficient HVAC equipment in terms of the types of

[16] The evaluation participant sample included participants who received a rebate from January 2007 to July 2009.

customers and decision-makers. The survey collected data on program awareness, preferred sources of information, market barriers to participation, equipment decision-making processes, and characteristics and firmographics.

PA completed telephone interviews with 116 customers who had not completed a project through the Xcel Energy Cooling Efficiency Program since the program began (“nonparticipants”). Eighty-nine of these businesses had commercial cooling equipment and paid cooling costs to Xcel Energy (“eligible nonparticipants”). Nineteen of these businesses had cooling costs included in their lease and eight businesses had swamp coolers as their only cooling equipment. These businesses completed a shortened version of the survey (“ineligible nonparticipants”).

Customer-identified Influential Trade Allies. The participant customer surveys were also used to assess free-ridership and spillover using a California influenced (and Xcel Energy approved) free-ridership and spillover battery. When assessing free-ridership and spillover, it is critical to speak with the person or persons most involved in the decision-making process. As we have found through other HVAC free-ridership and spillover studies, the decision maker is often not the customer. Rather, select trade allies tend to be influential in the decision-making process. In cases where the customer identified the trade ally as being influential in the decision, we also attempted to speak with the trade ally. PA completed 11 surveys with influential trade allies to assess the influence of the program on that particular project.

Participating and nonparticipating trade ally interviews. The participating and nonparticipating trade ally interviews provided rich qualitative information regarding program design and program impacts. PA sampled a census of participating trade allies from the program database, including those with very little activity. We also received a list of nonparticipating trade allies to sample from.

PA conducted in-depth interviews with 17 participating and 13 nonparticipating trade allies. These trade allies included those that supplied, installed, and serviced cooling equipment, as well as an engineer and several equipment suppliers. The interviews probed on a variety of issues including type of business activities, awareness of the program and program offerings, source of program information, barriers to customer (particularly small business) and trade ally participation, and recommendation practices for efficient equipment and program influence in these practices. The interviews also explored trade allies’ perception of the difference in purchasing and decision-making practices between different commercial customer segments (small, medium, large, national chain accounts vs. independently owned) and the impact of the economy on the trade allies’ abilities to promote, stock, and sell program-qualifying equipment. In addition, the trade ally interviews also attempted to gather information that could be used to assess market affects or other program-related impacts such as free-ridership and spillover[17].

Peer utility program benchmarking review. This task included a literature review, Internet research, and program manager and program evaluator interviews for eight similar utility

[17] Free-ridership refers to customers who participate in programs and obtain incentives for actions they claim they would have taken without the incentive. Spillover refers to savings induced by the program but not achieved (and claimed) through other utility programs.

programs. The benchmarking was designed to identify standard approaches and best practices in programs that are similar in scope and objectives to Xcel Energy's Cooling Efficiency program in Colorado. Specifically, the review examined program goals, objectives, and scope; effectiveness of the program in meeting goals and objectives; key elements of program design; marketing and recruitment of customers; quantification of program impacts; rebate levels; product offerings; application process; trade ally incentives and/or Quality Installation requirements; and trade ally outreach (especially to small business).

2.3.2 Impact evaluation methodology

The tasks that supported the impact evaluation are determining savings considering the 2006 International Energy Conservation Code (IECC) standards (which are the savings basis for the 2009 and 2010 program years) as well as the effects of the 2009 IECC standards if they are used in future program years[18], developing net-to-gross ratios (including free-riders, free-drivers, and spillover), and verifying baseline and technical assumptions.

Verify baseline and technical assumptions. The impact evaluation reviewed the 2009 baseline and technical assumptions using information relevant to Xcel Energy's territory and made recommendations concerning any adjustments we believe Xcel Energy should make going forward. The review activities included: (1) tracking system review, (2) engineering assumption review, and (3) participant survey results and project file review.

Calculate gross savings with IECC 2006 codes. The impact evaluation focused on 2009 program participants and on future years rather than reviewing assumptions retroactively. PA reviewed tracking system data from the Program Year 2009 applications that had been used to estimate program savings (Colorado uses IECC 2006 codes as the 2009 program baseline). For Program Year 2010, Colorado will also be using IECC 2006. Future program years after 2010 may be shifting the baseline to the IECC 2009 codes. The evaluation also included a forward-looking assessment of the new IECC 2009 standards to see what effect they could have on gross energy savings in future program years beyond 2010 if IECC 2009 baseline efficiency values are used.

Develop net-to-gross ratio. The net-to-gross ratio was calculated based on interviews with 1) 2008–2009 participating customers and influential vendors, 2) in-depth interviews with contractors, and 3) a literature review and benchmarking interviews with program managers of similar programs in the US.

2.4 ORGANIZATION OF THE REPORT

Section 3 of this report presents the findings from the various process evaluation activities, and Section 4 presents the findings from the impact evaluation activities. Section 5 provides suggested recommendations for program changes that could increase participation, reduce burden, and increase program impacts.

Appendix A contains the Technical Resource Manual review summary and Appendix B contains the IECC 2006 and IECC 2009 equipment analysis conducted as part of the impact

[18] The evaluation did not assess IECC standards before 2006 as Xcel Energy and PA Consulting Group agreed there was greater value in assessing the currently used codes instead of looking backward to codes that no longer apply.

evaluation activities. Appendix C contains the response rates to the participant and nonparticipant customer surveys.

3. PROCESS EVALUATION FINDINGS

This chapter presents the results of the process evaluation based on interviews with internal program staff, participant and nonparticipant customer surveys, participant and nonparticipant trade allies, and the benchmarking review. These results are organized as follows:

- Key findings
- Program administration, processes, and resources
- Participating and nonparticipating customer characteristics
- Participating customer satisfaction with the program
- Customer awareness and marketing
- Customer decision making processes
- Trade ally results
- Benchmarking results
- Program potential
- Opportunities for improvement

3.1 KEY FINDINGS

Before discussing the results we present the overarching key process evaluation findings. Key findings are detailed by program design and operations, customer experiences, trade ally experiences, and barriers to new equipment purchases and program participation.

3.1.1 Program design and operations

- Program staff believe the Prescriptive component of the program is an area of the program that is working well. They have experienced frustration with the custom program and reported there have been trade allies and customers also frustrated with this component of the program. Trade ally interviews confirmed some level of frustration with the custom component of the program, although the issue did not arise through interviews with program participants who received services through the custom program. In fact, the post-inspection process, which was a point of contention raised in internal and trade ally interviews, received a high rating of satisfaction by custom program participants.
- Xcel Energy employs an assigned Trade Relations Manager to communicate and work directly with trade allies in Colorado. Having this assigned Trade Relations Manager was seen as a critical role by program staff, although having only one person fill this role for the entire state may mean that more rural or outlying areas are not being reached.
- The Business Solution Center (BSC) is viewed favorably by program staff as a referral point for the non-managed and small business customers. However, there is little direct marketing activity to small commercial customers through the BSC.
- Several program staff commented on the need to receive information regarding program changes in a more formal manner.

- Xcel Energy's Cooling Efficiency program is consistent with other programs as identified in the benchmarking study. Measures with incentives and other incentives are within range of or slightly lower than other programs.
- The benchmarking study attempted to identify net-to-gross ratios used by other programs. Some programs were able to provide their net-to-gross ratios based on evaluation efforts, although most program managers were unable to provide this information as either they use a deemed net-to-gross value or are not required to report net-to-gross ratios for their program. The primary and secondary data review provided context for the Xcel Energy net-to-gross results, indicating that the results are in line with other programs.
- The benchmarking study identified a variety of best practices for cooling programs.
  - Utilize key account representatives and trade allies as much as possible for program communication.
  - Become fully educated on trade associations when leveraging them to target customers. Identify all associations representing that particular market segment and have control mechanisms in place to scale down or ramp up depending on activity level.
  - Identify a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs.
  - Set effective rebate and efficiency levels. A comparison of rebate levels in other programs with Xcel Energy’s found Xcel Energy’s rebates are some of the lowest for air conditioning systems. Xcel Energy is also rebating a lower SEER rating for packaged and split AC units than other programs.
  - Streamline the application process.
  - Engage the customer early in their decision-making process to influence their choice of equipment.
  - Provide customer education and assistance as well as the rebate. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers.

3.1.2 Customer characteristics and experiences

- There are some differences in customer characteristics between participants and nonparticipants. Participants are more likely than nonparticipants to be classified as retail trade, and less likely to be classified as finance, insurance, and real estate. Participants are also more likely to be managed accounts. Although the average operating hours do not differ between participants and nonparticipants, participants are significantly more likely to have hours that very by the season or operating cycle. Participants are also more likely to own their building, and are more likely to report having taken an action in the past few years to reduce energy use.
- Overall, program participants are satisfied with the Cooling Efficiency program. They were also satisfied with the various aspects of the program, such as the post-inspection process, type of equipment eligible, the contractor they worked with and the rebate application process. Both participants and non-participants were satisfied with Xcel Energy in general.

- Approximately one-fourth of nonparticipants are aware of the program. The most common way that aware nonparticipants heard about the program was through Xcel Energy direct mail or a HVAC vendor.
- Account managers have been the most effective outreach channel for program participants, cited by 55 percent of participants. Hearing about the program through a HVAC vendor was the next most common way of learning about the program. Provided a significant portion of the program population is managed accounts, it is not surprising that account managers were identified by customers as the most notable means for hearing about the program.
- Few customers mentioned marketing materials as a means for hearing about the program. Interviews with program staff identified that the marketing materials distributed to customers and available to program staff are fairly generic, although the customer sectors that the program serves are unique.
- The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment.

3.1.3 Trade ally experiences

- Nearly three-quarters of nonparticipating contractors are aware of the program; therefore, lack of general awareness does not seem to be a barrier to program participation (although deeper understanding of the program is important). Participating and nonparticipating trade allies heard about the program through Xcel Energy representatives, materials, events, customers, and other Xcel Energy programs.
- The primary program-related benefits noted by trade allies are: being more price competitive by including the Xcel Energy rebate, and the ability to communicate and educate customers on energy efficiency by promoting the program. Trade allies saw the benefits for customers as primarily the cost savings, although increased energy efficiency was also mentioned.
- While participating trade allies are generally optimistic that their participation in the program will increase in the next 12 months, their optimism does not extend to the high efficiency HVAC market in general. They project it will continue to be difficult to convince customers to adopt high efficiency equipment due to financial constraints.
- Trade allies commented that it is more difficult to sell high efficiency equipment in replace-on-failure situations where decisions need to be made quickly. Therefore, it is important for trade allies to not just be aware of the program, but be intimately familiar with the program so they can easily and quickly provide information to customers in these situations.

3.1.4 Barriers to purchasing new equipment or participation

- The largest obstacle cited by nonparticipating customers regarding new equipment purchases is the lack of capital, mentioned by almost two-thirds of nonparticipants. This is consistent with information received from the trade ally interviews. When nonparticipants do need to replace equipment, contractors will be their first contact point.
- Both participating and nonparticipating trade allies corroborated nonparticipating customers' perception of purchasing barriers and identified the economy, coupled with the incremental cost of high efficiency cooling equipment as well as the first cost of cooling

equipment, as primary barriers for purchasing new, high-efficiency equipment. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high efficiency equipment as are leased buildings.

- Several trade allies distinguished the differences in barriers between small commercial and larger commercial customers. For smaller commercial customers, the main barrier was reported as incremental cost—the difference between standard and high efficiency equipment. For larger customers, the main barrier was first cost—large equipment is expensive and customers tend to repair it instead of replace it as long as possible (especially in the current economy).
- Another notable barrier was triple-net leases, which are reported as very common among commercial customers. In these situations, the customer does not own the building, but is responsible for the mechanical equipment. Trade allies report these customers are less likely to make the investment in high efficiency cooling equipment as they are unsure of how long they will be in the building and therefore may not realize the payback of the higher efficiency equipment.
- Non-financial barriers for moving customers to higher efficiency cooling equipment included customers' lack of awareness, knowledge, and/or understanding of the benefits of high efficiency equipment. Trade allies expressed the need for tools to help sell high efficiency equipment, and the need for more direct communications with Xcel Energy staff to understand program benefits, requirements, and obtain information necessary to help them sell equipment through the program.
- Trade allies provided a variety of suggestions for overcoming barriers, which typically corresponded to their perception of the barriers for selling high efficiency equipment. Suggestions for overcoming barriers include increasing the rebate levels, better educating trade allies on the program, helping them to sell high efficiency equipment by providing tools to help with the sales process (e.g., savings calculator), making the custom component of the program less burdensome and more transparent for trade allies and customers, and directly marketing the program to customers. Participating trade allies also suggested that Xcel Energy have more personal communications with them to provide information about the program.

3.2 PROGRAM ADMINISTRATION, PROCESSES, AND RESOURCES

As documented throughout this report, program participants, trade allies, and program staff generally speak favorably about this program. The Prescriptive component of the program in particular was mentioned by all parties interviewed as a component of the program that is working well.

Interviews with program staff, customers, and trade allies investigated the effectiveness of program administration, processes, and resources. This section summarizes the results of those interviews.

3.2.1 The prescriptive program and application process

The Cooling Efficiency Prescriptive Program's application process received special kudos from respondents, especially when they were comparing the program to other Xcel Energy programs. They commented that the application was streamlined, clear, and relatively easy to complete and process. This is particularly important amongst larger customers who do not

have time to deal with convoluted program processes and paperwork. This is consistent with remarks made by trade allies regarding the prescriptive application process.

Program participants were also generally satisfied with the application process, rating the process an average of 8.5 on a 0- to 10-scale where 10 indicates they were extremely satisfied with the processes. A majority of these program participants (52 percent) reported filling out the rebate application themselves and 10 percent of applications were completed by the equipment vendor.

3.2.2 Role of assigned trade relations manager

Two groups were specifically discussed as potential targets for Xcel Energy's Cooling Efficiency Program at the kick-off meeting: the trade allies and the non-managed accounts. The program is attempting to reach these targeted groups through the use of an assigned Trade Relations Manager and the Business Solutions Center (BSC).

The assigned Trade Relations Manager's role is to communicate and work directly with the trade allies in Colorado. It was clear through the interviews, and from our experience, that the trade allies are an important group to reach and inform about the program. They are a primary marketing tool for the program as they are often the first point of customer contact, especially for small commercial customers. They also have the opportunity to steer customers toward program-qualifying equipment with an eye to program requirements. Therefore, having this assigned Trade Relations Manager was seen as a critical role, and a positive component of the Cooling Efficiency Program.

Various program staff discussed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post project verification. The trade allies discussed earlier in this report also raised this as a need for the program. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

The Trade Relations Manager is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, but he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado. There is question about whether the single Trade Relations Manager is sufficient to reach trade allies given the expanse of the state and differences in region.

The BSC focuses on increasing the participation of the non-managed accounts. The BSC is primarily responsible for fielding calls to the non-managed accounts and will in the near future provide proactive outreach to these customers through their outbound call center (this was not yet happening at the time of the interviews). Account Managers and the Trade Relations Manager spoke favorably of having the BSC as a referral point for the non-managed and small business customers. They appreciate the ability to refer customers they meet that are not managed accounts to this call center.

3.2.3 Program communications

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes.

Currently the program employs several methods of communication to staff working on the Xcel Energy Cooling Efficiency Program. The company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates.

Several individuals interviewed commented on the need to receive information regarding program changes more formally. They recognize that they receive emails with these updates sent to them, but the emails tend to get buried in day-to-day activities. One individual said he found out about program changes from a vendor rather than through an Xcel Energy Communication. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effectively getting the information across.

Trade allies interviewed also commented that they would like to receive more information from Xcel Energy as discussed in the trade allies section. For example, one trade ally requested the development of a website specifically directed at trade allies to provide easy access to updates and program information.

3.2.4 Program marketing tools

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency.

The marketing materials distributed to customers and available to program staff are fairly generic. Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist amongst small business customers and commercial organizations that are in leased space.

Retailers were also identified by program staff as a difficult to serve group. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease space so they do not have ownership over the equipment installed (yet have to pay the energy bills).

Additionally, program staff identified an additional complexity of serving the common area. The common area in shopping malls consumes a significant amount of energy but depends on building owners to retrofit the equipment.

Little direct marketing activity is currently aimed at small commercial customers through the Business Solutions Center. At the time of the interviews they were only working reactively with

customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it appears there is little cross-referral between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

Program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

3.3 PARTICIPATING AND NONPARTICIPATING CUSTOMER CHARACTERISTICS

The evaluation reviewed businesses that participated in the Xcel Energy Cooling Efficiency program from its inception in 2006 through July 2009. A total of 285 businesses participated in the program during this time period.

Table 3-1 shows the distribution of the population of participants by SIC category, compared to the population of the nonparticipant population. The largest proportion of participants are in the services and retail trade sectors, accounting for almost two-thirds of all participants. When compared to the nonparticipant population, retail trade establishments are overrepresented in the participant population, while finance, insurance, and real estate establishments are underrepresented in the participant population.

Table 3-1. SIC Breakdown of Participants and Nonparticipants

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Services	34% (N=76)	30% (N=33,648)
Retail Trade	30% (N=67)	15% (N=16,602)
Finance, Insurance, And Real Estate	9% (N=21)	19% (N=20,812)
Public Administration	6% (N=14)	8% (N=8,968)
Manufacturing	5% (N=11)	4% (N=5,052)
Transportation, Communications, Electric, Gas, And Sanitary Services	2% (N=5)	5% (N=5,582)
Construction	1% (N=2)	5% (N=5,645)
Wholesale Trade	1% (N=2)	4% (N=5,003)
Ag, Forestry, and Fishing	0% (N=0)	2% (N=2,278)

SIC Category	Participants (% of pop N=222)	Nonparticipants (% of pop, N=111,877)
Mining	0% (N=1)	0% (N=349)
Not classified	10% (N=23)	7% (N=7,938)

Source: Xcel Energy Participant and Nonparticipant Population Databases

The program struggles with small business and non-managed account participation. Managed accounts are responsible for 96 percent of the program's historical impact and 86 percent of its participants. However, in the nonparticipant population, only 3.3 percent of businesses are managed accounts.

The below analysis further characterizes participants and nonparticipants in terms of their hours of operations, building characteristics, energy saving activities, and general satisfaction with Xcel Energy. The analysis distinguishes between eligible and non-eligible nonparticipants. Eligible nonparticipants are classified as businesses that have commercial cooling equipment and the cooling costs included in their electric bill to Xcel Energy. Ineligible nonparticipants either have their cooling costs included in their lease or have swamp/evaporative coolers as their commercial cooling equipment. Businesses that reported not having cooling equipment were not interviewed.

Statistically significant differences between participants and nonparticiants at the 90 percent confidence interval are noted in the text. Caution should be used when reviewing differences between different groups due to the small sample size of the participant group.

3.3.1 Building characteristics

Participating and nonparticipating customers primarily occupy free-standing buildings (70 percent participant, 65 percent eligible nonparticipant). Ineligible nonparticipants were least likely to occupy free-standing buildings (46 percent ineligible nonparticipants).

While the trade ally interviews discussed that renting a building was a barrier to participation, the survey results show that a large proportion of eligible nonparticipants actually own their building. Approximately one-half of participants and eligible nonparticipants reported owning their building. Only 24 percent of ineligible nonparticipants own their building. Participants were more likely than all nonparticipants to manage the property (19 percent versus. 3 percent).

3.3.2 Energy conservation activities

Businesses that participated in the Xcel Energy Cooling Efficiency program were more likely to report having taken an action in the past few years to reduce energy use than nonparticipants. Eighty three percent of participants said they made some change to reduce energy use, compared with 72 percent of eligible nonparticipants and 53 percent ineligible nonparticipants. These differences are statistically significant.

Of the changes discussed, the change that showed the largest difference between participant and nonparticipant responses was installing high efficiency lighting equipment. Fifty two percent of program participants that said they made a change also said they installed high-

efficiency lighting equipment in the past two years, compared with 27 percent of eligible nonparticipants and 11 percent of ineligible nonparticipants. Although not explored specifically in the survey, one explanation for the significant difference is that customers are being cross-referred to one program when they participate in the other.

3.3.3 Satisfaction with Xcel Energy

Overall, program participants and nonparticipants are very satisfied with Xcel Energy, with participants indicating the highest satisfaction. When asked to rate their satisfaction on a 0- to 10-scale, with 10 being very satisfied, 93 percent of participants rated their satisfaction with Xcel Energy as a 6 or higher compared with 89 percent of eligible nonparticipants and 74 percent of ineligible nonparticipants.

Sixty-four percent of participants said they were extremely satisfied with Xcel Energy by rating their satisfaction as 8 or higher, compared with 53 percent of eligible nonparticipants and 35 percent on ineligible nonparticipants.

3.4 PARTICIPATING CUSTOMER SATISFACTION WITH THE PROGRAM

Overall, program participants are very satisfied with the Xcel Energy Cooling Efficiency program. The average satisfaction rating was 8.7 on a 0- to 10-point scale, with 10 being very satisfied. Some explanations from customers on why they rated their program satisfaction as nine or above are as follows:

> *"It gives us money to spend on energy efficient projects we wouldn't have had. I use the rebate program all the time." —program participant*

> *"We had a couple questions on the application and the representative was very helpful in answering our question and guiding us on how to complete the application" —program participant*

> *"We purchased an existing building so we had access to their utility bills. We know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and part of the reason we were able to make the investment was because of the Xcel program." —program participant*

> *"It has a pretty easy process and the rebates came quickly." —program participant*

In addition to being asked about their overall satisfaction with the Xcel Energy Cooling Efficiency program, participants were asked their satisfaction level with various aspects of the program (using the same scale with 0 being not at all satisfied and 10 being very satisfied). As shown in Table 3-2, the average rating for all aspects of the program was 7.5 or higher. Participants of the custom program were also satisfied with the program, specifically the post-inspection process which they rated 9.2. The three aspects of the program with the lowest satisfaction rating (less than 8 on the 10 point scale) were the amount of time it took to receive the rebate, the length of time it took from project start to end, and the requirements for equipment eligibility.

Table 3-2. Participant Satisfaction with Specific Aspects of the Program

Specific Aspects of the Program	Mean rating (0-10 scale)
Post-inspection process (n=5, custom only)	9.2
Type of equipment eligible for program (n=43)	8.7
Contractor who installed equipment (n=44)	8.5
Rebate application process (n=43)	8.5
Support you received from Xcel Energy (n=43)	8.1
Pre-approval process (n=5)	8.0
Program's handling of questions/complaints (n=42)	8.0
Amount of time it took to receive rebate (n=43)	7.9
Length of time it took from project start to end (n=4)	7.8
Requirements for equipment eligibility (n=43)	7.5

Source: Xcel Energy Participant Survey, SA6A-K

Consistent with the high satisfaction rating for the type of equipment eligible for the program (8.7), all respondents reported that the cooling equipment installed through the Xcel Energy Cooling Efficiency program is still installed at their business.

Participating customers were asked what features of the program, if any, they would like to see changed. As shown in Figure 3-2, 67 percent of participants said they would not change anything. This is another indication that overall, the program participants were very satisfied with the program.

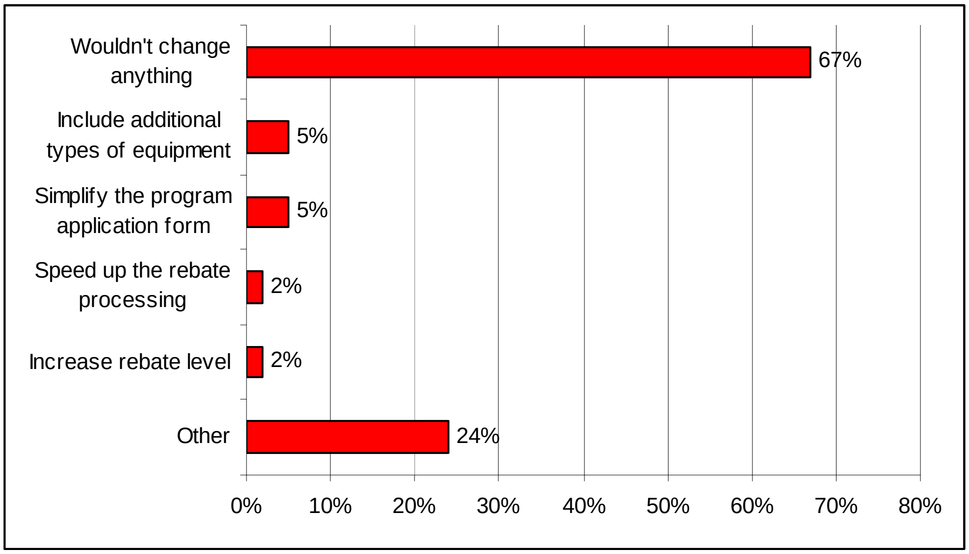
Those that did offer suggestions for improvements mentioned including additional types of equipment (five percent), simplifying the program application form (five percent), speeding up the rebate process (two percent), and increasing the rebate amount (two percent). These were consistent with the components of the program where participant satisfaction was lower. Some of the “other” suggestions mentioned included: communicate how the custom rebates are calculated (this was expressed in both internal staff and trade ally interviews as well as a source of frustration for some), include the option to submit the rebate application online, and provide a savings calculator to customers (this was also expressed in trade ally interviews as an area for improvement).

Below are quotes from a couple of participants on what features they would change with the program.

> *“It would be nice to get closer to instant responses on the rebate process. It seemed like there was a lot of back and forth.” —program participant*

> *“Specify what the unit is supposed to do and how to measure the savings.” —program participant*

Figure 3-1. Features of the Program Recommend Changing (n=42)



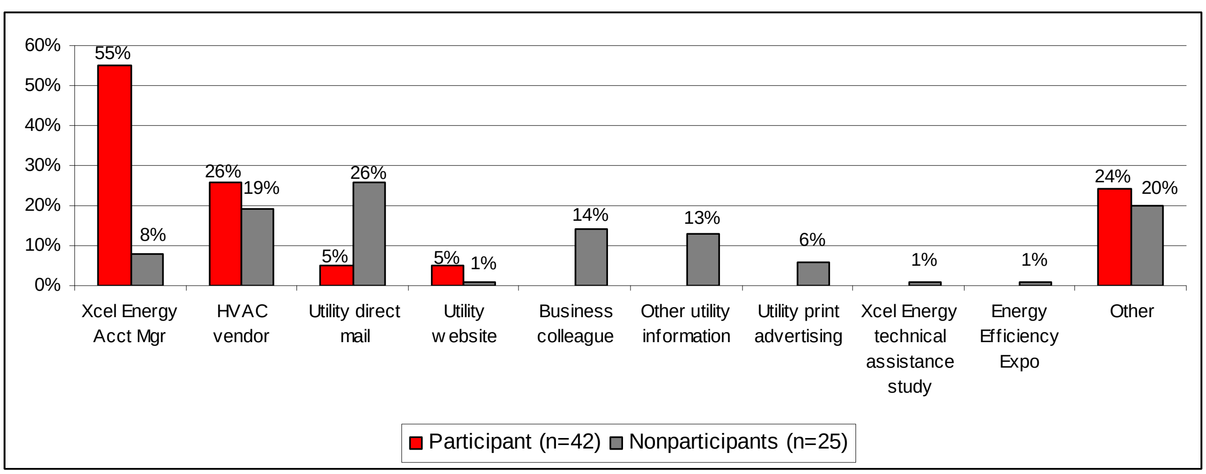
Source: Xcel Energy Participant Survey, SA7

3.5 CUSTOMER AWARENESS AND MARKETING

3.5.1 Participants

Account managers are the most noted outreach channel for program participants, followed by HVAC vendors*.* Program participants primarily heard about the Xcel Energy Cooling Efficiency program through their Xcel Energy account manager (55 percent). Of the managed accounts, 69 percent of participants mentioned that they heard about the program from their account manager. Hearing about the program through a Heating Ventilation and Air Conditioning (HVAC) vendor was the next most common way to find out about the program. Other ways participants heard about the program included: a contractor that worked on the building, an architect, or an engineer (Figure 3-3).

Figure 3-2. How Customer First Heard about Xcel Energy Cooling Efficiency Program



Source: Xcel Energy Participant and Nonparticipant Surveys, PA1 and A1

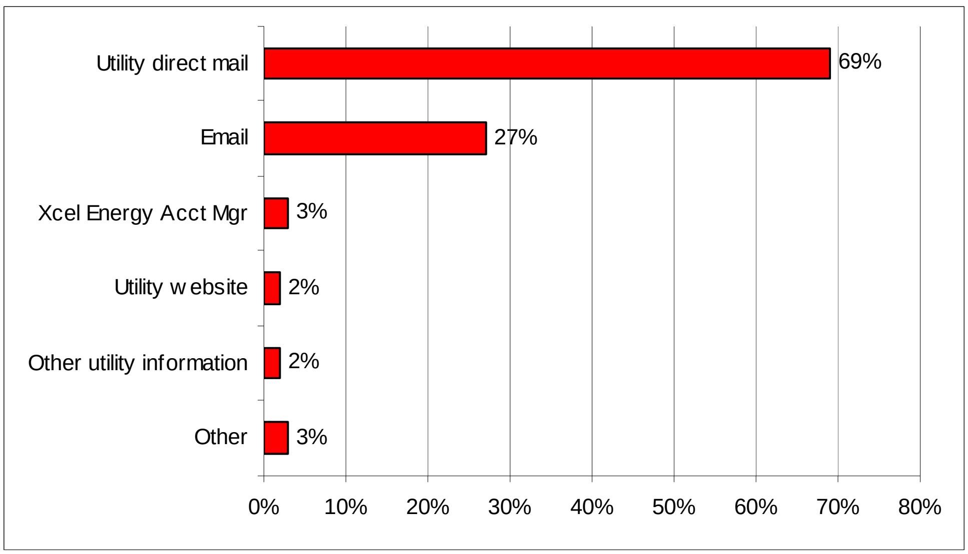
3.5.2 Nonparticipants

Approximately one-fourth of nonparticipants are aware of the program. Customers who have not participated in the Xcel Energy Cooling Efficiency program were asked if they had previously heard of the program. Of the nonparticipants who have cooling equipment and pay the costs for cooling, only 27 percent said they had heard of the program.

Unlike participants, the most common way for eligible nonparticipants to hear about the Xcel Energy Cooling Efficiency program was through Xcel Energy direct mail (26 percent). Another 19 percent heard about the program through their HVAC vendor, 14 percent through a business colleague, and 13 percent from other utility information.

Nonparticipants reported that direct mail is their preferred way to receive information about other energy efficiency programs, mentioned by 69 percent of nonparticipants. The second preferred way to receive information is through email, mentioned by 27 percent of eligible nonparticipants (Figure 3-4). A similar pattern was found for ineligible nonparticipants; 67 percent prefer to receive information from Xcel Energy by direct mail and 26 percent by email.

Figure 3-3. Prefer to Receive Information about Energy Efficiency Programs (n=88)



Source: Xcel Energy Nonparticipant Survey, A12

If a nonparticipant was interested in contacting a utility representative about an Xcel Energy program or service, 67 percent indicated they already had contact information. The 1-800 phone number was the most common means they would use to contact a utility representative (52 percent). A small percentage (five percent) mentioned the Business Services Center (BSC).

3.6 CUSTOMER DECISION MAKING PROCESSES

3.6.1 Participants

The introduction to the participant survey focused on identifying the key individual involved in the decision to install equipment through the program. In addition, the survey asked if others were involved in the decision. Two-thirds of the Cooling Efficiency program participants indicated there was more than one person involved in the decision of whether or not to

purchase cooling equipment through the program. Other company personnel involved in the decision to purchase equipment through the program included: business owner, maintenance supervisor, current tenant, property management department, Chief Financial Officer, architect, and the business services superintendent.

The most important factors considered by participants for cooling equipment purchases are the age of the equipment to be replaced, the company's standard practice/corporate policy, and the payback on investment. Program participants were asked to rate the importance of various factors that might have influenced their decision to purchase the cooling equipment. The rating was done on a scale of 0 to 10, with 10 being very important and 0 being not at all important in their decision. The age or condition of the old equipment was the most important factor, which was rated 8.1. As shown in Table 3-3, two other factors for purchasing new cooling equipment was rated an average of 7.0 or higher: standard practice or corporate policy and the payback on investment.

Table 3-3. Importance Factor for Purchasing Cooling Equipment for Participants

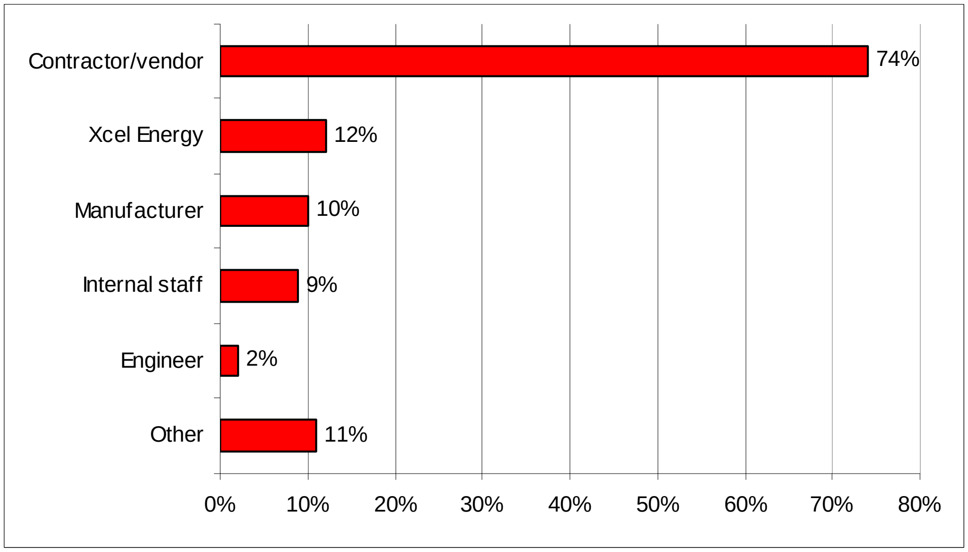
Importance Factor on Purchasing Decision	Mean rating on 0-10 scale
Age or condition of old equipment (N=50)	8.1
Standard practice or corporate policy (N=52)	7.2
Payback on investment (N=52)	7.2
General concerns about the environment (N=54)	6.6
Information provided through a Xcel Energy feasibility study (N=3)	6.3
Availability of program rebate (N=54)	6.0
Recommendation from a vendor/supplier (N=51)	6.0
Previous experience with the Cooling Efficiency program (N=43)	4.7
Endorsement or recommendation by Xcel Energy staff (N=52)	4.5
Information from the program marketing materials (N=52)	3.9
Information from the program training course (N=45)	2.8

Source: Xcel Energy Participant Survey, N3a-l

3.6.2 Nonparticipants

One factor when purchasing new equipment is deciding who to contact first to purchase the equipment. Almost all (74 percent) of eligible nonparticipants said that they would contact a contractor or vendor when purchasing cooling equipment. Contacting Xcel Energy or the equipment manufacturer were the other contacts mentioned by 12 percent and 10 percent respectively (Figure 3-5).

Figure 3-4. Preferred Contact Person when Purchasing New Cooling Equipment (n=84)



Source: Xcel Energy Nonparticipant Survey, I0

Twenty-two percent of eligible nonparticipants report that they have a policy that mandates the installation of energy efficient equipment when purchasing new equipment. When asked specifically what the company policy is for purchasing new equipment, respondents were unable to indicate a specific efficiency level or go into detail as to the company policy. Several businesses mentioned that they are trying to be as 'green' as possible and purchase efficient equipment. A couple respondents also mentioned that the equipment they purchase needs to be ENERGY STAR® rated.

The largest obstacle cited by nonparticipants when purchasing new equipment is the lack of capital, which was mentioned by 61 percent of eligible nonparticipants. This is consistent with information received from the trade ally interviews discussed later in this report. Other barriers that businesses face when considering purchasing new equipment include: the budgeting process (10 percent), lack of resources to implement (seven percent), time constraints (four percent), approval by board members (four percent), and the uncertainty of the return-on-investment (two percent).

3.7 PROGRAM POTENTIAL: NEEDS IDENTIFIED THROUGH NONPARTICIPANT INTERVIEWS

Of the population of existing nonparticipants, approximately three-fourths of this population could participate in the Cooling Efficiency Program (eligible nonparticipants). Ninety-seven percent of nonparticipating businesses contacted pay their electric bill to Xcel Energy[19]. Of those who pay their electric bill to Xcel Energy, 77 pay for cooling at their building.

The evaluation identified the lack of knowledge of the program among nonparticipants as a cause for lost opportunity among the program. When eligible nonparticipants were asked if they had purchased cooling equipment in the past two years, 33 percent reported that they

[19] The small percent that do not pay their electric bill to Xcel Energy are customers who rent/lease and the landlord pays the utility bill or property managers that report that tenants pay the cooling bills.

had. Only a small percentage (six percent) of those who had purchased or considered purchasing cooling equipment considered participating in the Xcel Energy Cooling Efficiency program. The primary reason they did not participate in the program was because they were not familiar with program requirements.

One key factor with a commercial cooling rebate program is for customers to understand the types of equipment customers currently have and the types of equipment they plan to purchase. Eighteen percent of nonparticipants who could participate in the program indicated that they are in the process of budgeting for or planning to purchase new cooling equipment. On average, eligible businesses expect to purchase the new equipment in 17 months.

Of the equipment installed, the greatest potential according to the nonparticipant surveys is roof-top units and condensing units. Roof-top units are the most common type of commercial cooling equipment used by eligible nonparticipants. Sixty-four percent of these nonparticipants have a roof-top unit installed and 30 percent of these nonparticipants plan to purchase a new roof-top unit. Condensing units are the other main type of commercial cooling, with 52 percent of businesses having a condensing unit installed and 29 percent of these planning on purchasing a condensing unit. Table 3-4 lists other common types of installed commercial cooling equipment and equipment that is planned for purchase.

Table 3-4. Type of Equipment Nonparticipants Have Installed and Plan to Purchase

Equipment	Installed Equipment at Business (n=80)	Currently Budgeting to Purchase Equipment (n=17)
Roof-top units	63.7%	30.4%
Condensing units	52.0%	28.7%
Split system air conditioners	23.9%	0.0%
Variable air volume boxes	13.7%	10.4%
Chillers	11.8%	3.4%
Packaged thermal air conditioners	8.2%	20.9%
Oversized cooling towers	7.6%	11.3%
Water source heat pumps	3.8%	17.3%
Other cooling equipment	10.8%	17.3%

Source: Xcel Energy Nonparticipant Survey, E1 and E5

One reason businesses plan to purchase new equipment is due to the age of their old equipment. Table 3-5 below shows the percent of each type of equipment that is 15 years old or older for eligible nonparticipants. This is consistent with some of the information gathered during the trade ally interviews where they said there is a market out there given the age of existing equipment

Table 3-5. Percent of Installed Equipment More than 15 Years Old among Nonparticipants

Equipment	Old Equipment More than 15 Years Old
Water source heat pumps (N=3)	33.3%
Variable air volume boxes (N=15)	28.2%
Oversized cooling towers (N=8)	25.0%
Roof-top units (N=48)	20.9%
Split system air conditioners (N=21)	16.5%
Condensing units (N=41)	10.5%
Chillers (N=15)	3.9%
Packaged thermal air conditioners (N=12)	3.2%
Other cooling equipment (N=9)	16.0%

Source: Xcel Energy Nonparticipant Survey, E3

For future cooling equipment purchases, eligible nonparticipating business customers demonstrated a level of interest in participating in the Xcel Energy Cooling Efficiency program. The average interest level was 7.27 on a 0- to 10-point scale, with 10 being very interested.

3.8 TRADE ALLY PARTICIPATION

We spoke with thirty trade allies as part of this program evaluation, 17 participating and 13 nonparticipating trade allies. This section summarizes the results of these interviews.

3.8.1 Characteristics of trade allies interviewed

Trade allies interviewed typically installed and serviced cooling equipment. PA also spoke with an engineer and several equipment suppliers. These trade allies work with a combination of planned replacement, new construction/major renovation, and replace-on-failure projects.

A significant portion of certain trade allies' work is replacement-on-equipment-failure. Nonparticipating trade allies were more likely than participating trade allies to report a higher percentage of their projects as replace-on-failure and a lower percentage of their projects as new construction/major renovation.

3.8.2 Trade ally awareness of Xcel Energy's cooling efficiency program

Nearly three quarters of nonparticipating trade allies (8 out of 11 that provided a response) said they were aware of Xcel Energy's Cooling Efficiency Program. Both participating and nonparticipating trade allies said they heard about the program through Xcel Energy staff, materials, seminars, their customers, or equipment suppliers.

One other source of program awareness is their participation in other residential programs provided by Xcel Energy. A number of trade allies interviewed also service residential customers and refer customers to Xcel Energy's residential efficiency programs. Through their

experience with these programs, they became familiar with the commercial program. This indicates the continued potential for Xcel Energy to cross-market the program through their other programs.

Trade allies report that it is more difficult to sell high efficiency equipment when there is a failure than when it is a planned project. These decisions need to be made quickly and efficiently. So while trade allies may be aware of the program, they may need a much better understanding of the benefits and offerings so they can more easily promote the program with their bid to the customers.

3.8.3 Benefits of the program for trade allies and customers

Participating trade allies were quick to comment that the program benefits both them and their customers. The ability to offer the incentive and make the purchase more cost-effective were the most commonly noted benefits of the program. However, the benefits go beyond just the incentive value. Trade allies mentioned that the program gives them an edge over their competitors, who are not taking the time to spec out bids with high efficiency options incorporating the rebate. Even if the customer chooses not to install high efficiency, the options give the appearance of the contractor taking the time to think through the alternatives for the customers' consideration.

The program also provides participating trade allies the opportunity to discuss energy efficiency with their customers. These trade allies are proponents of energy efficiency and enjoy the opportunity to promote high efficiency equipment. Because of the program, they are able to generate more conversation around the benefits of energy efficiency than they would have without the program.

According to participating trade allies, customers generally participate in the program because 1) they have a need for the equipment, 2) the program reduces the cost of the equipment, and 3) the equipment is more efficient and will result in longer-term savings. Several respondents also mentioned the desire or (in some cases) requirement for customers' buildings to be LEED certified; Xcel Energy's Cooling Efficiency Program helps them obtain this certification status more cost-effectively.

One trade ally specifically addressed the impact the program has on his sales. He said the Cooling Efficiency program, along with other initiatives such as LEED certification, has certainly impacted his ability to sell high efficiency cooling equipment. In fact, he said that without the program and these other initiatives he does not think he would have sold any energy efficient equipment this year.

3.8.4 Barriers to selling high efficiency equipment

One of the primary objectives of the interviews was to identify barriers for selling high efficiency equipment. Below we list the commonly mentioned barriers, the most notable being initial incremental costs of high efficiency equipment coupled with a weakened economy.

Economic downturn coupled with high incremental cost of high efficiency equipment. Economy was the buzzword throughout the trade ally interviews. One interviewer summed up the issue saying that activity now has little to do with the incentives available and more to do with the general economic environment. This respondent believed that absent a significantly higher incentive value to cover the incremental cost there will be less movement toward high

efficiency in the current economy. Other respondents provided similar philosophies by discussing the difficulty in encouraging their customers to install high efficiency equipment. When asked about the future of the cooling market, contractors often commented that customers would like to see trend toward increasing efficiency, thereby *uplifting the economy.*

Interviewees indicate the cost of high efficiency equipment is the primary barrier to moving forward on high efficiency purchases and installations across all commercial segments. However, for smaller commercial customers, several respondents commented that it is the relative incremental cost for smaller commercial customers. They reported that for smaller units, the incremental cost as a percentage of total cost is greater and the Xcel Energy rebate covers less of the incremental cost for smaller units.

Other respondents said that first cost is the biggest barrier for the larger commercial customers that use larger equipment. They reported that the cost of replacing that equipment is very significant. If they do replace it, the incremental cost is less and the Xcel Energy rebate covers more of the incremental cost of large equipment than for small equipment.

However, numerous respondents commented on the fact that these larger commercial customers are most likely to attempt to repair rather than replace the failing equipment. One respondent illustrated the point using the example of a customer whose repair of their old, inefficient rooftop unit cost about half the cost of installing new equipment. Although the newer more efficient equipment would yield savings within a three year payback and the contractor projected that the customer would need to replace the equipment within the next five years, they chose to go ahead with the repair instead of replacement. The capital investment of the new equipment was just too much for them to front if a repair for lower cost was possible.

Table 3-6 provides further qualitative evidence of trade allies' perception of the difficulty in selling high efficiency cooling equipment to their customers in this market. Participating and nonparticipating contractors were asked to rate their perceived level of difficulty in selling high efficiency cooling equipment to their customers on a one to five scale, where one was very difficult and five was not at all difficult.

As the table shows, the majority of participating trade allies rated the difficulty between a two and three although three respondents said selling high efficiency equipment was easy (rating of 4 or 5). Several trade allies mentioned that it is easier to sell the equipment to larger than smaller customers, quoting the large savings and increased payback as the reason. One respondent who rated it difficult to sell high efficiency said the rating would have been different in prior years when the economy was better; for these years, the sales of higher efficiency equipment was easier.

This analysis should be viewed with caution as it is based on very limited number of cases and cannot be extrapolated to the participating and nonparticipating trade ally population. However, the story it presents is compelling and shows the importance of reaching nonparticipating trade allies to help them promote high efficiency cooling equipment.

Table 3-6. Difficulty in Selling High Efficiency Cooling Equipment to Customers (1=very difficult, 5=not at all difficult)

Ratings												Average
Participating trade allies (n=11)	2	2	2	2.5	2.5	3	3	3	4	5	5	3.1
Nonparticipating trade allies (n=9)	1	1	1	1	2	2.5	3	3	3			1.9

There is some qualitative evidence that the program is helping to overcome the barrier of selling high efficiency cooling equipment. Nonparticipating trade allies were more likely to say selling high efficiency cooling equipment to customers is very difficult. Whereas no participating contractors rated the difficulty of selling high efficiency equipment a one, four nonparticipating contractors provided a rating of one. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary driver for their low ratings. Incidentally, these nonparticipating trade allies were also more likely to say they serve small business customers (under 500 kW), which may also be a driver of the increased perception of difficulty in selling high efficiency cooling equipment to their customers.

Relative low cost of energy. Several trade allies half jokingly commented that commercial customers would be more apt to participate and see greater value from the program if their energy rates were higher. One trade ally expanded on this discussion by saying that he has seen a distinct trend in the purchasing of high efficiency equipment with a higher cost of electricity. His perception was that since the economic shift, energy prices decreased which thereby decreased the demand for high efficiency equipment along with the reduced cash flow resulting from the poorer economy.

Customers' lack of knowledge and/or understanding of the benefits of energy efficiency. Another common theme heard throughout the interviews was the need for contractors to educate their customers on the benefits of high efficient equipment. Commercial customers may understand conceptually that there could be benefits to installing high rather than standard efficiency equipment; however, when faced with the incremental costs to install that equipment, customers may select the standard efficiency equipment to avoid the extra up-front expenditures. Contractors frequently commented on the need to educate these customers and help them understand the return-on-investment for them and how the installation of high efficiency equipment would positively impact the organization's cash flow. "*They don't understand life cycle costs, lease structures, and access to capital*."

Need for tools to help trade allies sell high efficiency cooling equipment to customers. Participating trade allies were asked what tools were available from Xcel Energy that helps them sell high efficiency cooling equipment. Of the thirteen individuals that answered this question, five said either they don't know what tools are available to them or they do not believe there are any tools available to them through the program to help them sell high efficiency cooling equipment.

As a follow-up to this question, trade allies were asked what tools they would like Xcel Energy to provide to help them sell high efficiency cooling equipment. Several respondents felt they had enough information in the rebate forms and brochures distributed to them by Xcel Energy.

However, several respondents did have recommendations for information or tools to help them promote equipment through the program. The most frequently cited request was for a tool to help trade allies calculate energy savings, payback, return-on-investment, and/or rebate values. While some respondents felt capable of doing these calculations on their own, others did not feel they had sufficient knowledge to do this. As one trade ally stated, "*We lack the software to be able to tell them what their payback is…we don't know the math*." Another respondent referred us to a tool through the Commercial Real Estate Energy Efficiency Program (CREE) website. This tool calculates return-on-investment of energy efficiency improvements. At a minimum, the program could promote this tool to trade allies.

Another respondent commented that he was able to calculate the energy savings and related rebates, but the rebate ended up being less than initially specified. He noted, "*If there was some way to automate that, to better calculate the rebate, that would be good."*

In terms of the materials provided by Xcel Energy, those who received the materials for the most part felt they were sufficient. Several respondents noted that they use the website often to obtain materials, although they would appreciate more hard copy materials for distribution to their customers. Another respondent said they would appreciate some verbiage from Xcel Energy on the benefits of the program and installing high efficiency equipment to include in their marketing materials.

Last, several trade allies said that it is difficult to see what is new in Xcel Energy's program through the website. They suggested that to make this process easier, perhaps Xcel Energy could have a website targeting only trade allies that clearly identifies program updates. This suggestion was also made in the internal interviews with Xcel Energy staff.

Need for more personal interaction with Xcel Energy staff. Building on the above point, five of the participating contractors said they did not recall receiving or were not provided with tools or information from Xcel Energy staff to help them sell high efficiency equipment. And one trade ally specifically mentioned the need for more personal interaction with staff to help arm him with the knowledge to better promote high efficiency cooling equipment.

Trade allies who do regularly interact with program staff were complimentary of their experience with these staff. They describe their interactions with Xcel Energy representatives as helpful, say they were excellent in interacting with the contractors and providing timely information. In general, they just want more of this interaction.

There is only one Xcel Energy staff member assigned to reaching out to contractors throughout the state of Colorado. He plans events for contractors, such as the workshops, seminars, and breakfast events to educate contractors about the program. Internal interviews identified that only having one trade ally representative may result in not personally reaching as many trade allies as desired, particularly in less populated areas.

3.8.5 Overcoming the barriers and increasing participation

Trade allies were encouraged to share their ideas regarding ways to overcome programmatic barriers and increase participation. These recommendations are detailed below.

a. INCREASE REBATE LEVELS

Not surprisingly, the most commonly noted recommendation was for the program to increase its rebate levels. It is not that trade allies felt the incentive levels were entirely too low, but that an increased incentive level would be beneficial in battling the incremental cost and reducing the payback period that plagues the ability for customers to install program-qualifying equipment. As found in the benchmarking review of rebate levels in other programs, Xcel Energy's rebates are some of the lowest for air conditioning systems.

b. EDUCATE TRADE ALLIES

Another recommendation made by several respondents was to better educate trade allies and make them more aware of the program benefits. These respondents discussed the need for Xcel Energy to make the process as easy and seamless as possible for trade allies—including marketing to customers using return-on-investment analysis. "*If it's not easy, we won't do it.*" One trade ally expanded on the need for more education noting the influx of new trade allies in the industry. He said that each time an HVAC contractor goes out of business, three more open up. This turnover increases the need for continual education and marketing from Xcel Energy among the trade ally groups. This recommendation is consistent with best practices found as part of the benchmark review of other programs.

c. IMPROVE THE CUSTOM PROCESS

Participating trade allies provided suggestions to make the custom program less burdensome for trade allies and customers. For the most part, participating trade allies thought the application and rebate processing requirements for the prescriptive component of the program were appropriate and not overly cumbersome. The distinction several respondents made, though, was between the prescriptive and custom program. These respondents said the administrative burden for completing the custom applications is high. One respondent compared the process to the prescriptive program which he described as not at all difficult to complete.

Another respondent described the custom program and its processes as a "*nightmare*." The time to complete the application and get Xcel Energy involved is significant and in some instances results in him losing the job. The trade ally expanded on this statement by saying that the rules for qualifying equipment do not seem to be transparent, which frustrates the trade ally and his customers.

One trade ally noted an additional complication in the custom process; his perceived inability to easily and quickly provide a rebate value to the customer. This trade ally said that he could calculate an incentive value based on manufacturer specifications and an understanding of the original equipment; however, he cannot provide the incentive level with enough certainty to make the customer comfortable with investing in the purchase.

This perception about the custom program and its application and project process is consistent with what we heard in the internal interviews. Account and trade representatives mentioned that the custom application process was significantly more cumbersome and involved than the prescriptive program process.

The reputation of the custom program reached trade allies that have not yet worked with a customer through that component of the program. One participating trade ally interviewed

commented on additional equipment he would like to see included in the program (evaporative coolers) and wondered if this measure could be promoted through the custom program. However, while this respondent recognized the usefulness of the custom program, he commented on the feasibility of going through the custom program, saying that there have been grumblings from others in the industry that the process is "*difficult and rigorous*."

d. MARKET DIRECTLY TO CUSTOMERS

Trade allies for the most part thought the program could more directly market to customers. Several respondents said the direct marketing should provide general information about the program and include analysis tools or information to illustrate the energy and/or financial savings from installing high efficiency equipment. This is not to say that customers are not receiving sufficient information about the program; the customer survey results will explore this issue more.

Trade ally responses varied considerably in their assessment of customers' awareness of the program. On average, participating trade allies said that almost one-half of their customers know about the program (sample size is only 10, so this information should be viewed as qualitative). One participating trade ally said that none of his customers were aware of the program and two trade allies said that all his customers were aware of the program. (Table 3-7). Nonparticipating trade allies were more likely to say that fewer of their customers were aware of the program.

Again, this information should be interpreted with caution given the sample sizes. The analysis represents the interviewed trade allies, not the trade ally population at large.

Table 3-7. Trade Ally Perception of Customers' Awareness of the Program

Percent											Average
Participating trade ally responses (n=10)	0%	10%	10%	10%	25%	30%	75%	95%	100%	100%	46%
Nonparticipating trade ally responses (n=5)	0%	13%	15%	50%	55%						27%

3.8.6 The future of the cooling market in Colorado

The majority of participating trade allies said they expect their involvement in the program to increase over the next twelve months. They project that customer demand will increase as they become more energy conscious and are more aware of energy efficiency based on federal initiatives and more stringent codes and standards. However, a number of these contractors caveat this optimism by saying it depends on the economy.

Additionally, several respondents commented on the aging cooling equipment in Denver as an indicator for increased opportunity for the program, particularly among larger commercial customers. As discussed earlier, because of the high capital investment in replacing cooling equipment, larger commercial customers are opting to repair versus replace the older equipment. This inefficient equipment will continue to fail and in time need to be replaced which will create further opportunity for the program.

While participating trade allies are optimistic that their participation in the program will increase in the next 12 months, their projection of the direction of the commercial cooling market in the next two years is mixed. The same is true for nonparticipating trade allies. Respondents from both groups of interviews said that unless there are government initiatives put in place, or stricter requirements, the high efficiency cooling market will stay the same or decrease. A number of these respondents again cited the incremental cost and perception that the benefits don't outweigh these costs; particularly given how constrained these companies are in their capital funding. "*I've got my fingers and toes crossed that we're going to come out of this recession and people will start purchasing high efficiency equipment*."

3.9 BENCHMARKING RESULTS

PA researched programs online for to characterize other cooling efficiency programs in terms of rebates or incentives available, eligible measures, eligible customers, required paperwork, and marketing. PA then conducted in-depth interviews with eight program staff and one evaluator for the following programs to obtain further insight into program operations. The utilities and programs reviewed are detailed below.

Table 3-8. Utilities and Programs Included in Benchmarking Study

Utility	Program
Ameren IL	Standard Business Incentives Program
Arizona Public Service	Solutions for Business: Prescriptive Incentives and Technical Assistance and Studies
Energy Trust of Oregon (Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas)	Existing Building Efficiency Program
Idaho Power	Building Efficiency for Commercial Construction and Easy Upgrades for Simple Retrofits
Pacific Gas & Electric (also includes SCE and SDG&E)	Non Residential Retrofit (previously Standard Performance Contract)
Platte River Power Authority (and four member utilities: Fort Collins Utilities, Longmont Power & Communications, Estes Park Light & Power, Loveland Water & Power)	Electric Efficiency Program (includes Cooling Rebate Program)
Puget Sound Energy	Commercial HVAC Rebate and Premium Service programs
Salt River Project	PowerWise Standard Business Solutions and PowerWise Custom Business Solutions

Programs varied from very new (only 1 year old) to fairly mature (up to 10 years old).

3.9.1 Program goals and challenge in meeting goals

Xcel Energy's goal for the Cooling Efficiency program is 6.9 mil kWh for 2009. However, information was not available from other programs on savings goals for cooling equipment only. For other business programs overall, savings goals ranged anywhere from 32.5 mil kWh to 160 mil kWh. Xcel Energy's total 2009 business goal is 103 mil kWh.

Most programs in the benchmarking study have been successful in meeting program goals despite the recent economic challenges. Many programs met or exceeded goals last year and are on track to come close to meeting targets this year. Several programs have higher goals set for this year than last year.

All programs are faced with the same primary challenge this year—the downturn in the economy. However, most have found a way to keep projects enrolling and continue to achieve energy savings. Mature programs are faring better which was reported to be a result of strong relationships with vendors and implementation contractors. It was also reported that it is important to be flexible and get involved with the customer early to influence their choice of equipment (as also discussed in the internal and trade ally interviews).

Several program managers reported bonus and timing adjustments their programs made in reaction to the downturn in the economy. One program offered a 10% bonus to customers and $500 gift cards to trade allies for projects with minimum size restrictions that were done before the end of May, 2009. Another program became more flexible with deadlines that were typically 18 months but would be extended if there were delays in the project timeline.

3.9.2 Key elements of program design

All programs offer prescriptive and custom options to business customers except for PG&E, which is custom only. Measures covered by prescriptive programs are similar across programs including air conditioning units, split and packaged units, air and water source heat pumps. Variations in measures offered include chillers, economizers, and controls. One program manager recommends more focus on controls and optimizers for retrofit to realize additional savings. Xcel Energy categorizes control-related projects within an Efficiency Controls program, rather than within the cooling program.

Most of the programs use outside firms to implement the program. One program manager appreciates that they have an implementation contractor who continuously works to improve their program.

Two programs manage the entire program internally as Xcel Energy does. This internal management includes the development of the infrastructure, outreach to trade allies, customer communication and setting and processing the rebates for eligible equipment. Internal staffing for the programs ranges from one person half-time to 6 business development staff handling specific customer segments.

3.9.3 Marketing and recruitment of customers

Depending on the program, either the implementation contractor or program staff market and provide outreach to customers. Marketing methods consist of general advertising in newspapers, through radio ads and mailings.

Marketing is not typically targeted to particular groups but to business customers in general. However, more targeted marketing through associations and business group meetings is favored by many program managers. These face-to-face meetings allow for a more tailored message (e.g. highlighting energy savings possible) and the opportunity to answer questions and build relationships. Associations targeted include ASHRAE, BOMA, Kiwanis, multiple trade organizations, and school groups.

Only one program, which is one of the more mature programs, uses targeted marketing. They have moved away from traditional marketing pieces, except for an overview, and are instead working with specific customer segments. They now concentrate on relationship building with customers, trade organizations, and equipment dealers.

Interviewees believe the most effective form of program communication is handled by key account representatives and trade allies. Trade allies know their markets well and are often in the best position to sell the higher efficiency to their customers. A couple of programs are also taking advantage of high bill inquiries and billing analysis to seek out possible participants.

One respondent shared that in their experience, a useful lesson is to become thoroughly educated on the different associations when using trade associations to target customers. The respondent felt this would identify and involve all associations representing that particular market segment. Without buy-in from particular association leaders, a utility could be kept out of a market. However, the program should be prepared for a potentially quick increase in projects. In order to handle abrupt increases or decreases in enrollment, have control mechanisms in place to scale down or ramp up depending on activity level.

3.9.4 Quantification of net program impacts

As PA has experienced with several other programs and the industry as a whole, there is much discussion around how to accurately calculate free-ridership and spillover to inform net-to-gross (NTG) factors for commercial cooling. In speaking with program managers, that uncertainty exists among all programs.

Table 3-9 summarizes net to gross information provided by the program managers or through the literature review. A few of the newer programs have not yet had the opportunity to evaluate their programs and estimate net-to-gross ratios and will likely review free-ridership and spillover measurement in later program years, according to program managers. In the meantime, they rely on either an average industry attribution rate of 0.80 to 0.85 or anecdotal information to provide qualitative context around program impacts (e.g. retrofits may be almost all free-riders but the nature of premium services would result in a very low free-ridership rate). And although some of the others have conducted evaluations, they have not measured free-ridership or spillover.

For those programs that have measured NTG and were able to provide us with the values, we see a range from 50 percent (when NTG only includes free-ridership, not spillover) to 80 percent NTG (when includes spillover). The NTG status for all programs reviewed is detailed in Table 3-9. In addition to speaking with program managers we also reviewed NTG estimates from the DEER database and measured NTG values from WI Focus on Energy Business Programs which are also included in the table below.

Table 3-9. NTG Summary Information

Sponsor	Program	NTG measurement status
WI Focus on Energy	Business Programs	Overall 2008 commercial NTG ratios were 69% kWh, 69% kW, and 33% therms.
Ameren (IL)	Standard Business Incentives	Measure free-ridership and spillover, but no NTG number available.
Arizona Public Service	Solutions for Business: Prescriptive Incentives	NTG calculated at the measure level using both free-ridership and spillover from self reports. Numbers not available at the time of the call.
Energy Trust of Oregon	Existing Building Efficiency Program	Influence rates of 80% for electric and 70% for gas for their HVAC program.
Idaho Power	Easy Upgrades for Simple Retrofits	Not currently measuring FR, SO or NTG.
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)	Measuring NTG but not final for 2006-2008 cycle. DEER database shows NTG from 2004-2005 was 50% for prescriptive HVAC and 54% for custom projects. DEER also indicates 50% NTG assumptions for prescriptive HVAC and 64% for custom for purposes of 2009-2001 planning.20
Platte River Power Authority	Cooling Rebate Program	.85 assumed.
Puget Sound Energy	Commercial HVAC Rebate	Not measuring NTG.
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	Measured NTG = .75 for Standard Business Solutions (not including adjustments for spillover).

3.9.5 Rebate levels and requirements

Rebate levels are similar across programs, although Xcel Energy's are some of the lowest for air conditioning systems (Table 3-10). Xcel Energy is also providing rebates for a lower SEER rating than the other programs reviewed. Most programs have done little to adjust their rebates over time, and any adjustments have been minor.

Minimum equipment efficiency to qualify for a rebate is typically decided based on CEE standards. Supplementing that decision is information from ASHRAE 90.1, ENERGY STAR®, and other market analysis. Rebates or incentives are typically offered for the efficiency above standard. Programs also have caps on the portion of the cost that will be paid, for example 50 percent or $10,000 maximum.

[20] Source: Updated DEER NTGR Values – 053008.xls

The requirements for receiving a rebate or incentive are similar among programs. Most programs have a pre-approval process or pre-application showing the efficiency the customer intends to install. Some programs skip this pre-application for projects below a certain rebate threshold ($1,000–$5,000). For one program, the pre-approval allows for a customer's incentive funds to be reserved for 90 days.

Once approved, the customer can have the work done. A few programs require inspections, although this is more common for custom projects or projects requesting a rebate over a certain threshold. Upon completion, customers are required to submit a final request for the rebate or incentive, accompanied by an invoice for the equipment purchased, and a cut sheet or other form showing the specifications for the energy efficient equipment. A few programs have 60-day or 90-day limits from time of project completion for submitting final rebate requests.

Table 3-10. Rebate Summary Information

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
CEE	Tier 1 standards	14 SEER (12.0 EER pkg, 11.6 EER split)	(11.5 EER, 11.5, 10.5, 9.7)	14.0 EER		14.0 EER			
CEE	Tier 2 standards	15 SEER (12.5 EER pkg, 12.0 EER split)	(12.0 EER, 12.0, 10.8, 10.2)	No specification s		No specification s			
Xcel Energy	Efficiency Cooling	13.5 SEER: $50/ton packaged, and $3/ton each adtl 0.1 SEER 14.0 SEER: $25/ton split, and $4/ton each adtl 0.1 SEER	$50/ton (EER of 11.0, 10.8, 9.8, 9.4)	Condensing 11.0 EER: $25/ton + incremental rebate: $3.00/ 0.1 EER		14.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	PTACs 11.0 EER: $50/ton Incremental Rebate: $4/ton for each additional 0.1 EER	$6-$12/ton See program for details	Boiler Tune-up: 25% of costs See program for details
Ameren (IL)	Standard Business Incentives	14 SEER: $15/ton 15 SEER: $30/ton	$15/ton (11.5 EER, 10.5, 9.7) $30/ton (12 EER, 10.8, 10.2)		$15/ton (14 SEER, 11.5 EER, 10.5, 9.7) $30/ton (15 SEER, 12 EER, 10.8, 10.2)		13.08–(0.02556*Btuh Capacity/ 1000) EER $15/ton	$20/ton (Air-cooled only)	Room Air Conditioners: $25-$35/ton Variable Frequency Drive on HVAC Motors: $45/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Arizona Public Service	Solutions for Business: Prescriptive Incentives	(1 Phase) 14 SEER & 11.5 SEER: $50-80/ton (3 Phase) 11.1 EER: $50-100/ton	11.4 EER $50-100/ton 11.2 EER $25-75/ton 10.4 EER $25-75/ton		(1-phase) 14 SEER & 11.5=$50-80/ton (3-phase) 11.1 EER= $50-100/ton 11.4 EER $50-100/ton 11.2 EER and 10.4 EER $25-75/ton		Both PTAC and PTHP 12.5-(0.213*cap/1000) EER $45-60/ton	Air cooled 1.15 kW per ton—IPLV = $7/ton Water cooled 0.57-0.68 kW per ton—IPLV = $7/ton	Economizer $15.ton
Energy Trust of Oregon	Existing Building Efficiency Program	$120-300 See program details	$120-300, See program details		$150-2,250/ton, See program for details	$200-4,000/ton, See program for details	$100/unit PTHP		Ground source heat pump $300-$3,000
Idaho Power	Easy Upgrades for Simple Retrofits	(1-phase) 14 SEER: $25/ton 15 SEER: $50/ton 16 SEER: $75/ton (3-phase) 13 SEER: $50/ton 14 SEER: $75/ton 15 SEER: $100/ton	$50/ton (EER of 11.0, 10.8, 10.0)				12 EER at $50/ton		Economizer $250/unit economizer controls $75/ton VSD for fan pump $60/hp program thermostat $60

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Pacific Gas and Electric	Non Residential Retrofit (Standard Performance Contract)								
Platte River Power Authority	Cooling Rebate Program	14 SEER/ 12 EER = $65/ton, $4 per ton for each 0.1 EER over 12.0	$50/ton (EER of 11.0, 10.8, 10.0), $4 per ton for each 0.1 EER over base				Both PTAC and PTHP 11.0 EER- $50/ton, $4 per ton for each 0.1 EER over 11.0		
Puget Sound Energy	Commercial HVAC Rebate		>= CEE Tier 1 = $30/ton						ECM on HVAC fan box- $.12/sq ft Boiler tune-up-up to $600 Program thermostat—up to $50 VSD on pumps and fans—$100/hp

Sponsor	Program	Air cooled AC <65k Btu/h (Packaged and split)	Air cooled AC >=65k Btu/h *	Water cooled air conditioning	Air-air heat pumps	Water source heat pumps	Terminal	Chillers	Other
Salt River Project	PowerWise Standard Business Solutions and Custom Business Solutions	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	$75/ton (EER of 11.5, 10.5, 9.7) $100/ton (EER of 12.0, 10.8, 10.2)	14 EER: $75/ton	(Single Phase) 14 SEER: $75/ton 14 SEER: $100/ton (3 Phase) 14 SEER: $75/ton 15 SEER: $100/ton	14.0 EER/4.6 COP: $75/ton	$50/ton See program for details	(Tons * $10/ton) + (Tons *$350 * (Minimum IPLV – Chiller IPLV))	VSDs for HVAC fan & pump: $55/ton

3.9.6 Trade ally relationships

Several programs rely heavily on trade allies to market the program to customers as well as provide quality service and have found them to be valuable outreach partners. It is important to have a reliable core group for marketing, auditing, and implementation. Those who are more service oriented have better relationships with customers and are more effective at recommending efficient equipment available through programs. Most programs do not offer trade ally incentives at this point.

Interviewees report that training and communication are instrumental in the trade ally relationship. Many programs incorporating trade allies hold workshops or frequent meetings with vendors as updates, as well as to find out what type of equipment is selling. One program holds about 10 one-day technical sessions throughout the year for trade allies in their territory. They hire expert trainers to come in for those sessions to cover topics such as DOE motors, HVAC, chillers, RCx, and lighting.

A few programs are struggling with building up their trade ally networks. A program manager from one of the more mature programs tells us that building a reliable trade ally network takes time—often as much as two years.

3.9.7 Why customers enroll

The initial view is that customers will participate in a program if it provides monetary incentives. However, some programs have found that the incentive or rebate alone will not result in a successful program. A key element for these programs is customer education and assistance. One program found through their survey that the assistance they provide and the rebate are equally motivating for their customers. These programs educate customers on the energy savings resulting from the high efficiency equipment (sustaining impacts) using the rebate to reduce the first-cost of purchasing and installing the equipment.

This education may come in several forms. One program manager attends association meetings where she can present energy savings opportunities. Another program has a general tool available to all customers on their website to calculate energy savings for 30 of the most common energy efficiency measure for typical buildings. A third program provides an online self-audit tool so customers can gain a better understanding of their own facility, which improves the conversation once they are ready to work with a program representative. Coaching is particularly important for the first time participants.

We asked program managers which key customer segments have been more likely to participate this year. A few of the newer programs are not yet tracking participation by customer segment as there is not much need at this point. Others have seen greater participation recently from offices and schools. Medical facilities have also been active in some programs. One program has seen property owners taking advantage of retail space switching over to office to implement upgrades.

4. IMPACT EVALUATION FINDINGS

The activities conducted to support the impact evaluation included verifying baseline and technical assumptions, determining savings considering 2009 International Energy Conservation Code (IECC) standards, and estimating a net-to-gross ratio. This chapter summarizes the key impact evaluation findings followed by more detailed analysis resulting from each activity.

4.1 KEY FINDINGS

4.1.1 Engineering and IECC standards review

The engineering review identified the following key findings.

- The energy and demand savings algorithms used in Xcel Energy's Cooling Efficiency Program's Technical Resource Manual (TRM) are, in general, consistent with algorithms used for other programs. Other than VAV boxes, the algorithms used in the deemed savings calculator (the Calculator) are also consistent with algorithms represented in other programs' TRMs.
- More research is needed to assess the accuracy of the algorithms currently used for VAV boxes by the Calculator. In view of the uncertainty of energy savings found in the engineering review and high free-ridership results, Xcel Energy may want to consider removing VAV boxes as a program measure in the 2010 Colorado Cooling Efficiency Program.
- The Cooling Tower offering was removed from the program in January 2009. The impact evaluation supports this removal (as it does for VAV boxes) due to uncertainty of savings found in the engineering review as well as high free-ridership results.
- The value for peak load coincident factor (CF) of 0.9 used in the Calculator is appropriate to account for gross generator kW saving. The equivalent full load hours (EFLH) provided in the Calculator are also appropriate.
- IECC 2006 stipulations for baseline efficiencies of C&I cooling measures will continue to remain in force for the program year 2009-2010. Changes from IECC 2006 to IECC 2009 baseline efficiency values will affect savings for rooftop units and chillers. The IECC 2006 and IECC 2009 use different coefficients for the adjustment factor algorithm to account for non-standard water-cooled chillers.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs which do not take into account variations in PTAC sizes.

4.1.2 Net-to-gross ratio

The net-to-gross analysis resulted in the following findings:

- The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 0.51. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 0.21. The resulting self-report net-to-gross ratio is 0.7 for the Colorado Cooling Efficiency Program in 2007–2009.

- Our net-to-gross preponderance of evidence research found that the net-to-gross ratio for the 2007–2009 program participant population ranges from 0.7 to 0.8 for the Colorado Cooling Efficiency Program.
- Removing cooling towers and VAV boxes, which we recommend be removed from the program, the self reported net-to-gross ratio is 0.75. As this value is within the recommended net-to-gross range from a preponderance of evidence approach, we recommend that this net-to-gross ratio be applied for the 2010 program year.

4.2 VERIFY BASELINE AND TECHNICAL ASSUMPTIONS

Cooling is an energy intensive process and can consume as much as one third of building energy use. Therefore, the need for verification of assumptions and parameters used for determining net energy savings achieved from an efficient cooling measure over a standard (complying with a stipulated minimum code or a baseline) is paramount.

To support the impact evaluation of the Cooling Efficiency Program, we reviewed algorithms used for estimating the deemed energy savings for end-use C&I cooling measures. This was supported through a review of several recent “technical reference manuals” (TRMs). We also reviewed the values of parameters used in the algorithms to assess the industry practices and ascertain their similarity (or dissimilarity) with those currently used by the Xcel Energy’s Colorado C&I “Deemed Savings Technical Assumptions” tool/calculator (“the Calculator”).

We also reviewed TRMs adopted in different jurisdictions in the country to assess consistency in the use of technical assumptions and the underlying algorithms for calculating the energy savings achievable from efficient cooling measures. Each of these TRM sources are summarized in Appendix A. Specific TRMs reviewed include:

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report, 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey’s Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009.

Below we define variables used deemed savings review. Note that different TRMs use varying notations for variables, for example EER_b or EER_{base} for “baseline energy efficiency ratio” of a measure. We designate one notation for a variable, as shown in Table 4-1, regardless of the (different) symbols used for the same variable in different TRMs. This is done to avoid repetition of variable definitions. Also note that terms EFLH and FLH are, at times, used interchangeably among different TRMs. For example the “Efficiency Maine TRM uses the term FLH while other TRMs reference in this study used the EFLH.

Table 4-1. Definition of Variables Included in Deemed Savings Analysis

Variable	Definition
Capacity	Size of a cooling measure (1 Ton = 12,000 BTU/hr)
EER	Energy Efficiency Ratio (3.413* Coefficient of Performance (COP); kW/Ton = 12/EER
SEER	Seasonal Energy Efficiency Ratio (EER/0.85)
EER_b	Energy efficiency ratio of a baseline cooling measure
EER_e	Energy efficiency ratio of an efficient unit
$SEER_b$	Seasonal Energy efficiency ratio of a baseline equipment
$SEER_e$	Seasonal Energy efficiency ratio of an efficient unit
CF	Coincidence Factor: The percentage of the total cooling load during peak hours.
EFLH	Equivalent Full Load Hours: Measure of energy use by season during the on-peak and off peak periods. EFLH is the ratio of measured kWh use during the period divided by design capacity (kW) of equipment.
FLH	Full load hours in a year
PE_b	Peak efficiency of the baseline chiller (kW/ton)
PE_e	Peak efficiency of the energy efficient chiller (kW/ton)
$IPLV_b$	Integrated part load value of the baseline cooling equipment
$IPLV_e$	Integrated part load value of the efficient cooling equipment
CDD	Cooling Degree Days

Xcel Energy's deemed savings calculator for the C&I end-use cooling measures use the following algorithms for air conditioning systems, chillers and VAV boxes.

Rooftop Units, Water Source Heat Pumps, Split Systems, Condensing Units

Energy Savings (Customer kWh) = Capacity x (12/SEERb - 12/SEERe) x EFLH

Demand Savings (Customer kW) = Size x (12/EER_Standard - 12/EER_Eff)

Chillers

Energy Savings (Customer kWh) = Capacity x (IPLVb - IPLVe) x EFLH

Demand Savings (Customer kW) = Capacity x (FLVb - FLVe)

Centrifugal Chillers

FLVb = FLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

IPLVb = IPLV_ARI/(6.1507-0.30244*T_var+0.0062692*T_var^2-0.000045595*T_var^3)

Temperature Variable, T_var = Chiller Lift + CWTD

Variable Air Volume (VAV) Boxes

Energy Savings (Customer kWh) = #_of_fans x Savings x EFLH x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Demand Savings (Customer kW) = #_of_fans x Savings x [(cfm_per_fan / cfm_per_ton) x FLV + bhp_per_fan x 0.746 x Load_Factor)]

Electrical Energy Savings (Gross Generator kWh) = Customer kWh / (1-TDLF)

Electrical Demand Savings (Gross Generator kW) = Customer kW x CF / (1-TDLF)

Electrical Energy Savings (Net Generator kWh) = Gross Generator kWh x NTG

Electrical Demand Savings (Net Generator kW) = Gross Generator kW x NTG

The following conclusions were drawn from a review of technical reference manuals for algorithms to estimate the energy and demand savings of C&I end-use cooling measures and their related variables.

- The review of different TRMs for energy and demand savings algorithms for C&I end-use cooling measures shows a general consistency in use of the algorithms in different jurisdictions.
- Xcel Energy's Colorado C&I end-use measure deemed savings calculator ("Calculator") uses algorithms that are consistent with other TRMs for most cooling measures.
- The Calculator correctly captures the adjustment factor algorithm for non-standard centrifugal chillers [i.e. chillers not designed to AHRI Standard 550/590 test conditions (44^{o}F leaving chilled water temperature and 85^{o}F entering condenser water temperature with 3 gpm/ton condenser flow rate)]. Also, the Calculator applies the adjusted IPLV values when specifications for non-standard centrifugal chillers are inputted. The instructions on the Calculator show that these adjustments are for standard chillers. The Calculator should add instruction to capture the fact that the adjustment factor is applicable to non-standard centrifugal chillers.
- Accuracy of the algorithms used for estimating energy and demand savings for VAV boxes could not be confirmed by its originator referenced in the Calculator[21]. In addition, none of the TRMs reviewed provides savings algorithms for VAV boxes. In view of this methodological deficiency, we suggest the algorithm currently used by the Calculator as the default algorithm. *However, from the net to gross analysis, we find that free-ridership for VAV boxes is high, indicating reduced efficacy of program support for the measure.* Also, support for VAV boxes has been withdrawn from another Xcel Energy jurisdiction (Minnesota). In view of these, we suggest Xcel Energy consider excluding VAV boxes from the Colorado Cooling Efficiency Program.

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[21]Telephone discussion with Mr. Eugene A. Scales, 12th October, 2009.

- The Calculator uses algorithms to determine the peak demand saving for both end-use (equipment) and gross generator level. It uses peak load coincident factor (CF) for generator gross kW saving and applies a value of 0.9. C&I cooling measures are likely to operate when the peak load hours are in effect for the Xcel Energy CO service territory. Therefore, use of a high peak load coincident factor would well capture the peak load savings from the utility perspective. Also, we recommend the need for more research for establishing different CFs for commercial and industrial segments as their end-use load shapes vary.

- Treatment of equivalent full load hours (EFLH) in different TRMs is opaque. Our extensive review of the TRMs shows lack of a clear methodology for estimating the EFLH. Based on our discussion with the representative of Xcel Energy CO Cooling Efficiency Program, we understand that the University of Arkansas had developed a methodology that establishes a linkage between EFLH and climatic variations (or cooling degree days [CDD]). We reviewed the work[22] and find (a) the algorithms are applicable to ground source heat exchangers and (b) no direct linkage with CDD. Also, an algorithm for EFLH for two locations in Arkansas are provided in the Arkansas Deemed Savings TRM that makes a direct relationship of EFLH with CDD through the following relation:

$$EFLH = A \times (CDD)^{b+1}$$

Where A and b are coefficients and their values are provided in the TRM for different building types.

The EFLH values developed for the Calculator are based on more advanced methodology that analyzed weather bins (based on dry bulb temperatures). Also, we understand from discussions with the Xcel Energy representatives that the market segment data for end-use cooling measures were used (along with occupancy and operational characteristics of the facilities).

Since there is a general methodological void in the estimation of EFLH in TRMs, and the Calculator uses EFLH values that are estimated using more robust methodology (as communicated by the Xcel Energy representatives), we recommend that the EFLH values currently applied in the Calculator are continued.

4.3 DETERMINE SAVINGS CONSIDERING 2009 INTERNATIONAL ENERGY CONSERVATION CODE (IECC) STANDARDS

As part of the engineering review, we reviewed baseline efficiency values for C&I cooling measures based on the "International Energy Conservation Code 2006" (IECC 2006). We understand that for the program year 2009-2010, the Xcel Energy Colorado Cooling Efficiency Program will continue to use IECC 2006 codes for defining the baseline efficiency of cooling measures. We also conducted a forward-looking study in the event that Xcel Energy Colorado C&I cooling efficiency program replaces IECC 2006 stipulation by those of

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[22] Sutton et al. (2002)a. An Algorithm for Approximating the Performance of Vertical Bore Heat Exchangers Installed in a Stratified Geological Regime. ASHRAE TRANSACTIONS 2002, V. 108. And

Sutton et al. (2002)b. Comparison of Multilayer Borefield Design Algorithm (MLBDA) to Available GCHP Benchmark Data. ASHRAE TRANSACTIONS 2002, V. 108, Pt. 2.

the IECC 2009 in the future. The tabulation of baseline efficiencies of end use measures that will result from adopting IECC 2009 stipulations are for informational purposes only.

We calculated the baseline efficiency of C&I cooling measures according to the IECC 2006 in Table 4-2 as the IECC 2006 codes will remain effective for the program years 2009 and 2010. Also, we provide IECC 2009 stipulations in Table 4-3 for any future use by the Xcel Energy Colorado C&I Cooling Efficiency Program. We compared the baseline measure efficiency values obtained from the IECC handbooks with those provided in the Calculator to identify any changes.

The Calculator converts the EER into SEER (and vice-versa) with a multiplier of 0.85. In addition, the Calculator shows the EER and IPLV values by deducting 0.2 to take into account the effect of heating section (other than electrical resistance heat). However, we do not apply these conversion factors to the baseline efficiency values.

The review of the baseline efficiency values for cooling measures from the IECC 2006 and IECC 2009 handbooks and the Calculator shows that:

- There is no change in the values of baseline efficiencies for Condensing units, PTACs and Water-source heat pumps for the IECC 2006 and IECC 2009.
- For Rooftop units, IECC 2009 baseline efficiency values are greater than those of the IECC 2006.
- The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except that for the PTACs.
- The Calculator needs to modify the algorithm for calculation of baseline efficiencies for PTACs to take into account variations in PTAC sizes (in line with the algorithms provided in the IECC 2006 or IECC 2009).
- We are unable to confirm the baseline efficiency for VAV box used in calculator and suggest that the value used currently is the default. However, as discussed above, these may be removed from the 2010 program.
- For Chillers IECC 2009 stipulates measure baseline efficiencies for two paths i.e. Path A and B. The Path B is intended for part-load operation.
- The IECC 2006 and IECC 2009 use different coefficient for the adjustment factor algorithm to account for non-standard water cooled chillers to the baseline efficiency.

The analysis, by equipment type, is detailed in Appendix B.

Table 4-2. Baseline Efficiency of C&I Cooling Measures—IECC 2006

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	9.7		ARI 210/240
≥ 5.4 -11.3 tons		10.3	
≥11.3 -19.9 tons		9.7	ARI 340/360
≥ 19.9–63.3 tons		9.5 (ILPV: 9.7)	
> 63.3 tons		9.2 (ILPV: 9.4)	
Split Systems < 5.4 tons	10		ARI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	ARI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			ARI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

Table 4-3. Baseline Efficiency of C&I Cooling Measures—IECC 2009

Cooling Measure and Capacity	Baseline Efficiency		Test Procedure
	SEER	EER	
Rooftop Units			
< 5.4 tons	13		AHRI 210/240
≥ 5.4 -11.3 tons		11.2	
≥11.3 -19.9 tons		11.0	AHRI 340/360
≥ 19.9–63.3 tons		10.0 (ILPV: 9.7)	
> 63.3 tons		9.7 (ILPV: 9.4)	
Split Systems < 5.4 tons	13		AHRI 210/240
Condensing Units			
Air cooled		10.1 (ILPV: 11.2)	AHRI 365
Water or evaporative cooled		13.1 (ILPV: 13.1)	
Water-source heat pump		12	ARI/ASHRAE 13256-1
PTAC			
New Construction			AHRI 310/380
<0.58 tons		11.0	
≥0.58 tons and ≤ 1.25 tons	12.5–0.213*(Cap/1000)		
> 1.25 tons		9.3	
Replacement			
<0.58 tons		9.4	
≥0.58 tons and ≤ 1.25 tons	10.9–0.213*(Cap/1000)		
> 1.25 tons		7.7	

4.4 HOURS OF OPERATION

We compared the operating hours obtained through the survey of the program participants with those reported in the Commercial Business Energy Consumption Survey (CBECS) database. We understand from our interviews with Xcel Energy staff that the operating hours for different business types from the CBECs database were used to develop the effective full load hours for the Calculator (the C&I Cooling Efficiency Deemed Savings Calculator). As shown in the table below, the operating hours reported in the participant survey and those obtained from the CBECs database for different business segments are, in general, consistent.

Table 4-4. Comparison of Participant's Self-reported Operating Hours with CBECS database

Business Type	Operating Hours (Weekly)			
	Participants' Response	Survey sample (n)	CBECS Database	# of buildings (in '000)
Education	56	10	50	386
Lodging	168	2	167	142
Office	64	17	55	824
Retail	55	7	59	443

4.5 NET-TO-GROSS ANALYSIS

Program attribution (or the net-to-gross ratio) refers to energy impacts that can be confidently attributed to program efforts. As discussed at the start-up meeting, Xcel Energy needs an overall net-to-gross ratio for the program for their 2010 planning.

We estimated the net-to-gross ratio following the California self report framework for standard net-to-gross projects[23], which uses a preponderance of evidence approach. Our estimate is based on 1) interviews with 2007–2009 participating customers and influential vendors, 2) in-depth interviews with trade allies, 3) in-depth interviews with Xcel Energy account managers, and 4) literature review and benchmarking interviews with program managers of similar programs in the US.

4.5.1 Data collection and study methodology

An initial net-to-gross ratio was calculated based on customer self-reports. The standard net-to-gross analysis specified in the California framework uses three primary sources of information to estimate net-to-gross: program files and information, participant (decision-maker) survey, and vendor (participating trade ally) surveys. Our approach to using each of these information sources for estimating free-ridership and spillover is described in more detail below.

Table 4-4 shows the number of survey respondents by managed and non-managed account and measure type. The self-reported net-to-gross ratio was calculated from these respondents.

[23] Methodological Framework for Using the Self-Report Approach to Estimating Net-to-Gross Ratios for Nonresidential Customers, Prepared for the Energy Division, California Public Utilities Commission by the Nonresidential Net-To-Gross Ratio Working Group, Revised May 8, 2009. This method estimates net-to-gross directly rather than estimating 1 minus free-ridership.

Table 4-5. Breakdown of Respondents Used to Calculate the Net-to-Gross Ratio

		Unweighted Count
Account type	Managed	44
	Non-managed	10
	Total	**54**
Prescriptive measures	Chillers	7
	Condensing units	2
	Cooling Towers	1
	PTAC	3
	Rooftop	29
	Split Systems	3
	VAV Boxes	4
	Total	**49**
Custom measures	Chillers	2
	Install new PMZ3 units in lieu of multi-zone RTUs	1
	Plate and frame heat exchanger	1
	Replace old condensing unit with evaporative cooler	1
	Total	**5**

The decision-maker survey, targeted at participating customers, asked highly structured questions about actions that would have been taken in the absence of the program. The survey was guided by information in program files. Respondents were first asked a series of questions to establish project context. Next, they were asked to rate the importance of program influences vs. non-program influences. Third, they were asked to rate the significance of different factors and events that may have led to their decision to install the efficient equipment at the time they did, including questions on the age or condition of the equipment, type of project, recommendations received, and their business policies related to equipment purchases.

The decision-maker survey also collected information about what participants would have done in the absence of the program. Specifically, respondents were asked a number of questions to assess the impact the program had on the timing, quantity, and efficiency level of the measure installed:

- Did the program impact the timing of the decision to replace cooling equipment and, if so, by how many months/years?
- Did the program impact the quantity of equipment installed, and if so, by how much (partial free-ridership)?
- Did the program impact the efficiency of equipment installed and, if so, by how much (partial free-ridership)?

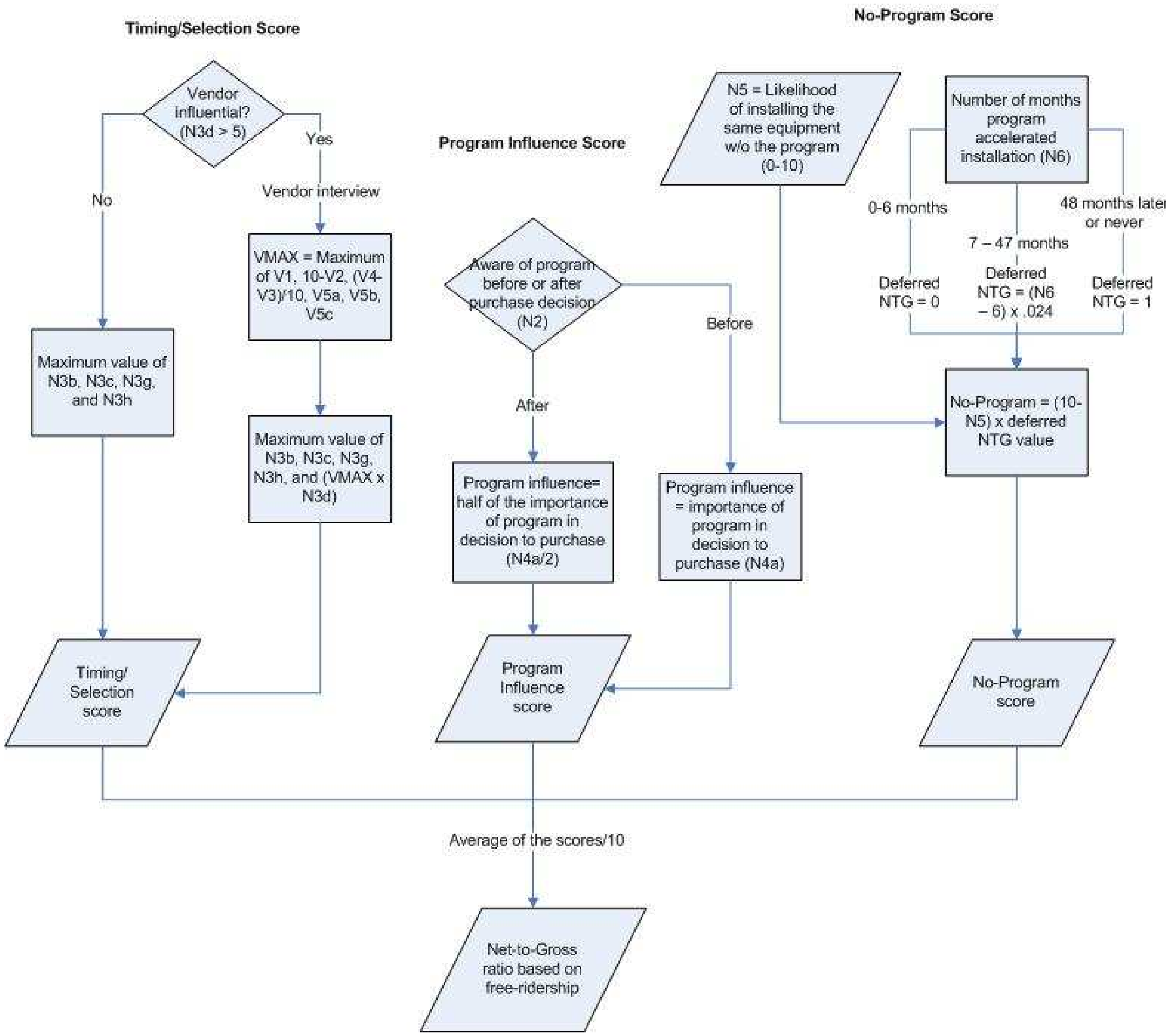
4.5.2 Measuring self-reported free-ridership

The calculation of the self-report-approach net-to-gross ratio based on free-ridership is summarized below in text and in Figure 4-1. In summary, the net-to-gross ratio based on free-ridership is calculated as an average of three scores representing responses to one or more questions about the decision to install a program measure:

1. A **timing and selection score** that captures the influence of the most important of various program and program-related elements in influencing the customer to select the specific program measure at this time. Program influence through vendor recommendations is also captured in this score when the customer says the vendor was influential in their decision. In these cases, the influential vendor was also interviewed and their responses were incorporated into the timing and selection score.
2. An overall **program influence** score that captures the perceived importance of the program (whether rebate, recommendation, or other information) in the decision to implement the specific measure that was eventually adopted or installed. The overall program influence score is reduced by half if the respondent says they learned about the program only after they decided to install the program qualifying measure.
3. A **no-program** score that captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. This score accounts for deferred free ridership by capturing the likelihood that the customer would have installed program qualifying measures at a later date if the program had not been available.

The core net-to-gross ratio is the average of these three scores divided by 10, as shown in Figure 4-1 below.

Figure 4-1. Net-to-Gross Ratio Flowchart Based on Self-report Free-ridership



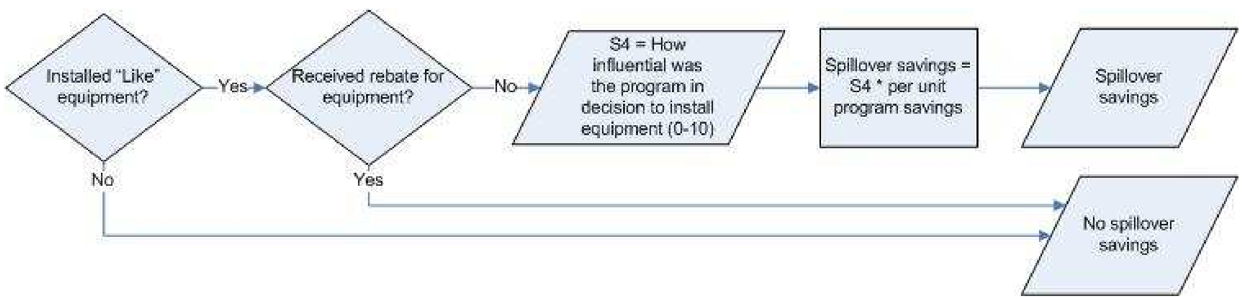
The California framework defines partial free-ridership as when, in the absence of the program, the participant would have installed something more efficient than the program-assumed baseline efficiency but not as efficient as the item actually installed as a result of the program. Of the 54 participants interviewed, five stated that, in absence of the program, they would have installed something more efficient than the standard equipment but less efficient than the equipment that was rebated through the program. For these cases, an adjustment should either be made to the net-to-gross ratio or to the gross savings. For all fives cases, we believe that the calculated net-to-gross ratio already accurately accounts for the impact of the program on these participants. Therefore, no further adjustment to the net-to-gross ratio was made.

4.5.3 Measuring self-reported spillover

The self-report protocol included a battery of questions to quantify spillover for use in estimating spillover. The spillover methodology uses a series of questions designed to measure "like" spillover. These questions ask about recent purchases (since program participation) of any additional energy-efficient equipment of the same type, installed through the program, made *without* any technical or financial assistance from the utility, but influenced by the program. A "like" spillover estimate is computed based on how much more of the same energy-efficient equipment the participant installed outside the program because of their positive experience with the program.

One of the issues with attempting to quantify spillover savings is how to value the savings of measures installed outside the program since we are relying on customer self-reports of the quantity and efficiency of any measures installed. We used a conservative approach and reported only those measures installed outside the program that were of exactly the same type and efficiency as the ones installed through the program ("like" spillover). Our conservative approach allowed customers to be more certain about whether the equipment they installed outside the program was the same type as the program equipment. This, in turn, made it possible for us to use the estimated program savings for that measure to calculate the customer's "like" spillover savings. Figure 4-2 details the process for quantifying spillover savings.

Figure 4-2. Spillover Savings



We also attempted to measure the extent of free-drivers, or nonparticipant spillover. The data for this type of analysis could be collected from nonparticipants directly or from the design professionals and vendors who recommended, sold, and/or installed qualifying high efficiency equipment. We prefer to survey the design professionals and/or vendors primarily because they typically provide much more accurate information about the efficiency level of installed equipment than nonparticipants. Our experience has shown that customers cannot provide enough data about the new equipment they have installed to allow for accurate estimates of the energy savings achieved from the equipment. While they usually can report what type of equipment was installed, they typically cannot provide sufficient information about the quantity, size, efficiency, and/or operation of that equipment to allow us to determine whether the equipment is "program-eligible." On the other hand, design professionals and equipment vendors who have worked with the program are typically more knowledgeable about equipment and are familiar with what is and is not "program-eligible."

The in-depth interviews with participating vendors suggested little nonparticipant spillover due to the program at this time given the economy, the incremental cost of high efficiency cooling equipment, and the fact that this is only the third year of the program. In addition to these barriers, trade allies noted that the low cost of energy is further reducing the demand for high

efficiency equipment. Therefore, there are no adjustments to the net-to-gross ratio based on free-drivers.

4.5.4 Self-report net-to-gross results

The self-reported free-ridership rate for 2007–2009 participants using the California self-report methodology was 51 percent. The self-reported spillover rate for 2007–2009 participants using the California self-report methodology was 21 percent. The resulting self-report net-to-gross ratio is 0.7[24] for the Colorado Cooling Efficiency Program in 2007–2009.

We recommend Xcel Energy set a net-to-gross ratio in the range of 0.7 to 0.8 for the Colorado Cooling Efficiency Program, depending on program eligibility requirements. We recommend a net-to-gross range because as eligible program equipment changes (as it did between 2008 and 2009), we expect program attribution to change. Because we expect net-to-gross analysis will only be conducted periodically for the program, a realistic range allows Xcel Energy flexibility to set the net-to-gross ratio based on program eligibility requirements.

For example, PA Consulting has conducted biannual net-to-gross surveys for National Grid's commercial HVAC program. Prior to 2007, National Grid was using CEE Tier 1 eligibility standards for HVAC equipment. In 2002, the free-ridership rates for HVAC equipment ranged from 40 to 44 percent. In 2005, the free-ridership rates for HVAC equipment ranged from 41 to 56 percent. National Grid increased the eligibility standards to CEE Tier 2 in 2007. In 2007, with the higher eligibility requirements, free-ridership rates dropped significantly from 8 to 15 percent[25].

Results from the benchmarking review of HVAC programs that estimated a net-to-gross ratio ranged from 0.50 (when the net-to-gross ratio only includes free-ridership) to 0.85 (when the net-to-gross ratio includes spillover). This is in line with the self-report net-to-gross estimates from 2007–2009 Colorado Cooling Efficiency program participants discussed above.

There is also qualitative evidence from the 30 in-depth interviews with participating and nonparticipating trade allies which supports a net-to-gross range of 0.7 to 0.8. The qualitative results indicate that the program is helping to overcome barriers of selling high efficiency cooling equipment. In addition, the interviews suggest a medium level of spillover to customers of participating trade allies, supporting the medium to high level of spillover found in the customer survey. Nonparticipating trade allies were much more likely to say selling high efficiency cooling equipment to customers is very difficult. Nearly all these nonparticipating trade allies quoted finances and the high incremental costs as the primary drivers for the difficulty rating they gave. They also mentioned lack of knowledge or education on the benefits of high efficiency equipment.

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[24] Net-to-gross = (1 - .51) + .21

[25] The Northeast has significantly higher electric rates than Colorado and National Grid's program is very mature, which has supported the success of moving to the higher CEE Tier levels. We are not recommending that this be done for the Xcel Energy Colorado Cooling Efficiency Program, but instead use it as an illustrative example of how changes in program eligibility affects program attribution.

Participants' self-report results substantiate the trade ally interview findings as participants with high net-to-gross ratios often stated that they were trying to achieve a good return-on-investment or that the rebate allowed them to purchase higher efficiency equipment.

> *"We purchased an existing building so we had access to their utility bills so we know based on a variety of improvements that our savings on our utilities are pretty dramatic. We got a return on our investment and (the rebate was) part of the reason we were able to make the investment."* (net-to-gross ratio = .79)

> *"We were doing upgrades anyway so it worked out to get rebates to help us get more efficient equipment."* (net-to-gross ratio = .83)

At the same time, there is qualitative evidence supporting a certain amount of program free-ridership—also found in the customer self-report calculations. Xcel Energy account managers discussed that larger accounts tend to have standard practices toward energy efficiency. Participants with low net-to-gross ratios often stated that the equipment they installed through the program was their only option or mandated by regulations, supporting the account managers' perspectives.

> *"[The equipment was] the only choice we had for a flat roof building for the tenant re-finish."* (net-to-gross ratio = .27)

> *"It's giving me money back for stuff I'm already going to do, stuff that I'm mandated to do."* (net-to-gross ratio = .25)

> *"We got money back on something we would have had to do anyway."* (net-to-gross ratio = .35)

For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program. This ratio excludes VAV boxes and cooling towers, which yielded lower net-to-gross ratios. We recommend VAV boxes be removed from the program based on the engineering review and net-to-gross analysis, and cooling towers were removed from the program in 2009.

5. RECOMMENDATIONS

This chapter outlines recommendations for Xcel Energy's consideration. These recommendations are based on activities and key findings detailed within this report. Recommendations are organized by process recommendations (administration, marketing and outreach) and impact recommendations.

5.1 PROCESS RECOMMENDATIONS

5.1.1 Administration

Establish formal communication mechanisms to communicate program information, marketing, and changes to program staff and trade allies.

Communication is important to the success of any program. It is especially important for the Colorado Cooling Efficiency Program given the dispersion of program staff across states and the changes in the HVAC market which could drive programmatic changes. Additionally, given the importance of the trade ally infrastructure in promoting the program to the customers, it is important for trade allies to be abreast of program updates and changes.

Currently the program employs several methods of communication. To communicate information to staff, the company maintains an intranet that provides documentation and information for all programs administered by Xcel Energy. The company also communicates program updates and information via email to relevant parties. Last, the company distributes quarterly Energy Exchange newsletters which provide program-specific updates. Communication to trade allies is provided through the Trade Relations Manager and a website provided to trade allies.

Several interviewed program staff commented on the need for more formal dispersal of information regarding program changes. They recognize they receive emails with critical updates, but the information sent via email tends to get buried in day-to-day activities. One individual said that he found out about program changes from a vendor rather than through an Xcel Energy Communications. This is not to say that Xcel Energy did not communicate the information at some point; rather, the means for communication is not always effective in getting the information across.

Additionally, the program manager needs to be apprised of issues that impact the program operations or projected savings. The program manager should be connected with issues related to program design, program staffing, trade relations, and changes in the market. As an example, the Colorado Cooling Efficiency Program uses the International Energy Conservation Code (IECC) 2006 codes as the 2009 program baseline. Colorado does not have a statewide energy code, but is working toward enforcing IECC 2009 codes which could be effective as early as 2010. This type of shift in codes and standards would have significant implications on program design, including the ability to meet program goals. This information, known to the engineering staff in Colorado, was unknown to the program manager and based on subsequent conversations unknown to other program staff working with the program.

There are significant changes to the energy efficiency climate due to internal utility and other forces such as the American Recovery and Reinvestment Act (ARRA). Couple these changes with internal Xcel Energy changes such as any change in program staff and it stands to

reason that establishing a more formal communication process is necessary for more effective program operations.

We recognize that regular communications could become cumbersome and time intensive with program staff being involved in multiple programs. With this in mind, we make the following recommendations.

- Communicate all program changes to key staff using multiple communications venues. We recommend that, at minimum, conference calls are held with key members of the program which include account managers, BSC staff, and the Trade Ally Manager.
- Hold regular meetings with key staff to keep abreast of market and program issues. We recommend that these meetings happen, at minimum, every other month.
- Profile key program updates on the intranet. If not already included, have program-specific links that show the history of program changes and updates in one location for all of Xcel Energy's demand side management programs.

Consider additional resources to expand the reach of the Trade Relations Manager.

As discussed above, the addition of the Trade Relations Manager is noted as a positive element of the program. It is critical to be able to reach the vendors and trade allies to inform them of program requirements and changes.

This finding was underscored by discussions from various respondents who relayed the need to get into a location *prior to* equipment purchase and installation. The custom program requires that all projects need to be pre-approved, and that large projects (over 1 GWh projected savings) require post-project verification. Therefore, in order for the customer to optimize full program benefits, it is necessary for the program to be involved prior to the purchasing decision being made.

As the vendor is often the first point-of-contact and responsible for equipment specifications, it is necessary to ensure that they are well educated about program benefits and requirement specifications. The Trade Relations Manager we spoke with is the only assigned individual in this role. Not only is he responsible for setting up events that will provide this level of education and communicating with vendors across the state, he is responsible for doing this for all commercial programs provided by Xcel Energy in Colorado.

While the Trade Relations Manager believed that he was most effectively reaching the highest concentration of vendors working in the Denver area where the population is greatest, he may be missing other outlying areas of the state. One example provided was Boulder Junction, which is approximately four hours outside of the Denver area. It is difficult for the Trade Relations Manager role to reach these more rural areas due to the travel requirements.

This is not to say that there is no activity with vendors in the outlying areas. Account managers and other program staff may be filling part of that role, such as in the Boulder Junction area where the Trade Relations Manager works with the account manager. However, given the importance of targeting and reaching the trade allies it may be worthwhile to consider having a role dedicated to reaching the trade allies in the more rural or outlying areas or incorporating this more formally into account managers' responsibilities (and staffing account managers accordingly).

Further assess internal staff needs to support not only the Colorado Cooling Efficiency program, but all of Xcel Energy's demand side management and demand response programs.

The internal review conducted for this evaluation included a very limited sample size of staff interviews. While this is certainly a starting point for thinking about resources and processes that could improve program support, it is far from comprehensive. Furthermore, the Colorado Cooling Efficiency program is just one program in Xcel Energy's commercial portfolio. We suggest Xcel Energy consider conducting an internet or email survey with a census of its account managers, BSC representatives, and other staff that support Xcel Energy's programs to further assess ways to improve program communications, marketing materials and tools and customer and trade ally outreach activities. Establishing resources and processes that cut across all the programs—instead of being specific to just one program—may also increase staff's understanding and utilization of resources and processes.

Provide trade allies with more tools and training to help them sell high efficiency equipment.

Due to a variety of barriers detailed within this report, trade allies are having difficulty selling high efficiency equipment. While there is some anecdotal evidence that the program is making it easier for trade allies to promote high efficiency, there is still the potential for the program to make this process even easier. Trade allies discussed the need for a tool to calculate return-on-investment and/or payback periods and more materials to provide to customers. Trade allies also introduced the need for more education or training on how to pitch the high efficiency equipment and improve customers' knowledge and understanding of the benefits.

5.1.2 Marketing and outreach

Customize marketing tools for target customers and trade allies.

Xcel Energy has standard marketing materials that they use for all commercial and industrial customers. The marketing materials provide an overview of the program offerings and discuss the benefits of energy efficiency. Xcel Energy also provides information about their programs on their website as well as through email communications such as the *Conservationwise Product Update*, which is soon to be re-branded by Xcel Energy as *Xcel Energy's Product Update*.

The marketing materials distributed to customers and trade allies and available to program staff are fairly generic. This, according to the benchmarking study, is fairly common for programs such as Xcel Energy's Cooling Efficiency program. However, given Xcel Energy's desire to reach groups not currently being served by the program (e.g., non-managed accounts), there may be a need for more specific materials to be distributed to targeted customer groups.

Interviews with program staff confirm that the customer sectors they each serve are unique from each other. Larger accounts overseen by the account managers vary from the non-managed accounts serviced by the BSC. Even within the managed accounts there are variances in needs; hospital sector customers, for example, have different needs than food sector customers. Additional complexities exist among small business customers and commercial organizations that are in leased space.

Xcel Energy should examine target groups that are of high priority and develop marketing materials specific for those groups. The small commercial sector may be worthy of consideration given the relative difficulty in reaching that sector. An effective suggestion for targeting small commercial customers identified in the trade ally interviews is to work with trade allies that have ongoing maintenance agreements with these customers.

Trade allies and staff interviews also identified the hospital sector and data centers as the most attractive target populations due to their high cooling needs. While the sample size of customers by business classification was too small to quantitatively identify the most attractive target populations that either do or do not participate in the program, we do recommend Xcel Energy conduct some targeted marketing efforts to both the hospital and data center sectors based on the recommendations from the qualitative interviews.

Retailers were also identified by program staff as a group that is difficult to serve. Retailers tend to be housed within shopping malls that have large cooling loads. These organizations tend to be capital constrained and lease commercial space. Therefore, they do not have ownership over the equipment installed but still have to pay the energy bills.

Xcel Energy may want to direct targeted marketing materials to trade allies as well as customers as trade allies often work with specialized groups. Several of the trade allies mentioned they work specifically with small and medium customers as they maintain cooling maintenance contracts for this group.

When developing the marketing materials, Xcel Energy could engage program staff that work closely with the targeted customer segments. BSC staff, for example, should be involved in developing materials for small commercial customers. Account managers should be included if sector-specific specific marketing materials are developed. The Trade Relations Manager should be involved in developing trade ally materials.

It may also be worthwhile to elicit insights from vendors active in the program. These vendors are intimately familiar with customers' decision-making processes and could provide significant value to the development of more targeted marketing collateral.

One last approach is to profile case studies. We have seen sector-specific marketing materials developed and implemented successfully for other programs by using this case study approach that highlights a participant's experience in that sector.

Encourage a direct marketing approach with small commercial customers.

Currently there is little direct marketing activity aimed to small commercial customers through the BSC. At the time of the interview they were only working reactively with customers through the inbound calls. Discussions with program staff identified plans for outbound calls in the near future, and some strategizing around which organizations would be targeted for outbound calls. One opportunity identified were the smaller businesses under 30 kW. These organizations may benefit from high efficiency retrofits if their use could be moved to below 25 kW and be assigned a less costly rate structure.

Another opportunity mentioned was to track the transfer of small commercial customers within leased facilities. Customers move in and out of some leased facilities relatively frequently. It may be possible to target the newer customers who may not be familiar with the program early in their lease period and encourage the replacement of older inefficient equipment.

A third opportunity for marketing to customers is to integrate the on-site assessment audit program with the Cooling Efficiency Program. From discussions with program staff it seems as if there are few cross-referrals between these programs. However, the on-site assessment audit could be an opportunity for promoting the Cooling Efficiency program to these small commercial customers.

As detailed above, program staff welcomed the opportunity to be part of the development of marketing materials to small commercial customers. They said they currently don't have anything specific and would find this type of collateral useful.

Continue to market directly to customers through multiple venues including mailings, trade associations, and personal communications.

Trade allies responses on the percentage of customers that knew about the program prior to their interaction with the customer varied. By and large, though, the majority said that few customers were aware of the program before they interacted with them. Over a quarter of participating customers said they first heard about the program through their HVAC vendor.

Participating customers were most likely to say they first heard about the program through an Xcel Energy account manager, whereas nonparticipating customers were more likely to say they first heard of the program through Xcel Energy direct mailings. As the majority of program participants are managed accounts, it is not surprising that they heard about the program through their account manager.

Trade allies discussed the fact that personal interactions with Xcel Energy staff was most effective in delivering information about the program. They suggested that the program should at minimum market directly to customers through bill inserts and mailings. Understanding the importance of that personal communication, however, the program should consider marketing to customers through other trade associations and venues where commercial customers will be participating, such as trade shows. In fact, one of the best practices identified in the benchmarking study was to engage trade associations to help promote the program.

5.1.3 Program design

Revisit and prioritize target markets.

One of the researchable issues of this evaluation is whether the program is targeting the right markets and if there is a sector that would be advantageous for the program to target. Reasons that would make one market more advantageous than another could be free-ridership rates, decision-making processes, cooling needs, and lower initial barriers to participation.

Xcel Energy staff should consider what they believe to be target markets that could be prioritized and reasons for prioritizing those markets. Trade allies suggested the hospital sector because of the high cooling load and specific small business sectors such as retailers. Other sectors that may be advantageous for the program to consider are those that have extensive data center space which have a high need for cooling, as well as small business who is underrepresented in the program.

Consider increasing the rebate levels, taking into consideration the overall cost-effectiveness of the program. Include in the program additional service such as customer education and technical assistance.

The most commonly noted means for increasing program participation by trade allies was to increase the incentive levels. Trade allies thought this would be helpful, and program staff interviewed commented that they currently think the rebate levels are a benefit for many customers, but not sufficient to push them from standard to high efficiency equipment. These staff believe higher incentive levels would engage customers that otherwise would not install higher efficiency equipment.

However, as the benchmarking study found, while money may be the most notable reason for customers coming into the program, customer education and training are also important elements of an energy-efficiency program. Technical assistance and program support are equally important as businesses are time and staffing constrained. Results of one program's customer survey found that the assistance the program provides and the rebate are equally motivating for their customers. Examples of effective customer education included face-to-face meetings and on-line tools for calculating savings.

Of course, increased rebate levels have significant impacts on the overall cost-effectiveness of a program, particularly in a cool, dry climate such as Colorado. Therefore, any changes in program design would need to be justified by an increase in sales and installation of high efficiency equipment.

Review the custom program processes.

Interviews with program staff discussed the difficulty Xcel Energy staff saw in the custom application and rebate process. Several participating trade allies who actually participated in the custom component of the program commented on the complexity. These trade allies were emphatic about the burden it puts on them as the contractor as well as the burden it places on the customer. One trade ally said that he has in the past lost jobs because of the length of time it took to move through this process. And another trade ally that hadn't even participated in the custom component of the program said he was not inclined to participate based on his knowledge of the difficulty of participating in this component of the program through others in the industry. This issue should continue to be revisited by Xcel Energy.

Engage the smaller commercial customers more; consider offering a separate incentive structure for smaller customers.

A number of trade allies believe that the smaller commercial customers are more likely to have difficulty installing higher efficiency equipment than larger commercial customers. Furthermore, analysis of the Xcel Energy database shows that the program is not reaching this customer segment effectively. Xcel Energy has put strategies in place to try to reach these customers (e.g., the Business Solutions Center); however, it may be worthwhile for Xcel Energy to think beyond the marketing to these customers and consider additional strategies for encouraging participation.

One such strategy would be to offer an incentive level that is unique to smaller commercial customers. This is not uncommon in energy efficiency program offerings; many utilities have programs targeted to small commercial customers, offering a higher level of incentive for these customers, as well as offering on-bill financing.

In addition, to the extent this sector represents leasers, an increased incentive will decrease the payback period and the uncertainty that the customer will enjoy the benefits of the high efficiency equipment before their lease ends. Xcel Energy should continue to evaluate the barriers in serving these smaller customers and means for overcoming those barriers, including strategies with the incentive levels.

5.2 IMPACT RECOMMENDATIONS

Consider modifying the PTAC algorithm in the calculator and remove VAV boxes from program offerings.

The baseline efficiency values used in the Calculator and the IECC 2006 are consistent for all measures except the PTACs. Xcel Energy should consider modifying the algorithm in the Calculator for calculation of baseline efficiencies to take into account variations in PTAC sizes.

Additionally, we recommend Xcel Energy remove VAV boxes from program offerings starting in 2010. Based on findings from the engineering review and net-to-gross analysis, we recommended that VAV boxes should be removed from the program starting in 2010.

Establish a net-to-gross ratio range to be used going forward in 2010 between 0.7 and 0.8. The program's net achievements for 2009 and prior will not be retroactively adjusted to reflect any recommendations from this evaluation. We note the net-to-gross range for the 2007-2009 program years in order to set a basis for the net-to-gross ratio. The net-to-gross ratio should continue to be revisited and revised as program modifications are made that would have an upward or downward effect on the net-to-gross ratio. For example, below we recommend a net-to-gross ratio of .75 for the 2010 program based on the removal of both Cooling Towers and VAV boxes from the program. These changes should have an upward effect on the net-to-gross ratio as both measures experienced high free-ridership during the 2007-2009 program years.

Set the net-to-gross ratio at 0.75 for the 2010 program year. For the 2010 program, we recommend a net-to-gross ratio of 0.75 be applied to the program for the reasons discussed above.

APPENDIX A: TECHNICAL RESOURCE MANUAL REVIEW SUMMARY

This appendix summarizes the findings through the review of five programs' Technical Resource Manuals (TRMs).

1. Efficiency Maine Commercial Technical Reference Manual No. 2006-1. Measure Savings Algorithms and Cost Assumptions; 2007.
2. Arkansas Deemed Savings, Quick Start Program—Commercial Measures: Final Report; 2007.
3. Technical Reference Manual for Pennsylvania: Act 129—Energy Efficiency and Conservation Program and Act 213—Alternative Energy Portfolio Standards; 2009.
4. Connecticut CL&P and UI Program Savings Documentation for 2008 Program Year; 2007.
5. New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review; 2009.

A.1 EFFICIENCY MAINE TRM

The Efficiency Maine TRM provides algorithms for three categories of cooling measures, (a) small cooling measures with capacity less than 65,000 BTUh[26], (b) large cooling systems having capacity 65,000 BTUh or more[27,28], and (c) Electric Chillers.

Small Systems

Energy Saving (kWh) = Capacity (kBTU/hr) × (1/SEERb - 1/SEERe) × FLH

Demand Saving (kW) = Capacity (kBTU/hr) × (1.1/SEERb - 1.1/SEERe)

Large Systems

Energy Saving (kWh) = kBTU/hr × (1/EERb - 1/EERe) × FLH

Demand Saving (kW) = kBTU/hr × (1/EERb - 1/EERe)

Electric Chiller

Energy Saving (kWh) = Capacity (tons) × (PEb - PEe) × FLH

Demand Saving (kW) = Capacity (tons) × (PEb - PEe)

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[26]Measures include small split system and single package air conditioners and heat pumps excluding room air conditioners PTACs, PTHPs, water source heat pumps and ground source heat pumps.

[27] Air conditioners, PTAC's, water-source heat pumps

[28]Although the TRM provides algorithm for electric chillers, it recommends energy saving calculations derived from detailed engineering analysis of the

The TRM uses 800 full load cooling hours (FLH) for small systems. We discuss the measure efficiency values (SEER, EER or PE) in Section 4.2 as part of the IECC 2006 and IECC 2009 baseline stipulations.

A.2 ARKANSAS DEEMED SAVINGS TRM

Two types of cooling measures included in the TRM are (a) Unitary air conditioners and (b) electric chillers. The algorithms used for quantifying the energy saving are as follows.

Unitary Air Conditioners:

Energy Saving (kWh) = Capacity (BTU/hr) x (1/1000) x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (BTU/hr) x (1/1000) x (1/EERb - 1/EERe)

The TRM uses IECC 2003 for defining the measure baseline efficiencies. The expression for the equivalent full load hours is:

EFLH = A x $(CDD)^{b+1}$

For unitary systems the TRM provides calculated EFLH for two cities i.e. “Fort Smith (FS)” and “Little Rock (LR)” in Arkansas State as shown in Table A-1. However, the methodology used for calculating the EFLH values is not provided in the TRM.

Table A-1. Calculated EFLH for Unitary Cooling Equipment*

City	Stage	M-Fri, 7 a.m. to 5 p.m.	M-Fri, 7 a.m. to 7 p.m.	M-Fri, 9 a.m. to 10 p.m.; Sun, 11 a.m. to 6 p.m.	All week, 6 a.m. to 10 p.m.	All week, 6 a.m. to Midnight	All week, All day
Fort Smith	Single	1,207	1,444	2,033	2,520	2,739	3,230
	Dual	854	1,020	1,443	1,750	1,881	2,155
Little Rock	Single	1,177	1,383	1,948	2,419	2,627	3,137
	Dual	801	938	1,303	1,611	1,730	1,997

*Source: Arkansas Deemed Savings Quick Start Program Commercial Measures: Final Report (Page 2–25)

Electric Chillers:

Energy Saving (kWh) = Capacity (ton) x 3.517 x (1/IPLVb - 1/IPLVe) × EFLH

Demand Saving (kW) = Capacity (ton) x 3.517 x (1/COPb - 1/COPe), and

EFLH = A x $(CDD)^{b+1}$

The coefficients A and B for calculating the EFLH for different building types are given in the TRM and shown in Table A-2.

Table A-2. Coefficients for calculating EFLH

Building Type	A	B
Education—Community College	327.83	-0.8835
Education—Secondary School	240.98	-0.9174
Education—University	512.11	-0.9148
Health/Medical—Clinic	313.54	-0.8437
Health/Medical—Hospital	730.76	-0.8836
Lodging	589.61	-0.8750
Office	657.91	-0.9437
Retail	404.00	-0.8645

The Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator also mentions use of the same methodology for estimating the EFLH. The EFLH estimates were developed by analyzing facility occupancy and operating hour distribution based on (a) Minnesota "occupation and employment statistics" data, (b) TMY2 data for Denver and Grand Junction and (c) building characteristics data from CBECS. This methodology would provide a better estimation of the EFLH values, although may always not be accurate. A detailed investigation of the methodology used for estimating the EFLH values currently being used for Xcel Energy Colorado C&I Colorado Cooling Efficiency Deemed Saving Calculator is beyond the scope of the current study.

A.3 PENNSYLVANIA ENERGY EFFICIENCY AND CONSERVATION PROGRAM TRM

The TRM provides energy and demand saving algorithms for C&I cooling measures for room and central air conditioners split systems, packaged terminal systems, and water source heat pumps. Also, the TRM provides energy saving algorithms for electric chillers.

Air Conditioner:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. A coincident factor (CF) of 0.67 is used in the demand savings calculations. The EFLH hours are obtained for seven locations within the state using the "Energy Star Calculator" of the Department of Energy[29].

[29] At the time of writing, we were unable to obtain the EFLH from the Energy Star Calculator hosted at the DOE website. The calculator needs input of the FLH or EFLH, else it uses a default value of 2000 Hrs.

Table A-3. EFLH for Seven Locations in Pennsylvania

Place	EFLH (hours)
Allentown	784
Erie	482
Harrisburg	929
Philadelphia	1032
Pittsburgh	737
Scranton	621
Williamsport	659

Electric Chillers

Energy Savings (kWh) = Tons X (kW/ton$_b$ – kW/ton$_e$) X EFLH

Demand Savings (kW) = Tons X (kW/ton$_b$ – kW/ton$_e$) X CF

The algorithms for estimating energy and demand saving are loosely linked to the equipment efficiency rating. The TRM uses the same CF and EFLH values as used for the air conditioning equipment.

A.4 CONNECTICUT CL&P AND UI PROGRAM SAVINGS TRM

The TRM provides algorithms for estimating the energy and demand savings for unitary air conditioners, as follows:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x (1/EER$_b$ -1/EER$_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x (1/EER$_b$ -1/EER$_e$) x CF

The TRM recommends use of SEER for equipment rated below 65,000 BTU/h and EER for equipment capacity of 65,000 BTU/h or more. The full load cooling hours are given for around sixty facility types ranging from 564 hours to 1308 hours (Table 2.0.0; page 246) also shown in Table 6.5 in this report. For demand saving estimation a peak load factor (CF) of 0.82 is recommended (Table 1.1.1; page 231).

For chillers the TRM recommends custom calculated energy savings based on specific equipment capacity, operational staging, operating profile, and load profile.

A.5 NEW JERSEY'S CLEAN ENERGY PROGRAM ENERGY IMPACT EVALUATION AND PROTOCOL REVIEW

This report is a well-researched TRM. It reviews energy and demand savings algorithms for end-use cooling (and other) measures from TRMs used in different jurisdictions. The report recommends algorithms for air conditioners and chillers. The air conditioning systems include unitary/split systems, PTACs, Water-source heat pumps etc.

Air Conditioners:

Energy Savings (kWh) = Capacity (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x EFLH

Demand Savings (kW) = (Btu/hr) x (1/1000) x ($1/EER_b$ -$1/EER_e$) x CF

Electric Chillers

Energy Savings (kWh) = Tons X (IPLVb - IPLVe) X EFLH

Demand Savings (kW) = Tons X (IPLVb - IPLVe) X CF

The TRM recommends a single value of 1360 hrs for EFLH and 0.67 for the CF (page 3-58).

Table A-4. Full load cooling hours by facility type*

Facility Type	Full Load Cooling Hours	Facility Type	Full Load Cooling Hours
Auto Related	837	Medical Offices	797
Bakery	681	Motion Picture Theaters	564
Banks, Financial centers	797	Multi-Family (Common Areas)	1306
Church	564	Museum	797
College-Cafeteria	1139	Nursing Homes	1069
College-Classes/Administrative	646	Office (General Office Types)	797
College-Dormitory	709	Office/Retail	797
Commercial Condos	837	Parking Garages & Lots	878
Convenience Stores	1139	Penitentiary	1022
Convention Centers	564	Performing Arts Theaters	646
Dining-Bar Lounge/Leisure	854	Police/Fire Stations (24 Hrs)	1306
Dining-Cafeteria/Fast Food	1149	Post Office	797
Dining-Family	854	Pump Stations	563
Entertainment	564	Refrigerated Warehouse	648
Exercise Center	1069	Religious Buildings	564
Fast Food Restaurants	1139	Residential (Except Nursing Homes)	709
Fire Station	564	Restaurants	854
Food Stores	837	Retail	837
Gymnasium	646	Schools/University	594
Hospitals	1308	Schools (Jr/Sr. High)	594
Hospital/Health Care	1307	Schools (Preschools/elementary)	594
Industrial- 1 Shift	681	Schools (Technical/Vocational)	594
Industrial-2 Shift	925	Small Services	798
Industrial- 3 Shift	1172	Sports Arena	564
Laundromats	837	Town Hall	797
Library	797	Transportation	1149
Light Manufacturers	681	Warehouse (Not Refrigerated)	648
Lodging (Hotels/Motels)	708	Waste Water Treatment Plant	1172
Mall Concourse	938	Warehouse	798
Manufacturing Facility	681		

*Source: New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review; SmartStart Program Protocol Review, 2009 (page 3-41).

APPENDIX B: IECC 2006 AND IECC 2009 EQIUPMENT ANALYSIS

B.1.1 Rooftop units

For all RTU sizes the EER (SEER and/or IPLV) values stipulated in the IECC 2009 are greater than those in IECC 2006. The measure baseline efficiency values used in the Calculator (reduced by 0.2 to account for the heating section) are consistent with the codes.

B.1.2 Water source heat pump

No change in EER values between IECC 2006 and IECC 2009. The Calculator and IECC 2006 values are consistent.

B.1.3 Condensing units

No change in EER values between IECC 2006 and IECC 2009. The Calculator uses EER value for air cooled condensing units only and this is in agreement with IECC 2006 value. The EER and (IPLV) values for water or evaporative cooled condensers are also provided in the Tables 6.7a and 6.7b.

B.1.4 Packaged Terminal Air Conditioners (PTAC)

No change in equipment baseline efficiencies between IECC 2006 and IECC 2009. Minimum energy efficiency ratio (EER) for PTACs according to both IECC 2006 and IECC 2009 is given by the following relation:

New Construction:

EER = 12.5 - (0.213*Capacity/1000)

Replacement:

EER = 10.9 - (0.213*Capacity/1000)

Code handbooks stipulate that for PTAC capacity less than 7,000 BTU/hr (0.58 ton) the equation should use default capacity value of 7000 BTU/hr to calculate the EER. Similarly, for equipment capacity over 15,000 BTU/hr the default capacity is 15,000 BTU/hr. Based on the above assumptions we calculate the EER values shown in Table 6.6a and 6.6b.

The Calculator uses a single EER value of 9.1 (excluding 0.2 for heating section); based on an average value of PTAC size obtained from the Xcel Energy CO market segment data. Plugging the EER value of 9.3 (9.1 + 0.2 for heating section) in above algorithms leads to PTAC sizes of about 15,000 BTU/hr and 7,000 BTU/hr for new construction and replacement units respectively. This does not capture the PTAC sizes that fall within the 15,000 BTU/hr and 7000 BTU/hr range. . We recommend that the Calculator applies the above algorithm to take into account the capacity variations for PTACs.

B.1.5 Electric chillers

In Table B-1 and B-2 we provide baseline measure efficiencies for electric chillers. The “Full Load Value (FLV) in kW/ton” and “Integrated Part Load Value (IPLV) in kW/ton” provided in the Calculator and the IECC 2006 handbook are consistent.

Table B-1. Baseline Efficiency of C&I Chillers—IECC 2006

Cooling Measures	IECC 2006		
	FLV (kW/ton)	IPLV (kW/ton)	Test Procedure
Scroll/Screw Chiller < 150 tons	0.79	0.78	ARI 550/590
Scroll/Screw Chiller ≥150 tons and < 300 tons	0.72	0.71	
Scroll/Screw Chiller ≥ 300 tons	0.64	0.63	
Centrifugal Chiller < 150 tons	0.65	0.65	
Centrifugal Chiller ≥150 ton and < 300 tons	0.63	0.63	
Centrifugal Chiller ≥ 300 tons	0.58	0.58	
Air-Cooled Chillers ≥ 150 tons	1.41	1.41	

Note: For non-standard centrifugal chillers (chillers not designed to standard ARI 550/590 test conditions) the IPLV is factored for adjustment (according to the algorithm well captured in the Calculator).

The IECC 2009 codes for water cooled chillers contain the amendments made by the ASHRAE 90.1—2007 standards. Two paths have been established—Paths A and B. Path B is intended for measure applications where significant time is expected at part load and all Path B chillers need demand-limiting controls.

Table B-2. Baseline Efficiency of C&I Chillers—IECC 2009

Measure	IECC 2009				
	Path A		Path B		
	FLV kW/ton	IPLV kW/ton	FLV kW/ton	IPLV kW/ton	Test Procedure
Scroll/Screw Chiller < 75 tons	≤0.78	≤0.63	≤0.0.80	≤0.60	AHRI 550/590
Scroll/Screw Chiller ≥75 and <150 tons	≤0.78	≤0.62	≤0.79	≤0.59	
Scroll/Screw Chiller ≥150 and <300 tons	≤0.68	≤0.58	≤0.72	≤0.54	
Scroll/Screw Chiller ≥ 300 tons	≤0.62	≤0.54	≤0.64	≤0.49	
Centrifugal Chillers < 150 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥150 and < 300 tons	≤0.63	≤0.60	≤0.64	≤0.45	
Centrifugal Chillers ≥300 and < 600 tons	≤0.58	≤0.55	≤0.60	≤0.40	
Centrifugal Chillers ≥ 600 tons	≤0.57	≤0.54	≤0.59	≤0.40	
Air-Cooled Chillers ≥ 150 tons	≥9.6 EER	≥12.75 EER	NA	NA	

The adjustment factor for non-standard chillers is given by the following equation.

Adjusted NPLV = IPLV/K_{adj}

K_{adj} = 6.174722 – 0.303668(X) + 0.00629466 $(X)^2$ – 0.000045780 $(X)^3$

X = D_{std} + LIFT

D_{std} = (24 + FLV*6.83)/Flow rate

LIFT = CEWT – CLWT (^{o}F)

CEWT = Full load condenser entering water temperature (^{o}F)

CLWT = Full load leaving chilled water temperature (^{o}F)

Note that the coefficients of the equation for K_{adj} provided in the IECC 2009 are different from that in IECC 2006.

APPENDIX C: PARTICIPANT AND NONPARTICIPANT SURVEY RESPONSE RATES

Table C-1 presents the response rate and cooperation rate to the participant survey, and Table C-2 presents the same information for nonparticipants.

Table C-1. Cooling Efficiency Program Participant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**134**	**23**	**157**
Number not in service[4]	1	0	1
Non-working number[4]	0	3	3
Person not at number	7	0	7
Adjusted Sample Size	***126***	***20***	**146**
Hard Refusal	28	3	31
Soft Refusal[1]	0	0	0
Incompletes (partial interviews)	0	0	0
Unavailable for duration	3	2	5
Language barrier/non-English	0	0	0
Active[2]	***51***	***5***	**56**
Completed Surveys[5]	**44**	**10**	**54**
Cooperation Rate[3]	***34.9%***	***50.0%***	***42.5%***

[1] Attempts were made to convert all soft refusals
[2] An average of 16.7 contacts per active case were made to reach these still active cases
[3] Number of completed surveys divided by Adjusted Sample Size
[4] All bad numbers were traced with a telephone append service or directory assistance service
[5] Surveys were completed with 54 participants at 44 locations

Table C-2. Cooling Efficiency Program Nonparticipant Cooperation Rate

Sample Disposition	Managed	Non-managed	Total
Sample Size	**156**	**572**	**728**
Temporarily disconnected[4]	1	5	6
Fax/data line[4]	4	3	7
Disconnected number[4]	1	30	31
Residential number	12	59	71
Ineligible—no commercial cooling	18	80	98
Ineligible—terminated during survey	12	77	89
Adjusted Sample Size	***108***	***318***	**426**
Hard Refusal	24	69	93
Soft Refusal[1]	0	2	2
Incompletes (partial interviews)	1	4	5
Unavailable for duration	3	14	17
Language barrier/non-English	0	2	2
Active[2]	***58***	***187***	**245**
Completed Surveys	**27**	**62**	**89**
Completed Surveys—Swamp Coolers Only	**1**	**7**	**8**
Completed Surveys—Doesn't Pay Cooling	**4**	**15**	**19**
Cooperation Rate[3]	29.6%	26.4%	***28.0%***

[1] Attempts were made to convert all soft refusals

[2] An average of 9.8 contacts per active case were made to reach these still active cases

[3] Number of completed surveys divided by Adjusted Sample Size

[4] All bad numbers were traced with a telephone append service or directory assistance service