



2017/2018 Demand-Side Management Plan Electric and Natural Gas

Public Service Company of Colorado
Proceeding No. 16A-0512EG

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Document Layout

The Plan has four major sections, summarized below:

1. Executive Summary – provides a high-level overview of the strategic direction of the overall 2015/2016 DSM Plan; provides program and product level targets and budgets; identifies budgets by cost category; and addresses customer participation.
2. Program and Product Summaries – a high-level summary of each program area followed by specifics of each DSM product offering.
3. Cost-Benefit Analyses – provides the electric and natural gas Portfolio and Program cost-benefit analysis results for 2015 and 2016.
4. Appendices – presents a list of acronyms; key terms; product rankings; avoided costs; description of budget categories; natural gas DSM \$/Therm and Acknowledgement of Lost Revenue (“ALR”) methodology; and the technical reference manual (deemed savings and forecast technical assumptions).

Executive Summary: Plan Overview

Public Service Company of Colorado (“Public Service” or the “Company”) submits this combined electric and natural gas 2017/2018 Demand-Side Management Plan (“Plan”) to the Colorado Public Utilities Commission (“Commission”). This Plan is the result of an extensive effort by the Company to assess market potential in our Colorado service territory and devise a plan to reach the Commission-approved annual energy savings goal by offering an inclusive and cost-effective DSM portfolio, delivered to customers via proven marketing techniques.

The Company’s 2017/2018 DSM Plan is grounded in a continuance of preceding years’ successful approaches, in combination with necessary adjustments made to improve DSM offerings to reflect market shifts and integrate emerging technologies identified in the Potential Study;¹ and to be responsive to the Commission’s Decision² in the 2013 DSM Strategic Issues (Proceeding No. 13A-0686EG). That Decision resulted in lowered energy savings goals for 2015-2020,³ recognizing contracting market potential. In an attempt to combat rate impacts, the Commission instituted an energy efficiency budget cap starting in 2015⁴ and enhanced focus on ensuring achievement of 100% of the energy savings goal through changes to the Company’s financial incentive mechanism.⁵

This Plan meets the requirements of the relevant Commission Decisions and Rules,⁶ and aims to hit the Commission-approved energy savings goal (400 GWh), while overcoming the challenges presented by a dynamic and complex market that has evolved from the environment under which HB07-1037⁷ was initiated. These challenges include stricter lighting standards and building codes that are beneficial for achieving greater naturally-occurring energy efficiency, but are reducing the level of incremental energy savings that the Company can claim through its portfolio. The DSM products continue to experience low avoided costs, juxtapose higher costs of market capture, making it more challenging for many DSM products to maintain cost-effectiveness. The Company was able to develop this Plan by making a series of modifications to the portfolio for 2017 and 2018.

To meet the Commission-approved goal for the DSM portfolio, Public Service has developed the Plan under the following high-level approaches:

¹ The *Update to the Colorado DSM Market Potential Assessment*, completed in June 2013, available: https://www.dora.state.co.us/pls/efi/efi.show_document?p_dms_document_id=210745&p_session_id=

² Decision No. C14-0731, Proceeding No. 13A-0686EG.

³ The previous electric energy saving goals were approved Decision No. C11-0442, where the goal was set at 411 GWh for 2015 and 441 GWh for 2016. Decision C14-0731 reduced the 2015 and 2016 goals to 400 GWh annually.

⁴ The energy efficiency budget cap is set at \$84.3 million; per Paragraph 5 on pages 2-3 of Decision No. C14-0997.

⁵ Beginning in 2015, the Company is eligible for a performance incentive at 100% of goal achievement per Paragraph 32 on page 13 of Decision No. C14-0731.

⁶ Commission’s Decision Nos. C11-0442 and C11-0645 issued in Docket No. 10A-554EG, Decision No. C14-0731 issued in Docket No. 13A-0686EG; and Rules 4750 to 4760 of the Commission’s Rules Regulating Gas Utilities and Pipeline Operators (the Gas DSM Rules).

⁷ An Act of the Colorado House of Representatives Concerning Measures to Promote Energy Efficiency passed in 2007, available: http://www.dora.state.co.us/puc/rulemaking/HB07-1037/HB07-1037_enr.pdf.

- Leveraging robust project queues (for products with long planning/construction cycles, such as New Construction);
- Continuing the use of midstream rebate approaches (Cooling and Lighting Efficiency);
- Launching promising new pilots (for example, ENERGY STAR Retail Products Platform Pilot); and
- Accelerating market penetration in all customer classes through increased promotions and trade channel development.

Public Service also believes that successful implementation of this Plan will be the result of active participation by stakeholders. These stakeholders include our customers, the Colorado Energy Office, Staff of the PUC, the Office of Consumer Counsel, local governments, environmental groups, external consulting groups, efficient equipment manufacturers, distributors and vendors, installation contractors, and customer advocates. Each of the Company's DSM products offers its own opportunities for stakeholder involvement and feedback. In addition, Public Service will continue to host quarterly DSM Roundtable Meetings as a forum for open dialogue and discussion.⁸

2017/2018 DSM Plan

In this filing, Public Service proposes an annual DSM Plan designed to achieve energy savings of approximately 401.2 GWh in electric and 636,078 Dth in natural gas in 2017, at proposed costs of \$80.2 million and \$13.1 million, respectively. For 2018, Public Service proposes achievement of energy savings of approximately 401.7 GWh in electric and 573,136 Dth in natural gas, at proposed costs of \$77.7 million and \$12.8 million, respectively. The 2017 and 2018 electric energy savings goal, 400 GWh annually, was established by the Commission in Docket No. 13A-0686EG (Decision No. C14-0731, ¶19). The Plan is also designed to achieve incremental demand reduction from energy efficiency totaling 59 MW in 2017 and 57 MW in 2018 compared to the Commission-approved annual demand reduction goal of 65 MW from energy efficiency.⁹ (Cumulative demand reduction impacts expected from the Company's demand response ("DR") programs and pilots are discussed in the Demand Response Program section of the Plan). Table 1 below provides a summary of the budgets, energy savings targets and demand savings associated with the overall portfolio of energy efficiency and DR.

⁸ The quarterly DSM Roundtable meetings have been held since the 2009/2010 Plan. The meetings offer a chance for interested stakeholders to review and discuss DSM achievements and any programmatic changes with the Company.

⁹ Decision No. C14-0731, Proceeding No. 13A-0686EG, paragraph 60, pg. 22.

Table 1: 2017/2018 DSM Plan Budgets & Targeted Energy and Demand Savings¹⁰

	Budget	Energy Savings Target (Gen KWh or Dth)	Incremental Demand Target (Gen kW)
2017 – Electric			
Energy Efficiency Programs	\$ 69,490,404	399,019,773	58,828
Indirect Program	\$ 10,837,514	2,149,899	636
Total 2017 Electric EE	\$ 80,327,918	401,169,673	59,463
Demand Response Programs	\$ 16,316,436	123,179	16,120
Demand Response Pilots	\$ 2,863,697	0	0
Total 2017 Electric DR	\$ 19,180,133	123,179	16,120
2015 Electric TOTAL	\$ 99,508,051	401,292,852	75,583
2017 – Natural Gas			
Energy Efficiency Programs	\$ 11,755,556	635,809	---
Indirect Program	\$ 1,389,021	269	---
2017 Natural Gas TOTAL	\$ 13,144,577	636,078	---
2017 TOTAL	\$ 112,652,628	401,292,852 kWh 636,078 Dth	75,583
2018 – Electric			
Energy Efficiency Programs	\$ 68,104,235	398,692,135	57,019
Indirect Program	\$ 9,599,833	2,866,581	848
Total 2018 Electric EE	\$ 77,704,067	401,558,717	57,867
Demand Response Programs	\$ 17,406,029	123,179	16,120
Demand Response Pilots	\$ 3,219,472	0	0
Total 2018 Electric DR	\$ 20,625,501	123,179	16,120
2018 Electric TOTAL	\$ 98,329,568	401,681,896	73,987
2018 – Natural Gas			
Energy Efficiency Programs	\$ 11,452,930	572,776	---
Indirect Program	\$ 1,343,737	359	---
2018 Natural Gas TOTAL	\$ 12,796,667	573,136	---
2018 TOTAL	\$ 111,126,235	401,681,896 kWh 537,136 Dth	73,987

Modifications in 2017 and 2018

While many of the DSM products included in this Plan are the same as those that have been implemented since 2009, products have naturally evolved since that time to promote cost-effectiveness and adapt to the marketplace. The evolution of products has been documented through previous DSM Plans, as well as through the 60-Day Notice process first established in the 2009/2010 Plan Stipulation approved in Docket No. 08A-366EG, to afford the Company

¹⁰ Decimal places associated with data and sum totals is not displayed.

discretion to make mid-year changes to Plans in order to achieve the greatest level of energy savings.¹¹

The Plan also reflects additional noteworthy changes that include:

- Updated avoided costs and technical assumptions to reflect current data.
- New product additions to the portfolio, including Peak Partner Rewards and Multifamily Buildings.
- The addition of new measures to the following programs:
 - Motors & Drives;
 - Commercial Refrigeration;
 - Lighting Efficiency and Small Business Lighting;
 - ENERGY STAR New Homes;
 - High Efficiency Air Conditioning;
 - School Kits;
 - Home Lighting & Recycling;
 - Single Family Weatherization;
 - Home Energy Squad; and
 - Cooling Efficiency.
- Measure, pilot, or product retirement including:
 - Refrigeration Recommissioning;
 - ENERGY STAR Dishwashers;
 - CFL lighting measures; and
 - Business Energy Feedback.
- New pilots including Critical Peak Pricing and ENERGY STAR Retail Products Platform.
- Relative to the 2015/2016 DSM Plan, and due to expected performance in 2017/2018, budgets and/or savings targets for the following products have decreased:
 - Commercial Refrigeration Efficiency;
 - Compressed Air Efficiency;
 - Computer Efficiency;
 - Custom Efficiency;

¹¹ Decision No. R08-1243. Per the Settlement Agreement, 60/90-Day Notices are required for any proposal to add a new DSM product, reduce rebate levels, adopt new or discontinue existing measures, or change technical assumptions or eligibility requirements. Details of 60-Day Notices are posted at: http://www.xcelenergy.com/About_Us/Rates_&_Regulations/Regulatory_Filings/CO_DSM.

- LED Street Lighting;
 - Lighting Efficiency;
 - Motor & Drive Efficiency;
 - Process Efficiency;
 - Recommissioning;
 - Self Direct;
 - Evaporative Cooling;
 - High Efficiency Air Conditioning;
 - Home Lighting & Recycling;
 - Home Performance with ENERGY STAR;
 - School Education Kits; and
 - Water Heating
- Relative to the 2015/2016 DSM Plan, and due to expected performance in 2017/2018, budgets and/or savings targets for the following products have increased:
 - Cooling;
 - Data Center Efficiency;
 - Energy Management Systems;
 - Heating Efficiency;
 - Lighting – Small Business;
 - Multifamily Buildings;
 - New Construction;
 - Energy Feedback Residential;
 - ENERGY STAR New Homes;
 - Insulation & Air Sealing;
 - Refrigerator & Freezer Recycling; and
 - Residential Heating.
 - Natural gas program expenditures have remained consistent with levels in the 2014 and 2015/2016 plans at approximately \$13 million which is approximately twice the minimum spend requirement.
 - Conclusion of the Smart Thermostat pilots in 2016. The Company will review the results of the pilots to determine if the programs can be cost-effective as products in the Residential and Business programs. If the evaluation of the pilots is positive, the Company will file a 60-Day Notice in 2017 to implement full programs.

- Conclusion of the Multifamily Buildings Pilot – The pilot concluded in 2016 and the evaluation results were sufficiently positive to be included in the 2017/2018 Plan as a full program.

2017/2018 Goals by Program

Public Service continues a full portfolio of electric and natural gas DSM products to serve all customer segments. Public Service will market its energy efficiency products to each customer segment based on the number of customers, relative size of each customer, and amount of conservation potential at a customer site.

The energy savings and participation targets, and budgets, for these programs are summarized below.

Business Electric and Gas Programs

Energy efficiency sales to the Business Programs are achieved through Public Service's Account Managers, end-use equipment vendors, and energy service companies ("ESCOs"), as well as our Business Solutions Center. Proposed targets and budgets for the Business Program in 2017 and 2018 are:

Business Electric Program (2017)

- Electric budget \$44,074,268
- Electric savings 32,659 Net Gen. kW and 240.9 Net Gen. GWh

Business Natural Gas Program (2017)

- Natural gas budget \$2,986,871; natural gas savings 212,820 Dth

Business Electric Program (2018)

- Electric budget \$41,956,268
- Electric savings 29,948 Net Gen. kW and 233.0 Net Gen. GWh

Business Natural Gas Program (2018)

- Natural gas budget \$2,488,524; natural gas savings 143,681 Dth

Although economies of scale enable the business segment to offer a comparably lower cost of DSM per unit of energy saved, business DSM is some of the most difficult to achieve over time. This is the case because business customers tend to require very short paybacks on investments and do not readily respond to traditional mass-market appeals. Further, on the natural gas side, the majority of large customers, who present some of the largest energy efficiency potential, are gas transport customers who will neither pay into the Demand-Side Management Cost Adjustment (DSMCA), nor be eligible to participate in the program offerings.

Residential Electric and Gas Programs

Public Service has approximately 1.4 million electric and 1.3 million natural gas customers in its residential market in Colorado.¹² The Residential Program includes single-family homes, town homes, apartments, and condominiums. Public Service developed its Plan to recognize that the residential market requires choices of conservation opportunities that accommodate various lifestyles, convenient participation, and information to make wise energy choices presented in useable and understandable forms and formats. Proposed targets and budgets for the Residential Program in 2017 and 2018 are:

¹² Electric and natural gas customers as of 2015.

Residential Electric Program (2017)

- Electric budget \$21,642,049
- Electric savings 25,417 Net Gen. kW and 152.6 Net Gen. GWh

Residential Natural Gas Program (2017)

- Natural gas budget \$5,469,292; natural gas savings 353,485 Dth

Residential Electric Program (2018)

- Electric budget \$22,334,879
- Electric savings 26,319 Net Gen. kW and 160.1 Net Gen. GWh

Residential Natural Gas Program (2018)

- Natural gas budget \$5,602,053; natural gas savings 357,816 Dth

Low-Income Electric and Gas Programs

The primary objective of the Low-Income Program is to reduce energy consumption in low-income customers' homes and thereby reduce low-income customer bills. Proposed targets and budgets for the Low-Income Program in 2017 and 2018 are:

Low-Income Electric Program (2017)

- Electric budget \$3,774,087
- Electric savings 750 Net Gen. kW and 5.5 Net Gen. GWh

Low-Income Natural Gas Program (2017)

- Natural gas budget \$3,299,393; natural gas savings 69,503 Dth

Low-Income Electric Program (2018)

- Electric budget \$3,813,087
- Electric savings 751 Net Gen. kW and 5.5 Net Gen. GWh

Low-Income Natural Gas Program (2018)

- Natural gas budget \$3,362,353; natural gas savings 71,280 Dth

Indirect Products and Services

The Company's Indirect Products and Services, for the most part (other than a few pilots with direct savings), support the direct products in the DSM portfolio. The Education/Market Transformation area includes five customer-facing products for providing education, training, and product demonstration, and marketing DSM rebates and incentives. The Planning and Research area includes five services to support the DSM portfolio: Planning and Administration, Program Evaluations, Measurement and Verification, Market Research, and Product Development. While the majority of the Indirect Products and Services do not have savings goals, the Company is offering four pilot products, with electric and gas savings (if cost-effective). Proposed targets and budgets for Indirect Products and Services in 2017 and 2018 are:

Indirect Products & Services (2017 – Electric)

- Electric budget \$1,343,737
- Electric savings 636 Net Gen. kW and 2.2 Net Gen GWh

Indirect Products & Services (2017 – Natural Gas)

- Natural gas budget \$1,389,021; natural gas savings 269 Dth

Indirect Products & Services (2018 – Electric)

- Electric budget \$9,599,833
 - Electric savings 848 Net Gen. kW and 2.9 Net Gen. GWh
- Indirect Products & Services (2018 – Natural Gas)*
- Natural gas budget \$1,343,737; natural gas savings 359 Dth

Market Transformation and Customer Education

In this Plan, Public Service is continuing to place increasing emphasis on programs and services that help to redefine the energy efficiency marketplace through market transformation and customer education. The Company believes that market transformation and customer education are some of the lowest cost ways to influence customer decisions and behaviors for the long term.

Public Service defines market transformation as a strategy for influencing the adoption of new techniques or technologies by consumers. The objective is to overcome barriers within a market through coordinating tactics such as education, training, product demonstration, and marketing, often conducted in concert with rebates or other financial incentives.

Activities for which the Company will not attempt to measure savings will have an assumed MTRC ratio of 1.0.¹³

Pilot Products

In Proceeding No. 07A-420E, the Commission distinguished pilots from existing or continuing DSM products. These would be products that are testing unproven delivery methods, markets, or technologies; and for any of these reasons, pilot products may not necessarily achieve an MTRC ratio equal to or greater than 1.0. For market transformation programs, such as pilots, for which the Company intends to claim savings to count against energy savings or demand reduction goals, the Commission requires detail on how the measurement and verification of such savings will be accomplished, and how those efforts are linked to credit for savings.¹⁴

Public Service offers three pilots in 2017 and two pilots in 2018 that are fully described in the Indirect Products & Services section of this Plan, including the Company's overall pilot requirements. These pilots include:

- Building Optimization DR Pilot (2017 - market transformation, direct savings, demand response)
- ENERGY STAR Retail Products Platform Pilot (2017 & 2018 - market transformation, direct savings)
- Critical Peak Pricing Pilot (2017 & 2018 - market transformation, demand response)

¹³ The Modified Total Resource Cost (MTRC) test measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs. The presumed MTRC of 1.0 for indirect market transformation programs was approved by the Commission in Decision No. C08-0560 (Docket No. 07A-420E) paragraph 141, and reaffirmed by Decision No. C11-0442 (Docket No. 10A-554EG) paragraph 99.

¹⁴ Decision No. C11-0442 (Docket No. 10A-554EG) paragraph 99.

Competitive Acquisition of DSM Resources: Third-Party Providers

As a result of the Commission’s order in Docket No. 10A-554EG, in the Company’s Strategic Issues filing, Public Service is required to identify the specific products that are open to competitive bidding for implementation.¹⁵ Additionally, Public Service is to set forth the specific criteria by which these bids will be evaluated.¹⁶ Public Service evaluates all bids in two phases, the Pre-qualification phase and the Bid Evaluation phase. The Pre-qualification phase ensures that request for proposal (“RFP”) respondents meet minimum requirements to conduct business on the Company’s behalf. Respondents are evaluated on safety, financial health, terms & conditions adoption, and prior experience. These are also factors in the Bid Evaluation phase but have lower weightings due to the initial evaluation. This helps to ensure business risk to the Company is as low as possible.

The Bid Evaluation phase is based upon up to eight factors and is the phase where the risk of the supplier performing is weighed against the cost to perform. These factors and their weighting are detailed below. Weighting may be adjusted based on specific business needs.

Table 2a: Bid Evaluation Factors and Weighting

Evaluation Factors	Explanation	Weighting
Cost	<ul style="list-style-type: none"> • Cost transparency • Total cost of ownership • Bid amount 	45% - 65%
Ability To Perform	<ul style="list-style-type: none"> • Prior experience • Feasible plan • Quality of project team • Ability to meet schedule 	30% - 50%
Safety	<ul style="list-style-type: none"> • Historical safety record 	5% - 15%
Terms & Conditions	<ul style="list-style-type: none"> • Adherence to Xcel Energy standards 	5% - 10%
Financial Health	<ul style="list-style-type: none"> • Pre-qualifier in RFP. 	Pre-qual only
Diversity	<ul style="list-style-type: none"> • Firm’s commitment to diversity and inclusion. 	0% - 15%
Green Business Practices	<ul style="list-style-type: none"> • Firm’s commitment to environmental sustainability. 	0% - 15%
Project Specific Needs	<ul style="list-style-type: none"> • Dependent on project. <i>Examples:</i> field presence in jurisdiction, expertise with specific market segment, unique or proprietary software, etc. 	0% - 15%

¹⁵ Decision No. C11-0442.

¹⁶ In the matter of the application of Public Service Company of Colorado for approval of a number of strategic issues relating to its DSM plan, including long-term electric energy savings goals, and incentives. Docket No. 10A-554EG, Decision No. C11-0442, paragraph 81.

The table below identifies all products that have a third-party implementer and further identifies which of these products will have new contracts bid or be sole-sourced in 2017 and 2018. Contracts may be sole-sourced for a variety of reasons, such as the contracted party having unique access to market players or proprietary tools that another firm would not have. Public Service tracks and reports within Annual DSM Status Reports, the administrative costs that are incurred when conducting RFPs and any additional costs for managing third-party providers, as required in Decision No. C11-0645.¹⁷

¹⁷ Decision C11-0645 (Proceeding 10A-554EG), page 5 paragraph 14.

Table 2b: 2017/2018 Products with Third-Party Implementers

No Bids Planned in 2017/2018	RFP Anticipated for 2017/2018	Contract Type (existing)
Energy Management Systems (EIS measure only)		n/a
Behavioral Residential		Sole-sourced (2010)
Critical Peak Pricing Pilot		n/a
Building Optimization DR Pilot		Sole-Sourced (2015)*
Business Energy Analysis (Onsite Audits)		Competitive Bid (2012)
Commercial Refrigeration Efficiency		Competitive Bid (2012)
Cooling (DEPACC)		Competitive Bid (2013)
Cooling (Midstream)		Sole-sourced (2015)*
Computer Efficiency		Sole-sourced (2012)
Energy Efficient Showerhead		Sole-sourced (2014)
Energy Savings Kits		Sole-sourced (2014)
ENERGY STAR New Homes		Competitive Bid (2014)
Energy Feedback - Residential		Sole-sourced (2014)

No Bids Planned in 2017/2018	RFP Anticipated for 2017/2018	Contract Type (existing)
ENERGY STAR Retail Products Platform Pilot		n/a
Home Lighting & Recycling		Competitive Bid (2013)
Home Energy Audits		Competitive Bid (2012)
Home Energy Squad		Competitive Bid (2015)
Home Performance with ENERGY STAR		Competitive Bid (2012)
Lighting Efficiency (Midstream)		Competitive Bid (2014)
Lighting – Small Business		Competitive Bid (2013)
Multifamily Weatherization		Sole-sourced (2015)
Multifamily Building Program		Competitive Bid (2014)*
New Construction		Competitive Bid (2011)
Non-Profit Energy Efficiency		Sole-sourced (2015)
	Peak Partner Rewards	n/a
	Process Efficiency	Sole-sourced (2013)
Recommissioning		Sole-sourced (2014)
Refrigerator & Freezer Recycling		Competitive Bid (2015)
School Education Kits		Competitive Bid (2013)
Single-Family Weatherization		Competitive Bid (2014)

History of PSCo's DSM Activity in Colorado

Over the last eighteen years, Public Service has entered into several regulatory settlements involving demand-side management in conjunction with its integrated resource/least-cost planning process. The following paragraphs describe those settlements, as well as legislation and decisions significant to demand-side management:

- In the 1996 Integrated Resource Plan Settlement Agreement (Decision C98-1042, Docket No. 97A-297E), the Company committed up to \$10M for DSM over four years through two bid processes. The first focused on residential air conditioning load control and lighting for commercial customers ("Bid 2000") and the second followed the completion of the Bid 2000 program.
- In the 1999 integrated Resource Plan DSM Stipulation and Settlement Agreement (Decision C00-1057, Docket No. 00A-008E), the Company committed to use its best efforts to acquire 124 MW of cost-effective DSM resource through the 1999 IRP Resource Acquisition Period ending December 31, 2005. The Company was authorized to spend no more than \$75 million (Year 2000 Dollars) to obtain the 124 MW of DSM. This amount included total capital costs and operating expenses incurred by the Company, but excluded expenses for the natural gas Energy Savings Partners ("ESP") low-income weatherization program. The 1999 Agreement identified target savings by customer class and program type.
- As part of the 2003 Least-Cost Resource Plan Settlement Agreement (Decision C05-0049, Docket Nos. 04A-214E, 04A-215E, 04A-216E), the Company committed to obtain 320 MW and 800 GWh of cost effective conservation for \$196 million (Year 2005 Dollars) between 2006 and 2013.
- House Bill 07-1037, Concerning Measures to Promote Energy Efficiency, and Making as Appropriation Therefore, was passed by the Colorado General Assembly and signed into law by Governor Ritter in 2007. It codified in relevant part at §§ 40-1-102(5), (6) and (7), C.R.S. as well as §§ 40-3.2-101 and 104, C.R.S. That bill establishes that:

*cost-effective natural gas and electricity demand-side management programs will save money for consumers and utilities and protect Colorado's environment. The general assembly further finds, determines, and declares that providing funding mechanisms to encourage Colorado's public utilities to reduce emissions or air pollutants and to increase energy efficiency are matters of statewide concern and that public interest is served by quality of life and health of Colorado citizens and an increase in the attractiveness of Colorado as a place to live and conduct business.*¹⁸

Section 40-3.2-104, C.R.S. further directs the Commission to:

establish energy savings and peak demand reduction goals to be achieved by an investor-owned electric utility, taking into account the utility's cost-effective DSM potential, the need for electricity resources, the benefits of DSM investments, and other factors as determined by the commission. The energy savings and peak demand reduction goals shall be at least five percent of the utility's retail system

¹⁸ § 40-3.2-101, C.R.S.

*peak demand measured in megawatts in the base year and at least five percent of the utility's retail energy sales measured in megawatt-hours in the base year. The base year shall be 2006. The goals shall be met in 2018, counting savings in 2018 from DSM measures installed starting in 2006. The commission may establish interim goals and may revise the goals as it deems appropriate.*¹⁹

- On June 27, 2007, the Commission issued Decision No. C07-0562, opening Docket No 07I-251G to investigate issues associated with the natural gas DSM requirements contained in §40-3.2-103, C.R.S. which directs the Commission to implement rules to establish specific natural gas DSM requirement for jurisdictional natural gas utilities. Through an informal workshop and two rounds of comments on proposed rules, the Commission issued Decision No. C08-0248 adopting the Rules regarding Natural Gas Demand Side Management, pursuant to House Bill 07-1037, enacted as § 40-3.2-103, C.R.S..
- On October 31, 2007, Public Service filed its Application for Authorization to Implement an Enhanced Demand Side Management Program and to Revise its Demand Side Management Cost Adjustment Mechanism to Include Current Cost Recovery and Incentives. Public Service requested approval to implement an enhanced electric DSM program and to revise its demand-side management cost adjustment mechanism ("DSMCA") to include current cost recovery and incentives designed to reward Public Service for successfully implementing cost-effective electric DSM programs and measures. On June 5, 2008, the Commission issued its Decision No. C08-0560 approving, in part, the enhanced DSM Plan proposed by the Company and establishing annual electric energy savings goals for Public Service from 2009 through 2020. As part of Decision No. C08-0560, the Commission also endorsed the Company's proposal to file biennial DSM plans and to combine gas and electric DSM plans in one filing, thereby waiving the gas DSM rules' requirement for the Company to file triennial natural gas DSM Plans.
- In compliance with Decision No. C08-0560, Public Service filed its first combined gas and electric 2009/2010, DSM Plan on August 11, 2008. In this Plan, the Company proposed a comprehensive portfolio of electric and natural gas demand-side management programs for 2009 and 2010 as well as annual budgets and annual goals for the natural gas DSM programs. The Commission initiated Docket No. 08A-366EG to consider the 2009/2010 DSM Plan filing and numerous parties intervened. However, prior to hearings, the majority of the Interveners, the Commission Staff, and the Company entered into a Stipulation and Settlement Agreement. The Settling Parties recommended approval of the Plan subject to certain amendments and changes to specific DSM programs agreed to and described in the Appendix to the Agreement. The Settling Parties further agreed to recommend to the Commission that the Company be afforded the discretion to modify the plan during the course of the plan period and agreed to a process for providing notice of plan changes to interested stakeholders.
- The Commission accepted the 2009/2010 Plan Stipulation in Decision R08-1243 issued on November 28, 2008. As agreed to in the Stipulation, in compliance with Decision No.

¹⁹ § 40-3.2-104(2)

R08-1243, on February 20, 2009, the Company filed its 2009/2010 DSM Plan Update, including all changes that had been agreed to in the Stipulation as well as corrections to certain errors made in the original plan filing. On May 1, 2009, the Company filed a further amendment to the Plan.

- On July 1, 2010, Public Service filed its Verified Application for approval of its proposed 2011 DSM Plan and continuation of the terms of the Stipulation and Settlement Agreement entered into and approved by the Commission in Docket No. 08A-366EG, except to the extent that those terms are specific to the company's 2009/2010 Biennial DSM Plan in Docket 10A-471EG. On December 16, 2010, the Stipulation and Settlement Agreement was approved by the Commission in Decision R10-1336.
- On August 10, 2010 Public Service filed a Verified Application for Approval of a Number of Strategic Issues relating to its DSM Plan, including long term electric energy savings goals and incentives in Docket No. 10A-554EG. The Application proposed new electric savings goals along with a new electric incentive mechanism. In addition, the application requested various other changes to the plan. Following the hearing in that proceeding, the Commission issued on April 26, 2011, Decision Nos. C11-0442, approving Public Service's Application with modifications. The Commission then issued Decision No. C11-0645 on June 14, 2011, addressing Public Service's Application for Rehearing, Reargument, or Reconsideration and granting the Company's motion for a one-month extension to file its 2012-2013 Biennial Plan to August 1, 2011.
- On August 1, 2011 the Company filed a combined electric and natural gas 2012/2013 Biennial Demand-Side Management Plan in Docket No. 11A-631EG. On November 10, 2011 a Stipulation and Settlement Agreement along with a Joint Motion to Approve Stipulation Agreement were filed by Public Service. The Stipulation and Settlement Agreement was approved by the Administrative Law Judge by Decision No. R-11-1326 issued on December 9, 2011 without significant modification. No exceptions were filed, and, therefore, Decision No. R11-1326 became the final decision of the commission on December 29, 2011. It was ordered by the ALJ that within 60 days of the effective date of the Recommended Decision, Public Service shall file an update of its DSM Plan reflecting changes approved with approval of the Stipulation and Settlement Agreement, together with an erratum correcting errors. On February 28, 2012, Public Service filed the updated 2012/2013 DSM Plan.
- On June 17, 2013 the Company filed a Verified Application for Approval of a Number Strategic Issues Relating to its DSM Plan (Proceeding No. 13A-0686EG), including proposed new electric savings goals along with a new electric incentive mechanism, and approval for new DSM products. Following the hearing in that proceeding, the Commission issued on July 1, 2014, Decision No. C14-0731, approving Public Service's Application with modifications. The Commission then issued Decision No. C14-0997 on August 13, 2014, addressing Public Service's Application for Rehearing, Reargument, or Reconsideration.
- On July 1, 2013 the Company filed a combined electric and natural gas 2014 DSM Plan in Docket No. 13A-0773EG. On September 19, 2013, the Company filed a Joint Statement of Clarification Regarding the Interim Extension of the Company's 2013 Electric and Natural Gas DSM Plan, Pending Consideration of the Company's Proposed 2014 DSM Plan ("Joint Statement"). The purpose of the Joint Statement was to clarify the effect of the interim extension of the Company's 2013 DSM Plan on the energy

savings goals and budgets during calendar year 2014, as well as the calculation of net economic benefits and associated incentives under the electric 2013 DSM Plan and 2014 DSM Plan in calendar year 2014, the calculation of lost revenues and gas bonus under the natural gas 2013 DSM Plan and 2014 DSM Plan in calendar year 2014, and the operation of the DSM tracker during 2014, among other matters. On September 27, 2013, a Recommended Decision was issued (Decision No. R13-1204-1) granting the proposed interim extension of the 2013 DSM Plan consistent with the terms set forth in the Joint Statement. On October 29, 2013 a Stipulation and Settlement Agreement along with a Joint Motion to Approve Stipulation Agreement were filed by Public Service. The Stipulation and Settlement Agreement was approved by the Administrative Law Judge by Decision No. R14-0389 issued on April 11, 2014 without significant modification following the hearing in the proceeding. No exceptions were filed, and, therefore, Decision No. R14-0389 became the final decision of the commission on May 1, 2014. On May 22, 2014, Public Service filed the updated 2014 DSM Plan, reflecting changes approved with approval of the Stipulation and Settlement Agreement.

- On October 30, 2014 the Company filed a combined electric and natural gas 2015/16 DSM Plan in Proceeding No. 14A-1057EG. On March 3, 2015 a Stipulation and Settlement Agreement along with a Joint Motion to Approve Stipulation Agreement were filed by Public Service. The Stipulation and Settlement Agreement was approved without modification by the Administrative Law Judge by Recommended Decision No. R15-0496, issued on May 22, 2015. The Commission stayed the Recommended Decision through Decision No. C15-0543-I; and exceptions to the Recommended Decision were filed by Western Resource Advocates and the Office of Consumer Counsel. On July 21, 2015, the Commission issued Decision No. C14-0735 addressed exceptions, and required the Company to conduct an avoided transmission and distribution study with its next DSM Plan. The Decision also required the Company to submit within 10 days an avoided energy compliance filing using Strategist modeling, which the Company filed on July 31, 2015. The final Decision became effective on August 1, 2015. On August 20, 2015, Public Service filed the updated 2015/16 DSM Plan, reflecting changes approved with approval of the Stipulation and Settlement Agreement.

The following figures 1 and 2 below show Public Service’s electric and natural gas savings and expenditures over the past thirteen years.

Figure 1: Historical Electric Program Savings and Expenditures

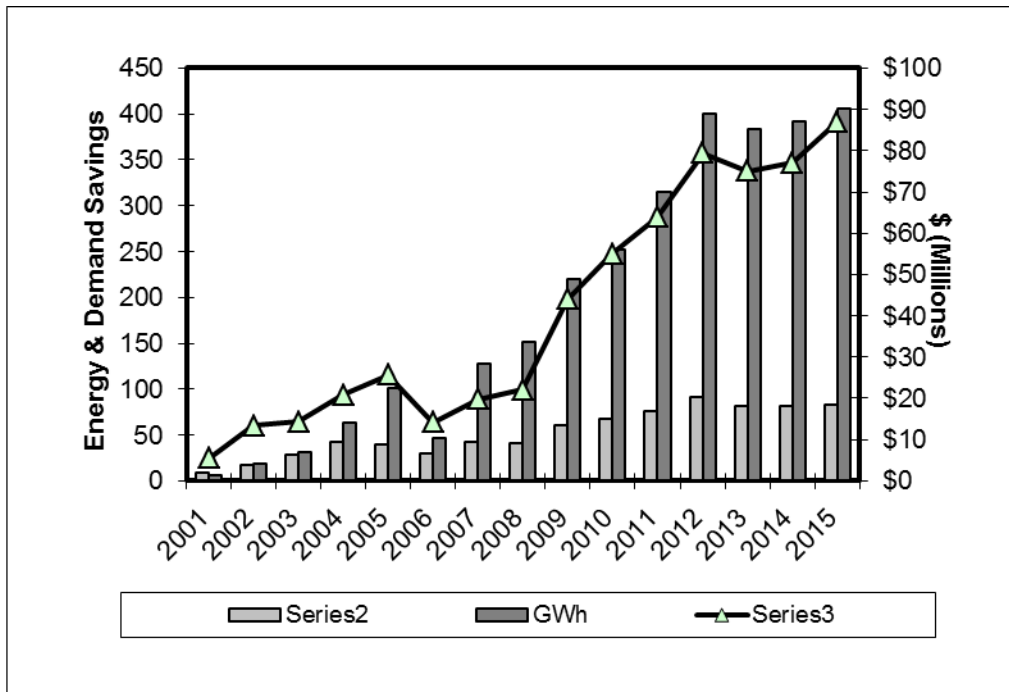
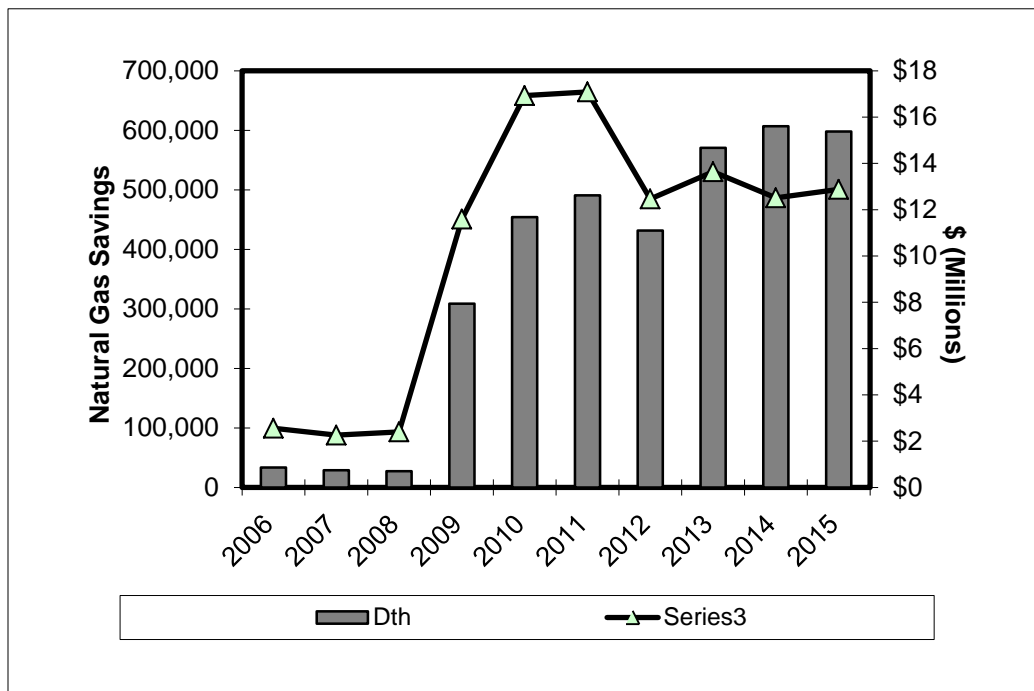


Figure 2: Historical Natural Gas Program Savings and Expenditures



Executive Summary: Electric DSM Tables

The following tables summarize the forecasted impacts of the Company's proposed electric DSM portfolio for 2017 and 2018, including anticipated expenditures, energy savings, demand response, costs by budget category, and Modified Total Resource Cost (MTRC) test ratios.

Table 3a: Public Service's 2017 Electric DSM Budgets and Targets

2017	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Business Program				
Commercial Refrigeration Efficiency	\$1,097,446	573	5,679,594	1.37
Compressed Air Efficiency	\$754,669	577	3,673,199	1.28
Computer Efficiency	\$276,896	293	2,293,385	0.69
Cooling	\$4,312,694	3,891	9,950,311	1.09
Custom Efficiency	\$1,225,622	876	5,334,276	1.32
Data Center Efficiency	\$1,309,624	755	8,296,607	1.52
Energy Management Systems	\$1,315,943	135	8,534,453	1.25
Heating Efficiency	\$10,716	8	44,967	1.59
LED Street Lights	\$43,000	0	7,380,270	0.79
Lighting Efficiency	\$10,025,679	8,632	74,903,705	1.44
Lighting - Small Business	\$5,477,550	2,435	21,643,604	1.13
Motor & Drive Efficiency	\$2,564,206	1,644	10,004,053	1.49
Multifamily Buildings	\$932,646	535	3,917,923	2.26
New Construction	\$10,811,209	9,039	46,336,774	1.13
Process Efficiency	\$2,185,154	1,700	18,084,744	1.85
Recommissioning	\$721,307	302	6,277,029	1.26
Self Direct	\$1,009,907	1,264	8,528,318	1.90
Business Program Total	\$44,074,268	32,659	240,883,211	1.31
Residential Program				
Energy Efficiency Showerhead	\$57,416	80	991,735	10.68
Energy Feedback Residential	\$3,114,496	4,441	20,670,112	1.01
ENERGY STAR New Homes	\$999,113	985	3,283,030	1.46
Evaporative Cooling	\$2,544,886	4,309	2,873,245	2.26
High Efficiency Air Conditioning	\$2,584,444	2,529	2,409,080	1.02
Home Energy Squad	\$306,195	204	1,580,210	1.49
Home Lighting & Recycling	\$7,988,201	10,177	104,667,777	1.67
Home Performance with ENERGY STAR	\$303,752	477	727,728	1.03
Insulation & Air Sealing	\$206,189	385	431,033	1.11
Refrigerator & Freezer Recycling	\$1,339,828	566	4,954,115	1.51
Residential Heating	\$694,972	746	4,238,928	1.49
School Education Kits	\$1,470,807	498	5,672,969	1.20
Water Heating	\$31,750	21	102,246	0.62
Residential Program Total	\$21,642,049	25,417	152,602,208	1.53
Low-Income Program				
Energy Savings Kit	\$319,057	80	908,428	1.05
Multifamily Weatherization	\$1,156,816	266	1,900,602	0.68
Non-Profit	\$1,106,947	304	1,493,941	0.92
Single-Family Weatherization	\$1,191,267	101	1,231,383	0.69
Low-Income Program Total	\$3,774,087	750	5,534,354	0.78

Low-Income Program				
Energy Savings Kit	\$319,057	80	908,428	1.05
Multifamily Weatherization	\$1,156,816	266	1,900,602	0.68
Non-Profit	\$1,106,947	304	1,493,941	0.92
Single-Family Weatherization	\$1,191,267	101	1,231,383	0.69
Low-Income Program Total	\$3,774,087	750	5,534,354	0.78
Indirect Products & Services				
Education/Market Transformation				
Business Education	\$176,739			
Business Energy Analysis	\$721,499			
Consumer Education	\$1,199,908			
Energy Benchmarking	\$89,000			
Energy Efficiency Financing	\$59,804			
Home Energy Audit	\$517,763			
Education/Market Transformation Total	\$2,764,713			
Planning and Research				
DSM Planning & Administration	\$573,390			
Program Evaluations	\$674,600			
Market Research	\$345,940			
Measurement & Verification	\$10,738			
Product Development	\$5,545,318			
Building Optimization DR Pilot	\$36,750	0	0	
ENERGY STAR Retail Products Platform Pilot	\$886,065	636	2,149,899	0.61
Product Development Total	\$6,468,133	636	2,149,899	0.34
Planning and Research Total	\$8,072,801	636	2,149,899	0.29
Indirect Products & Services Total	\$10,837,514	636	2,149,899	0.27
EE PORTFOLIO TOTAL	\$80,327,918	59,463	401,169,673	1.26
Demand Response Program				
Building Optimization DR Pilot	\$91,650	0	0	
Critical Peak Pricing Pilot	\$145,000	0	0	
Peak Partner Rewards	\$2,627,047	0	0	
Saver's Switch	\$16,316,436	16,120	123,179	1.52
DR PORTFOLIO TOTAL	\$19,180,133	16,120	123,179	1.38
PORTFOLIO TOTAL	\$99,508,051	75,583	401,292,852	1.27

Table 3b: Public Service's 2017 Electric DSM Costs by Category

2017	Program Planning & Design	Administration & Program Delivery	Advertising/Promotion/Customer Ed	Participant Rebates and Incentives	Equipment & Installation	Measurement and Verification	Total
Business Program							
Commercial Refrigeration Efficiency	\$12,000	\$594,171	\$101,151	\$369,524	\$0	\$20,600	\$1,097,446
Compressed Air Efficiency	\$5,000	\$216,751	\$35,684	\$473,234	\$0	\$24,000	\$754,669
Computer Efficiency	\$0	\$269,146	\$1,500	\$6,250	\$0	\$0	\$276,896
Cooling	\$0	\$2,714,250	\$86,634	\$1,501,810	\$0	\$10,000	\$4,312,694
Custom Efficiency	\$0	\$701,630	\$113,267	\$380,725	\$0	\$30,000	\$1,225,622
Data Center Efficiency	\$0	\$121,816	\$173,971	\$988,837	\$0	\$25,000	\$1,309,624
Energy Management Systems	\$0	\$504,578	\$73,314	\$703,051	\$10,000	\$25,000	\$1,315,943
Heating Efficiency	\$0	\$6,000	\$2,000	\$2,716	\$0	\$0	\$10,716
LED Street Lights	\$0	\$43,000	\$0	\$0	\$0	\$0	\$43,000
Lighting Efficiency	\$30,000	\$2,551,836	\$997,299	\$6,390,144	\$0	\$56,400	\$10,025,679
Lighting - Small Business	\$0	\$2,617,375	\$746,456	\$2,067,719	\$0	\$46,000	\$5,477,550
Motor & Drive Efficiency	\$0	\$669,421	\$243,470	\$1,626,738	\$0	\$24,577	\$2,564,206
Multifamily Buildings	\$0	\$217,363	\$0	\$395,810	\$319,473	\$0	\$932,646
New Construction	\$5,000	\$3,546,199	\$322,770	\$6,347,913	\$0	\$589,327	\$10,811,209
Process Efficiency	\$0	\$519,560	\$13,257	\$1,620,679	\$0	\$31,658	\$2,185,154
Recommissioning	\$30,000	\$243,629	\$76,946	\$364,732	\$0	\$6,000	\$721,307
Self Direct	\$0	\$97,883	\$33,477	\$877,547	\$0	\$1,000	\$1,009,907
Business Program Total	\$82,000	\$15,634,608	\$3,021,196	\$24,117,429	\$329,473	\$889,562	\$44,074,268
Residential Program							
Energy Efficiency Showerhead	\$0	\$39,366	\$2,329	\$15,525	\$0	\$196	\$57,416
Energy Feedback Residential	\$16,193	\$3,036,801	\$26,358	\$0	\$0	\$35,144	\$3,114,496
ENERGY STAR New Homes	\$0	\$224,851	\$35,861	\$622,638	\$0	\$115,763	\$999,113
Evaporative Cooling	\$0	\$663,159	\$386,347	\$1,470,300	\$0	\$25,080	\$2,544,886
High Efficiency Air Conditioning	\$0	\$304,813	\$20,000	\$2,212,631	\$0	\$47,000	\$2,584,444
Home Energy Squad	\$0	\$44,078	\$91,253	\$17,710	\$146,904	\$6,250	\$306,195
Home Lighting & Recycling	\$0	\$1,132,275	\$1,358,926	\$5,487,000	\$0	\$10,000	\$7,988,201
Home Performance with ENERGY STAR	\$0	\$162,434	\$8,919	\$102,399	\$0	\$30,000	\$303,752
Insulation & Air Sealing	\$0	\$28,371	\$5,370	\$162,448	\$0	\$10,000	\$206,189
Refrigerator & Freezer Recycling	\$0	\$658,629	\$296,199	\$375,000	\$0	\$10,000	\$1,339,828
Residential Heating	\$0	\$57,883	\$95,589	\$528,000	\$0	\$13,500	\$694,972
School Education Kits	\$0	\$590,654	\$5,254	\$874,899	\$0	\$0	\$1,470,807
Water Heating	\$0	\$1,500	\$500	\$24,750	\$0	\$5,000	\$31,750
Residential Program Total	\$16,193	\$6,944,814	\$2,332,905	\$11,893,300	\$146,904	\$307,933	\$21,642,049
Low-Income Program							
Energy Savings Kit	\$0	\$84,886	\$45,920	\$185,751	\$0	\$2,500	\$319,057
Multifamily Weatherization	\$0	\$81,761	\$40,000	\$1,019,704	\$0	\$15,351	\$1,156,816
Non-Profit	\$0	\$103,670	\$45,000	\$930,452	\$0	\$27,825	\$1,106,947
Single-Family Weatherization	\$0	\$94,054	\$167,690	\$885,260	\$0	\$44,263	\$1,191,267
Low-Income Program Total	\$0	\$364,371	\$298,610	\$3,021,167	\$0	\$89,939	\$3,774,087
Indirect Products & Services							
Education/Market Transformation							
Business Education	\$0	\$0	\$176,739	\$0	\$0	\$0	\$176,739
Business Energy Analysis	\$30,000	\$121,653	\$193,850	\$375,996	\$0	\$0	\$721,499
Consumer Education	\$0	\$517,173	\$682,735	\$0	\$0	\$0	\$1,199,908
Energy Benchmarking	\$4,000	\$75,000	\$10,000	\$0	\$0	\$0	\$89,000
Energy Efficiency Financing	\$0	\$35,000	\$14,804	\$10,000	\$0	\$0	\$59,804
Home Energy Audit	\$0	\$231,838	\$61,530	\$186,996	\$0	\$37,399	\$517,763
Education/Market Transformation	\$34,000	\$980,664	\$1,139,658	\$572,992	\$0	\$37,399	\$2,764,713
Planning and Research							
DSM Planning & Administration							
Program Evaluations	\$1,000	\$40,000	\$0	\$0	\$0	\$633,600	\$674,600
Market Research	\$2,000	\$343,940	\$0	\$0	\$0	\$0	\$345,940
Measurement & Verification	\$0	\$10,738	\$0	\$0	\$0	\$0	\$10,738
Product Development	\$462,272	\$1,309,151	\$72,832	\$1,046,063	\$2,437,500	\$217,500	\$5,545,318
Building Optimization DR Pilot	\$3,600	\$33,100	\$50	\$0	\$0	\$0	\$36,750
ENERGY STAR Retail Products Platform Pilot	\$0	\$105,301	\$4,365	\$741,255	\$0	\$35,144	\$886,065
Product Development Total	\$465,872	\$1,447,552	\$77,247	\$1,787,318	\$2,437,500	\$252,644	\$6,468,133
Planning and Research Total	\$468,872	\$2,412,620	\$80,247	\$1,787,318	\$2,437,500	\$886,244	\$8,072,801
Indirect Products & Services Total	\$502,872	\$3,393,284	\$1,219,905	\$2,360,310	\$2,437,500	\$923,643	\$10,837,514
EE PORTFOLIO TOTAL	\$601,065	\$26,337,077	\$6,872,616	\$41,392,206	\$2,913,877	\$2,211,077	\$80,327,918

Demand Response Program							
Building Optimization DR Pilot	\$10,800	\$80,700	\$150	\$0	\$0	\$0	\$91,650
Critical Peak Pricing Pilot	\$50,000	\$35,000	\$8,900	\$0	\$26,100	\$25,000	\$145,000
Peak Partner Rewards	\$0	\$592,953	\$25,000	\$1,710,000	\$274,094	\$25,000	\$2,627,047
Saver's Switch	\$0	\$5,328,076	\$2,423,360	\$8,440,000	\$0	\$125,000	\$16,316,436
DR PORTFOLIO TOTAL	\$60,800	\$6,036,729	\$2,457,410	\$10,150,000	\$300,194	\$175,000	\$19,180,133
PORTFOLIO TOTAL	\$661,865	\$32,373,806	\$9,330,026	\$51,542,206	\$3,214,071	\$2,386,077	\$99,508,051

Table 3c: Public Service's 2018 Electric DSM Budgets and Targets

2018	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Business Program				
Commercial Refrigeration Efficiency	\$1,097,041	573	5,679,594	1.43
Compressed Air Efficiency	\$782,288	607	3,859,230	1.31
Computer Efficiency	\$276,896	293	2,293,385	0.74
Cooling	\$4,722,153	4,253	10,320,751	1.07
Custom Efficiency	\$1,396,185	876	5,334,276	1.29
Data Center Efficiency	\$1,447,885	876	9,887,452	1.71
Energy Management Systems	\$1,412,425	147	8,823,461	1.19
Heating Efficiency	\$10,874	8	49,241	1.72
LED Street Lights	\$43,000	0	9,840,359	0.83
Lighting Efficiency	\$11,202,784	10,077	85,586,169	1.46
Lighting - Small Business	\$5,531,477	2,438	21,686,864	1.16
Motor & Drive Efficiency	\$2,263,739	1,422	8,663,413	1.52
Multifamily Buildings	\$1,191,160	714	5,223,897	2.40
New Construction	\$6,650,518	4,399	22,870,323	1.06
Process Efficiency	\$2,190,761	1,700	18,084,744	1.92
Recommissioning	\$724,950	302	6,277,029	1.34
Self Direct	\$1,012,131	1,264	8,528,318	1.97
Business Program Total	\$41,956,268	29,948	233,008,505	1.35
Residential Program				
Energy Efficiency Showerhead	\$58,960	80	991,735	10.65
Energy Feedback Residential	\$3,124,554	4,356	19,820,695	1.09
ENERGY STAR New Homes	\$1,070,548	1,078	3,593,510	1.49
Evaporative Cooling	\$2,545,418	4,309	2,873,245	2.31
High Efficiency Air Conditioning	\$2,693,592	2,646	2,515,951	1.04
Home Energy Squad	\$351,932	232	1,771,790	1.40
Home Lighting & Recycling	\$8,408,941	10,925	112,445,526	1.77
Home Performance with ENERGY STAR	\$303,978	477	727,728	1.05
Insulation & Air Sealing	\$207,646	385	431,033	1.12
Refrigerator & Freezer Recycling	\$1,353,906	566	4,954,115	1.57
Residential Heating	\$694,990	746	4,238,928	1.54
School Education Kits	\$1,488,664	498	5,672,969	1.15
Water Heating	\$31,750	21	102,246	0.63
Residential Program Total	\$22,334,879	26,319	160,139,471	1.59
Low-Income Program				
Energy Savings Kit	\$326,222	80	908,428	1.01
Multifamily Weatherization	\$1,156,816	266	1,900,602	0.70
Non-Profit	\$1,107,475	304	1,493,941	0.94
Single-Family Weatherization	\$1,222,574	102	1,241,188	0.68
Low-Income Program Total	\$3,813,087	751	5,544,159	0.79

Indirect Products & Services				
Education/Market Transformation				
Business Education	\$176,739			
Business Energy Analysis	\$722,966			
Consumer Education	\$1,199,908			
Energy Benchmarking	\$89,000			
Energy Efficiency Financing	\$59,804			
Home Energy Audit	\$517,765			
Education/Market Transformation Total	\$2,766,182			
Planning and Research				
DSM Planning & Administration	\$556,545			
Program Evaluations	\$541,444			
Market Research	\$372,595			
Measurement & Verification	\$10,953			
Product Development	\$4,260,050			
ENERGY STAR Retail Products Platform Pilot	\$1,092,064	848	2,866,581	0.64
Product Development Total	\$5,352,114	848	2,866,581	0.45
Planning and Research Total	\$6,833,651	848	2,866,581	0.38
Indirect Products & Services Total	\$9,599,833	848	2,866,581	0.34
EE PORTFOLIO TOTAL	\$77,704,067	57,867	401,558,717	1.31
Demand Response Program				
Critical Peak Pricing Pilot	\$65,000	0	0	
Peak Partner Rewards	\$3,154,472	0	0	
Saver's Switch	\$17,406,029	16,120	123,179	1.48
DR PORTFOLIO TOTAL	\$20,625,501	16,120	123,179	1.36
PORTFOLIO TOTAL	\$98,329,568	73,987	401,681,896	1.32

Table 3d: Public Service's 2018 Electric DSM Costs by Category

2018	Program Planning & Design	Administration & Program Delivery	Advertising/Promotion/ Customer Ed	Participant Rebates and Incentives	Equipment & Installation	Measurement and Verification	Total
Business Program							
Commercial Refrigeration Efficiency	\$12,000	\$593,766	\$101,151	\$369,524	\$0	\$20,600	\$1,097,041
Compressed Air Efficiency	\$8,000	\$215,459	\$35,683	\$499,146	\$0	\$24,000	\$782,288
Computer Efficiency	\$0	\$269,146	\$1,500	\$6,250	\$0	\$0	\$276,896
Cooling	\$0	\$3,123,709	\$86,634	\$1,501,810	\$0	\$10,000	\$4,722,153
Custom Efficiency	\$0	\$730,202	\$216,758	\$380,725	\$0	\$68,500	\$1,396,185
Data Center Efficiency	\$0	\$123,565	\$173,971	\$1,125,349	\$0	\$25,000	\$1,447,885
Energy Management Systems	\$0	\$562,636	\$63,217	\$746,322	\$13,000	\$27,250	\$1,412,425
Heating Efficiency	\$0	\$6,000	\$2,000	\$2,874	\$0	\$0	\$10,874
LED Street Lights	\$0	\$43,000	\$0	\$0	\$0	\$0	\$43,000
Lighting Efficiency	\$30,000	\$2,706,641	\$997,299	\$7,412,444	\$0	\$56,400	\$11,202,784
Lighting - Small Business	\$0	\$2,642,616	\$767,731	\$2,075,130	\$0	\$46,000	\$5,531,477
Motor & Drive Efficiency	\$0	\$672,790	\$154,431	\$1,411,941	\$0	\$24,577	\$2,263,739
Multifamily Buildings	\$0	\$231,335	\$0	\$527,747	\$432,078	\$0	\$1,191,160
New Construction	\$10,000	\$2,682,281	\$281,770	\$3,109,140	\$0	\$567,327	\$6,650,518
Process Efficiency	\$0	\$525,166	\$12,656	\$1,620,679	\$0	\$32,260	\$2,190,761
Recommissioning	\$30,000	\$247,272	\$76,946	\$364,732	\$0	\$6,000	\$724,950
Self Direct	\$0	\$100,107	\$33,477	\$877,547	\$0	\$1,000	\$1,012,131
Business Program Total	\$90,000	\$15,475,691	\$3,005,224	\$22,031,361	\$445,078	\$908,914	\$41,956,268
Residential Program							
Energy Efficiency Showerhead	\$0	\$40,398	\$2,369	\$15,991	\$0	\$202	\$58,960
Energy Feedback Residential	\$16,193	\$3,046,859	\$26,358	\$0	\$0	\$35,144	\$3,124,554
ENERGY STAR New Homes	\$0	\$225,221	\$35,861	\$686,485	\$0	\$122,981	\$1,070,548
Evaporative Cooling	\$0	\$663,691	\$386,347	\$1,470,300	\$0	\$25,080	\$2,545,418
High Efficiency Air Conditioning	\$0	\$312,711	\$20,000	\$2,313,881	\$0	\$47,000	\$2,693,592
Home Energy Squad	\$0	\$46,902	\$114,722	\$18,000	\$166,058	\$6,250	\$351,932
Home Lighting & Recycling	\$0	\$1,140,515	\$1,358,926	\$5,899,500	\$0	\$10,000	\$8,408,941
Home Performance with ENERGY STAR	\$0	\$162,660	\$8,919	\$102,399	\$0	\$30,000	\$303,978
Insulation & Air Sealing	\$0	\$29,828	\$5,370	\$162,448	\$0	\$10,000	\$207,646
Refrigerator & Freezer Recycling	\$0	\$672,707	\$296,199	\$375,000	\$0	\$10,000	\$1,353,906
Residential Heating	\$0	\$57,901	\$95,589	\$528,000	\$0	\$13,500	\$694,990
School Education Kits	\$0	\$608,113	\$5,254	\$875,297	\$0	\$0	\$1,488,664
Water Heating	\$0	\$1,500	\$500	\$24,750	\$0	\$5,000	\$31,750
Residential Program Total	\$16,193	\$7,009,006	\$2,356,414	\$12,472,051	\$166,058	\$315,157	\$22,334,879
Low-Income Program							
Energy Savings Kit	\$0	\$101,352	\$45,920	\$176,450	\$0	\$2,500	\$326,222
Multifamily Weatherization	\$0	\$81,761	\$40,000	\$1,019,704	\$0	\$15,351	\$1,156,816
Non-Profit	\$0	\$104,198	\$45,000	\$930,452	\$0	\$27,825	\$1,107,475
Single-Family Weatherization	\$0	\$94,932	\$167,690	\$914,240	\$0	\$45,712	\$1,222,574
Low-Income Program Total	\$0	\$382,243	\$298,610	\$3,040,846	\$0	\$91,388	\$3,813,087
Indirect Products & Services							
Education/Market Transformation							
Business Education	\$0	\$0	\$176,739	\$0	\$0	\$0	\$176,739
Business Energy Analysis	\$30,000	\$123,120	\$193,850	\$375,996	\$0	\$0	\$722,966
Consumer Education	\$0	\$519,188	\$680,720	\$0	\$0	\$0	\$1,199,908
Energy Benchmarking	\$4,000	\$75,000	\$10,000	\$0	\$0	\$0	\$89,000
Energy Efficiency Financing	\$0	\$35,000	\$14,804	\$10,000	\$0	\$0	\$59,804
Home Energy Audit	\$0	\$231,840	\$61,530	\$186,996	\$0	\$37,399	\$517,765
Education/Market Transformation	\$34,000	\$984,148	\$1,137,643	\$572,992	\$0	\$37,399	\$2,766,182
Planning and Research							
DSM Planning & Administration	\$0	\$553,545	\$3,000	\$0	\$0	\$0	\$556,545
Program Evaluations	\$1,000	\$45,000	\$0	\$0	\$0	\$495,444	\$541,444
Market Research	\$2,000	\$370,595	\$0	\$0	\$0	\$0	\$372,595
Measurement & Verification	\$0	\$10,953	\$0	\$0	\$0	\$0	\$10,953
Product Development	\$462,000	\$1,401,840	\$62,210	\$1,096,500	\$1,137,500	\$100,000	\$4,260,050
ENERGY STAR Retail Products Platform Pilot	\$0	\$64,232	\$4,355	\$988,333	\$0	\$35,144	\$1,092,064
Product Development Total	\$462,000	\$1,466,072	\$66,565	\$2,084,833	\$1,137,500	\$135,144	\$5,352,114
Planning and Research Total	\$465,000	\$2,446,165	\$69,565	\$2,084,833	\$1,137,500	\$630,588	\$6,833,651
Indirect Products & Services Total	\$499,000	\$3,430,313	\$1,207,208	\$2,657,825	\$1,137,500	\$667,987	\$9,599,833
EE PORTFOLIO TOTAL	\$605,193	\$26,297,253	\$6,867,456	\$40,202,083	\$1,748,636	\$1,983,446	\$77,704,067

Demand Response Program							
Critical Peak Pricing Pilot	\$0	\$22,800	\$0	\$0	\$29,700	\$12,500	\$65,000
Peak Partner Rewards	\$0	\$560,289	\$25,000	\$2,242,000	\$302,183	\$25,000	\$3,154,472
Saver's Switch	\$0	\$5,677,669	\$2,523,360	\$9,080,000	\$0	\$125,000	\$17,406,029
DR PORTFOLIO TOTAL	\$0	\$6,260,758	\$6,260,758	\$11,322,000	\$331,883	\$11,653,883	\$20,625,501
PORTFOLIO TOTAL	\$605,193	\$32,558,011	\$13,128,214	\$51,524,083	\$2,080,519	\$13,637,329	\$98,329,568

Executive Summary: Natural Gas DSM Tables

The following tables summarize the forecasted impacts of the Company's proposed natural gas DSM portfolio for 2017 and 2018, including anticipated expenditures, energy savings, costs by budget category, and Modified Total Resource Cost (MTRC) test ratios.

Table 4a: Public Service's 2017 Gas DSM Budgets and Targets

2017	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Business Program					
Commercial Refrigeration Efficiency	\$11,905	2,434	204,437	\$263,780	8.60
Compressed Air Efficiency					
Computer Efficiency					
Cooling					
Custom Efficiency	\$83,213	3,768	45,285	\$118,120	1.71
Data Center Efficiency					
Energy Management Systems	\$51,303	8,810	171,721	\$230,191	1.54
Heating Efficiency	\$488,280	18,032	36,930	\$16,504	1.01
LED Street Lights					
Lighting Efficiency					
Lighting - Small Business	\$17,940	3,497	194,907	\$97,794	5.62
Motor & Drive Efficiency					
Multifamily Buildings	\$558,090	20,184	36,166	\$1,319,066	2.31
New Construction	\$1,716,943	152,646	88,905	\$1,328,790	1.16
Process Efficiency					
Recommissioning	\$59,198	3,450	58,277	\$8,870	1.08
Self Direct					
Business Program Total	\$2,986,871	212,820	71,252	\$3,383,115	1.30
Residential Program					
Energy Efficiency Showerhead	\$460,118	52,190	113,428	\$6,205,675	10.56
Energy Feedback Residential	\$483,345	63,873	132,149	\$141,506	1.29
ENERGY STAR New Homes	\$2,150,945	93,054	43,262	\$1,892,423	1.38
Evaporative Cooling					
High Efficiency Air Conditioning					
Home Energy Squad	\$336,108	11,592	34,490	\$205,989	1.38
Home Lighting & Recycling					
Home Performance with ENERGY STAR	\$559,460	26,853	47,999	-\$359,155	0.83
Insulation & Air Sealing	\$385,385	20,687	53,678	-\$83,481	0.94
Refrigerator & Freezer Recycling					
Residential Heating	\$533,403	47,981	89,953	\$206,477	1.07
School Education Kits	\$438,447	34,972	79,762	\$4,004,469	7.51
Water Heating	\$122,080	2,283	18,700	-\$73,546	0.69
Residential Program Total	\$5,469,292	353,485	64,631	\$12,140,357	1.88
Low-Income Program					
Energy Savings Kit	\$116,094	8,005	68,951	951,508	7.04
Multifamily Weatherization	\$592,539	10,835	18,286	-242,522	0.81
Non-Profit	\$293,413	3,821	13,021	-106,306	0.80
Single-Family Weatherization	\$2,297,347	46,842	20,390	1,065,960	1.26
Low-Income Program Total	\$3,299,393	69,503	120,648	\$1,668,640	1.27

Indirect Products & Services					
Education/Market Transformation					
Business Education	\$19,638	0	0		
Business Energy Analysis	\$65,507	0	0		
Consumer Education	\$133,323	0	0		
Energy Benchmarking	\$31,000	0	0		
Energy Efficiency Financing	\$60,000	0	0		
Home Energy Audit	\$545,006	0	0		
Education/Market Transformation	\$854,474	0	0		
Planning and Research					
DSM Planning & Administration	\$63,124	0	0		
Program Evaluations	\$168,400	0	0		
Market Research	\$96,732	0	0		
Measurement & Verification	\$1,193	0	0		
Product Development	\$170,668	0	0		
Building Optimization DR Pilot	\$0	0			
ENERGY STAR Retail Products Platform Pilot	\$34,430	269	7,826	-\$120,818	0.24
Product Development Total	\$205,098	269	1,314	-\$291,486	0.12
Planning and Research Total	\$534,547	269	504	-\$620,935	0.06
Indirect Products & Services Total	\$1,389,021	269	194	-\$1,206,309	0.20
EE PORTFOLIO TOTAL	\$13,144,577	636,078	48,391	\$15,985,803	1.49

Table 4b: Public Service's 2017 Gas DSM Costs by Category

2017	Program Planning & Design	Administration & Program Delivery	Advertising/Promotion/Customer Ed	Participant Rebates and Incentives	Equipment & Installation	Measurement and Verification	Total
Business Program							
Commercial Refrigeration Efficiency	\$0	\$4,909	\$0	\$6,996	\$0	\$0	\$11,905
Compressed Air Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Computer Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cooling	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Custom Efficiency	\$0	\$66,137	\$56	\$17,020	\$0	\$0	\$83,213
Data Center Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Energy Management Systems	\$0	\$25,042	\$600	\$25,661	\$0	\$0	\$51,303
Heating Efficiency	\$0	\$199,951	\$12,078	\$248,251	\$0	\$28,000	\$488,280
LED Street Lights	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Lighting Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Lighting - Small Business	\$0	\$14,724	\$0	\$3,216	\$0	\$0	\$17,940
Motor & Drive Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Multifamily Buildings	\$0	\$212,028	\$0	\$229,581	\$116,481	\$0	\$558,090
New Construction	\$10,000	\$696,811	\$20,423	\$824,709	\$0	\$165,000	\$1,716,943
Process Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Recommissioning	\$0	\$12,521	\$3,000	\$43,677	\$0	\$0	\$59,198
Self Direct	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Business Program Total	\$10,000	\$1,232,123	\$36,157	\$1,399,110	\$116,481	\$193,000	\$2,986,871
Residential Program							
Energy Efficiency Showerhead	\$0	\$230,968	\$20,286	\$206,260	\$0	\$2,604	\$460,118
Energy Feedback Residential	\$3,858	\$470,989	\$3,642	\$0	\$0	\$4,856	\$483,345
ENERGY STAR New Homes	\$0	\$437,995	\$69,832	\$1,428,130	\$0	\$214,988	\$2,150,945
Evaporative Cooling	\$0	\$0	\$0	\$0	\$0	\$0	\$0
High Efficiency Air Conditioning	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Home Energy Squad	\$0	\$50,093	\$111,102	\$82,280	\$86,383	\$6,250	\$336,108
Home Lighting & Recycling	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Home Performance with ENERGY STAR	\$0	\$103,785	\$5,852	\$419,823	\$0	\$30,000	\$559,460
Insulation & Air Sealing	\$0	\$49,006	\$9,938	\$306,441	\$0	\$20,000	\$385,385
Refrigerator & Freezer Recycling	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Residential Heating	\$0	\$64,198	\$80,745	\$378,960	\$0	\$9,500	\$533,403
School Education Kits	\$0	\$259,504	\$2,661	\$176,282	\$0	\$0	\$438,447
Water Heating	\$0	\$34,080	\$2,000	\$67,000	\$0	\$19,000	\$122,080
Residential Program Total	\$3,858	\$1,700,618	\$306,058	\$3,065,177	\$86,383	\$307,198	\$5,469,292
Low-Income Program							
Energy Savings Kit	\$0	\$49,750	\$22,451	\$41,393	\$0	\$2,500	\$116,094
Multifamily Weatherization	\$0	\$72,436	\$20,000	\$487,038	\$0	\$13,065	\$592,539
Non-Profit	\$0	\$80,083	\$15,000	\$181,272	\$0	\$17,058	\$293,413
Single-Family Weatherization	\$0	\$207,078	\$125,861	\$1,870,865	\$0	\$93,543	\$2,297,347
Low-Income Program Total	\$0	\$409,347	\$183,312	\$2,580,568	\$0	\$126,166	\$3,299,393
Indirect Products & Services							
Education/Market Transformation							
Business Education	\$0	\$4,200	\$15,438	\$0	\$0	\$0	\$19,638
Business Energy Analysis	\$3,000	\$14,507	\$0	\$48,000	\$0	\$0	\$65,507
Consumer Education	\$0	\$46,700	\$86,623	\$0	\$0	\$0	\$133,323
Energy Benchmarking	\$1,000	\$25,000	\$5,000	\$0	\$0	\$0	\$31,000
Energy Efficiency Financing	\$0	\$32,000	\$28,000	\$0	\$0	\$0	\$60,000
Home Energy Audit	\$0	\$237,293	\$50,133	\$221,100	\$0	\$36,480	\$545,006
Education/Market Transformation	\$4,000	\$359,700	\$185,194	\$269,100	\$0	\$36,480	\$854,474
Planning and Research							
DSM Planning & Administration	\$0	\$63,049	\$75	\$0	\$0	\$0	\$63,124
Program Evaluations	\$0	\$10,000	\$0	\$0	\$0	\$158,400	\$168,400
Market Research	\$0	\$96,732	\$0	\$0	\$0	\$0	\$96,732
Measurement & Verification	\$0	\$1,193	\$0	\$0	\$0	\$0	\$1,193
Product Development	\$100,368	\$45,233	\$12,567	\$0	\$0	\$12,500	\$170,668
Building Optimization DR Pilot	\$0	\$0	\$0	\$0	\$0	\$0	\$0
ENERGY STAR Retail Products Platform Pilot	\$0	\$1,704	\$70	\$27,800	\$0	\$4,856	\$34,430
Product Development Total	\$100,368	\$46,937	\$12,637	\$27,800	\$0	\$17,356	\$205,098
Planning and Research Total	\$100,368	\$217,911	\$12,712	\$27,800	\$0	\$175,756	\$534,547
Indirect Products & Services Total	\$104,368	\$577,611	\$197,906	\$296,900	\$0	\$212,236	\$1,389,021
EE PORTFOLIO TOTAL	\$118,226	\$3,919,699	\$723,433	\$7,341,755	\$202,864	\$838,600	\$13,144,577

Table 4c: Public Service's 2018 Gas DSM Budgets and Targets

2018	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Business Program					
Commercial Refrigeration Efficiency	\$11,918	2,434	204,214	\$269,213	8.76
Compressed Air Efficiency					
Computer Efficiency					
Cooling					
Custom Efficiency	\$83,538	3,768	45,109	\$128,319	1.77
Data Center Efficiency					
Energy Management Systems	\$52,595	8,878	168,791	\$252,447	1.59
Heating Efficiency	\$488,280	18,119	37,107	\$64,987	1.05
LED Street Lights					
Lighting Efficiency					
Lighting - Small Business	\$17,940	3,497	194,907	\$104,768	5.95
Motor & Drive Efficiency					
Multifamily Buildings	\$687,416	26,912	39,150	\$1,871,914	2.45
New Construction	\$1,087,593	76,624	70,452	\$763,545	1.17
Process Efficiency					
Recommissioning	\$59,244	3,450	58,232	\$14,595	1.13
Self Direct					
Business Program Total	\$2,488,524	143,681	57,737	\$3,469,787	1.45
Residential Program					
Energy Efficiency Showerhead	\$473,661	52,190	110,185	\$6,311,701	10.42
Energy Feedback Residential	\$484,764	64,550	133,157	\$177,748	1.37
ENERGY STAR New Homes	\$2,232,379	94,878	42,501	\$2,180,723	1.42
Evaporative Cooling					
High Efficiency Air Conditioning					
Home Energy Squad	\$351,408	13,423	38,197	\$301,829	1.51
Home Lighting & Recycling					
Home Performance with ENERGY STAR	\$560,434	26,853	47,915	-\$292,182	0.86
Insulation & Air Sealing	\$385,385	20,687	53,678	-\$32,346	0.98
Refrigerator & Freezer Recycling					
Residential Heating	\$540,988	47,981	88,692	\$329,075	1.12
School Education Kits	\$451,103	34,972	77,525	\$4,082,228	7.45
Water Heating	\$121,930	2,283	18,723	-\$68,012	0.72
Residential Program Total	\$5,602,053	357,816	63,872	\$12,990,764	1.92
Low-Income Program					
Energy Savings Kit	\$117,642	8,005	68,044	974,022	7.12
Multifamily Weatherization	\$592,539	10,835	18,286	-215,050	0.83
Non-Profit	\$293,986	3,821	12,996	-94,777	0.82
Single-Family Weatherization	\$2,358,186	48,620	20,617	1,275,891	1.30
Low-Income Program Total	\$3,362,353	71,280	21,200	\$1,940,086	1.31

Indirect Products & Services					
Education/Market Transformation					
Business Education	\$19,638	0	0		
Business Energy Analysis	\$65,548	0	0		
Consumer Education	\$133,323	0	0		
Energy Benchmarking	\$31,000	0	0		
Energy Efficiency Financing	\$60,000	0	0		
Home Energy Audit	\$544,637	0	0		
Education/Market Transformation	\$854,146	0	0		
Planning and Research					
DSM Planning & Administration	\$61,895	0	0		
Program Evaluations	\$143,864	0	0		
Market Research	\$108,380	0	0		
Measurement & Verification	\$1,217	0	0		
Product Development	\$145,061	0	0		
ENERGY STAR Retail Products Platform Pilot	\$29,174	359	12,309	-\$152,760	0.22
Product Development Total	\$174,235	359	2,061	-\$297,821	0.13
Planning and Research Total	\$489,591	359	733	-\$613,177	0.06
Indirect Products & Services Total	\$1,343,737	359	267	-\$1,198,323	0.21
EE PORTFOLIO TOTAL	\$12,796,667	573,136	44,788	\$17,202,315	1.58

Table 4d: Public Service's 2018 Gas DSM Costs by Category

2018	Program Planning & Design	Administration & Program Delivery	Advertising/Promotion/ Customer Ed	Participant Rebates and Incentives	Equipment & Installation	Measurement and Verification	Total
Business Program							
Commercial Refrigeration Efficiency	\$0	\$4,922	\$0	\$6,996	\$0	\$0	\$11,918
Compressed Air Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Computer Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cooling	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Custom Efficiency	\$0	\$66,462	\$56	\$17,020	\$0	\$0	\$83,538
Data Center Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Energy Management Systems	\$0	\$25,334	\$600	\$26,661	\$0	\$0	\$52,595
Heating Efficiency	\$0	\$199,951	\$12,078	\$248,251	\$0	\$28,000	\$488,280
LED Street Lights	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Lighting Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Lighting - Small Business	\$0	\$14,724	\$0	\$3,216	\$0	\$0	\$17,940
Motor & Drive Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Multifamily Buildings	\$0	\$226,000	\$0	\$306,108	\$155,308	\$0	\$687,416
New Construction	\$0	\$558,024	\$11,523	\$433,046	\$0	\$85,000	\$1,087,593
Process Efficiency	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Recommissioning	\$0	\$12,567	\$3,000	\$43,677	\$0	\$0	\$59,244
Self Direct	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Business Program Total	\$0	\$1,107,984	\$27,257	\$1,084,975	\$155,308	\$113,000	\$2,488,524
Residential Program							
Energy Efficiency Showerhead	\$0	\$237,711	\$20,820	\$212,448	\$0	\$2,682	\$473,661
Energy Feedback Residential	\$3,858	\$472,408	\$3,642	\$0	\$0	\$4,856	\$484,764
ENERGY STAR New Homes	\$0	\$438,031	\$69,832	\$1,496,122	\$0	\$228,394	\$2,232,379
Evaporative Cooling	\$0	\$0	\$0	\$0	\$0	\$0	\$0
High Efficiency Air Conditioning	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Home Energy Squad	\$0	\$47,621	\$105,391	\$94,500	\$97,646	\$6,250	\$351,408
Home Lighting & Recycling	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Home Performance with ENERGY STAR	\$0	\$104,759	\$5,852	\$419,823	\$0	\$30,000	\$560,434
Insulation & Air Sealing	\$0	\$49,006	\$9,938	\$306,441	\$0	\$20,000	\$385,385
Refrigerator & Freezer Recycling	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Residential Heating	\$0	\$71,783	\$80,745	\$378,960	\$0	\$9,500	\$540,988
School Education Kits	\$0	\$266,871	\$2,661	\$181,571	\$0	\$0	\$451,103
Water Heating	\$0	\$33,930	\$2,000	\$67,000	\$0	\$19,000	\$121,930
Residential Program Total	\$3,858	\$1,722,120	\$300,881	\$3,156,866	\$97,646	\$320,682	\$5,602,053
Low-Income Program							
Energy Savings Kit	\$0	\$51,298	\$22,451	\$41,393	\$0	\$2,500	\$117,642
Multifamily Weatherization	\$0	\$72,436	\$20,000	\$487,038	\$0	\$13,065	\$592,539
Non-Profit	\$0	\$80,656	\$15,000	\$181,272	\$0	\$17,058	\$293,986
Single-Family Weatherization	\$0	\$209,930	\$125,861	\$1,926,090	\$0	\$96,305	\$2,358,186
Low-Income Program Total	\$0	\$414,320	\$183,312	\$2,635,793	\$0	\$128,928	\$3,362,353
Indirect Products & Services							
Education/Market Transformation							
Business Education	\$0	\$4,200	\$15,438	\$0	\$0	\$0	\$19,638
Business Energy Analysis	\$3,000	\$14,548	\$0	\$48,000	\$0	\$0	\$65,548
Consumer Education	\$0	\$47,191	\$86,132	\$0	\$0	\$0	\$133,323
Energy Benchmarking	\$1,000	\$25,000	\$5,000	\$0	\$0	\$0	\$31,000
Energy Efficiency Financing	\$0	\$32,000	\$28,000	\$0	\$0	\$0	\$60,000
Home Energy Audit	\$0	\$237,024	\$50,133	\$221,000	\$0	\$36,480	\$544,637
Education/Market Transformation	\$4,000	\$359,963	\$184,703	\$269,000	\$0	\$36,480	\$854,146
Planning and Research							
DSM Planning & Administration	\$0	\$61,820	\$75	\$0	\$0	\$0	\$61,895
Program Evaluations	\$0	\$20,000	\$0	\$0	\$0	\$123,864	\$143,864
Market Research	\$0	\$108,380	\$0	\$0	\$0	\$0	\$108,380
Measurement & Verification	\$0	\$1,217	\$0	\$0	\$0	\$0	\$1,217
Product Development	\$101,000	\$42,865	\$1,196	\$0	\$0	\$0	\$145,061
ENERGY STAR Retail Products Platform Pilot	\$0	\$1,040	\$70	\$27,800	\$0	\$264	\$29,174
Product Development Total	\$101,000	\$43,905	\$1,266	\$27,800	\$0	\$264	\$174,235
Planning and Research Total	\$101,000	\$235,322	\$1,341	\$27,800	\$0	\$124,128	\$489,591
Indirect Products & Services Total	\$105,000	\$595,285	\$186,044	\$296,800	\$0	\$160,608	\$1,343,737
EE PORTFOLIO TOTAL	\$108,858	\$3,839,709	\$697,494	\$7,174,434	\$252,954	\$723,218	\$12,796,667

DSM Participation

Decision No. C14-0731 in 2013 DSM Strategic Issues (Proceeding No. 13A-0686EG) directed the Company to “collect, define, and analyze participant and non-participant rates. In future DSM plan filings, the Company shall explain how these data were collected and used for each program.”²⁰ Furthermore, the Commission clarified in Decision No. C14-0997 that “we also require that the Company set forth proposals for tracking participants and non-participants for specific programs and measures and to provide estimates of participant and non-participant counts in its DSM Plans. While we recognize that, for certain programs or measures it may be difficult or prohibitively expensive to collect such data, it is reasonable for the Commission to consider plans for tracking participation and non-participation when programs and measures are proposed in a DSM Plan filing and when we review the cost-effectiveness and ratepayer impacts of those programs and measures.”²¹

Tracking Participants / Non-Participants

To most effectively comply with the Decision, Public Service has determined that participant counts should be collected at the customer level (rather than at the premise level as had been done in the past) and provided by DSM product and by customer class. Because customers may participate in more than one product within a single year, the total number of portfolio participants will not be a direct summation of the individual product participation counts. In order to identify the non-participants, the Company will provide the number and percentage that the portfolio participation count makes up of total PSCo customers (eligible for DSM).²² Going forward, the Company will begin to identify the number of customers participating in each DSM product in a given year within the DSM Annual Status Report. Additionally within the Status Report, a portfolio participation and non-participation count will be provided.

The Company believes a thorough analysis of participants and non-participants must go beyond a counting of participation each year. It must also consider the amount of cumulative consumption savings realized by individual customers each year, due to the participation in DSM programs over several program years. To this end, the Company will also identify the estimated percentages of business and residential customers by their range of consumption savings attributable to DSM participation since the expansion of the DSM programs in 2009. The extent of individual participation can further be compared to the cumulative rate impacts of DSM program since 2009. The combination of these factors results in the level and distribution of bill savings among business and residential customers. This additional participation data analysis is included in the DSM Annual Status Reports.

²⁰ Paragraph 115, pg. 39.

²¹ Paragraph 24, pg. 8.

²² PSCo gas transport customer classes are not eligible to participate in DSM.

Key Assumptions

Participation data is provided with the following key assumptions:

- A participant will be “one individual customer” (based on account number) participating in DSM in a given year.²³ Customers may have multiple premises,²⁴ multiple projects, and/or participate in multiple DSM products across multiple years. (This represents a shift from historical reporting of “participant” which was based on premises).
- Some participation related data analysis is provided only at the portfolio level, such as non-participant²⁵ data; this approach ensures that the endeavor is not undertaken in a manner that is costly or extensively laborious.
- Downstream products’ participation counts will be actual customer counts based on tracked participation data (means of tracking as identified in Tables 5b and 5c).
- Where mid/upstream products’ do not track participation at the customer level, counts will be an estimate within both the DSM Plans and the Annual DSM Status Reports, unless otherwise noted, given the nature of the approach and difficulty and cost associated with specific customer tracking.

Product-Specific Considerations

Products with unique participant tracking approaches are described below:

Cooling – Midstream: The participating tracking mechanism for the midstream rebate portion of the product will be determined in conjunction with the selected third-party implementer. The data will either be directly uploaded into Salesforce—the Company’s tracking software—or tracked separately and manually added to the Salesforce data for the third-party implemented portion of product participation.

Computer Efficiency: Program participation for the upstream component of the program is derived through monthly sales reporting from the third-party implementer. This data is manually entered into Salesforce and is also tracked separately. Based on the total quantity of units sold, it is estimated that participants buy an average of ten computers. Therefore, participation is assumed to be 10% of total units sold.

Lighting Efficiency and Small Business Lighting – Midstream: Program participation for the midstream component of the program is derived through monthly sales reporting from the third-party implementer. This data is manually entered into Salesforce and is also tracked separately.

²³ Within the Detailed Technical Assumptions table at the end of [Appendix G: Technical Reference Manual](#) of this Plan, the Company identifies “units,” which differ from “participants.” Units are the total number of equipment installed by measure.

²⁴ A premise is an individual physical location where a customer is served; a customer may have multiple premises associated with their one account, and vice versa a premise could have multiple customer accounts. For tracking participants, individual customer accounts will be tracked as one participant.

²⁵ A non-participant is a PSCo customer who is eligible to participate in DSM, but has not chosen to do so. This type of data point is able to be tracked based on total PSCo customers and/or PSCo customers by class (business or residential).

Energy Efficient Showerhead: Public Service uploads a participation report from the third-party implementer into Salesforce; however, a manual calculation needs to be completed (given current Salesforce configuration), in order to identify the total number of unique customers that receive a showerhead.

ENERGY STAR New Homes: Upstream participation is based on the number of unique new home builders participating in the product each year and is tracked by the third-party implementer. Downstream participation is based on the number of homes completed in the product by that smaller number of builders. In other words, each home is purchased and occupied by a unique customer and no customer is assumed to own more than one participating home during the product year. Therefore, participation estimates included herein will reflect the number of homes.

Home Lighting & Recycling: This product is wide-reaching with a significant amount of bulbs sold and distributed across both the Residential and Business populations. Because the product achieves the vast majority of participation through retail outlets that do not track information on the customers purchasing the bulbs in the product, some estimation of the breadth of participation—based on average bulbs per customer, total installed bulbs, and the product saturation rate—has been performed.

Multifamily Weatherization and Multifamily Buildings: Participants are considered to be both residents living within housing units that receive energy-efficiency measures (regardless of whether they paid for improvements or received them as a direct-install measure), as well as the building and/or equipment owners, who may not represent the metered, bill-payer given the nature of multifamily building units.

Building Optimization DR Pilot: Pilot participants will be required to sign an application form. Each participant's information will then be manually recorded on a tracking spreadsheet which will be used to record relevant data during the course of the pilot. As pilot participation is capped at ten participants this manual tracking system is manageable and appropriate.

School Education Kits: The Company presumes one customer account per kit. However, it is possible that there may be very limited circumstances where a customer could receive two or more kits in one program year and/or multiple kits over the course of several program years (not unlike potential duplicate participation in other DSM products), but these instances cannot be tracked.

Class Participation Calculations

To estimate the count of unique customers participating within each segment (Business or Residential), calculations must be made to estimate the duplication of participation across the individual products. Summing the participation across products and then applying adjustments to account for duplicate participation results in an accurate measure of the breadth of participation within each segment. The methods to estimate duplicate participation across various types of programs are described below:

Individually-Tracked Products: To estimate the amount of duplicate participation expected to occur in the 2017 and 2018 program years, the ratio of the sum of unique participation within each product observed in the 2015 program year over the unique participation within the Business or Residential segment is calculated. For instance, for the Business class of customers in the 2015 program year, individually-tracked products had a sum of 4,726 unique accounts within products, but these represented only 3,966 unique accounts within the Business class. This results in a factor of 16.08% to account for duplicate participation across the individually tracked products.

Non-Individually-Tracked Products: For several products, it is not feasible to track the individual participation. Home Lighting & Recycling and Computer Efficiency include upstream portions that represent very large participation that do not provide an opportunity to identify the individual participants. For 2017 and 2018, behavioral products for both the Business and Residential classes will be applied to a large fraction of the population, with the individual participants not yet determined. For these products, duplicate participation is estimated by multiplying the fraction of population represented by each product by each other. For instance, if in 2017, the Home Lighting & Recycling product is expected to reach 25% of the Residential class population, and the Residential Behavioral product is expected to reach 40% of the Residential class, the duplicate participation is estimated at 10% ($25\% * 40\%$) of the Residential class. The total fraction of the Residential class population participating in either of these programs is estimated by summing the total fraction of the two products at 65% ($25\% + 40\%$) and then subtracting the duplicate participation fraction (10%) to get a fraction of 55% of the Residential class population participating in at least one of these products.

DSM Participation Tables

The following tables included in this Plan present the Company's best estimates for participation and non-participation in DSM programs in 2015 and 2016, based on the methodology for estimating participation described above.

- 5a: 2017/2018 Electric Participant & Non-Participant Estimates, Percentage
- 5b: 2017/2018 Electric Participation Estimates, Average Rebate and Savings by DSM Product
- 5c: 2017/2018 Natural Gas Participation Estimates

Table 5a: 2017/2018 Electric Participant & Non-Participant Estimates, Percentage

	Total Unique DSM Participants[1]		Total PSCo Customers		PSCo Customers Participating in DSM		PSCo Customers Not Participating in DSM	
	Count	%	Count	%	Count	%	Count	%
2017 Total	722,360	100%	1,310,424	100.00%	722,360	55.12%	588,064	44.88%
Business	25,614	3.55%	97,464	7.44%	25,614	26.28%	71,850	73.72%
Residential	696,746	96.45%	1,212,960	92.56%	696,746	57.44%	516,214	42.56%
2018 Total	698,392	100%	1,310,424	100.00%	698,392	53.30%	612,032	46.70%
Business	25,898	3.71%	97,464	7.44%	25,898	26.57%	71,566	73.43%
Residential	672,494	96.29%	1,212,960	92.56%	672,494	55.44%	540,466	44.56%

Table 5b: 2017/2018 Electric Participation Estimates, Average Rebate and Savings by DSM Product

Product	2017 Estimated Participants	Average Rebate Per Customer	Average kWh Savings Per Customer	2018 Estimated Participants	Average Rebate Per Customer	Average kWh Savings Per Customer
Business Program						
Commercial Refrigeration Efficiency	394	\$ 937.88	13,478	394	\$ 937.88	13,478
Compressed Air Efficiency	65	\$ 7,280.52	52,838	65	\$ 7,679.17	55,514
Computer Efficiency	5,350	\$ 1.17	401	5,350	\$ 1.17	401
Cooling Efficiency	500	\$ 3,003.62	18,607	650	\$ 2,310.48	14,846
Custom Efficiency	20	\$ 19,036.25	249,377	20	\$ 19,036.25	249,377
Data Center Efficiency	12	\$ 82,403.05	646,444	12	\$ 93,779.12	770,397
Energy Management Systems	50	\$ 14,061.03	159,594	54	\$ 13,820.78	152,777
Heating Efficiency	20	\$ 135.81	2,102	20	\$ 143.71	2,302
LED Street Lights – Co. Owned	21	\$ -	328,598	15	\$ -	613,382
Lighting Efficiency	2,100	\$ 3,042.93	33,350	2,300	\$ 3,222.80	34,793
Lighting - Small Business	1,388	\$ 1,489.71	14,580	1,429	\$ 1,452.16	14,190
Motor & Drive Efficiency	202	\$ 8,053.16	46,306	190	\$ 7,431.27	42,633
Multifamily Buildings	150	\$ 2,638.73	24,422	200	\$ 2,638.73	24,422
New Construction	115	\$ 55,199.24	376,738	120	\$ 25,909.50	178,198
Process Efficiency	18	\$ 90,037.72	939,402	18	\$ 90,037.72	939,402
Recommissioning	35	\$ 10,420.93	167,686	35	\$ 10,420.93	167,686
Self-Directed	5	\$ 175,509.37	1,594,796	5	\$ 175,509.37	1,594,796
Residential Program						
Energy Feedback - Residential	524,723	\$ -	109*	490,823	\$ -	112*
ENERGY STAR New Homes	2,695	\$ 231.03	1,125	2,830	\$ 242.57	1,172
Evaporative Cooling Rebate	3,050	\$ 482.07	870	3,050	\$ 482.07	870
Residential Heating	5,130	\$ 102.92	763	5,130	\$ 102.92	763
High Efficiency Air Conditioning	2,768	\$ 799.36	803	2,918	\$ 792.97	796
Home Energy Squad	2,000	\$ 8.86	729	2,250	\$ 8.00	727
Home Lighting & Recycling (Residential)	280,554	\$ 18.38	253	280,554	\$ 19.77	272
Home Lighting & Recycling (Business)	17,908	\$ 18.38	1,446	17,908	\$ 19.77	1,553
Home Performance w/ENERGY STAR	392	\$ 261.22	1,714	392	\$ 261.22	1,714
Insulation & Air Sealing	818	\$ 198.59	486	818	\$ 198.59	486
Refrigerator Recycling	7,520	\$ 49.87	608	7,710	\$ 48.64	593
School Education Kits	38,500	\$ 22.72	136	38,500	\$ 22.73	136
Energy Efficiency Showerhead	1,750	\$ 8.87	523	2,650	\$ 6.03	345
Water Heater Rebate	55	\$ 450.00	1,716	55	\$ 450.00	1,716
Low-Income Program						
Energy Savings Kit	5,813	\$ 31.95	144	5,813	\$ 30.35	144
Multifamily Weatherization	35	\$ 29,134.40	50,127	35	\$ 29,134.40	50,127
Non-Profit Energy Efficiency	32	\$ 29,076.62	43,651	32	\$ 29,076.62	43,651
Single-Family Weatherization	1,625	\$ 544.78	700	1,625	\$ 562.61	705
Indirect Program						
Business Energy Analysis	300	\$ 1,253.32	0	300	\$ 1,253.32	0
Consumer Education - Business	1,385	\$ -	0	1,385	\$ -	0
Consumer Education - Residential	34,000	\$ -	0	34,000	\$ -	0
Energy Benchmarking	250	\$ -	0	250	\$ -	0
Energy Efficiency Financing	15	\$ 666.67	0	15	\$ 666.67	0
ENERGY STAR Retail Products Platform Pilot	10,200	\$ 72.67	195	13,600	\$ 72.67	195
Residential Home Energy Audit	2,200	\$ 85.00	0	2,200	\$ 85.00	0
Building Optimization DR Pilot (EE)	7	N/A	N/A	7	N/A	N/A
Demand Response Program						
Building Optimization DR Pilot	12	\$ -	0	0	N/A	N/A
Critical Peak Pricing Pilot	15	\$ -	0	15	N/A	N/A
Peak Day Partners	156	\$ 10,961.54	0	137	N/A	N/A
Saver's Switch	11,429	N/A	N/A	11,429	N/A	N/A

Table 5c: 2017/2018 Natural Gas Participation Estimates

Product	2017 Natural Gas DSM Participation Est.	2018 Natural Gas DSM Participation Est.
Business Program		
Commercial Refrigeration Efficiency	56	56
Custom Efficiency	8	8
Energy Management Systems	20	22
Heating Efficiency	159	159
Lighting - Small Business	19	20
Multifamily Buildings	150	200
New Construction	95	100
Recommissioning	25	25
Residential Program		
Energy Efficiency Showerhead	23,250	23,250
Energy Feedback Residential	458,523	461,823
ENERGY STAR New Homes	4,100	4,305
Home Energy Squad	2,000	2,250
Home Performance w/ENERGY STAR	392	392
Insulation & Air Sealing	1,359	1,359
Residential Heating	3,127	3,127
School Education Kits	38,500	38,500
Water Heating	928	928
Low-Income Program		
Energy Savings Kit	8,091	8,091
Multifamily Weatherization	14	14
Non-Profit	25	25
Single-Family Weatherization	1,265	1,265
Indirect Program		
Business Education	593	593
Business Energy Analysis	100	100
Consumer Education	34,000	34,000
Energy Benchmarking	150	150
Energy Efficiency Financing	90	90
ENERGY STAR Retail Products Platform Pilot	865	1150
Home Energy Audit	2,500	2,500
Building Optimization DR Pilot (EE)	5	0
Demand Response Program		
Building Optimization DR Pilot	8	0

Business Program

A. Description

The Business Program offers prescriptive and custom DSM products to commercial and industrial customers in the Colorado service territory.²⁶ Public Service has a total of 223,234 gas and electric commercial and industrial customer premises in Colorado.²⁷ A breakdown of business premises by type is shown in the table below.

Table 6: Business Premise Counts by Type²⁸

	Natural Gas Only	Electric Only	Both Gas & Electric	Total
Commercial	36,308	121,796	71,705	229,809
Industrial	2,942	389	94	3,425
Total	39,250	122,185	71,799	223,234

Public Service divides business customers into two sub-segments for marketing purposes: (1) large customers and (2) small- and medium-sized customers. Large customers are typically single or aggregated electric customers with demand usage of over 500 kW, natural gas customers with annual loads of 5,000 Dth or more, and/or national customers, such as fast-food chains. The Company assigns an Account Manager to large customers to serve as a liaison with Public Service on a variety of energy topics. Small- and medium-sized business customers work with the Company's Business Solutions Center (BSC) to answer any questions they may have on their accounts and to discuss Company resources for potential energy efficiency projects.

Products

An extensive portfolio of products is planned for the Business Program in 2017 and 2018, including 17 electric and eight natural gas DSM. All of the natural gas products coincide with their electric counterparts such as Custom Efficiency where electric, natural gas, or electric and natural gas savings can be analyzed. Public Service's Business Program continues to offer 12 of the same products²⁹ that were first launched in 2009 to continue to target those specific market segments with energy savings opportunities and become larger contributors to the DSM portfolio energy savings. The business product rankings are shown in Table 7 below.

²⁶ The majority of PSCo's high natural gas consumption customers are transportation-only customers that do not purchase gas directly from the Company, and therefore those customers are exempt from the Demand-Side Management Cost Adjustment (DSMCA) and ineligible to participate in the Company's energy efficiency products.

²⁷ Premise counts as of September 2014.

²⁸ Natural gas transportation-only customer are excluded.

²⁹ Compressed Air Efficiency, Cooling Efficiency, Custom Efficiency, Data Center Efficiency, Energy Management Systems, Lighting Efficiency, Motor & Drive Efficiency, New Construction, Process Efficiency, Recommissioning, Self Direct, and Lighting – Small Business.

Table 7: Business Product Rankings

2017-2018	Rank
Lighting Efficiency	2
Multifamily Buildings	4
Lighting - Small Business	6
Motor & Drive Efficiency	8
Commercial Refrigeration Efficiency	10
Process Efficiency	11
Cooling	15
New Construction	16
Computer Efficiency	17
Data Center Efficiency	18
Self Direct	20
Energy Management Systems	21
Recommissioning	22
Compressed Air Efficiency	24
Custom Efficiency	26
LED Street Lighting	29
Heating Efficiency	31

The newest product being launched for the Colorado market is the Multifamily Buildings product. This product was the result of a highly successful pilot program operated in 2015 and 2016.

B. Targets, Participants & Budgets

Targets and Participants

The Business Program is anticipated to contribute 240.9 GWh and 212,820 Dth in 2017 and 233.0 GWh and 143,681 Dth in 2018. This is approximately 60% and 33% respectively of the 2017 achievements and 58% and 25% respectively of the 2018 achievements. Each of the product targets were reviewed by the Company's energy efficiency team for reasonability and appropriateness based on technical potential.

The product's energy savings and participation, and corresponding budgets, are shown in Tables 8a through 8d below.

Table 8a: 2017 Electric Business Program Budgets and Targets

2017	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Business Program				
Commercial Refrigeration Efficiency	\$1,097,446	573	5,679,594	1.37
Compressed Air Efficiency	\$754,669	577	3,673,199	1.28
Computer Efficiency	\$276,896	293	2,293,385	0.69
Cooling	\$4,312,694	3,891	9,950,311	1.09
Custom Efficiency	\$1,225,622	876	5,334,276	1.32
Data Center Efficiency	\$1,309,624	755	8,296,607	1.52
Energy Management Systems	\$1,315,943	135	8,534,453	1.25
Heating Efficiency	\$10,716	8	44,967	1.59
LED Street Lights	\$43,000	0	7,380,270	0.79
Lighting Efficiency	\$10,025,679	8,632	74,903,705	1.44
Lighting - Small Business	\$5,477,550	2,435	21,643,604	1.13
Motor & Drive Efficiency	\$2,564,206	1,644	10,004,053	1.49
Multifamily Buildings	\$932,646	535	3,917,923	2.26
New Construction	\$10,811,209	9,039	46,336,774	1.13
Process Efficiency	\$2,185,154	1,700	18,084,744	1.85
Recommissioning	\$721,307	302	6,277,029	1.26
Self Direct	\$1,009,907	1,264	8,528,318	1.90
Business Program Total	\$44,074,268	32,659	240,883,211	1.31

Table 8b: 2018 Electric Business Program Budgets and Targets

2018	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Business Program				
Commercial Refrigeration Efficiency	\$1,097,041	573	5,679,594	1.43
Compressed Air Efficiency	\$782,288	607	3,859,230	1.31
Computer Efficiency	\$276,896	293	2,293,385	0.74
Cooling	\$4,722,153	4,253	10,320,751	1.07
Custom Efficiency	\$1,396,185	876	5,334,276	1.29
Data Center Efficiency	\$1,447,885	876	9,887,452	1.71
Energy Management Systems	\$1,412,425	147	8,823,461	1.19
Heating Efficiency	\$10,874	8	49,241	1.72
LED Street Lights	\$43,000	0	9,840,359	0.83
Lighting Efficiency	\$11,202,784	10,077	85,586,169	1.46
Lighting - Small Business	\$5,531,477	2,438	21,686,864	1.16
Motor & Drive Efficiency	\$2,263,739	1,422	8,663,413	1.52
Multifamily Buildings	\$1,191,160	714	5,223,897	2.40
New Construction	\$6,650,518	4,399	22,870,323	1.06
Process Efficiency	\$2,190,761	1,700	18,084,744	1.92
Recommissioning	\$724,950	302	6,277,029	1.34
Self Direct	\$1,012,131	1,264	8,528,318	1.97
Business Program Total	\$41,956,268	29,948	233,008,505	1.35

Table 8c: 2015 Natural Gas Business Program Budgets and Targets

2017	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Business Program					
Commercial Refrigeration Efficiency	\$11,905	2,434	204,437	\$263,780	8.60
Compressed Air Efficiency					
Computer Efficiency					
Cooling					
Custom Efficiency	\$83,213	3,768	45,285	\$118,120	1.71
Data Center Efficiency					
Energy Management Systems	\$51,303	8,810	171,721	\$230,191	1.54
Heating Efficiency	\$488,280	18,032	36,930	\$16,504	1.01
LED Street Lights					
Lighting Efficiency					
Lighting - Small Business	\$17,940	3,497	194,907	\$97,794	5.62
Motor & Drive Efficiency					
Multifamily Buildings	\$558,090	20,184	36,166	\$1,319,066	2.31
New Construction	\$1,716,943	152,646	88,905	\$1,328,790	1.16
Process Efficiency					
Recommissioning	\$59,198	3,450	58,277	\$8,870	1.08
Self Direct					
Business Program Total	\$2,986,871	212,820	71,252	\$3,383,115	1.30

Table 8d: 2018 Natural Gas Business Program Budgets and Targets

2018	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Business Program					
Commercial Refrigeration Efficiency	\$11,918	2,434	204,214	\$269,213	8.76
Compressed Air Efficiency					
Computer Efficiency					
Cooling					
Custom Efficiency	\$83,538	3,768	45,109	\$128,319	1.77
Data Center Efficiency					
Energy Management Systems	\$52,595	8,878	168,791	\$252,447	1.59
Heating Efficiency	\$488,280	18,119	37,107	\$64,987	1.05
LED Street Lights					
Lighting Efficiency					
Lighting - Small Business	\$17,940	3,497	194,907	\$104,768	5.95
Motor & Drive Efficiency					
Multifamily Buildings	\$687,416	26,912	39,150	\$1,871,914	2.45
New Construction	\$1,087,593	76,624	70,452	\$763,545	1.17
Process Efficiency					
Recommissioning	\$59,244	3,450	58,232	\$14,595	1.13
Self Direct					
Business Program Total	\$2,488,524	143,681	57,737	\$3,469,787	1.45

Budgets

Achievement targets were developed as a result of an organic participation and energy savings estimation process for each product, which was rolled up to the Business Program total. Similarly, budgets for each product were developed based on the anticipated level of achievement and cost of market penetration, including review of historical data for the past several years and longer-term experience with similar products in Minnesota.

Rebate budgets were established according to the desired number of product participants and estimated average project size. Next, budget components, such as advertising and promotion, were developed as part of the product planning process. Then, product delivery budgets, including Company labor and external resources, were calculated. The resulting budgets from this planning process are shown in the executive summary section of the Plan.

The Company is continuing to closely manage natural gas DSM expenditures due to concerns about reduced cost-effectiveness of many gas DSM products given low gas commodity prices, the lack of significant system benefits from gas DSM, and the rate impact on non-participating customers.

Additional details are presented in the product descriptions that follow this overview section.

C. Application Process

Application processes vary by product. See individual product summaries following this overview for more information.

D. Market Objectives & Strategies

Market analysis shows that the commercial segment had the highest potential for energy savings within indoor and outdoor lighting, cooling and ventilation, data servers, and refrigeration end-uses. In the industrial market segment, pumps, lighting, compressed air, fans, cooling, and drives show the greatest-end use potential.

Transactional research is also conducted by Public Service to identify who is participating in our DSM products. Specific detail from our rebate applications, including customer name, vendor, type of equipment, etc., is collected on each transaction and added to a database. This information is monitored to determine metrics such as: participation/non-participation in DSM products, market segments utilized, and equipment types our customers use. By analyzing specific end-use data, Public Service can continue to shape the Business Program to further meet the needs of the market.

Trade allies, end-use equipment vendors, energy services companies, and Public Service's Account Managers and marketing team work individually and collaboratively to drive participation in the Business Program. While coordination of DSM participation by the largest business customers typically requires regular personal communications and site visits, Public

Service also utilizes newsletters, customer events, direct mail, email communications, and awareness advertising to reach Business Program customers. A challenge in marketing energy efficiency is that it's not a topic on the top of customers' minds – they are busy managing the core aspects of their businesses, particularly for those who do not have dedicated onsite energy managers. Customers tend to focus on purchase price (or “first costs”) rather than lifetime costs and are often unlikely to replace equipment prior to failure. Customers may also not be aware of energy efficient equipment and process options available to them when the need arises to make purchase decisions. Yet, opportunities are growing in marketing energy efficiency to customers as awareness on conservation, climate change, and the environment increases leading to an affinity for energy-saving actions. To support marketing efforts, Public Service employs an integrated approach to marketing communications, where the tactics are designed to work in concert with each other and reinforce key messages over time.

Strategy

Public Service follows the “AIDA” (awareness, interest, desire, action) process for encouraging customers to participate in DSM products. The following are the steps in this process:

1. Create awareness of electricity and/or natural gas impacts on bottom-line profits, and quantify potential cost savings and available rebates.
2. Promote interest in DSM products by providing more information about the offerings, including payback examples and case studies, through a variety of customer touch-points.
3. Instill the desire for participation in DSM products by quantifying the impacts of a bundle of potential energy savings technologies and processes, based on specific product and industry information for each targeted market segment.
4. Move the customer toward action by offering a variety of product options with varying degrees of financial commitment and/or long-term customer involvement.

Key Messages and Target Audience

When communicating with customers, Public Service uses several overarching key messages including:

- Energy efficiency reduces operating costs and improves the bottom line.
- Public Service helps lower energy bills by offering rebates and incentives for installing highly efficient equipment, using energy-saving building designs and optimizing existing equipment to maximize comfort and energy savings.
- Rebates and incentives shorten payback periods for energy-efficient equipment and systems, providing lasting savings for years to come.
- Energy efficiency helps reduce environment impacts.

Public Service also markets its products differently to the various business sub-populations, depending on the target audience. Each of these target audiences are identified by key shared characteristics before analyzing their motivations. Once motivations are identified, Public Service can adjust the above key messages to meet the customers' specific needs.

Small- and Medium-Sized Businesses

Small and medium-sized business customers traditionally own or work in buildings in segments such as offices, retail, healthcare, education, lodging, light manufacturing and grocery. They are

motivated differently than larger businesses and are busy trying to keep their businesses successful and running smoothly which means energy is a low-interest category. Small business owners are motivated by how to save money and how to make things more convenient. Key messages used to address these needs include:

- Energy savings go right to profits.
- Partnering with the property manager (where applicable) to employ energy savings can lower energy costs, improve ambiance, and increase the owner's property value.

Large Businesses

Large commercial customers traditionally own or work in buildings in segments such as office, retail, education, healthcare, restaurants, auto dealerships and congregations. These customers recognize the value of environmental responsibility and sustainability efforts; but in doing so want to weave these efforts into their long-term financial strategies. Industrial manufacturing in Colorado is most concentrated in the areas of food and beverage, chemicals, computer and electrics, and machinery. They are highly engaged in getting the most production from every unit of energy, to keep operating costs low and eliminate waste. In all, these customers are the most energy-savvy and are constantly monitoring their equipment and processes. Key messages used to address both these customer groups include:

- Energy is a large part of the operating budget.
- Rebates help reduce up-front costs, shorten payback periods and provide ongoing savings for years to come.
- Energy savings go right to the bottom line as increased profits.
- Investing in energy savings is a smart decision.
- Energy-efficient equipment and systems help increase reliability while decreasing maintenance costs.
- Saving energy helps reduce environment impacts and meet sustainability goals.

Marketing Tactics

Marketing tactics center on product-specific promotions, solutions-based marketing, and a variety of communications vehicles.

Product-specific Promotions: Product-specific marketing efforts tie back to the overriding message, offering specific examples of concrete ways to do more. These examples show customers and trade partners the direct, personal impacts of their efforts, offering examples of energy savings, paybacks and lifetime savings or personal rewards.

Solutions-based Marketing: These communications focus on product combinations that offer solutions for a specific customer segment (e.g., schools) or solutions that address common customer concerns (e.g., weather, energy costs, environmental) rather than marketing a single product.

Communications Vehicles:

- Product collateral, including feature sheets, applications, customer case studies, savings calculators, participating vendor lists and cross-product energy-savings guides.
- Newsletters for specific products or cross promotion, such as the Energy Exchange for trade partners and Energy Solutions for Public Service customers.

- Websites.
- Direct mail campaigns for specific product end uses announcing new incentives or for customer education, as well as general direct mail pieces targeted at specific market segments.
- Events, including product and technical training, customer education and customer recognition.
- Speaking opportunities in local industry meetings, business events (i.e. Chambers, National Association of Industrial and Office Properties, and Building Owners and Managers Association) and local conferences.
- Media relations, including free placement in appropriate media, focusing primarily on customer stories and product information and changes.
- Advertising in business magazines, newspapers, the internet and radio spots.

E. Program-Specific Policies

The Company has adopted several general policies that are followed across products in the Business Program. Individual products may have additional, unique policies as noted in each of the product summaries that follow. The general policies provide guidelines; however, they may be altered under specific circumstances and/or for specific periods of time when warranted for promotional events or other purposes.

The program-level policies include:

- *Proof of installation:* All products require documentation of installation, such as proof-of-purchase (e.g., invoices) or a site verification.
- *Installation date:* Rebates are provided for qualifying equipment installed within a 12-month period.
- *Payback requirements:* The payback policy for custom conservation products:
 - a. Rebates may be paid on projects with payback of at least 1 year.
 - b. Project payback must be less than the project lifetime, which varies by product and technology.
- *Studies:* Study funding cannot exceed 75% of the study cost and studies must be completed within three months.
- *Load Shifting:* Load shifting occurs when a measure shifts electrical energy and demand usage to an off-peak period, without reducing the total load served over a defined time period. Potential load shifting projects need to meet all existing eligibility requirements of the applicable product as well as additional persistence requirements.
- *Study-Driven Savings:* If a customer implements measures that are less than a one year payback, they will not receive a rebate, but Public Service will claim the study-driven savings regardless. The Company believes that our financial and technical help in identifying and/or analyzing energy efficiency measures provides sufficient influence on the customer's decision to implement those measures.

F. Stakeholder Involvement

Since 2009, the primary avenue for external party involvement has been the quarterly DSM Roundtable Meetings. The Roundtable Meetings are open to all interested parties who want more information on Public Service's DSM products and would like to provide feedback into the design, planning, and implementation of the products.

Beyond the Roundtable Meetings, each DSM product manager involves applicable trade allies and other stakeholder groups, as needed, in the development of the Company's products. The Company also participates in regional and national efforts to design and develop the best DSM products for business customers. For example, participation in the Consortium for Energy Efficiency's (CEE's) planning and research efforts to promote energy efficiency technologies.

In 2014, the Company launched the *Partners in Energy* program to support communities in developing and implementing comprehensive energy action plans. In 2015 and 2016 the Company will continue to work with local community partners through this initiative, to reach out to businesses to support them in reducing their energy consumption by participating in the Company's DSM products. This innovative approach will give local businesses greater access to DSM resources through non-traditional channels. This approach leverages joint marketing opportunities and community momentum to drive additional customer participation.

In 2016, the Company also held small group discussions with past intervenors to solicit feedback on the development of the 2017/2018 Plan. These meetings allowed Public Service to have more candid and detailed conversations with parties likely to intervene in the 2017/2018 Plan proceeding and address issues prior to filing.

G. Rebates & Incentives

Business rebates are offered for custom and prescriptive products to promote high efficiency technology implementation. Rebates and incentives vary by product and can be offered to customers, vendors, distributors and manufacturers. The Company may also decide it prudent to offer bonus rebates to customers and/or trade partners to boost participation if implementation lags and budget allows..

Indirect products, such as Business Energy Analysis and Business Education support participation in business DSM products.

H. Evaluation, Measurement & Verification

The specific product measurement and verification plans are described in the EM&V section of this Plan; and products that will undergo comprehensive evaluations in 2017 or 2018 are also noted that section.

➤ **Commercial Refrigeration Efficiency**

A. Description

The Commercial Refrigeration Efficiency product offers refrigeration maintenance and upgrades to commercial customers with significant refrigeration loads, notably restaurants, and grocery, convenience, and liquor stores. Refrigeration systems in these targeted facility types typically account for over 50% of the building's energy use and run 24 hours per day, year-round.

This product consists of five major components:

1. *Free Onsite Energy Assessment* – Each customer will be offered a free on-site facility energy assessment and walk-through to identify and explain key energy efficiency opportunities. The assessment will be performed by a third-party implementer. A copy of the assessment report will be provided to the customer, and will include a prioritization of identified opportunities.
2. *Direct Install for Immediate Savings* – While onsite for the energy assessment, the third-party implementer will perform free installation of the following energy savings measures, where applicable:
 - a. Screw-in LEDs for walk-in coolers/freezers; and
 - b. Pre-rinse sprayers for restaurant and commercial kitchens, and aerators in public restrooms and kitchen sinks.
3. *Full Coil Cleaning* – As part of the onsite visit, the third-party implementer will perform a free coil-cleaning service, including materials and training for self-contained equipment. Cleaning condenser coils in self-contained units is estimated to save an average of 6% of the equipment's annual energy consumption, depending on the system and its condition. Since coil cleaning should be performed annually, customers will be provided with a coil cleaning brush, an instructional "How-To" sheet, and an onsite tutorial, to equip them with the tools and knowledge to complete this task on a regular basis using in-house staff. The Company will claim energy savings for the initial cleaning performed onsite by the third-party implementer.
4. *Rebated Refrigeration Measures* – These measures are the core of the product offering. In order to qualify for the rebate, the equipment must be professionally installed. These measures include:
 - Enclosed Reach-in Cases: Rebates will be available for reach-in cases with doors when the customer replaces existing open multi-deck cases with equivalent storage (cubic feet or linear feet) or adds doors to existing open multi-deck cases.
 - Night Curtains: Night curtains may be rebated when they are installed on open refrigerated cases to reduce heat transfer and mixing of air inside and outside the case during times of low store traffic. The rebate will be available for permanent, low emissivity (reflective) night curtain products only.

- Walk-in Electronically Commutated Motors (ECM): Rebates will be available for the replacement of evaporator fan motors with new, more efficient motors, (typically ECM) in walk-in coolers and freezers where none previously existed.
- LED Case Lighting: Rebates will be available for the installation of LED case lighting, including horizontal and vertical solutions, to replace existing mixed populations of older lighting technologies.
- Anti-Sweat Heater Controls: Rebates will be available for efficient anti-sweat heater controls installed on existing commercial cooler and freezer doors to prevent the door from fogging or having condensation buildup on the glass.
- Floating Head Pressure Controls: Rebates will be available for floating head pressure controls. The floating head pressure control will control the compressor pressure based on outside temperature.
- Evaporator Fan Motor Controls: Rebates will be available for fan controls that limit the fan runtime to 100% baseline speed for 5,875 hours per year and 70% of baseline speed for 2,520 hours per year.

5. *Turn-Key Services* – The customer will be provided with proactive project management, by the third-party implementer, to assist with the implementation of prescriptive projects, including coordination between the customer, Public Service, and the installation contractors/trade allies to complete the improvements and submit rebate applications.

B. Targets, Participants & Budgets

Targets and Participants

The energy savings targets for this product were derived from historical data, market data, and equipment deemed savings values.

Budgets

Public Service plans to work with a third-party implementer to provide this product. The forecasted expenditures in 2017 and 2018 for this product are based on projected participation levels, promotion, and administration expenses. The majority of the product costs are for administration, vendor marketing/training, and customer rebates.

C. Application Process

The Company plans to promote the product through the outreach efforts of a third-party implementer. Secondary outreach is likely to occur through the Company's Account Managers, Xcel Energy Business Solution Center's (BSC's) Energy Efficiency Specialists, contracted trade allies, and/or other marketing efforts such as mailings, newsletters, and the Company website.

The application process will include:

1. *Customer Intake:* The Company will work with the third-party implementer to establish and follow a set protocol for receiving and qualifying customers who are interested in this product. Interested customers will be contacted to schedule an installation/assessment.
2. *Identify Opportunities:* After completion of direct installation measures, the third-party implementer will use the assessment results to work with the customer and PSCo to identify deeper prescriptive savings opportunities.
3. *Turn-Key Support:* The third-party implementer will offer proactive project management to assist with implementation of the prescriptive rebate projects, including coordination between the customer, PSCo, and the installation contractors/trade allies to complete projects and submit rebate applications.

D. Marketing Objectives & Strategies

The marketing strategy for Commercial Refrigeration Efficiency is built upon the Company's and the third-party implementer's experience working in the Colorado market. The strategy incorporates best practices learned from similar refrigeration programs offered across the United States, and is integrated within the Company's larger marketing efforts. The Company and third-party implementer will develop targeted marketing collateral that may include sell-sheets, direct mail, e-mail communications, case studies, and leave-behinds.

The third-party implementer will use education and training to market the product while building trade ally and customer knowledge about energy efficiency technologies and encouraging better energy decisions.

Marketing Channels: The third-party implementer will use several marketing channels for the Refrigeration Efficiency Product, including:

- Program Field Staff: Field staff will be the on-the-ground marketing team, conducting targeted outreach to relevant customer groups and industry associations in addition to working with customers.
- Account Management and BSC Staff: The third-party implementer will build relationships with Public Service's Account Managers and BSC staff to drive customer participation. The product will also be promoted to select Lighting-Small Business participants to offer them more comprehensive savings opportunities, where applicable.
- Trade Partners: The third-party implementer will engage trade partners as early as possible through training to increase their ability to reach customers at an appropriate time so that the product can influence a buying decision.
- Direct Marketing: PSCo will work with the third-party implementer to incorporate marketing materials into product training sessions, direct mailings to target customer segments (grocers, restaurants, convenience and liquor stores), and distribute at targeted locations.
- Industry Associations: Public Service will work with the third-party implementer to develop relationships and marketing strategies with food service and sales associations to target the major players within the commercial and industrial refrigeration customer segment.

E. Product-Specific Policies

Refrigeration Efficiency has the following product-specific policies:

- All rebated equipment must be new and meet all product rules and requirements. The rebate application must be submitted within 12 months of the invoice date.
- Rebates assume a one-for-one replacement of retrofit fixtures that will result in energy savings.
- The product is available to retail business customers with electricity and natural gas service, or electricity service only. Natural gas-only customers are not eligible for this product.

F. Stakeholder Involvement

There are relatively few trade allies who specialize in refrigeration, but Public Service will target this network, and use other marketing outreach as described in Section D above, to ensure that all qualified organizations have the opportunity to participate.

G. Rebates & Incentives

Customers may apply for prescriptive and custom rebates for qualifying equipment. Third-party implementer services and direct installations will be performed at no additional cost to the customer.

➤ **Compressed Air Efficiency**

A. Description

The Compressed Air Efficiency product helps customers address inefficiencies in their compressed air systems. The product encourages repair and redesign of existing systems, and encourages the purchase of efficient options for new and replacement systems. The product has three components:

1. Prescriptive rebates for the most common high-efficiency options such as no-loss air drains, cycling dryers, purge controls, mist eliminators, and for certain Variable Frequency Drive (VFD) compressors;
2. Rebates for studies that help customers identify efficiency opportunities from fixing leaks as well as from redesign or replacement of system components; and
3. Custom rebates for implementation of unique improvements identified by studies. Improvements can include capital purchases, such as qualifying compressors and “process” changes, such as piping modifications or horsepower (hp) reductions.

Rebates are available for any size of compressed air equipment through the product’s custom component. For equipment over 50 hp, customers are advised to complete a system study prior to submitting an application for a custom efficiency rebate. Examples of equipment replacement that may qualify for the custom rebate include:

- Replacing a 40 hp compressor with a 50 hp compressor;
- After completing a compressed air study, replacing an existing 150 hp air compressor with two 75 hp compressors and controls; and
- After completing a compressed air study, replacing an existing 150 hp air compressor with a 150 hp VFD compressor.

The Compressed Air Efficiency product is available to all electric commercial and industrial customers within the Company’s service area. The primary participants are mid-sized business customers that have some or all of the following characteristics:

- Demand of 100+ kW, and/or
- Operate within energy-intensive industries (e.g., food processing, mining, etc.).

In addition, there is a secondary target of small business customers that may have some or all of the following characteristics:

- Limited internal resources to purchase, install and finance projects, and/or
- Limited technical expertise, and/or
- A focus on short-term paybacks.

Members of the trade are also targeted to increase product education and engagement, including equipment manufacturers and installers, as well as design engineers and electricians.

B. Targets, Participants & Budgets

Targets and Participants

Participation and savings targets were established in light of recent product trends and experience, including performance from 2013 through 2015. Trade feedback, an evaluation of potential customers within the Colorado service territory, and results from the product's 2014 comprehensive evaluation also informed target-setting.

Budgets

Historical budgets were analyzed to project the product budget for 2017 and 2018. Other factors such as planned promotions, trainings, and staffing influenced deviations from historical trends. The budget is largely driven by rebates and internal labor, as well as consulting fees. Specifically:

- *Rebates* – The budget for rebates is established by estimating participation for the product and applying the rebate amounts per kW and kWh.
- *Internal labor* – Compressed Air Efficiency is a labor-intensive product. It is one of the few products in Colorado that has prescriptive, study-based, and custom components. The study and custom components require Xcel Energy staff to conduct detailed analysis for preapproval of each potential project. Labor is typically 25% to 30% of the product cost.
- *Consulting* – A consultant provides measurement and verification (M&V) services, as needed.

C. Application Process

Customers can learn about the product through various channels, including from a Public Service account representative, compressed air vendor, website literature, or product advertising. Applications must be signed by the customer, but can be submitted by customer representatives including building owners, contractors, engineering firms, energy services companies, and equipment vendors. Typically, the customer or a vendor selling to the customer identifies a project and starts the application process described below.

Compressed Air Prescriptive Measures

For prescriptive measures, the application process is similar to other prescriptive products:

- Customers may apply for rebates by completing and signing the application and providing a detailed invoice for the installed equipment. The equipment must be new and meet all the qualifications detailed on the application. The customers may submit a rebate application within twelve months after the invoice date. Once the paperwork is completed and submitted, rebate checks are mailed to the customer within six weeks, as indicated on the application.
- The replacement of compressors must be for a new variable speed drive compressor(s) with hp that is less than or equal to that of the replaced load/no-load compressor(s). If the retrofit is not a reduction in hp or involves additional compressor types, customers may apply for preapproval through the Custom Compressed Air process.

- The replacement or installment of a new cycling dryer must be 75 SCFM to 2400 SCFM and must not be used as backup. Non-cycle or refrigerating dryers are not eligible. The replacement or installment of a new mist eliminator filter must be 125 SCFM to 900 SCFM and must not be used as backup. The rated pressure drop of all mist eliminators must be 0.75 pounds per square inch gage or less over the lifetime. The installment of only new dew point controls (purge controls) must be for systems that are 95 SCFM to 2000 SCFM and cannot be used as backup. Dryers must have a dew point sensor at discharge to monitor demand and only desiccant heatless dryers are eligible. Anything that meets the requirements listed above would be processed through the Custom Compressed Air channel.

Compressed Air Studies

In order to begin the study process the customer will first obtain a study estimate from a participating compressed air vendor/contractor. A list of eligible participating providers and trade partners is available on the Company's website.³⁰ The customer submits the Compressed Air Efficiency study application and the proposed cost of the study to a Company Account Representative. To receive preapproval, the study application must propose to include the following components:

- An ultrasonic leak survey to locate and tag air leaks, and estimate the cost of inefficiencies due to system leaks and misuses;
- An efficiency report with system recommendations and estimate of energy cost savings due to each recommendation;
- Characterization of major compressed air system components including:
 - Compressor ID, model, manufacturer, nameplate hp, motor nameplate hp type, capacity, pressure rating in psig age, and control type
 - Compressor motor size, efficiency, and age
 - Type, capacity, and age of dryers and other conditioning equipment
 - Type of automatic compressor controls, if any
 - Description of major compressed air end uses
 - Location and layout of piping and major system components
 - Inspection of compressed air system components and identification of problem areas.
- Identification of system loading of major compressed air users including size, frequency, and duration of use;
- Measurement of power, pressure and flow for a minimum of seven days for all systems;
- Summary of the results of the leak and unregulated demand inspection, including the location and approximate size of each leak;
- Summary of the execution steps and cost estimate to repair the leaks, unregulated end-uses and inefficient compressed air applications;
- Recommendations for improvements to customer's maintenance procedure and equipment retirement/replacement schedules; and

³⁰ <http://www.xcelenergy.com/staticfiles/xcel/Marketing/Files/CO-Bus-Compressed-Air-Participating-Providers.pdf>

- Recommendations for follow-up actions to improve operation and efficiency, including the installation of new equipment.

To receive the study rebate, the completed study report must show data was collected on the preapproval date or within the allotted preapproval timeframe. The customer must repair at least 50% of the air loss due to leaks as identified by the study and included in the completed report. Once the customer has repaired the leaks, the customer will inform their Account Representative. The customer and Account Representative review the list of identified leaks and note the repair status of each leak. The customer and Account Representative both sign the verification section of the application and submit it to the product manager along with copies of invoices and other required information as stipulated in the preapproval letter.

Custom Compressed Air

If the customer chooses to implement recommended capital improvements to the compressed air system that do not qualify for prescriptive rebates, they may apply for preapproval of their project through the Company's Custom Efficiency product application process. Please see the [Custom Efficiency](#) product section of this Plan for a description of the process to be followed.

D. Marketing Objectives & Strategies

Account Representatives and compressed air vendors are the primary marketing conduits for this product and will market the product through their direct relationships with customers. In addition, the following strategies will help meet product targets in 2017 and 2018:

Targeting Industrial Customers. Industrial customers make up a sizeable market that has the potential to bring in large compressed air projects. The Company targets these customers with direct contact (which may include mailings, email blasts, etc.) to create awareness and answer questions about the product.

Leveraging Trade Partners. The trade partners operating in Colorado are a significant factor in the success of this product. Working directly with these trade partners helps to identify potential participants early in the planning stages of a project. The Company continually strives to demonstrate how incorporating incentives into trade partners' bids can be a benefit to their businesses.

Competition amongst the small group of vendors is high due to the mid-to-large industrial/manufacturing markets targeted. Therefore, the Company trains each trade partner individually. Throughout 2017 and 2018, training with trade partners will continue. The trainings provide a forum to review the vendor's work, make recommendations for a better end-product, and solicit feedback on the effectiveness of the Compressed Air product.

Delivering Marketing Collateral. Marketing collateral is an important tool to provide customers with useful, easy to follow guidelines for the product. The Company continuously solicits feedback from customers and trade partners to improve these materials. Collateral is available for customers, trade partners, and others. Customers and trade partners can request

hard copies of the material or they can access material on Xcel Energy's website. The collateral includes:

- **Compressed Air Information Sheet** – Helps describe the product to customers and trade partners. Provides examples of projects that may qualify, business reasons to participate, and a summary of the procedures to follow.
- **Compressed Air Application (for qualifying prescriptive measures)** – Lists qualifying prescriptive measures. The customer fills out several sections including technical information related to the proposed and existing equipment.
- **Compressed Air Study Application** – A document that customers fill out to start the process of participation. The customer or vendor is asked to fill out several sections including information about the location, applicable rates, project description, equipment supplier, technical information about existing and proposed equipment, and project verification.
- **Participating Study Providers List** – A list of trade partners who have submitted studies in the past or expressed an interest in participating in the product. The list is provided for the convenience of customers who do not have a working relationship with a vendor. The Company does not endorse any particular provider over another and is willing to amend or add partners as the market changes.
- **Compressed Air Study Template** – A detailed example of a study that is comprehensive and provides value to customers' energy saving efforts.

E. Product-Specific Policies

Compressed Air studies and custom projects require pre-approval before purchase and installation. This process helps to minimize free ridership and it ensures the technical and financial soundness of projects that are awarded rebates. All compressed air equipment projects must have a payback period over one year.

The system requirements include:

- Electrically driven compressed air systems;
- Minimum 50 hp total installed air compressor capacity (excluding backup equipment); and
- Systems must operate at least 40 hours per week (2,000 hours per year).

F. Stakeholder Involvement

Customers, trade partners, and other stakeholders are currently engaged at the specific project level. Feedback is garnered individually from each participant and once a trend develops (positive or negative), the company makes a change to the product design. If it is a small change, it is then discussed internally and possibly with a few key trade partners and, if deemed acceptable, implemented. A larger change would possibly involve review by the product's external technical resources or other third-party.

G. Rebates & Incentives

The Compressed Air Efficiency product helps customers lower operating costs by offering rebates on compressed air studies and by providing rebates on compressed air equipment. Rebates apply to new and leased equipment, but not to used equipment. All rebates are subject to Product-Specific Policies (Section E above) and Business Program Policies.

Study rebate levels are described in Appendix G: Technical Reference Manual and are described in the study funding application as well as on the Company's website.

Prescriptive rebates for compressed air equipment are available for no loss air drains, cycling dryers, mist eliminators, dew point controls, and select variable speed drive compressors. Prescriptive rebate levels are shown in the Appendix G: Technical Reference Manual, on the rebate application, and on the Company's website.

In 2017 and 2018, the product will provide custom rebates for all other compressed air energy saving projects implemented from a study of up to \$600 per kW saved. For Custom Compressed Air projects implemented without a study, the product will provide up to \$400 per kW saved.

➤ Computer Efficiency

A. Description

The Computer Efficiency product offers upstream measures and downstream prescriptive measures—both are available to electric business customers of Public Service.

Upstream measures offer incentives to manufacturers that design, install, and deliver desktop personal computers (PCs) and server equipment with high-efficiency power supplies.

1. High Efficient Power Supply
2. Desktop personal computer (PC)s
3. Servers

Manufacturers that sign a participation agreement and turn in a claim form to the Company's third-party implementer can receive incentives to cover part of the incremental cost for installing high efficient power supplies. Manufactures typically use this incentive to promote their efficient PCs to increase the number of products offered with high-efficiency power supplies. Units are shipped to qualified zip codes (as confirmed by the manufacturer).

The third-party administrator delivers the incentive to manufacturers and provides a monthly sales report and invoice to the Company for reimbursement.

Downstream measures offer incentives to business customers who implement a Virtual Desktop Infrastructure (VDI) strategy ("Desktop PC Virtualization") or install PC Power Management Software.

4. Desktop PC Virtualization

This downstream measure provides rebates to business customers who implement a VDI strategy. This strategy involves installing a VDI device (also known as "thin clients," "zero clients" or "ultra-thin clients") instead of the traditional desktop PC. The VDI device has a lower operating wattage and uses less energy than traditional desktop computers. The VDI device communicates with a server to enable access to software applications and for the user to store data on the server rather than on their local hard drive.

This measure is administered by Public Service and follows the methodology of other prescriptive measures. Customers can apply for a rebate of \$60 per VDI installed.

5. PC Power Management

This downstream measure provides rebates to business customers who install power management software that remotely controls a computer's power management strategy from data centers or other central locations. The software, that manages the computer's power management settings, is locked and the computer user cannot override the power management settings.

The prescriptive rebate is only for applications on desktop PCs and excludes installations on laptops, tablets and other hardware. In addition, it is limited to computers used during a typical single shift workweek. The computers being controlled by the power management software must be located in the Company's electric service territory to qualify for the rebate.

B. Targets, Participants & Budgets

Targets and Participants

Energy and participation targets are developed based upon historic program performance and input from the third-party implementer.

High Efficient Power Supply: Demand kW and energy kWh impact goals were determined from equipment wattages levels based on information from the third-party implementer and ENERGY STAR[®]. Participant levels for the upstream manufacturer incentives were determined by product experience in the Company's Minnesota service territory and performance in the Colorado service territory since the program's inception.

Desktop PC Virtualization: The number of participants per year is estimated based on historical participation across the offerings and includes any predicted growth in products.

PC Power Management: The number of participants per year is estimated based on historical participation across the offerings and includes any predicted growth in products.

Budget

The program's budget was determined by looking at the Company's overall electric goal and past participation levels. The estimated M&V budget anticipates costs for both the third-party implementer's visits to customer sites, as well as their follow-up communications to customers, as detailed in the M&V section of this Plan. The main budget drivers include the following:

6. Customer Incentives – This budget reflects only the downstream rebates. This is based on historical participation across the offerings and includes predicted growth in products.
7. Implementation – A majority of the budget is allocated to the third-party implementation of the upstream product, which includes upstream incentives to computer manufacturers. Upstream incentives have been adjusted for 2017 and 2018. The internal labor budget is based on past program performance.
8. Promotion and Advertising – Budgets for direct promotion and sales support materials are included in the total budget. Promotions are targeted to customers and trade partners and typically focus around activities such as new or revised product offerings, case studies featuring successful projects, educational opportunities, and campaigns to increase specific product awareness.

C. Application Process

Manufacturers learn of the upstream incentives and the benefits through marketing by the third-party implementer. Interested manufacturers can sign up to participate in the program by contacting the third-party implementer directly.

End-use customers will learn about the prescriptive rebates for Desktop Virtualization and PC Power Management through marketing by Public Service. Customers will apply for rebates through an application process managed by Public Service. Applications for the products are available on Xcel Energy's websites. The application process for the prescriptive products is similar to our other prescriptive products. Customers may apply for rebates by completing the application and providing a detailed invoice and specification sheet for the newly installed equipment. The customers may submit for a rebate after the equipment or software has been purchased and installed. All equipment must be new and meet all the qualifications detailed on the application. After the customer has installed the equipment or software, the rebate application and invoice must be submitted to Public Service within twelve months of the invoice date. Once the paperwork is completed and submitted, rebate checks will be mailed to the customer as indicated on the application within six to eight weeks. Participants in the product may submit their application to their account manager or the Business Solutions Center.

D. Marketing Objectives & Strategies

The primary marketing efforts for the manufacturer incentives will revolve around Ecova connecting with computer manufacturers to continue increasing program participation with additional manufactures. Public Service will educate the benefits of purchasing high efficient computing products to our business customers through newsletters, Business Solution Center representatives, customer events and our websites.

Desktop Virtualization and PC Power Management product challenges include customer awareness, incremental customer costs, and educating trade partner mind-set around the technology and rebate structure. Public Service will promote the technology to the trade through: newsletters, Business Solution Center representatives trade relations managers, and our trade partner website.

E. Product-Specific Policies

For the upstream manufacturer incentive, manufacturers must submit a rebate claim form to the third-party implementer within twelve months of unit delivery to receive a rebate.

For the end-use customer rebates, all equipment rebated through the measure must be new and meet all measure rules and requirements and the application must be submitted within twelve months of the invoice date.

F. Stakeholder Involvement

Public Service consulted with equipment vendors for guidance when designing the Computer Efficiency Product for Colorado. These vendors provided insight into the types of products to rebate and the incremental and total equipment costs to be expected. Public Service will also rely on the trade to help promote the product to customers.

G. Rebates & Incentives

1) High Efficient Power Supply

It is unclear how much of the incentive paid to manufacturers is passed on to program participants in the form of reduced purchase cost. Because of this uncertainty it is assumed that the incentives paid to manufacturers should not be accounted as a rebate. If there is evidence found that the incentives paid to the PC manufacturers directly result in purchase costs lower than the incremental cost assumed in the technical assumptions, this reduction in cost will be accounted as a rebate and not as an incentive.

The incentive structure is listed below:

- \$3 incentive for ENERGY STAR 6.0 / 80 Plus Bronze desktop power supplies
- \$5 incentive for ENERGY STAR 6.0 / 80 Plus Silver desktop power supplies
- \$8 incentive for ENERGY STAR 6.0 / 80 Plus Gold desktop power supplies
- \$10 incentive for ENERGY STAR 6.0 / 80 Plus Platinum desktop power supplies

2) High Efficiency Servers

- \$5 incentive for each server meeting 80 PLUS Gold requirements
- \$15 incentive for each server meeting 80 PLUS Platinum requirements
- \$20 incentive for each server meeting 80 PLUS Titanium requirements

3) Desktop PC Virtualization

Business customers are paid \$60 per desktop PC removed from their system and replaced with a “thin-client” or “zero-client” device.

4) PC Power Management

Business customers are paid \$5 per PC controlled remotely by power management software.

➤ Cooling

A. Description

The Cooling product encourages Public Service business customers to consider high efficiency options when choosing to replace existing cooling equipment. Cooling is typically the second or third largest user of electricity for business customers.

The Cooling product offers a broad range of prescriptive rebates for high efficiency equipment options. Some cooling solutions require individual “custom” evaluations to determine the savings and rebate potential; those projects follow the guidelines of the Company’s [Custom Efficiency](#) product.

Participants receive rebates to help buy down the initial capital cost and shorten the payback period. The new equipment also provides better reliability and lower maintenance costs, as well as lower utility bills via energy savings. Public Service reviewed and adopted best practices for DSM product development and product structure from across the country. The Company also adopted the guidelines of the International Energy Conservation Code (IECC) 2015 for equipment definitions, standard formulas, and minimum recommended efficiencies. These sources, along with Public Service’s historical experience, allowed the Company to develop influential prescriptive rebates that encourage the most efficient choice of equipment in the majority of equipment categories.

Midstream measures are a newly emerging offering under this product designed to deliver incentives to market actors who sell qualifying high efficiency HVAC equipment. The logic that underscores this approach is that a small number of midstream market actors are in a position to impact hundreds of thousands of customers and influence their choice of equipment by increasing the stocking and promotion of high efficiency HVAC equipment. Distributors currently have limited stock of high efficiency HVAC equipment. This condition limits the current program’s effectiveness with replace-on-burn-out projects. The midstream model cost-effectively leverages existing market structure and relationships. The product also provides a web-based paperless rebate application system to facilitate program participant sales and invoice tracking, which further reduces administrative costs as compared with paper application processing. This feature has been shown to increase the number of participants and dramatically increase the level of participation. The Midstream measures are designed to adapt to market changes, and the Company will continue working with relevant industry players to enhance the program to include new midstream incentives for “beyond-code efficient” equipment.

B. Targets, Participants & Budgets

Targets and Participants

Cooling targets are based on the achievements of past years, estimates of market penetration, and a review of potential cooling technology efficiency improvements.

Participation was derived from prior years' (2014 and 2015) performance. Additional factors included feedback from trade partners, product participation trends, average project size, and historical participation.

The Midstream offering includes a variety of non-incentive program services intended to support customers and contractors in achieving greater energy efficiency from HVAC upgrades. Such services include:

- Education, training, and sales tools for contractors on high efficiency cooling components, controls, and features on packaged HVAC units. Trainings will include sales, marketing, cost-effectiveness (ROI), and financing of these features.
- Improved comfort and indoor air quality for customers.

Budgets

Historical cost and participation information was analyzed to project expenditures. External resources and discussions with local stakeholders were used to ascertain expenditures and market equipment cost. Comparative spending analysis of past year activity is generally conducted but is not the determining factor, since other external variables like promotions, materials, and staffing influence future costs.

Rebates, incentives, labor, and promotions influence the budget:

- *Rebates:* Developed using the average project rebate cost from the detailed technical assumptions, multiplied by anticipated participation levels.
- *Administration:* Determined by estimating the number of full-time employees needed to manage the product and execute the marketing strategy and rebate process, including Account Management and BSC support.
- *Promotions:* The estimated promotional budget anticipates several customer and trade partner communications and events during the year.

For the midstream offering, external resources and discussions with local stakeholders are leveraged to ascertain the market potential for HVAC equipment. Incentives and third-party implementer costs influence the budget:

- *Incentives:* Midstream incentives to HVAC distributors influence the sale of high-efficiency products to contractors, thereby increasing the availability of these products for customers in the marketplace.
- *Administration:* A third-party implementer will facilitate recruiting of distributors, design and management of the web-based paperless rebate application, and process individual applications. Internal administration and advertising costs are minimal; Account Management and BSC budgets are not required. Rebate Operations costs are minimal.

C. Application Process

Prescriptive Measures:

Applications for the product are available from trade allies and on Xcel Energy's website.³¹ Customers may apply for rebates by completing the prescriptive Cooling application and providing a detailed purchase invoice for the newly installed equipment. The equipment must be new and meet all the qualifications detailed on the application. After the customer has installed the equipment, the application and invoice must be submitted to Public Service within twelve months of the invoice date. Applications may be mailed to Public Service or submitted directly to participants Account Manager or the BSC. Once the paperwork is received and processed, rebate checks will be mailed to the customer, or alternate recipient, as indicated on the application, within six to eight weeks.

Midstream Incentive:

A critical component of the midstream measure is its use of a web-based paperless application. A paperless system is critical for ease of participation and for reducing the cost per kWh saved. Incentives will be paid to participating distributors on a bi-weekly basis. The distributor must submit the following information into an online application in order to receive the incentive:

Qualifying Equipment Information:

1. Manufacturer
2. Model
3. Number of units installed
4. Unit Serial numbers

Installation Site Information:

5. Business name and address where the equipment is to be installed
6. Contact information (customer, or contractor, or installer)

Sales Information:

7. Invoice number and date

Custom Cooling:

Customers with projects that save cooling energy, but do not have a corresponding prescriptive rebate, can submit custom cooling projects for evaluation under the Custom Efficiency product, with preapproval.

The sales cycle for cooling projects is typically influenced by the size and complexity of equipment. It may take two years to study, purchase, and install a new, large system, while smaller rooftop units (RTUs) can take only two weeks to replace. For this reason, the Cooling product makes every effort to remind customers to evaluate high efficiency options when they are faced with a purchasing decision.

³¹ http://www.xcelenergy.com/Save_Money_&_Energy/Rebates/Cooling_Efficiency_-_CO

D. Marketing Objectives & Strategies

The Cooling product creates a base level of knowledge in the marketplace through newsletters and direct mail to customers and trade allies. These tactics make customers aware of the key benefits of energy efficiency and its applicability to cooling systems, and gives the trade a platform from which to educate customers on high efficiency solutions for their particular applications. The product provides literature and tools for the customers and trade to evaluate rebates and incorporate them into purchase decisions. In addition, customers are served by Public Service's Account Managers and BSC who educate them on energy efficiency, evaluating rebate potential, and the rebate application process. The trade can find similar assistance through the Trade Relations Manager. The Cooling product also benefits from opportunities identified for participants via the Company's Business Energy Analysis and Recommissioning products.

Marketing communications will revolve around the benefits of energy efficiency through paybacks, lifecycle costs, and environmental benefits. Newer cooling equipment is typically more efficient, more reliable and may have more effective controls than an older system providing both energy and non-energy benefits to the end user. Public Service uses generally accepted information from sources such as ENERGY STAR[®], the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE), the Federal Energy Management Program (FEMP), and others to educate customers on no- and low-cost ways to save energy, such as performing regularly scheduled maintenance and simple tune-up tips to ensure systems are operating optimally.

To reach its energy savings target, Cooling needs to continue to penetrate the centrifugal chiller market. These systems provide the largest per project savings for the lowest transactional costs, making them the most cost-effective opportunities. The product has been successful in penetrating this market through strong relationships between Public Service account managers and customers and increasingly strong relationships with the trade. Custom cooling strategies, such as cooling controls have been identified as an area of growth. Future strategies will involve more online tools to help customers evaluate the benefits of high efficiency equipment. Rebate and payback calculators, as well as lifecycle costing tools, have recently been developed for vendors and customers to improve their decision making process when purchasing equipment. Online submission of rebate applications will also be a priority.

The Company also intends to explore other potential prescriptive rebates to add to the portfolio.

Why target distributors?

1. Distributors control equipment stocking and sales.
2. Influence contractors' purchase decisions which influence customer purchases.
3. Minimize downstream markups and lost opportunities.
4. Fewer market actors enable lower implementation costs.
5. Meets customer's demand for immediate replacement.
6. Distributors influence majority of equipment sales.
7. Most qualified sales staff with financial, technical, and sales skills.

E. Product-Specific Policies

The prescriptive Cooling product does not rebate back-up equipment because deemed energy savings will not be realized. In addition, portable equipment is not eligible for a rebate.

For the midstream approach:

Qualifying Distributors: A qualifying distributor is an entity that purchases qualifying equipment directly from the manufacturer and sells such equipment to be installed at a qualifying customer's facility. A vendor who purchases equipment from a distributor does not qualify. Under certain circumstances, a manufacturer and/or a manufacturer's representative may serve as its own distributor and sell directly to the end-use customer. In this case, the manufacturer/distributor can qualify.

Qualifying Customers: Must be commercial electric customers in Public Service's service territory.

Qualifying Equipment: Qualifying equipment must be new and permanently installed at the end-use customer. Currently qualifying equipment includes RTUs, split systems (including fan coil units) consisting of one evaporator and one condenser, condensing units, packaged terminal air conditioners/heat pumps, water source heat pumps (PTACs/PTHPs), and air-cooled chillers. Downstream rebates will not be available for these equipment types.

F. Stakeholder Involvement

Because cooling systems can be very complex, trade partner support is imperative to achieving the product's energy savings and participation targets. The Company has engaged trade allies in product design and improvement through the creation of a Cooling Council. This group meets twice per year to discuss new technologies, product issues, and general market topics. The Cooling Council members are representatives from all levels of the cooling equipment distribution chain. Members include manufacturer's representatives, mechanical engineering firms, and equipment contractors.

A successful market transformation program—the midstream approach—rests on the coordination of efforts across many stakeholders. The most successful market transformation programs have involved multiple organizations, providing overlapping market interventions.

G. Rebates & Incentives

Most of the components of the product provide prescriptive rebates based on the size of the unit in tons combined with an efficiency bonus to encourage customers to exceed minimum qualifying efficiencies.

Generally, Public Service has set the minimum qualifying efficiency at a point that nominally exceeds the IECC 2015 minimum efficiency requirements to encourage customers to purchase the most efficient equipment, while ensuring that manufacturers have equipment that meets the criteria of the product.

The proposed rebate level averages approximately 60% of the incremental cost. This level balances the cost-effectiveness of the product with the incentive needed to motivate the customer to purchase efficient equipment, achieving a payback of less than five years in most cases. Rebates are designed to buy down the incremental cost of purchasing efficient equipment, which is increasing with the stricter code requirements in the market.

The midstream approach provides distributor incentives based on the size of the unit in tons.

➤ Custom Efficiency

A. Description

The Custom Efficiency product offers custom electric and gas rebates to all business customers who install qualifying energy efficiency measures not covered under traditional prescriptive products.

The product also provides study funding up to 75% of the study cost—not to exceed \$25,000—to help customers identify project savings.

Many types of energy saving measures may not be eligible for a prescriptive rebate, but could be eligible for a custom rebate, including, but not limited to, the following:

Equipment	Application
Compressed Air	New equipment, reduction in horsepower (hp) of compressors, storage, vacuum pumps, and variable speed drive compressors, reduction of compressor run time
Controls	CO ₂ based ventilation, compressed air and refrigeration controls
Cooling	Heat recovery, process cooling and controls
Lighting	Lumen output changes, exterior lighting, LED and daylighting, retrofits (not one-to-one)
Miscellaneous	Energy efficient windows (film, argon, Low E), humidification, insulation, printing presses, welders, and elevator modernization (DC to AC motor conversion)
Motors & Drives	Motors > 200 hp, Drives > 200 hp, any motor type outside the prescriptive program parameters, and Drives for non-fan, non-pump processes.
Refrigeration	Ammonia compressors, freezer doors, and evaporative condensers
Process changes	<ul style="list-style-type: none"> • New system produces more output than the old system while using the same amount of energy as the old system. • New system produces the same output as the old system using less energy. • Reconfigure system layout.

B. Targets, Participants & Budgets

Targets and Participants

The energy savings target was determined by looking at both historical performance and projects that are currently in the product pipeline, as well as consideration of current economic conditions.

The participation target was derived from historical product performance over the last three years, in particular from the 2015 average project size and mix of custom technologies.

Budgets

Historical cost and participation information is tracked and analyzed to project future expenditures. For the Custom Efficiency product, administration, advertising, and customer rebates are the primary budget drivers:

- *Administration:* Custom Efficiency is a labor-intensive product due to the intensive pre-approval process and analysis components.
- *Advertising:* The budget supports marketing of DSM resources to business customers.
- *Rebates:* The budget for rebates is established based on an estimation of participation levels, multiplied by the rebate per kW amount in the technical assumption models.

C. Application Process

The application process for custom projects is more involved than those for prescriptive measures. Each custom project must meet specific eligibility requirements. This process can be broken into distinct steps: Application Submission, Project Analysis, Project Acceptance or Rejection, and Project Completion:

Application Submission:

Account Managers and/or the BSC work with a customer and their vendor to identify a project with energy efficiency opportunities and start the application process. In addition to the two-page application which must be signed by the customer, an electronic “workbook” must be filled out with a detailed description of the project.

Project Analysis:

Engineers review the project information and enter pertinent data into a Modified Total Resource Cost (MTRC) test model to determine the projected energy savings, benefit/cost ratio and payback. The model calculates energy savings for various end-uses (lighting, motors, cooling, compressed air, etc.) to ensure consistency in analysis from one project to another. All calculations are based on approved American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) methods or other similar industry standards. Based on the modeled results, the project either passes or fails.

Project Acceptance or Rejection:

Once the engineers have completed the analysis, an approval or rejection letter is sent to the customer. The letter provides critical information regarding the project, including: project rebate amount, project description and costs, energy savings, and any conditions that must be met to receive the rebate (e.g., measurement and verification). Should a project be rejected, a rejection letter is sent to the customer with an explanation as to why the project was not approved.

Project Completion:

When a project is completed, the customer will inform their Account Manager or Energy Efficiency Specialist. The customer and Account Manager or Energy Efficiency Specialist sign the verification section of the application and submit it along with copies of invoices and other required information as stipulated in the approval letter. If the final documentation

matches the approved project information, the project the paperwork is submitted to Rebate Operations for issuance of the rebate.

Occasionally, projects must undergo re-analysis because the final project parameters do not match the original project application. This may be due to minor changes in project scope, changes in final project cost, or the purchasing of similar, but not identical, equipment to what was analyzed during the approval analysis. In these cases, the actual project information will be given to the technical staff for review and re-analysis. The original analysis will be updated with the new information to determine if the project still meets passing criteria. A passing project will be awarded a rebate based on the calculated savings from the updated analysis. A project that fails on re-analysis will not be issued a rebate.

D. Marketing Objectives & Strategies

Marketing is conducted primarily by Account Managers, leveraging their direct relationships with customers. In addition, the Company will use the following strategies to achieve the product's energy savings targets in 2017 and 2018:

- *Target Industrial Customers.* Colorado's industrial base is relatively small, but these few customers offer tremendous opportunity. Many of the opportunities will come from specialized applications or processes requiring a greater insight into the individual customer's operations. To achieve this, the Company relies heavily on leads from Account Managers and outreach to the vendor community.
- *BSC Energy Efficiency Specialists.* The BSC provides direct support to the non-managed commercial customers.
- *Use of Collateral.* Public Service has developed a broad range of marketing collateral for the product; this information is available in electronic format on Xcel Energy's website³² and in hard copy format for customers, trade allies, and internal Public Service staff. This material is continually reviewed and revised based on feedback from participants, and as changes are made to the product. The key collateral includes:
 - Custom Efficiency Brochure – This is the primary tool for Account Managers that helps describe the product to customers and trade allies. It provides examples of projects that may qualify; business reasons to participate; and a summary of the procedures to follow.
 - List of Potential Projects – Project types that have fared well in Colorado and Minnesota serve as the basis for this list. The list includes both electric and natural gas conservation measures.
 - Trade Partner Website³³ – This resource was designed specifically for the Company's trade allies. It includes all of the collateral indicated above and other helpful information.

³²http://www.xcelenergy.com/Programs_and_Rebates/Business_Programs_and_Rebates/Equipment_Rebates/Custom_Efficiency

³³http://www.xcelenergy.com/Partners/Trade_Partners/Business_Trade_Partners/Custom_Efficiency_for_Trade_Partners

- Energy Exchange – A quarterly email newsletter that goes out to all trade allies who have registered to be part of the trade ally network.
- Custom Specific Workshops – Workshops will be conducted for vendors and/or customers to communicate project opportunities specific to custom end-use situations.

E. Product-Specific Policies

All custom projects must have an MTRC ratio of equal to or greater than 1.0; and a simple payback of over one year, and less than the estimated life of the product to be eligible for a rebate. Rebates are capped at 60 percent of the incremental project cost.

F. Stakeholder Involvement

Customers, trade allies, and other stakeholders are engaged at the project level to gather input regarding best practices, methods, and support for evaluating new technologies.

G. Rebates & Incentives

Rebates apply to new and leased equipment. Used or portable equipment are not eligible. To determine eligibility for a rebate, all projects are analyzed as described in the application process. Rebates are calculated based on the demand reduction (kW) yielded by the project. Additional details are identified in the Electric and Natural Gas Forecast Technical Assumptions within Appendix G: Technical Reference Manual. For 2017 and 2018, Public Service is maintaining an incentive level of \$400 per kW for electric energy savings projects and \$4 per Dth for natural gas savings projects.

➤ Data Center Efficiency

A. Description

The Data Center Efficiency product helps customers address energy conservation opportunities in both new and existing data centers. This specialized product was designed in response to the significant energy savings potential of these customers, and their projected growth in energy use in data centers.

There are numerous ways data centers can become more energy efficient, including:

- High Efficiency Servers
- Server Virtualization/Consolidation
- Airflow Improvements
- Electrical Equipment
- High-Efficiency Cooling
- Humidification
- Power Systems
- High-Efficiency Lighting
- Electrically commutated (EC) plug fans
- Plate and frame heat exchangers

Any size data center may participate. The product encourages a holistic approach to energy efficiency within the data center.

For existing facilities, the product provides funding toward an onsite evaluation and analysis and rebates based on the energy savings resulting from implementation. Projects will be analyzed and rebated using a custom model. However, prescriptive rebates for EC plug fans and plate and frame heat exchangers are available. Data center customers can also apply for prescriptive equipment rebates from other products offered in the Company's DSM portfolio.

For new facilities, the product delivers expert knowledge and resources to help data center owners optimize the efficiency of their facilities during the siting, design, and early construction and operation stages of the new data center. Aligned closely with the design of the Energy Design Assistance (EDA) offering within New Construction (for commercial new construction projects), this new Data Center offering will provide free consulting during the site selection and design phases of new data center construction projects, and provide financial incentives to offset the increased costs of more advanced energy systems. The product commences with the customer's first discussions with Xcel Energy regarding siting of a new data center and ends after construction and occupancy of the last in-scope portion of the data center.

Public Service maintains a list of approved study providers to perform data center studies and analysis. Study paths leverage the study providers, who have been provided training on Company tools, to conduct the analysis.

B. Targets, Participants & Budgets

Targets and Participants

Electric energy savings and participation targets were determined by looking at historic participation and identified projects since the 2009 product launch through 2015.

In the new construction market, the Company plans to promote this offering to owners and developers of new data center facilities. For 2016, the Company expects three new projects to begin design assistance in this sector.

Budgets

Budgets were developed commensurate with the electric energy savings target, based on historical cost of achievements. The largest cost in the budget is for energy efficiency project implementation and study rebates.

C. Application Process

Customers learn about the product through a variety of channels, including: the Xcel Energy website, Account Managers and trade partners or study providers. In addition, the Company will identify data center experts to help with education of the product to customers. Product applications are available through all of these channels. Customers may submit an application through their account manager or a trade partner, or send it via mail or email to Public Service.

Customers building a new data center need to submit their application in the early phases of design to ensure recommended strategies are included in final design plans. The data center design study will follow the New Construction product's Energy Design Assistance guidelines for facilities.

Preapproval is required to receive rebates for studies and custom measures. Prescriptive measures do not require preapproval and will be rebated for implemented projects.

D. Marketing Objectives & Strategies

The marketing strategy for Data Center Efficiency leverages a variety of channels, including Account Managers, trade relations managers, professional organizations, and direct customer communications. The goal of the Data Center Efficiency product is to build and/or retrofit data centers, with their copious electronic equipment, to be as efficient as possible. Because the market for this product is so specific, Public Service will have Account Management focus on recruiting data center customers to participate. Face-to-face contact with our customer base is necessary to engage them in the product. The Company will also conduct meetings with study providers and design firms to provide rebate information and other support for customer engagement.

Soliciting Data Center Efficiency participation has typically required significant marketing effort to influence customers; many are reluctant to make changes to their mission-critical operations, and upgrades require agreement across many function areas.

E. Product-Specific Policies

Existing Facilities

Customers may perform a study by selecting a pre-qualified study provider³⁴. If they select a provider who is not on the Company's list, the new provider will be required to submit qualifications prior to receiving study funding approval.

The Company typically evaluates measures identified within a study as one project, based on the customer's indication to implement all measures included in the project. Preapproved projects must be cost-effective. If at least two years has passed since a project was approved, the technical staff will re-analyze it to determine if the savings/payback has changed. This re-analysis is conducted prior to issuing a rebate check.

Studies, once preapproved, need to be submitted to Public Service within three months of issuance of the preapproval letter.

New Facilities

To participate in this measure, customers will work directly with contracted agents of the Company who will facilitate the integrated design and modeling components of the measure. The choice of contracted providers is influenced primarily by the fact that the new Data Center market is highly dynamic and complex. To manage the risk introduced by this complexity, the Company chose to move forward with a limited provider delivery model. As the market evolves, the Company will evaluate the potential to open the consulting services of this measure up to other providers in a manner similar to the existing Data Center Efficiency studies and EDA offerings.

F. Stakeholder Involvement

As part of the product design effort, prior to the 2009 product launch, Public Service conducted focus groups with data center facility managers and one-on-one interviews with information technology executives in order to better understand their needs and interest in energy efficiency.

The Company continues to develop collateral and education materials to support the product. As participant feedback is received, suggestions will be evaluated for feasibility of incorporating changes.

³⁴ <http://www.xcelenergy.com/staticfiles/xcel/PDF/Marketing/CO-BUS-Data-Center-Efficiency-Provider-List.pdf>

Xcel Energy has been an active participant in the Consortium for Energy Efficiency (CEE) Data Centers and Servers Initiative.³⁵ The initiative focuses on collaboration among utilities striving for energy efficiency standards for data center equipment, including knowledge sharing data center efficiency product development.

Xcel Energy is also a member of AFCOM³⁶, the leading association of data center and facilities management professionals.

G. Rebates & Incentives

Data Center Efficiency studies for existing facilities will be rebated up to 75% of the incremental study cost not to exceed \$25,000. This cap may be reevaluated if a very large data center is being reviewed.

Prescriptive rebates will be applied where applicable, and all other energy efficiency upgrades will be handled through a custom analysis. Individual custom projects will be rebated at up to \$400 per kW saved. Additional promotional incentives may be considered, depending on the expected impact on market penetration and product cost-effectiveness. For new facilities, incentive levels will follow those of EDA.

³⁵ <http://www.cee1.org/content/committee-work>

³⁶ <http://www.afcom.com/>

➤ Energy Management Systems

A. Description

The Energy Management Systems product features two options—energy management systems (EMS) and energy information systems (EIS).

Energy Management Systems (EMS) Measures

EMS offers customers consultation and rebates for installing systems that control and reduce a building's energy usage both on- and off-peak. Electric and natural gas customers are eligible for participation in this product.

An energy management system is a system of controls and sensors that are centrally operated, typically via a computer software package. Through automatic programming, such systems may control the heating, cooling, ventilation, and lighting in a facility. Systems covered in the product include new energy management systems in an existing building, replacing a non-functional EMS, replacing an obsolete EMS, or adding functionality to a current system.

The duplication of existing systems does not qualify for a rebate under the EMS product. Potential measures that pair well with the EMS product are shown in the table below.

EMS Components

Scheduling <ul style="list-style-type: none"> • Holiday scheduling • Zonal scheduling • Override control and tenant billing • Night setup/setback • Optimum start • Optimum stop • Morning warm-up/cool-down 	Resets <ul style="list-style-type: none"> • Supply air/discharge air temperature • Hot deck and cold deck reset • Entering condenser water temperature • Chilled water supply temperature and pressure • VAV fan duct pressure and flow 	Miscellaneous <ul style="list-style-type: none"> • Simultaneous heating/cooling control • Zone-based HVAC control • Chiller staging • Boiler control • Building space pressure • Variable speed drive control • Heat recovery
Ventilation Control <ul style="list-style-type: none"> • Carbon dioxide sensing • Occupancy sensing with central programming • Supply air volume/OSA damper compensation routines • Exhaust fans 	Lockouts <ul style="list-style-type: none"> • Boiler system • Chiller system • Direct expansion compressor cooling • Resistance heat 	Lighting <ul style="list-style-type: none"> • Lighting sweep • Occupancy sensors • Daylight dimming • Zonal lighting control
Air-Side Economizers <ul style="list-style-type: none"> • Night ventilation purge 	Energy Monitoring <ul style="list-style-type: none"> • Whole building or end-use • KWh or demand 	Demand Control <ul style="list-style-type: none"> • Demand limiting or load shedding, when in conjunction with other energy savings controls • Duty cycling

Energy Information Systems (EIS) Measures

The Company added a group of EIS measures to the EMS product in 2015. These new measures expand the EMS product to add visualization and analysis of real-time energy data from across a customer's facility via an EIS. EIS enables customers to expand the energy savings from an EMS to include identification and implementation of low-cost recommissioning measures as well as behavioral and operational energy savings measures. Leveraging support from experts in the field of strategic energy management (SEM), the Company helps customers put the appropriate data collection systems in place to accurately describe the energy performance of their facilities and associated energy systems. Information from the data collection systems will be sent to a Web-based visualization and analytics tool (known as an EIS) of the customer's choice, where both the customer and Company staff will be able to interpret usage patterns, identify opportunities for energy savings, and ultimately verify that energy savings were achieved as a result of implementing those opportunities. Services provided to commercial and industrial customers that invest in EIS will include SEM consulting, real-time data visualization and analytics software, and energy efficiency opportunity identification.

This product is typically delivered in phases; each phase is defined in a Memorandum of Understanding (MOU) between the Company and the customer that is customized to reflect the needs of the specific customer.

Phase 1: Setup

Before the customer selects an EIS solution provider, the Company will work with the customer to identify the customer's metering and communications needs, existing sources of data, and opportunities to improve data collection through new metering or data logging equipment for the site. At this time, the Company and the customer will establish a common understanding of goals for the metering solution as well as the definition for how efficiency for each building and system is characterized. The Company will pre-qualify EIS providers, to ensure solutions will enable accurate and reliable M&V for the program, and help customers select an EIS provider that meets their specific needs. Once the system installation is verified and approved, an installation incentive will be paid to help overcome the first cost of EIS investment.

Phase 2: Treatment

Once the EIS is operational it will take a period of time to sufficiently capture the data required to inform the identification of energy efficiency opportunities. These opportunities are expected to arise in a variety of behavioral, operational, and capital forms. Frequent communication with the customer and thorough documentation throughout this phase will be required to ensure that new measures are discovered and implemented.

Phase 3: Verification

On an annual basis, an analysis will be compiled that delineates savings achievements from each primary measure identified in Phase 2. Capital measures will be analyzed and incented using the "bottom-up" analysis methods through the Company's prescriptive and custom programs. Bottom-up calculates the energy savings for each specific energy saving measure and adds them all to get the overall savings in the facility. Behavioral and no-cost operational measures will be analyzed using a "top-down" method completed

through multi-variable regression modeling embedded in the EIS tool. The top-down model calculates the energy savings based on the whole facilities usage.

EIS services will create three types of new savings measures within the EMS product. While these measures are expected to be the predominant measure types identified through and attributed to the EIS, the Company anticipates identification of additional capital improvement opportunities that can be captured through participation in other DSM products as well.

Measure Type	Description
New system or process automation opportunities	Measures that consist of equipment and processes whose automation capabilities don't currently exist or are underutilized. By identifying and applying appropriate control measures, incremental energy savings can be achieved.
Low- / no-cost recommissioning opportunities	Measures that address failure or underperformance of installed systems and equipment that can be fixed by making small adjustments, typically not requiring new equipment.
Behavioral or operation opportunities	Measures that require manual intervention to achieve energy savings that may not be feasible through system automation.

If the customer chooses to participate in EIS, the Account Manager will coordinate the walk-through of the customer facility as described in Phase 1 above. The customer's formal acknowledgement of planned participation in the product begins with the customer signing the MOU at this stage.

The Company views the signing of the MOU as formally establishing a date of influence for all projects completed under the umbrella of the product. Conditional preapproval is established for the measures the customer chooses to pursue after signing the MOU.

Measurement and Verification (M&V) of EIS Energy Savings

To ensure persistence of savings, the Company will follow appropriate monitoring guidelines and participants will be held to those requirements in return for eligibility toward incentives related to energy-efficiency activities pursued. The table in the [EM&V section](#) of this Plan describes the protocols for verifying savings from each of the EIS measure types.

B. Targets, Participants & Budgets

Targets and Participants

For 2017-2018, EMS energy savings and participation targets were established considering recent product trends, average project size, and the product's historical performance. For EIS savings and participation, The Company utilized trade partner and industry expert feedback.

Budgets

Historical costs and anticipated participation levels guided budget development. The product's budget is driven by rebate, consulting and labor costs:

- *Rebates* – The budget for rebates is estimated using historical data and analyzing anticipated payouts per kW, kWh, and Dth.
- *Third-party provider* – Initial project analysis is conducted by a third-party implementer, whose work is reviewed by the Company's in-house engineering staff. With the addition of the EIS measures, the provider may also perform the SEM consulting role to help identify energy-efficiency opportunities for customers.
- *Internal labor* – EMS is a labor-intensive product due to the preapproval process and analysis component of the product. Labor is usually less than one-fifth of the total cost of the product.

C. Application Process

The application process for the EMS product is similar to the Custom Efficiency product or end-use study where each project is individually analyzed and preapproved prior to installation. Applications must be signed by the customer but can be submitted by other participants including: building owners, contractors, engineering firms, energy services companies and equipment vendors. The general application steps and requirements are as follows:

1. Application Submission

Typically, the Company's account management team works with a customer and their vendor to identify a project with energy efficiency opportunities and starts the application process. The application form is available from Account Managers as well as on Xcel Energy's website.³⁷ The scope of work (SoW) provided by the vendor to the participating customer must be included with the application form submitted to the Company. A well-defined SoW must include enough detail to allow the Company's internal engineers to analyze the savings opportunities. Details should include at minimum:

- *General Building Information* – Total building square footage as well as square footage to be controlled, year built, building use type, and annual electric and natural gas use.
- *Type of Equipment In Use* – Includes lighting fans/air handling, cooling and heating, and each piece of equipment's specifications and operating conditions.
- *Process* – Existing and new connected kW and operating hours; existing and new gas BTUh and full load hours.
- *Controls* – Existing and new temperature setbacks and resets, outside air optimization, DDC conversions, variable air volume boxes.

In 2015, the Company launched a Custom Workbook application for EMS, using Microsoft Excel.

³⁷

http://www.xcelenergy.com/Programs_and_Rebates/Business_Programs_and_Rebates/Equipment_Rebates/Energy_Management_Systems

2. Application Review

Upon receipt of a completed application (along with a scope of work) the application is reviewed for completeness and the project is entered and tracked by the Company's DSM management system

3. Project Analysis

The Company's third-party consultant completes an initial analysis of the project application. The consultant reviews the project information and enters pertinent data into a spreadsheet model to determine the projected energy savings, benefit-cost ratio and payback. The model enables consistency in analysis from one project to another. For the EMS measures, all calculations are based on approved American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) methods or other similar industry standards. For the EIS measures, calculations will involve a combination of methods, including established engineering literature and statistical modeling utilizing multi-variable regression analysis.

Based on the modeled results, the consultant will suggest preapproving or rejecting the project and provide the results to the Company's internal engineering staff for review. Should an error be discovered, documentation will be sent back to the consultant for re-analysis.

4. Project Acceptance or Rejection

Once the project analysis is approved, a preapproval letter is sent to the customer. The preapproval letter provides critical information regarding the project, including potential project rebate amount, the project description and costs, and any conditions that must be met to receive the rebate (e.g., measurement and verification). Should a project be rejected, a rejection letter is sent informing the customer of why their project is not eligible. A copy of the preapproval or rejection letter is also sent to the Account Manager. All project documents, including the application, specification sheets, proposals and the analysis model are held by the Company.

5. Completion

The final step in the process is verification that the project was implemented. The customer fills out the verification section of the application and provides invoices for the completed project. Customers may submit American Institute of Architects project continuation sheets in lieu of invoices. The Company checks the completed documents for any variances from the project proposal, including cost variances of 10% or more. Projects with variances are re-analyzed for rebate and impact adjustments.

D. Marketing Objectives & Strategies

Marketing is primarily conducted by Account Managers, leveraging their direct relationships with customers. In addition, the following strategies will help meet product energy savings targets in 2017-2018:

Collateral

Customers and trade partners can access material electronically on Xcel Energy's website.³⁸ Marketing materials include:

- *Product Information Sheet* – The primary tool for sales staff that helps describe the product to customers and vendors. It provides examples of qualifying projects, business reasons to participate, and a summary of procedures.
- *Product Application and Worksheet* – The document that customers fill out to start the process of participation. The customer or vendor is asked to fill out several sections including information on the business location, Account Manager, applicable rates, project description, and technical information related to proposed and existing equipment, equipment supplier and project verification upon completion. The worksheet aspect is used to gather all of the necessary information about the project and the building. Filling out the worksheet completely enables a smooth analysis process.

Vendor Communications

The Company will continue to communicate to all EMS/EIS vendors via email and during site visits. Each contact reminds vendors that the product exists and how they can take advantage of it with their customers. Communications may also include links to tools that will help with project analysis.

Other efforts to further strengthen relationships include:

- *Energy Exchange* – a quarterly email newsletter that goes out to all vendors who have registered to be part of our trade ally network.
- *Product Training* – Our site visits with trade partners usually include a program review and/or product training for vendor employees.

Target Market

All commercial and industrial customers within the company's service area are eligible to participate. For the initial EIS measure offering, the Company expects that its largest, most engaged and progressive customers will participate. As EIS matures and case studies are created, more customers are expected to take interest.

The bulk of energy management systems are installed in commercial facilities (office buildings, schools, etc.). The product focus is on managed accounts and large unmanaged accounts. Approximately 80% of these customers are concentrated within the Denver metro area, thus marketing campaigns are focused in this area. Additional information on target markets includes:

Primary Market: The primary target is a large business customer with any of the following characteristics:

- Demand of 500+ kW;
- Facilities built before the 1990s;

- Interest in newer building automation technologies; or
- Facilities with large cooling or refrigeration needs.

Secondary Market: The secondary target is a small business customer with any of these characteristics:

- Demand of 100 kW to 500 kW;
- Have limited internal resources to purchase, install and finance projects; or
- Have limited technical expertise.

The product is also marketed to trade partners, which primarily consist of:

- Manufacturers of equipment;
- Electrical contractors;
- Mechanical contractors;
- Design engineers; and
- Architects.

E. Product-Specific Policies

Much like the Custom Efficiency product, EMS projects require:

- preapproval before any equipment is purchased or installed, or any contracts are signed or binding commitments are made;
- an mTRC ratio equal to or greater than one; and
- a payback between one and 15 years based on the analysis.

Information pertaining to minimum requirements is included on the application.

F. Stakeholder Involvement

Customers, trade partners, and other stakeholders are currently engaged at the project level. Feedback is garnered individually from each participant. The Company works with these stakeholders to identify product trends that may require changes to product design. If it is a small change, it is then discussed internally and possibly with a few key trade partners and, if deemed acceptable, implemented (or a 60-Day Notice is initiated, if required). Significant changes may involve additional review by external technical consultants or other third parties.

G. Rebates & Incentives

EMS offers electric rebates of up to \$600 per kW of demand reduction and natural gas rebates of up to \$4 per Dth saved. Rebate amounts are based on the project performance and cost-effectiveness.

EIS offers an incentive of up to 30% of the system installation costs to help cover up-front costs, once verified and approved.

➤ Heating Efficiency

A. Description

Public Service's Heating Efficiency product provides rebates for business customers who purchase high efficiency natural gas or dual-fuel commercial equipment for space heating, water heating or process heating loads less than 30 percent. Available rebates are designed to promote the installation of high-efficiency equipment that improves combustion and seasonal efficiency above standard levels for both natural gas and electricity. While this product is only available for Public Service's retail natural gas and electric business customers, those who choose to switch from a third-party natural gas provider can also be eligible for natural gas measures. This product is not available for *Gas Transport Only* customers. The product has several components which include: hot water boiler systems, furnaces, water heaters, boiler auxiliary equipment improvements, pipe insulation, boiler tune-ups and other unique (custom) heating systems. The product's electric component provides a rebate for Electronically Commutated Fan Motors (ECMs) for commercial furnaces—either as a retrofit or new furnace option. The Company is also adding a new prescriptive measure, Unit Heaters. This measure will allow for both natural gas and electricity savings, offer low install costs, and is able to heat large volume areas without requiring extensive duct systems. The details for each product measure are described below.

1. Hot Water Boiler Systems

Public Service rebates hot water boilers that exceed the minimum efficiency levels established by 2015 International Energy Conservation Code (IECC) standards. IECC requires a minimum efficiency of 82% on 2,500 MBTUH or larger units and requires a minimum efficiency of 80% on hot water boilers less than 2,500 MTUH. Rebates are eligible for the installation of a new condensing boiler where either no previous boiler existed or the current boiler is no longer functional, for two possible scenarios:

- Plan A-1 – Boilers equal to or above 85% efficiency; or
- Plan A-2 – Boilers equal to or above 92% efficiency.

2. Furnaces

Furnaces must have a minimum efficiency of 92% Annual Fuel Utilization Efficiency (AFUE), which aligns with ENERGY STAR® guidelines. Furnaces of 94% AFUE or higher receive a larger rebate. ECMs for furnace fans allow the motor to adjust its speed to ensure the optimal airflow at all times using significantly less electricity to deliver air in both the heating and cooling seasons.

3. Water Heater Systems

Public Service rebates commercial water heating systems that exceed the minimum efficiency levels established by the 2015 IECC standards. These can be either tankless or storage systems, greater than 150 MBTUH and more than 92% efficiency.

4. Boiler Auxiliary Equipment Improvements

The performance of a boiler system can be enhanced with controls and system efficiency improvements. Boiler auxiliary equipment rebates are based on the incremental cost of efficient equipment and are calculated based on a percentage of the project cost (i.e. how much it costs to perform that portion of the project, not the entire project cost). Rebates for tune-ups are available on the same boiler every two years. The following will be rebated:

a) Boiler Tune-Ups

Must include the following activities in order to qualify:

- Measurement of combustion efficiency using an electronic flue gas analyzer at steady state conditions
 - Test results of the electronic flue gas analyzer must be included with the application
- Adjustment of air flow and reduction of excessive stack temperatures
- Adjustment of burner and gas input, manual or motorized draft control
- Cleaning of burners, combustion chamber and heat exchanger surface, when weather or operating schedule permits
- Cleaning and inspecting the burner nozzles
- Checking for proper venting
- Completing visual inspection of system piping and insulation
- Checking safety controls
- Checking adequacy of combustion air intake

b) Boiler Efficiency Retrofits

- Modular burner controls (addition of controls to existing equipment)
- 5:1 turndown ratio or greater
- Outdoor air reset controls
- Stack dampers
- Steam trap replacement/parts

c) Pipe Insulation

- Insulation rebates are for boiler or water heater pipes and are based on the pipe's diameter, R-value of the insulation, and the linear feet of insulation.

5. Unit Heaters

Electricity savings for the non-condensing power vent unit heater and condensing unit heaters are for the fan that is associated with a unit heater; infrared unit heaters do not have a fan.

Rebates are for customers who install:

- A non-condensing power vent unit heater with a minimum efficiency of 83%
- A condensing unit heater with a minimum efficiency of 90%
- Infrared heater with a minimum efficiency of 80%

6. Custom Boilers

Equipment installations performed outside of the prescriptive scope may be eligible for rebates available through the Custom Efficiency product. All projects require preapproval prior to purchase and installation and must conform to all Custom Efficiency product guidelines. More Custom Efficiency rebates and guideline information can be found on the Company's website.³⁹

These projects require individual evaluation to determine how much energy will be saved and to ensure cost-effectiveness. Projects that typically fall under the custom category include, but are not limited to:

- Large boiler systems (greater than 10 million BTUH)
- Carwash boilers
- Pool boilers
- Boiler control systems
- Process loads

B. Targets, Participants & Budgets

Targets and Participants

Project pipeline and market potential were evaluated to determine participation and energy savings targets. Participation increased rapidly through the first few years of the product's natural gas energy efficiency offerings, but due to low natural gas prices, pipeline momentum has slowed in recent years. ECMs for furnace fans have been introduced as an option for electric energy savings. To increase participation in the product, the Company will review potential new prescriptive measures identified through Custom Efficiency, as technology improves and markets change.

Budgets

For the Heating Efficiency product, rebates are the largest expense, with promotional costs and labor also being factors. The following summarizes the budget drivers:

- *Rebates* – calculated using average rebate cost per Dth, kW, and kWh.
- *Promotions* – important to build awareness and provide education on the benefits of high efficiency heating systems.
- *Labor* – determined by estimating the number of full-time employees needed to manage the product and execute the marketing strategy and rebate process.

³⁹ http://www.xcelenergy.com/Energy_Solutions/Business_Solutions

C. Application Process

Rebate applications are available on the Xcel Energy website.⁴⁰ Hard copies are also available via Account Managers, the Trade Relations Manager, and trade allies. Participants in the product may submit their application through their Account Manager or the Business Solutions Center (BSC). Customers must apply for rebates within 12 months of equipment purchase and start-up. Participants are required to complete an application, and provide manufacturer equipment specifications and an invoice, as proof of purchase.

The following equipment information must be included on the application when applying for a boiler rebate:

- Plan selection (A-1 or A-2),
- use (space heat and/or domestic water heat or both),
- status (new or existing),
- manufacturer and model number,
- process load percentage,
- efficiency,
- size (MMBTUH), and
- quantity.

Information required for other equipment may include:

- r-value,
- fluid temperature,
- pipe location (inside/outside) linear feet,
- pipe diameter,
- cost, and
- serial number.

Preapproval is not required before the customer buys or installs equipment for prescriptive measures, but will be required for custom projects in accordance with the Custom Efficiency product policies.

D. Marketing Objectives & Strategies

The objective of the Heating Efficiency product is to provide education and incentives that motivate customers to purchase high efficient heating equipment and run their existing heating systems at optimum efficiency. Boiler systems are typically installed in mid- to large-sized facilities, while furnaces tend to be in smaller buildings. The product marketing

⁴⁰ http://www.xcelenergy.com/Energy_Solutions/Business_Solutions

strategy supports identification of and targeted messaging to these different facilities for efficiency improvement.

The Heating Efficiency product follows the marketing strategy of other prescriptive products, leveraging the BSC to improve the level of knowledge on heating efficiency in the marketplace. The Company also provides a newsletter and direct communication campaigns to customers and trade allies, and participates in trade shows and other events. These tactics make customers aware of the key benefits of energy efficiency and its applicability to heating systems. The Company provides fact sheets and rebate applications to customers directly, and via trade allies, to encourage them to consider leveraging Heating Efficiency rebates as they make equipment purchase decisions. An online case study helps customers, identifying the energy and non-energy benefits of upgrading to high efficiency equipment and auxiliary equipment. In addition, Public Service's Account Managers and BSC will educate customers on the project's energy savings potential, impact of the rebate on the payback calculation, and how to complete the application process. Trade allies can get similar assistance from the Company's Trade Relations Manager.

The Heating Efficiency product may also follow-up on customer opportunities identified following participation in the Business Energy Analysis product—communications will center on the benefits of energy efficiency through reduced paybacks and lifecycle costs, and greater environmental benefits.

E. Product-Specific Policies

Gas Transport Only customers cannot participate in rebates for the Heating Efficiency product. Participating customers must be a business retail natural gas customer of Public Service at the time the gas rebate is issued and must be an electric only or a combination electric and gas customer to qualify for the electric ECM rebate.

F. Stakeholder Involvement

Public Service routinely consults with several of the major equipment suppliers and contractors for guidance when refining the Heating Efficiency product for Colorado.

These stakeholders provided insight into the types of products to rebate, the incremental and total equipment costs to be expected, and how the application process can be improved. The Company also works closely with state and local governments to promote energy efficiency and holds semi-annual Heating Advisory Board meetings to engage with contractors and seek feedback and input on product updates and other considerations in delivering this product.

G. Rebates & Incentives

Rebate levels have been designed to encourage customers to install high efficiency equipment. Auxiliary equipment rebates are available to encourage customers to further improve the standard choices that could be made. Pipe insulation and boiler tune-ups are lower cost options for customers who wish to enhance the overall performance and efficiency of their system.

There are two levels of hot water boiler equipment rebates. The Plan A-1 boiler measure rebates systems greater than 85% efficiency which is the lowest efficiency hot water boiler rebate offered. Plan A-2 covers boilers greater than 92% efficiency. Both plans are for Public Service customers who have installed a new boiler where no previous boiler existed, an existing boiler that is no longer functional is being replaced, or the customer has a desire to upgrade the existing functioning boiler to a more efficient model.

Hot Water Boilers*		
Minimum Requirements	Plan A-1	Plan A-2
	85% minimum efficiency	92% minimum efficiency
Rebate	\$750/MMBTUH	\$3,500/MMBTUH

*Conditions: (1) Equipment must use natural gas fuel as the primary fuel but can have dual fuel capability for backup. (2) Efficiency is based on either thermal efficiency (natural gas fuel) or efficiency determined from a combustion analyzer test (boiler systems with optional controls). (3) MBH or MMBTUH is based on boiler input capacity.

Rebates for furnaces must meet minimum efficiency requirements that align with ENERGY STAR guidelines and are AFUE rated. Customers may receive rebates of \$80 per unit for systems with minimum 92% AFUE, or \$120 per unit for systems, with minimum 94% AFUE. The electric savings for ECMs will be calculated based on space cooling, space heating, motor horsepower, and geographical region (Denver/Front Range, Western Slope, or Alamosa/Mountain). The rebate is \$100 for new or retrofit units.

Commercial water heater equipment rebate levels are set at \$200/100,000 BTUH per unit (greater than 150 MBTUH). Rebates apply to tankless water heaters, or units with storage. They must be at least 92% efficient to qualify.

Pipe insulation rebate levels are based on the size of the pipe being insulated and the R-value of the insulation. Larger diameter pipes with thicker insulation will be eligible for the highest rebates. Rebates are issued per linear foot of insulation installed, as detailed in the table below.

Pipe Insulation		
Pipe Diameter	R-Value	Rebate per linear foot per inch of pipe diameter
0.5" – 2"	3.5	\$3.00
0.5" – 6"	5.0	\$4.00
2.5" – 12"	7.0	\$5.00

Retrofit Controls, Heat Recovery and System Improvements

- i. Boiler Tune-Ups:
 - \$250/MMBTUH (only available on the same boiler every two years)
- ii. Boiler Efficiency Retrofits:
 - Modular Burner Control, 5:1 Turndown Ratio or Greater: \$750/MMBTUH;
 - \$2,000 max
 - Outdoor Air Reset Controls: \$250/MMBTUH
 - Stack Dampers: \$250/MMBTUH
 - Steam Trap Replacement/Parts: 25% up to \$250/trap; max \$10,000/facility

The following equipment information must be included on the application when applying for rebates on system improvements:

- boiler use for use (space heat and/or domestic water heat or both)
- process load percentage
- boiler size (MMBTUH)
- quantity
- cost

Unit Heaters

Customers are paid using the following table for each unit heater installed:

- Non-Condensing (minimum 83% efficiency) \$50/100,000 BTUH
- Condensing (minimum 90% efficiency) \$500/100,000 BTUH
- Infrared (minimum 80% efficiency) \$125/100,000 BTUH

➤ **LED Street Lights**

A. Description

The Company's LED Street Lights product captures energy savings for local municipalities on the Street Lighting Service (SL) Rate by replacing legacy Company-owned street lights with LED fixtures.

The Company owns approximately 95,000 cobrahead-style street lights across its service territory with nearly three-fourths of those lights being concentrated within a small number of larger municipalities. Replacement of the current bulbs (70 Watt, 100 Watt, 150 Watt, 250 Watt, and 400 Watt fixtures) with more efficient LED fixtures will result in significant energy savings. Cobrahead replacements offered through this voluntary product will be provided to customers who opt-in to the new SL Rate to transition to LED technology, for both retrofits and new installations. The Company intends to replace 100% of cobrahead fixtures within 10 years. Although Xcel Energy will be closely monitoring the performance and cost-effectiveness of decorative-style LED fixtures going forward, no decorative options are being offered at this time.

B. Targets, Participants & Budgets

Targets and Participants

The Company is forecasting replacement of 15,000 of Company-owned cobrahead street light fixtures—through retrofits and new installations—in 2017 and 20,000 units in 2018. The replacement schedule is tied to an energy savings target of approximately 7.3 GWh in 2017 and approximately 9.8 GWh in 2018 which represents the annual savings estimates.

Budgets

Equipment and labor costs for LED installation are not being recovered through the DSMCA and therefore are not included in the DSM Plan budget for this product. The Company is including minimal DSM budget for customer engagement activities and energy savings reporting.

C. Application Process

Customers are required to submit their preference for the Option A or Option B rate by January 1, 2017.

D. Marketing Objectives & Strategies

Product marketing will be necessary into the 2017 calendar year to develop a customer communications, case studies, and allow for customers who many have opted out to now participate. Should the Company choose to pursue any additional LED marketing campaigns, these efforts will be supported out of our O&M budget.

E. Product-Specific Policies

Voluntary product participation is available for only Public Service customers on the Street Lighting Service (SL) Rate. The upgraded street lighting infrastructure will remain under Public Service ownership.

Note: The Company offers separate rebates for customer-owned street lighting within the Lighting Efficiency product.

F. Stakeholder Involvement

Local municipalities on the Company's SL Rate are the primary product stakeholders. The Company consulted with local municipalities regarding this product through several outreach meetings in October 2014, March 2015, and April 2015. Collaboration will continue as implementation continues in 2017 and 2018.

H. Rebates & Incentives

No rebate will be offered for this product because the Company is the equipment-owner. SL ratepayers will benefit from the ability to transition to the new technology under the new, lower rate enabled by the lower energy consumption and competitive cost of the LEDs.

➤ **Lighting Efficiency**

A. Description

The Lighting Efficiency product offers prescriptive and custom rebates to Xcel Energy electric business customers who install qualifying energy efficient lighting equipment in existing or new buildings. Rebates are offered to encourage customers to purchase energy efficient lighting by lowering the upfront premium costs associated with this equipment. The product is primarily marketed through Account Managers, trade partners, manufacturers' representatives, distributors, and contractors.

The product's main offerings include the following:

- Prescriptive rebates for qualifying measures⁴¹ that save energy, such as:
 - Replacement of high intensity discharge (HID) fixtures with new light emitting diode (LED) fixtures;
 - LED and compact fluorescent lamps (CFLs) and fixtures that replace inefficient systems, including incandescent, HID and fluorescent.
 - LED measures include both interior and exterior fixtures, retrofit kits, and lamps for new construction and retrofit applications.
- Custom rebates for energy saving lighting projects that do not fall within the requirements of the prescriptive rebates.
- Midstream LED lamp incentives for local distributors, called Business LED Instant Rebate.

Prescriptive Lighting Rebates

The product offers rebates for qualifying lighting equipment that is more efficient than existing equipment in retrofit situations or more efficient than standard equipment in new construction applications. Lighting measures applicable to a prescriptive rebate format are ones that are commonly installed in the marketplace and have an easily identifiable means to determine energy savings.

Custom Lighting Rebates

Energy saving lighting measures that do not fit into a prescriptive rebate category can be evaluated through the Custom Efficiency analysis. Requirements include that the customer obtains pre-approval before proceeding with the project, and the customer gathers and provides all information needed to analyze the energy savings potential of the project.

⁴¹ http://www.xcelenergy.com/Save_Money_&_Energy/Rebates/Lighting_Efficiency_-_CO

Advanced Lighting Controls

Lighting control projects that do not fit into a prescriptive rebate category can be evaluated through the Advanced Lighting Controls custom lighting analysis. Requirements include that the customer obtains pre-approval before proceeding with the project, purchases new equipment, and the control retrofit is for an existing building. The customer is required to complete a rebate application and workbook and gain pre-approval prior to proceeding with the project.

B. Targets, Participants & Budgets

Targets and Participants

The product's participation and energy savings targets were determined by looking at historical participation levels, as well as the large number of LED products that are expected to be commercially available during the time period of this Plan. Previous project characteristics, including equipment type/mix, were also used to develop projected average cents per kWh rebate for each measure.

Budgets

Historical expenditures were analyzed to project the budget. The program target in 2017 and 2018 will remain similar to 2015 and 2016; however, the cost to achieve the savings is becoming more expensive. The reasons for this are the LED products are more expensive and the amount of savings per project is decreasing. Additional budget dollars have been allocated for product expansion and increased marketing and promotional efforts.

The main budget drivers include:

- *Participant Incentives* – The vast majority of the budget is allocated for rebates. This budget reflects the new rebate levels and projected customer participation in each measure, which was based on 2015 participation across the offerings.
- *Administration* – These budgets are based on past product performance with a slight increase built in for expanded product offerings, engineering, and account management involvement. The budget also includes third-party implementer costs for the implementation of Business LED Instant Rebate efforts and technical assistance with complex lighting projects.
- *Advertising and Promotion* – A promotional budget was developed based on historical expenditures on marketing activities. Promotions are targeted to customers and trade partners and typically focus around activities such as new or revised product offerings, case studies featuring successful projects, educational opportunities such as events, and bonus rebates.
- *Customer Service* – This budget will be applied to consulting and analytical services for lighting projects that are analyzed through the Custom Efficiency product.

C. Application Process

Customers may hear of the Lighting Efficiency product through several channels, including the Company's website, advertising, direct mail, email promotions or through the lighting trade.

Account Managers work directly with the Company's largest customers to help them identify energy saving opportunities in lighting and the Business Solutions Center (BSC) is available for all business customers, particularly small- and mid-sized business customers, who need information on lighting rebate products.

Lighting Efficiency Retrofit and New Construction Applications

The application process for the prescriptive retrofit and new construction products is similar to our other prescriptive products. Customers may apply for rebates by completing the application and providing a detailed invoice for the newly installed equipment. The customers may submit a rebate application after the equipment has been purchased and installed. The replacement of fixtures for retrofit situations must be a one-for-one replacement that will result in energy savings. If the retrofit is not a one-for-one replacement but still results in energy savings, customers may apply for preapproval through the [Custom Efficiency](#) product. The equipment must be new and meet all the qualifications detailed on the application form. After the customer has installed the equipment, the application and invoice must be submitted to the Company within 12 months of the invoice date. Once the paperwork is completed and submitted, rebate checks will be mailed to the customer as indicated on the application within six to eight weeks.

Custom Efficiency Lighting and Advanced Lighting Controls

Applications for energy saving lighting projects that do not fit into the prescriptive paths may be reviewed using the Custom Efficiency or Advanced Lighting Control product preapproval application and the accompanying Lighting Evaluation Worksheet. Project analysis and preapproval of Custom Efficiency and Advanced Lighting Control lighting projects is required prior to equipment purchase and installation.

D. Marketing Objectives & Strategies

The key marketing objective is to raise awareness, interest and participation in the Lighting Efficiency product, contributing to goals for energy savings and demand reduction.

Marketing Strategy

Lighting Efficiency is primarily promoted through Company Account Managers, Energy Efficiency Specialists via inbound and outbound telemarketing, through Colorado's lighting and electrical trade via the Company's Channel Managers, and by traditional marketing vehicles such as advertising, mailings, Web content and tools, email and other sales promotions.

Account Managers and the BSC market the Lighting Efficiency product to customers—especially mid- to large-sized commercial and industrial customers, where the majority of the product's savings are realized—within their day-to-day interactions.

Significant market segments for potential Lighting Efficiency savings include: office buildings, manufacturing sites, retail establishments, schools, and 24-hour facilities. Marketing campaigns targeted to those customer segments are executed during one-on-one Account Manager meetings, BSC scripted calls, and/or via mass communications that drive inquiries to the Company's inbound phone center.

Marketing to Trade Partners

The Company's outreach and relationship building with lighting and electrical trade, professional engineers, architects and lighting designers is another key strategy to reach important business segments and indirectly influence the purchase and installation of energy-efficient lighting systems. The Company establishes and maintains contact with this audience by:

- In-person training and presentations by the Channel Managers at industry events and trade shows, such as the Energy Efficiency Expo held in first quarter of each year, for both customers and trade allies;
- The Lighting Advisory Board, described in section *F. Stakeholder Involvement* below;
- *Energy Exchange*, a quarterly email that is sent to the trade discussing energy efficiency lighting applications, case studies, product changes, and other pertinent topics; and
- Trade website,⁴² including applications, specific brochures and informational pieces directed toward the trade, and updates on product offerings.

Marketing to Small Business Customers

The Company accesses this harder-to-reach market primarily through direct mail, email, and the BSC, as well as via outreach conducted by the Company's Lighting – Small Business third-party implementer.

In addition, several printed marketing pieces are available on the Company's website⁴³ for viewing or download. These pieces are targeted to large-, medium- and small-sized business customers, as well as trade partners. The website offers information on lighting technologies, case studies of successful lighting upgrades, and external sources highlighting reasons to pursue lighting upgrades or implement efficient lighting sources.

- *Prescriptive Rebate Applications* – Applications detail product requirements, rebate levels and additional information to help customers complete the form and submit it for rebate with accompanying invoices and equipment specifications.
- *Lighting Efficiency Product Summary* – This brochure is available on the Company's website and is used by Account Managers, BSC, and trade to describe the product, discuss reasons to upgrade to more efficient lighting, and identify potential lighting projects.
- *Resource Documents* – The Lighting Efficiency webpage links to several documents on energy efficient lighting technologies, written by outside organizations such as E-Source, that further identify lighting efficiency sources and opportunities.
- *Managing Costs by Segment Documents* – Documents identifying specific energy savings ideas for key segments, such as grocery stores, office buildings, schools and universities.

⁴²http://www.xcelenergy.com/Energy_Partners/Trade_Partners/Commercial_Programs/Lighting_Efficiency_for_Trade_Partners_-_CO

⁴³ http://www.xcelenergy.com/Save_Money_&_Energy/Rebates/Lighting_Efficiency_-_CO

E. Product-Specific Policies

Lighting Efficiency has a number of product-specific policies:

- All rebated equipment must be new, meet all product rules and requirements, and the application must be submitted within 12 months of the invoice date.
- In cases where the customer is unable to obtain an equipment invoice, the Company will send an Account Manager to complete an onsite field verification to confirm that equipment was installed as stated on the application.
- Preapproval is required for Custom Efficiency and Advanced Lighting Control lighting projects prior to the purchase and installation of lighting equipment. The customer has up to 24 months after the preapproval date to implement the lighting project. Custom and Advanced Lighting Control projects that exceed their planned timeframe, or have significant equipment deviations from the original plan, require reanalysis and approval.

F. Stakeholder Involvement

Stakeholder involvement in the Lighting Efficiency product comes through a Lighting Advisory Board and the quarterly DSM Roundtable Meetings. The Lighting Advisory Board was formed as a collaborative effort between several key lighting professionals and the Company's management team. The objectives of the board are to identify gaps in the Company's product offerings, suggest areas of improvement, and to offer a forum for open discussion of lighting topics. Several recommendations from the board have been addressed through the Company's product development process and incorporated into the product. The Board will continue to meet on a regular basis, or as long as needed.

G. Rebates & Incentives

Lighting Efficiency offers rebates through the retrofit and new construction prescriptive components, and/or Custom Efficiency and Advanced Lighting Controls paths.

➤ **Lighting – Small Business**

A. Description

The Lighting – Small Business product offers free lighting audits, rebates and support for energy efficient lighting upgrades to Public Service’s small- and mid-sized business customers with annual peak demand of up to 400 kW. In addition to lighting, the customer will be informed of other energy saving opportunities available for rebates, such as heating, ventilation, cooling, motors, and recommissioning of their existing equipment.

The product aims to overcome specific barriers that often prevent small businesses from investing in energy efficiency measures, such as:

- Lack of knowledge of energy savings potential in lighting system upgrades;
- Lack of time to complete all the necessary steps to upgrade lighting system;
- Lack of capital to make lighting improvements;
- Uncertainty of value when facility is not owner-occupied; and/or
- Limited access to qualified contractors due to small margins on some projects.

To address these issues, the product offers:

- a. Intensive outreach to bring resources to the customer, rather than relying on the customer to seek them out;
- b. Simple, one-stop services that keep customer time requirements to a minimum;
- c. Computerized lighting audits and reporting systems that generate site-specific feedback and reports;
- d. Objective recommendations backed by the credibility of the Company;
- e. Introductions to participating lighting trade partners;
- f. Substantial rebates to offset the cost of installing energy efficient fixtures and lamps;
- g. Assistance with preparing and submitting the rebate paperwork to the Company;
- h. LED instant rebates; and
- i. Direct installation of LED lamps, aerators, weather stripping, pre-rinse spray valves, and showerheads.

To facilitate the above offerings, the Company employs a third-party implementer to provide the following services:

- Free lighting audit when customer agree to participate in the product;
- Identification of other non-lighting energy savings opportunities during the audit and, at a minimum, making customers aware of other rebate opportunities;
- Access to a network of qualified contractors, approved by the Company, to aid the customer in implementation of lighting retrofits;
- Serving as a liaison between the customer and the contractor;
- Maintaining engagement with the customer to ensure that recommended measures get implemented and assist the customer, as needed, in hiring a contractor; and
- Reviewing and submitting the customers’ application for rebate.

Direct Install for Immediate Savings – Customers with an annual peak demand of less than 100 kW will qualify for participation in the direct install (DI) component of the product. Based on market data, the list of DI eligible lamps will be expanded starting in 2017 to better meet the needs of small business customers. While onsite for the lighting assessment, the third-party implementer will perform free installation of the following energy savings measures, where applicable:

- a. Select screw-in LED lamps; and
- b. Aerators in public restrooms and kitchen sinks.

B. Targets, Participants & Budgets

Targets and Participants

The targets for this product were derived from historical data, market data, and equipment deemed savings values in Colorado. Trade participation and feedback, and lighting industry economic and market trends also influenced estimates.

Budget

The forecasted expenditures in 2017 and 2018 for this product are based on projected participation levels, promotion, and administrative expenses. The majority of the product costs are driven by third-party costs for implementation of the program, in addition to customer rebates and promotional expenses.

C. Application Process

The Company promotes the Lighting – Small Business product primarily through the outreach efforts of a third-party implementer. Secondary outreach is likely to occur through the Company's Account Managers, contracted trade allies, and/or other marketing efforts such as mailings, newsletters, and the Company website.

The BSC is also available for all small- and mid-sized business customers, who may inquire about lighting rebates. The BSC may refer new leads to the third-party implementer for follow-up. The third-party implementer is expected to aggressively promote the product to increase participation.

The third-party implementer offers and conducts a free lighting audit at the customer's facility and provides a written report of the energy saving findings. At the time of the audit, customers with an annual demand of 100 kW or less may qualify for direct installation of specific measures (as outlined above). Throughout the process, the third-party implementer will assist customers in applying for rebates for qualifying equipment, reviewing completed applications, and ensuring that there is a detailed invoice for the newly installed equipment.

The third-party implementer will also assist customers in applying for a Custom Efficiency lighting rebate for projects that do not fit into the prescriptive rebate offerings. Project analysis and preapproval of Custom Efficiency lighting projects is required prior to equipment purchase and installation; the third-party implementer assists the customer with that process.

After the customer has installed the equipment, the rebate application and invoice must be submitted to the Company within 12 months of the invoice date. Once the paperwork is completed and submitted, rebate checks will be mailed to the customer as indicated on the rebate application.

D. Marketing Objectives & Strategies

The target customers for this service are small- to mid-sized businesses with up to 400 kW of annual demand. The key marketing objective is to raise awareness, interest and participation in the product, contributing to achievement of the Company's energy savings goal. The product is marketed primarily through the third-party implementer—they are required to meet the implementation targets for which they are contracted and they will deliver the marketing strategies needed to meet them.

E. Product-Specific Policies

Lighting – Small Business has a number of product-specific policies:

- The product is for customers with peak electricity demand of 400kW or less; customers with an annual demand of 100 kW or below may qualify for direct installation of specific measures at the time of the lighting audit (as described above).
- All rebated equipment must be new, meet all product rules and requirements, and the application must be submitted within 12 months of the invoice date.
- Rebates assume a one-for-one replacement of retrofit fixtures that will result in energy savings.
- Once completed paperwork is submitted, rebate payments are usually issued in six to eight weeks.
- Preapproval is required for Custom Efficiency small business lighting projects prior to the purchase and installation of lighting equipment. The customer has up to 24 months after the preapproval date to implement the lighting project. Custom projects that exceed that timeframe, or have significant equipment deviations from the original plan, require reanalysis and approval.

F. Stakeholder Involvement

The third-party implementer has considerable influence on the success of the product, as they will be the face of the Company to potential participants. The Company expects that the third-party implementer will engage stakeholders in the implementation of this product.

Lighting trade partners are an important stakeholder as they will be performing the lighting retrofits as well as promoting the product to customers. The Company expects the third-party implementer to continue to grow the trade partner list of qualified contractors available for lighting retrofits. The trade partners on this list will have a vested interest in the product's success, as they will benefit from the work generated by the audits.

Stakeholders are also involved in the product through the Lighting Advisory Board and quarterly DSM Roundtable Meetings. The Lighting Advisory Board was formed as a collaborative effort between several key lighting professionals and the Company's management team. The objectives of the board are to identify gaps in the product offerings, suggest areas of improvement, and to offer a forum for open discussion of lighting topics. The Board will continue to meet on a regular basis, or as long as needed.

G. Rebates & Incentives

Prescriptive rebates will be paid for the qualifying equipment identified in Appendix G: Technical Reference Manual for the Lighting Efficiency product.

Third-party implementer project management services and direct installations will be performed at no additional cost to the customer.

➤ Motor and Drive Efficiency

A. Description

Public Service's Motor and Drive Efficiency product strives to assist customers with awareness and incentives to reduce the barriers associated with equipment purchases. Over time, the product line has adjusted to market and regulatory conditions, and incorporated input from completed product evaluations.

The Company offers prescriptive incentives for:

- Variable Frequency Drives (VFDs), which save energy consumed by motors when the demands on the motor allow for lower and varying speeds.
- Constant Speed Motor Controllers (CSMCs), which provide savings on devices which require constant speeds, like escalators, and under-loaded conveyers.
- Motors which exceed NEMA Premium[®] efficiencies.⁴⁴

Custom rebates are available for motors or motor-related equipment that fall outside the prescriptive criteria. Custom rebates are targeted for equipment that allows customers to operate efficiently, and provides multiple benefits like longer equipment life span, and reduced maintenance costs.

B. Targets, Participants & Budgets

Targets and Participants

The product's energy savings and participation targets are based on performance in recent years, inputs from the 2010 Motor & Drive comprehensive evaluation,⁴⁵ and empirical research from primary and secondary research sources, including:

- The Motor Decisions MatterSM (MDM) workgroup of the Consortium for Energy Efficiency (CEE),⁴⁶
- Other utility programs, and
- Interactions with trade partners.

Budgets

The product budget was derived from rebate levels associated with the anticipated measure quantities that are forecasted to deliver energy savings in 2017 and 2018. Historical actual expenses also influence forecasted expenditures. The budget has been tightened by delivering efficiencies within labor and advertising cost categories.

⁴⁴ NEMA Premium Motors, <http://www.nema.org/Policy/Energy/Efficiency/Pages/NEMA-Premium-Motors.aspx>.

⁴⁵ 2010 Motor & Drive Comprehensive Evaluation, <http://www.xcelenergy.com/staticfiles/xcel/Regulatory/Regulatory%20PDFs/2010ColoradoMotorandDriveProgramEvaluation.pdf>.

⁴⁶ Motor Decisions Matter, <http://www.motorsmatter.org/>.

C. Application Process

Customer awareness occurs through various marketing channels: the Xcel Energy website, direct and email promotions, and Public Service's account management team, end-use equipment trade allies, and occasional advertising or direct mail. Rebate applications are available to download on the Company's website.⁴⁷ Applications are also provided by the Xcel Energy account management team or participating trade partners, as needed.

Prescriptive Rebate Applications

The rebate application process for prescriptive motors and drives is similar to other DSM prescriptive product rebates. Customers may apply for a rebate up to 12 months after the equipment has been purchased and installed. The equipment must be new and meet all qualifications detailed on the rebate application form. Once the paperwork is completed and submitted, the application package is reviewed for accuracy and entered into the Company's customer relationship management system. Rebate checks are mailed to customers with qualifying applications within six to eight weeks.

Custom Rebate Applications

For motors, drives, or related equipment that does not fit into the prescriptive offer, the customer may apply for a custom motors rebate using the application and information worksheet available within the [Custom Efficiency](#) product. Project analysis, engineering analysis and preapproval of custom projects is required prior to equipment purchase and installation.

D. Marketing Objectives & Strategies

The overall marketing objective is to drive qualifying energy savings by raising awareness, interest, and participation in the product.

The product is primarily promoted through Company account representatives and mechanical and electrical contractors, and via traditional marketing vehicles such as advertising, mailings, website content, email, and other sales promotions.

Account representatives include:

- *Account Managers*, who work directly on projects with large commercial and industrial customers, where the majority of savings are realized; and
- *Energy Efficiency Specialists at the Business Solutions Center (BSC)* responding to inbound calls and initiating outbound telemarketing, specializing in marketing to small- and medium-sized businesses.

⁴⁷ <http://www.xcelenergy.com/staticfiles/xcel/Marketing/Managed%20Documents/CO-Bus-Motors-Motor-Rebate-Application.pdf>

Significant market targets include (HVAC systems within) office buildings, schools, and retail establishments. Manufacturing sites are also potential participants. However, the Company's service territory has fewer manufacturing sites, and prescriptive VFDs do not contribute prescriptive savings from most processing equipment.

As outreach to mechanical and electrical contractors, the Company's channel and program managers actively engage in:

- Presentations at industry events and trade shows, such as the Company's Energy Efficiency Expo held each year, for both customers and trade allies.
- Sponsorship and presence at industry events such as the conference of the Electrical Apparatus and Service Association.
- In-person trainings at the contractors' offices.
- The *Energy Exchange*, a quarterly email that is sent to trade partners to share information on energy efficiency projects, case studies, product changes, and other pertinent topics.
- Collaborative efforts with organizations such as MDM, which is a national public-awareness campaign; sponsors include a consortium of motor manufacturers, motor service centers, trade associations, electric utilities, and government agencies.

E. Product-Specific Policies

All rebated equipment must be new and meet all product rules and requirements; and the rebate application must be submitted within 12 months of the purchase date. Additional product-component policies include:

- For prescriptive rebates, VFDs must automatically control the speed of existing or new motors.
- For HVAC in new construction, VFD rebates are available for a limited subset of horsepower levels.
- Custom projects require either preapproval or other acceptable project documentation, prior to purchase. The customer has up to 24 months after preapproval to implement the project. Custom projects that exceed their timeframe, or have significant equipment deviations from the original plan, require reanalysis and approval.

F. Stakeholder Involvement

Public Service's Motor and Drive Efficiency product has been successful because of external support from trade allies and other stakeholders who understand the product and assist in driving customer education, and awareness. Customers benefit from hearing a consistent message from a variety of sources. Product inputs come from customers, account representatives, the quarterly DSM Roundtable Meetings, workgroups, primary and secondary research, and through discussions with other utilities. Comments are considered and implemented if and when appropriate.

G. Rebates & Incentives

Rebates are paid directly to customers unless the customer reassigns the rebate to their vendor as an alternate rebate recipient.⁴⁸ The product offers rebates based on the information shown in the following table:

Description	Horsepower (hp)	Rebate Amount
Enhanced efficiency motors (exceeding NEMA Premium [®] efficiencies)	1 hp – 200 hp	Tiered rebate offer depending on the horsepower, and on whether the motor is an efficiency upgrade or if it is for new or restored capacity.
VFDs controlling motors used on fans and pumps	1 hp – 200 hp	Tiered rebate offer depending on the controlled horsepower.
Constant Speed Motor Controllers	5 hp to 3,000 hp	Tiered rebate offer depending on the controlled horsepower.
Custom for larger and non-prescriptive motors, drives, or related measures	Outside the prescriptive parameters	Individual project rebates determined under the Custom Efficiency product guidelines.

⁴⁸ See *Alternative Rebate Recipient* section of the rebate application form:

<http://www.xcelenergy.com/staticfiles/xcel/Marketing/Managed%20Documents/CO-Bus-Motors-Motor-Rebate-Application.pdf>.

➤ Multifamily Buildings

A. *Description*

The Multifamily Buildings product is designed to engage multifamily building equipment owners⁴⁹ in deploying DSM measures that will lower customers' energy consumption. The multifamily customer segment has historically been a difficult market to reach with traditional DSM products because building / equipment owners may not be the metered bill-payer for individual units. The product—first launched as a pilot in 2014—was designed to encourage DSM participation by this market segment by offering an energy assessment and in-unit improvements, and some common area measures, via direct-install at no additional cost to the customer. The assessment will also identify larger efficiency improvement opportunities for participating buildings, which will primarily focus on mechanical and lighting systems and common-area improvements, and rebates will be offered to customers to pursue these larger energy improvement projects.

The product will engage customers in a three-stage process for multifamily buildings:

- Stage 1. Energy assessment
- Stage 2. Direct-install measures
- Stage 3. Traditional energy efficiency improvements (comprehensive building upgrades, custom/prescriptive projects, etc.)

Stage 1: Energy Assessment

The first step is completing an on-site energy assessment ("assessment"). The assessment will identify opportunities for improving building energy efficiency via a specific set of direct-install measures (eligible measures listed below under Stage 2). This will include an inspection of a sample of units within each building, typically 10% of the total. The assessment will be offered at no additional cost if a majority of the direct-install measures identified by the assessment are installed by the third-party implementer within three months of receiving the assessment results. If the customer chooses not to complete the recommended Stage 2 installations, they will be required to pay back the cost of the assessment performed in Stage 1. The assessment also will identify energy-savings opportunities within individual apartments or units outside of the Stage 2 direct-install measures, as well as larger, capital-intensive projects for the whole building (Stage 3).

Stage 2: Direct-Install

The second stage of participation will be direct installation of energy savings measures identified in the energy assessment. Installation is completed by the Company's third-party implementer. There are five eligible measures for Stage 2 that will be installed at no additional cost to customers:

- LED lamps (≤ 15 bulbs per unit)

⁴⁹ Equipment owner could be the building owner, the tenant, or other third-party.

- Low-flow showerheads
- Kitchen and bathroom sink faucet aerators
- Water heater blankets
- LED exit signs

Participants will work with the third-party implementer to schedule installation and will have up to three months after the assessment results are presented to complete Stage 2 installations.

Stage 3: Prescriptive or Custom Energy Efficiency Improvements

The third stage for participants involves the completion of prescriptive or custom energy-efficiency improvement projects such as HVAC upgrades, common-area lighting upgrades, or other projects through the Company's prescriptive or holistic program offerings.

Implementation of Stage 3 projects may be challenging for a number of reasons; be it lack of ownership willingness, long sales cycle, capital constraints, and market economics, among others. To overcome these barriers the third-party implementer will provide participants with advice on selecting a contractor and reviewing bids as well as periodically provide follow up consultations. The Company aims to achieve a conversion rate of 18% or more each year.

The third-party implementer is crucial to the success of the product, as a consistent point of contact for participants. The third-party implementer will be responsible for advertising and recruiting participants, delivering the Stage 1 on-site energy assessment and Stage 2 measure installations, and successfully converting participants into Stage 3 projects in conjunction with the Company's Account Managers or Energy Efficiency Specialists.

B. Targets, Participants & Budgets

Targets and Participants

The Company estimates that there are approximately 250,000 units in existing multifamily buildings within Public Service's service territory. The Company had participants enrolled and implementing Stage 2 projects within the Multifamily Buildings Pilot starting in 2015. By the end of 2016, the Company expects to see participation of approximately 1,000 units for Stages 1 and 2 spread across multiple multifamily buildings and complexes.

The participation targets for energy assessments, direct installs, and larger energy efficiency projects for 2017 and 2018 were based on forecasts provided by the third-party implementer.

Budgets

The bulk of the product expenditures will be for program administration and for incentives to customers in the form of energy assessments and direct-installation of energy-efficient equipment. The budget also includes costs for prescriptive and custom rebates from Stage 3 projects.

Direct-install costs were developed based on the actual costs contracted between the Company and the third-party implementer and the forecasted participation. Rebates for Stage 3 are

estimated by the third-party implementer based on deemed values from the anticipated mix of prescriptive and custom DSM measures.

C. Application Process

The product is available to multifamily buildings that are Public Service electric and/or natural gas customers. To participate, customers must apply through the third-party implementer, who will review applications and approve participants. Applications will be reviewed on a first-come, first-served basis. Upon meeting the qualifications for participation, customers will work with the implementer to schedule an on-site assessment (Stage 1).

D. Marketing Objectives & Strategies

The third-party implementer will recruit customers by leveraging their existing customer relationships and market expertise. Options for direct promotion by the Company may include the following:

- Marketing materials and brochures;
- A Web-page to educate interested customers, explaining how to participate and the benefits of participating;
- Attending multifamily events in the Company's service territory; and/or
- Co-hosting educational events with the third-party implementer.

E. Product-Specific Policies

All multifamily buildings that are Public Service electric and natural gas customers with five or more units per building will be eligible to participate in this product. This includes market-rate and low-income qualified buildings, although the product is primarily targeting market-rate buildings.

As previously mentioned, there is one stipulation for receiving the on-site energy assessment at no additional cost: the participant must complete the installation of a majority of eligible direct-install measures identified by the energy assessment within three months of presentation of the assessment results. Should participants choose not to complete the installation of identified direct-install measures within three months of the assessment date, they will be required to pay the full cost of the on-site energy assessment.

F. Stakeholder Involvement

The Company worked closely with a number of external stakeholders in 2014 to design this product (which began as a pilot), under a working group which included representatives from the following organizations:

- Energy Outreach Colorado
- Energy Efficiency Business Coalition

- Colorado Energy Office
- City and County of Denver
- Adams County
- City of Boulder
- Boulder County
- Southwest Energy Efficiency Project
- Populus
- Cornerstone Apartments
- ACEEE
- Colorado PUC Staff

The Company has also been active with national multifamily working group efforts to research successful utility multifamily programs and network with those program managers and staff. Primarily, the Company has participated in ACEEE's Utility Multifamily Working Group and E Source's Multifamily Leaders Group.

The Company has also worked with third-party implementers and other vendors to understand the tools and services available to this customer segment.

I. Rebates & Incentives

The product provides an on-site energy assessment (Stage 1) and eligible direct-install measures (Stage 2) to participants at no additional cost (assuming requirements in Section E above are met); therefore 100% of those costs are considered to be a rebate to customers. The product will provide direct rebates for eligible projects completed in Stage 3 based on savings calculations from the Company's holistic program models and/or prescriptive products' deemed technical assumptions.

➤ New Construction

A. Description

The New Construction product influences building owners, architects, and engineers to include energy efficient systems and equipment in their design for new construction and/or major renovation projects. Since the Company services building owners of different areas and size, the New Construction product offers two core components:

1. Energy Design Assistance (EDA)
2. Energy Efficient Buildings (EEB)

Both components are available to non-residential customers in Public Service's electric and natural gas service territory.

1. Energy Design Assistance

The EDA offering provides a source of energy expertise to encourage energy efficient building design and construction practices. EDA offers design assistance in support of integrated design process by providing comprehensive computer modeling of the planned design, funding to offset the cost of design time associated with the increased energy analysis, financial incentives to improve the cost-effectiveness of a package of energy-efficient measures, and field verification to ensure that the strategies are installed per the design intent. Public Service covers the average energy modeling cost of an EDA project for customers.

According to *Best Practices Benchmarking for Energy Efficiency Programs*,⁵⁰ it is crucial for new construction DSM products to engage early in the design process and utilize integrated design modeling. The report states that, "Integrated design adds value because cost-effective energy savings opportunities decline as the project progresses through the various design stages." EDA uses computer energy models and a well-established, collaborative method for exchanging information with design professionals, contractors, developers, and building owners throughout the integrated design process. Important information is provided at critical points in the design process about the value and application of strategies for reducing peak demand and energy use. By analyzing integrated systems in the beginning of the design process, customers can make a building significantly more efficient, more comfortable for the occupants, and less costly to operate in the future.

In addition to technical assistance, Public Service provides financial incentives to building owners to improve the cost-effectiveness of energy efficient materials and equipment. Incentives are paid only after a verification process is completed, which typically occurs within two months of building occupancy. Verification ensures that the measures were installed as proposed, and provides an added degree of confidence in the project's calculated energy savings.

EDA offers two tracks for customer involvement:

⁵⁰ *National Energy Efficiency Program Best Practices Study*, Quantum Consulting Inc., Dec. 2004, pg. NR8-2. Available: http://aceee.org/files/proceedings/2004/data/papers/SS04_Panel5_Paper21.pdf.

Basic/Express Track

The Basic track is for Public Service customers interested in the opportunity to participate in a collaborative design process and identify energy savings opportunities using new technologies and energy methodology. The following requirements apply to the Basic track:

- Square footage: Greater than 20,000 square feet (new construction, major renovation or addition)
- Design phase: Schematic design or early design development
- Energy Savings: 15% peak demand savings and 15% natural gas savings minimum goals are required to be accepted into the basic track.

Enhanced Track

The Enhanced track is for Public Service customers interested in obtaining sustainable building certifications, such as the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®).⁵¹ The Enhanced track allows for further analysis in daylighting, lighting, and mechanical system comparison and building orientation. The following requirements apply to the Enhanced track:

- Square footage: Greater than 20,000 square feet (new construction, major renovation or addition)
- Design phase: Pre-design or early schematic design
- Energy Savings: 30% peak demand savings and 15% natural gas savings minimum goals are required to be accepted into the enhanced track.

Public Service administers EDA using third-party implementers to help identify product candidates, facilitate meetings with the design teams (including the owner), and complete energy modeling activities. Energy modelers are chosen based on a set of qualification criteria to become a third-party implementer of EDA services. Qualification opportunities are open as Public Service deems appropriate. Third-party implementers are paid on a pay-for-performance basis.

From 2007-2015, EDA has achieved approximately 177 GWh in savings. Acceptance into the Colorado market is strong given the improvements in the economy. All segment types can participate in EDA; however, many of the projects fall in the sectors of office, schools, retail, multifamily and healthcare.

2. Energy Efficient Buildings

The EEB offering is intended to provide a simplified approach to optimizing energy efficiency options in new construction or major renovations. This component addresses the portion of the new construction market not suited for the full-scale energy modeling offered through EDA. Projects must be a minimum of 5,000 square feet. Projects are also generally less than 70,000 square feet and have passed the schematic design stage of new construction. However, any size project above 5,000 square feet may qualify.

⁵¹ USGBC, LEED, <http://www.usgbc.org/leed>.

Focusing on the needs of small building owners, the EEB offering provides a comprehensive list of typical energy efficiency measures that can be incorporated into the new/major renovation building design, as well as the rebate amount available for each measure. Incentives are provided for heating and cooling, lighting, building envelope, electric motors, refrigeration and custom opportunities. Customers will receive a rebate tailored to their building after the project has been constructed and onsite verification completed. From 2010-2015, EEB has achieved approximately 20.6 GWh in savings.

Public Service administers EEB using both internal and external resources to review the calculations and rebates, and verify installation. The EEB offering is managed by a third-party implementer to assist the customer with the EEB process.

B. Targets, Participants & Budgets

Targets and Participants

The EDA energy savings targets were estimated based on the average energy savings of participating buildings when compared to the usage of a baseline building. The baseline building is defined as a building compliant with the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) 90.1 standards, or the local jurisdiction's code, whichever is more stringent. New code adoption only impacts new EDA project starts. Since the sales cycle for EDA is typically two to four years—from project initiation and design to the completion and occupancy of a physical building—many of the projects expected to finish in 2017 have already been identified by the Company and third-party implementers.

Participation was estimated using actual historical product data.

Budgets

Once targets were established, the budget was developed based on historical cost and participation information. Average project modeling drives the budget, construction incentives, measurement and verification (M&V), and promotional expenses. The following are the specific budget drivers:

- *Consulting Payments:* Much of the product delivery budget is associated with the cost of modeling for customer projects. Modeling costs are estimated to be approximately \$260 per kW saved for the Basic track and \$300 to \$400 per kW saved for the Enhanced track. Modeling costs are then split between the year modeling begins and the year in which the project will be completed due to final as-built modeling being used in rebate calculations. There are also minimal dollars allocated for EEB for a third-party implementer.
- *Incentives:* Incentives are determined by establishing a dollar value per participant at the appropriate rebate level.
- *M&V:* Completed in two steps for the offering and described in the M&V section of this Plan. Cost estimates are based on construction documentation and site review and are analyzed on a per project basis. Verification costs, on average, range between \$4,000 and \$10,000 per project.
- *Promotions, Advertising and Customer Education:* Promoting the product through specific advertising campaigns, trade shows, and training opportunities is an important

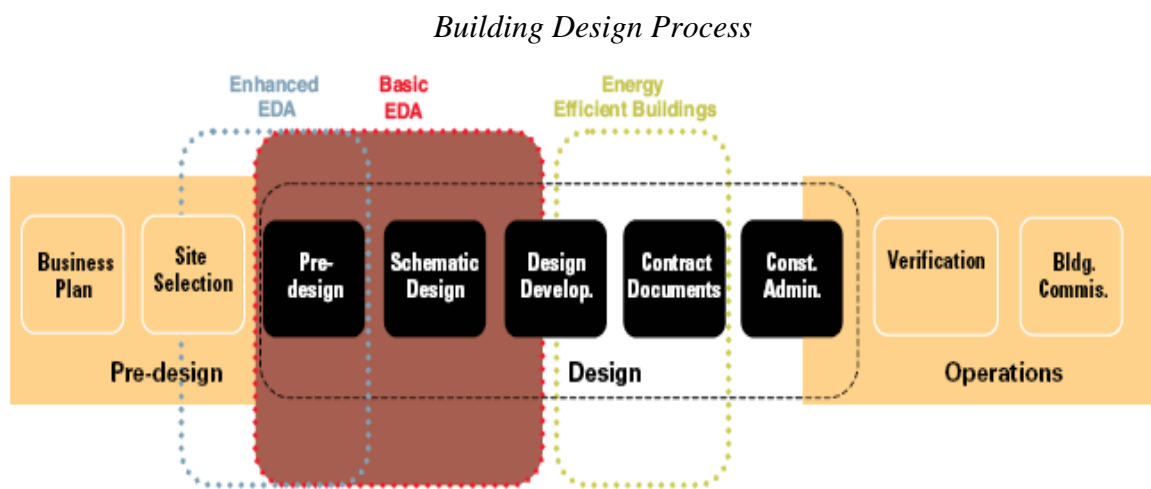
part of New Construction and aids in shifting the market towards higher efficiency. As such, historical data was used to determine the appropriate level of expenditure on product marketing.

C. Application Process

The rebate application process differs between EDA and EEB.

Energy Design Assistance

The application process for EDA is more involved than for prescriptive products and follows the design schedule of a new construction project as outlined in the following diagram.



The average time frame for project completion can range from two to four years depending on project schedules. For example, projects beginning modeling in 2017 will likely be completed in 2020 or beyond.

The application steps for the product include:

1. *Application Submittal:* Each project is evaluated by Public Service and the third-party implementers to ensure the project meets eligibility requirements. Customers who are interested in participating in the product must meet the design schedule requirements. Once approved to participate in the EDA offering, the customer receives an email approving the project and explaining next steps.
2. *Introductory Meeting:* An introductory meeting with the customer, design team, the third-party implementer, the Public Service Account Manager, and other key parties, takes place within two weeks of approval, depending on the design schedule. This meeting sets the tone for the collaborative approach, by explaining how the process works, who is involved, and what results should be expected. Initial project details, such as baseline systems, are collected during this meeting.

3. *Preliminary Analysis:* Using project details and costs from the design team, the third-party implementer begins the modeling process. Analysis is completed using a whole-building energy simulation computer program. Modeling software and protocols are established by Public Service, with reference to ASHRAE 90-1 standards, or the local jurisdiction's code, whichever is more stringent. Further analysis under the Enhanced track, if applicable, is also completed using the relevant modeling program and code base.

Within this analysis, different energy efficiency opportunities are explored that fit into the project criteria—payback analysis, energy expectations, and original design strategy. A meeting is then held to review these strategies to find the ones that meet the original project criteria and which ones should be considered moving forward.

4. *Final Energy/Strategy Analysis:* Energy efficiency opportunities are then packaged together in design alternatives to show expected building energy savings, paybacks and incentives. A whole building approach is used to identify the net effect of multiple strategies on a project. This approach provides opportunity for more energy savings impact, by trading less effective ideas that may be in the budget for more effective, new concepts. The packaging of design alternatives also provides protection against pitfalls in the value-engineering phase of the design/construction process, which typically cuts individual elements of projects based on their first-cost and impact on the tangible elements of the building, with little regard for ongoing energy use. These energy alternatives are then presented to the design team and the customer to choose the best approach for their project.
5. *Construction Document Analysis:* Once the design team completes construction documents (CDs), a third-party implementer reviews the CDs and adjusts the energy model as needed. This energy model is used to determine the expected incentives from Public Service and to verify compliance with the energy savings intent of the customer. A review of the CD energy analysis is completed before construction.
6. *Verification:* The final step in the EDA offering occurs when Public Service completes an onsite verification of the energy alternative addressed within the energy model. Equipment and systems are logged to evaluate performance variables as appropriate to verify consistency with modeling assumptions. The actual results are compared to the estimated savings to determine the final customer rebate.

Energy Efficient Buildings

Customers may hear of the EEB offering through several channels, including Account Managers, the BSC, architects and engineers, general contractors, or equipment trade partners. The application process is similar to other Public Service prescriptive products; however, preapproval is required to allow for calculations of energy efficient measures, review of construction documents for verification of project design, and for final verification of actual installation.

The first step in the process is for the customer to submit a preapproval application and agreement to Public Service. Once received, Public Service will review the project to confirm the project timeline, building square footage, and customer interest in energy efficiency options. Once the application is preapproved, the customer will receive an email from Public Service

explaining the terms of the EEB offering and processes. An introduction meeting invitation will be extended to the customer to provide energy efficiency advice. The building owner will then submit the project data throughout the construction of the project, and upon completion, for review by Public Service. The customer will receive the final construction rebate once the project and onsite verification have been completed.

D. Marketing Objectives & Strategies

The New Construction product is primarily marketed through the Company's sales team and external third-party implementers to reach architects, engineers, general contractors, and Public Service customers, as detailed below. The Company fosters a collaborative approach, meeting with design teams to show how the product works and how it is beneficial to customers. Marketing strategies used within the product scope include trade shows, electronic newsletters, face-to-face meetings, advertising, and participation with various trade organizations including American Institute of Architects, Association of General Contractors, US Green Building Council, and ASHRAE. A secondary market is building owners and developers. The EEB offering, on the other hand, is primarily marketed to developers and customers.

Primary Market – General Contractors, Architects, Mechanical and Electrical Engineers:

- Implement energy efficiency
- Influence customer/developer decisions
- Trusted by owner
- Often suggest New Construction product to owners and developers
- Key to actual inclusion of strategies and cooperation

Secondary Market – Owners and Developers:

- Make initial decision on budget
- Hire and contract with an architect, engineers, and general contractor(s)
- Initiate conversations on energy efficiency
- Make final decision on equipment choices
- Key to moving general contractors to energy efficiency strategies within a limited budget

Public Service continually tries to improve and update the information available to customers on the website and/or for events. There are several pieces of collateral used for the New Construction product:

- *Product Feature Sheet*: explains the features and the benefits of the product.
- *Case Studies*: provides examples of how various customers benefited from participating in the product.
- *Process Flow Chart*: detail information on the product processes.
- *White Papers*: explain different options for energy efficiency in lighting, heating, cooling, envelope, and other measures.

The EEB offering provides Public Service with the opportunity to conduct a larger marketing effort for New Construction. Several strategies are used, such as:

- *Product Feature Sheet:* Explains the features and the benefits of the product
- *Trade and Customer Seminars:* In-person opportunities to educate customers and trade partners on the benefits of new construction; an important part of the marketing strategy.
- *Conferences and Exhibits:* In-person expertise to help customers determine what product best fits their needs, as well as guidance on the EEB and EDA processes.
- *E-newsletters:* Another avenue to educate the market on the product and benefits of reviewing new construction projects for energy efficiency opportunities.

E. Product-Specific Policies

The following policies are in place for the New Construction product:

- *Natural Gas Impacts.* In taking the whole building approach, there are times when an efficiency measure may cause a decrease in one fuel consumption, but an increase in consumption of another fuel. In these situations, Public Service will account for both the decreases (energy savings) and increases in fuel consumption and will issue the rebate accordingly.
- *Completion of several opportunities.* The EEB offering will require installation of new equipment in both the electrical and mechanical sections of the building. Buildings that only require adjustments to one “section” will be referred to the Company’s other prescriptive products.

F. Stakeholder Involvement

Customers, trade allies, and other stakeholders are engaged at the project level. Feedback is garnered individually from participants and when feedback trends are identified, Public Service will develop recommended changes for consideration in product design. If it is a small change that does not require a 60-Day Notice, then it is typically discussed internally, and possibly with a few key trade allies and, if deemed acceptable, implemented. More significant product changes may involve review by external technical consultants or other third-parties, and would be submitted via 60-Day Notice (if required) and/or presented at a quarterly DSM Roundtable Meeting.

The Company continues to coordinate with other utilities and organizations to improve and effectively deliver the New Construction offerings. In addition, surveys are used to gather feedback from participants to continually improve the product.

H. Rebates & Incentives

The EDA offering covers energy modeling services valued at an average of \$25,000 per project. Public Service also reimburses design team members to offset the incremental cost of their participation from \$4,000 to \$12,000 per project, depending on the square footage of the

building. The EEB offering covers analysis of measure opportunities valued at an average of \$3,300 per project, and provides both prescriptive and custom rebates for measures above code.

In addition to energy modeling and analysis, Public Service provides financial construction incentives to building owners to improve the cost-effectiveness of the chosen energy efficiency measures. Customer incentives are based on demand and energy savings set at a base rate of \$400 per kW saved and \$0.04 per kWh saved. In addition, a natural gas savings rebate of \$4 per dekatherm saved is available.

➤ **Process Efficiency**

A. Description

The Process Efficiency product is the Company's primary strategic energy management (SEM) offering designed to target energy-intensive processes in customers' facilities. This holistic approach to energy conservation helps the customer create and implement a sustainable energy management plan that targets a system level approach to energy conservation versus a project level approach. This product is typically delivered in phases; each phase is defined in a Memorandum of Understanding (MOU) between the Company and the customer that is customized to reflect the needs of the specific customer.

Phase 1: Identification – A high-level analysis is performed to identify opportunities for energy savings in both a customer's business practices and the technical opportunities within their operations. This is completed at no cost to the customer.

Phase 2: Scoping – Support and resources are provided to further define and offer recommendations for energy savings opportunities identified in Phase 1.

Phase 3: Implementation – The Company works with the customer to set conservation goals and create an energy management plan to achieve those goals. Projected estimates of the rebates that the Company will provide to support these efforts are calculated for the customer. Equipment rebates for this product include both prescriptive and custom measures, adhering to applicable policies and rebate levels for those project types.

The Company expanded the product starting in 2015 to include both large customers and mid-tier industrial customers, offering two tracks:

1. *Large Customer Offering* – Available to customers with 20 GWh or more in annual usage where proposed projects have a minimum of 2 GWh in potential conservation opportunities.
2. *Mid-tier Customer Offering* – Available to customers with a minimum annual consumption of 2 GWh.

Both components are available to eligible electric customers in Public Service's service territory. For the Mid-tier Customer Offering, Phases 1 and 2 are combined at the outset.

Successful delivery of this product is resource intensive both internally and externally. Due to the magnitude and complexity of custom projects, significant internal PSCo resources are required for completing project analyses and verifying adherence to all M&V requirements. Additionally, the product's success relies heavily on a more developed relationship with the customer garnered through the Account Management team. Lastly, the Company provides support, in partnership with trade allies, to customize the offering to match customer needs.

External resources are used to deliver services in all phases of the product. A third-party implementer delivers the Phase 1 session, but given the breadth of opportunities and the volume of studies, their resources may also be augmented by additional service providers. The product emphasizes building on what the customer has in place, so, when possible, vendors with familiarity with specific the customers' operations are utilized. This approach has included leveraging various engineering firms and equipment vendors. The Company requires that the vendor possess the necessary skills and experience and deliver the services at a reasonable price. This is achieved by requiring the vendor to submit costs and a proposal for Phase 2 study funding prior to preapproval, which is the same process followed by other study-based products within the Company's DSM portfolio.

B. Targets, Participants & Budgets

Targets and Participants

Participation levels are based on the number of customers actively participating in the project pipeline.

The Company generally will not see impacts from new customers in their first year of engagement in the product offering, which is the result of the extended sales cycle for the process-related, capital-intensive conservation improvements being targeted for implementation. An 18-24 month period is anticipated leading up to project installation, however, the Company does aim to influence installation of some smaller, energy efficiency projects in the interim.

Budgets

The majority of the budget traditionally has been, and will continue to be, spent on rebates and consulting services to provide the assessment and scoping phases of the product. The budgets and goals were developed by reviewing historical performance, the current pipeline for projects, and anticipated market uptake.

The product budget was developed based on historical performance with adjustments to rebates to drive additional implementation from the potential participants.

C. Application Process

Due to the extensive customer engagement required for participation in this product, the Company identifies potential participants by cross referencing customers' historic electric usage with general industry energy consumption and conservation potential data—particularly for Public Service customers using more than 10 GWh per year. Beginning in 2015, the participation threshold was lowered to accommodate a mid-tier industrial customer with minimum annual consumption of 2 GWh. Once eligible customers are identified, Account Managers are relied upon to approach the customer with a description of the product and facilitate an informational meeting, if appropriate, between the customer, the DSM product manager, and any other relevant parties.

If the customer chooses to proceed with participation in the Process Efficiency product, the Account Manager will coordinate the walk-through of the customer facility as described in Phase 1 above. The customer's formal acknowledgement of planned participation in the product begins with the customer signing the MOU at this stage.

The Company views the signing of the MOU to formally establish a date of influence for all projects completed under the umbrella of the product. Conditional preapproval is established for the measures the customer chooses to pursue after signing the MOU.

D. Marketing Objectives & Strategies

This product is marketed primarily to customers through Public Service's internal Account Managers. In addition, the Company will continue to offer segment-specific seminars to introduce new energy-efficient technologies to the market and attract customers to participate in the product. The comprehensive nature of the product's process will evaluate energy use throughout a customer's operations instead of focusing on implementation of specific technologies or efficiency upgrades. This holistic approach can lead to the identification of significant conservation opportunities resulting from process or business practice changes.

E. Product-Specific Policies

The "large customer offering" is available to all commercial and industrial customers with a minimum annual consumption of 20 GWh. The "mid-tier customer offering" is limited to industrial customers with minimum annual consumption of 2 GWh. Both options are expected to attract participants primarily with energy-intensive processes.

Conservation opportunities may be grouped into a single or multiple projects within a customer's energy management plan. The plan will identify the expected sequencing and scheduling of the projects.

If a study conducted at a Process Efficiency customer's facility identifies custom projects that do not meet the Custom Efficiency product's rebate eligibility requirements, energy savings credit will still be claimed by the Company as "study-influenced savings."

The anticipated timeframe from project initiation to completion is expected to be 18-24 months. No energy savings impacts will be recorded until a project is fully installed, operational, and the final rebate (if applicable) is issued. This approach results in significant investment by the Company in the year preceding realized impacts. There will also be customers who start the sales cycle but withdraw before completing any projects resulting in stranded investments by Public Service. These risks are mitigated through monitoring of corporate commitments during established multi-year energy management plan checkpoints.

The incentive to optimize a system versus implement individual projects may also result in a lag between when individual components are installed and when the rebate is paid. These rebates will not be paid until all projects identified in the MOU are completed.

Bundling of two or more projects to achieve cost-effectiveness, improve payback, or to meet rebate requirements is an option for Process Efficiency participants if the requested bundled projects meet certain requirements:

- projects included in a bundle cannot be completed before they are preapproved as a bundle;
- payback for each project will be individually analyzed and confirmed to be within the lifetime requirements for the measures; and
- the entire project bundle must be cost-effective.

F. Stakeholder Involvement

The Process Efficiency product is being offered in direct response to requests from customers who have significant conservation potential and a willingness to complete energy efficiency projects, but may not have available resources or internal expertise.

The quarterly DSM Roundtable Meetings provide a forum for stakeholder involvement and feedback on this product, and others in the Company's DSM portfolio in Colorado.

G. Rebates & Incentives

Participants will be eligible for both study funding and end-use equipment rebates. The funding for Phase 2 studies will be based on the customer contributing 25% of the cost of the study, up to a maximum of \$7,500 for "large customer offering" and \$2,500 for the "mid-tier customer offering," to encourage implementation of study recommendations. Projects will be rebated based on the measures installed and the energy and demand savings achieved. Rebates will be valued according to the levels established for end-use equipment within the Company's other DSM products. Bonus incentives may be given for completion of milestones within the energy management plan, or achievement of energy savings exceeding the level indicated in the MOU.

➤ **Recommissioning**

A. Description

Building recommissioning is the process of reviewing existing equipment and systems within a building to ensure that they are working as efficiently as possible and operating as intended. The product covers both recommissioning and retrocommissioning. *Recommissioning* is commissioning a building that has already been commissioned in the past. *Retrocommissioning* is commissioning a building that has never been commissioned. The Recommissioning product is designed to assist electric and/or natural gas business customers in improving the efficiency of their existing building operations by identifying existing functional systems that can be “tuned up” to run as efficiently as possible through low- or no-cost improvements.

Examples of typical recommissioning measures include:

- Calibration/tune-up of energy management system points
- Adjustment of outside air and return air dampers
- Resetting the chilled water and hot water supply temperatures
- Optimum start/stop of air handlers and makeup air units (early shutdown in the evening, late start in the a.m.)
- Resetting of a chiller’s condenser water temperature
- Eliminating simultaneous heating and cooling

Recommissioning generally consists of two main steps: diagnosis (studies) and implementation. Public Service offers rebates for recommissioning studies and the implementation of recommissioning measures. The customer selects and hires a qualified trade partner to complete the study and implementation.

The Recommissioning product has three different paths a customer can choose:

1. *Study and implementation* – Customers receive funding for both the study and implementation from Public Service. Public Service works with the customer from the beginning of the project until the end. The study path has historically been the most popular choice for Public Service’s customers within Recommissioning.
2. *Fast track implementation* – This path is for customers who have either performed a study outside of this product offering, or have identified a few recommissioning measures within their building without doing a comprehensive study. To qualify, Public Service will review the study and/or recommended energy savings opportunities to determine recommissioning implementation rebates.
3. *Small Building Tune-Up* – This path is an option targeted to buildings less than 50,000 square feet. An onsite study is performed, but focuses on a more targeted checklist of measures, along with the study vendor completing fixes on-site as appropriate. This option opens the door to owners of smaller buildings to recommissioning activities without having to spend limited capital on a costly study.

B. Targets, Participants & Budgets

Targets and Participants

To achieve the product targets, Public Service claims energy and demand savings as customers implement the measures identified in their study. Participants are allowed to pick which measures they want to implement; a typical recommissioning study may suggest anywhere from five to ten measures, with varying costs and paybacks.

Budgets

Historical cost and participation information was analyzed to project budget requirements. For the Recommissioning product, most of the budget is driven by the number of studies completed and the number of customers who implement projects in a given year. The following factors were considered in determining the budget: total participants; rebate levels offered; promotional, advertising, and educational opportunities; and labor requirements to achieve energy savings and participation targets.

C. Application Process

Customers learn of the product through their Public Service Account Manager, direct marketing efforts, and via recommissioning trade partners.

If a customer is interested in participating in a study, they should apply for preapproval before they begin the study. To obtain preapproval, the customer will submit an application and a proposal from their recommissioning trade partner that outlines the scope of the project. After the customer receives preapproval, they can begin the study on their building. When the study is completed, Public Service's internal engineer reviews the study to ensure that it meets our requirements and that the energy savings calculations are reasonable. After Public Service approves the study, the trade partner will present their final recommendations to the customer and then the customer can receive their study rebate. At this point, the customer will review the study and select individual measures to implement. After they finish implementation, they will receive their rebate check for the individual measures.

The typical sales cycle for a regular recommissioning project (study and implementation) takes one to two years to complete. Once preapproved, the study can typically take three months to complete and receive Public Service approval. Another year or more may go by before the customer receives internal approval for their capital expenditures needed to complete the project.

If a customer wants to participate in the fast track implementation option (described above), where they receive implementation rebates only (no study funding), they obtain pre-approval for implementation rebates prior to completing the measures. To obtain pre-approval, they need to submit either their study or their project proposal for review. The sales cycle for fast track projects is typically shorter than a regular recommissioning project since they have already completed a study or may only be requesting a proposal from the trade partner.

To participate in the Small Building Tune-Up option, customers submit an application and the vendor performs the study.

D. Marketing Objectives & Strategies

The marketing strategy is to educate customers and trade partners on what recommissioning entails and the benefits of recommissioning a building. Due to the long sales cycle, it is important to continually build the study pipeline to meet future year's goals. To build the pipeline and to attract customers and recommissioning trade partners, various marketing tactics such as direct mail, educational seminars, targeted email newsletters, in person meetings, case studies, and the website are utilized. Another tactic is to provide increased study funding and/or implementation funding to customers if participation and/or achievement is lower than anticipated during 2017 and/or 2018.

The primary market segment for Recommissioning is commercial customers that are 50,000 square feet or larger, such as offices, hospitals, and schools. These customers are good candidates due to the following:

- Office real estate owners are looking for quick paybacks on their buildings and want to cut their operating costs without sacrificing tenant comfort. Recommissioning is an ideal option for these customers as many measures are low/no cost with quick paybacks.
- Hospitals are intense energy users, and their energy systems frequently run as if there is full load, although that often isn't the case. There are many opportunities for low cost savings in hospitals and medical centers.
- Schools are closed down for more periods than most buildings and have more opportunities for optimizing their energy systems.

A comprehensive list of marketing materials has been developed for customers, providers, and Account Managers, including:

- Product feature sheet – explains the features and the benefits of the product;
- Study preapproval application;
- Study rebate application – used to receive a study rebate after study has been approved;
- Fast track preapproval application;
- Recommissioning guidebook – information booklet that explains recommissioning, benefits, process, etc.;
- Trade partner list – contains providers who have participated in our product in the past;
- Case studies: hospital, school, office building, hotel, medical and research facility – provides examples of how other customers benefited from participating in recommissioning;
- Process flow chart;
- Provider tips booklet – helps providers through the process;

- Customer website⁵² – snapshot of our product and links to many useful resources and marketing materials;
- Trade partner website⁵³ – contains information on the product and tips that are specific to trade partners participating in the product. The website also has links to all of the marketing materials for easy access; and
- Recommissioning calculation tool - helps trade partners with basic calculations of recommissioning energy savings.

Periodically, specific marketing materials that cover timely information are developed, such as:

- Direct mail pieces – promotional piece that is sent to a specific target market either based on size or segment;
- Customer newsletters – reminds customer of product offering, highlights product changes/enhancements;
- Customer email – a brief email that is available to Account Managers to send to customers;
- Customer seminar – educate customers about Recommissioning and the benefits; and
- Trade partners seminar – educate the trade on how to participate in the product.

Recommissioning trade partners play a key role in the success of the product since customers rely on trade partners to identify energy saving opportunities in their building. While trade partner interest in participating in the product is increasing, the Company will be working to identify additional trade partners in 2017 and 2018 to help meet future demand. The goal is to make sure that trade partners understand expectations for the product and provide the necessary tools to help customers through the process. To help trade partners participate in the product, the Company meets with them one-on-one or in group training sessions to explain the process and requirements and encourage working through the projects collaboratively with Public Service.

E. Product-Specific Policies

Recommissioning has a few policies that are specific to the product which include:

- *Study/analysis driven credit:* If a customer implements measures that are less than a one-year payback or over a 15-year payback, they will not receive a rebate, but Public Service will claim the study/analysis-driven savings. The Company believes that our help identifying and/or analyzing energy efficiency measures provides sufficient influence on the customer's decision to implement those measures.
- *Maintenance:* The Recommissioning product may claim energy savings for major maintenance measures identified and implemented through the recommissioning process.

⁵²

http://www.xcelenergy.com/Programs_and_Rebates/Business_Programs_and_Rebates/Energy_Audits_and_Studies/Recommissioning

⁵³

http://www.xcelenergy.com/Partners/Trade_Partners/Business_Trade_Partners/Recommissioning_for_Trade_Partners

- *Rebate/energy savings validity:* If at least two years has passed since a project was approved, the technical staff re-analyzes it with current rates to determine if the savings / payback has changed. This re-analysis is conducted prior to issuing a rebate.
- *Customer eligibility:* The product is available to retail business customers with both electricity and natural gas service, or electricity only service. Gas only service customers are not eligible for this product

If it becomes too burdensome for the customer to provide an invoice or other formal documentation supporting the implementation of a recommissioning measure (e.g. recommissioning measure implementation cost was part of a larger project), the Company will accept only their signature as documentation of implementation, as long as the customer accepts foregoing any implementation rebate they may have qualified for. In such cases, because Public Service helped fund the study identifying the recommissioning measure, the Company will claim credit for the measure but will not issue an additional implementation rebate to the customer.

F. Stakeholder Involvement

The Company values feedback from customers and trade partners and makes an effort to gather their input to ensure the product is effective. As ideas are generated from stakeholders, they will be reviewed and implemented, if feasible. The Company will meet with our active trade partners to discuss product specifics and to obtain feedback. Continuous communication with this group through informal conversations and project work provides opportunities to keep this feedback channel open.

G. Rebates & Incentives

The Recommissioning product offers two types of customer rebates: study and implementation.

Study rebate: Public Service will pay up to 75% of the recommissioning study cost, up to \$25,000. Payment of the remaining balance by the customer ensures customer commitment to identifying and implementing measures found within their study.

Implementation rebate: Public Service will pay up to \$400 per peak summer kW or \$0.08 per kWh saved, whichever is higher, and an additional \$4/Dth saved for Public Service natural gas customers, up to 60% of the recommissioning measure costs that are identified in recommissioning studies or preapproved through the fast track implementation option.

➤ Self Direct

A. Description

The Self Direct product provides large commercial and industrial customers in Colorado the opportunity to control all stages of their project's rebate application process. Participating customers will identify, engineer, implement, and commission qualifying energy efficiency projects to receive rebates for implementing those projects. The dollar value of the rebates will be calculated based on the incremental energy savings achieved. Because the Self-Direct product shares many of the features of the Custom Efficiency product, it can be viewed as a traditional custom product targeted towards a unique subset of customers.

A fundamental principle and differentiating factor of the Self Direct product is that the customer performs all of the work and incurs all the costs for the identification study, design, engineering, measurement & verification (M&V), and reporting work associated with the energy saving projects. Large customers with energy saving evaluation resources may choose to participate in the Self Direct product because they believe that it is beneficial for them to perform more of the administrative and engineering activities, and in doing so, receive a higher rebate over Public Service's other DSM products.

Participation in the Self Direct product will generally follow this sequence:

1. Public Service prequalifies customers who are eligible for participation.
2. Once prequalified, a customer identifies energy savings opportunities, then develops and submits a project proposal.
3. Public Service provides confirmation of application receipt, reviews the application, and requests additional information as necessary.
4. Public Service notifies the customer of preapproval or denial of the application, including the estimated rebate and energy savings from the project, and finalizes a mutually agreed upon M&V plan.
5. Public Service encourages the customer to attend a project planning meeting to discuss final rebate application preparation and project details.

If the customer chooses to implement the preapproved project they must follow the requirements detailed in the M&V plan and conduct all necessary steps in order to verify energy savings. Any data required for pre-installation monitoring detailed in the M&V plan should be submitted to the Company and approved before the customer implements the energy efficiency measures. Upon acceptance of the data the customer can then implement the measures and perform any follow-up monitoring as described in the M&V plan.

Once the project is implemented and operational and all necessary M&V is completed, the customer will submit their project completion report with required details. Public Service will review the report, request any additional data, and calculate the final rebate. The rebate will be paid by check upon completion of the project and Public Service's approval of the project completion report.

B. Targets, Participants & Budgets

Targets and Participants

Energy savings and participation targets have been estimated based on projects currently in the pipeline, as well as analysis of historical performance.

Budgets

The product budget was estimated based on the project pipeline and historical participation. No M&V costs are budgeted for because customers incur the costs associated with M&V for custom projects.

C. Application Process

Customers are most likely to hear about the Self Direct product through their Account Managers or trade partners. Customers must be prequalified for participation before submitting a project application. The customer is responsible for providing the Company with justification for eligibility (prequalification). Justification must include, but is not limited to, a list of the customer's account numbers, locations, and meter numbers to be aggregated (to meet the minimum aggregated peak load requirement – see Section E below).

Once prequalified, the customer will submit a project application for each Self Direct project. The project applications may contain a single measure, or a combination of multiple measures at a single, or multiple customer sites. All energy conservation measures must be at customer locations that receive electric service from the Company.

D. Marketing Objectives & Strategies

The Self Direct product is marketed to large customers who have expressed an interest in overseeing their own energy efficiency improvement projects. Other marketing efforts will focus on potential participants based on customer energy use, conservation potential, and in-house experience and expertise with energy efficiency improvement projects.

E. Product-Specific Policies

The Self Direct product is open to Public Service commercial and industrial electric customers who have an aggregated peak load of at least 2 MW in any single month and an aggregated annual energy consumption of at least 10 GWh. The customer of record must be the same for all aggregated meters to qualify for this product. New customers, or existing customers with new facilities, that demonstrate predicted demand and usage above the minimum requirements, may participate in the Self Direct product.

The MTRC test ratio for each application will be calculated based on the combination of all measures proposed in the application. The Company will provide an MTRC calculator to facilitate this calculation. The customer will again use the MTRC calculator to calculate the final project MTRC value and include this in the project completion report using the actual implementation costs, energy conservation data, non-energy costs and/or benefits and the calculation methodology provided by the Company. The Company will verify the MTRC for the completed project upon review of the project completion report.

Participants in the Self Direct product will be allowed to participate in other DSM products offered by the Company, but will not be rebated for the same energy efficiency measure through two different DSM products. No funding will be paid by Public Service for the identification (study) of projects being rebated through the Self Direct product. Customers may enroll their new facilities in either the Self Direct product or the New Construction product, but not both. If the customer chooses to participate in the Self Direct product for a new building project, the design work and energy modeling shall follow the protocol established in the New Construction product; however, the customer will be required to pay for all energy modeling costs.

Project Application

The project application must include the following components:

- Description of the customer, including electric and gas rate classifications, business activities at involved sites, names and roles of personnel involved in the project, and those personnel's history of and expertise with energy efficiency projects.
- Description of the proposed project(s) including technology, locations, implementation schedule, expected measure life, how the projects fit into the customer's operations, and a description of previous implementations of similar technology or projects. The project description should include product specification sheets, white papers, quotes from vendors to validate cost estimates, and other supporting documentation. Self Direct project applications may contain a single measure, or a combination of multiple measures at a single or multiple locations. All energy efficiency measures must be at customer locations receiving electric service from the Company.
- For new buildings, the application must contain computer energy modeling specific to the planned building to forecast the base case and efficient energy use. Computer modeling should be in accordance with the protocol specified within the Energy Design Assistance approach of the New Construction product.
- Engineering calculations to forecast energy and demand savings, participant O&M benefits and costs, and the estimated rebate.
- Benefit-cost calculations to determine the MTRC test ratio, including a discussion of the sensitivity of the MTRC and payback to various inputs, and the perceived accuracy of the inputs.
- Description of the controls the customer will use to reduce the likelihood of project cost and schedule overruns.
- Description of the proposed monitoring activities that will be used to track and document demand and energy savings. Pre- and post-installation metering and verification will be required for all projects with predicted energy savings greater than 0.25 GWh, unless the Company and customer agree upon another methodology. The Company reserves the right to require data measurement and verification for projects of any size.

- Any information reasonably requested by the Company to document and support the application.

Project Completion Report

The format of the project completion report must include the following components:

- Description of all deviations from the application package including equipment substitution, cost adjustments, operating procedures, etc.;
- Documentation of all actual costs incurred including invoices, internal labor, incremental operation and maintenance costs, etc.;
- Raw monitoring results and engineering calculations to demonstrate actual energy and demand savings based on monitoring results;
- Requested rebate amount; and
- Any information reasonably requested by the Company to document and support the project completion report.

F. Stakeholder Involvement

Customers, trade allies, and other stakeholders are currently engaged at the project level. Feedback is garnered individually from participants. The Company will evaluate trends for product improvement and, after discussion with key stakeholders and/or third-party consultants, implement potential changes (via 60-Day Notice, as needed).

G. Rebates & Incentives

Public Service will pay rebates based on the actual savings from a project, up to \$525 per customer kW or \$0.10 per customer kWh. Rebates will be given for either peak demand or energy savings for a project, not both, and will be limited to 50% of the incremental costs of the project. Rebates will apply to new and long-term leased equipment, but not to used equipment. The maximum lifetime and payback for a measure is limited to the lease duration. All measures submitted in a Self Direct application will be combined for calculation of financial tests and rebate levels. Rebates will not be given for applications with expected paybacks of less than one year. Rebate levels will be adjusted downward so that no project (with rebates included) has a payback less than one year. For rebate calculation purposes, kW saved shall reflect the reduction in the customer's peak demand (kW) as a result of the energy efficiency project. For rebate calculation purposes, kWh saved will be the annual kWh saved as a result of the energy efficiency project(s).

The expected rebate for the project will be communicated to the customer upon preapproval. The final rebate amount will equal the preapproved rebate amount if the actual project costs and energy/demand savings are within 10% of the estimated values and the MTRC test ratio for the completed project meets the criteria stated above. If actual project costs, energy or demand savings differ from the estimated values by more than 10%, the customer should include revised calculations for the requested rebate in the project completion report.

Residential Program

A. Description

Public Service will continue to offer a wide range of product offerings to serve residential customers in 2017 and 2018. The DSM products that make up the Residential Program will be available to over 1.2 million electric and 1.24 million natural gas customers.⁵⁴ These customers traditionally reside in single-family homes, multi-family homes, and apartments/condominiums. To address this varied set of customers, the Company will offer a unique set of products targeted to reach the vast majority of the residential market and provide customers with multiple opportunities to participate.

While the Business Program focuses on customers with large energy savings projects, the Residential Program is truly a mass-market program that will touch tens of thousands of customers annually. The products are implemented in a manner that enables large numbers of customers to participate and benefit from the products.

The residential DSM products focus on educating customers on energy efficiency and giving them simple ways to participate, encouraging long-term commitment to reduce energy use. The Company offers a comprehensive set of products including prescriptive rebates for heating and cooling equipment, home lighting, whole house solutions for new or existing homes, lessons on energy efficiency to school-aged children, energy savings through behavior change, and refrigerator recycling.

Products

A thorough portfolio of residential products is planned for 2017 and 2018. The full list of residential products is provided in the table below. Public Service is not adding any new product offerings; however, as evaluations of the existing pilots continue Public Service may look to add new products, such as Residential Smart Thermostats, through a 60-Day Notice in 2017.

⁵⁴ Customers counts as of July 29, 2014.

Table 9: Residential Program Product Rankings

2017-2018	Rank
Home Lighting & Recycling	1
School Education Kits	3
Energy Feedback Residential	5
Energy Efficient Showerhead	7
Refrigerator & Freezer Recycling	9
ENERGY STAR New Homes	12
Evaporative Cooling	13
Residential Heating	14
Home Energy Squad	23
High Efficiency Air Conditioning	25
Insulation & Air Sealing	30
Home Performance with ENERGY STAR	32
Water Heating	33

In developing and refining the portfolio of products, Public Service worked closely with external consultants familiar with residential and low-income products nationally. This included assessing possible new products, developing technical assumptions for new energy efficiency measures, evaluating the Colorado climate and energy code impacts, and performing an initial cost-effectiveness analysis. The Company researched other utility offerings to learn about new products, understand their challenges, and discover how the existing products could be improved. The Company worked with industry consultants and vendors such as E-Source, ACEEE, and CEE to learn about energy efficiency activities across the nation. In addition, Public Service spoke with local energy industry members to shape and refine products and discuss partnership opportunities.

B. Targets, Participants & Budgets

Targets and Participants

The Company's residential DSM products have a large reach to customers and provide a wide portfolio of offerings that will allow all customers to participate. The Residential Program is anticipated to contribute 152.6 GWh and 353,485 Dth in 2017 and 160.1 GWh and 357,816 Dth in 2018. This is approximately 38% and 56% respectively of the 2017 achievements and 40% and 62% respectively of the 2018 achievements.

Table 10a: 2017 Electric Residential Program Budgets & Targets

2017	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Residential Program				
Energy Efficiency Showerhead	\$57,416	80	991,735	10.68
Energy Feedback Residential	\$3,114,496	4,441	20,670,112	1.01
ENERGY STAR New Homes	\$999,113	985	3,283,030	1.46
Evaporative Cooling	\$2,544,886	4,309	2,873,245	2.26
High Efficiency Air Conditioning	\$2,584,444	2,529	2,409,080	1.02
Home Energy Squad	\$306,195	204	1,580,210	1.49
Home Lighting & Recycling	\$7,988,201	10,177	104,667,777	1.67
Home Performance with ENERGY STAR	\$303,752	477	727,728	1.03
Insulation & Air Sealing	\$206,189	385	431,033	1.11
Refrigerator & Freezer Recycling	\$1,339,828	566	4,954,115	1.51
Residential Heating	\$694,972	746	4,238,928	1.49
School Education Kits	\$1,470,807	498	5,672,969	1.20
Water Heating	\$31,750	21	102,246	0.62
Residential Program Total	\$21,642,049	25,417	152,602,208	1.53

Table 10b: 2018 Electric Residential Program Budgets and Targets

2018	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Residential Program				
Energy Efficiency Showerhead	\$58,960	80	991,735	10.65
Energy Feedback Residential	\$3,124,554	4,356	19,820,695	1.09
ENERGY STAR New Homes	\$1,070,548	1,078	3,593,510	1.49
Evaporative Cooling	\$2,545,418	4,309	2,873,245	2.31
High Efficiency Air Conditioning	\$2,693,592	2,646	2,515,951	1.04
Home Energy Squad	\$351,932	232	1,771,790	1.40
Home Lighting & Recycling	\$8,408,941	10,925	112,445,526	1.77
Home Performance with ENERGY STAR	\$303,978	477	727,728	1.05
Insulation & Air Sealing	\$207,646	385	431,033	1.12
Refrigerator & Freezer Recycling	\$1,353,906	566	4,954,115	1.57
Residential Heating	\$694,990	746	4,238,928	1.54
School Education Kits	\$1,488,664	498	5,672,969	1.15
Water Heating	\$31,750	21	102,246	0.63
Residential Program Total	\$22,334,879	26,319	160,139,471	1.59

Table 10c: 2017 Natural Gas Residential Program Budgets & Targets

2017	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Residential Program					
Energy Efficiency Showerhead	\$460,118	52,190	113,428	\$6,205,675	10.56
Energy Feedback Residential	\$483,345	63,873	132,149	\$141,506	1.29
ENERGY STAR New Homes	\$2,150,945	93,054	43,262	\$1,892,423	1.38
Evaporative Cooling					
High Efficiency Air Conditioning					
Home Energy Squad	\$336,108	11,592	34,490	\$205,989	1.38
Home Lighting & Recycling					
Home Performance with ENERGY STAR	\$559,460	26,853	47,999	-\$359,155	0.83
Insulation & Air Sealing	\$385,385	20,687	53,678	-\$83,481	0.94
Refrigerator & Freezer Recycling					
Residential Heating	\$533,403	47,981	89,953	\$206,477	1.07
School Education Kits	\$438,447	34,972	79,762	\$4,004,469	7.51
Water Heating	\$122,080	2,283	18,700	-\$73,546	0.69
Residential Program Total	\$5,469,292	353,485	64,631	\$12,140,357	1.88

Table 10d: 2018 Natural Gas Residential Program Budgets and Targets

2018	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Residential Program					
Energy Efficiency Showerhead	\$473,661	52,190	110,185	\$6,311,701	10.42
Energy Feedback Residential	\$484,764	64,550	133,157	\$177,748	1.37
ENERGY STAR New Homes	\$2,232,379	94,878	42,501	\$2,180,723	1.42
Evaporative Cooling					
High Efficiency Air Conditioning					
Home Energy Squad	\$351,408	13,423	38,197	\$301,829	1.51
Home Lighting & Recycling					
Home Performance with ENERGY STAR	\$560,434	26,853	47,915	-\$292,182	0.86
Insulation & Air Sealing	\$385,385	20,687	53,678	-\$32,346	0.98
Refrigerator & Freezer Recycling					
Residential Heating	\$540,988	47,981	88,692	\$329,075	1.12
School Education Kits	\$451,103	34,972	77,525	\$4,082,228	7.45
Water Heating	\$121,930	2,283	18,723	-\$68,012	0.72
Residential Program Total	\$5,602,053	357,816	59,112	\$12,990,764	1.92

Budgets

Achievement targets were developed as a result of a participation and energy savings estimation process for each product, which was rolled up to the Residential Program total. Similarly, budgets for each product were developed based on the anticipated level of achievement and cost of market penetration, including review of historical data for the past three and half years, and longer-term experience with similar products in Minnesota.

Market Analysis

The Company's Residential Program reflects the primary market opportunities for residential energy savings in four areas: whole home and building envelope, HVAC, education and behavior change, and common measures.

1. *Whole Home and Building Envelope:* With increased awareness of energy costs, interest in conservation, and varied energy performance of existing homes, there continues to be good energy efficiency opportunities for residential customers in new or existing homes.
Products: ENERGY STAR New Homes, Home Performance with ENERGY STAR, Insulation & Air Sealing
2. *HVAC:* Public Service believes evaporative cooling is an excellent low cost source for cooling in the Colorado climate. The Company also realizes that customers are looking for central air conditioning and heating options. To address this demand, the Company offers products focused on quality installation of new units and replacement of inefficient, existing systems.
Products: Evaporative Cooling, Residential Heating, and High Efficiency Air Conditioning
3. *Education and Behavior Change:* The Company funds initiatives to educate customers, enhance participation in direct impact products, and influence market transformation.
Products: Energy Feedback Residential and School Education Kits
4. *Common Measures:* The Company supports rebates and incentives for prescriptive, energy-saving measures focused on the most common household equipment.
Products: Home Energy Squad, Home Lighting & Recycling, Refrigerator & Freezer Recycling, Energy Efficiency Showerhead, and Water Heating.

C. Application Process

Application processes vary by product. See individual product summaries following this overview for more information.

D. Marketing Objectives & Strategies

Trade allies, end-use equipment vendors, energy services companies, Public Service's call center representatives and marketing team are the primary drivers for realization of the planned achievements in the Residential Program. The Company utilizes newsletters, customer events, direct mail, telemarketing, email communications, and awareness advertising to reach customers. A challenge in marketing energy efficiency is that it's not a topic on the top of customers' minds. Customers tend to focus on purchase price (or "first costs") rather than lifetime costs and are unlikely to replace equipment prior to failure. Customers may also not be aware of energy efficient equipment options available to them when the need arises to make purchase decisions. Yet, opportunities are growing in marketing energy efficiency to customers because energy costs and climate change have led to increased awareness and affinity for energy-saving actions. To

support marketing efforts, Public Service employs an integrated approach to marketing communications, where the tactics are designed to work in concert with each other and reinforce key messages over time.

Furthermore, residential DSM product managers and product developers periodically meet with the Company's residential Customer Care Centers and energy efficiency specialists to determine how the energy efficiency products and services are being received in the marketplace, and solicit ideas for existing product improvement or new product introduction.

Strategy

Public Service follows the "AIDA" (awareness, interest, desire, action) process for encouraging customers to participate in DSM products. The following are the steps in this process:

1. Create awareness of electric and/or gas prices and potential savings from energy efficiency offerings.
2. Promote interest in DSM products by providing information about the offerings across a variety of customer touch-points.
3. Instill the desire for participation in DSM products by showing how customers can reduce their "first costs" via rebates in the near-term and reduce their monthly energy bills in the long-term with energy-efficient appliances and equipment.
4. Move the customer toward action by providing a wide range of product offerings to address one or more of their needs.

Key Messages and Target Audience

When communicating with customers, Public Service uses several overarching key messages including:

- Energy efficiency reduces monthly energy bills due to lower operating costs.
- Public Service helps lower energy bills by offering rebates and incentives for installing highly efficient equipment.
- Energy efficiency helps reduce environmental impacts.

E. Program-Specific Policies

There are several general policies that apply to Public Service's Residential Program. Individual products may have additional, unique policies as noted in each of the product summaries that follow.

Residential Program policies include:

- *Proof of installation:* Nearly all residential DSM products in the Company's portfolio require documentation of installation through either proof of purchase (i.e. detailed invoices) or by measurement and verification.
- *Installation date:* Determines rebate eligibility and amount. Once equipment is installed and operational, rebate applications may generally be submitted within a 12-month period.

F. Stakeholder Involvement

Throughout the product development process, Public Service has discussions with key external parties. The discussions are often initiated via work groups, public forums like the quarterly DSM Roundtable Meetings, one-on-one meetings, phone calls, and/or brainstorming sessions. In developing this Plan, the Company had discussions with local stakeholders, including: City/County of Boulder, City of Denver, Colorado Energy Office, Colorado Department of Public Health and Environment, Energy Efficiency Business Coalition (EEBC) and Denver Water.

In addition to discussion with Colorado area contacts, Xcel Energy had also worked with national organizations in the past when developing many of the DSM products, including: ACEEE, CEE, U.S. Department of Energy, U.S. Environmental Protection Agency, E Source, Southwest Energy Efficiency Project (SWEEP), and Wisconsin Energy Conservation Corporation (WECC).

These organizations continue to provide feedback on the Company's DSM products to suggest areas for future improvement.

Additionally, as the Company explores new ways to reach the residential market, we continue to work with local communities as key partners. In 2014, the Company launched the *Partners in Energy* program to support communities in developing and implementing comprehensive energy action plans. Local energy plans are a platform to drive participation in the Company's DSM products. In 2015 and 2016, the Company will continue to support and grow community partnerships through *Partners in Energy*, by configuring our DSM products and resources to support the unique energy goals and markets of individual communities.

G. Rebates & Incentives

Residential rebates are prescriptive, and vary by product.

Indirect Programs such as Consumer Education, Energy Efficiency Financing, and Home Energy Audits support customer learning, and influence participation in residential prescriptive products.

H. Evaluation, Measurement, & Verification

The specific product measurement and verification plans are described in the EM&V section of this Plan; and products that will undergo comprehensive evaluations in 2015 or 2016 are also noted that section.

➤ **Energy Efficient Showerhead**

A. Description

The Energy Efficient Showerhead product is designed to offer year-round natural gas and electric savings to Public Service customers. Residential natural gas and combination gas and electric customers are eligible to receive free, energy-efficient showerheads and faucet aerator kits to help reduce their energy and water use.

Eligible customers are contacted and offered multiple kit options based on their past participation in the Energy Efficient Showerhead product. Kit combinations may include one or more of the following units:

- 1.5GPM showerhead
- 1.0GPM bathroom faucet aerator
- 1.5GPM kitchen faucet aerator

The free kit is mailed to customers who make the decision to request the energy efficiency measures within the promotional period. In addition to the showerheads and aerators, the kits include Teflon tape and illustrated installation instructions. Participants receive one kit per household.

The Company contracts with third-party implementers to manage customer requests and distribute the kits. Customer participation is tracked and provided to the Company following the kit distribution.

B. Targets, Participants & Budgets

Targets and Participants

The Company set the 2017 and 2018 product targets for participation and energy savings based on past performance of the product. Actual savings will be driven by the customer's water heater energy source and service type (electric and/or natural gas) and customer installation rates.

Budgets

The product budget was developed based upon the cost of reaching the proposed energy savings targets – using 2015 product performance as a guide for the cost of the showerheads/aerators, fulfillment charges, postage, and all necessary marketing efforts. Since the third-party implementer will manage all day-to-day activities outside of marketing, minimal internal Company labor is allocated to this product.

C. Application Process

Customers are notified of this product through direct mail and/or email, typically distributed in the spring (and occasionally fall) targeting different areas of the service territory. Customers have a limited amount of time (approximately 45 to 60 days for direct mail and a one to two weeks for email) to respond to the third-party implementer. Once the customer responds to the offer, they are shipped one free energy-savings kit within six weeks.

In addition to the direct mail and email campaigns, Public Service will continue to seek out or consider proposed partnerships with other organizations or cities to distribute free energy efficient showerheads and/or aerators.

D. Marketing Objectives & Strategies

An average of 15% of customers who received a direct mail or email offer in 2015 requested the product. Based on this data, the Company has developed a marketing plan utilizing direct mail and/or email campaigns and partnerships to reach the participant goal. The marketing collateral requests the customer to indicate whether their water heater runs on gas or electricity.

E. Product-Specific Policies

Natural gas and combination gas and electric customers who have not previously participated are eligible for the offer. Additionally, past program participants may be offered additional or replacement units through follow-up marketing offers based on when they participated. If an eligible customer who did not receive the offer becomes aware of the product and would like a free kit, they will receive one if budget allows.

The Company is aware of the Colorado Senate Bill 103 which prohibits the sale of products not certified with the WaterSense[®] label beginning in September 2016, effectively lowering the baseline. However, because this is a retrofit product the program assumes the federal minimum GPM for plumbing products as the baseline.

F. Stakeholder Involvement

In past program years, Public Service has partnered with local cities and counties on their water efficiency initiatives. PSCo plans to continue its support of these types of programs in 2017 and 2018.

G. Rebates & Incentives

The product provides free energy efficient equipment rather than a rebate to the customer—the price for that equipment is classified as the rebate in the product budget.

➤ **Energy Feedback – Residential**

A. Description

The Energy Feedback product provides targeted communication of energy-use comparisons and information called the Home Energy Report (HER) to PSCo's Colorado residential customers, providing specific recommendations and feedback to motivate and to educate customers on how to reduce their energy consumption. Customers receive new information with each HER that is delivered by mail or email, or a combination of both formats. An online version of this information (marketed as "My Energy") along with additional energy-awareness and savings tools is available for all PSCo residential customers. Savings are quantified by the third-party implementer who compares energy consumption of the participating group to a non-participating control group.

The product's main offerings include the following two components:

Personalized Home Energy Reports – A targeted direct mailing and/or email that provides specific recommendations and feedback designed to motivate customers to reduce their energy consumption. The individualized reports provide:

- Customers' energy use compared to the average of 100 similar-sized homes with similar characteristics (neighbor comparison); and
- Personalized energy efficiency recommendations and tips based on an analysis of the household's energy usage, demographics, home characteristics and information provided by the participant; and
- Advice on how customers can easily implement energy efficiency measures based on their individual circumstances.

The group of randomly assigned customers receiving the HERs is referred to as the Treatment Group. The third-party implementer uses its extensive experience with utility behavioral programs and data analytics capabilities to identify which of these customers receive a mailed print version of the HER, an emailed report only, or both print and email reports.

The group of randomly assigned customers who do not receive the HERs is referred to as the Control Group.

Energy savings from the Treatment Group are compared against those of a Control Group in order to determine the DSM product's energy savings. The savings results are reported to the Company each month.

My Energy – An online suite of tools that gives customers greater insight into their energy consumption and actions they can take to become more energy efficient. These tools are available to all PSCo residential customers in Colorado, and provide the same information that customers receive in their HERs, with a more robust set of customization options and energy-savings tools. These tools offer customers flexibility to analyze their consumption and provide

options for customers to update their My Energy profiles to make future HERs even more personalized and useful. The My Energy online suite includes the following sections:

- *Home* – A home energy assessment tool with simple and straightforward questions that provide immediate value and feedback. Input provided improves the customers HER experience;
- *My Energy Use* – Provides customer-specific electricity and natural gas consumption and cost data, which can be overlaid with local weather temps to better understand the impact;
- *What Uses Most* – A graphic depiction showing where energy is consumed in the home. Using the Home Energy Assessment tool, customers can input additional profile and home information that improves results;
- *Compare My Bills* – Provides an analysis of the customer's current and previous bills by fuel type;
- *My Goal* – Customers are encouraged view their energy goal and track ongoing progress toward that goal;
- *My Plan* – Customers are offered a list of personalized tips and recommendations from which they can take action and track their progress, and;
- *Ways to Save* – Offers customers an extensive library of tips and ways to reduce energy consumption.

Customers who engage in the My Energy online tool are compared to similar customers who have not accessed the My Energy portal, in order to determine energy savings resulting from customers' use of My Energy tools. Savings from customers who are part of the HER Treatment Group who also use My Energy tools will have all savings measured as part of their HER savings calculation. Only savings from customers who are not part of the HER Treatment Groups will be counted as attributable to My Energy savings.

Participants are given the opportunity to opt-out of outbound communications at any time.

B. Targets, Participants & Budgets

Targets and Participants

The Company has developed specific energy savings and participation targets for each product component:

Home Energy Report: Participants in the 2016 product will carry over and remain in the print and email groups for 2017 and 2018. New participants will be randomly selected and added by the third-party implementer in 2017 and 2018 to account for normal product attrition, which is the result customers that have moved and those who have chosen to opt-out. After selection, these participants will be randomly divided into Treatment and Control Groups. Based on past experience, savings ramp up over time as customers receive multiple reports, so newly added customers will save less energy initially.

In 2013, treatment was stopped for approximately 10,000 dual-fuel customers as a part of a separate analysis to see if energy savings persist over time after treatment stops.

We anticipate the analysis will be completed in Q4-2016, and the results reported in 2016 DSM Annual Status Report.

My Energy: All PSCo residential customers have access to My Energy, however customers must sign-up for My Account in order to access My Energy.

My Energy follows an opt-in model where customers will receive targeted marketing messages encouraging them to access My Energy and actively participate. This differs from the HERs, where customers are randomly selected to receive reports unless they opt-out. Some My Energy participants may be single-fuel service customers while others may receive both natural gas and electric service from Public Service. Therefore, each fuel service counts as a “participant,” meaning a dual-fuel customer will count as a gas participant and also as an electric participant.

Budgets

The budgets were developed based on previously negotiated third-party implementer pricing⁵⁵ and internal administrative cost estimates for 2017/18. The majority of the product’s budget is allocated to third-party implementation services, which includes preparing and mailing the HERs, data analytics, marketing and conducting an ongoing regression analysis of Treatment and Control Group participants to determine the electric and natural gas savings. Administrative costs for customer data extraction and product administration to be completed by PSCo are based on costs derived from previous program years.

The multi-state budget for My Energy is largely fixed due to the information technology and delivery method, and does not change as more customers use the tools and services. A share of My Energy online portal license fees are apportioned to this product’s budget based on customer counts for each state and fuel type. M&V costs have also been budgeted for My Energy due to the complexity and unique challenges of measuring behavior savings from this service. The possibility exists that savings measured for 2016 and the measurement methods used are considered adequate going forward and thus no M&V expenditure would be required for 2017 and/or 2018.

C. Application Process

There is no customer application for this product. Participants for the print and email Treatment Groups are secured using a random selection process administered by the third-party implementer. New participants will be informed of their selection at the beginning of treatment and will be given the opportunity to opt-out from receiving the Treatment Group communications (HER) at any time. Appropriately-sized Control Groups are identified by the third-party implementer and enable isolation of effects attributable to each Treatment Group. The Control Group customers have not and will not be directly contacted or targeted by the Company or third-party implementer’s marketing efforts regarding this product. My Energy program is

⁵⁵ The third-party implementer contract pricing was negotiated at the end of 2014 and included optional years for 2017 and 2018.

opt-in. Customers become participants once they log onto My Account and go to the My Energy Feedback tab.

D. Marketing Objectives & Strategies

HERs participants will continue from the 2016 product, and no additional marketing is needed to attract these customers. New participants will be randomly selected and added by the third-party implementer, which do not require specific marketing tactics. Customers who receive HERs may choose to participate in other DSM products, and this becomes more likely when a specific DSM program is cross-promoted on the HER itself. The Company plans to continue to utilize this effective marketing channel for targeted promotion of other energy-saving DSM products and services.

My Energy is available to all Colorado residential customers who engage in the My Account portal. Active engagement of those customers will be initiated through:

- Customer visits to the My Account portion of the Company's website, which features customized energy feedback results and a prominent button for customers to select to see more details and use the My Energy portal tools. My Account customers receive periodic reminders to visit My Account to view their bill, make payments, or track energy use (i.e. using My Energy).
- General marketing and promotion of My Energy tools and services as part of the Company's communications.
- Outbound marketing efforts to targeted customers may include email, email, on-bill messaging and promotion, social marketing, demos at outreach events, special offers, and direct mail.

E. Product-Specific Policies

Customer confidentiality and data privacy practices will be stringently applied in accordance with Xcel Energy's Privacy Policy, available on the Company's website, here:
<https://www.xcelenergy.com/staticfiles/xcel/Admin/Xcel%20Online%20Privacy%20Policy.pdf>.

Customer assistance will be provided to participants and non-participants in the same manner.

Other policies will be determined as needed.

F. Stakeholder Involvement

This product was piloted prior to launch, based on recommendations from stakeholders participating in the DSM Roundtable, from 2010-2014.

J. Rebates & Incentives

Rebates are not offered as part of the product.

➤ **ENERGY STAR New Homes**

A. Description

The ENERGY STAR New Homes product provides builders of single-family and small multi-family homes with an incentive to exceed local building codes and common construction practices. Homebuilders are encouraged to look at the “whole-house” as a system when considering deployment of energy saving construction methods and installation of energy efficient appliances. Homeowners benefit with lower energy bills, fewer maintenance concerns, higher resale value, and a more comfortable, quiet home.

Builders have the flexibility to mix and match efficient technologies and building practices to meet the product requirements and qualify for a rebate. In order to qualify for a rebate, participants are required to build homes that exceed local building jurisdiction’s energy codes by at least 10%. In order to measure this, a rating must be completed on each home by a Residential Energy Services Network (RESNET) certified home energy rating system (HERS) rater. The HERS rater provides a valuable service by consulting with the homebuilder during the construction phase and ensures the designed energy efficiency measures have been properly installed in the home. HERS raters will complete the rating for each home using REM/Rate software or a RESNET accredited software approved by the Company and will provide select informational details to the Company’s third-party implementer for evaluation. Energy savings are determined individually for each home based on the difference between the energy used by the reference home (or baseline home; modeled to match the local jurisdictional energy code) and the energy used by the new as-built home.

The Company utilizes a third-party implementer who works directly with local HERS raters to get homes enrolled in the product. HERS raters in the state of Colorado have established strong relationships with the builder community. HERS rating companies have the flexibility to participate in this product by completing a standard scope of work administered and managed by the Company’s third-party implementer. The HERS rater will model each home and test the home to measure the level of energy efficiency achieved. Once the home is completed, the HERS rater provides the required information to the third-party implementer who then determines whether or not the home meets the product requirements and is eligible for a rebate. The third-party implementer is responsible for reviewing the information submitted by the rater, working with the rater to correct or provide missing information and then reporting it to the Company. The third-party implementer provides product training for the rater and will assist with builder training as needed.

Product Changes and Improvement

The Company will implement some product changes beginning in 2017. Some local jurisdictions have recently, or are in the process of, moving from the 2009 International Energy Conservation Code (IECC) to the 2015 IECC. The incremental costs for a builder to achieve 10% better-than-code (BTC) is greater for a home built in a 2015 IECC jurisdiction versus the same home built under 2009 IECC. Separate incremental cost curves were developed for 2009 IECC and lower and 2012 IECC and higher jurisdictions. In order to assist builders with the increased

incremental cost for achieving higher efficiency levels in 2012 IECC and higher homes, the Company developed a split tier rebate structure that is based on both the local energy code in place *and* the percent BTC achieved (as shown in Section G below). The improved allocation of incremental costs and rebates based on the local energy code requirements increases the product's cost effectiveness and helps keep the product open all year long.

Also, the High Efficacy Lighting measure has been separated into two measures to account for differing energy code requirements between jurisdictions and to capture continued energy savings from jurisdictions that remain on the 2009 IECC. The ENERGY STAR dishwasher measure will no longer be offered because most dishwashers available and installed in new homes today are ENERGY STAR certified and very little savings would be claimed by the Company.

B. Targets, Participants & Budgets

Targets and Participants

The product targets builders who construct single-family and small, multi-family homes. Energy savings and participation targets are based on historical product performance and growth forecast assumptions in the residential new construction marketplace. New construction growth continues to improve and barring any significant impacts to the financial sector, we anticipate this growth will continue to occur around 5% year over year. As more jurisdictions adopt higher energy codes such as 2012 and 2015 IECC, we expect participation will be lower in the entry level rebate tiers. A home that meets the minimum 10% BTC participation requirement in a 2009 IECC jurisdiction will likely not meet the minimum 10% BTC threshold readily once their jurisdiction adopts the 2012 IECC. Under IECC 2012, the baseline home is now more energy efficient and the energy savings the Company can claim for these homes is reduced. Generally speaking for 2017/18, we expect a shift in participation from mid-level BTC code tiers to lower BTC tiers for jurisdictions adopting higher energy codes. As a result, overall product savings targets are impacted and we anticipate the average claimable energy savings on a per home basis to be lower than in previous years.

Budgets

The product budget is primarily driven by forecasted participation for 2017/18 and established rebate levels that are designed to encourage participation. Additional costs include; product administration, promotional and outreach activities, measurement and verification. Product administration costs include Company labor and third-party implementer services, which were competitively bid and implemented beginning in 2015. Builder rebates and energy rater administrative fees together comprise approximately 74% of the product budget and are the single largest expense component.

C. Application Process

Enrollment for this product is typically completed by the HERS raters on behalf of their clients (builders). HERS raters have strong, long established relationships with most of the builders

operating within the Company's Colorado service territory. To initiate the enrollment process, HERS raters will contact builders to encourage their participation, or the builder will contact a rater and express interest in constructing an energy-efficient home. The rater will explain the product offering and potential rebates available, review the home's blueprints and building schedule, and enter the home details into the third-party implementer's tracking database. The rater consults with the builder throughout the construction phase to construct a home that qualifies for the product rebate.

When the home is completed, the HERS rater will perform an air tightness test on the house and determine the energy impacts using REM/Rate. This information is submitted to the third-party implementer who will review and approve each home. The builder will receive a rebate based on the local energy code requirement and the percent BTC achieved. Specific gas and electric energy savings are determined by the Company using the HERS rater's modeling information. There is no rebate application for the builder or rater to complete since all required information is entered by the HERS rater into the third-party implementer's database using a web portal interface. The third-party implementer reviews and ensures all information is accurate and captured and works directly with the energy rater to correct any omissions or errors. Once the data is deemed complete, the third-party implementer is responsible for manually entering selected portions of the collected data for each home into the Company's database.

D. Marketing Objectives & Strategies

The Company will update existing builder and homebuyer marketing materials and make them available to participants. The objective of the builder marketing material is to increase product awareness and effectively communicate product benefits (energy savings, economics, and comfort/durability) along with the requirements for participation. The homebuyer collateral was created as an aid for builders to easily explain the benefits of an energy efficient home to their potential clients. Additionally, a certificate of completion was created for the homebuyer. The certificate demonstrates the home successfully completed the product requirements and contains useful information such as the HERS index achieved and who rated the home. The development of new marketing materials will be driven in part by the outreach plans of the third-party implementer and feedback received from participants. The product does not utilize mass marketing campaign efforts as a method of driving participation.

The Company's third-party implementer will engage in outreach activities with participants and stakeholders. The outreach objectives are intended to maintain good working relationships with builders and raters, ensuring they are satisfied with the product offering and to provide education and training support where needed. The third-party implementer will initiate monthly program update communications to all participants, and hold in-person and conference-call meetings with raters along with routine email and phone communications.

The third-party implementer will provide training to participants (primarily raters) on the product requirements, REM/Rate modeling software and use of their database system in order to improve efficiency and ensure more accurate data reporting. These activities are expected to encourage energy-efficient building practices resulting in increased energy savings. The third-party implementer will offer up to 30 no-cost professional sales training sessions to realtors and

builder's sales agents throughout the year. The Company is also evaluating opportunities to work with the net-zero energy (NZE) home community to jointly provide training on energy efficiency and NZE homes with architects and builders. The Company's third-party implementer is working with ESNH participating energy raters to identify pathways for implementing this joint training activity. The ESNH program shares common interests with the NZE community since the best path to reach to net-zero is to start with a highly energy-efficient home. The Company is also considering how Solar*Rewards and the ESNH program may be jointly marketed to customers. Other types of training will be identified with the assistance of the product participants, key stakeholders and the third-party implementer who will be responsible for developing specific outreach plans. Key stakeholders include organizations such as local homebuilder associations, the Colorado Energy Office (CEO), the Colorado Code Compliance Collaborative and other related industry organizations.

E. Product-Specific Policies

This product applies to builders of residential single-family buildings, small multi-family (duplex, triplex, fourplex) buildings and townhomes that receive combined electric and natural gas service, or natural gas-only service, from Public Service. Structures that have common conditioned space such as hallways and elevator shafts are not eligible to participate in the product. Additional product requirements are:

1. Raters must be RESNET certified and use the REM/Rate modeling software or a RESNET accredited software approved by the Company to model each home.
2. Raters must provide a confirmed (RESNET registered) HERS rating for each home. Sample ratings are not accepted.
3. Raters must complete the Rater Field Checklist and the home must pass the applicable sections.
4. Builders will receive a rebate based on the local energy code requirement and the percent BTC. The percent improvement is determined using REM/Rate software to model the energy used by the reference home (or baseline home; modeled to match the local jurisdictional energy code) and the energy used by the new as-built home. The energy use is converted to MMBTU and the following formula is used to determine the percent improvement:
$$\frac{\text{Ref_Home_MMBTU} - \text{As-Built_Home_MMBTU}}{\text{Ref_Home_MMBTU}}$$
5. Homes that achieve ENERGY STAR certification and receive a percent BTC rebate (as detailed in Section G below) may be eligible for an additional \$100 rebate.
6. Natural gas-only participants are not eligible to receive the appliance rebate for installing the ENERGY STAR refrigerator or High Efficacy Lighting measures.
7. Homes that receive electric-only service from the Company are not eligible to participate in the product.
8. Homes qualifying for a product rebate are not eligible for Company's *separate prescriptive* rebates under the following products; Evaporative Cooling, Heating Efficiency, High Efficiency A/C, Insulation & Air Sealing, Smart Thermostats, and Water Heating.
9. Impacts from PV or other renewable generation systems installed in the home will not be included in the percent BTC improvement (rebate) or energy savings calculations.

F. Stakeholder Involvement

The Company maintains on-going relationships with the U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy, which jointly oversee the national ENERGY STAR program. The Company is an active Sponsor and participant in the national program, recognizing the strong customer awareness of the ENERGY STAR brand, and has received several ENERGY STAR awards for this product.⁵⁶

This product has received significant interest and input from external Colorado stakeholders in preparation of Plan filings and during Plan Settlement. This input has been valuable and taken under consideration for the product design.

The Company serves on the new home construction committee of the Consortium for Energy Efficiency (CEE), which meets regularly and works closely with the EPA. The third-party implementer attends RESNET conferences on behalf of the Company.

Public Service will strive to work with and engage Colorado stakeholders, such as the CEO, SWEEP, EEBC, the Colorado Energy Code Collaborative, the City of Denver and others to partner when possible and continue the product's success.

The Company will issue monthly communications to participating builders and energy raters, providing year-to-date product updates on participation, achievement, expenditures, and other important product information as it arises. The Company's third-party implementer communicates regularly with participating energy raters and builders, including requests for their input on training and education gaps related to energy efficiency and more specifically, how the product can assist filling those gaps.

G. Rebates & Incentives

Builders with qualifying homes are eligible to receive a rebate based on the local energy code requirement and the percent BTC improvement achieved (see *Product-Specific Policies* for details). A builder's home must achieve a minimum 10% BTC improvement in order to qualify.

Rebate Levels – 2009 IECC or Lower, and Percent BTC

Percent BTC	Rebate
10% - 14.999%	\$200
15% - 19.999%	\$350
20% - 24.999%	\$500
25% - 29.999%	\$650
30% - 34.999%	\$800
35% - 39.999%	\$1,000
40% and higher	\$1,400

⁵⁶ View the ENERGY STAR Awards Archive: <https://www.energystar.gov/about/awards/awards-archive>

Rebate Levels – 2012 IECC or Higher, and Percent BTC

Percent BTC	Rebate
10% - 14.999%	\$250
15% - 19.999%	\$400
20% - 24.999%	\$600
25% - 29.999%	\$900
30% - 34.999%	\$1,300
35% - 39.999%	\$2,000
40% and higher	\$2,550

The ENERGY STAR certified rebate is an *add-on* rebate available to qualifying homes that have earned ENERGY STAR certification and meet the following:

- a) Home must have both electric and gas service from Public Service. Gas-only or electric-only homes served by the Company are not eligible;
- b) Home must qualify for a percent BTC rebate;
- c) HERS rater verifies the home meets all national ENERGY STAR certification requirements and;
- d) ENERGY STAR label is applied to the home's electrical breaker box.

ENERGY STAR Certified Rebate

ENERGY STAR certified	\$100
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The ENERGY STAR appliance rebate is another *add-on* rebate available to qualifying homes that have earned a percent BTC rebate and installed one or any combination of the qualifying appliances listed below. Homes that receive natural gas-only service from the Company are not eligible for the ENERGY STAR Refrigerator or High Efficacy Lighting rebates.

Appliance & Lighting Rebate Levels for Qualifying Homes

Appliance/Lamp	Rebate
ENERGY STAR Clothes Washer	\$30
ENERGY STAR Refrigerator	\$10
High Efficacy Lighting – 2009 IECC or lower with CFL or LEDs - Minimum 20 lamps	\$20
High Efficacy Lighting – 2012 IECC or higher with 100% High Efficacy (CFLs or LEDs)	\$10

➤ **Evaporative Cooling**

A. Description

The Evaporative Cooling product provides a rebate to Public Service's residential electric customers who purchase and install energy-efficient evaporative cooling equipment, and incentives for trade allies to promote the product to their customers.

Evaporative Cooling encourages customers, trade partners and builders to purchase evaporative coolers rather than less efficient central air conditioning. Customers benefit by reducing the up-front cost of buying evaporative cooling units, saving energy throughout the lifetime of the equipment, and reducing electric bills.

Qualifying equipment must be new, permanently installed evaporative cooling units. Portable coolers or systems with vapor compression backup are not eligible, neither is used or reconditioned equipment. Customers can replace an existing evaporative cooling or air conditioning unit or purchase a new first-time installed unit to qualify.

For homes in dry climates, such as Colorado, evaporative cooling provides an experience like an air conditioner, but with significantly less equipment and installation costs and lower energy use.

B. Targets, Participants & Budgets

Targets and Participants

The target is based on past activity, current market conditions, and projected sales of evaporative coolers. Proposed savings were estimated on a per unit basis using the projected number of participants. Participation in this product is weather-sensitive. Cooler-than-normal summers have been shown to result in lower participation, as customers may forgo their decision to install a unit or choose to delay purchasing a unit if the weather is mild.

Budgets

The budget was developed based on historical and projected participation and the funds needed to promote and administer the product to achieve the associated level of savings. The majority of the product's budget goes towards customer rebates for the purpose of lowering the cost of purchasing energy-efficient evaporative cooling equipment. Other key budget categories are advertising and promotion to drive participation.

C. Application Process

Public Service propels customer awareness of the product through a variety of sources including targeted marketing communications, advertising, events and sponsorships, the Xcel Energy website, email and social media, HVAC contractors and retailers. To participate in the

Evaporative Cooling product, eligible customers must submit a completed application with a copy of their invoice or receipt. Customers may self-install, or work with an HVAC contractor to install the evaporative cooling equipment. When a customer submits the rebate form with an invoice, it is reviewed for accuracy, ensuring that rebate qualifications are met prior to mailing a rebate check.

Invoices or receipts must detail purchased equipment. If the application is for a first-time installation, premium or whole house evaporative cooling system, the customer must provide a receipt for additional components (e.g. remote thermostat, purge pump, supply ducts) or have these items detailed on the invoice. If the documentation does not meet the first-time installation criteria, the application may be processed as a replacement and receive a lesser rebate amount.

D. Marketing Objectives & Strategies

The main objective of the Evaporative Cooling product is to promote the use of efficient evaporative coolers to customers with older, less-efficient models, and to promote efficient evaporative coolers in place of air conditioning to customers installing a home cooling system for the first time. The product will be promoted through the following strategic marketing efforts:

- Newspaper and print advertising, typically in the spring and summer;
- Point of Purchase displays at big box stores and appliance retailers;
- Targeted customer emails, newsletters, bill messaging and social media;
- Internet ads and search engine promotions (Google, Yahoo, Bing);
- Sponsorships and events; and
- Contractor education, training and incentives.

Public Service has partnered with numerous equipment manufacturers, distributors, dealers and retailers in the state of Colorado who receive our product literature and assistance promoting the product. Contractors and builders in Colorado are an essential partner in creating customer awareness of Evaporative Cooling and, thus, will receive information on any product changes directly.

In addition, Public Service utilizes a trade relations manager to assist with communicating product details to the dealer and distributor channels. Other activities of the channel manager may include: training sessions on product specifics, product related mailings, relationship development and management.

E. Product-Specific Policies

Customers must purchase qualifying units in order to be eligible for a rebate. Units are qualified for the product based on the manufacturer's specifications. Equipment is added to the list of qualifying units as Public Service is notified of their release.

Qualifying equipment must be new and be a permanently installed direct, indirect or two-stage evaporative cooling unit. Portable coolers or systems with vapor compression backup are not eligible, nor is used or reconditioned equipment. Customers can replace an existing evaporative cooler or central A/C system, or purchase a first-time installed evaporative cooling unit, to qualify for a rebate.

There are three equipment tiers available for the Evaporative Cooling product:

- Standard System/Tier 1: Qualifying evaporative cooling units with airflow output of 2,500 cubic feet per minute (CFM) or greater.
- Premium System/Tier 2: Qualifying evaporative cooling units with Media Saturation Effectiveness of 85% or greater. The units must be manufactured with remote thermostat control and periodic purge water control (e.g. purge pump) or have these two items included on the invoice.
- Whole House System/Tier 3: In addition to 85% Saturation Effectiveness, remote thermostat control and periodic purge water control, qualifying evaporative cooling units must be indirect/directly cooling the whole house with a minimum of four supply ducts installed (two at a minimum must be newly installed).

F. Stakeholder Involvement

In order to determine qualifying evaporative cooling equipment, Public Service works with manufacturers and distributors to verify current and new equipment efficiencies to meet each rebate tier. Trade allies include, but are not limited to:

- Champion Manufacturers (including Champion and Mastercool Brands)
- Climate Technologies (Bonaire Brand evaporative coolers)
- Essick Air Products (Excel N Series and Champion UltraCool)
- Jenrus Corporation (FineAire Brand)
- Phoenix Manufacturer Incorporated (AeroCool Trophy, Brisa, CoolTool, CoolView, Frigiking)
- Seeley International (Breezaire Brand)
- Speakman Company (OASys Brand)
- Symphony Limited
- Tradewinds

G. Rebates & Incentives

The Evaporative Cooling product offers a tiered rebate. Customers may receive up to a \$1,200 rebate, depending on the equipment purchased.

- Standard System/Tier 1: Qualifying evaporative cooling units have a minimum Industry Standard Rated (ISR) airflow of 2,500 CFM. The first-time installation rebate amount is the lesser of \$300, or the purchase price of the unit, and the replacement rebate is \$200. Taxes and ancillary items, such as hoses, are not covered by the rebate. Retailers or trade partners will receive a \$50 incentive for each approved rebate application received.

- Premium System/Tier 2: Qualifying evaporative cooling units have a minimum Media Saturation Effectiveness of 85%. The units must be manufactured with remote thermostat control and periodic purge water control (e.g. purge pump) or have these two items included on the invoice. The first-time installation rebate amount is the lesser of \$700 or the purchase price of the unit, and the replacement rebate is \$600. Contractors or retailers will receive a \$75 incentive for each approved rebate application received.
- Whole House System/Tier 3: To qualify for the whole house rebate, the whole house cooler must be indirect/directly cooling and fully ducted in the home with a minimum of four down ducts installed (two at a minimum must be newly installed). The rebate amount is \$1,200 to the customer. Contractors or retailers will receive a \$100 incentive for each approved rebate application received.

➤ High Efficiency Air Conditioning

A. Description

The High Efficiency Air Conditioning (HEAC) product comprehensively addresses energy efficiency opportunities related to central air conditioners, air source heat pumps, ductless mini-split heat pumps and ground source heat pumps. The HEAC product is comprised of six measures, each meeting a different need in the cooling marketplace.

- **Plan A New Equipment Rebates** – Central air conditioners and air source heat pumps (ASHPs) that meet certain energy efficiency standards, as outlined in Section G below, are eligible for a rebate. The goal of the rebate is to encourage consumers to purchase units that meet or exceed the ENERGY STAR efficiency standard of 15.0 SEER. Equipment must be Air Conditioning and Refrigeration Institute (AHRI) performance-certified at standard rating conditions.
- **Quality Installation** – All Plan A New Equipment rebates must also include a Quality Installation (QI). The QI process is based on standards developed by the Air Conditioning Contractors of America (ACCA) which dictate the steps a contractor must take to ensure a true quality installation. This QI measure, which starts with a load calculation to determine the proper size of equipment to be installed, helps ensure that the total energy savings potential of newly installed equipment is realized.
- **Plan B Trade-In Rebates** – This measure is intended to motivate homeowners to replace older, lower efficiency residential central air conditioning or air source heat pump units that are still operable. These units may be working well now or may need some capital dollars for repair. Customers will be required to replace them with high efficiency units (14.5 SEER or higher) before the end of the unit's useful life. This measure is expected to bring in new incremental participation that would not have been realized otherwise.
- **Ductless Mini-Split Heat Pumps** – The ductless mini-split heat pump equipment serves a small market niche of consumers who cannot install ducted systems, have a hot or cold room or have already decided a mini-split is the best solution. To be eligible to participate, residential electric customers must purchase and install a unit that is 15.0 SEER or higher. The unit must be used for cooling and heating purposes. Equipment must be AHRI performance-certified at standard rating conditions.
- **Ground Source Heat Pumps** – The Ground Source Heat Pump (GSHP) equipment measure serves a small market niche of consumers who seek out the most highly efficient technology. To be eligible to participate, residential electric customers must purchase and install a unit that is ENERGY STAR certified. The ENERGY STAR certified GSHP performance criteria are a minimum of 3.3 COP and 14.1 EER. Rebates will be given for GSHPs that are installed as closed-loop systems and are used for both heating and cooling. The rebates are only available for electrically-heated homes where natural gas is not in use. This measure will require a similar QI standard as required for Plan A.
- **Western Cooling Control** – The Western Cooling Control (WCC) device effectively increases the capacity of a central air conditioner or ASHP unit by capturing cooling energy left in the refrigerant within, as well as the water condensed on the cooling coil after a cooling cycle has completed. Due to the fact that many newer cooling units have

built-in features that provide similar benefits to the WCC device, this measure is available only to customers with units installed in 2009 or prior.

Participating contractors installing central air conditioners, ASHPs or ductless mini-split heat pumps must have a technician on staff that holds current North American Technical Excellence (NATE) certification in air conditioning or air to air heat pump installation.

Participating contractors installing GSHPs must have a technician on staff that holds current NATE-certification in GSHP loop installation or accreditation through the International Ground Source Heat Pump Association (IGSHPA).

B. Targets, Participants & Budgets

Targets and Participants

Participation and energy savings levels for this product are based primarily on past product performance in the Colorado marketplace. Approximately 70% of all participants are projected to qualify through Plan B. The HEAC product's tiered SEER levels are designed to move customers beyond the 14.5 SEER level.

Budgets

The 2017 and 2018 budgets were established primarily based on the cost per participant. The high efficiency equipment rebate begins at a minimum of 15.0 SEER for Plan A and 14.5 SEER for Plan B. Contractors are paid a QI incentive at all SEER levels, further encouraging their support of the product and a financial interest to continue quality installation practices. The budget also includes costs for verifying a percentage of the new equipment installations in the field to ensure they meet ACCA quality installation standards and expected energy savings.

C. Application Process

The application process requires that the customer use a registered contractor with a NATE-certified technician. These contractors have agreed to the terms of the product and meet the requirements related to quality installation practices. A list of registered contractors can be found on the Xcel Energy website.⁵⁷

The customer must select a new central air conditioning or air source heat pump system with an overall efficiency of 15.0 SEER or higher for a Plan A New Equipment rebate and 14.5 SEER or higher for a Plan B Trade-In Equipment rebate. All new equipment installed for this product *must* meet QI standards to receive an equipment rebate. The system must meet the following requirements to be eligible:

⁵⁷

www.xcelenergy.com/cotrades

- The equipment, components and/or system must be listed in AHRI's Residential Directory.⁵⁸ This directory is used to identify product classification, determine efficiency ratings, and confirm matched systems.
- Multi-stage air conditioning units are eligible for rebates if an earlier matching furnace was installed and is part of the high efficiency air conditioning system per AHRI Residential Directory listings. The homeowner or contractor must supply the furnace model number and serial number on the application and invoice.
- For single-stage systems, the use of a furnace's variable speed fan to increase the SEER rating above the nominal rating will be allowed for determining rebate eligibility, provided that the overall furnace and air conditioning rating can be found in the AHRI's Residential Directory. The homeowner or contractor must supply the furnace model number and serial number on the application and invoice.

In order to verify that the equipment has been properly installed, the contractor must bring the system to a steady state and perform QI tests – as specified in the Xcel Energy QI guidelines based on ACCA standards.⁵⁹ There is no separate application process for the contractor QI incentive; there is a section within the customer application to indicate the quality installation process is being followed. Testing can only occur when the outside temperature is 67 degrees or higher, or 60 degrees or higher if the Field Diagnostic Services, Inc. (FDSi) diagnostic tool is used.

The Company requires that a dated sales receipt/invoice with the following information accompany the rebate application:

- Purchase date
- Equipment manufacturer
- Condenser model and serial numbers
- Evaporator coil model and serial numbers
- Furnace model and serial numbers (if installed simultaneously with a new system or to increase the SEER rating per AHRI listings)
- Size or Capacity
- Efficiency levels
- Customer name and installation address

Additionally, for the Trade-In Equipment measure, the following retired (existing) unit information must accompany the rebate application:

- Make, model and serial number of the condenser
- Unit SEER and/or EER rating as given by the manufacturer

The equipment installation and testing for QI must be completed before the rebate application is submitted for processing by the Company. All information on the receipt/invoice must match the information on the rebate application exactly. In addition, the application form will require the name and signature of the NATE-certified technician indicating that the NATE-certified

⁵⁸ <https://www.ahridirectory.org/ahridirectory/pages/home.aspx>

⁵⁹ <http://www.acca.org/quality-standard/qi/>

technician has reviewed the new equipment installation on the application. An AHRI certificate, printed in the same year as the installation, must accompany the rebate and invoice for approval.

Ductless Mini-Split Heat Pump installations require a separate rebate application. The Company requires that a dated receipt/invoice with the following information accompany the rebate application:

- Purchase date
- Equipment manufacturer
- Condenser model and serial numbers
- Evaporator model and serial numbers
- Size or capacity
- Efficiency levels
- Customer name and installation address

All information on the receipt/invoice must match the information on the rebate application exactly. An AHRI certificate, printed in the same year as the installation, must accompany the rebate and invoice for approval.

WCC installations require a separate rebate application. The Company requires that a dated receipt/invoice with the following information accompany the rebate application:

- Purchase date
- Age of the existing unit
- SEER rating of the existing unit
- Cooling capacity (in tons) of the existing unit
- Customer name and installation address

D. Marketing Objectives & Strategies

The HEAC product seeks to increase demand for and availability of high efficiency cooling equipment, and to increase awareness and penetration of the QI process within the Company's service area. The ultimate goal is to increase energy savings for the customer. To support this goal, the Company plans to implement the following marketing strategies to increase product awareness:

- Use of the HVAC contractor community as the primary marketing channel. The Company's Channel Manager is responsible for conducting trade partner training, meetings, telephone calls, letters and newsletters with regular frequency to keep the trade informed and engaged in the product. In addition, a qualified contractors list is available on the Company's website and participating contractors are expected to assist in promoting the product. The Company provides brochures for contractors to distribute to customers as well.
- Company bill inserts and newsletters will be used to create customer awareness.
- The Company's website also includes information regarding the product and is updated as needed to more effectively reach customers. This includes information on proper equipment sizing and airflow, product details and where to find qualified contractors. The

site also hosts webpages designed specifically for HVAC trade partners to obtain information about the product.

E. Product-Specific Policies

In order to qualify for a Plan A New Equipment rebate, customers must purchase a qualifying unit. High efficiency equipment rebates will not be paid without QI from an approved contractor. Contractors must have a NATE-certified technician on staff, attend all required trainings conducted by the Company, follow all program guidelines, and be approved by the Company. Contractors who do not comply with the product requirements and guidelines are not allowed to participate in the product, including suspensions during the calendar year.

In order to be eligible for the Plan B Trade-In Equipment rebate, the retired (existing) unit must have a SEER of 12.0 or lower. This will be determined by the contractor at the time of removal from the customer's premise. The retired unit information will be included in the rebate application. If the SEER or EER cannot be determined by the contractor, the unit will not be eligible for the rebate.

In order to be eligible for a Ductless Mini-Split Heat Pump rebate, customers must purchase a qualifying unit from an approved contractor. The unit must be used for cooling and heating purposes.

In order to be eligible for a GSHP rebate, customers must purchase a qualifying unit. High efficiency equipment rebates will not be paid without QI from an approved contractor. Contractors must have a NATE-certified or IGSPHA accredited technician on staff, attend all required trainings conducted by the Company, follow all program guidelines, and be approved by the Company. Contractors who do not comply with the product requirements and guidelines are not allowed to participate in the product, including suspensions during the calendar year.

In order to be eligible for the WCC device rebate, the existing air conditioning or ASHP equipment must have been installed in 2009 or prior.

F. Stakeholder Involvement

The Company considers stakeholders for the HEAC product to be the HVAC contractors and distributors, the Colorado Energy Office (CEO), local municipalities within the PSCo service territory, and environmental organizations. Stakeholders will be invited to share their product suggestions during the Company's quarterly DSM Roundtable Meetings. In addition, Xcel Energy is a member of the Consortium for Energy Efficiency (CEE), and monitors and participates in its initiatives related to residential HVAC equipment.

H. Rebates & Incentives

The Company will pay rebates for the purchase and QI of qualifying high efficiency air conditioning equipment or for the purchase and installation of a WCC device. Plan A New Equipment, Plan B Trade-In Equipment, GSHP and WCC device rebates are paid directly to the customer, while QI incentives are paid to the contractor. Plan B Trade-In Equipment rebates include the same rebate levels as Plan A New Equipment measures, as well as an additional rebate for the trade-in of the existing unit that is assumed to be functioning or in need of minor repairs. New equipment measures must meet both the SEER and EER standards to receive a rebate under either the Plan A New Equipment or Plan B Trade-In Equipment rebate options. The rebate is paid according to the lesser value of the SEER/EER. The following tables describe the customer rebate and contractor incentive levels available.

Plan A New Equipment and Plan B Trade-In Equipment with QI Rebate Levels

Equipment Tier	SEER	EER	Plan A New Equipment Rebate*	Plan B Early Retirement Rebate*	Total Customer Rebate Available*	Total Contractor QI Incentive*
	13.0	below 12.0	\$0	\$0	\$0	\$50
	14.5	12.0	\$0	\$500	\$500	\$50
Tier 1	15.0	12.5	\$350	\$500	\$850	\$50
Tier 2	16.0	13.0	\$500	\$500	\$1,000	\$50
Tier 3	17.0	13.0	\$650	\$500	\$1,150	\$50

*Rebates and incentives are dependent on contractor participation/acceptance into the product and contractor following QI guidelines.

Homeowners may receive the equipment rebate directly or may provide written permission for the rebate to be paid directly to the contractor or to another designated alternate rebate recipient. Builders, as the original purchaser of equipment, are eligible to receive an equipment rebate; however, the rebate will only be issued once so builders should negotiate with the homeowners as to who will receive the rebate. The QI incentive is paid to the contractor on submittal and approval of a completed application signed by the customer.

Ductless Mini-Split Heat Pump Rebate Level

Equipment	SEER	HSPF	New Equipment Rebate
Ductless Mini-Split Heat Pump	15.0 – 26.0	9 – 12	\$200

GSHP Rebate Level

Eligible customers (electrically-heated homes where natural gas is not in use) can receive a rebate for GSHPs with QI as closed-loop systems used for both heating and cooling.

GSHP Application	Rebate/Ton	Average Tons	Average Total Rebate*
Existing Homes	\$300	4.7	\$1,410
New Homes	\$300	3.1	\$930

*Rebates are dependent on contractor participation/acceptance into the product and contractor following QI guidelines.

WCC Rebate Level

Eligible customers can receive a \$35 rebate for a WCC device installation onto an existing unit.

Customers who receive a rebate through another DSM product (e.g., Home Performance with ENERGY STAR or ENERGY STAR New Homes) for the same equipment are not eligible to receive a rebate through this product. By accepting a rebate, the customer agrees to reasonably accommodate M&V consultants.

Rebate applications must be submitted by July 31 of the year following purchase and installation to qualify for a rebate.

➤ Home Energy Squad®

A. Description

The Home Energy Squad product offers installation services and discounted equipment costs to customers who seek to improve their homes' energy efficiency, increase their comfort, and lower their utility bills. The Company seeks to expand the market for Home Energy Squad based on a successful track record implementing the product in other jurisdictions.

The Home Energy Squad team will install a number of moderate-impact, low-cost measures for combination natural gas and electric, and electric-only, customers. The product seeks to assist customers in overcoming barriers related to making energy improvements. Such barriers include confusion on which products are right for their home, product cost and payback, and finding qualified installers.

The main product offerings include:

- Electric conservation measures:
 - Value LED bulbs of various wattages
 - Installation of new, or temperature setback of an existing, programmable thermostat (primarily leading to cooling electric savings in summer months)
- Electric conservation measures, available for customer purchase:
 - Premium LED bulbs or fixtures of various wattages
 - Power control timers for TVs & electronic accessories
- Natural gas conservation measures:
 - High efficiency showerheads
 - Low flow sink aerators
 - Installation of new, or temperature setback of an existing, programmable thermostat (primarily leading to natural gas heating savings in winter months)
 - Weather-stripping of one external door
 - Insulation blanket for hot water heater
 - Temperature assessment and setback of water heater
- Natural gas conservation measures, available for customer purchase:
 - Weather-stripping of an additional door
 - Installation of second programmable thermostat

This product offers the delivery and installation of energy conservation measures bundled within one package with flat pricing. The price covers the cost of the base measures; PSCo pays for the labor. Customers also can purchase additional measures that are priced individually.

B. Targets, Participants & Budgets

Targets and Participants

The product participation and savings targets were developed based on Colorado residential market size and experience with similar products in Xcel Energy's other jurisdictions.

Budgets

Budgets were determined by evaluating vendor cost estimates and potential participation levels in Colorado and historical product expenses in other Xcel Energy jurisdictions. Spending for advertising, promotion and outreach generate awareness, interest and participation in targeted areas. Primary budget drivers are:

- *Administration* – program administration costs for third-party implementation and the installation of energy efficient measures in customers' homes.
- *Advertising and Promotion* – print, radio, broadcast, direct mail, interactive media and event promotion.

C. Application Process

During an in-home visit, the Home Energy Squad technician will work directly with customers to determine which energy-saving measures will make their home more energy efficient. Customers pay a \$75 trip charge and receive a suite of energy-saving items such as Value LED bulbs, high efficiency showerheads and aerators, etc. The installation labor and materials are included in the trip charge, and therefore they immediately begin saving energy and money. The third-party implementer reports the installation of energy-saving measures to the Company, and, therefore, the customer does not need to submit a post-project rebate application.

D. Marketing Objectives & Strategies

This product, and its approach to direct installation of measures in residential customer homes, is new to the Colorado market. Therefore initial marketing objectives will be focused on building awareness and product interest, and driving initial customer participation.

Marketing strategies and tactics will include mass media advertising, online interactive, email, neighborhood canvassing, telemarketing, local-market advertising and special promotions. Participating trade partners will also be an important means to building product awareness, referrals and participation. Customers who have completed a Home Energy Audit but have not taken action on the recommendations may be a good fit for cross promotion of Home Energy Squad's energy-saving measures and services.

E. Product-Specific Policies

A Home Energy Squad participant must be a combination gas and electric, or electric-only, customer. In 2017, the Company expects to offer the program throughout its entire service territory. The Company will connect customers with participating contractors to begin the product engagement.

The technical assumptions will largely reflect those of other residential products such as Home Lighting & Recycling and Energy Efficient Showerhead to consistently report measure costs and energy savings.

F. Stakeholder Involvement

The Company will partner with its existing array of customer and trade stakeholders regarding program design and introduction, awareness building and ongoing product feedback. This may include partnering with other natural gas utilities where PSCo is the electric-only provider.

G. Rebates & Incentives

Customer co-pay, of \$75, will be required to receive the direct-installed energy-saving items such as Value LEDs, high efficiency showerheads, etc. This process differs from most prescriptive rebate programs where the customer submits a rebate application after equipment is installed and operational. The third-party implementer will report the installed measures to the Company, and the customer does not need to submit a post-project rebate application.

➤ Home Lighting & Recycling

A. Description

The Home Lighting & Recycling product provides resources for customers to purchase energy efficient light bulbs and dispose of them in an environmentally-friendly manner. Using energy efficient bulbs is an easy and inexpensive way for customers to save electricity. Public Service provides an avenue for customers to purchase discounted energy-efficient bulbs through local retailers. Customers can also recycle CFLs free of charge through the program, at Ace Hardware.

Bulb Discounts

The Company motivates customers to purchase CFLs and LEDs by offering in-store retail discounts. An instant rebate is provided through Company collaboration with bulb manufacturers and retailers, enabling customers to purchase a variety of energy-efficient bulb models at a discounted price. PSCo partners with retailers such as Home Depot, Walmart, Costco, Ace Hardware, and King Soopers. Customers receive the discounted price at the register; there is no mail-in rebate form.

In 2017, the Company will offer CFL discounts, but will focus on increasing the awareness and sales of LED bulbs. Continuing to offer CFL discounts to customers during 2017 will help ease the transition to LEDs while the marketplace is changing and allow energy efficient bulbs to be available to all customer types at a low cost. In 2017 - 2018, retailers will begin to discontinue stocking CFLs, replacing the product with value LEDs. Value LEDs are characterized by lower lifetime hours, commonly 10,000-15,000 hours. Also, the price is much lower than the traditional LEDs, making them more cost effective and attractive to customers who want to use LED technology but have been resistant to price. The program will offer a minimal amount of CFL discounts in 2017 to cover retailers that have not transitioned to LEDs. Beginning in 2018, the Company will discontinue the support of CFLs.

A new ENERGY STAR specification for LEDs goes into effect January of 2017. The new specification will reduce the stringent requirements on LED bulbs. It will require lower lifetime hours, 15,000 versus 25,000. The EPA has eliminated the dimming requirement and changed the omni-directional requirement. This change in the ENERGY STAR specification will require lower cost LEDs to perform better and be more consistent in order to meet the certification.

CFL Recycling

The CFL Recycling component of the product provides an environmentally-friendly method for customers to dispose of CFLs. Public Service maintains a partnership with Ace Hardware to serve as the retail arm for CFL recycling. Customers can bring spent CFLs to any Ace Hardware store throughout the state and recycle them free of charge. The retailer then stores the bulbs in a covered bin until it is full. Then they ship the bulbs to the recycler in the postage paid bin. The Company covers the cost to ship and recycle the bulbs that are submitted for recycling at participating retailers within the Company's service territory.

B. Targets, Participants & Budgets

Targets and Participants

The energy savings target for the product was derived by analyzing the market potential and historical sales data, while considering new technologies, market potential, available retail channels and participating customer segments. All Public Service electric customers are eligible to participate in the Home Lighting & Recycling product.

Budgets

The 2017 and 2018 Home Lighting & Recycling budgets have decreased slightly from the previous filing due to decreased costs of LED incentives. LED incentives make up more than 80% of the budget costs. Public Service works hard to control administration and marketing costs for the product, thus they are expected to be consistent with that of the previous filing.

C. Application Process

Customers do not need to apply to participate in the Home Lighting & Recycling product. Public Service works with retailers and manufacturers to provide a discounted price on bulbs through upstream incentives. The incentive varies depending on the type of bulb and the manufacturer/retailer partner. The customer receives the discounted price at the cash register. Incentives are paid upstream and the discounts are passed on to the customer.

D. Marketing Objectives & Strategies

The objective of the Home Lighting & Recycling product is to motivate customers to purchase energy efficient bulbs, and encourage them to recycle CFLs when they burn out. Public Service will focus marketing dollars building awareness and sales of LED bulbs, in addition to helping educate customers about the product benefits in this changing marketplace. The Company will use various media channels to reach customers including television, radio, in-store signage, publications, bill inserts, social media, internet and sponsorship of local events. The peak sales period for energy efficient bulbs is in the fall and winter, as such, promotions are focused during these buying time periods.

Public Service uses an RFP process each year to select participating retailers and endeavors to enable partnership with a variety of retailers (including big box, mass merchandiser, and hardware and grocery outlets) to ensure optimal pricing and to help reduce free-ridership.

CFL Recycling is marketed locally through the local retail partner, Ace Hardware. The Company also markets recycling through CFL and LED promotions and through the Company's website.

E. Product-Specific Policies

Public Service selects retailers within the Colorado service area and assumes that the customers purchasing the discounted bulbs live within the given area. Although there may be crossover sales with bordering utilities' territories, the Company assumes that the crossover coming in and out of the territories is equal.

The third-party implementer will be responsible for delivering the calculated savings, actual high efficiency product sales details, including the location, types and quantities of bulbs sold each year to be used in the DSM Annual Status Report.

Public Service currently uses a third-party implementer for CFL recycling. The selected implementer is known to be the best in industry because they separate the CFL components by hand to ensure that hazardous materials do not end up in the ground soil or water. The third-party implementer also provides bins made of recycled material and recycles the bins that the bulbs are shipped in. In addition, they provide certificates of proper recycling.

F. Stakeholder Involvement

The Company collaborates with several organizations to monitor and incorporate best practices into lighting product design. These activities include: member of the Consortium for Energy Efficiency, annually attending the national ENERGY STAR Lighting Partner meeting, and monitoring information published by lighting manufacturers, E-Source, the American Council for an Energy-Efficient Economy (ACEEE), the U.S. Environmental Protection Agency and the U.S. Department of Energy.

G. Rebates & Incentives

The upstream markdown incentives typically account for 30% to 70% of the incremental cost, depending on the bulb. The cost savings are passed on to the customer as an instant rebate.

➤ **Home Performance with ENERGY STAR**

A. Description

The Home Performance with ENERGY STAR (Home Performance) product is targeted for existing single-family homes in need of at least three energy efficiency improvements. By providing these customers with rebate incentives, Public Service is able to incorporate a whole house approach to energy efficiency. In order to participate in the product, all qualified Public Service customers must receive either both natural gas and electric service, or have electric service only with electric heat.

Home Performance was developed using principles from the nationally recognized ENERGY STAR® “Home Performance with ENERGY STAR” product.⁶⁰ The concept of the product is to provide the customer with one-stop for all of their home efficiency needs. In this comprehensive approach, the customer receives an energy audit; the audit is then used to generate a list of recommendations. The contractor, who may also be the auditor, reviews the recommended improvements, completes the work, and may receive an independent verification of the improvements after completion if a QC is performed. The contractor and homeowner may also request advice on recommended upgrades and rebates from the Energy Advising service.

This product leverages the Company’s Home Energy Audit offering, requiring an advanced in-home blower door audit as the first step in the process for product participation. After the customer completes the audit and meets the product eligibility requirements, the customer may sign up to participate in Home Performance. Customers must achieve at least a 20% energy reduction in their home energy consumption by implementing qualifying savings improvements to earn rebates.

Trade partner companies interested in performing installations must have a technician on staff who is currently certified in one of the following: Building Performance Institute (BPI) Building Analyst, BPI Envelope, BPI Heating, BPI Residential Building Envelope Whole House Air Leakage Control Installer or Crew Chief, Quality Control Inspector (QCI), Advanced Energy Auditor, and/or North American Technician Excellence (NATE) Gas Heating plus approved Combustion Appliance Zone (CAZ) training, NATE AC or NATE ASHP or GSHP certification (with the exception of evaporative cooling and water heaters, which don’t require a certified contractor). Each trade partner company must have one technician in each certification area, in which they are participating. A technician’s certification may not be used by another trade partner company to meet the program requirements. Trade contractors must also complete the appropriate Home Performance contractor training depending on the services they offer.

The primary focus of these trainings is to provide contractors with information on the product components, how the process works, and the diagnostic testing required as part of the efficient

⁶⁰ Learn more about EPA’s Home Performance with ENERGY STAR:
https://www.energystar.gov/index.cfm?fuseaction=hpwes_profiles.showSplash&s=footer

measure installations. All participating contractors must sign the corresponding contractor agreement before providing installs for participants in the product. Once contractors have completed this training, they will be included on the approved contractor list, which is included in the customer packets and on the Company's website.⁶¹

B. Targets, Participants & Budgets

Targets and Participants

The product targets were developed based on the 2015 product results and performance of similar products in other Xcel Energy service territories.

Budgets

The budget for this product is based on the 2014 and 2015 expenditures, third-party implementer costs, and software costs, including measurement and verification inspections, as well as the cost to promote the product through print advertising and collateral. Both cooling and attic measures will include a trade incentive rebate as well.

C. Application Process

Customers interested in participating in the Home Performance product must begin by requesting a Home Energy Audit with blower door test. The auditor will provide information on the Home Performance product as part of their in-home audit, tying specific product requirement information and recommendations to the audit. The customer may then sign up for the product the day of the audit through their auditor or the online signup form.

Once a customer has signed up for the program, they have one year to complete the required and optional equipment installs. The customer then completes the recommended improvements and works with their contractor to submit the rebate form. A random sample of 10% of the contractor's jobs will be inspected and verified.

The Home Performance product information, approved contractor list, and signup form are available on the Company's website.⁶² Customers can receive applications through their registered and approved contractor only. Customers may also contact the Residential Customer Care center (1-800-895-4999) to request product information or guidance on how to obtain rebates.

D. Marketing Objectives & Strategies

Public Service will implement a variety of marketing strategies to provide product information through the website, bill onserts, targeted mailers, and local "green" community events.

⁶¹ www.xcelenergy.com/cotrades

⁶² www.xcelenergy.com/homerebates

Incentives will be provided to trade partners for identifying participants that may not be aware of the “whole house option” through Home Performance.

The Home Performance product will be marketed through the Company’s Home Energy Audit promotions directly to customers, and approved Home Performance participating contractors. Public Service will monitor product participation on a monthly basis and implement additional marketing tactics if necessary to achieve the year-end target.

In addition, Public Service will attempt to fully utilize the trade partners who have been trained and contracted to deliver this product to customers. This is viewed as the most important marketing channel for building awareness and participation in the product. As a result, Public Service is offering incentives to participating installation contractors that are designed to increase the number of projects performed. These incentives are designed provide contractors with additional motivation to promote the Home Performance product.

E. Product-Specific Policies

The Home Performance product requires that customers have either a standard Home Energy Audit with blower door test or an Infrared Audit with blower door test performed in order to qualify for participation. The audit is required prior to starting the improvements. Customers are eligible for a Home Energy Audit every two years. Public Service will provide the customer a list of contractors participating in the product; however, the Company does not guarantee the contractor’s expertise or warrant any of the products or services, nor is one contractor promoted over another. Public Service shall have no liability for contractor work or negligence.

To complete the product and be eligible for the rebates, customers must agree to achieve a 20% reduction in their home’s energy consumption. The customer must complete air sealing, attic insulation, and CFLs or LEDs as part of their improvements if they have not made these upgrades previously. The customer will receive rebates for improvements completed within one year of signing up under the Home Performance product. The Company will not rebate pre-existing efficient equipment.

F. Stakeholder Involvement

Public Service periodically meets with the Cities of Boulder, Fort Collins, Greeley, and Colorado Springs, the Center for Resource Conservation, the Platte River Valley Authority, the Colorado Energy Office, the U.S. Environmental Protection Agency, the U.S. Department of Energy, Electric & Gas Industries Association, and the Energy Efficiency Business Coalition (EEBC) for product feedback. The Company plans to continue meeting with these organizations, and other stakeholders, for feedback to improve the product.

Additionally, Public Service is an active member of Affordable Comfort, Inc. (ACI)—a leading educational resource for the Home Performance industry; and has an active partnership with the BPI — a national standards development and credentialing organization for residential energy efficiency retrofit work.

G. Rebates & Incentives

Home Performance product rebates are prescriptive and based on the specific measures installed. Rebate levels are enhanced when compared to rebates offered for similar measures in the Company's related DSM products to encourage customers to pursue whole-home improvements instead of individual upgrades. The rebate levels are provided in the following table.

Rebates for Home Performance Measures

Home Improvement Measures	Prescriptive Rebates					
Top Three Required Improvements (If listed as a recommendation in the customer’s audit report)	Rebate for Natural Gas Heated Home w/o Cooling		Rebate for Natural Gas Heated, AC Cooled Home	Rebate for Electric Resistance-Heated Homes		
Attic Insulation* (30% up to cap)	\$400		\$600	\$700		
Air Sealing, Bypass Sealing & Weather-stripping* (60% up to cap. See insulation application for tier-level requirements)	Bottom Tier	\$250	\$400	\$450		
	Top Tier	\$325	\$500	\$550		
High Efficiency LEDs*	\$2/per bulb up to \$40					
Optional Improvements						
Wall Insulation (above grade)	Rebate for Natural Gas Heated Home w/o Cooling	\$400	Rebate for Natural Gas Heated, AC Cooled Home	\$600	Rebate for Electric Resistance-Heated Homes	\$700
Evaporative Cooling – Standard System (1 st)	\$325					
Evaporative Cooling – Standard System (Replace)	\$225					
Evaporative Cooling – Premium System (1 st)	\$725					
Evaporative Cooling – Premium System (Replace)	\$625					
Evaporative Cooling – Whole House System	\$1200					
Central AC 15 SEER, EER 12.5	\$400					
Central AC 16 SEER, EER 13	\$550					
Central AC 17 SEER, EER 13	\$700					
Central AC Trade-in	\$550					
Ground Source Heat Pump	\$300 per ton					
Electric Heat Pump	\$550					
Programmable Set Back Thermostat	\$25					
95% AFUE or higher High Efficiency Furnace	\$200					
Electronically Commutated Motor	\$125					
Tankless Water Heater .90 EF or higher	\$200					
Water Heater .67 EF or higher	\$100					
ENERGY STAR Refrigerator/Primary	\$15					
ENERGY STAR Dishwasher	\$10					
ENERGY STAR Clothes Washer	\$50					

*If any of these three measures are a recommended improvement from the Home Energy Audit, they must be completed in order to participate in Home Performance with ENERGY STAR.

➤ **Insulation and Air Sealing Rebate**

A. Description

The Insulation and Air Sealing Rebate product offers rebates for installing insulation and air sealing measures in existing single-family homes or one-to-four unit properties. Eligible customers include residential electric and natural gas customers within the Public Service territory and include those with a combination of residential electric and natural gas service, gas-only service, or are electric service only customers who are electrically-heating their residences.

Public Service will rebate the following types of qualifying installations:

- Air sealing, bypass sealing and weather stripping (required with insulation applications unless the home is 0.50 NACH (Natural Air Changes per Hour) or better resulting in a minimum of a 20% reduction in air leakage
- Attic insulation (where existing is R-15 or less) to an R-value of R-49 minimum and R-60 maximum
- Wall insulation to an R-value of R-13 (where existing exterior wall cavities are empty)

B. Targets, Participants & Budgets

Targets and Participants

The Company anticipates approximately 85% of homes participating will require air sealing. The Company has split the air sealing measure into two tiers based on the percent of savings they provide. The savings for air sealing measures are calculated using the same baseline home compared against the anticipated average savings within each tier:

	Estimated Therm Savings per home	Estimated kWh Savings per home
20-29% reduction	9.77 therms	306 kWh
30% reduction and higher	19.81 therms	663 kWh

The residential customers who can expect the most return from air sealing and insulation improvements are, electrically heated homes, natural gas heated and AC cooled, and natural gas heated with no AC cooling. Participant targets and rebate amounts have been aligned with marketing and trade partner education plans to encourage participation of the customers who will benefit the most.

Budgets

Budgets were based on 2014 and 2015 product performance. The air sealing incremental costs include allocating the cost to the customer for bypass attic air sealing, weatherization and envelope, as well as additional costs of blower door testing. M&V costs are based on a

percentage of the installations to ensure they meet quality installation standards and achieved the expected energy savings.

Typically, this product is promoted through the Company's website and newsletters, communications to local area insulation and air sealing contractors, and via community events and by consumer education. For that reason, historically the product has required little budget for promotion and marketing purposes. Some budget dollars have been allocated for contractor trainings and educational opportunities for the trade community.

C. Application Process

The application process requires that the customer use a participating trade partner, in order to qualify for the rebate, and can only receive the rebate application from those trade partners. Air sealing and weather-stripping are required for each install, unless the home meets the 0.50 NACH threshold. Pre- and post-blower door results in CFM 50 are required for all projects, with the exception of a home that meets the 0.50 NACH value.

The Company must receive a copy of the dated invoice reflecting the qualified installation work performed. Qualified improvements will be processed accordingly by the rebate operations team and checks issued within six to eight weeks. The Company will issue the rebate directly to the customer, or the alternate rebate recipient as designated on the rebate application form.

Participating trade partner companies must have a technician on staff that is currently certified in one of the following: BPI Analyst, Envelope or Residential Whole House Air Leakage Control Installer or Crew Chief. A technician's certification may not be used by another trade partner company to meet the program requirements. All registered contractor companies must also be listed on the Company's trade partner website.⁶³ These contractors have agreed to the terms of the Company's trade partner agreement and meet the requirements related to quality installation practices per BPI.

D. Marketing Objectives & Strategies

The Insulation and Air Sealing Rebate product will be marketed through a variety of channels such as the Home Energy Audit, the Company's website, direct mailings to local area BPI-certified insulation contractors, and environmentally-focused community events. The Company will support this overall marketing strategy with seasonal bundled direct mail and email efforts, social media, blogs, newsletters and bundled onserts to targeted customers. Historically, this strategy has worked well when implemented during the key heating months of December, January, and February, and during summer months to highlight cooling benefits.

Additionally, the Company will incorporate communications activities to local insulation contractors so they can educate qualified customers on how they can benefit from this rebate. By

⁶³ www.xcelenergy.com/cotrades

collaborating with Public Service on outreach to our customers, local contractors may be able to drive more customers to commit to quality assured insulation installations.

Finally, the Company may initiate cross marketing efforts with our other natural gas rebate products. An example of this could be a winter bill insert that outlines existing rebate and energy efficiency products available to natural gas customers of Public Service. This strategy has proved successful in the past. Other, emerging strategies may also be incorporated.

E. Product-Specific Policies

The customer must use a trade partner company who employs an employee or subcontractor who holds a BPI Analyst, Envelope, Residential Whole House Air Leakage Control, Quality Control Inspector, or Advanced Energy Auditor certification. This person's certification cannot be used by more than one trade partner company to qualify them for participation. All participating contractors in good standing will be listed on the Company's trade partner website.⁶⁴ These contractors have agreed to the terms of the Company's trade partner agreement and meet the requirements related to quality installation practices per BPI.

Air sealing and weather-stripping are required for each installation, unless the home meets the 0.50 NACH (Natural Air Changes per Hour) threshold, using the Company's modified NACH formula. A pre-improvement blower door test, measured in CFM 50, is required for all projects that have not had a recent Home Energy Audit that included a blower door test. If the home's results show(ed) the home is already "tight enough" (.50 NACH value) then no further air sealing work will be rebated; in that instance, a post-improvement blower door test is unnecessary. The customer may then qualify for only attic and/or external wall insulation improvements. If the pre-improvement NACH reveals that the house is not already "tight enough," meeting the air sealing improvement criteria is a pre-qualification for the attic and/or wall insulation measure rebates.

Most homes have a NACH higher than the threshold and will require air sealing improvements, and a post-improvement blower door test must be done and show a minimum improvement of 20%, before insulation improvements can qualify for the rebate.

Self-installations, or installations done by contractors without the BPI certifications listed above, do not qualify for rebates.

This product excludes new residential construction, new residential additions, insulation of doors, garages, sheds, workshops, below-ground basements, mobile homes, projects with pre-improvement R-values of R-16 or greater, and residential properties with more than four units. To qualify for a rebate, all insulation must be installed to the manufacturer's specifications and meet all state and local codes and federal regulations. Air sealing and weather stripping must follow industry-accepted practices for mitigating air leakage. For safety reasons, residences with

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asbestos and/or vermiculite cannot receive a blower door test and are disqualified from the program until they can prove that mitigation work has been done to remove all asbestos and/or vermiculite from the residence.

A combustion appliance zone (CAZ) test check box is included on the rebate application—contractors are required to acknowledge that the testing was completed and/or note a recommendation for CAZ testing to be performed by an HVAC contractor. Public Service reserves the right to inspect installations before or after issuing a rebate. Rebates will not be issued if the same purchase has already been rebated through other Public Service rebate products, such as through the Home Performance with ENERGY STAR Product. Customers are eligible for one rebate per calendar year.

F. Stakeholder Involvement

The quarterly DSM Roundtable Meetings provide a forum for stakeholder involvement and feedback regarding this product. The Company continues to conduct meetings with interested trade partners and stakeholders to improve and implement this product, particularly around the issues of quality assurance and air sealing requirements. The Company will continue to engage stakeholders in garnering product feedback.

H. Rebates & Incentives

The rebate structure aligns with the anticipated energy savings a customer can expect, based on the way the customer's home is heated and cooled. Air sealing rebates are 60% of the actual incremental costs, up to the maximums allowed, based on the type of the heating and cooling of the Company's individual residential customers. Attic and wall insulation rebates are 30% of the actual incremental costs, up to the maximums allowed, based on the type of the heating and cooling of the Company's individual residential customers.

Rebate measure category	Rebate for natural gas-heated home, no central AC	Rebate for natural gas heated homes with central AC	Rebate for electric resistance-heated homes with or without central AC
Air-sealing, 20-29% improvement	\$175	\$300	\$350
Air-sealing, 30% improvement or greater	\$250	\$400	\$450
Attic Insulation	\$350	\$500	\$600
Exterior wall insulation	\$350	\$500	\$600

If a customer does multiple measure improvements, the measure rebates are added together. For example, if a qualified customer with a natural gas heated home with central AC gets a 32% reduction in the air sealing, and has the attic and wall insulation as well, the rebates would be $\$400 + \$500 + \$500 = \1400 total.

A customer may receive a rebate one time per calendar year. For example, a customer can receive the air sealing rebate for work done in 2017, and the attic and/or wall insulation rebate for work done in 2018. Public Service will not provide additional rebates for the same improvement type at the same address unless the customer has experienced a catastrophic loss, such as a fire.

➤ **Refrigerator and Freezer Recycling**

A. Description

The Refrigerator and Freezer Recycling product strives to decrease the number of inefficient refrigerators and freezers in use, and by doing so, deliver electric energy savings and peak demand reduction. The product is designed to reduce energy usage by allowing customers to dispose of their operable, inefficient primary refrigerators, secondary refrigerators, and freezer units in an environmentally safe and compliant manner. Eligible customers include residential electric customers in the Company's service territory. Customers with qualifying units will receive an incentive for their participation and will not be directly responsible for any costs associated with pick-up, transportation, disposal, and proper recycling of their unit. The Company will use the services of a qualified third-party implementer to perform the following:

- Refrigerator/Freezer collection, transportation and storage;
- Verification of eligibility of refrigerator/freezer at time of scheduled pick-up;
- Appliance processing and materials recycling;
- Issuing the customer incentive payment;
- All customer service aspects related to above activities;
- Product tracking and reporting; and
- Supporting M&V requirements

The implementer will be required to comply with all local, state and federal requirements. This includes maintaining all permits and licenses required for any facilities, equipment and personnel used for this product. Adherence to this process will ensure that recycled units will not re-enter the secondary or primary market and be placed back on the Company's grid.

Customers will also receive two Value LEDs at the time of unit collection as an added incentive to participate.

B. Targets, Participants & Budgets

Targets and Participants

Participation and energy savings levels for this product were developed based on historical product performance, as well as projections using annual harvest rates, which is a unit of measurement to determine a segment of the population that would qualify for the recycling program, projected by the Company's third-party implementer using program modeling.

Budgets

The 2017 and 2018 budgets were developed based on forecast participation. Recycling-related expenditures account for approximately 40% of the overall budget. The projected rebates account for nearly 30% of the budget. Marketing, M&V and labor expenses make up the remaining budget.

C. Application Process

Customers will either call-in to the third-party implementer's toll-free service number or schedule this service online.⁶⁵ The third-party implementer will ask qualifying questions in order to minimize costs and maximize customer satisfaction. The implementer will schedule an appointment and will be required to pick-up the unit no later than 10 business days after the customer's requested pick-up date. Customers will be called one to two days prior to their scheduled pick-up date in order to confirm their appointment and remind them to turn on their unit and make sure it is empty. Customers will receive their incentive check within six to eight weeks after their unit has been picked-up by the implementer.

D. Marketing Objectives & Strategies

The product will be available to customers year round; however, the marketing strategy will utilize spring and fall campaigns to promote the product.

The target market consists of customers who are disposing of their primary (usually located in the main kitchen) or second refrigerator (usually located in a garage or basement area), or freezer units (usually located in a garage or basement). Generally these customers have single-family homes with two or more individuals in the household. Customer interest in this type of product is seasonal, usually occurring in the spring, summer and early fall seasons (prior to the Thanksgiving holiday). Product demand often peaks in the summer months, which is associated with customer home improvement periods. Deployment of promotional tactics will coincide with these seasonal time periods.

The Company will utilize several marketing channels for this product, including bill inserts, newsletters/blogs, radio, social media, and the Company website. Additional tactics may include door hangers, sweepstakes or promotional incentives, depending on targets. Similar marketing opportunities exist with other products such as Home Performance with ENERGY STAR and some of the low-income weatherization products. Targeted direct mail and telemarketing tactics may also be used. Call Center agents will direct any customers inquiring about this product to contact the third-party implementer using their toll-free number or website.

E. Product-Specific Policies

All refrigerator and freezer units must meet the following requirements to qualify for this product:

- Must be an operational primary or secondary refrigerator unit or a standalone freezer. "Operational" is defined as in working order. Refrigerators must be capable of freezing water; freezers must be capable of freezing.
- Appliances will be categorized as follows for reporting purposes:

⁶⁵ <http://www.xcelenergy.com/fridge>

- *Secondary*: Used as a secondary unit for at least two months prior to pick up;
 - *Primary*: Used as the primary unit in the home at the present time;
 - *Freezer*: Used separately from the primary refrigerator and is a standalone unit.
- Refrigerator/Freezer must be plugged in the night before the pick-up date (customer will receive a call from the implementer, reminding them to do this). This is to ensure full operation (cooling/freezing water for a refrigerator; freezing capability if a freezer) when inspected at the time of pick-up.
- Appliances must be no smaller than 10 cubic feet or no larger than 30 cubic feet.
- There will be a limit of two freezers and/or refrigerators per household.

F. Stakeholder Involvement

The Company is a proud partner of the U.S. Environmental Protection Agency's (EPA's) Responsible Appliance Disposal (RAD) Program. This voluntary partnership program began in 2006 to help protect the ozone layer and reduce emissions of greenhouse gases through the responsible disposal of appliances.

The Company has been responsibly recycling appliances for many years. The Company's voluntary participation in the RAD Program further underscores commitment to helping customers make responsible technology and appliance choices. The Company has been published within the RAD annual report and recognized at annual events for product accomplishments.

H. Rebates & Incentives

Participants will receive a \$50 incentive to remove their inefficient primary and/or secondary refrigerators and freezers. The primary and secondary refrigerator or freezer will be removed and properly recycled at no cost to the customer. The \$50 incentive is on par with many similar programs in the U.S.

In addition to the \$50 incentive, customers will receive the benefit of energy savings, which on average is equal to about \$100 annually; as well as two Value LEDs at the time of unit collection.

➤ Residential Heating

A. Description

The Residential Heating product provides an incentive in the form of a cash rebate to Public Service's customers who purchase high-efficiency heating equipment, including furnaces, and electronically commutated motor (ECM) furnace fans for residential use. Residential customers who purchase their natural gas from the Company may qualify for the furnace rebate. Residential customers who purchase their electricity from the Company may qualify for the ECM rebate.

Public Service customers benefit by receiving a reduced cost for energy efficient units, in addition to experiencing energy savings throughout the lifetime of the equipment. In making a purchase decision, consumers can check with Public Service or a registered Heating, Ventilating and Air Conditioning (HVAC) contractor participating in the product to ensure all minimum qualifications exist with the chosen system to obtain a rebate. Public Service allows customers to choose a registered heating system contractor or installer. Trade partners must have at least one North American Technician Excellence (NATE) Gas Heating certified technician to register and participate in the Residential Heating product. A technician's certification may not be used by another trade partner company to meet the program requirements. These contractors have agreed to the terms of the product and meet the requirements related to quality installation practices. A list of registered contractors can be found on the Xcel Energy website⁶⁶. The product is applicable only for the purchase of qualifying new furnaces and ECM furnace fans installed in existing or new residential homes. Furnace rebates are offered for a minimum furnace efficiency of 95% Annual Fuel Utilization Efficiency (AFUE). ECM rebates are offered for both retrofit applications and when the ECM is installed as part of a new furnace only.

B. Targets, Participants & Budgets

Targets and Participants

Targets were developed based on 2013 - 2015 participation and energy savings trends, and experience with similar products in the Company's other jurisdictions. Total participant and savings targets for this product will remain consistent from 2017 to 2018.

Budgets

Budgets were developed based on the cost per participant from 2013 through 2015 product results. Budget dollars are focused on rebates for residential furnaces and ECMs. The budget also includes costs needed to engage the HVAC contractor base in order to serve the customers in the territory and manage accurate record keeping of the NATE Gas Heating certification requirement fulfillment by participating trade partners. The budget also contains contingency funding, to be used if needed, to further incentivize product participation on a fixed reward basis.

⁶⁶

www.xcelenergy.com/cotrades

per rebate application. In the recent past, bonus incentives have helped to increase customer participation during months where heating systems sales are slower; this tactic has been utilized in other Xcel Energy service territories.

C. Application Process

The typical sales cycle begins with a customer hiring a participating trade partner, learning about energy efficient models, and purchasing and installing the unit. Following installation, the customer or trade partner submits a completed Public Service rebate application and equipment invoice. Invoices must reflect the same information provided on the application form, specifically the model number, serial number, installation address, and purchase date. Other information gathered on the application form includes the customer's Public Service account number, mailing address if different from installation address, customer signature, trade partner signature and the unit's efficiency level.

Equipment eligibility is determined by using the Air Conditioning and Refrigeration Institute (AHRI) Directory of Certified Product Performance,⁶⁷ The Company reviews each application and verifies that all the required data has been provided as well as the unit's energy efficiency level. Rebates are typically mailed within four to six weeks.

D. Marketing Objectives & Strategies

The Residential Heating product's primary objective is to increase demand for high efficiency heating equipment among Public Service customers, and through consumer demand, assist the overall effort to increase the availability of high-efficiency heating units in the marketplace. Another objective is to help Public Service customers save energy with their heating needs and understand the immediate and long-term value of purchasing and installing high efficiency equipment.

Residential heating and residential HVAC systems typically have a short- to medium-term sales cycle. Public Service uses the following marketing communications strategies to make customers aware of the Product:

- Print and online banner advertising (radio on contingency basis). Advertising is an effective way to reach a broad audience. Banner advertising will be strategically placed on local popular news and weather sites, in addition to local larger print newspaper sites. Print advertising media plans will include the larger print papers serving the metropolitan areas, and print papers in smaller cities and other parts of the state.
- Public Service bill messaging. Bill messaging is timed according to appropriate seasons for the equipment. Typically, heating season promotion begins as early as July to coincide with the busy summer trade season when heating and cooling equipment is being replaced or installed simultaneously in customer homes. Bill messaging for high

⁶⁷ <http://www.ahridirectory.org>

efficiency heating equipment has also proven to be effective in the spring, when winter has ended and customers have had recent experience with high heating bills.

- Xcel Energy website. The website contains heating-related pages targeted to both customers and energy partners—installers, contractors and distributors. The pages are updated according to equipment efficiency changes and available promotions. The rebate schedule is always available on these pages, along with links to related pages or to forms and collateral.
- Trade Relations Manager. The Company utilizes a trade relations manager to communicate product details to the contractor and distributor channels (i.e. trade community) and conduct training sessions on product specifics. The Company will also participate in appropriate tradeshow and presentations related to heating.
- Trade Community. The primary promotional channel is the trade community. Training, meetings, telephone calls, letters and newsletters keep the HVAC trade informed about the product and help to increase awareness among new contractors. Contractors are required to register with Public Service as a product participant and obtain a contractor ID number for their company; this number is a unique identifier and helps with trade management internally.

E. Product-Specific Policies

Eligibility requirements for participation include having a residential natural gas account with Public Service for the gas furnace rebate, and a residential electric account with Public Service for the ECM furnace fan rebate. The product is applicable only for the purchase of qualifying new furnaces and ECMs installed in new or replacement applications.

HVAC contractors and installers must be NATE Gas Heating certified, attend any required company trainings, follow all program guidelines, and be approved by Public Service to participate.

F. Stakeholder Involvement

Public Service considers its stakeholders for the Residential Heating product to be the HVAC contractors and distributors, Southwest Energy Efficiency Project (SWEEP), the Energy Efficiency Business Coalition (EEBC), the Colorado Energy Office (CEO), local municipalities within the service area, and other environmental organizations. Stakeholders are able to share their product suggestions during the Company's quarterly DSM Roundtable Meetings. In addition, the Company is a member of the Consortium for Energy Efficiency (CEE), and monitors its initiatives related to residential HVAC equipment.

G. Rebates & Incentives

The Residential Heating product offers three different rebate levels, depending on the type and efficiency of the equipment purchased:

- Furnaces at or above 95% AFUE qualify for a rebate of \$120
- ECM furnace fans qualify for a rebate of \$100

The proposed incentive amounts encourage customers to move to the highest efficiency equipment available.

➤ **School Education Kits**

A. *Description*

The School Education Kits offer a turnkey product that combines a set of classroom activities with projects in the home to install energy efficiency and water conservation measures. The product is targeted for fifth or sixth grade students in Public Service's electric and natural gas service territory. The Company works with a third-party implementer to implement this product. The third-party implementer will recruit and train teachers, provide associated educational materials, and track participation by the students and teachers.

Along with various classroom materials, each participant receives a kit containing the following:

- Two (2) LED bulbs (11 Watt)
- Four (4) LED bulbs (9 Watt)
- One (1) 1.5 gpm High Efficiency Showerhead
- One (1) 1.5 gpm Kitchen Faucet Aerator
- One (1) 1.0 gpm Bathroom Faucet Aerator
- LED Night Light
- Filtertone Alarm
- Digital Water / Air Thermometer
- Parent Evaluation Card

An evaluation of the K-12 schools in Colorado indicates that there are approximately 70,000 students in the fifth and sixth grades in a given year. The fifth and sixth grades were chosen for participation to align with Colorado State learning requirements. Specifically, the topics covered in Science Standard 4, Earth Sciences call for discussion of renewable/non-renewable natural resources, solar heat in the environment, and water circulation through the hydrologic cycle.

In Colorado, individual school districts have the ability to establish their own standards, which supersede state requirements, so there may be some local areas where kit participation is moved to another grade level to accommodate these local preferences. The same materials and kit measures are provided to those districts.

This product has many advantages – it enables an educational program to have direct-impacts on energy conservation, it helps build awareness of energy conservation among children; and can impact customers at all income levels. Similar products are offered in Xcel Energy's New Mexico and Minnesota service territories.

B. Targets, Participants & Budgets

Targets and Participants

School enrollment data was updated recently and has identified approximately 68,000 students in the service territory served by the Company. Historical data indicated that approximately 80% of teachers offered participation in the program choose to participate.

Budgets

The product cost is all-inclusive, made up of not only the kits, but also the curriculum support materials for the teacher, the pre- and post-surveys, and third-party implementer website support. The product budget was developed based on participation targets and an approximate cost per kit. Labor, administration fees, and postage have been added to the budget as well. M&V of installation will be conducted by the third-party implementer and those costs are included in the product's administration fees. This product does not require advertising; school districts within the territory served by the Company are eligible to participate.

C. Application Process

The teachers may enroll through various means (i.e. phone, email, mail, or via the website). If the response to enrollment calls is insufficient, the third-party implementer will redesign the marketing materials and/or offer incentives to teachers to participate. Examples of incentives may be gift cards to select retailers.

Upon enrollment, the teachers indicate to the third-party implementer the time during the school year at which they would like to use the product materials and will subsequently provide enrollment/participant numbers. The third-party implementer will send the teachers the School Education Kit materials in advance of the selected program date. Third-party implementer staff will remain in contact with the teachers via phone, email and mail at various times throughout the program to provide support for the teachers and to request return of audit forms. Participants are provided with a toll-free number to call if they need help.

The Company receives the results from participating schools on average three months after each program begins.

D. Marketing Objectives & Strategies

The third-party implementer will manage all aspects of marketing and outreach for the product, including:

- Identifying the schools that are within the Company's service territory and determining the approximate number of eligible teachers and students.
- Sending out customized marketing materials to help enroll the classrooms. These materials explain the program, and the fact that it's offered free of charge to their classroom thanks to the sponsoring agency (the Company).

- The third-party implementer and the Company will work together to determine the eligibility of interested schools.

E. Product-Specific Policies

Only those schools that are selected to participate in the product are able to distribute the School Education Kits. All kits must come from the Company's third-party implementer.

F. Stakeholder Involvement

In the past the Company has worked with the third-party implementer to conduct focus groups to gather feedback around the kits and the associated classroom materials. The Company has also presented the product to the Colorado Associate of School District Energy Managers.

G. Rebates & Incentives

The Company will fund 100% of the cost of the School Education Kits. There will be no rebate provided to participants.

➤ **Water Heating**

A. Description

The Water Heating product is designed to encourage Colorado customers to purchase and install high efficiency natural gas or electric water heating equipment for residential use. The product's objectives are to increase demand for high efficiency water heating equipment among Public Service customers and increase the availability of high efficiency water heaters in the marketplace. An additional product objective is to help Public Service customers capture energy savings with their water heating needs and understand the immediate and long-term value of purchasing and installing high efficiency equipment. In addition to providing a cash incentive and long-term operational savings to customers, this product also is intended to promote market transformation through increasing customer demand for high efficiency equipment in the marketplace. Participants receive a rebate for the purchase and installation of qualifying water heaters.

Customers may choose their own independent residential water heating contractors or installers, or may install the unit themselves. Eligibility requirements for participation include being either a residential natural gas or electric customer. The product is applicable only for the purchase of qualifying new standard storage tank water heaters, tankless water heaters or electric heat pump water heaters installed in new or replacement applications. Qualification for a rebate requires a minimum efficiency of 0.67 Energy Factor (EF) for standard tanks, tankless 0.90 EF, and electric heat pump water heaters.

Although the Water Heater product is not cost-effective, it is included in the portfolio to encourage the purchase of high-efficiency water heaters as a common replacement item in customers' homes. Alternate product design and delivery to Public Service customers will be considered in an effort to reduce costs and improve cost-effectiveness.

B. Targets, Participants & Budgets

Targets and Participants

The energy savings and participation targets were developed based on historical participant data, current market conditions, and projected sales of water heaters. Proposed savings were estimated on a per unit basis using the projected number of participants.

Budgets

Budgets for the Water Heating product were developed based on the expected costs per participant, and include costs associated with engaging heating, ventilation, and air conditioning (HVAC) installers in the Colorado service territory. Specifically, this includes newsletters and email to the contractor community. An internal Trade Relations Manager will also reach out to trade allies and develop key relationships to ensure product success. The overall marketing budget for consumers was determined by the number of marketing communications necessary to continue education and awareness of the product and to encourage participation. This product is

often cross-marketed with the Residential Heating product to offer customers yet another way to save on natural gas and electric costs in the home.

C. Application Process

Customers can expect to receive a rebate six to eight weeks after submitting an application. The product does not require preapproval. Customers receive rebate checks via mail (rather than a bill credit). Rebates for new home construction are negotiated between the builder and resident/new homebuyer to determine who will receive the cash rebate.

The customer will learn about the Water Heating rebate product through bill messaging, retailers that sell water heaters on site, the HVAC community and low-cost advertising and promotions such as newsletters and email. The typical sales cycle starts with a customer either purchasing and installing a water heater on their own or hiring an HVAC technician to install it. In either case, the water heater could be purchased through the contractor or a retailer. Following installation, a completed rebate application form and invoice are submitted to Public Service. Forms are mailed or emailed to the utility by either the contractor or the customer. Invoices must reflect the same information provided on the rebate application form, specifically manufacturer and model number, size or capacity (gallons), BTU, Energy Factor, equipment type, serial number and installation and purchase dates. Other information gathered on the rebate application form includes the unit size, efficiency level, the customer's account number, mailing address (if different from the installation address), customer signature, and contractor signature, unless the equipment was self-installed.

D. Marketing Objectives & Strategies

Marketing tactics may include the following: email, communications on the Company's website, tradeshow, trade communications, trainings, direct mail, newsletters, and HVAC community relationship building.

Specifically:

- Public Service contractor communications are timed according to appropriate seasons for the equipment. Since water heating demand is year-round, this provides flexibility with marketing seasonality. To maximize the value of messaging, the Water Heating product is often cross-marketed in bill messaging with the Residential Heating product.
- Internet pages for Water Heating are developed for customers and the pages are updated according to equipment efficiency changes and available promotions.
- The Company will participate in tradeshow related to water heating to provide information about the product, and/or make a formal presentation. The channel manager also presents product details, objectives and policies to trade partners at various contractor meetings.
- Trade partners also support Water Heating promotions. Training, meetings, telephone calls, letters and newsletters with biannual frequency keep the trade informed about the product and help increase awareness among new contractors as well as ensure proper application rules are followed. Customers can obtain information on contractors from the

Company's website.⁶⁸ Contractors are encouraged to register with the Company as a registered contractor and obtain a contractor ID number.

As an important marketing channel, the HVAC community helps ensure product guidelines, eligibility requirements and processes are clearly communicated. This product relies heavily upon HVAC installers; they are on the frontline with customers as trusted individuals hired to perform service installation projects in their homes.

E. Product-Specific Policies

Customers and installers must adhere to all product rules listed on the reverse side of the rebate application form. An invoice for the equipment is required along with the rebate application form. Invoices must reflect the same information provided on the rebate application form, specifically manufacturer and model number, size or capacity (gallons), BTU, Energy Factor, equipment type, serial number and installation and purchase dates.

Equipment eligibility is determined using the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Directory of Certified Product Performance⁶⁹ or ENERGY STAR Qualified Products on the ENERGY STAR[®] website.⁷⁰ The Company's Rebate Operations team reviews each application for accuracy and qualifications prior to mailing a rebate check. In the event of insufficient information, the rebate application and invoice are returned to the customer with a letter requesting additional information.

Customers applying for a water heater rebate will be rebated at the level indicated in that calendar year's approved DSM Plan. Customers are allowed to submit a rebate application for more than one water heater at a time, as some larger homes may require more than one; however, if more than one unit is installed at an address, one application per unit is required to receive a rebate for each unit.

F. Stakeholder Involvement

Ongoing consumer awareness and usability research studies are used to identify potential product modifications and enhancements. Product-specific studies are conducted every few years, allowing past participants and contractors to provide feedback about their experiences with the product. Public Service staff also engages with stakeholders for best practice sharing via the Consortium for Energy Efficiency's (CEE) High Efficiency Residential Gas Water Heating Initiative.⁷¹

⁶⁸

http://www.xcelenergy.com/Save_Money_&_Energy/Residential/Supplemental_Information/Contract_or_Legal_Disclosure

⁶⁹ <https://www.ahridirectory.org/ahridirectory/pages/home.aspx>

⁷⁰ <https://www.energystar.gov/>

⁷¹ CEE Energy Efficiency Program Library: <http://library.cee1.org/content/cee-high-efficiency-residential-natural-gas-water-heating-initiative>.

G. Rebates & Incentives

Rebates for qualifying equipment are shown in the table below.

Water Heater Type	Rebate
Standard Tank Water Heater 0.67 EF	\$70
Tankless Water Heater 0.90 EF	\$100
Electric Heat Pump Water Heater	\$450

Rebate applications must be submitted by July 31 of the following year after purchase and installation to qualify for a rebate.

Low-Income Program

A. Description

The Low-Income Program includes Public Service's energy efficiency and education products targeted at income-qualified customers. Public Service continues to make a substantial commitment to both low-income gas and electric energy efficiency in 2017 and 2018. The Company recognizes that low-income products offer a unique opportunity to both substantially improve the efficiency with which customers use energy and to directly improve their quality of life. Energy efficiency products likely provide other non-energy related benefits to low-income customers in the form of health, safety, comfort, and other improvements. Reductions in low-income customers' utility bills can have a disproportionately beneficial effect on household income as compared to non-low-income customers because a larger percentage of a low-income customer's income is spent on energy.

With these factors in mind, Public Service will continue to offer the same four products included in the 2015/2016 Plan intended to reach a large percentage of the low-income community while leveraging resources already in place to serve this customer group. The Company continues to partner with Energy Outreach Colorado (EOC) and the Colorado Energy Office (CEO) who actively work with this customer segment.

The Low-Income Program consists of the following four products:

- Energy Savings Kit
- Multifamily Weatherization
- Non-Profit
- Single-Family Weatherization

Low-Income Product Rankings

All products in the DSM portfolio were ranked through the same process⁷² and the results for low-income products are shown in Table 11 below. Criteria used to rank the products included: market segments, customer classes, natural gas energy savings, electric energy savings, number of participants, participant rate (percent of the entire customer class), and MTRC test ratio results.

Table 11: Low-Income Program Product Rankings

2017-2018	Rank
Energy Savings Kit	19
Single-Family Weatherization	28
Non-Profit Energy Efficiency	34
Multi-Family Weatherization	35

⁷² The entire DSM product ranking can be found in [Appendix C](#) of this Plan.

B. Targets, Participants & Budgets

Targets and Participants

The Company developed participation and energy savings targets based on historical experience with these products. Participation rates were established in partnership with CEO, EOC, low-income agencies, and vendors to further refine the goals and budgets.

Public Service relies on customers who request and qualify for energy assistance on their energy bills to determine eligibility and is rapidly exhausting this list of prospects to market these offerings to.

Budgets

Budgets for low income DSM products have increased compared to the 2015/2016 Plan, consistent with Commission guidance received in Decision No. C14-0731.⁷³

Table 12a: 2017 Electric Low-Income Program Budgets and Goals

2017	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Low-Income Program				
Energy Savings Kit	\$319,057	80	908,428	1.05
Multifamily Weatherization	\$1,156,816	266	1,900,602	0.68
Non-Profit	\$1,106,947	304	1,493,941	0.92
Single-Family Weatherization	\$1,191,267	101	1,231,383	0.69
Low-Income Program Total	\$3,774,087	750	5,534,354	0.78

Table 12b: 2018 Electric Low-Income Program Budgets and Goals

2018	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Low-Income Program				
Energy Savings Kit	\$326,222	80	908,428	1.01
Multifamily Weatherization	\$1,156,816	266	1,900,602	0.70
Non-Profit	\$1,107,475	304	1,493,941	0.94
Single-Family Weatherization	\$1,222,574	102	1,241,188	0.68
Low-Income Program Total	\$3,813,087	751	5,544,159	0.79

⁷³ Decision No. C14-0731, page 27 paragraph 76.

Table 12c: 2017 Natural Gas Low-Income Program Budgets and Goals

2017	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Low-Income Program					
Energy Savings Kit	\$116,094	8,005	68,951	951,508	7.04
Multifamily Weatherization	\$592,539	10,835	18,286	-242,522	0.81
Non-Profit	\$293,413	3,821	13,021	-106,306	0.80
Single-Family Weatherization	\$2,297,347	46,842	20,390	1,065,960	1.26
Low-Income Program Total	\$3,299,393	69,503	21,065	\$1,668,640	1.27

Table 12d: 2018 Natural Gas Low-Income Program Budgets and Goals

2018	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Low-Income Program					
Energy Savings Kit	\$117,642	8,005	68,044	974,022	7.12
Multifamily Weatherization	\$592,539	10,835	18,286	-215,050	0.83
Non-Profit	\$293,986	3,821	12,996	-94,777	0.82
Single-Family Weatherization	\$2,358,186	48,620	20,617	1,275,891	1.30
Low-Income Program Total	\$3,362,353	71,280	21,200	\$1,940,086	1.31

C. Marketing Objectives & Strategies

The Low-Income Program aims to educate low-income customers on the importance of and value provided by energy efficiency. The Company will work with low-income providers, cities/counties and other community organizations to promote all available services. Marketing and promotion activities will occur primarily through partners with collateral material developed by Public Service. This tends to be the most effective way to target the low-income customers, as other targeting methods are limited. Xcel Energy's call center agents are also trained to provide useful information with which to direct potentially eligible customers to participate in the Program's products.

D. Program-Level Policies

Customers participating in the Energy Savings Kit and Single-Family Weatherization products must purchase retail electricity or gas from Public Service on a residential tariff. Participants in the Multifamily Weatherization product must be a residential customer or own multi-family buildings whose rental units are a minimum 66% occupied by customers certified as low-income per product guidelines. Non-Profit Weatherization participants have business electric and gas accounts with Public Service since they are a business. Specific products within the Program may have different eligibility requirements depending on the services offered, funding partners or customers served.

E. Stakeholder Involvement

Public Service received significant input and assistance in originally developing and modifying products for the Low-Income Program and will rely heavily on stakeholders to deliver successful products. Perhaps more than any other Program, the Low-Income Program depends on outside expertise in the form of government agencies and non-profits to provide product benefits to customers. In this sense, Public Service is the facilitator that provides financial and energy efficiency resources to complement the services provided by state and local organizations.

The Company will continue to work with the CEO, EOC, vendors, outside consultants, Commission Staff, and local weatherization organizations to ensure that its Low-Income Program products are delivering promised benefits and producing effective results. These interactions will also guide mid-year performance adjustments that may be necessary to keep products on track.

F. Rebates & Incentives

Low-income rebates are unique in that the incentive level assigned for the measures offered under these four DSM products covers 100% of the incremental capital cost.

G. Evaluation, Measurement & Verification

The specific product measurement and verification plans are included in the EM&V section of this Plan.

The Company plans to conduct a comprehensive product evaluation of the Low-Income Non-Profit product in 2016.

➤ **Energy Savings Kit**

A. Description

The Energy Savings Kit provides home energy efficiency measures bundled and distributed to low-income customers through email and direct mail campaigns and partnerships. The kits offer electricity and natural gas saving measures and customer education materials to help lower customer bills and improve the comfort and safety of their dwellings.

Income-qualified customers will receive an offer through email or the mail informing them of their eligibility to receive a free Energy Savings Kit. The offer details the contents of the kit and how much money they could save on their energy bill if they install all the measures provided. If the customer chooses to receive a kit, they will send their response to the third-party implementer. Customers will receive a kit within six to eight weeks.

The Energy Savings Kits will include the following electric and natural gas efficiency measures:

- Eight (8) LED bulbs (10 Watt)
- One (1) 1.5 gpm High Efficiency Showerhead
- One (1) 1.5 gpm Kitchen Faucet Aerator
- One (1) 1.0 gpm Bathroom Faucet Aerator

B. Targets, Participants & Budgets

Targets and Participants

The Company set the participation target (number of kits to be sent out) based on historical product performance and participation projections for 2017 and 2018. Energy savings targets were developed based on the installation rate of the kit measures in 2015.

Budgets

The budget is based on the number of forecasted kits. The budget includes the costs of kit contents, and production, distribution, and fees from the third-party implementer. The budget also includes costs for labor, marketing materials and M&V.

C. Application Process

Customers who have received Low Income Home Energy Assistance Program (LIHEAP) funding, any energy assistance funding (including county assistance and fuel fund assistance), Low-Income Energy Assistance Program (LEAP) funding, or other state assistance programs and live the Public Service electric and/or natural gas service territory will be sent an offer to receive the kit. The third-party implementer will track customer participation so that customers do not receive more than one kit. This tracking information will also be provided to the Company on a regular basis. Income-qualified customers are eligible to receive a kit once every ten years.

D. Marketing Objectives & Strategies

The overall objective of the product is to increase and expand education among the low-income customers on the importance of energy efficiency and the value of taking action to improve efficiency in their homes. The Company will work with local and state agencies to obtain customer mailing lists to reach more customers annually.

E. Product-Specific Policies

In order to participate, customers must receive LIHEAP, LEAP, or any energy assistance funding (including county assistance and fuel fund assistance) or other low-income state assistance programs.

F. Stakeholder Involvement

The Company will continue to work with local and state agencies to identify eligible customers and determine additional kit content needs.

G. Rebates & Incentives

The Company will fund 100% of the cost of the Energy Savings Kits. There will be no rebate provided to customers.

➤ Multifamily Weatherization

A. Description

The Multifamily Weatherization product is designed to provide funding for a wide variety of equipment and process improvements for electric and natural gas efficiency measures in low-income multifamily buildings. This offering differs from the Single-Family Weatherization product in that these dwellings have common areas, greater overall square footage, more appliances and other potential energy-saving measures.

The product will be implemented in partnership with Energy Outreach Colorado (EOC).

Public Service funds will supplement federal weatherization grants to produce incremental, cost-effective electric and natural gas savings. EOC works jointly with the Colorado Energy Office (CEO) and other entities to identify and qualify multifamily units for participation. Details of measures, rebates, reporting processes, and M&V procedures will be evaluated on a per-project basis using a detailed engineering analysis.

B. Targets, Participants & Budgets

Targets and Participants

Participation and energy savings targets were developed by evaluating 2015 project completions and information provided by EOC on anticipated participants. Participation can vary from building to building as many properties are master metered.

Budgets

Historical project costs and participation information were tracked and analyzed to develop a budget estimate. The majority of the budget is allocated to electric and natural gas rebates benefiting tenants in low-income multifamily buildings. Other external variables contributing to costs, such as outreach, material costs and staffing, were also evaluated.

C. Application Process

To participate in the product, customers must submit an application to EOC. Applications are reviewed by EOC and must have a comprehensive audit performed on the building prior to submitting an application. Low-income households must comprise at least 66% of the building's total households for the building to be eligible to apply. EOC will determine which applicant locations have the greatest need for weatherization services. In some cases, if the need is very high, the application may be approved for buildings that are occupied by 50% low-income households.

D. Marketing Objectives & Strategies

The overall marketing objective is to increase education among low-income customers and building owners on the importance of energy efficiency, thereby driving product participation. Public Service will also work to educate customers on the value of taking further actions to

improve efficiency in their homes in conjunction with EOC and other low-income customer advocates.

E. Product-Specific Policies

Eligible customers for this product are building owners or property managers of multifamily housing complexes with at least 66% of the rental units occupied by low-income customers whose income is below 80% of the local area median. Customers meeting the U.S. Department of Energy Weatherization Assistance Program funding guidelines,⁷⁴ as determined by the Colorado Energy Office (CEO), EOC, local governments, or their agencies, are automatically deemed income eligible.

F. Stakeholder Involvement

When designing the product, Public Service worked with external consultants to determine which measures would ensure customer comfort while saving money on energy costs. Public Service will continue to evaluate historical projects with EOC to determine measure implementation and needs trending.

G. Rebates & Incentives

The product does not provide a rebate to customers, but rather provides project funding in the form of grants. The estimated average incentive amounts for electric and natural gas energy improvements can be found in [Appendix G: Technical Reference Manual](#). Public Service will evaluate each project on a custom basis to determine funding levels using a detailed engineering analysis. Engineers review the project information to determine the projected energy savings, benefit/cost ratio and payback. Projects will be bundled in order to pass the MTRC test ratio for the product. Testing, study, engineering and project management fees may be included in the project costs.

⁷⁴ <http://energy.gov/eere/wipo/where-apply-weatherization-assistance>

➤ **Non-Profit**

A. Description

The Non-Profit product is designed to provide funding on a wide variety of equipment and process improvements for electric and natural gas efficiency measures to qualified non-profit organizations within the Company's Electric and Natural Gas service territory. The product's focus is on helping organizations that serve low-income individuals, such as shelters, safe houses, and residential treatment centers.

The product will be implemented in partnership with Energy Outreach Colorado (EOC). EOC utilizes funding through their existing Non-Profit Facilities Program Grants (NEEP) targeting non-profits. Public Service funds will supplement federal weatherization grants to produce incremental, cost-effective electric and natural gas savings. EOC works to identify and qualify non-profit facilities for the product. Details of energy-saving measures, rebates, reporting processes, M&V procedures will be evaluated on a per project basis using a detailed engineering analysis.

B. Targets, Participants & Budgets

Targets and Participants

Participation and energy savings targets were developed by evaluating 2015 projects completions and information provided by EOC on anticipated participants.

Budgets

Historical costs and participation information were tracked and analyzed to develop a budget estimate. The majority of the budget is allocated to electric and natural gas rebates benefiting non-profit facilities. Other external variables contributing to costs, such as outreach, material costs, and staffing were also evaluated.

C. Application Process

Customers can learn about the product through information that is available on EOC's website.⁷⁵ EOC reaches out to those customers who may not be aware of funding and educates them on the benefits of an energy-efficient retrofit improvement. Customers who are interested in the product can apply online through the EOC website. The online application must be completed, and includes a description of existing equipment in the facility, confirmation of building ownership/facility usage, proof that the building is registered with the Colorado Secretary of State as a 501(c)3 and documentation showing the financial stability of the organization. A

⁷⁵ <http://www.energyoutreach.org/what-we-do/non-profit-facility-programs>

committee made up of non-profit industry leaders then determines the applicant's needs and how the EOC and Public Service funding can help.

D. Marketing Objectives & Strategies

The overall marketing objective is to increase and expand education among the low-income customers and building owners on the importance of energy efficiency, thereby driving product participation. Public Service will also work to educate customers on the value of taking further actions to improve efficiency at the facility. The EOC markets the product through various channels, including communications through non-profit association literature, community resource center announcements, and local low-income foundations.

E. Product-Specific Policies

To receive funding, the following customer and facility eligibility requirements must be met:

- Customers must receive electricity and/or natural gas from Public Service;
- Customer must operate the non-profit facility on a property they own and for which they pay energy bills, or have a long-term lease that requires only non-profits to occupy the space with plans to be in current location for at least the next ten years; and
- The property must provide services to vulnerable populations including but not limited to: transitional housing, homeless shelters, affordable housing, domestic violence shelters and day shelters, organizations that provide services (substance abuse, health and mental health services, child care, education and/or emergency services) for special needs populations, including low-income families, the disabled, senior, and youth communities.

In addition, the following project requirements must be met:

- Be recommended by an independent energy auditor based on energy conservation calculations that are available for review; and
- Reduce the use of energy (electricity, natural gas, or both) provided by Public Service to the facility.

Participating low income agencies must agree to the following:

- Installation of an energy use monitoring and reporting system;
- A comprehensive energy audit by a qualified entity;
- Set target energy use goals for each facility
- Consider installation of all qualifying efficiency measures;
- Engage appropriate contractors and manage the installation and completion of efficiency measures;
- Provide a summary project report at the completion of the installations;
- Provide all insurance and legal protections requested by Public Service; and
- Annually review the energy use of the retrofitted facility and formulate a plan for further improvement using available and appropriate assistance.

F. Stakeholder Involvement

When designing the product, Public Service worked with external consultants to determine which measures would ensure customer comfort while saving money on energy costs. Public Service will continue to evaluate historical projects with EOC to determine specific measure trends.

G. Rebates & Incentives

The product does not provide a rebate to customers, but rather provides project funding in the form of grants. The estimated average incentive amounts for the energy improvements can be found in [Appendix G: Technical Reference Manual](#).

Public Service will evaluate each project on a custom basis to determine funding levels using a detailed engineering analysis. Engineers review the project information to determine the projected energy savings, benefit/cost ratio and payback. Projects will be bundled in order to ensure that the product passes the MTRC test ratio. Testing, engineering and project management fees may be included in the project costs.

➤ Single-Family Weatherization

A. Description

The Single-Family Weatherization product will offer natural gas and electric efficiency measures to low-income single-family households. Depending on need, Public Service may provide rebates to qualifying customers for any of the following measures:

Natural Gas Measures

- Furnace efficiency upgrades
- Wall insulation
- Attic insulation
- Crawl space insulation
- Attic insulation for manufactured homes
- Water heaters
- Storm windows
- 1.5 GPM showerheads
- GPM aerators
- 0.5 GPM aerators
- Air Sealing
- Programmable Thermostat Installation and Programming

Electric Measures

- Refrigerator replacements
- Electrically Commutated Motors (ECMs)
- Compact fluorescent light (CFL) bulbs (rebated per CFL installment)LEDs (A-19 and BR-30 bulbs)
- Cooling savings for building shell measures
- Water heater blanket

In addition to these measures, a major focus of this product will be customer education on ways to reduce energy use in the home. Low-income auditors will provide educational materials, historical energy usage information, and bill analysis to these customers during the weatherization process. The Company will not claim any energy savings associated with the educational component of this product.

The Single-Family Weatherization product is delivered in partnership with a third-party implementer. The third-party implementer secures public grants and private funds which, when matched with Public Service funds, produce incremental, cost-effective gas and electric savings for low-income households. The third-party implementer also develops annual contracts with local weatherization agencies within the Public Service electric and gas service territories. Processes for reporting measure detail, rebates, and measurement and verification (M&V) are managed by the third-party implementer with the local weatherization agencies.

B. Targets, Participants & Budgets

Targets & Participants

Energy savings and participation targets were established in partnership with the third-party implementer and involved low-income state offices, using historical product participation in 2014 and 2015 as a guide. Recommendations from the third-party implementer on expected workflow were also considered when developing energy savings targets and participation rates.

Budgets

Budgets for the product were developed based on the historical incremental cost of measures installed in low-income homes.

C. Application Process

In order to participate, customers must purchase retail electricity or gas from the Company on a residential tariff and have a household income below 80% of the area median income (AMI). Customers will be informed of the Single-Family Weatherization product when they sign up for Low Income Home Energy Assistance Program (LIHEAP) funding from the U.S. Department of Energy's (DOE's) Weatherization Assistance Program, among other outreach avenues. LIHEAP qualification is at 150% below the Federal Poverty Line (FPL) and approximately 50% AMI depending on the county. DOE allows for 200% below the FPL which is usually around 60% AMI.

Once it is determined that the customer meets the income guidelines and receives energy services from the Company, they will be qualified by their local weatherization agency, and the third-party implementer, to receive weatherization services. Local weatherization agencies will actively seek out customers that qualify to participate in this product, and customers can inquire about it on their own as well.

D. Marketing Objectives & Strategies

The overall marketing objective of this product is to deliver energy savings that support low-income customers in the reduction of energy costs and increased comfort. A secondary objective is to increase and expand education among low-income customers on the importance of energy efficiency and the value of taking action to improve efficiency in their homes. The Company will work with low-income providers, such as local weatherization agencies and community organizations to encourage promotion of all services available. Information will be posted on Xcel Energy's website⁷⁶ directing customers to their local weatherization agency. The Company may also partner with other low-income groups to market this product to low-income customers.

⁷⁶ http://www.xcelenergy.com/Save_Money_&_Energy/Rebates/Income_Qualified_Weatherization_-_CO

E. Product-Specific Policies

In order to participate, customers must purchase retail electricity or gas from Public Service on a residential tariff and have a household income below 80% AMI. Customers meeting the DOE Weatherization Assistance Program funding guidelines, as determined by the third-party implementer, local government, or local agencies, are automatically eligible.

The third-party implementer will contract with subcontracted agencies to perform weatherization measures. All contractors will be trained to follow BPI installation requirements for weatherization services. These contractors are funded through the third-party program implementer and other state funding and have agreed to weatherize homes following state regulations and guidelines.

F. Stakeholder Involvement

When designing the product, the Company worked with external consultants to define which measures would save customers money on their energy costs while ensuring comfort in their home. The product is delivered in partnership with federal, state, and nonprofit low-income weatherization organizations.

G. Rebates & Incentives

The Company will pay 100% of the costs to install a subset of the predetermined electric and natural gas energy efficiency measures available to low-income, single-family customers.

Indirect Products & Services

A. Description

Indirect Products and Services support planning, analysis, administration, and evaluation of products with direct savings impacts as well as development and implementation of the Plan. Most of these indirect products and services are not independently evaluated for cost-effectiveness, with the exception of pilots with measured savings impacts that are being assessed for potential future transition to a product—those do undergo a cost-benefit evaluation. Pilot implementation and evaluation approaches are fully discussed in each written pilot summary, following the Product Development description. All of the Indirect Products and Services costs are included in the overall DSM portfolio cost-benefit analysis.

Indirect Products and Services play a critical role in ensuring that the overall DSM portfolio is effectively researched, managed, and operated. These products and services provide valuable information and support for the direct impact products and offer innovative approaches for inciting change in the DSM marketplace. These innovative approaches, manifested in education and market transformation products, may not produce readily quantifiable energy and demand savings, but still play a very important role in shifting markets and attitudes to be more energy efficiency and demand reduction oriented.

There are two main areas of Indirect Products & Services:

1. Education/Market Transformation and
2. Planning and Research.

Education/Market Transformation

The Company offers five customer-facing education and market transformation products, including: Business Education, Business Energy Analysis, Consumer Education, Energy Efficiency Financing, and the Home Energy Audit. The definition of market transformation in the Public Service gas DSM Rulemaking is:

...a strategy for influencing the adoption of new techniques or technologies by consumers. The objective is to overcome barriers within a market through coordinating tactics such as education, training, product demonstration and marketing, often conducted in concert with rebates or other financial incentives.⁷⁷

Planning and Research

The Company will operate five internal DSM services: Evaluations, Market Research, Measurement & Verification, Planning & Administration, and Product Development.

⁷⁷ 4 CCR 723-4-4751(n)

B. Targets, Participants & Budgets

Targets and Participants

Most indirect products and services do not have savings or participation targets, with the exception of some pilots, whose energy savings and participation targets are described within each pilot's written summary which follows this section.

Budgets

Because the majority of Indirect Products and Services do not directly produce energy and demand savings and, therefore, may reduce the overall cost-effectiveness of the DSM portfolio, there is a natural tendency to limit activity and spending in this area to only the most essential elements. The Company will not limit its spending in this area to a specific percentage of the overall portfolio, but will remain vigilant about limiting the Indirect Products and Services overall size.

The budget consists primarily of labor, educational material, and study costs. Most studies are conducted by outside experts, generally selected through a competitive bid process. Tables 13a through 13b provide the overall Indirect products and services energy savings and participation targets, if applicable, and budgets, broken out by each product / service.

Table 13a: 2017 Electric Indirect Products & Services Goals & Budgets

2017	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Indirect Products & Services				
Education/Market Transformation				
Business Education	\$176,739			
Business Energy Analysis	\$721,499			
Consumer Education	\$1,199,908			
Energy Benchmarking	\$89,000			
Energy Efficiency Financing	\$59,804			
Home Energy Audit	\$517,763			
Education/Market Transformation Total	\$2,764,713			
Planning and Research				
DSM Planning & Administration	\$573,390			
Program Evaluations	\$674,600			
Market Research	\$345,940			
Measurement & Verification	\$10,738			
Product Development	\$5,545,318			
Building Optimization DR Pilot	\$36,750	0	0	
ENERGY STAR Retail Products Platform Pilot	\$886,065	636	2,149,899	0.61
Product Development Total	\$6,468,133	636	2,149,899	0.34
Planning and Research Total	\$8,072,801	636	2,149,899	0.29
Indirect Products & Services Total	\$10,837,514	636	2,149,899	0.27

Table 13b: 2018 Electric Indirect Products & Services Goals & Budgets

2018	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Indirect Products & Services				
Education/Market Transformation				
Business Education	\$176,739			
Business Energy Analysis	\$722,966			
Consumer Education	\$1,199,908			
Energy Benchmarking	\$89,000			
Energy Efficiency Financing	\$59,804			
Home Energy Audit	\$517,765			
Education/Market Transformation	\$2,766,182			
Planning and Research				
DSM Planning & Administration	\$556,545			
Program Evaluations	\$541,444			
Market Research	\$372,595			
Measurement & Verification	\$10,953			
Product Development	\$4,260,050			
ENERGY STAR Retail Products Platform Pilot	\$1,092,064	848	2,866,581	0.64
Product Development Total	\$5,352,114	848	2,866,581	0.45
Planning and Research Total	\$6,833,651	848	2,866,581	0.38
Indirect Products & Services Total	\$9,599,833	848	2,866,581	0.34

Table 13c: 2017 Natural Gas Indirect Products & Services Goals & Budgets

2017	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Indirect Products & Services					
Education/Market Transformation					
Business Education	\$19,638				
Business Energy Analysis	\$65,507				
Consumer Education	\$133,323				
Energy Benchmarking	\$31,000				
Energy Efficiency Financing	\$60,000				
Home Energy Audit	\$545,006				
Education/Market Transformation Total	\$854,474				
Planning and Research					
DSM Planning & Administration	\$63,124				
Program Evaluations	\$168,400				
Market Research	\$96,732				
Measurement & Verification	\$1,193				
Product Development	\$170,668				
ENERGY STAR Retail Products Platform Pilot	\$34,430	269	7,826	-\$120,818	0.24
Product Development Total	\$205,098	269	1,314	-\$291,486	0.12
Planning and Research Total	\$534,547	269	504	-\$620,935	0.06
Indirect Products & Services Total	\$1,389,021	269	194	-\$1,206,309	0.20

Table 13d: 2018 Natural Gas Indirect Products & Services Goals & Budgets

2018	Gas Budget	Net Annual Dth Savings	Annual Dth/\$M	Gas MTRC Test Net Benefits	Gas MTRC Test Ratio
Indirect Products & Services					
Education/Market Transformation					
Business Education	\$19,638				
Business Energy Analysis	\$65,548				
Consumer Education	\$133,323				
Energy Benchmarking	\$31,000				
Energy Efficiency Financing	\$60,000				
Home Energy Audit	\$544,637				
Education/Market Transformation Total	\$854,146				
Planning and Research					
DSM Planning & Administration	\$61,895				
Program Evaluations	\$143,864				
Market Research	\$108,380				
Measurement & Verification	\$1,217				
Product Development	\$145,061				
ENERGY STAR Retail Products Platform Pilot	\$29,174	359	12,309	-\$152,760	0.22
Product Development Total	\$174,235	359	2,061	-\$297,821	0.13
Planning and Research Total	\$489,591	359	733	-\$613,177	0.06
Indirect Products & Services Total	\$1,343,737	359	267	-\$1,198,323	0.21

C. Application Process

Most indirect products and services do not have rebate applications, with the exception of some pilots, whose rebate applications and/or participation parameters are described within each pilot's written summary which follows this section.

D. Marketing Objectives & Strategies

Indirect Products & Services serve all markets addressed by Public Service's direct impact products. During 2017 and 2018, market research activities will be focused on customer and market characterization. Each process evaluation conducted by Market Research includes: the quantification of product penetration, provides segment and target market information, determines trends and barriers affecting participation, and investigates best practices observed by peer utility programs. This information provides a basis from which product and program decisions can be made.

Through membership in consultative organizations such as E Source, Market Research receives vendor-neutral and reliable market intelligence overall, and specific to a product/program or by targeted segments. Other general research provides demographic and firmographic data about the characteristics of our customer base, attitudinal and awareness information which informs market strategy, and levels of customer satisfaction which address program vitality.

Marketing, advertising, and promotion activities under Indirect Products and Services are primarily focused on the Education/Market Transformation area. The very nature of these products suggests that they will use customer contacts in the form of newsletters, bill inserts, community events, energy efficiency workshops, direct mail and email campaigns, communications to new residents, and advertising through radio, television and print to educate customers and transform markets. Promotional costs are also budgeted to create awareness and generate enrollments in the Home Energy Audit and Business Energy Analysis products.

E. Program-Specific Policies

The Company will make every effort to focus its Education and Market Transformation messages and promotions on Public Service customers, yet there will likely be spillover benefits to non-Public Service customers particularly with those activities that convey information to general audiences (like the Company website, partnerships with regional agencies, and community-based events).

F. Stakeholder Involvement

Indirect Products and Services rely heavily on input from internal and external stakeholders, and, as such, manage the Company's interaction with "official" stakeholder groups such as the DSM Roundtable. Market Research and Education/Market Transformation activities actively engage internal and external stakeholders including employees, customers, trade allies, and vendors to ensure that product objectives are met.

G. Rebates & Incentives

Most indirect products and services do not have energy savings targets or offer rebates, with the exception of some pilots, whose rebates and incentives are described within each pilot's written summary which follows this section.

H. Evaluation, Measurement and Verification

The Indirect offering includes the Company's Evaluation, Measurement and Verification (EM&V) plan for 2015 and 2016, which describes the EM&V approach for all of the DSM products included in the Plan. The majority of Planning and Research services themselves are not subject to EM&V, with the exception of pilots, where their EM&V is described within each pilot's written summary which follows this section.

The DSM Planning & Administration group is responsible for developing the EM&V methodologies, while the Market Research group will oversee third parties conducting the research. These efforts are described in more detail within the EM&V and Market Research sections below.

➤ **Business Education**

A. Description

The goal of Business Education is to improve public knowledge concerning the benefits of energy efficiency and conservation. The Company views this as an important part of a long-term effort to create educated, engaged customers who are ready to act on energy efficiency opportunities. The following key messages will be incorporated into all of the product's marketing efforts:

- DSM is a more cost-effective resource than building new generation resources.
- DSM costs incurred today are an investment that defers incurring higher costs for new generation equipment later.

Further, the purpose of Business Education is to induce permanent changes in customers' energy usage through long-term education and proactive customer interactions. A key to the success of market transformation is creating sophisticated consumers who have information that allows them to make more informed and effective decisions. Among the changes that will affect market transformation are shifts in conventional thinking, heightened awareness, and increased knowledge. Specifically, the Company will educate customers about how to use energy wisely, how to change energy usage behaviors, and how to buy energy efficient appliances, such as those that are ENERGY STAR-rated. Going beyond the initial education, the true intent of this product is to engage customers about energy conservation and efficiency and motivate them to reduce their energy usage.

Primary emphasis is placed on:

- Energy efficiency and conservation messaging through email and print newsletters;
- Face-to-face interaction via customer events and sponsorships through business and trade associations;
- Digital tools for customers to utilize in their business
- Utilizing mass market advertising such as radio, print and digital to create awareness in energy efficiency;

B. Targets, Participants & Budgets

Targets and Participants

Business Education is targeted to all Colorado natural gas and electric business customers, with strong emphasis on small- to mid-sized customers.

Budgets

Public Service's budget for this product was determined through estimates of material, labor, and past activities in Colorado and other states. The majority of the budget is driven by customer education, conservation promotion, and internal labor.

C. Application Process

This indirect program does not include an application process.

D. Marketing Objectives & Strategies

The primary objective of Business Education is to heighten business customers' awareness about energy efficiency and conservation resulting in engaged customers who will proactively take steps to reduce energy consumption by upgrading to high efficiency measures.

E. Product-Specific Policies

This indirect program has no specific policies.

F. Stakeholder Involvement

Public Service will create and leverage strategic partnerships and alliances with governmental, non-governmental, and trade partners to reach target businesses in Colorado.

G. Rebates & Incentives

This indirect program does not offer customer rebates.

➤ Business Energy Analysis

A. Description

The Business Energy Analysis product is an indirect impact product that offers analysis services to identify energy saving opportunities for Colorado business and industrial customers. The goals of this product are to provide a method and entry way for commercial and industrial customers to learn how their businesses use energy today and to identify measures that will help them save energy and reduce operating costs in the future. This service is a first step for customers to uncover energy saving opportunities with little capital investment and risk. Public Service representatives have and continue to use this as a selling point for engagement in other energy efficiency products. Participation is heavily dependent on promotion by internal Public Service representatives, as well as the trade partners and outside business customer assistance programs.

The Business Energy Analysis product offers three different types of assessments: online assessments, onsite audits, and engineering assistance studies, which vary in customer involvement and capital investment. The reports in all three assessments provide detailed information about cost and paybacks, which will assist in creating a business case to make energy efficiency upgrades.

- *Online energy assessment:* An online energy assessment is a free online tool developed and operated by vendor third-party contractor. This online assessment interviews the customer about their equipment and operating conditions to uncover areas where energy and cost savings opportunities may exist. Based on industry averages and trends, regional data, and customer knowledge of the facility, the online tool is a starting point for determining energy saving opportunities. This tool requires the customer to invest time, but no money in the analysis, making it virtually risk-free. For the purposes of the online assessment, the online tool uses an industry average facility based on a regional data derived from the Energy Information Administration (EIA) and E Source.
- *Onsite energy audit:* Public Service sends an energy advisor to a customer's facility to conduct an onsite energy audit, which is a comprehensive audit of the facility and its energy use. The customer receives a detailed report including energy conservation opportunities with the associated payback, savings, cost, and available rebates. Qualified third-party contractors are selected through an RFP process to perform the onsite energy audits.
- *Engineering assistance studies:* Provides guidance when the customer is seeking to replace or upgrade a major process or system. The customer will hire a trade partner of their choice to analyze the facility and develop recommendations for the most energy efficient equipment options. The analysis targets customers who are focused on analyzing their refrigeration, cooling, custom, or space and processing heating systems.

B. Targets, Participants & Budgets

Targets and Participants

The 2017-2018 targets were developed by analyzing historical participation data, and the commercial and industrial customer market segment.

Budgets

The budget was developed based on historical data, auditor pricing, and the presumed size and location of participating buildings, to estimate an average assessment cost.

Labor, promotions, and consulting drive the budget level:

- *Consulting:* Developed using average auditor pricing and participation goal.
- *Labor Charges:* Estimated costs for program management, execution of the marketing strategy, and rebate processing.
- *Promotions and Advertising:* The estimated promotional budget anticipates several customer and trade communications during the year and support for general DSM advertising campaigns.

C. Application Process

Customers may become aware of this product through their Account Manager or the Business Solutions Center (BSC), contracted trade allies, external customer assistance products, and/or marketing efforts including mailings, newsletters, and the Xcel Energy website. All avenues are essential for increasing product awareness in conjunction with marketing efforts.

If a customer is interested in an online assessment, preapproval is not necessary. Customers will find the free online tool on the Xcel Energy website.⁷⁸

Onsite energy audits and engineering assistance studies require preapproval prior to project initiation. Customers may access the onsite audit preapproval application on the Xcel Energy website⁷⁹

and work with the Company to complete the process by collecting their billing history information. Once the application is complete with customer and building information, an auditor will be assigned to assess the building. The customer will typically receive their final report from the engineer within three months from applying for preapproval. This time allows for internal processing, onsite engineer walkthrough of the facility, creation of the report, and a final review by Public Service internal engineering staff, as needed. The customer must select a trade partner prior to preapproval, because a project proposal including the scope of work must be included with the preapproval application to determine funding levels. Engineering assistance

⁷⁸ <http://www.energyprofiletool.com/xcel/>

⁷⁹

https://www.xcelenergy.com/Programs_and_Rebates/Business_Programs_and_Rebates/Energy_Audits_and_Studies/Energy_Analysis

studies typically take three months to complete and to be reviewed and approved by Public Service internal engineering staff.

D. Marketing Objectives & Strategies

The main goal of the Business Energy Analysis product is to raise awareness and knowledge of Public Service's other energy efficiency products. The Company will rely heavily on trade partners and stakeholder resources, such as city and county driven products throughout Colorado, to increase awareness in the Business Energy Analysis product and partner in the audit process. Though the target markets will differ by assessment type, both online assessments and onsite audits are popular with small business customers. Methods used to reach and educate customers include:

- *Xcel Energy website:* Provides a description of the product offering, and links product collateral and study brochures;
- *Collateral:* Product brochure, case studies, applications, frequently asked questions, and study templates that give the customer an idea of the resources they will receive by participating;
- *Direct mailings:* Informational piece to gain awareness and understanding of the product offerings;
- *Email campaigns:* Brief email from Public Service representatives to gain interest in the product from customers;
- *Newsletters:* Another medium to gain customer awareness and participation in the product; and
- *Customer seminars:* Educate customers about the product offering and benefits.

E. Product-Specific Policies

Products in the Company's Indirect Program, such as Business Energy Analysis, have no immediate savings attributed to them. Business Energy Analysis is meant to open the door for customers to participate in Public Service's other energy efficiency offerings and rebates that have direct impacts that contribute to achievement of goals. Once an onsite audit or engineering report is complete, the customer will receive a summary of energy efficiency opportunities available in their facility. When a customer moves forward with implementation, they follow the guidelines of the specific product that they participate in (i.e. Motor & Drive Efficiency), based on the opportunities identified in the report.

F. Stakeholder Involvement

Public Service worked closely with the contracted audit trade partners to develop and streamline the audit process. The Company also receives recommendations and feedback from stakeholders via the DSM Roundtable.

G. Rebates & Incentives

Customers do not receive a rebate for participation in the Business Energy Analysis product, but they do receive study funding assistance for the onsite audit and the engineering study. Business Energy Analysis offers two types of study funding based on whether an onsite audit or engineering assistance study was completed. Participants in an onsite audit are responsible for paying a small fee, depending on the building square footage, which is approximately 10-15% of the actual cost of the audit. Public Service will pay up to 75% of the engineering study cost, up to \$25,000; funding is based on the potential energy savings of the project and the cost of the study.

➤ **Consumer Education**

A. Description

The Consumer Education program focuses on creating awareness of energy conservation while providing residential customers with information on what they can do in their daily lives to reduce energy usage. The residential market segment in Colorado is demographically varied; thus, the Company will employ a wide variety of marketing channels to communicate key energy efficiency messaging.

Communication strategies include:

- Annual community and conservation events, and outreach;
- Social media (Facebook, Twitter, blogs, etc.);
- Online and social media messaging through local media, community and partner digital channels;
- Digital kiosks featuring “How to” energy efficiency videos;
- Power Check/Draft Check meters and materials placed in public libraries;
- Direct mail marketing to address seasonal usage challenges;
- Sponsorship of local Earth Day events;
- Conservation messaging through seasonal bill messaging;
- Sponsorship of community events supporting residential conservation and energy efficiency; and
- Customer feedback surveys and customized post-event emails following outreach events.

Participating in direct customer outreach events creates an opportunity for meaningful conversations with customers. Outreach and participation in these events is valuable for creating active engagement with residential customers. Public Service will continue to focus on renewing existing community partnerships that have provided consistent customer participation and engagement. Maintaining diversity in our communication channels will continue to increase our customers’ knowledge of energy efficiency, drive to direct program signups and provide them with access to a variety of resource options and services.

B. Targets, Participants & Budgets

Targets and Participants

Consumer Education is widely targeted to all Colorado natural gas and electric residential customers. Targets are established through targeted outreach to customer segments and use of multiple channels for delivery of energy efficiency messaging.

Budgets

Public Service’s budget for this product was determined through estimates of material, labor, identification of customer growth patterns, and past activities in Colorado and other states. Budgets reflect the expansive reach and impact of digital media and sponsorships—with the Company’s premier partnerships and community partnerships yielding direct product

participation leads. The majority of the budget is driven by customer education, conservation, promotion, community partnerships, and internal labor.

C. Application Process

This indirect program does not include an application process.

D. Marketing Objectives & Strategies

The primary objective of the Consumer Education program is to initially heighten residential customers' awareness about energy efficiency and conservation and then develop engaged customers who will proactively take steps to reduce energy consumption. The goal of the program is to get customers to conserve and consider upgrading to high-efficiency measures, when possible, thereby reducing energy consumption. The program will deliver communications that provide behavior-altering strategies that customers can implement in their daily lives to conserve energy (e.g. move customers from awareness to action). Another focus of the Consumer Education program is to drive to direct program signups where able to help support the portfolio. Customized post-event emails will continue to be implemented as a way to follow-up with customers showing interest in specific programs to provide additional information.

Our strategy will continue to utilize a wide variety of communications channels including social media, print and event outreach. While messaging will continue to align with the overall portfolio strategy of seasonal energy-saving tips and information for residential customers focused on reducing their energy usage, active engagement through outreach events and premier partnerships with key community partners will also be. Historically, seasonal messaging has been effective in the residential market. The Company's residential customer education strategy will continue to promote the financial and environmental benefits of energy conservation and the ease of measure implementation. To engage the customer in energy efficiency there will be a focus on expansion of existing channels such as the digital kiosks with "How to" videos and Power Check/Draft Check meters, which provide residential customers with energy efficiency tips and program resources for reducing their energy usage. These digital kiosks will continue to be placed in public libraries and at community partnership locations. Additional channel expansion and integration will also likely include digital and social media channels. The channels that are utilized will continue to be focused on targeted segments and will continue to align with the overall residential communication strategy.

E. Product-Specific Policies

This indirect program has no specific policies.

F. Stakeholder Involvement

Public Service will create and leverage strategic partnerships and alliances with governmental, non-governmental, and trade partners to reach residential customers in Colorado.

G. Rebates & Incentives

This indirect program does not offer customer rebates.

➤ Energy Efficiency Financing

A. Description

Energy Efficiency Financing is an indirect impact product offering aimed at increasing the availability of financing to overcome economic barriers to customer participation in the Company's other energy efficiency products. As an indirect impact product no direct attributable energy or demand savings are recorded, but the product plays an important role in shifting markets and attitudes toward greater energy efficiency implementation.

The Energy Efficiency Financing product encourages residential and small commercial customers to participate in existing direct impact rebate products by augmenting existing rebate programs with financing options. The Company facilitates the financing of these projects through partnerships with existing financial institutions and financing programs and by assisting in the creation, by existing lenders, of financing options in areas where such programs don't exist. Public Service is not providing capital for these loans, offering a loss reserve, servicing loans, or offering on-bill financing in connection with this product.

Public Service conducted extensive interviews with parties who currently offer energy efficiency loans in Colorado including private sector lenders, non-profit lenders and government entities throughout the state. In all cases these parties have access to capital to fund loans or leases, a credit enhancement to provide a loan loss reserve, or both. The gap that these entities have identified is not a lack of capital, but a need for assistance in marketing to drive volume. These existing lenders appreciate the fact that the Company is not confusing the marketplace by offering a competing loan product, but is enhancing the existing marketplace by driving business to these lenders for financing energy efficiency.

The Company will actively market selected loan products to targeted customer segments, including by leveraging lender relationships, using the following channels:

- Contractor Training
- Direct Outreach and Marketing
- Bill Inserts
- Web Links
- Rebate Integration
- Loan Customer Case Studies

The Company will ensure organized resources for staff and allies to reference.

The Company has identified loan products that best match the financing needs of customers to include:

1. *Residential Unsecured Loans* – These loans are for short term, reactive needs. The customer has an immediate need for a product and may be willing to upgrade the system if an attractive financing option were available. Participants in the Home Performance

with ENERGY STAR, High Efficiency Air Conditioning, Insulation and Air Sealing or Evaporative Cooling products would be ideal for this product.

2. *Business Loans or Leases* – This type of financing requires a quick turnaround from the lender. Having the loan or lease available may drive the customer to make the improvement immediately. Participants in the Lighting Efficiency, Lighting – Small Business, or Motors and Drive products could be interested in this type of loan or lease.

B. Targets, Participants & Budgets

Targets and Participants

The primary goal of this product is to drive incremental participation in existing direct impact energy efficiency products that include:

- Business Program:
 - Lighting Efficiency
 - Lighting – Small Business
 - Motor & Drive Efficiency
 - Custom Efficiency
- Residential Program:
 - Evaporative Cooling
 - Residential Heating
 - High Efficiency Air Conditioning
 - Insulation and Air Sealing
 - Home Performance with ENERGY STAR

The product's achievements are measured by the number of participants rather than direct energy savings. The target for each year is 150 participants, including 25 business loans and 125 residential loans. These targets have been developed through research of similar programs, review of participation factors for the direct impact products, historical participation, and discussions with industry experts.

For planning purposes, the Company estimates that approximately 10% of these loans might be "incremental" in that the resulting energy savings would have not occurred had the Energy Efficiency Financing product not been available.

Budgets

Public Service's 2015 and 2016 budgets for this product were determined through estimates of material, labor and past activities in Colorado.

C. Application Process

Customers are made aware of financing options at the same time they become aware of rebates. Awareness may be driven by Account Managers, the Business Solution Center (BSC), trade

allies, external customer assistance programs, and/or marketing efforts including mailings, newsletters, and the Company's website.

Customers will be directed to one or more lending alliances suited to their needs. Loan applications will be completed by the customer and submitted directly to the participating lender. Billing and payment processing will also be between the customer and the participating lender without the Company's involvement.

D. Marketing Objectives & Strategies

The product's marketing objective is to identify customers that want to implement more energy efficiency but require financial assistance, linking those customers with the most appropriate rebates and loan products.

Direct and indirect marketing strategies will be employed. Direct marketing will be done in partnership with the Product Managers of the targeted direct impact products. Indirect Marketing involves broad communication that spans multiple (or all) direct impact products. The best example is contractor training and education. Understanding that many customers interact primarily or exclusively with a contractor, the Company will ensure that interested trade allies are armed with the knowledge, expertise, and collateral to educate customers about the best available financing option for their situation.

The Company will use a consultant who is knowledgeable about financial loan offerings to assist with additional partnerships, as needed.

E. Product-Specific Policies

This indirect product has no product specific policies.

F. Stakeholder Involvement

Public Service worked closely with stakeholders to develop this product. Channels for this involvement have included the following:

- *Political Engagement* – Public Service's Government Affairs group has been actively involved in liaising with legislative interests related to energy and energy efficiency.
- *Stakeholder Communication* – A stakeholder meeting was held in 2012 to gather and incorporated stakeholder input into the product design. More recently, the 2015-2016 product evaluation includes stakeholder input, and ongoing communication with stakeholders will continue.
- *Consultant Services* -- The Company has used consultant services to expand/refine partnerships with various financial allies as well as refining product specific details, and will continue to do so as needed.
- *DSM Roundtable Meetings* – Product updates have been presented and discussed at quarterly DSM Roundtable Meetings.

G. Rebates & Incentives

No customer rebates are offered through this product. Trade ally incentives have been offered in 2015 and 2016 to help drive their participation. This practice may be continued.

H. Evaluation, Measurement, & Verification

Basic product operations will be monitored and reported regularly. Metrics reported in preparation for the quarterly DSM Roundtable Meetings includes loan participation and expenditures. These measures are of interest, and aligned with reporting for other indirect product offerings, but will not fully characterize the achievement or shortcomings of this product. Thus, program evaluation was performed by an independent third party in 2014 to obtain preliminary feedback on this product. The evaluation involved surveying participants and stakeholders to:

- Measure incremental direct impact participation and resulting energy/demand savings;
- Evaluate customers' and lenders' experience with the product; and
- Estimate how much energy efficiency and other benefits the alliances created outside of existing direct impact products.

This evaluation allowed for attribution of the product's indirect costs to results achieved by the direct impact products—identifying cost-effectiveness with and without this product.

A second year of evaluation will be completed in 2016. This staggered approach was designed to give the program more time to mature, so that the evaluation can effectively help with the ongoing success of the program, including analyzing results from the 2014 evaluation's recommendations.

Cost-effectiveness for this indirect offering will be measured in two ways:

1. Multiply the net benefit intensity for each direct impact product by the incremental and attributable energy saved with this product. If the sum of all of those net benefits exceeds the costs incurred by the indirect product, Energy Efficiency Financing will be considered cost-effective.
2. Examine the cost-effectiveness of each direct impact product with and without the Energy Efficiency Financing costs and attributed incremental achievements. This secondary analysis will identify any product that is not improving its cost-effectiveness via financing, enabling the Company to take action to ensure prudent expenditures going forward.

➤ Home Energy Audit

A. Description

The Home Energy Audit product offers Public Service residential customers a rebate on three types of auditing services: a Standard Audit, a Standard Audit with Blower Door Test, and an Infrared Audit. The purpose of this product is to improve energy savings by influencing homeowners' and renters' behaviors through conservation education.

Standard Audit

The essential elements of the in-home Standard Audit are:

- Customer energy bill analysis;
- Client assessment and education;
- Shell assessment;
- Mechanical and electrical equipment review; and
- Energy savings recommendations derived from energy modeling software.

Typically, the audit begins with the auditor's review and analysis of billing history since this is often an indication of what the customer may need to address first. The auditor also takes this opportunity to discuss any concerns or questions the customer may have regarding their home's energy usage and related comfort. Once the areas of concern are identified, the auditor initiates the onsite inspection. This process begins with a shell assessment of the exterior of the home, identifying cracks, exterior signs of air leakage or maintenance needs. The auditor then begins the interior evaluation with inspection of the attic or crawl space. This determines what insulation has been installed prior to the audit, and any upgrades the customer should consider. Suggested upgrades could include items such as additional insulation and sealing bypass areas.

Next, the auditor reviews the home's heating and/or air conditioning systems for efficiency ratings and discusses monthly maintenance tips. The auditor will also show the customer how to implement suggested maintenance options — like changing air filters — on a regular basis. As the auditor moves through the home, they will continue to educate the customer on how they can implement energy efficiency measures. The auditor will inspect and provide information on the efficiency of their appliances, as well as on possible replacement options that are ENERGY STAR-qualified.

Finally, the Standard Audit ends with a review of the top three to five recommendations to the homeowner and a final review of the customer's questions and concerns. The auditor will email the completed report and scope of work to the customer and leave behind efficiency product collateral on relevant rebate products. The entire Standard Audit process takes about two hours to complete and can vary depending on size of home.

Standard Audit with Blower Door Test

The Standard Audit with Blower Door Testing includes all components listed above, as well as a blower door test and a combustion appliance zone (CAZ) test. The blower door test will be

conducted in every home and the CAZ test will be performed only if atmospherically vented appliances are present.

The blower door test is a diagnostic tool designed to measure the air tightness of a home and identify air leakage locations. A blower door includes use of a calibrated fan for measuring the airflow rate and a pressure-sensing device to measure the pressure created by the fan's airflow. The combination of this pressure and the fan's airflow measurements are used to determine a home's air tightness. Before the test is performed, customers must go through their home closing and locking all exterior windows. Once the fan is turned on, a vacuum effect is created and customers can then check windows and interior bypasses by holding up their hands and feeling the airflow created. Because this test provides such a visual image for customers, they are often motivated to address air sealing opportunities they may have overlooked prior to the testing. This tool can also identify potential venting issues around a home's heating system.

Infrared Audit

The Infrared Audit includes all Standard Audit components as well as an infrared scan. The infrared scan evaluates internal structures such as drywall and insulation, and determines temperature differences where insulation is present, missing, or not working effectively. Blower door testing is also a mandatory part the Infrared Audit. Benefits of infrared testing include: identifying insulation needs, air leakage paths within walls, attics, windows and doors; it also provides a quality check on existing insulation. Infrared testing, along with the required blower door test, gives customers a visual understanding and detailed list of structural conservation improvements available to them through non-invasive testing — thus identifying additional savings potential. The Infrared Audit will be available to all natural gas customers and electrically-heated homes. Electric-only customers with gas provided by another utility or customers who use propane as a heat source, are not eligible for the Infrared Audit because it is primarily used as an inspection to detect where your home is losing heat. As with the Standard Audit, customers receive a cash rebate from Public Service and pay the auditor directly.

The Company uses the Home Energy Audit product to support and drive participation in the Home Performance with ENERGY STAR (Home Performance) product. Customers must begin the Home Performance process with a home audit to identify areas for improvement and to educate them as to whether or not their house is a good candidate for participation. If they are a good candidate, customers may sign up for the Home Performance product through their auditor. The audit also assists in developing a scope of work for their project, and encourages completion of the recommended improvements.

B. Targets, Participants & Budgets

Targets and Participants

The Home Energy Audit product includes a participant goal, but no energy or demand savings goals because this product does not measure direct savings.

Budgets

The Home Energy Audit budget was developed based upon the desired participation level, associated product software, and administration costs. Using the product's previous years'

performance and marketing needs as a proxy, the cost of the rebate, product collateral, and all necessary marketing efforts are included.

C. Application Process

The customer will contact the third-party implementer and speak with an Energy Advisor or visit the Company's website⁸⁰ to find a qualified and participating auditor. The customer calls the auditor to schedule the appointment. Once the audit is complete and the customer has received the audit report, the customer or the auditor submits the rebate paperwork to the Company with proof of purchase. A rebate takes at least six to eight weeks to process once the application is received. Customers are limited to one audit per two-year period, unless they move to a new address.

D. Marketing Objectives & Strategies

Historically, the Company's Home Energy Audit product has proven to be a popular offering. This product will be marketed primarily through seasonal bill inserts, social media, trade partners, and media relations. Further, Public Service will market this product through general customer inquiries regarding their energy bill and cross-marketing efforts with other Public Service residential energy efficiency products. In addition, the Company will identify "green event" opportunities within the community and provide product collateral as part of the overall marketing plan. Product activity will be monitored on a monthly basis to quickly implement the above strategies, if warranted.

Public Service will offer customers Energy Advising as additional support toward completing retrofits. The purpose of the advising is to encourage customers to complete and implement findings within their Home Energy Audit reports, regardless of the DSM product they participate in (Home Performance), Saver's Switch, Refrigerator & Freezer Recycling, etc.). The Energy Advising service has achieved a consistent 50% conversion rate in helping homeowners make upgrades and homeowners rate this service very highly. By necessity, the Energy Advising service provides rebate assistance to Standalone as well as Home Performance rebates.

E. Product-Specific Policies

In order to qualify for the product, participants must be residential customers living in the Company's Colorado service territory. Infrared Audit customers must be residential customers that receive natural gas or electric-only service with electric heat from Public Service to qualify for participation. Qualifying customers may receive an audit once every two years.

Participating trade partner companies must have a technician on staff with a minimum of a Building Performance Institute (BPI) or RESNET's Home Energy Rating System (HERS) certification and training/in-field experience to provide audit services for this product. All auditors will also be required to attend mandatory product training, which will include training

⁸⁰ http://www.xcelenergy.com/Save_Money_&_Energy/Residential/Energy_Audits/Home_Energy_Audit_CO

on the product modeling software. There will be a \$150 per auditor membership fee which will be allocated to costs associated with software and quality assurance provided by the third-party; this one-time fee will be paid directly to the software vendor. An auditor's certification may not be used by another trade partner company to meet the program requirements. All registered contractor companies must also be listed on the Company's trade partner website.⁸¹ These contractors have agreed to the terms of the Company's trade partner agreement and meet the requirements related to quality installation practices per BPI. A list of registered contractors can be found on the Xcel Energy website.

Auditors will be required to utilize the scope of work tool within the software to deliver actionable recommendations to the customer. This is a critical part of the product as the third-party administrator will be tracking the conversion rate of audit-to-improvements. To maintain consistency, training, audit quality, and overall quality assurance between the auditors, the Company will require auditors to use a specific energy modeling software package.

F. Stakeholder Involvement

Public Service collaborates with trade allies such as the Energy Efficiency Business Coalition (EEBC), Colorado Energy Office, other utilities, local communities, and contractors. The Company also provides updates to interested parties at the quarterly DSM Roundtable Meetings.

G. Rebates & Incentives

To simplify product participation for homeowners, the Company offers the following audit rebate schedule:

Audit type	% of cost
Infrared Audit	60% up to \$200 rebate
Blower Door Audit	60% up to \$160 rebate
Standard Audit	60% up to \$100 rebate

*Rebate amounts determined by the average audit cost for the Colorado market.

The Company understands the actual price for an in-home audit will vary based on the location and complexity of the residence, but the purpose of this product is to provide customers with a straight-forward process to improve their knowledge on energy efficiency and options they have within their home.

⁸¹ www.xcelenergy.com/cotrades

➤ **DSM Planning & Administration**

A. Description

DSM Planning & Administration is an indirect service with internal staff that manages all energy efficiency-related compliance filings, including this Plan, the annual DSM Status Report, and other regulatory filings. This group performs the benefit-cost analyses of all of the energy efficiency and load management products, provides tracking of the energy and demand savings achievements, and collaborates with the Resource Planning group to develop inputs for the resource plans. The DSM Planning and Administration group also provides management and oversight of all evaluation, measurement, and verification planning and internal policy guidance, hosts the quarterly DSM Roundtable meetings and correspondence with the Roundtable members, and works with outside consultants, when needed, to bring additional expertise to our product planning. These functions are needed to ensure a cohesive and high quality DSM portfolio that meets all legal requirements as well as the expectations of Public Service's customers, regulators, and staff.

This service is administrative in nature and is not open to customer participation. However, because this group operates in all of the states where Xcel Energy offers energy efficiency products, the Company is able to lend consistency and share best practices across all of the jurisdictions.

B. Targets, Participants & Budgets

Targets and Participants

As an indirect service, DSM Planning & Administration does not have savings or participation targets.

Budgets

The DSM Planning and Administration budget is made up primarily of internal labor required to manage DSM filings, regulatory proceedings, stakeholder meetings, and cost-effectiveness analysis. Employee expenses, consulting and contracting services are a very small portion of the total budget. Actual expenditures in recent years were used as a guide for development of the 2017 and 2018 budgets.

C. Application Process

DSM Planning & Administration is not customer-facing, and therefore, has no associated application.

D. Marketing Objectives & Strategies

The DSM Planning and Administration services are not customer-facing, and therefore, have no associated marketing objectives or strategy.

E. Product-Specific Policies

The DSM Planning and Administration services ensure DSM compliance with internal policies and Commission directives.

F. Stakeholder Involvement

Public Service considers its stakeholders for DSM Planning and Administration to be both the internal groups who manage the DSM products and require DSM data, as well as the external governmental agencies, environmental, and customer groups who express interest in the design of and strategy for the Company's future DSM products. The DSM Planning and Administration group meets with its external stakeholders regularly through the DSM Roundtable, but also meets with parties at other times as needed.

G. Rebates & Incentives

There are no customer rebates associated with this service.

➤ Evaluation, Measurement & Verification

A. Description

The Company's Evaluation, Measurement & Verification (EM&V) plan was developed to evaluate, measure, and verify direct savings for electric and natural gas DSM products. The Company's EM&V approach is separated into performance year and post-performance year activities. Performance year activities are conducted during the reporting year, as products are in operation, and may include rebate application validation, field inspections, verification of equipment installation, and engineering calculation review. Post-performance year activities include verified savings calculation and reporting; comprehensive product evaluations; and portfolio-wide technical assumption evaluations. Section I of this document describes our performance year EM&V activities in greater detail. Section II of this document describes our post-performance year EM&V activities further. Table 14 at the end of the EM&V Plan summarizes each product's planned EM&V. The Company will report any modifications to this EM&V plan in a 60-Day Notice posted to the Xcel Energy website. Notifications of new DSM products (or pilots that will claim savings), launched via 60-Day Notice, will include a detailed EM&V process consistent with the approach described herein.

I. Performance Year M&V

M&V is conducted on an ongoing basis on measures implemented throughout the product performance year. These ongoing M&V activities ensure that rebate application forms contain complete and correct information, the specified equipment is installed, and the claimed gross energy savings are accurate. These performance year activities include:

Rebate Application Validation

This validation procedure applies to all residential and business products (electric and gas) offered in Colorado. The procedure is comprised of the following two steps, both performed by Rebate Operations:

Step 1: Front-End Validation – Rebate Operations reviews all prescriptive business and residential product rebate applications and vendor invoices, including those for indirect impact products. They check the customer information, equipment eligibility, and proper rebate amounts. If information is missing or incorrect, the application is sent back to the account representative or customer. For custom products, engineering staff reviews the project documentation to verify customer information, equipment eligibility, and proper rebate amounts, and then delivers final numbers to Rebate Operations.

Step 2: Daily Audit – Rebate Operations then audits all business and residential applications to verify that the information was correctly entered. This is the final review prior to issuing the rebate. If errors or issues are found, they are corrected. The daily audit report is re-run after the problems are corrected and filed for permanent storage.

Ongoing M&V of Savings

Ongoing M&V of savings differs between prescriptive products, custom products, upstream/midstream approaches, behavioral approaches, and pilots. The following sections describe the general M&V methods that will be used for each. (In addition, products having characteristics requiring unique M&V approaches are detailed below).

1. Prescriptive DSM Product M&V

For direct impact prescriptive products, the Company contracts with third-party verification contractors (VCs) and third-party implementers to perform M&V. VCs will use the onsite verification information gathered between November 1 and October 31 to confirm energy efficiency measure installation rates for each calendar year (reported in the DSM Annual Status Reports). Using an offset calendar will allow the VC to provide the required information in sufficient time for it to be incorporated into the DSM Annual Status Report each year.

Prescriptive products use stipulated or deemed technical assumptions assigned to each measure in order to calculate gross energy and demand savings. The VCs will follow a deemed savings approach when conducting verification activities for prescriptive products, where the primary goal of M&V is to use field inspections to sample projects to determine that the measures are properly installed and have the potential to generate savings. This approach corresponds to the basic rigor method outlined in the International Performance Measurement and Verification Protocol (IPMVP) – *Option A: Retrofit Isolation: Key Parameter Measurement*.

Information gathered at customer sites will vary based on the product and sector, but will generally confirm that the installed equipment matches equipment listed on rebate application. For example, as applicable, the contractor may confirm the manufacturer, model number, efficiency rating, equipment size, capacity or output, application of measure (e.g. motors that run fans versus pumps, versus other mechanical systems), business sector (e.g. restaurant versus college, versus office building), quantity (e.g. number of light bulbs), or any concerns regarding the operation of the fixtures or deviations from the customer application.

For most prescriptive products, the VC will select a statistically valid number of projects to verify through field inspections or phone surveys. The sample size is designed to achieve accuracy levels of between 10% and 20% given a confidence level of 90% around the “realization rate,” and is weighted to select larger projects. The number of randomly selected participants in the sample may increase or decrease during the year in order to ensure that the realization rate accuracy exceeds the accuracy goal for the product. Sampling bias will be reduced using a random selection of sample points. Rebate forms notify all customers that their respective premises and measures are subject to verification inspections.

The “realization rate” for a project is the ratio of the verified savings to the savings reported on the rebate application. The realization rate for the product as a whole is the ratio of the product’s total verified savings to the total rebate reported savings. The product realization rate is applied to gross savings to determine gross product impacts. The net-to-gross (NTG) factor is then

applied to the verified gross savings to yield net product impacts. The following products, or prescriptive components of these products, adhere to the prescriptive M&V process:⁸²

Business Products

- Commercial Refrigeration Efficiency
- Compressed Air Efficiency
- Computer Efficiency
- Cooling
- Data Center Efficiency
- Heating Efficiency
- Lighting Efficiency
- Lighting – Small Business
- Multifamily Buildings
- Motor & Drive Efficiency
- Process Efficiency

Residential Products

- Evaporative Cooling
- High Efficiency Air Conditioning
- Insulation and Air Sealing
- Residential Heating
- Water Heating

The general M&V process for the following prescriptive products, or prescriptive components of products, is outlined below.

1(a). General Prescriptive DSM Project M&V Process

General prescriptive M&V includes validation of individual rebate applications as well as ongoing M&V.

Rebate Application Validation

1. Customer submits rebate application and required documentation to Public Service after measure is installed.
2. Rebate Operations reviews each business and residential product rebate application and associated vendor invoices, checking the customer information, equipment eligibility and proper rebate amounts. If information is missing or incorrect, the application is sent back to the account representative or customer to make changes.
3. If the project qualifies for rebate, Rebate Operations enters rebate application data into Salesforce (customer relationship management system) and authorizes rebate payment. Prior to authorizing rebates, all applications are verified in a daily audit.

Ongoing M&V

4. Public Service will send the VC a list of projects completed to-date on an agreed to schedule.
5. The VC will select a statistically valid sample of projects to inspect, weighted towards the larger projects. The sample size is designed to achieve 90% confidence with 10-20% precision.

⁸² Note: these products may have both prescriptive and custom components, in which case they will be subject to both prescriptive and custom M&V.

6. The VC will contact each customer to schedule the inspection or complete the phone survey.
7. The VC will visit or phones each customer site and verify the savings factors or checkpoints for that measure.
8. The VC will use the verified savings factors to calculate the project's verified energy savings and realization rate (RR), which is calculated by dividing the recalculated or verified savings by the reported or rebated savings. At 1.0 or 100%, the verified and rebated savings are equal.
9. The VC will calculate the product's RR, which is the sum of all verified savings divided by the sum of all rebated savings for all projects in the product sample. The product's RR is applied to the rebate application savings captured in Salesforce to determine gross verified savings.
10. NTG factors are applied to the gross verified savings to determine net savings.

1(b). Exceptions to the Prescriptive Product M&V Process

Certain prescriptive products have special design elements that require verification processes unique to those particular products. The following products, or components of these products, require exceptions to the prescriptive M&V process:⁸³

Business Products

- Data Center Efficiency
- Multifamily Buildings

Residential Products

- Energy Efficient Showerhead
- ENERGY STAR New Homes
- Home Energy Squad
- High Efficiency Air Conditioning
- Home Performance with ENERGY STAR
- Refrigerator & Freezer Recycling
- School Education Kits

Low-Income Products

- Energy Savings Kits
- Multifamily Weatherization
- Non-Profit
- Single-Family Weatherization

The unique M&V processes for these products are described below:

Data Center Efficiency

For verification of the EC plug fan measure installation, the VC will maintain a log of any refusals for site entry for M&V, and subsequently seek out, and document, verbal confirmation of installation from the customer and/or installer.

⁸³ Note: these products may have both prescriptive and custom components, in which case they will be subject to both prescriptive and custom M&V.

Energy Efficient Showerhead

The third-party implementer will report on the quantity of showerheads distributed. A third-party survey company will survey customers to determine the installation rate of each component.

ENERGY STAR New Homes

The ENERGY STAR New Homes product utilizes the HERS raters' report outputs as the basis for product M&V. The third-party implementer conducts Quality Assurance/Quality Control (QA/QC) of the HERS raters' results. Each project is verified by a HERS rater and the third-party product implementer prior to issuing a rebate to the builder using the following process:

1. Builder contacts HERS rater to express interest in building an energy efficient home and participating in the ENERGY STAR New Homes product.
2. HERS rater works with builder to construct the home to meet or exceed the ENERGY STAR New Homes product requirements. The HERS rater visits the home during construction to inspect the building method used and the equipment installed.
3. Once the home is completed, the HERS rater performs a blower door test on the house and then calculates the final HERS Index. The HERS rater models the home by entering the individual home characteristics into the RESNET accredited REM/Rate modeling software or a RESNET accredited modeling software approved by the Company. When the rating of the home is completed, the REM/Rate files for the modeled house are submitted to the rater's HERS provider. RESNET sets forth the role of the provider, provides accreditation and requires that HERS providers perform quality assurance on 10% of each rater's building files and fully replicate 1% of the home ratings annually. The HERS provider performing the QA must not be the same individual that rated the home.
4. The rater submits the specific REM/Rate reports and the final HERS Index to the Company's third-party product implementer, at which point the implementer performs QA/QC. The builder's rebate is calculated based on the percent by which the new home exceeds the local building jurisdictions energy code requirements, which has a direct correlation to gas and electric savings. There is no rebate application for this product. The rater, acting on behalf of their builder client, submits the required REM/Rate files, reports and other supporting information to the third-party product implementer. The submitted data is used to determine each individual home's rebate amount. The third-party product implementer ensures that all the information entered by the HERS rater into their database system is correctly entered and tracked. The third-party product implementer then enters the required information into Salesforce, including the key REM/Rate output data. The REM/Rate data is used by the Company to calculate the energy savings achieved for each home.
5. Public Service tracks and stores key parameters in Salesforce such as the home address, square footage, builder name and address, HERS Index, blower door test score, gas and electric energy saved, date completed, and rebate amount paid to the builder. Additional data for each home such as a photograph of the installed gas meter and the submitted REM/Rate files are retained by the third-party implementer.

Home Energy Squad

The third-party implementer will verify and report implemented measures (and baseline equipment being replaced, where applicable) to the Company. The Company will track this information in Salesforce. Due to the direct installation nature of this product, the realization and installation rates are set at 100%.

High Efficiency Air Conditioning

The High Efficiency Air Conditioning (HEAC) product has three energy saving components that are calculated and rebated separately, including:

- New Equipment – Purchase of high efficiency equipment.
- Quality Installation – The proper installation of new standard or high efficiency residential air-conditioning equipment.
- Trade-Ins – Replacement of low efficiency units with high efficiency units.

The M&V process for the New Equipment and trade-in components will follow the standard prescriptive product M&V process above.

The Quality Installation component requires slight deviations from the standard prescriptive process. To verify a quality installation, the VC will verify that a Public Service-approved load calculation was performed, that the unit is sized properly, and that refrigeration charge, airflow, and duct leakage are within acceptable ranges. Each component of the savings calculation for Quality Installation will be verified independently. The process includes the following steps:

1. Public Service will send the VC a list of projects completed to-date on an agreed to schedule.
2. The VC will select a statistically valid sample of projects to inspect. The sample size is designed to achieve 90% confidence with 10-20% precision.
3. The VC will contact each customer to schedule the inspection.
4. The VC will verify that a PSCo-approved load calculation was used to size the equipment.
5. The VC will visit the customer site and test the loaded, equilibrium performance of installed air conditioning equipment for proper refrigerant charge and air flows.
6. The VC will verify duct sealing by observation of sealing mastic or other Air Conditioning Contractors of America (ACCA)-approved sealing means on accessible joints.
7. The VC will compare airflow, refrigerant charge, and duct leakage results to the range of values deemed acceptable for the specified equipment. If the actual values are within the acceptable range, the verified savings are considered to be 100% of the rebated values. If the actual values are outside of the acceptable range, the savings will be reduced according to the deviation from the acceptable range. Details on the savings reductions are provided in the Deemed Savings Technical Assumptions sheets within the Technical Reference Manual (see Appendix G).
8. The VC will input the verified savings factors into an M&V calculator spreadsheet to calculate the project's verified energy savings.

9. The VC will calculate the project's RR by dividing the recalculated or verified savings by the reported or rebated savings. At one or 100%, the verified and rebated savings are equal.
10. The VC then will calculate the product's RR, which is the weighted(?) average RR of all projects in the product sample. The product's RR is applied to the rebate application savings captured in Salesforce to determine gross verified savings. For purposes of determining and applying the RR, the M&V calendar year will run from November 1 to October 30 of each product year. The realization rate determined for this 12 month period will be applied to the product values for the calendar year corresponding to the September 30th date (as described above).
11. NTG factors will be applied to the gross verified savings to determine net savings.

Home Performance with ENERGY STAR

The Home Performance with ENERGY STAR product is designed to take a whole house approach to improving the energy efficiency of existing single-family homes. Contractors will have their first five completed projects inspected and then 10% of their completed projects thereafter. The M&V process for Home Performance with ENERGY STAR is as follows:

1. Customer receives a Home Energy Audit with blower door test.
2. Customer submits product application form.
3. Within one year of enrollment in the product, the customer installs the required measures. As required depending on the number of the projects completed by the contractor, the contractor schedules a final verification inspection with our selected third-party implementer.
4. During the verification inspection, the VC performs a blower door test and a Combustion Appliance Zone (CAZ) test and verifies that the homeowner has performed all of their planned energy efficiency improvements. If the contractor tests out of this requirement (for their first five projects), a random inspection of 10% of projects completed thereafter will be conducted by the third-party implementer.
5. When the inspection is completed, the third-party implementer and/or contractor submit a rebate form to the Company, along with copies of invoices for all of the completed improvements.

Multifamily Buildings

The third-party implementer of the Multifamily Buildings product will report the number of direct installation measures completed to the Company. This information will be entered and tracked in Salesforce.

Refrigerator and Freezer Recycling

The Refrigerator & Freezer Recycling third-party implementer will send monthly reports to Public Service of all customers who participated in the product. The VC will conduct phone surveys to verify removal of each unit and that the refrigerator/freezer was operable at time of removal.

School Education Kits

The School Education Kits third-party implementer will send follow-up surveys to a sample of the participants to determine the equipment installation rates which are then applied to the gross savings for the calendar year.

Energy Savings Kit (Low-Income)

A third-party partner will conduct phone surveys with a sample of participants to determine whether the kit contents were installed. Through the survey results, the third-party partner will determine the installation rates, which are then applied to the gross savings for the calendar year.

Single-Family Weatherization (Low-Income)

The Single-Family Weatherization product offers standard payments to the product's third-party implementer for the installation of specific, predetermined prescriptive energy efficiency measures. Verification is built into the product design, as the third-party implementer and its subcontracted agencies actually install the measures. The specific product process, including verification, is outlined below.

1. The third-party implementer guides income-qualified customer to sign up for weatherization services.
2. The third-party implementer arranges for an energy auditor to visit the customer's home to identify savings opportunities.
3. The crew returns to the home within 14 days to implement the identified measures.
4. The third-party implementer submits documentation of the measures that were installed to the Company, along with a request for payment for the installed measures.
5. Public Service reviews the documentation and issues payment for the installed measures.

Multifamily Weatherization (Low-Income)

The Multi-Family Weatherization product offers payments to the third-party implementer for the installation of custom energy efficiency measures. Verification is built into the product design, as the contracted weatherization agency actually installs the measures. The specific product process, including verification, is outlined below.

1. Income-qualified customer (multi-family building owner) signs up for weatherization services through the third-party implementer.
2. The third-party implementer arranges for the contracted consultant to visit the building and identify savings opportunities.
3. Consultant produces an audit report outlining savings opportunities and potential savings.
4. Public Service engineer reviews project specifications as provided by the consultant.
5. The third-party implementer arranges for the weatherization crew to install measures approved by Public Service.
6. The third-party implementer arranges for the contracted consultant to visit the building to verify measure installation and calculate final savings.
7. Contracted consultant submits completed audit report with final savings to the third-party implementer.

8. The third-party implementer submits this documentation to Public Service, along with a request for payment for the installed measures.
9. Public Service reviews the documentation and issues payment for the installed measures.

Non-Profit (Low-Income)

The Non-Profit Energy Efficiency product provides funding for energy efficiency retrofit improvements to qualified non-profit organizations within the Company's service territory. Verification is built into the product design, as the contracted weatherization agency actually installs the measures. The specific product process, including verification, is outlined below:

1. Income-qualified customer signs up for weatherization services through third-party implementer.
2. The third-party implementer arranges for the contracted consultant to visit the building and identify savings opportunities.
3. Consultant produces an audit report outlining savings opportunities and potential savings.
4. Public Service engineer reviews project specifications as provided by the consultant.
5. The third-party implementer arranges for the weatherization crew to install measures approved by Public Service.
6. The third-party implementer arranges for the contracted consultant to visit the building to verify measure installation and calculate final savings.
7. Contracted consultant submits completed audit report with final savings to the implementer.
8. The implementer submits this documentation to Public Service along with a request for payment for the installed measures.
9. Public Service reviews the documentation and issues payment for the installed measures.

2. *Custom DSM Product M&V*

Custom products use technical assumptions that are specific to each project in order to calculate the energy and demand savings. For all Custom projects, the Company's energy efficiency engineers will calculate the demand and energy savings at the pre-approval stage. Senior and managing engineers will audit the pre-approval calculations for all projects, as outlined in Step 3 of the General Custom Project M&V Process below. In addition, a random sample of all pre-approved projects will be sent to an outside engineering firm for review, as shown in Step 4 below.

All measures with anticipated savings greater than or equal to 1 GWh or 20,000 Dth require a project-level M&V plan, outlining the scope and methods of the M&V activities at the specific facility. The methods, such as pre- and post-metering, will be aligned with the appropriate IPMVP options. The duration of the metering will vary depending upon the load variability or project complexity, but typically, these projects will be metered for a minimum of two weeks pre- and post-installation. If metering is too costly or physically impossible, engineering modeling or building simulation modeling may be substituted.

Metering also may be used to verify savings of smaller projects at the discretion of the engineer. Typically metering is performed on smaller projects with new or uncommon technologies, or where the calculated energy savings or rebate is significantly impacted by assumptions for which there is not ample supporting information at the time of pre-approval.

The general Custom project approval process is described below and applies to the following products, or certain custom components of these products:

Business Products

- Commercial Refrigeration Efficiency
- Compressed Air Efficiency
- Cooling
- Custom Efficiency
- Data Center Efficiency
- Energy Management Systems
- Heating Efficiency
- Lighting Efficiency
- Motor & Drive Efficiency
- Multifamily Buildings
- Process Efficiency

Low-Income Products

- Multifamily Weatherization
- Non-Profit

2(a). General Custom Project M&V Process:

The general custom project M&V process includes pre-approval, M&V site verification, and rebate approval and payment.

Pre-Approval Process:

1. Customer submits custom application describing the proposed project, purpose, and potential for energy savings.
2. A Public Service energy efficiency engineer or outside engineering firm will review the application and calculate the anticipated energy and demand savings based on the technical assumptions specific to that measure and the potential rebate. Calculations on small projects completed by Public Service energy efficiency engineers may proceed to Step 4 without review from a senior energy efficiency engineer if the engineer conducting this step has been approved by Public Service for direct sign-off for the particular type and size of project in question.
3. Public Service senior energy efficiency engineer reviews the calculations completed by external engineers.
4. Public Service randomly selects a sample of all projects to send to an outside engineering firm (if Public Service engineer performed Step 2) to review the calculations.
5. If the outside engineering firm disagrees with the Public Service engineer's analysis, they discuss the project and reach consensus on the calculations.
6. Public Service sends out a pre-approval or rejection letter stating the pre-approved demand and energy savings along with the rebate amount.

Monitoring & Site Verification:

7. If monitoring is required, a Public Service energy efficiency engineer will draft a project-specific M&V plan, which is sent out for customer review and signature.
8. If the customer does not have the appropriate meter structure, an outside engineering firm will install metering equipment and collect the pre-data as set forth in the project-specific M&V Plan and forward the data to Public Service.
9. After the designated pre-monitoring period, the customer will complete the project installation and submits all required documents.
10. Outside engineering firm collects post-installation monitoring data and sends post data to Public Service.
11. For managed accounts, the customer's account manager confirms project installation, which may include visiting the site or reviewing invoices and other project documentation. The project documentation is then submitted to Public Service.
12. For non-managed customers completing custom projects, the Company's Business Solutions Center and Program Manager will review project documentation.

Savings Reconciliation:

13. For non-metered projects, final documents are reviewed for compliance with the initial pre-approval. If the project costs or the project savings vary by greater than 10%, the project is reevaluated.
14. For metered projects, Public Service's energy efficiency engineer, or outside engineering firm, determines actual savings based on metering results. All metered projects previously reviewed only by internal engineers will be sent to an outside engineering firm for review. If the outside engineering firm disagrees with Public Service engineer's analysis, they will discuss the project and reach consensus on the calculations.
15. If the post-project kW and kWh savings and incremental cost are within 10% of the pre-approved values, values, the preapproved rebate will be paid. If the post-project quantities are not within 10% of the pre-approved values, then the rebate will be based on the post-M&V results. In all cases, the post M&V results for kW, kWh, Dth, and incremental cost will be booked for the project.

2(b). *Exceptions to Custom DSM Product M&V*

The following Business products, having special design elements, are verified using processes unique to the product or component:

- Energy Management Systems
- New Construction
- Recommissioning
- Self Direct

The M&V process for each of these products is described below:

Energy Management Systems

All EMS product components that include installation of systems to control and reduce a building's energy usage both on- and off-peak will follow the general Custom M&V process.

The Energy Information Systems (EIS) component of the product, which offers visualization and analysis of real-time energy data from across a customer's facility to capture low-cost recommissioning opportunities as well as behavioral and operational energy savings, will use the following unique Custom M&V processes:

M&V for EIS Measures

Measure Type	Description	M&V Protocol
New system or process automation opportunities	Measures that consist of equipment and processes whose automation capabilities don't currently exist or are underutilized. By identifying and applying appropriate control measures, incremental energy savings can be achieved.	Follow General Custom M&V Process
Low cost / no cost recommissioning opportunities	Measures that address failure or underperformance of installed systems and equipment that can be fixed by making small adjustments, typically not requiring new equipment.	Follow Unique Custom M&V Process used for Recommissioning product.
Behavioral or Operation Opportunities	Measures that require manual intervention to achieve energy savings that may not be feasible through system automation.	Within the EIS, tracking mechanisms will be established to check the ongoing performance of each behavioral measure. On an annual basis the third-party implementer, with review by Xcel Energy engineers, will analyze data from the EIS in accordance with IPMVP criteria and the Company's custom M&V process, to ensure persistence of the behavioral measure's savings. These savings will be reported annually for the duration of the customer's involvement in the EIS measure. Since the period of participation is expected to last five years, 1/5 of the annual savings for each behavioral measure will be claimed each year in the Company's DSM Annual Status Report.

New Construction

The New Construction product is comprised of two components: Energy Design Assistance and Energy Efficient Buildings.

The Energy Design Assistance component provides design assistance to the architects and engineers designing new buildings. Public Service contracts with a third-party product implementer to complete the energy modeling and measurement and verification. The rebate is not paid until project savings are verified. The specific product process, including verification, is outlined below.

1. Customer submits an application describing the proposed project.

2. The third-party implementer conducts an introductory meeting with the design team/customer.
3. The third-party implementer completes energy modeling to identify efficiency opportunities.
4. The third-party implementer reviews construction documents for qualifying energy efficiency measures identified through the energy model. The design team and customer are notified whether or not these measures were found within these documents.
5. The third-party implementer provides Public Service with a verification plan for each project.
6. The third-party implementer visits site and verifies that specified measures were installed. Equipment and systems are monitored for a two-week timeframe, as appropriate, to evaluate performance variables against modeling assumptions.
7. For projects with individual measures that have savings greater than or equal to 1.0 GWh or 20,000 Dth per year, data logging is required for a time period of four weeks.
8. The actual results are compared to the estimated savings to determine the final rebate. If the actual results are not within 15% of the energy savings identified within the previous model, the consultant completes an as-built model to determine final energy savings.
9. Rebate is issued to customer based on final savings.

The Energy Efficient Buildings component provides customers a review of their new construction, major renovation or additions for potential energy efficiency measure opportunities before the building is built. The specific product process, including verification, is outlined below.

1. Customer submits an application describing the proposed project.
2. Third-party implementer conducts an introductory meeting with the design team/customer.
3. Customer applies for rebates based on the energy efficiency measures they have incorporated into their design plans.
4. Third-party implementer reviews construction documents compared to application submitted.
5. Third-party implementer visits site and verifies that specified measures were installed.
6. For projects with individual measures that have savings greater than or equal to 1.0 GWh or 20,000 Dth per year, data logging is required for a time period of four weeks.
7. Third-party implementer determines final savings based on data logging and verification.
8. Rebates are issued to customer based on final savings.

Recommissioning

The Recommissioning product identifies existing functional systems that can be “tuned up” to run as efficiently as possible through low- or no-cost improvements. Because Recommissioning projects are difficult to meter, a combination of metering and calculations may be used. The specific product process, including verification, is outlined below.

Study Pre-Approval

1. Customer hires an engineering firm (Recommissioning provider) to draft a proposal to conduct a study.
2. Customer submits application and proposal from Recommissioning provider to Public Service for study pre-approval.
3. After pre-approval, Recommissioning provider or customer can begin study of the building to identify savings opportunities and determine energy savings for each measure. Approved customers may perform their own measure analysis and/or use our Recommissioning calculator tool with standard savings calculations.

Study Approval

4. Completed study is submitted to Public Service for review.
5. If study is approved, the provider will present study to customer and Public Service issues study rebate. If study is not approved, Public Service will follow up with provider or customer to reconcile issues.
6. Public Service follows up (generally within seven business days) with a detailed M&V plan that the customer must sign. Public Service engineer reviews all savings calculations and identifies if any individual measures will require metering (measure savings > 1 GWh or 20,000 Dth). If metering is needed, Public Service will send out a letter alerting customer that one or more measures will require metering.

Implementation

7. Customer notifies Public Service of measures to be improved. For those measures > 1 GWh or 20,000 Dth, Public Service notifies the VC that pre-installation metering is needed. Pre-metering must be completed prior to measure recommissioning in accordance with the M&V plan.
8. Customer implements selected measures and notifies their Public Service account manager of their completion. For measure savings > 1 GWh or 20,000 Dth, Public Service notifies the VC that the customer is ready for post-metering.
9. Post-monitoring data is submitted to Public Service engineer for analysis and determination of final savings and rebate amount.

Approval & Rebate Payment

10. Account manager collects invoices and signed rebate form identifying which measures were installed.
11. The invoices are reviewed and if the invoice details match what was submitted on the rebate form, then the pre-approved rebate is awarded. If there are discrepancies, the account manager works with the customer to provide additional detail and reconcile differences.
12. Rebate is issued to the customer based on final savings.

Self-Directed Custom Efficiency

The Self-Directed Custom Efficiency product provides rebates to customers who identify, scope, and verify the energy savings for qualifying projects to offset their costs to implement

energy efficiency projects. The specific product process, including verification, is outlined below.

1. Public Service pre-qualifies customers who are eligible for participation in the Self-Directed Product.
2. Once pre-qualified, a customer identifies the opportunity, then develops and submits a project application. For projects over 250,000 kWh, the customer is required to develop a project-level M&V plan and submit it with their application. Specific components of the plan will be determined by the customer, and agreed upon by Public Service. At a minimum, the plan should employ sound engineering judgment and follow standard industry practices such as the IPMVP.
3. Public Service provides confirmation of application receipt, reviews the application, and asks for additional information if necessary. Public Service notifies the customer of approval or denial of the application, expected rebate, and mutually agreed on M&V plan.
4. If the customer chooses to implement the pre-approved project, they must follow the requirements detailed in their M&V plan and conduct all necessary steps in order to verify energy savings. Any data required for pre-installation monitoring detailed in their M&V plan should be submitted to the Company and approved before the customer implements the efficiency measures. Upon acceptance of the data, the customer can then implement the measures and perform any follow-up monitoring as described in their M&V plan.
5. The customer then submits a project completion report. Public Service reviews the report, requests any additional data, and calculates the final rebate. The rebate is paid upon completion of project and Public Service's approval of project completion report.
6. A random sample of all pre-approved projects will be selected by the Company and sent to an outside engineering firm for metering and verification.

3. *M&V Process for Products Delivering Upstream/Midstream Incentives*

The Computer Efficiency and Home Lighting & Recycling products were launched from their outset as upstream products. Beginning in 2015, the Company started offering midstream incentives to distributors for Cooling and Lighting Efficiency measures. The rebate treatment (administration vs. participant incentive) and NTG are based on actual, verified participant costs and market penetration rates observed through the products. The rebate will only be recorded as a participant incentive if the verified Net Participant Costs (based on invoices) are equal to the sum of the incremental capital costs and baseline capital costs, less the rebate; otherwise the rebate will be recorded as an administration cost. M&V for these approaches will be conducted as follows:

Computer Efficiency

The Computer Efficiency product offers upstream incentives to manufacturers that produce and sell PCs and servers with high efficiency power supplies to Public Service electric business customers and downstream incentives for Desktop PC Virtualization and PC Power

Management to business customers who implement these strategies. These two product components have different M&V processes.

For the high efficiency power supplies, Public Service tracks the quantity and model number of the computers and servers sold through a third-party implementer and pays incentives to the manufacturer. The specific product process, including verification, is outlined below:

1. Participating manufacturers provide monthly sales reports to the third-party implementer, listing the model, quantity, ship-to zip code, and number of computers sold.
2. Participating manufacturers provide monthly reports to the third-party implementer listing customer returns to be credited.
3. To determine the efficiency and rebate level, each PC and server model are assigned by the third-party implementer to one of four rebate tiers based on the efficiency of the model's power supply.
4. The third-party implementer enters the information into a tracking system and submits monthly reports on the data to Public Service.
5. Public Service will receive quantity of units sold/returned, zip codes, efficiency levels, and incentive levels, and calculate energy savings from the monthly reports provided.

The Computer Efficiency upstream incentive component is assumed to have an installation rate of 100% because computers are purchased to be put into service and are not inventoried for long periods due to their high cost and short shelf-life.

Cooling

Distributors will be offered incentives in return for increasing their stock and promotion of high efficiency HVAC equipment. The NTG for this approach will be deemed within the DSM Plan and verified through periodic product evaluations. The M&V process for the midstream component of the Cooling product is as follows:

1. Participating distributors provide biweekly reports of products sold, including the manufacturer, model, number of units installed, unit serial numbers, address where equipment was installed, contact information (for the customer, contractor, or installer), and distributor invoice number and date.
2. The third-party implementer enters the information into a tracking system and submits weekly reports containing the data to be uploaded into Sales Force.

The VC will include the midstream projects within the sample of Cooling projects that receive M&V throughout the year, in order to calculate realization rates for net energy and demand savings.

Lighting Efficiency and Small Business Lighting

Within the Lighting Efficiency and Small Business Lighting products, LED lamp incentives will be offered to distributors as the Business LED Instant Rebate. The NTG for this approach will be deemed within the DSM Plan and verified through periodic third-party product evaluations. A fraction of the rebate may be treated as a Vendor Incentive (administration cost) and the remainder as a participant incentive if the fraction of Net Participant costs are greater than the sum of the incremental capital and baseline capital costs, and there is evidence that a portion of the rebate is passed on to program participants. If there is no evidence that a portion of the rebate is passed on to program

participants, then the full rebate cost will be captured as an administrative cost. The M&V process for the midstream component of the Lighting Efficiency/Small Business Lighting products is as follows:

1. Participating distributors provide sales reports listing the model, wattage, type, and number of bulbs sold.
2. The distributor enters the information into a tracking system and submits monthly reports to the third-party implementer containing the data and the third-party implementer calculates the demand and energy savings using technical assumptions provided by PSCo.
3. The third-party implementer audits the database output by examining and comparing against retailer sales reports. The VC conducts a field verification of 10% of completed projects; and subsequently the third-party implementer adjusts the wattage and number of bulbs if errors are found and provides the final verified savings for all bulbs for year-end.

Public Service compares the net costs paid by program participants to the deemed incremental capital and baseline capital costs to determine the amount of instant rebate passed on to participants as a reduction in product cost. This amount is used in calculating the portion of the presumed participant incentive that is treated as a rebate in the cost-benefit analysis completed for the status report following the program year.

Home Lighting & Recycling

To deliver the Home Lighting & Recycling product, the Company partners with manufacturers and retailers to reduce the retail price of qualifying bulbs and promote them to the retailers' customers. Public Service tracks the manufacturer, model number, quantity, wattage, cost, and type of the bulbs sold through a third-party implementer and pays incentives to the manufacturer. The M&V process for the Home Lighting component of the product is as follows:

1. Participating retailers provide weekly or monthly sales reports listing the model, wattage, cost, type, and number of bulbs sold.
2. A third-party implementer enters the information into a tracking system and submits monthly reports containing the data and calculation of the demand and energy savings using technical assumptions provided by PSCo. Higher bulb costs may be forecasted in the Plan based on estimated costs at the time, observed costs will be captured throughout the year and used to calculate the actual average incremental capital cost which will be reported in the DSM Annual Status Report. The baseline bulb costs will be deemed within the Plan and also used within DSM Annual Status Report.
3. The VC audits the database output by examining and comparing against retailer sales reports. The validation contractor adjusts the wattage and/or number/type of bulbs if errors are found and provides the final verified total savings for all bulbs for year-end.

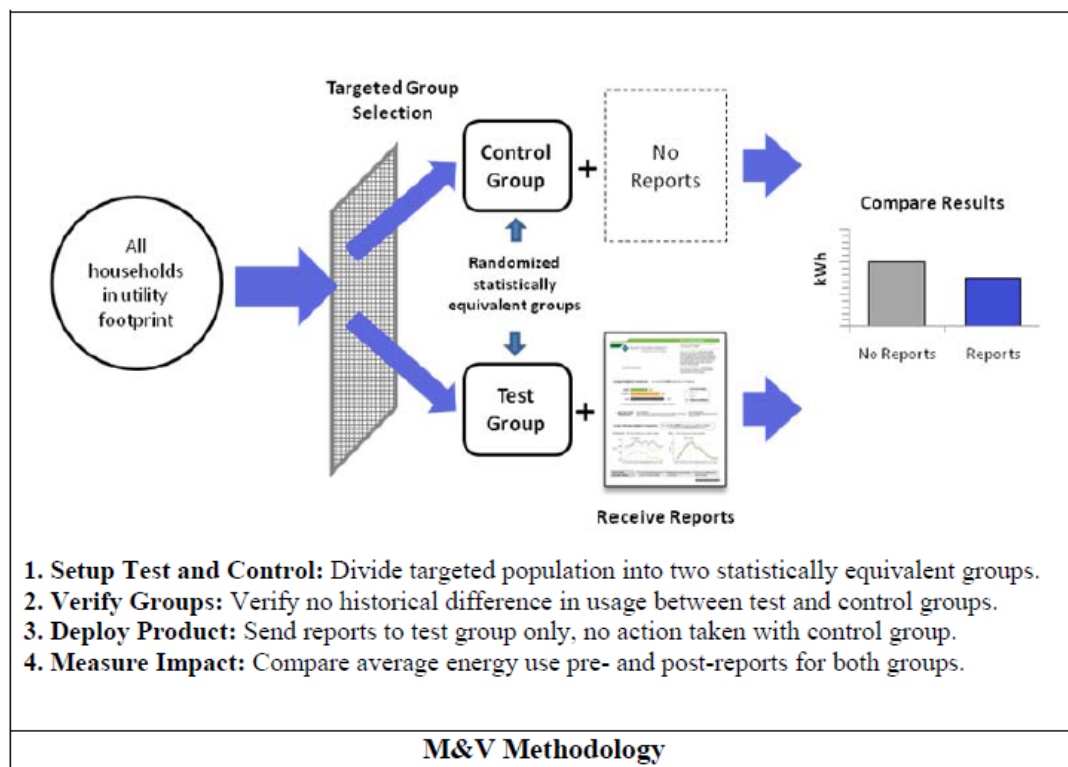
4. M&V Process for Energy Feedback Behavioral Products

Behavioral products present unique challenges related to measuring resulting savings. M&V is critical for understanding the savings delivered and fine-tuning the product's effectiveness. The M&V protocol for the Energy Feedback products is described below.

Energy Feedback – Residential Opt-out Product

The Energy Feedback opt-out product provides targeted communication of energy-use comparisons and information to our residential customers, providing specific recommendations and feedback to motivate and teach customers how to reduce their energy consumption. Actual consumption in the form of meter data is used to M&V this program. Meter data for all participants, comparison homes, and control homes are provided to the third-party implementer for continuous analysis and performance reporting. The third-party implementer compares the consumption of participants (Treatment Group) to those of the Control Group to determine the savings resulting from the product. Savings for the print/email product will be measured compared to an appropriately sized Control Group of non-participant customers that are uninformed by any direct action of this product. In addition to determining the savings resulting from the product, the third-party implementer will track and adjust for participant's incremental participation in other energy efficiency products.

This M&V methodology is recommended by the State and Local Energy Efficiency Action Network (SEE Action). The following figure depicts the M&V methodology.



Moreover, the M&V methodology incorporates recommendations made by the Center for Energy and Environment (CEE) in their evaluation of the Minnesota Residential Energy Feedback pilot. Specifically, the following recommendations were incorporated:

- Opt-out customers are included in total savings. While opt-out customers were previously included in the calculation of savings per household (i.e. in the regression), the aggregation of savings did not include the count of opt-out customers
- Negative “savings” estimates are included in total savings. Previously, zero savings were reported in months with negative savings estimates. The updated method includes negative “savings” that occur in any month.
- Duplicate records are eliminated. Data preparation steps now remove (if present) duplicate billing records along with records from multiple meters at a customer's home that may have been added during the course of the program. The total number of records removed are noted in a logfile and stored.
- Model is robust to varying monthly imbalances between treatment and control. The regression model below controls for any remaining overall and seasonal differences between treatment and control. This update achieves the intent of the evaluation's recommendation to take care in adjusting estimates for any residual overall or seasonal imbalance between the treatment and control group.

The following regression model is used to estimate $\hat{\beta}$, the average energy saved per day per household/business. The model is estimated separately for electricity and gas.

Where:

Variables:

- $usage_{it}$ is average daily usage for meter read t for household/business i in the post-treatment period
- $treatment_i$ is an indicator for assignment of household/business i to the treatment group
- pre_usage_i is average daily usage across household/business i 's available pre-treatment meter reads
- pre_winter_i is average daily usage over the months of Dec, Jan, Feb, and Mar across household/business i 's available pre-treatment meter reads. This value is imputed, if missing, with household/business i 's value for pre_usage_i .
- pre_summer_i is average daily usage over the months of Jun, Jul, Aug, and Sep across household/business i 's available pre-treatment meter reads. This value is imputed, if missing, with household/business i 's value for pre_usage_i .
- mm_t is a vector of month-year dummies

Parameters

- β is the average treatment effect of interest
- α_0 is a common intercept term
- α_1 , α_2 , and α_3 are the effect of the control variables pre_usage_i , pre_winter_i , and pre_summer_i on $usage_{it}$ in the reference month.
- γ is a vector of parameters capturing the average effect of each month-year dummy on $usage_{it}$

- δ_1 , δ_2 , and δ_3 capture the effect of the control variables pre_usage_i , pre_winter_i , and pre_summer_i on $usage_{it}$ in each month-year (mm_t) of the post-period
- ε_{it} is an error term
- i is notation for the i th customer
- t is notation for the first, second, third, etc.. month of the post-treatment period

kWh/Dth saved by Treatment Group = $-\hat{\beta} * \text{total_treatment_days}$ – kWh/Dth saved by rebated equipment for the same time period and same customers

Kilowatt (kW) demand reduction will be determined by first estimating the daily energy savings from the monthly energy savings, then apportioning the daily energy savings over the system peak hour.

Online Energy Feedback (My Energy) Opt-in Product

Residential customers in the print or email product who opt-in to participate in the My Energy tools will remain in the Home Energy Report Treatment Group and their savings will be included in the print/email product savings calculation.

Because login to the My Energy tools is a self-selected, opt-in action and therefore not easily subject to random assignment in a Randomized Controlled Trial, savings for Online Energy Feedback are performed using the Propensity Score Matching methodology. This analysis employs a quasi-experimental matching method which seeks to match customers who log in to My Energy (“treatment customers”) to very similar customers who did not log in to My Energy (“matched control customers”). Matched controls are drawn from a larger set of candidate control customers. Not all customers who log in are successfully matched largely due to not having 12 months of pre-login usage data. These customers are not matched due to the concern that they cannot be matched well. As a result, the analysis measures the average treatment effect on the treated for those customers who visited the web and who could be matched well; it is not a measurement of the effect of web on all customers who visited My Energy.

The algorithm follows Imbens and Rubin (2015) and begins by selecting customer characteristics for estimation of a propensity score. The propensity score is the predicted probability of receiving the treatment (i.e. logging in to My Energy). Matching customers based on nearly identical propensity scores serves to balance the distribution of the included customer characteristics among the treatment and matched control populations. An important limitation of this method is that treatment customers may still differ from matched control customers along unobserved dimensions (e.g. attitudes toward energy efficiency) which could bias results. Despite this limitation, propensity score matching is an accepted method in the Department of Energy SEE Action guidelines and widely used in other disciplines.

Energy savings will have a one-year life, with ongoing treatment and information exposure necessary to continue the full energy-savings benefits. To address this unique situation with treatment-driven behavior programs, Public Service will discount the annual savings so that 1/3 of the total savings measured are claimed each year during a three-year cycle. This is different than the standard conservation product, where a measure gets installed and credit is taken for the multi-year life of that installed measure. The third-party implementer will calculate savings throughout 2017 and 2018 using a comparison of the Treatment Group and the Control Group as savings occur and only if they occur.

Public Service will track rebates by customer and account and will subtract the energy saved through these product participations from the Energy Feedback results to prevent double counting.

5. *Pilot Products*

EM&V for pilot products can differ from the EM&V for prescriptive and custom products since the pilots are being evaluated for market viability. Therefore, additional testing may be necessary, and, in some cases, specifically designed for a particular pilot. For these reasons, the detailed EM&V Plan for each pilot is included in the pilot's product description, which can be found in the Indirect Products and Services section of the Plan under Product Development.

II. *Post-Performance Year Product EM&V*

The purpose of the post-performance year EM&V is to ensure that all technical assumptions, including the NTG ratios, are accurate and that the product is operating as effectively as possible. Post-performance year activities take place in the years following the performance year and include comprehensive product evaluations, a portfolio-wide technical assumptions evaluation, and calculation of outcomes for the annual status report.

a) Verified Savings Calculation and Reporting

At year-end, net verified generator savings are calculated from gross customer (meter) savings using the approved line losses, measured or assumed installation and realization rates, and NTG values and reported in the EM&V Results section of each DSM Annual Status Report, according to the following formulas:

Net verified kW savings =

Peak customer kW * Line Loss * Installation Rate * Realization Rate * NTG

Net verified kWh savings =

Customer kWh * Line Loss * Installation Rate * Realization Rate * NTG

Net verified Dth savings =

Gross Dth * Line Loss * Installation Rate * Realization Rate * NTG

Where,

- peak customer kW, customer kWh, and gross Dth are reported from Salesforce and/or provided by the third-party implementers;
- line losses are 6.51% for business products and 7.69% for residential products;
- installation rates are assumed to be 100% for all of the products within the Business, Residential, and Low-Income Programs, and for pilots, with the exception of the Home Lighting & Recycling, School Education Kits, Energy Efficient Showerhead, and Energy Savings Kits products. For each of the exceptions, the third-party implementer measures the installation rate and reports it, along with gross savings, to the Company.
- realization rates are assumed to be 100% for custom products, Low-Income products, and pilots, and are measured and reported by the M&V contractor or the third-party implementer for the prescriptive products; and
- NTG values are as filed in the Technical Reference Manual of the DSM Plan, unless modifications were adopted resulting from a product evaluation, as described below.

Note that:

- Installation and realization rates, as well as NTG values, are applied at the measure and end-use levels within each product.
- Either an installation rate or a realization rate, but not both, are typically applied to calculations of net verified savings.
- Comprehensive products that claim prescriptive or custom savings from other end-uses, will apply the installation rates, realization rates, and NTG ratios specific to each end-use when calculating net verified savings.
- Products that offer studies (such as Compressed Air Efficiency, Data Center Efficiency, or Recommissioning, for example) may distinguish study-driven savings from non-study-driven savings and apply different installation rates, realization rates, or NTG values to the various categories of savings, as described in the Technical Reference Manual of the DSM Plan.

b) Comprehensive Product Evaluations

In addition to the performance-year M&V described above, Public Service will hire independent third-party consultants to complete comprehensive evaluations for specific products each year. Comprehensive product evaluations are conducted on a staggered schedule so that all products receive comprehensive evaluations at least once every eight years. The principal objectives of the comprehensive product evaluation is to assess customer satisfaction with the DSM product and implementation processes, conduct a thorough review of industry-wide approaches (process evaluation), and/or to assess changes that should be made to NTG ratios based on the evaluator's primary research (impact evaluation). When considering the evaluation recommendations, Public Service will follow the guidance from Decision No. C11-0465, which gives Public Service the discretion to

make changes to its DSM products that are reasonable, cost-effective, and timely; as well as to reject suggested changes that are flawed.⁸⁴

Factors that are taken into consideration in determining the priority and schedule of product evaluations include, but are not limited to: product tenure in Colorado, savings achieved per participant and relative to total goals, product expenditures compared to total budgets, uncertainty and/or risk associated with savings or technical assumptions, and availability of other studies regarding the particular measures. Discussions with portfolio managers, product developers, and technical consultants are used to finalize the priority and schedule of evaluations.

The Company plans to conduct comprehensive process and impact evaluations of Cooling Efficiency, Data Center Efficiency, Insulation and Air Sealing, and Residential Heating in 2017 as well as a process-only evaluation of Commercial Refrigeration, for a total of five evaluations.⁸⁵ In 2018, Lighting Efficiency,⁸⁶ Evaporative Cooling, and School Education Kits will receive comprehensive process and impact evaluations, while Custom Efficiency will receive a process-only evaluation. This schedule will be reviewed at the beginning of each year and may be adjusted based on costs, scope, and need.

c) Portfolio-Wide Technical Assumption Evaluations

In lieu of evaluating product-specific technical assumptions in each comprehensive product evaluation, Public Service has initiated an ongoing portfolio-wide review of its technical assumptions, where the assumptions for all programs are reviewed on a rotating basis approximately every two years. This process will ensure that the Company is using the latest, best information available in every product offered.

NTG ratios will be updated as comprehensive product evaluations are completed, but are generally not be addressed in the portfolio-wide technical assumptions evaluation.

III. EM&V Best Practices

Public Service's ongoing M&V procedures are aligned with utility industry best practices for measuring product results. The Company requires that its contractors follow standard protocols, such as the IPMVP and the California Evaluation Framework. The following links are to some of the common reference materials describe these protocols in more detail:

⁸⁴ Order Addressing Application for Rehearing, Reargument, or Reconsideration & Motion for Extension of Time to File 2012-2013 Plan. Docket No. 10A-554EG, Order No. C11-0465, Pages 6 – 7.

⁸⁵ The Company agreed to conduct four comprehensive product evaluations each year, starting in 2016 under the 2015/16 DSM Plan Settlement Agreement (Proceeding No. 14A-1057EG).

⁸⁶ Under the 2015/16 DSM Plan Settlement Agreement (Proceeding No. 14A-1057EG), the Company also agreed to evaluate each of its lighting products (Home Lighting & Recycling, Lighting Efficiency, and Lighting – Small Business) on a three year rotation. As part of a previous Settlement Agreement, the Company evaluated both the Home Lighting & Recycling and Lighting Efficiency products in 2015; and will evaluate Lighting – Small Business in 2016. This means the initial batch of evaluations was completed in two years due to the timing; therefore, the three-year cycle will resume in 2018, starting with the Lighting Efficiency product.

California Evaluation Framework:

http://www.calmac.org/publications/California_Evaluation_Framework_June_2004.pdf

National Action Plan:

<http://www.epa.gov/cleanenergy/energy-programs/suca/resources.html>

SEE Action EM&V Resource Portal:

<https://www4.eere.energy.gov/seeaction/topic-category/evaluation-measurement-and-verification>

The International Performance Measurement and Verification Protocol can be found in the Products & Services section of the Efficiency Valuation Organization's website at <http://www.evo-world.org>.

B. Targets, Participants & Budgets

Targets and Participants

Not applicable.

Budgets

The robustness of Public Service's EM&V plan is balanced against its costs; we continue to be mindful of the objectives of ensuring accurate savings while keeping expenditures prudent and maintaining the cost-effectiveness of products. The budgets for the various EM&V components are included within this DSM Plan in the following ways:

- *Rebate validation:* Internal labor is charged as an Administration and Product Delivery cost to individual DSM product budgets.
- *Ongoing M&V:* Most outside contractor costs, including database development, data tracking, and reporting, are charged as an M&V cost to individual DSM product budgets and are not included in the general Measurement & Verification budget under the Indirect Products and Services section of the Plan. Budgets for these activities were forecasted based upon historical experience or followed a more general budgeting plan at between 3 to 5% of the respective DSM products' total budgets.
- *Comprehensive Product Evaluations:* Outside consultant costs are included within the "Program Evaluations" budget under the Indirect Products and Services section of the Plan. These costs were developed based on previous evaluation costs.
- Internal Xcel Energy labor that supports administration and oversight of ongoing M&V and comprehensive product evaluations is charged to "Measurement & Verification" or "Program Evaluation" budgets, respectively, under the Indirect Products and Services section of the Plan.

The Company realizes the EPA may require enhanced EM&V protocols for utilities implementing energy efficiency programs in order for those energy savings to count toward future EPA Clean Power Plan targets. If this occurs, we understand this may increase the amount we need to spend annual on EM&V for our electric energy efficiency programs. Since the state's compliance plan for the EPA 111(d) Rule has not yet been drafted as of May 2016 and EM&V requirements for that plan have not been identified, the Company has not proposed to

increase 2017 or 2018 EM&V budgets at this time. The Company does not anticipate that EM&V spending will need to be increased during the 2017-18 time period, given that the compliance period for the Rule will not start until 2022.

C. Application Process

Not applicable.

D. Marketing Objectives & Strategies

Not applicable.

E. Product-Specific Policies

EM&V does not have any specific policies.

F. Stakeholder Involvement

EM&V does not have any unique stakeholder involvement.

G. Rebates & Incentives

Not applicable.

H. Evaluation, Measurement, & Verification

As described in section (A) above and in Table 14 below.

Table 14: Measurement and Verification Summary by Product

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
Business Electric:			
Commercial Refrigeration Efficiency ¹	Prescriptive	General Prescriptive	Verification Contractor selects random sample & performs field inspections of deemed savings factors from implemented measures.
	Direct Install	Unique Prescriptive	Xcel Energy's program implementer documents equipment installed onsite, no further verification is required.
	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects ≥ 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
Compressed Air Efficiency	Prescriptive	General Prescriptive	Prescriptive rebates available for Variable Frequency Drive Compressors that are less than 50 hp and have no air loss drain valves. Verification Contractor selects random sample and performs field inspections of deemed savings factors -- e.g. size of compressor and number of drains.
	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects ≥ 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
	Custom - Study Driven Credit	Unique Custom	Studies may yield direct energy savings from leak fixes. The study provider will identify the location and size of leaks. The study provider and/or the customer will fix the identified leaks. The customer must verify all leak fixes, as 50% or more of the fixes must be completed in order to qualify for the study rebate. A realization rate of 100% is applied to the calculated savings from leak fixes.

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
Computer Efficiency	Prescriptive Rebates	General Prescriptive	Verification Contractor selects random sample and performs field inspections of deemed savings factors -- e.g. equipment type, model of equipment, building type. Information gathered for a sample of VDI devices and extrapolated to total population.
	Upstream/Midstream	Unique Prescriptive	Participating manufacturers will provide periodic sales reports, listing the model, quantity, ship-to zip code and number of computers sold to the third-party administrator. The third-party administrator will enter the information into a tracking system. The administrator will submit monthly reports containing the data tracked to Public Service. Public Service will receive quantity sold/returned, zip codes, efficiency levels, incentive levels and calculate energy savings from the monthly reports.
Cooling ¹	Prescriptive	General Prescriptive	Verification Contractor selects random sample and performs field inspections of deemed savings factors; e.g. equipment type, size, efficiency, climate zone and building type.
	Upstream/Midstream	Unique Prescriptive	Participating distributors will enter sales data into an online application administered by a third-party, listing the make, model, serial number, quantity, installation address and zip code. The third-party administrator will verify customer eligibility and provide periodic sales reports. Verification Contractor selects random sample and performs field inspections of deemed savings; e.g. equipment type, size, efficiency, climate zone and building type.
	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects ≥ 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
Custom Efficiency ²	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects ≥ 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
Data Center Efficiency ¹	Prescriptive	General Prescriptive	Verification Contractor selects random sample & performs field inspections of deemed savings factors; e.g. equipment type, number of equipment.
	Prescriptive	Unique Prescriptive	For verification of the EC plug fan measure installation, the VC will maintain a log of any refusals for site entry for M&V, and subsequently seek out, and document, verbal confirmation of installation from the customer and/or installer.
	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects ≥ 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
Energy Management Systems	Custom	General (EMS) & Unique Custom (EIS)	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects ≥ 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
	Behavioral	Behavioral Custom	The third-party implementer, with review by Xcel Energy engineers, will analyze data from energy information systems (EIS) in accordance with IPMVP criteria and the Company's custom M&V process, to ensure persistence of the behavioral measure's savings. These savings will be reported annually for the duration of the customer's involvement in the EIS measure.
Lighting Efficiency ²	Upstream / Midstream	Unique Prescriptive	Participating distributors provide sales reports listing the model, wattage, type, and number of bulbs sold. The third-party implementer enters the information into a tracking system and submits monthly reports containing the data and calculation of the demand and energy savings using technical assumptions provided by PSCo. The VC audits the database output by examining and comparing against retailer sales reports. The VC adjusts the wattage and number of bulbs if errors are found and provides the final verified savings for all bulbs for year-end.

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
	Prescriptive	General Prescriptive	Verification Contractor selects random sample and performs field inspections of deemed savings factors -- e.g. number of fixtures, equipment type, building type, existence of air conditioning. Information gathered for a sample of lamps/fixtures and extrapolated to total population.
	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects \geq 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
Lighting - Small Business	Prescriptive	General Prescriptive	Verification Contractor selects random sample & performs field inspections of deemed savings factors -- e.g. number of fixtures, equipment type, building type, existence of air conditioning. Information gathered for a sample lamp/fixtures.
	Direct Install	Unique Prescriptive	Xcel Energy's program implementer documents equipment installed onsite, no further verification is required.
	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects \geq 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
Motor & Drive Efficiency	Prescriptive	General Prescriptive	Verification Contractor selects random sample and performs field inspections of deemed savings factors -- e.g. horsepower, efficiency, type, speed, application, building type, and use of motor. For VFDs, size, speed, type, application and use of motor drive, and building type. If more than 10 motors, information will be gathered for a sample.

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects \geq 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
Multifamily Buildings	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects \geq 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
New Construction	Custom - Energy Efficient Buildings	Unique Custom	Consultant visits site and verifies that specified measures were installed. Projects with individual measure savings \geq 1 GWh savings: Four weeks of data logging verifies savings.
	Custom - Energy Design Assistance	Unique Custom	Consultant visits site and verifies that specified measures were installed. Equipment and systems are monitored for a two week timeframe, as appropriate, to evaluate performance variables against modeling assumptions. Projects with individual measure savings \geq 1 GWh savings: Four weeks of data logging verifies savings. All projects verified with actual results not within 15% of the energy savings identified in the original model will have an as-built model completed for rebate calculations.
Process Efficiency	Prescriptive	General Prescriptive	Verification Contractor selects random sample and performs field inspections of deemed savings factors specified for applicable end use product.
	Custom	General Custom	Projects <1 GWh savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification if PSCo engineers complete analysis. Account Manager or Business Solutions Center verifies project installation and collects equipment invoices. Projects \geq 1 GWh savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
Recommissioning	Custom	Unique Custom	Customer hires an engineering firm to conduct study of building and to determine energy savings for each measure. Internal energy efficiency engineers reviews and verifies that savings calculations are accurate for 100% of projects. For measures over 1 GWh of savings, pre and post metering is required to verify savings, if feasible. For projects that are very difficult to meter, a combination of metering and calculation may be used.
Self Direct	Custom	Unique Custom	Customer will calculate savings and Company will verify calculations. Customer will develop and implement M&V plan specific to project. Company will review M&V plan and results. Pre- and post-installation metering and verification will be required for all projects with predicted energy savings greater than 0.25 GWh, unless the Company and customer agree upon another methodology. The Company reserves the right to require data measurement and verification for projects of any size.
Business Gas:			
Commercial Refrigeration Efficiency	Prescriptive	General Prescriptive	Verification Contractor selects random sample & performs field inspections of deemed savings factors from direct installed measures and implemented measures
	Direct Install	Unique Prescriptive	Xcel Energy's program implementer documents equipment installed onsite, no further verification is required.
Heating Efficiency	Prescriptive	General Prescriptive	Verification Contractor selects random sample and performs field inspections of deemed savings factors. For boilers -- size and efficiency. For steam traps -- high or low pressure. For all other -- size and implemented measure.
	Custom	General Custom	Projects <20,000 Dth savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification. Account Manager or Business Solutions Center verifies project installation, collects equipment invoices. Projects ≥ 20,000 Dth savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
Custom Efficiency	Custom	General Custom	Projects <20,000 Dth savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification. Account Manager or Business Solutions Center verifies project installation, collects equipment invoices. Projects \geq 20,000 Dth savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
Energy Management Systems	Custom	General Custom & Unique Custom (EIS)	Projects <20,000 Dth savings: Company engineers or outside engineering firm calculate savings for pre-approval, calculations reviewed by higher levels of engineering staff depending on size. Random samples of projects sent to outside engineering firm for verification. Account Manager or Business Solutions Center verifies project installation, collects equipment invoices. Projects \geq 20,000 Dth savings: Pre & Post Metering verifies savings. (Projects of all sizes may be metered depending on certainty assessment of savings).
	Behavioral	Behavioral Custom	The third-party implementer, with review by Xcel Energy engineers, will analyze data from energy information systems (EIS) in accordance with IPMVP criteria and the Company's custom M&V process, to ensure persistence of the behavioral measure's savings. These savings will be reported annually for the duration of the customer's involvement in the EIS measure.
Lighting – Small Business	Direct Install	Unique Prescriptive	Xcel Energy's program implementer documents equipment installed onsite, no further verification is required.
New Construction	Custom - Energy Efficiency Buildings	Unique Custom	Consultant visits site and verifies that specified measures were installed. Projects with individual measure savings \geq 20,000 Dth savings: Four weeks of data logging verifies savings.
	Custom - Energy Design Assistance	Unique Custom	Consultant visits site and verifies that specified measures were installed. Equipment and systems are monitored for a two week timeframe, as appropriate, to evaluate performance variables against modeling assumptions. Projects with individual measure savings \geq 20,000 Dth savings: Four weeks of data logging verifies savings. All projects verified with actual results not within 15% of the energy savings identified in the original model, will have an as-built model completed for rebate calculations.

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
Recommissioning	Custom	Unique Custom and Study-Drive Credit	Customer hires an engineering firm to conduct study of building and to determine energy savings for each measure. Internal engineer reviews and verifies that savings calculations are accurate for 100% of projects. For measures >1 GWh savings or over 20,000 Dth of savings, pre and post metering is required to verify savings, if feasible. For projects that are very difficult to meter, a combination of metering and calculation may be used.
Residential Electric:			
Energy Feedback Residential	Behavioral	Behavioral Prescriptive	Actual consumption in the form of meter data is used to M&V this program. Meter data for all participants, comparison homes, and control homes are provided to the third-party implementer for continuous analysis and performance reporting. The third-party implementer compares the consumption of participants (Treatment Group) to those of the Control Group to determine the savings resulting from the product.
ENERGY STAR New Homes	Prescriptive	Unique Prescriptive	RESNET Certified HERS rater performs multiple site walk-throughs and at the end of construction determines final HERS rating - 100% site verification. Rebate amount is determined by the modeled energy consumption (as-built home) percent better than local code requirement (reference home). Home size information, measures installed, and HERS rating are verified by third party product implementer and then submitted to Public Service.
Evaporative Cooling ²	Prescriptive	General Prescriptive	Verification Contractor selects random sample and performs field inspections of deemed savings factors; e.g. type of unit (tier 1, 2 or 3), and type of unit if previously installed and if registers and ducting are complete (if applicable to tier).
Home Energy Squad	Prescriptive	Unique Prescriptive	Third-party implementer verifies installation of measures.
Home Lighting & Recycling	Prescriptive	Unique Prescriptive	Third party administrator provides tracking data and manufacturer sales reports for bulbs sold. Verification contractor audits the data and compares to manufacturer sales reports. Verification contractor corrects any errors and calculates energy savings based on Public Service assumptions.
High Efficiency Air Conditioning	Prescriptive	Unique Prescriptive	Verification Contractor selects random sample and performs field inspections of deemed savings factors using a defined process. This includes verifying load calc was performed, unit sized properly and that refrigerant charge, air flow, and duct leakage are within acceptable ranges.

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
Home Performance with ENERGY STAR	Prescriptive	Unique Prescriptive	Third-party product implementer performs a walk through inspection after the homeowner has performed all of their planned energy efficiency improvements. The work conducted by a participating installation contractor will be inspected through this method. Contractors will have first five completed projects inspected followed by a ten percent sample of homes. The product has this permanently built into the product as a requirement to ensure all stated improvements have been made prior to issuing the rebate. PSCO will also implement a market research survey with customers to gauge satisfaction with the product, auditors, and installation contractors that were used.
Refrigerator & Freezer Recycling		Unique Prescriptive	Verification contractor conducts phone surveys of random sample of participants to verify removal of refrigerator and that refrigerator was operable at time of removal.
School Education Kits ²	Prescriptive	Unique Prescriptive	Third-party product implementer conducts mail surveys to teachers/students to confirm what was installed at students home.
Residential Gas:			
Energy Efficient Showerheads	Prescriptive	Unique Prescriptive	Verification Contractor selects random sample & performs phone survey of deemed savings factors -- e.g. did the customer receive the product and was it installed.
Energy Feedback Residential	Behavioral	Behavioral Prescriptive	Actual consumption in the form of meter data is used to M&V this program. Meter data for all participants, comparison homes, and control homes are provided to the third-party implementer for continuous analysis and performance reporting. The third-party implementer compares the consumption of participants (Treatment Group) to those of the Control Group to determine the savings resulting from the product.
ENERGY STAR New Homes	Prescriptive	Unique Prescriptive	Third-party implementer manages certified energy raters who consult directly with builders during construction phase and then assign a HERS rating (with blower door testing) at end of construction prior to rebating for product - 100% site verification. Home size information, measures installed, and HERS rating are verified by product implementer.
Residential Heating ¹	Prescriptive	General Prescriptive	Verification Contractor selects random sample & performs field inspections of deemed savings factors; e.g. manufacturer, model, serial number
Home Energy Squad	Prescriptive	Unique Prescriptive	Third-party implementer verifies installation of measures.

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
Home Performance with ENERGY STAR	Prescriptive	Unique Prescriptive	Third-party product implementer performs a walk through inspection after the homeowner has performed all of their planned energy efficiency improvements. The work conducted by a participating installation contractor will be inspected through this method. Contractors will have first five completed projects inspected followed by a ten percent sample of homes. The product has this permanently built into the product as a requirement to ensure all stated improvements have been made prior to issuing the rebate. PSCO will also implement a market research survey with customers to gauge satisfaction with the product, auditors, and installation contractors that were used.
Insulation & Air Sealing ¹	Prescriptive	General Prescriptive	Verification Contractor selects random sample & conducts onsite verification to confirm measure(s) were installed. VC conducts post blower door test for accuracy of air leakage reduction and confirms that the contractor is certified under Building Performance Institute (BPI), registered under Xcel Energy's program and licensed in Colorado.
School Education Kits	Prescriptive	Unique Prescriptive	Third-party product implementer conducts mail surveys to teachers/students to confirm what was installed at students home.
Water Heating	Prescriptive	General Prescriptive	Verification Contractor selects random sample & performs field inspections of deemed savings factors -- e.g. type of unit installed.
Low-Income Electric:			
Energy Savings Kits	Prescriptive	Unique Prescriptive	Verification Contractor selects random sample & conducts phone surveys to confirm what was installed at recipient's home.
Multi-Family Weatherization	Prescriptive	Unique Prescriptive	Consultant visits building and completes energy audit. PSCo engineer reviews audit report and approves or denies report. Consultant visits site to verify that approved measures were installed and submits final savings in verification report.
Non-Profit Energy Efficiency	Prescriptive	Unique Prescriptive	Consultant visits building and completes energy audit. PSCo engineer reviews audit report and approves or denies report. Consultant visits site to verify that approved measures were installed and submits final savings in verification report.
Single Family Weatherization	Prescriptive	Unique Prescriptive	Contracted weatherization agency visits home, identifies savings opportunities and then installs measures. Weatherization agency provides documentation of completed measures to third-party product implementer, who submits information to PSCo.

Product Name	Program Component	M&V Protocol	2017/18 M&V Plan
Low-Income Gas:			
Energy Savings Kits	Prescriptive	Unique Prescriptive	Verification Contractor selects random sample & conducts phone surveys to confirm what was installed at recipient's home.
Multi-Family Weatherization	Prescriptive	Unique Prescriptive	Consultant visits building and completes energy audit. PSCo engineer reviews audit report and approves or denies report. Consultant visits site to verify that approved measures were installed and submits final savings in verification report.
Non-Profit Energy Efficiency	Prescriptive	Unique Prescriptive	Consultant visits building and completes energy audit. PSCo engineer reviews audit report and approves or denies report. Consultant visits site to verify that approved measures were installed and submits final savings in verification report.
Single Family Weatherization	Prescriptive	Unique Prescriptive	Contracted weatherization agency visits home, identifies savings opportunities and then installs measures. Weatherization agency provides documentation of completed measures to third-party product implementer, who submits information to PSCo.
¹ Comprehensive Evaluation will be conducted in 2017. ² Comprehensive Evaluation will be conducted in 2018.			

➤ Market Research

A. Description

The Company conducts market research and analysis to support effective design and implementation of DSM products and services. This enhances understanding of current and potential customers, market segmentation, and engagement drivers. Additional research is conducted through procurement of third-party consultants who review primary and secondary data. Market research subscriptions that offer energy efficiency and/or marketing resources are also purchased. Research projects are selected and completed, providing strategic information regarding customers, DSM products, and business direction for DSM efforts.

In 2017 and 2018, the Company plans to continue procurement of the following market research resources:

- *E Source* membership provides unbiased, objective research and advisory services that help advance efficiency programs, improve the customer experience, and use energy more efficiently.
- *Dun & Bradstreet* list purchase provides specific demographic information helpful in effectively identifying potential business customers capable of benefiting from existing and planned DSM programs.
- *Consortium for Energy Efficiency* (CEE) membership assists in defining market approaches aimed at more efficient use of regulated energy sources.
- *Attitude, Awareness and Usage* (AAU) research helps gain an understanding of current customer perceptions around energy conservation and gather feedback on product offerings.
- *Home Use Study* provides valuable information regarding saturation of various home appliances and technologies in residential homes.
- *NTG Survey for Prescriptive Products* provides insight into business customer decision making processes shortly after receiving prescriptive rebates.
- *Residential and Business Advertising Tracking* data ensures the effectiveness and reach of DSM advertising efforts by asking customers reactions and recall of specific campaigns.

The list of research projects will be reviewed at the beginning of each year and may be adjusted to align with current information needs.

B. Targets, Participants & Budgets

Targets and Participants

This indirect impact product does not have participants or energy savings.

Budgets

The budget reflects annual internal research costs and third-party vendor costs for market research to execute surveys, collect data from research participants, and analyze and interpret

data, ensuring representative samples of the study populations, to support research results and findings. Respondents may include peer utility contacts with similar programs, customer participants and non-participants, vendor partners and internal staff involved with the programs of interest. Research is often bid competitively among a list of approved vendors.

C. Application Process

This indirect impact product does not have a rebate / participation application.

D. Marketing Objectives & Strategies

Research is focused to identify opportunities that will maximize existing DSM product impacts and identify new marketing opportunities. Market trends are reviewed to identify market potential for DSM products and gauge customer understanding and satisfaction with program implementation.

E. Product-Specific Policies

This indirect impact product does not have any product-specific policies.

F. Stakeholder Involvement

Trade allies and vendors help enable successful execution of market research with integrity and cost-effectiveness.

G. Rebates & Incentives

This indirect impact product does not deliver customer rebates or incentives.

➤ **Product Development**

A. Description

The Product Development team identifies, assesses, and develops new conservation and load management products and services for potential addition to the DSM portfolio. The Product Development process begins when customers, regulators, vendors, or energy professionals submit ideas through an Opportunity Identification Form or when Public Service staff or the Product Development team identifies potential opportunities for new products or measures. The Product Development team works on both energy-efficiency and load-management products.

Opportunity Identification

The Product Development team will screen, research, evaluate, and prioritize ideas for potential inclusion in the DSM portfolio. New items may be added to the portfolio in the form of a new measure within an existing product, launched as a pilot in need of further testing, or as a stand-alone new product. This work enables Public Service to periodically update its portfolio with promising new energy-saving opportunities for customers. The Company reports on its analysis and next steps for concepts submitted via the Product Development Opportunity Identification Form⁸⁷ at quarterly DSM Roundtable Meetings.

The Company will continue to provide at least 30 days notice prior to each roundtable event in order to remind participants of the roundtable to submit Idea Submission Forms for consideration in the Product Development process. The Company will inform participants of the DSM roundtable events of in progress products along with new concepts to be evaluated.

Custom Efficiency Analyses

The team will review measures within the Custom Efficiency product on a periodic basis. As emerging technologies become more commonly rebated as custom measures, the Company will evaluate the potential for transitioning them to prescriptive rebates, if cost-effective.

Net Zero Energy New Construction Project Support

Product Development plans to support a growing number of commercial, industrial, and mixed use buildings and neighborhood developments striving to incorporate strategies across multiple distributed energy resources technologies in order to minimize net energy consumption at the site. These projects require additional assistance beyond that offered in the current Energy Design Assistance offering, including earlier consulting and energy modeling as well as enhanced monitoring and verification once the project is completed and in operation. The focus of Product Development efforts in these projects will be to identify strategies that would enable a streamlined, cost-effective approach to serving these projects through the New Construction program in the future.

⁸⁷ www.xcelenergy.com/productideas

Emerging Technologies Research

Product Development also conducts research on emerging technologies.⁸⁸ Product Development works with other utilities, program administrators and research organizations³ to identify new technologies that have the potential for consistent and measurable energy savings, and are close to commercialization. Promising new technologies are then evaluated through the Opportunity Identification process described above.

Pilots

Pilot programs will continue to contribute to the Company's efforts to innovate and explore new approaches to cost-effectively achieve its energy-efficiency goals. The Company selects measures or products to pilot based on a variety of criteria, including: potential energy savings, cost of savings, customer interest, market dynamics, feasibility to be developed and brought to market quickly and at a reasonable cost, potential longevity of the offering, level of market barriers and risk. In addition to researching new product offerings and emerging technologies, Product Development also explores and investigates new energy-efficiency concepts, market transformation opportunities and market approaches as part of our long-term DSM strategy.

The Product Development team will support implementation and evaluation of the following energy efficiency and demand response pilots during 2017 and 2018:

- ENERGY STAR Retail Products Platform Pilot
- Smart Thermostat Pilot (Residential)
- Small Business Smart Thermostat Pilot
- Building Optimization DR Pilot
- Critical Peak Pricing Pilot

DR Pilots

In addition to the existing operational pilots and those listed above, Product Development also plans to support the Company's forecasted Demand Response goals by focusing research and development efforts to develop new pilots that will help achieve those goals. Product Development will specifically investigate emerging load management technologies, innovative program designs, markets barriers and opportunities, and under-utilized customer segments. By combining those efforts with learnings from current and previous pilots, Product Development will identify strategies and cost-effective opportunities that will contribute to the forecasted DR goals. These efforts may include the pilots listed above as well as future products yet to be evaluated.

⁸⁸ First added in the 2009/10 Biennial DSM Plan (Docket No. 08A-366EG) as part of the Stipulation and Settlement Agreement, Appendix A, Paragraph f, pg. 4; which stated: "The Company agrees to increase the budget for research on emerging technologies and new program development."

³ Examples of research organizations include Western Cooling Efficiency Center (WCEC), E Source, Emerging Technologies Coordinating Council (ETCC), Consortium for Energy Efficiency (CEE), and the American Council for an Energy-Efficient Economy (ACEEE).

The Company will offer to hold at least two meetings with interested stakeholders, to discuss any new pilots that the Company decides to pursue, prior to 60-Day Notice.

B. Targets, Participants & Budgets

Targets and Participants

This is an indirect program and as such, has no estimated energy or participation targets.

Budgets

The budget was estimated based on the historical cost of similar work in other Company service areas. Product Development spending can fluctuate significantly from year to year depending on the products in development and the funding needed to research and develop those products. Due to the nature of the emergence of new technologies within the market, it is not always possible to predict steady expenditures from one year to the next.

C. Application Process

This indirect program does not include a customer application process.

Ideas for new products or measures can be submitted for consideration to the Company by following the detailed instructions included on the forms listed under 'Product Development Idea Submissions' on the Company's website.⁸⁹.

D. Marketing Objectives & Strategies

This indirect program does not have marketing objectives.

E. Product-Specific Policies

Product Development utilizes the following criteria to consider whether a DSM technology / approach warrants exploration via a pilot:

- Does the market assessment indicate broader deployment is possible? Or are additional learnings needed?

⁸⁹ http://www.xcelenergy.com/Company/Rates_&_Regulations/Filings/Colorado_Demand-Side_Management

- Does the preliminary assessment sufficiently answer all technical assumptions?
 - Does sufficient market attractiveness exist for a wide-scale deployment?
- Is additional testing necessary to understand/define the true capabilities of the concept?
 - Has the chosen technology solution been widely deployed elsewhere in a comparable program with comparable learnings?
- Does the enterprise infrastructure support a full deployment or do significant manual processes still exist?
- Do the market, technical and functional requirements meet the needs of all impacted groups (e.g. technical, legal, regulatory, etc.) or are additional learnings needed?

F. Stakeholder Involvement

Public Service will rely heavily on the active participation of employees, customers, trade allies and vendors to successfully identify and develop new products with a high level of integrity, timeliness, and cost-effectiveness. Representatives of the energy-efficiency industry and other stakeholder groups are engaged in the development process through such channels as the quarterly DSM Roundtable Meetings and the use of Opportunity Identification Forms found on the Company's DSM Website.

G. Rebates & Incentives

This indirect program does not provide customer rebates.

➤ **ENERGY STAR® Retail Products Platform**

A. *Description*

A continuation of the product development efforts which began in early 2016, this pilot will engage retailers through midstream incentive payments to increase the demand and supply for the most energy efficient residential plug-load and appliance products on the market, driving greater sales of select ENERGY STAR® certified products to customers. With a combination of incentives and engagement, retailers will assort, stock, and promote more energy efficient models than they would have absent the pilot. Eligible products are expected to include freezers, clothes dryers, room air cleaners, room air conditioners, and sound bars. The shift in product availability will generate energy savings as utility customers purchase and install these more efficient models in their homes.

The Company will engage national retailers through the ENERGY STAR Retail Products Platform (ESRPP), an initiative facilitated by the U.S. Environmental Protection Agency (EPA). The ESRPP is based on the concept of developing a national-level structure for the design of pilot delivery and engagement with retailers. The ESRPP gives sponsors new access to a low-cost retail program through national coordination. The goal of the ESRPP is to transform markets by streamlining and harmonizing energy efficiency programs with retailers, making them less complex and more cost-effective.

Target Market

Market intervention strategies are aimed at a highly concentrated group of retail decision makers. In many energy consuming product categories, a small group of retail merchants and marketers decide which products consumers see on the retail floor, are promoted in-store, advertised in marketing materials and featured on the web. These same retail merchants and marketers purchase millions, and sometimes billions, of dollars of products from global manufacturers which earns retailers significant influence in determining market price and features (such as those contributing to energy performance) of products most prevalent in the market.

Pilot Delivery

The strategy for ESRPP Pilot delivery includes the following main elements:

1. **Pilot Design:** The Company intends to adhere to a consistent national program design and common program implementation to promote core product categories using exact specifications, and will receive a standard set of data from participating retailers. Product categories can be shifted in the longer term as markets develop and change.
2. **Retailer Engagement:** The Company will work through a partnership framework facilitated by EPA to partner with national retailers involved with the ESRPP. Retail Partners will supply the data that will help Public Service develop a local baseline for sales of the core product categories and sales goals for the duration of the pilot cycle. At periodic stages

throughout the pilot cycle, Public Service will be given sales data as agreed upon prior to pilot launch.

3. **Customer Outreach and Education:** Public Service and participating retailers will leverage national marketing messages (with regional enhancements) and co-branded marketing templates developed by EPA in collaboration with Retailer Partners and pilot sponsors participating in the ESRPP, and tailor them directly to the needs of customers in Public Service's service territory.
4. **Incentive Coordination and Processing:** At periodic stages throughout the pilot cycle, the Company will provide participating retailers with incentive payments as agreed prior to pilot launch in Public Service's service territory.
5. **Pilot Performance Tracking and Improvement:** At periodic stages throughout the pilot cycle, the Company will compare aggregate baseline energy savings data to aggregate achieved energy savings data and assess changes in qualified product market share for product categories in order to make recommendations for strengthening and improving the pilot model for the next period.
6. **Reporting:** A predefined set of consistent and detailed category-level sales data will be provided by participating retailers for the purpose of the Company's internal, regulatory, and evaluation, measurement, and verification (EM&V) requirements. Retailers' "business-as-usual" sales strategies for the core products and their chosen sales tactics that were adopted and implemented as a result of the Company's incentive payment will also provide evidence of pilot performance.

B. Targets, Participants & Budgets

Targets and Participants

The energy savings and participation targets for this product were derived from historical data, market data, and equipment deemed savings values.

Budgets

The forecasted expenditures for 2017 and 2018 are based on projected participation levels, promotion, and administration expenses for the 2016 program year. The majority of the product costs are for administration, promotions, and retailer incentives. As the Company learns more about how the pilot performs in 2016, administrative costs should decrease.

C. Application Process

The Company will work with its Retail Partners to establish qualifying retail locations that are located within Public Service's service territory. Additional methods to address the spillover effect related to purchases by consumers not served by the Company will be explored and evaluated through the course of the Pilot.

No application forms are necessary for customers, given the upstream approach of this pilot.

D. Marketing Objectives & Strategies

The Company faces increased challenges in acquiring energy savings from consumer products programs as market share and per-unit efficiency increases for consumer products. The higher efficiency of average units decreases the incremental savings available from more efficient units, which reduces the cost-effectiveness of traditional consumer rebate approaches. With shrinking sales volume and smaller per-unit rebates available, national retailers also having increasing difficulty justifying participation in traditional efficiency programs which vary from region to region with different utilities and their associated disparate rules and offerings. The Company faces higher implementation costs as easy-to-implement program opportunities decline or disappear from the market. The table below summarizes current market barriers and ESRPP Pilot elements that address these barriers.

<i>Traditional Market Barriers</i>	<i>ESRPP Pilot Approach</i>
<ul style="list-style-type: none"> Increasing market share of efficient units and dwindling per-unit energy savings of higher efficient units render traditional consumer rebates less cost-effective. 	<ul style="list-style-type: none"> Smaller per-unit incentive payments are directed toward the retailer rather than the customer to affect increased stocking and sales of targeted measures.
<ul style="list-style-type: none"> Retailers are becoming less interested in participating in utility energy efficiency programs, because they are not core to their business; they introduce cost and complexity; and consumer incentives offered by the utility may not be perceived as offering value and efficacy as a tool for driving sales. 	<ul style="list-style-type: none"> ESRPP, as a national platform, reduces complexity of multiple program approaches and requirements while allowing retailers the flexibility to determine the best path toward reaching sales goals. Incentive payments to retailers help to engage and encourage them to offer ENERGY STAR products to their customers.
<ul style="list-style-type: none"> Administrative costs as a percentage of program costs for retailer-based program implementation are on the rise. Costs for rebate administration may prohibit some products whose incremental costs would yield small rebates from being delivered as cost-effective downstream programs. 	<ul style="list-style-type: none"> Nationally facilitated relationships with retailers and a uniform program structure will increase operational efficiencies and reduce administrative costs for both Public Service and retailer partners.
<ul style="list-style-type: none"> Customers may not always follow through on rebate/incentive applications regardless of their purchase of an ENERGY STAR certified product due to low per-unit rebates or the ease of online purchasing. 	<ul style="list-style-type: none"> ESRPP eliminates the customer responsibility for submitting rebate forms and instead relies on facilitated access to data from participating retailers.
<ul style="list-style-type: none"> Obtaining high quality and detailed sales data from retailers to verify savings. 	<ul style="list-style-type: none"> Retailer Partners in ESRPP have already agreed to provide unprecedented access

<i>Traditional Market Barriers</i>	<i>ESRPP Pilot Approach</i>
	to category-level sales data required for EM&V activities.
<ul style="list-style-type: none"> Quickly evolving retail industry and small per unit energy savings make it difficult to successfully engage consumers in the traditional retail environment due to varying rules and program offerings from region to region across the country. 	<ul style="list-style-type: none"> Collaboration of utility program administrators through the ESRPP creates opportunities to develop cost-effective platforms to engage customers.

E. Product-Specific Policies

While the current set of products contained in the platform for the initial pilot launch have been firmly selected, in the future changes will be made as the Company successfully transforms the market in the Public Service service territory to more efficient products. This transition will be triggered by changes in market share, the development of new products, changes to ENERGY STAR or minimum efficiency standards, or other factors. The goal will be to stay ahead of the market and closely monitor changes in energy efficient products with the goal of maximizing cost-effective energy savings over an increasing number of consumer electronics and appliances. Table 4 below identifies the key metrics for gauging pilot success.

Table 1: Pilot Metrics and Research Questions to be Addressed

<i>Research Question Addressed</i>	<i>Metric</i>
Can this midstream pilot approach yield measureable and cost-effective energy saving impacts?	Gross energy and demand savings associated with purchased/installed measures (purchases x unit energy savings for each qualified product)
	Pilot implementation costs incurred
	Pilot cost-effectiveness (Modified Total Resource Cost (MTRC) test)
Can this midstream pilot approach deliver market transformation?	Increase in number and proportion of qualifying products stocked at participating retailers
	Number of qualifying measures purchased by model/product
	Market share (qualified units as a share of all units sold within each product category)
To what degree are changing codes and standards resulting in “naturally-occurring” DSM that can no longer be claimed by utilities?	Gross energy and demand savings associated with purchased/installed measures due to adoption of codes and standards
What mix of midstream product measures is most cost-effective?	Sales weighted unit energy consumption (UEC) – average usage of all models sold within each product subcategory weighted by their respective sales volume

<i>Research Question Addressed</i>	<i>Metric</i>
	over a specified time period
What influence can a utility DSM program exert over retail market transformation, and thereby customer decision-making at point-of-purchase?	Net unit energy savings (difference between the non-qualified and qualified UEC values within each subcategory)
What are the most effective retail strategies to support the pilot?	Validation of in-store associate training, customer education, promotional and marketing efforts by retailer for qualifying measures sold
Is this upstream pilot approach operationally feasible to sustain in the long-term?	Retailer satisfaction with the pilot and the products

F. Stakeholder Involvement

Through involvement in the ENERGY STAR Retail Products Platform, the Company will work closely with EPA and its affiliates, as well as other Program Sponsors—utilities—across the country. In delivering the pilot, the Company expects to hire a third-party implementer to conduct field visits and engage closely with Retail Partners. The Company anticipates selecting this entity through a competitive process.

G. Rebates & Incentives

The Company will provide incentives to participating retailers in Public Service’s service territory to increase sales of ENERGY STAR certified products. Initially these products will include freezers, clothes dryers, room air cleaners, room air conditioners, and sound bars. Examples of retailer strategies may be increased stocking and promotion of qualifying ENERGY STAR models or marketing campaigns focusing on core products, as well as sales associate spiffs or training. If retailers feel it would effectively increase sales, they may choose to use incentive funds to reduce the sales price for products, but this is not a requirement or an expectation of the pilot. This strategy will be monitored for effectiveness, as described above in Table 3.

The following table identifies the initial consumer products that will be eligible for retailer incentives through the pilot. This list of measures is expected to change as new products are added and new versions of ENERGY STAR qualifications are created by the EPA.

Table 2: Initial Incentive Levels for Qualified Products

<i>ENERGY STAR Certified Product</i>	<i>Specification</i>	<i>Initial Unit Incentive Level</i>
Freezers	ENERGY STAR Version 5.0	\$20
Clothes Dryers	ENERGY STAR Version 1.0	\$50

<i>ENERGY STAR Certified Product</i>	<i>Specification</i>	<i>Initial Unit Incentive Level</i>
Room Air Cleaners	ENERGY STAR Version 1.2	\$20
Room Air Conditioners	ENERGY STAR Version 4.0	\$10
Sound Bars	ENERGY STAR Version 3.0+50%	\$15

To motivate retailers to transform the market towards efficient products, the specifications for qualified products are common among sponsors.

Incentive payments will be made to retailers on a per-unit-sold basis, within a predetermined budget, paid on a regular basis during the pilot cycle. Individual incentive levels for specific product categories may be adjusted throughout the pilot to reflect new cost information or market needs.

H. Evaluation, Measurement, & Verification

EM&V recommendations are being collaboratively developed for this pilot by ESRPP national collaborators, including EPA, the Cadmus Group, and participating utility program administrators, and will be disseminated to pilot participants in 2017 and 2018.

The following activities are representative of the mixed-methods approach contemplated by the ESRPP team. Under this approach, evaluation will rely on systematically gathering and analyzing data from multiple sources using a variety of techniques relevant to the pilot implementation logic model to triangulate savings estimates. The following activities are expected to be included in the EM&V approach:

- Surveys and/or interviews of retailers, contractors, and service providers who participate and/or promote the pilot;
- Collection and analysis of in-store associate training, customer education, promotional and marketing efforts by retailer for qualifying measures sold as well as how the rebate dollars are utilized;
- Interviews with the implementation team and Company staff;
- Interviews with manufacturers;
- Review analysis of historical and pilot-period sales data for each product category from participating retailers (including category level historical data, as well as pilot year categorical level sales data);
- For participating retailers, compare participating stores to non-participating stores with respect to sales of qualified products and market share;
- Visual data inspection to establish trend of pilot influence; and
- Comparison of forecasted higher efficiency unit sales prior to ESRPP implementation to post-implementation actual sales using segmented regression techniques.

Tracking and Reporting

Retailers will help Public Service establish a sales baseline by providing sales data for the 12 months preceding pilot launch for products sold for each product category in participating stores in Public Service's service territory. On a monthly basis, participating retailers will provide sales and model information at the store level. This will be uploaded into a tracking tool with ENERGY STAR product information to identify category-level (qualified and non-qualified) sales and to capture accurate measure-level gross energy consumption and savings for units sold. The Company's implementation team, with the assistance of Retail Partners, will also:

- Verify the reporting of measures for a statistical sample of projects to maintain quality assurance;
- Supply tracking database extracts on an as-needed basis, to be determined by EM&V contractors, to properly measure and verify the pilot savings and ensure accuracy in quarterly reports; and/or
- Track other short-term and mid-term indicators over time to make sure that the pilot is on track to achieve its ultimate objective, which is market transformation.

Net-to-Gross Assumptions

The Company intends, as described above, to derive an appropriate, cost-effective methodology for assigning a Net-to-Gross (NTG) value for each product category before the conclusion of the pilot. For the purposes of the pilot phase, the Company intends to use the following NTG values. These values are based on results from a recent workpaper published by the Pacific Gas & Electric Company with the California Public Utilities Commission.⁹⁰

Table 3: Pilot Net-to-Gross

<i>Measure</i>	<i>NTG</i>
Freezers	48%
Gas Clothes Dryers	83%
Electric Clothes Dryers	66%
Air Cleaners	95%
Room Air Conditioners	81%
Sound Bars	83%

⁹⁰ See http://www.caltf.org/s/CalTF-Workpaper-PGECOAPP128-Retail-Products-Platform_10202015.docx

➤ **Building Optimization DR Pilot**

A. *Description*

The Building Optimization DR Pilot (Pilot) is designed to evaluate the use of building optimization software to obtain reliable Demand Response (DR) load relief from commercial business customers.

Building managers use a variety of systems to manage their energy use. A growing trend in managing these resources is to utilize building energy management systems with “optimization” software to better manage building’s heating, ventilation, and air-conditioning (HVAC) systems. Through the use of cloud-based data collection and energy modeling, a building’s control system can be continuously adjusted to optimize performance. These systems promise to not only maintain occupant comfort level but reduce HVAC usage. Of key interest to the Company is these systems’ promised ability to reduce building loads in response to utility initiated DR control events. One customer segment believed to have potential is commercial office buildings. Traditionally building operators have been reluctant to participate in DR programs as they fear demand reduction measures would be difficult to implement and would adversely impact tenant comfort. The objective of the Pilot will be to: (1) evaluate how effective optimization software is in delivering promised demand reduction and (2) determine how unobtrusive these changes are deemed to be by building operators.

Vendors currently offer building optimization software through “software-as-a-service” (SaaS) models. For the Pilot, the Company plans on subsidizing a portion of the subscription cost for participants. A condition of receiving the software services will be the customers’ release of their building operating parameters for the purpose of studying how the software is used by customers. The load reductions and energy savings will be verified through analysis of the buildings interval meter data and using a third-party measurement and verification (M&V) evaluator to validate the software’s energy savings calculations.

The Pilot aims to address the following questions:

Demand Response:

- What level of DR does this technology deliver (kW/square-foot)?
- Can this demand response be reliably and repeatedly deployed?
- Can this resource be used for short notice events (< 10 minutes)?

Energy Efficiency:

- What level of energy savings can be attributed to optimization software?
- Is the value of energy savings sufficient for customers to subscribe to the software?

Demand Response

The Company plans to test the DR capabilities of building optimization software. Demand response events will be initiated through a utility-controlled DR portal provided by the selected software provider. The optimization software will respond to this control signal by adjusting

HVAC set points within the buildings control system. Through the use of pre-cooling, adjusting space temperatures, fine tuning duct static pressure and similar techniques the buildings load will be reduced. Load reductions will be verified through analysis of interval data collected from the buildings' main electric meter.

A potential draw-back of this technology in regards to demand response is the ability for customers to "opt-out" of DR events. The Pilot will look to understand what the customer's propensity to opt-out is, especially when multiple DR events are scheduled in close succession. Additionally the Pilot will attempt to determine if there is a reduction in the level of DR achieved when events are initiated with minimal advanced warning as compared to events scheduled 12-24 hours ahead of time.

Energy Efficiency

The primary motivation for customers to subscribe to building optimization software services is the promise of overall energy savings and the associated bill reductions. For agreeing to participate in DR events, the pilot participants will receive the software services at a subsidized rate. The Pilot will attempt to verify vendor's claims of the energy savings attainable and whether the associated bill savings are significant enough to persuade customers to subscribe to the service and participate in DR events.

B. Targets, Participants & Budgets

Targets and Participants

The target market for this pilot offering is customers with mid- to large-sized class A and class B office space. Qualifying buildings must have an existing BMS/EMS system compatible with the optimization software selected for the Pilot, a 15-minute interval data recording electric meter, and a minimum of 500 kW peak summer load. A maximum of 10 participants will be recruited.

Budget

The majority of the budget for 2017 is based on the optimization software licensing fee of \$0.09/controlled square foot. There is also budget allocated for Company pilot management, account management support, and third-party evaluation based on estimated expenditures in 2016.

C. Application Process

All Pilot participants have been identified. All participants have already signed a pilot participation agreement which detailed the terms of receiving the optimization software, expectations for participating in control events, and agreement to release data collected from the software for purposes of pilot evaluation.

D. Marketing Objectives & Strategies

Pilot expenditures will continue to be centered on design, research, and evaluation of the technology and pilot delivery techniques, with limited focus on marketing as all pilot participants have been identified.

E. Product-Specific Policies

To qualify for the Pilot, a customer must have buildings with an existing BMS/EMS system compatible with the optimization software selected, a 15-minute interval data recording electric meter, and a minimum of 500 kW peak summer load. In addition, they are required to agree to and sign a pilot participation agreement. By participating, customers will receive the building optimization software services at a subsidized rate for the duration of the Pilot. In return the participant agrees to participate in DR events initiated by the Company during the course of the Pilot. Additionally, participants agree to share data collected by the software with the Company (in accordance with Colorado state data privacy rules⁹¹ and the Company's Privacy Policy). The participants have the ability to opt-out of 15 DR events.

The Company will provide participants with a subscription to building optimization software for the duration of the pilot. The Company has selected a vendor based on their ability to provide the following features:

- *Energy Modeling* capable of accurately modeling the buildings energy requirements.
- *Forecast Energy Usage* incorporating external data streams to forecast energy use.
- *Optimized BMS Management* that interfaces with the existing building management system to optimize operations based on current and predicted conditions.
- *Ability to Maintain or Improve Tenant Comfort*, ensuring conditions conform ASHRAE 55 standards.
- *System Monitoring and Support* that reviews HVAC system performance with participant's building engineering staff.
- *Performance Assessments* provided to participants on a monthly basis, resulting from review of energy modeling and HVAC performance.

The vendor is responsible for providing and installing all equipment necessary to collect data from, and communicate with, the existing building automation system(s).

F. Stakeholder Involvement

Pilot updates and results will be shared with stakeholders through the quarterly DSM Roundtable Meetings. If Pilot results show promise of transitioning this concept to a full product, the development team will seek input from stakeholders on final product design.

⁹¹ CCR 723-3-3026 et seq., available: <http://www.dora.state.co.us/puc/rules/723-3.pdf>.

G. Rebates & Incentives

An objective of the Pilot is to determine whether receiving the benefits provided by the optimization software service (energy savings) at a reduced subscription price provides sufficient motivation for customers to participate in DR events. Because the software is provided through an on-going subscription fee, the rebate for this program will be different than the Company's typical incentive structure. The Company will subsidize 100% of the subscription fees for the first twelve months of participation and 50% of the cost in the second twelve months. The customer is responsible for 50% of the subscription fees in the second twelve months of participation.

H. Evaluation, Measurement, & Verification

Building optimization software is unique in that measurement and verification is an intrinsic part of the system. The process which is used to gather data, create a baseline model, and compare baseline consumption with actual meter data to calculate energy savings is consistent with International Performance Measurement and Verification Protocols (IPMVP). Verification of 2017 demand response event participation and load reduction will be achieved by an analysis of the buildings interval meter data during the event days as compared to baseline consumption on similar days.

The third-party evaluator will prepare a final report with comprehensive results for the summers of 2016 and 2017. The evaluator will provide the final results and descriptions of the methods used for inclusion in the evaluation report that they will deliver to the Company.

The Company will report on demand reductions in the 2017 Annual DSM Status Report, but will not claim against goals since eligible DR and energy efficiency impacts were to be claimed for the Pilot in 2016 only.

➤ **Critical Peak Pricing (CPP) Pilot Program**

A. Description

The Critical Peak Pricing (CPP) pilot program is a tariff rate that was introduced through Public Service's recent Phase II rate case.⁹² Upon approval of the rate by the Public Utilities Commission, the Company intends to offer the program as an additional resource for meeting its demand response goals. Price signals can be used to provide an incentive to reduce system costs, including reducing system peak, ultimately reducing costs for all customers. Tariffs focused on the reduction of system peak act much like Demand Response (DR) programs, and as such should count towards the DR goals.

Critical Peak Pricing programs attempt to strongly encourage – rather than require – customers to reduce their usage during periods when forecasts indicate the electric grid will experience high system loads as a percentage of available generation capacity. The nomenclature “critical peak” is a reference to such periods. The term “pricing” indicates that, rather than requiring load reductions, the Company will charge a high price for usage during these hours that will encourage customers to reduce their usage. During all other hours customers are assessed much lower charges.

The CPP tariff would be available to commercial and industrial (C&I) customers who have existing interval metering. The CPP offering will; provide an additional customer choice, provide customers an opportunity to reduce their bill by managing their energy usage, and contribute to reducing system costs by reducing system peak via the response price signals. This program provides an alternative for customers who cannot, or chose not to participate in the Company's other DR programs such as ISOC.

Participating customers will receive day-ahead notification of when “critical peak” days will occur. Critical peak events will be no more than four hours in duration. These events will always occur on non-holiday weekdays between the hours on noon and eight p.m. A maximum of 15 events can be called in any calendar year.

To better manage their energy usage during peak events participants will be provided with access to their electric load profile data in near real time. Access to this data will not only allow participants to monitor their performance during events, but also provide insight into their energy use throughout the year.

The CPP tariff is designed to be “revenue neutral” for the class average customer. That means a customer with the average load profile within a given rate class would pay the same amount for electricity on an annual basis whether they were on the standard rate or the CPP rate if they do not modify their consumption. This design provides a strong incentive for reducing usage with little inherent risk of an overall increase in electric bills.

⁹² See Proceeding No. 16AL-0048E.

B. Targets, Participants & Budgets

Targets and Participants

The CPP rate will be targeted to larger C & I customers with the sophistication to manage or ability to curtail their energy consumption. Customers would be recruited by Account Management. Market segments which may be interested in this program include:

- Manufacturing – ability to curtail a line or process during an event
- Office (commercial, institutional, etc.) – ability to pre-cool, adjust HVAC settings and shed discretionary loads
- Water/wastewater treatment – ability to shift process times

As this is a pilot program enrollment will be limited to 30 MW of capacity as measured by totaling the participant's annual peak demand. For the 2017 to 2018 Plan PSCo anticipates approximately 30 participants for demand reduction of 5 MW.

Budgets

All administrative and implementation costs are included in the annual budget. Unlike other DSM programs there is no monetary incentive associated with this program. Program costs are attributed to the following areas:

Program Planning & Design – these costs are associated with program development work and include such activities as billing system modifications, market research, equipment specification, developing marketing strategy, etc.

Administration – This category covers costs associated with day-to day operations of the program.

Equipment & Installation – This category reflects the cost to purchase and install monitoring equipment at each participant's facility.

Advertising & Promotion – This category is for marketing campaigns and associated collateral.

M & V – Measurement and verification of program performance will largely be automated through the Company's Demand Response Management System (DRMS). Periodic sampling of participant's data will be done to insure automated processes are performing correctly.

CPP Program Cost Estimates	2017	2018	2019
Program Planning & Design	\$ 50,000	\$ -	\$ -
Administration	\$ 53,000	\$ 53,000	\$ 53,000
Equipment & Installation	\$ 30,000	\$ -	\$ -
Advertising & Promotion	\$ 5,000	\$ 5,000	\$ 5,000
Participant Incentives	\$ -		
M&V	\$ 25,000	\$ 25,000	\$ 25,000
Total Budget	\$ 163,000	\$ 83,000	\$ 83,000

C. Application Process

Account Management will act as the primary channel for delivering this program to market. Account Managers will discuss the CPP tariff option with customers. Those customers wishing to participate will request to be placed on the new tariff. After verifying with the Program Manager whether there is available capacity remaining, the Account Manager will initiate the tariff change for the customer.

Once a customer has elected to be on the CPP tariff, monitoring equipment will be installed to provide the participant with near real time access to their load profile data. Though each participant's configuration may vary depending on their unique circumstance, in general this equipment will consist of a "pulse" device to transmit data pulse outputs from the customer's revenue meter and a data logger to record and translate the pulse outputs and communicate this data back to the Company's DRMS. This process is estimated to take 60 days.

D. Marketing Objectives & Strategies

A critical part of the Peak Savings program's success will be the Company's ability to locate potentially eligible customers, assist them in becoming a part of the program. A qualification of this pilot is the existence of interval metering. This customer base is made up primarily of "managed accounts". Potential customers will be contacted by their account manager to discuss the program. The objective of the meeting is to introduce the customer to the program, discuss tariff requirements, and assist the customer in identifying controllable loads which could be shed during a critical peak event.

Marketing and communication materials will be created to communicate the features and benefits of the program. These will include a rate evaluation tool which Account Managers can use to help customers evaluate whether the CPP rate offers them potential savings opportunities.

A key asset enabling this program will be the Company's DRMS. This system provides the platform from which all its demand response programs are managed. In addition to managing

events and providing customer notification the system will provide program participants with near real time access to their load profile data. Having this data will allow participants to manage their energy use during events to help them maximize their savings.

Overall program success will be tracked and managed by a designated program manager. This individual will work with account managers to insure program participation and MW goals are being met. The program manager will work with additional internal employees including product developers, marketers, technicians, and other product managers to track the progress of the program and meet the program goals and objectives. This goal measurement process consists of monitoring several indicators, including the number of customers participating, event load reduction data, forecasting MW expected during events, and calculating rate savings being achieved by participants.

The CPP program will require the need for ongoing customer support and communication to insure the program delivers reliable results year over year. Therefore marketing is a continuous process—not a single event—which includes initial discussion to recruit participants, then ongoing communication to ensure customers know and can continue to evaluate the benefits of the program in order to retain these customers, and ongoing communication/education about how the program works.

E. Product-Specific Policies

Qualification:

CPP is available to all Colorado business customers receiving electric service under Schedule SG, PG, or TG with the following qualifiers:

- Customers must have existing interval metering
- Customer's load factor for the previous 12 months is 30% or greater. Load factor (LF) is calculated as the customer's total annual usage in kWh divided by the product of the customer's annual peak demand in kW times 8,760. ($LF = \text{kWh}_{\text{annual}} / (\text{kW}_{\text{peak}} \times 8,760)$)
- Customer's average monthly peak demand in the summer (June through September) is equal to or greater than the customer's average monthly peak demand in non-summer months (October through May)

The pilot program will be limited to a total capacity of 30 MW as measured by aggregating the annual peak demand of each participant. Limiting the program in this manner provides the Company the opportunity to study the impact of CPP on system peak demands and base revenues before extending it more broadly.

Contract Term:

There are no contracts associated with this program other than the associated tariff. A minimum period of one year participation is stipulated within the tariff. The customer may elect to leave the tariff for after 12 months and revert to their original rate plan.

Events:

Critical Peak Pricing events are triggered whenever forecasts indicate the electric grid will experience high system loads as a percentage of available generation capacity. Based on historical system peaking conditions, events are most likely to be called during the summer months of June through September, but events may occur in any month throughout the year.

Events may be called between the hours of noon and 8:00 p.m. MST. Events will be no less than one hour duration and no more than four hours duration within this time period. Customers will be subject to no more than one event in any 24 hour period. No individual customer will experience more than 15 events per calendar year, for a maximum of 60 critical peak hours per year.

Load Reductions:

Load reduction will be determined by dividing the total energy reduced during the event period as measured in kWh by the number of hours in the event. Energy reduction will be calculated by subtracting the customer's actual usage during an event from the customer's baseline consumption for the same time period. The aggregate of participant's load reductions during critical peak events will be used to determine the amount of Demand Response provided by the program. Initially this amount has been estimated at 20% of the participant's peak demand based on the Company's investigation of similar programs from other utilities. As results from actual events become available the DR estimates can be adjusted to align with actual expected performance. The Company will create a seasonal DR forecast for the program to account for differences in participant's savings throughout the year.

Baseline Consumption:

For purposes of determining a participants load reduction the customers load during an event will be compared to the customers baseline load. The baseline methodology being proposed for this program is an adaptation of baseline calculations the Company has used in past programs. Public Service updated its historical approaches by reviewing "Measurement and Verification for Demand Response" (2013)¹. This document, commissioned by the National Action Plan on Demand Response Measurement and Verification Working Group, focuses on providing "best DR M&V practices in various market and program contexts." This report provided valuable context on different baseline approaches, and a number of recommendations contained within the report have been incorporated into the baseline.

Specifically for this program, the baseline usage for any 15 minute interval during an event will be calculated as the average of the measured demand during the same interval of the customer's five (5) highest energy consumption days within the last ten (10) non-holiday, non-weekend, non event days.

An event day correction will be made to each 15 minute interval during the event to reflect the impact of weather or other operational changes which could cause substantive differences between the event day and the baseline calculation. This event day correction will be the average 15 minute kW difference between the baseline calculation and the participant's actual load during the hour prior to event notification.

As customer baselines are inherently unobservable, one cannot measure usage which never took place, a poor baseline methodology can lead a systematic bias. To help mitigate this problem, Public Service will regularly evaluate baseline calculations. This can be done by selecting sample participants, calculating their baseline consumption for a simulated event day, and evaluating the difference between the calculated baseline and actual loads. Should these simulations show significant bias that is leading to inaccurate baseline assumptions, then Public Service will develop and recommend changes to the baseline methodology. It is proposed that such an evaluation be done annually prior to the summer event season. Should any changes be warranted, updates to the program would be made through 60-day notice.

Incentives:

CPP participant's "incentive" is the opportunity to save money by reducing usage during high priced critical peak events. Additionally, participants will receive the benefit of having access to their electric load profile data in near real time. Access to this data will not only allow participants to monitor their performance during events, but also provide insight into their energy use throughout the year. Data will be provided in "near real time" with updates occurring at least every fifteen minutes through a customer portal feature of the DRMS.

Notification:

Participating customers will receive advance notice of events. Notifications will be delivered a minimum of 22 hours prior to an event and always during normal business hours between 8:00 a.m. and 5:00 p.m. MST. Notifications will be sent to the customer's designated contact(s) via e-mail, text, voice message, or combination thereof as specified by the customer. Customers are responsible for insuring contact information is kept current and notifying the Program Manager if any changes are necessary.

F. Stakeholder Involvement

The DR Stakeholder group including representatives from the Southwest energy efficiency Project (SWEET), Western Resource Advocates (WRA), Office of Consumer Council (OCC), and Colorado Public Utilities Commission Staff have been updated and had input during the development of this program. The Company will continue to meet and interact frequently with these stakeholders at forums such as the quarterly DSM Round Table and encourages their input.

G. Rebates & Incentives

As previously mentioned there are no rebates or incentives associated with this program comparable to other DSM programs in the portfolio. The CPP pilot participant's incentive is avoiding high priced energy charges during critical peak periods. These charges are established through the CPP tariffs put forward by the Company as part of its Phase II rate case. During critical peak periods participating customers will be charged the following based on their respective rate class:

SG-CPP	\$1.50/kWh
PG-CPP	\$1.35/kWh

TG-CPP \$1.25/kWh

These rates were established in order to provide a strong incentive for customers to reduce their usage during these critical periods. Additionally the Company believes customers must see the opportunity to make a substantial impact on their annual electric bill to entice their participation. As CPP events are limited to 60 hours a year the effective price per kWh was set quite high to present an opportunity for substantial bill savings. At these price points, with an estimated usage reduction of 20% during peak periods, annual bill savings of between 5%-10% could be obtained.

Furthermore, participants face limited risk of increased electric bills as compared to the standard tariff as the CPP rates are designed to be revenue neutral on an annual basis.

H. Evaluation, Measurement, & Verification Plan

The Company will collect interval data from each participant in the Peak Savings Program from monitoring equipment installed as part of program enrollment and/or interval data metering installed as part of their regular electric service. This data will be stored and analyzed within the DRMS. Program performance for each event will be calculated by subtracting the actual aggregated usage of all customers from the aggregated baseline usage during the event window. This calculation, both on the portfolio level and for individual customers, will be automated through the functionality of the Company's DRMS. Performance data will be available to individual participants through the customer portal feature of the DRMS. Customers can view their usage at any time using their unique username and password to log into the system. The amount of demand reduction supplied for a given event is calculated by subtracting the actual aggregated usage of all customers from the aggregated baseline usage during the event window.

Demand Response Program

A. Description

Demand Response (“DR”) provides utilities with a valuable tool for managing peak demand on the electric system. The utility must maintain adequate generation reserve margins to fulfill its obligation to deliver power at all times, even when unforeseen factors impact generation supply. DR offers a lower cost alternative to meet this need as compared to building or acquiring additional generation capacity. The Company’s DR portfolio provides customers with an economic incentive, in the form of rebates or bill credits, in return for their commitment to reduce load when called upon. DR benefits all customers by helping create a more reliable electric system at a lower cost.

Demand response differs from *energy efficiency* in that demand response reduces load only during times of peak demand on the electric system and results in relatively little reduction in overall electric consumption. Energy efficiency, in comparison, provides a permanent reduction in overall electric consumption through equipment replacement, or process or behavior change, only a portion of which may be coincident with system peak demand.

Generally speaking, there are three DR program constructs that the Company intends to leverage:

- *Direct Load Control (“DLC”)* – The Company directly controls a customer’s load, remotely, during periods of high demand creating a dispatchable resource. Saver’s Switch is an example of a DLC.
- *Interruptible Tariffs* – Customers agree to reduce consumption at a pre-qualified discount. These products are also dispatchable. There is a fee associated with non-compliance with a control event. The Interruptible Service Credit Option (“ISOC”) is an interruptible tariff.
- *Other Demand Response* – Programs that would fall into this category include capacity bidding, demand bidding, and other aggregator offers, as well as programs that are non-dispatchable, or those that are directly controlled by customers, such as pricing structures. The Smart Thermostats Pilots are an example.

The Company’s DR portfolio includes all three types of demand response; however, the majority of customer load is from DLC and interruptible tariffs.

Products

Public Company is deploying, as part of this Plan, as potential future load management options. The originating filing and customer targets for each product / pilot are identified in the table below.

Table 15: PSCo's Demand Response Program

Product / Pilot	Customers	Filing Source
Building Optimization DR Pilot	Commercial/Industrial	DSM Plan
ISOC	Commercial/Industrial	07S-521E
Peak Partner Rewards	Commercial	DSM Plan
Saver's Switch	Residential	DSM Plan

DR products and pilots will contribute to both energy and demand savings. Demand savings will count towards total controllable load goals.

The intent of these products and pilots is to (1) minimize increased load adjustments until such time as there is an identified resource need and (2) pilot new approaches so that they could be in place as a need is realized. Pilot products in 2017 and 2018 are aimed to define the magnitude of potential peak capacity available during specific intervals.

B. Targets, Participants & Budgets

Targets and Participants

DR targets are forecasted differently than energy efficiency, as such, the tables below represent the incremental demand reduction estimates for the years 2017 and 2018. Table 2a summarizes the total controllable load expected from ISOC and Third-Party Demand Response. Table 2b, summarizes DSM products and pilots that will contribute to demand reduction, as shown in the Plan's Executive Summary.

Table 16a: 2017 Demand Response Incremental Load for Non-DSM Programs

2017	Marketing & Admin. Budget	Net Gen. MW
ISOC	\$551,323	1.00
Peak Partner Rewards	\$917,047	45.00
Total	\$1,468,370	46

Table 16b: 2018 Demand Response Incremental Load for Non-DSM Programs

2018	Marketing & Admin. Budget	Net Gen. MW
ISOC	\$551,323	0.00
Peak Partner Rewards	\$912,472	14.00
Total	\$1,463,795	14.00

Table 17a: 2017 Demand Response Incremental Load for DSM Products & Pilots

2017	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Demand Response Program				
Building Optimization DR Pilot	\$91,650	0	0	
Critical Peak Pricing Pilot	\$145,000	0	0	
Peak Savings	\$2,627,047	0	0	
Saver's Switch	\$16,316,436	16,120	123,179	1.52
DR PORTFOLIO TOTAL	\$19,180,133	16,120	123,179	1.38

Table 17b: 2018 Demand Response Incremental Load for DSM Products & Pilots

2017	Electric Budget	Net Generator kW	Net Generator kWh	Electric MTRC Test Ratio
Demand Response Program				
Critical Peak Pricing Pilot	\$65,000	0	0	
Peak Savings	\$3,154,472	0	0	
Saver's Switch	\$17,406,029	16,120	123,179	1.48
DR PORTFOLIO TOTAL	\$20,625,501	16,120	123,179	1.36

The Commission-approved demand response goals⁹³ are cumulative (total controllable load) demonstrating the total peak capacity the Company could make available during a control event (as shown in the Table 18). The Commission-approved demand response goals will be used to inform the Company's next Electric Resource Plan.

Table 18: Demand Response Targets & Goals – Total System Controllable Load

	MW		
	2016*	2017	2018
2017/2018 DSM Plan, DR Targets	602	621	646
Commission-approved Goals	602	620	640

*2016 is estimated and being displayed for comparison purposes only.

Budgets

Budgets for demand response efforts fall outside of our energy efficiency budget cap. The budget is a small increase from expenditures on existing DR products, however, an overall increase in budget for DR overall due to piloting opportunities. For 2017/2018, DR budgets were developed using the same well-defined process as all other energy efficiency products.

⁹³ DR goals were established by the Commission in Decision No. C14-0731 (Proceeding No. 13A-0686EG), Paragraph 60.

Budgets are based on incremental program load, with the exception of Saver's Switch, which includes monthly rebates for all installed switches.

C. Application Process

Application processes vary by product. See individual product summaries following this overall for more information.

D. Marketing Objectives & Strategies

In the spring of 2013, the Company completed a market potential study⁹⁴ to determine the overall opportunity for demand response. The study concluded:

- Incremental potential exists within our service territory
- Mass market dynamic pricing is currently not cost-effective, although could provide additional load to the portfolio as metering technologies are adjusted
- Most of the potential remains with dispatchable programs within residential and small to medium business customers

As a result of this analysis, Public Service's plan shows us strengthening our presence within segments that have significant potential: residential and small to medium sized businesses. Pilots such as the Smart Thermostat pilots and Building Optimization Pilots are intended to not only review the opportunity for potential within these segments but also help reduce our shortfall from Target to Goal. Launching the Peak Partner Rewards program further strengthens our presence in the small to mediums sized segment.

E. Program-Specific Policies

There are no DR Program-specific policies. Individual DR products may have unique policies as noted in each of the product summaries that follow.

F. Stakeholder Involvement

Demand Response efforts will follow the same process for stakeholder engagement as energy efficiency products, within the DSM Roundtable when filed originally within the DSM Plan.⁹⁵ DR efforts are also discussed with stakeholders during other proceedings such as our Energy Resource Plan. Beyond the DSM Roundtable and various proceedings, program managers individually involve trade allies, manufacturers and other groups in the development of products.

⁹⁴ *Estimating Xcel Energy's Public Service Company of Colorado Territory Demand Response Market Potential*, July 2013, available here:

https://www.dora.state.co.us/pls/efi/efi.show_document?p_dms_document_id=210750&p_session_id=

⁹⁵ The Third-Party Demand Response and ISOC programs were originally filed outside of the DSM Plan, and therefore will not be included in the DSM Roundtable process.

G. Rebates & Incentives

DR products offer annual or event-oriented incentive payments to participating customers rather than traditional one-time rebate payments. Incentive structures vary by product.

H. Evaluation, Measurement, & Verification

The impacts from the Company's Demand Response programs are analyzed annually. Public Service's load research organization leads an annual research project to evaluate the controllable system load available from our Saver's Switch and ISOC programs. This analysis includes all program participants still active in each program. For the Saver's Switch program the team hires a consultant—that specializes in load research—to conduct the data gathering and most of the analysis on a sample of program participants. For the ISOC program, data is recorded. The results are used to document the extent of load relief achieved during each actual control event occurring within the year. The amount of available total controllable system load is determined by this analysis twice annually in early spring and late summer.

The amount of available total controllable system load is made up from the cumulative historical achievement of incremental participation reported in past Status Reports. This available total controllable system load will differ from the sum of the incremental generator kW achievements reported in past Status Reports due to various reasons, as mentioned above, including but not limited to:

- *Load Loss:* Within DR programs there are factors we define as a "load loss pool." This pool includes customers who choose to discontinue participation as well as those who adjust their commitment to a lower load reduction in the ISOC program.
- *Regulation:* EPA rules, historically, can have an impact on the participation within the ISOC program. Recently, their BUG rules resulted in a significant drop of load from this program.
- *Savings Estimates:* Our Saver's Switch program assumes a deemed controllable system load per switch estimate in Status Reports. The actual controllable system load can vary over time. The Company uses data logging on a sample of installed Saver's Switches to identify the available system controllable load per switch. These data loggers record the actual load of the air-conditioning units controlled by the installed switches. This recorded load is used to estimate the available system controllable load at typical system peaking conditions. This estimated available system controllable load can vary over time due to changes in air conditioner efficiencies and residential conservation efforts. Additionally, performance of the switches varies over time due to the disconnection or mechanical failure of switches.
- *Third-Party Programs:* Any third-party demand response programs are included in the evaluation and may be subject to the reasons listed above for total system controllable load varying each year.

The results of the annual analysis of the impacts from the Company's Demand Response programs is combined with a forecast of the future participation in each DR program to produce a forecast of the total controllable system load expected in the future, referred to as the Load Management Forecast. The company proposes to use this annual analysis, combined with the actual participation in each DR program, to determine the achievement of total system controllable load goals in annual Status Reports.

Pilot programs include their own M&V procedures and are discussed in detail within the individual pilot write-ups.

➤ **Interruptible Service Option Credit (ISOC)**

A. Description

The Interruptible Service Option Credit (ISOC) program offers significant savings opportunities for Public Service's business customers who can reduce their electric demand when notified. In return for participating, customers receive a monthly credit based on the notification option and total interruption hours they select.

During periods of peak demand, such as hot summer days, the system may require more power than is normally available. By participating in this program, ISOC customers help reduce the amount of electricity needed, which helps Public Service meet electric system requirements at critical times.

The program is a tariff rate approved by the Colorado Public Utilities Commission,⁹⁶ and is available to commercial customers in Public Service's electric service territory. To qualify, customers must have an interruptible demand of at least 300 kilowatts (kW) during the months of June, July, August, and September. In addition, the customer must have a Contract Interruptible Load (CIL) of 300 kW or more.

The customer's contracted interruptible load is the median of their maximum daily 1-hour integrated demands, which occurred between noon and 8 p.m. on Monday through Friday (excluding holidays); from June 1 through September 30 of the previous year. In addition, their interruptible demand is the maximum daily integrated demand used during the month that occurred each day between noon and 8 p.m., less any firm demand. Customers must install a phone line that is connected to their meter---this will allow Public Service to provide near real-time usage information.

The participating customer signs a contract that includes their selected firm demand, the hours of interruption per year, and their advance-notice requirement. Customers can use electricity as usual until Public Service notifies them of a control period. The Company will give advanced notice before requiring the customer to curtail electricity use. Then, during the interruption period, customers cut their electricity use down to the firm demand chosen in their program agreement.

Customers choose the amount of interruption appropriate for their facility. The credit they receive is tied to the number of hours they contract to be interrupted each year and their advance notice option.

Interruption periods are triggered as a result of capacity, contingency and/or economic constraints. Economic interruptions are the only interruptions that offer the customer a buy-

⁹⁶ Docket No. 07S-521E.

through option. Currently, all interruptions (events) last a minimum of 4 hours, unless the customer has chosen to waive the 4-hour minimum interruption timeframe.

Unless customers choose the *Within-10-Minute Notice* option, the Company does not reduce the amount of electricity available to the customer's facility; it's up to the customer to take steps to reduce their load during control periods. If customers do not meet their agreed-upon load reduction, they will be charged penalties.

B. Targets, Participants & Budgets

ISOC is available to all customers that qualify for the tariff. From a total demand credit budget perspective, dollars allocated for this initiative are based on the number of hours they contract to be controlled each year, the amount of controllable load they have available, and their advance notice option.

As of January 1, 2016, there were 89 Public Service customers participating in the ISOC program. The Company anticipates these same business customers will continue to participate in the program in 2017. Based on the contracted interruptible load of these ISOC customers, the budget for customer credits is \$30,124,459.16. These credits paid are an actual monthly credit to the customer's energy bill so the above is the projection in 2017.

Other ISOC budget items include the development of marketing materials, such as customer ISOC System Guides (described in section D below), as well as an annual training for customers and Account Managers to share updates on any enhancements or revisions to the program. Total program administrative costs including marketing, labor, incentives, and system O&M is forecasted to be \$551,323 in 2017 and 2018.

C. Application Process

Account Managers play a vital role in communicating the benefits of this program to potential customers. They spend a great deal of time with the customer throughout the application process to ensure that the customer meets all the requirements of the program, and that all program information is understood. When customers decide to join the program, they will work with their Account Manager to determine the following:

Qualification:

ISOC is available to all customers that qualify for the tariff rate. Prior to completing a contract, the customer must have a minimum of 300 kW of Interruptible Demand in each of the summer months of June, July, August, and September. Additionally, the customer's CIL for Planning Reserves must be greater than 300 kW. The Interruptible Demand and CIL figures must be reduced by any Contract Firm Demand the customer chooses.

Contract Term:

The initial contract term shall be 24 months followed by an annual term that is automatically renewed each year.

Trial Period Provision: There is a first-year trial period provision provided in the tariff (*for example:* If the customer signs-up for ISOC in April, the trial period will run from April through December of that year). A six-month written notice is required from the customer in order to cancel their participation. If the customer chooses to cancel their agreement in the first year they can do so by returning all credits paid. Subsequently, the Company will return any capacity/contingency penalties and cancel the contract. This provision is only available to participants during the year in which the contract is signed.

Contract Authorization:

Once it is determined that the customer will qualify for the ISOC, an Interruptible Service Option Agreement will be executed. The Agreement must be approved by the customer and by an authorized representative of Public Service prior to May 31 for the customer to receive credits in that year.

D. Marketing Objectives & Strategies

A critical part of the ISOC program's success is the Company's ability to locate potentially eligible customers, assist them in becoming a part of the program, and provide service according to the tariff. That process begins by running a query on the customer information system to locate business customers in the electric service territory that meet eligibility requirements for the ISOC program.

Potential customers that meet program eligibility requirements are contacted by an Account Manager, and a meeting is scheduled with interested businesses. The objective of the meeting is to introduce the customer to the various ISOC program options, and discuss program requirements and responsibilities.

In addition to this customer prospecting process, marketing and communication materials are created, and these materials are used to communicate the features and benefits of the program. These marketing materials include:

- The "Interruptible Service Option Credit (ISOC) System Guide" – Provided to customers on an annual basis and is a valuable reference to navigating the ISOC tracking system.
- Electric Rate Savings Feature Sheet – Summarizes the program features and benefits, and helps potential customers determine their qualification status.
- Electric Rate Savings Credit Sheet – Outlines various control options and assists customers in understanding the savings they could realize by participating.
- ISOC Website – Extensive program information is also included on the Xcel Energy website for current and potential customers.⁹⁷ The website is reviewed on a consistent basis to ensure the information is current.

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http://www.xcelenergy.com/Programs_and_Rebates/Business_Programs_and_Rebates/Rates/Interruptible_Service_Option_Credit

Account Managers conduct outreach to potential customers utilizing the marketing and communications materials referenced above. The Account Managers play a crucial role in this program by interacting with customers on a regular basis to ensure customer satisfaction.

A group of internal employees including analysts, Account Managers, product developers, marketers, technicians, and product managers are also continually working to track the progress of the program to meet the program goals and objectives. This goal measurement process consists of monitoring several indicators, including the number of customers participating, interruption data, MW available for control, and credit dollars.

Much of the effort for future ISOC marketing initiatives will involve working to target qualified customers and increase the level of communications to current and potential customers.

For a program of this nature, it is not only important to promote the program up-front, but customers also need ongoing support and communication. It should also be noted that we view marketing as a continuous process—not a single event—which includes initial discussion to recruit participants, then ongoing communication to ensure customers know and can continue to evaluate the benefits of the program in order to retain these customers, and ongoing communication/education about how the program works.

This effort includes pre-season communication and training, as well as during and post-control event communications and support. Marketing staff work to understand the various stages of any particular customer's interpretation of the program and provide materials and support necessary to ensure consistent and positive customer experience.

Marketing encompasses both solicitation communications and education, and also on-going program communication, including training to retain participant customers in support of achieving the capacity deferral benefit potential of the program, as captured in the Company's ISOC forecast.

E. Product-Specific Policies

All contracts for service under this schedule shall be for an initial two-year term, with automatic one-year renewal terms. A customer must provide the Company a six-month advance notice in writing to cancel service under this schedule.

Any time during the first year of service under the contract a customer may opt to cancel by returning all monthly credits received to date. No additional payment will be assessed.

Any customer who cancels service without complying with the Service Period requirements under this schedule shall be required to pay Public Service, as a penalty, an amount equal to the product of 110% times the customer's CIL times the customer's Monthly Credit Rate for each of the remaining months of the unexpired contract term.

In addition, the customer shall reimburse Public Service for the direct cost incurred for equipment to measure the customer's Interruptible Demand and to interrupt the customer.

F. Stakeholder Involvement

Colorado business customers have played a major role in the on-going dynamics of this program. The Company continues to meet frequently and interact with these business customers to encourage their input.

G. Rebates & Incentives

The monthly kW credit paid to customers as part of the ISOC program is calculated by multiplying the Monthly Credit Rate by the lesser of the customer's CIL or the actual Interruptible Demand during the billing month. The credits are a monthly credit to the customer's energy bill.

The Monthly Credit Rate is revised effective January 1 each year, and shall remain in effect for the calendar year. The Monthly Credit Rate will vary by season. The summer season runs from June 1 through September 30, and the winter season is October 1 through May 31.

The number of hours in the year that each customer elects as interruptible is set in the ISOC Agreement. The options include 40 hours, 80 hours, or 160 hours.

H. Evaluation, Measurement, & Verification

There are both ISOC MW and ISOC credit dollar budget goals in place. The Company conducts M&V by monitoring progress toward these goals on a monthly basis to ensure alignment with the budget forecast. In addition to this on-going monitoring, the Company will have periodic meetings throughout the year with key ISOC players to evaluate the program strategy, and to measure and verify progress. Adjustments will be made in the marketing approach at that time, if warranted.

➤ **Peak Partner Rewards Program**

A. Description

The Peak Partner Rewards Program is a new Demand Response program designed to provide Public Service's business customers an incentive for agreeing to reduce their electrical loads when the electric grid experiences peak demand periods. The program is similar in concept to the ISOC program, but is designed to be more flexible and target customers who are not currently eligible for ISOC. Customer incentives will be outlined within a new tariff which may be updated annually, allowing the Company to balance program cost effectiveness and customer participation.

The Peak Partner Rewards Program will provide a replacement for customers currently participating in the third-party demand response program managed by EnerNOC. EnerNOC's contract expires at the end of 2016 and will result in the loss of approximately 37 MW of load relief from Public Service's DR portfolio. It is anticipated most of the customers participating in EnerNOC's program will transition to the Peak Partner Rewards program, thus maintaining Public Service's overall DR portfolio and providing opportunities for growth through additional customer acquisitions.

Participating customers will sign a contract agreeing to reduce a minimum load at their facility during peak demand periods. This minimum load will be determined by the customer based on their ability to manage operations within their facility, but must be at least 25 kW. Customers will receive a monthly credit (reservation incentive) based on this committed load reduction. During peak periods, customers will receive an additional incentive based on their total load reduction, measured in kWh, during the event (performance incentive). Customers who participate in the program will receive an additional benefit of having access to their electric load profile data in near real time. Access to this data will not only allow participants to insure they are complying with their contractual obligations, but also provide insight into their energy use throughout the year.

To facilitate a rapid build-up of program participants, the Company plans on utilizing a third party implementer. The implementer will augment the efforts of Public Service's Account Management and Business Solutions Center teams in acquiring customers.

Peak periods (events) are triggered as a result of capacity, contingency and/or economic constraints upon the electrical system. All interruptions will last a maximum of 4 hours. Participating customers will receive at least one hour notice prior to an event. If customers do not meet agreed upon load reduction they will not receive their event payment and may be removed from the program.

Peak Partner Rewards is designed to price capacity at or below the cost of avoided capacity as defined within the 2017-2018 DSM Plan Cost Benefit assumptions. This means that purely on a capacity basis, the program should always yield positive net benefits.

B. Goals, Participants & Budgets

Targets and Participants

Peak Partner Rewards is available to all commercial customers who can commit to reducing their electric load by a minimum of 25 kW. Initial marketing of the program will be focused on customers who previously enrolled in the EnerNOC managed third-party program. This covers a diverse spectrum of commercial and industrial customers, ranging in size from >1 MW to <100 kW.

For the 2017 to 2018 Plan the Company anticipates approximately 315 participants for demand reduction of 59 MW.

Budgets

Program costs are attributed to the following areas:

Program Planning & Design – these costs are associated with program development work and would include such activities as market research, equipment specification, developing marketing strategy, etc.

Administration – This category covers costs associated with day-to day operations of the program. Included in this category are expenses for the third party implementer assisting with the program.

Equipment & Installation – This category reflects the cost to purchase and install monitoring equipment at each participant's facility. Expenditure is expected to be greatest in the early years of the program as the participant base is built. Future expenditures will reflect costs of growing the program incrementally and any ongoing equipment maintenance for current participants.

Advertising & Promotion – This category is for marketing campaigns and associated collateral.

Participant Incentives – Participant incentives account for the bulk of the program budget and include both a reservation incentive for contracted load reduction and a performance incentive for actual load reduction during event days.

M & V – Measurement and verification of program performance will largely be automated through the Company's Demand Response Management System (DRMS). Periodic sampling of participant's data will be done to insure automated processes are performing correctly.

Peak Partner Rewards Program Costs	2017	2018
Program Planning & Design	\$0	\$0
Administration	\$592,953	\$560,289
Equipment & Installation	\$274,094	\$302,183
Advertising & Promotion	\$25,000	\$25,000
Participant Incentives	\$1,710,000	\$2,242,000
M&V	\$25,000	\$25,000
Total Budget	\$2,627,047	\$3,154,472

C. Application Process

Peak Partner Rewards will be offered to business customers of all sizes. Therefore program marketing will be delivered through several channels; Account Managers for larger C&I customers (Managed Accounts), the Business Solutions Center for non-managed customers making in-bound inquiries, and a third party implementer who will assist in transitioning customers from the legacy program as well as provide an additional resource to Account Managers and Business Solutions Center staff. Through these channels customers interested in the program will be guided through the following application details:

Qualification:

Peak Partner Rewards is available to all business customers who can agree to reduce usage during the summer months, June through September, between the hours of 2:00 p.m. and 6:00 p.m. by a minimum of 25 kW.

Contract Term:

The initial contract term shall be 24 months followed by an annual term that is automatically renewed each year. A sixty day written notice is required from the customer in order to cancel their participation. If the customer chooses to cancel their agreement in the first year they can do so by returning all credits paid. This provision is only available to participants during the year in which the contract is signed

Contract Authorization:

Once it is determined that the customer will qualify for Peak Partner Rewards, Peak Partner Rewards Program Agreement will be executed.

D. Marketing Objectives, Goals, & Strategy

A critical part of the Peak Partner Rewards program's success will be the Company's ability to locate potentially eligible customers, assist them in becoming a part of the program, and provide service according to the tariff. Customers that participated in the third party demand response program or those with similar attributes will be targeted initially as they are likely adopters of this new program.

Potential customers will be contacted by an Account Manager or the implementation provider to discuss the program. The objective of the meeting is to introduce the customer to the program, discuss program requirements and responsibilities, and assist the customer in identifying controllable loads which could be shed during an interruption.

Marketing and communication materials will be created to communicate the features and benefits of the program. These marketing materials will include a program guide summarizing key features and benefits and a Peak Partner Rewards website accessible on the Company's website to provide more extensive program information.

A key asset enabling this program will be the Company's Demand Response Management System (DRMS). This system, being procured and installed in 2016, will provide the platform from which all of the Company's demand response programs are managed. In addition to managing events and providing customer notification, the system will provide program participants with near real time access to their load profile data. Having this data will allow participants to manage their energy use during events to insure they comply with their contractual requirements as well as maximize their potential incentive.

Overall program success will be tracked and managed by a designated Program Manager. This individual will work with Account Managers, Business Solutions Center representatives, and the implementation provider to insure program participation and MW goals are being met. The program manager will work with additional internal employees including product developers, marketers, technicians, and other product managers to track the progress of the program and meet the program goals and objectives. This goal measurement process consists of monitoring several indicators, including the number of customers participating, interruption data, MW available for control, and incentive dollars.

The Peak Partner Rewards Program will require the need for ongoing customer support and communication to insure the program delivers reliable results year over year. Therefore marketing is a continuous process—not a single event—which includes initial discussion to recruit participants, then ongoing communication to ensure customers know and can continue to evaluate the benefits of the program in order to retain these customers, and ongoing communication/education about how the program works.

E. Product-Specific Policies

Third Party Implementer:

To facilitate a rapid build-up of the program's participant base the Company plans on utilizing a third party implementer. The implementer will augment the efforts of Public Service's Account Management and Business Solutions Center teams in acquiring customers. It is the Company's intent to engage EnerNOC for this purpose in 2017. As EnerNOC currently manages the third-party demand response program and has established relationships with those customers, they are well suited to transition customers to this new program. After the outcome of recruitment in 2017 has been established, if necessary an RFP will be issued in 2018 to select a vendor to provide future implementation services.

Qualification:

Peak Partner Rewards is available to Public Service's firm rate Commercial and Industrial customers who are not currently under an existing interruptible contract (ISOC), Critical Peak Pricing tariff, or on a Standby Tariff. Participants must agree to reduce usage by a minimum of 25 kW during the summer months, June through September, between the hours of 2:00 p.m. and 6:00 p.m.. Although no minimum or maximum customer size is required, the program is focused on providing an option to customers with smaller loads who do not qualify for the ISOC tariff.

Events:

Demand response event periods are triggered as a result of capacity, contingency and/or economic constraints upon the electrical system. Based on historical system peaking conditions, events are most likely to be called during the summer months of June through September, but events may occur in any month throughout the year.

Events may be called between the hours of 12:00 p.m. and 8:00 p.m. MST. Events will be no less than one hour in duration and no more than four hours in duration within this time period. Customers will be subject to no more than one event in any 24 hour period. No more than 15 events would be called for any one customer during a given year (60 total event hours).

In addition to events called for a specific need, each customer may be subject to up to two test events each calendar year. The purpose of test events is to insure participants are able to deliver the load reductions committed. Participants will receive the same incentive for test events as for actual events.

Should a capacity or contingency situation arise outside of the prescribed hours of 12:00 p.m. to 8:00 p.m., program participants may be notified and asked to curtail load on a "best effort" basis. The customer will be under no obligation to reduce load, but those able to participate will be compensated for energy reductions at the tariffed incentive level.

Contracts:

Term - All contracts for service under this schedule shall be for an initial two-year term, with automatic one-year renewal terms. A customer must provide Public Service a sixty day advance notice in writing to cancel.

Load Reduction Obligation – Each participating customer will be responsible for reducing their facilities load during an event by an amount equal to or greater than that designated within their contract. Participants will designate their load reduction obligations, in terms of kW, by calendar month. The kW commitment can vary each month and may be a zero kW commitment, however during the summer months of June through September the participants commitment can not be less than 25 kW.

Load reduction during an event will be determined by taking the total energy reduction during the event period as measured in kWh and dividing by the number of hours in the event. Energy reduction will be calculated by subtracting the participant's actual usage during an event from the participant's baseline consumption for the same time period. The customers minimum hourly load reduction must be no less than the kW stipulated within the participant's contract.

Baseline – For purposes of determining a participants load reduction the customers load during an event will be compared to the customers baseline load. A description of the baseline methodology is provided later in this document.

Penalties - If a participant does not meet or exceed their contractual obligation they will not receive payment of their performance incentive. If a participant fails to meet their contractual obligation during two events within the same calendar year they will be dropped from the program. Should a participant elect to leave the program during their initial two-year contract term, a one-time fee of \$500 will be assessed to cover costs associated with decommissioning hardware supplied to the participant for this program.

Incentives:

Customers will receive three distinct incentives for their participation:

Reservation Incentive – The customer will receive a credit on their monthly bill for the capacity they have agreed to supply within their contract. This incentive is designed to keep customers committed to the program over the long term.

Performance Incentive – Participants will receive an additional incentive based on actual performance during events. This is designed to help insure customers meet their obligation during actual events. The incentive is based on a participants total energy reduction during the event period.

Load Profile Data Access – Customers who participate in the program will receive an additional benefit of having access to their electric load profile data in near real time. Access to this data will not only allow participants to insure they are complying with their contractual obligations, but also provide insight into their energy use throughout the year. Data will be provided in “near real time” with updates occurring at least every fifteen minutes through a customer portal feature of the DRMS.

Notification:

Participating customers will receive advance notice of events. Notifications will be delivered a minimum of one hour prior to an event and will include the event start time, duration of event, and event end time. Notifications will be sent to the participating customer’s designated contact(s) via e-mail, text, voice message, or combination thereof as specified by the customer. Customers are responsible for insuring contact information is kept current and notifying the Program Manager if any changes are necessary.

Baselines:

For purposes of determining a participants load reduction the customers load during an event will be compared to the customers baseline load. The baseline methodology being proposed for this program is an adaptation of baseline calculations the Company has used in past programs. Public Service updated its historical approaches by reviewing “Measurement and Verification for Demand Response” (2013)¹. This document, commissioned by the National Action Plan on Demand Response Measurement and Verification Working Group, focuses on providing “best

DR M&V practices in various market and program contexts.” This report provided valuable context on different baseline approaches, and a number of recommendations contained within the report have been incorporated into the baseline.

Specifically for this program, the baseline usage for any 15 minute interval during an event will be calculated as the average of the measured demand during the same interval of the customer’s five (5) highest energy consumption days within the last ten (10) non-holiday, non-weekend, non event days.

An event day correction will be made to each 15 minute interval during the event to reflect the impact of weather or other operational changes which could cause substantive differences between the event day and the baseline calculation. This event day correction will be the average 15 minute kW difference between the baseline calculation and the participant’s actual load during the hour prior to event notification.

As customer baselines are inherently unobservable, one can not measure usage which never took place, a poor baseline methodology can lead a systematic bias. To help mitigate this problem, Public Service will regularly evaluate baseline calculations. This can be done by selecting sample participants, calculating their baseline consumption for a simulated event day, and evaluating the difference between the calculated baseline and actual loads. Should these simulations show significant bias that is leading to inaccurate baseline assumptions, then Public Service will develop and recommend changes to the baseline methodology. It is proposed that such an evaluation be done annually prior to the summer event season. Should any changes be warranted updates to the program would be made through 60-day notice.

F. Stakeholder Involvement

The DR Stakeholder group including representatives from the Southwest energy efficiency Project (SWEET), Western Resource Advocates (WRA), Office of Consumer Council (OCC), and Colorado Public Utilities Commission Staff have been updated and had input during the development of this program. The Company will continue to meet and interact frequently with these stakeholders at forums such as the quarterly DSM Round Table and encourages their input.

G. Rebates & Incentives

The Peak Partner Rewards program was designed to price capacity at or below the avoided costs used within this DSM Plan. levelized avoided cost of a combustion turbine. This results in a program that, on a capacity basis, always yields positive net benefits.

Reservation Incentive – The Reservation Incentive is a monthly kW credit calculated by multiplying a capacity payment by the participant’s contractual summer load reduction obligation. The capacity payment for the 2017-2018 DSM Plan year’s is \$2.00/kW-mo.

Performance Incentive – The performance incentive is calculated by multiplying an energy payment by the participants total energy reduction during the event period. The energy payment

for the 2017 – 2018 DSM Plan year's is \$0.70/kWh. Based on an estimated 20 event hours per year this equates to \$1.17/kW-mo. The energy payment does not necessarily reflect the anticipated marginal cost of energy during event periods. It's value was established to provide participants a compelling incentive to perform during demand response events.

Administration Costs - Administration costs over a five year program life have been estimated to determine average annual costs. These costs can be reflected in dollar per kW terms of \$0.8/kW-mo on a levelized basis.

Adding the reservation incentive, performance incentive, and administration costs result in a total capacity cost for the program of \$3.97/kW-mo.

	Unit Cost	\$/kW-mo
Capacity Payment (\$/kW)	\$ 2.00	\$ 2.00
Energy Payment (\$/kWh)	\$ 0.70	\$ 1.17
Customer Incentive		\$ 3.17
Administrative Costs (avg/yr for 5 years)	\$531,889	\$0.81
Total Program Costs (20 hours/yr)		\$3.97

H. Evaluation, Measurement, & Verification Plan

The Company will collect interval data from each participant in the Peak Partner Rewards Program from monitoring equipment installed as part of program enrollment and/or interval data metering installed as part of their regular electric service. This data will be stored and analyzed within the DRMS. Program performance for each event will be calculated by subtracting the actual aggregated usage of all customers from the aggregated baseline usage during the event window. This calculation, both on the portfolio level and for individual customers, will be automated through the functionality of the Company's DRMS. Performance data will be available to individual participants through the customer portal feature of the DRMS. Customers can view their usage at any time using their unique username and password to log into the system. The amount of demand reduction supplied for a given event is calculated by subtracting the actual aggregated usage of all customers from the aggregated baseline usage during the event window.

➤ **Saver's Switch**

A. Description

Saver's Switch® is a demand response product that offers residential participants a \$40 annual bill credit as an incentive for allowing the company to control operation of their central air conditioners on days when the system is approaching its peak. This product is generally utilized on hot summer days when Public Service's load is expected to reach near-peak capacity. Since the launch of Saver's Switch in 2000, Public Service has declared an average of seven control days per year. Saver's Switch helps reduce the impact of escalating demand and price for peak electricity.

When activated, a control signal is sent to interrupt the customer's central air conditioning load during peak periods, typically between the hours of 2:00 p.m. and 7:00 p.m. on weekdays. The product deploys switches with varying load control strategies:

- Switches installed prior to 2004 are cycled 15 minutes out of every 30 minutes (a 50% cycling strategy) during the control period.
- Switches installed after 2004 have utilized an "adaptive algorithm" cycling strategy. This strategy allows the switches to "learn" how a customer's air conditioning is being operated in order to achieve a 50% reduction in load. The newer switches generally provide greater load reduction per unit. Approximately 96% of the approximately 193,000 switches in the field (as of December 31, 2015) use the adaptive algorithm strategy.

Control events, normally last for about four hours on a control day and take place in the late afternoon or early evening. With the expanding participant population, Public Service has created sub groups of participants to enable the activation of less than the entire population at a time. This gives the company flexibility to better manage peak demands on the system.

B. Targets, Participants & Budgets

Targets and Participants

The program has been heavily promoted to residential homeowners over the past seven years. As a result, believes that the program penetration rate among eligible customers now exceeds 50%. With the high penetration rate, the Company is seeing a challenging recruiting environment with diminishing response rates to promotional activities. In 2017 and 2018, Saver's Switch target has been increased to 16,000 new switches per year, to reach company commitments for the demand response portfolio. In addition, the company will replace approximately 4,000 older Saver's Switches deployed prior to 2005. While increasing available load relief, due to the technology being newer, these replacements not be counted toward the program achievements.

Budgets

The primary costs in operating the Saver's Switch product are: the cost of switches, switch installation, rebates for participating customers, and promotional expenses for recruiting participants.

C. Application Process

Customers may sign up for the product via a mail-in form, phone, or the Company website.⁹⁸ Applications are generally processed and switches installed within six to eight weeks. Due to variations in air conditioner age, code compliance, and where the A/C unit is located (next to the house), the installer will make the final onsite determination as to whether the customer qualifies for the product. The installation works normally takes place entirely outside, allowing customers not to be home for the installation.

D. Marketing Objectives & Strategies

Saver's Switch is promoted to residential customers using a variety of channels including bill inserts, company newsletters, print and radio advertising, direct mail and telemarketing.

Based on an analysis of customer energy usage during the summer months and market research, Public Service estimates that approximately 325,000-375,000 residential electric customers in Colorado have central air conditioning. Of those, about 193,000 were signed up for the product at the end of 2015. Where possible (i.e. in direct mail and telemarketing), the Company directs its promotional efforts to customers identified as likely to have central air conditioning.

In 2017 and 2018, Public Service expects to continue an intense promotional effort with activities including:

- Direct mail, including up-front incentives to new participants
- Outbound telemarketing
- E-mail marketing
- Bill inserts
- Radio advertising
- Print advertising

E. Product-Specific Policies

Saver's Switch has the following additional requirements:

- The product does not offer customers the choice of opting out of individual control days. The one exception is in the case of medical emergencies where customers can be removed from the product on very short notice.
- When a customer moves into a premise with a pre-existing switch, they are automatically enrolled in the product, but notified that they may opt-out.

⁹⁸ www.xcelenergy.com/saversswitch

- Upon request for a Saver's Switch from a customer, a third-party implementer installs the switch. The third-party makes the determination in the field as to whether or not a switch can be successfully deployed, depending on the age of the A/C unit, electrical code compliance, etc.

F. Stakeholder Involvement

Public Service recognizes that the HVAC community and homebuilders are in a position to influence customer attitudes towards the product. The HVAC community may also have lingering misconceptions about Saver's Switch being harmful to customers' air conditioners. Public Service is planning to increase its efforts to educate the HVAC / builder community about the benefits of Saver's Switch to customers.

G. Rebates & Incentives

Product participants will receive a \$40 discount on their October energy bills following participation in the preceding summer control season.

H. Evaluation, Measurement, & Verification

Public Service's load research organization leads an annual research project to evaluate the load relief achieved from installed Saver's Switch units. The team hires a consultant—that specializes in load research—to conduct the data gathering and most of the analysis. A sample of participants is included in the research, undertaken annually. This is done with data loggers deployed onsite to monitor A/C run time and Saver's Switch operations during the cooling season. The results are used to document the extent of load relief achieved during a control day.

Cost-Benefit Analyses

The cost-benefit analyses (CBAs) resulting from the DSM portfolio described herein are displayed on the following pages, with the 2015 electric and gas CBAs, followed by the 2016 electric and gas CBAs.

EE PORTFOLIO TOTAL					2017	ELECTRIC	GOAL	
2017 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals			
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW			
	Test	Test	Impact	TRC	Lifetime (Weighted on Generator kWh)	A	12 years	
	Test	Test	Test	Test	Annual Hours	B	8760	
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Gross Customer kW	C	1 kW	
Benefits					Generator Peak Coincidence Factor	D	32.84%	
Avoided Revenue Requirements					Gross Load Factor at Customer	E	24.79%	
Generation Capacity	N/A	\$47,315,963	\$47,315,963	\$47,315,963	Net-to-Gross (Energy)	F	91.2%	
Trans. & Dist. Capacity	N/A	\$5,924,431	\$5,924,431	\$5,924,431	Net-to-Gross (Demand)	G	88.5%	
Marginal Energy	N/A	\$127,984,147	\$127,984,147	\$127,984,147	Transmission Loss Factor (Energy)	H	6.912%	
Avoided Emissions (CO2)	N/A	N/A	N/A	\$0	Transmission Loss Factor (Demand)	I	7.314%	
Subtotal				\$181,224,541	Installation Rate (Energy)	J	98.5%	
Non-Energy Benefits Adder (10.2%)				\$18,494,850	Installation Rate (Demand)	K	99.1%	
Subtotal	N/A	\$181,224,541	\$181,224,541	\$199,719,390	MTRC Net Benefit (Cost)	L	\$263	
Other Benefits					MTRC Non-Energy Benefit Adder	M	\$97	
Bill Reduction - Electric	\$341,203,777	N/A	N/A	N/A	Net coincident kW Saved at Generator	(G x C x K) x D / (1 - I)		0.3107 kW
Incentives	\$41,392,206	N/A	N/A	\$41,392,206	Gross Annual kWh Saved at Customer	(B x E x C)		2,171 kWh
Incremental Capital Savings	\$0	N/A	N/A	\$0	Net Annual kWh Saved at Customer	(F x (B x E x C x J))		1,951 kWh
Incremental O&M Savings	\$2,075,980	N/A	N/A	\$1,262,754	Net Annual kWh Saved at Generator	(F x (B x E x C x J)) / (1 - H)		2,096 kWh
Subtotal	\$384,671,963	N/A	N/A	\$42,654,960	Program Summary All Participants			
Total Benefits					Total Budget	N	\$80,327,918	
Costs					Gross kW Saved at Customer	O	191,404 kW	
Utility Project Costs					Net coincident kW Saved at Generator	(G x O x K) x D / (1 - I)		59,463 kW
Program Planning & Design	N/A	\$601,065	\$601,065	\$601,065	Gross Annual kWh Saved at Customer	(B x E x O)		415,588,423 kWh
Administration & Program Deliv	N/A	\$26,337,077	\$26,337,077	\$26,337,077	Gross Installed Annual kWh Saved at Custome	(B x E x O x J)		409,443,989 kWh
Advertising/Promotion/Custom	N/A	\$6,872,616	\$6,872,616	\$6,872,616	Net Annual kWh Saved at Customer	(F x (B x E x O x J))		373,440,927 kWh
Participant Rebates and Incentiv	N/A	\$41,392,206	\$41,392,206	\$41,392,206	Net Annual kWh Saved at Generator	(F x (B x E x O x J)) / (1 - H)		401,169,673 kWh
Equipment & Installation	N/A	\$2,913,877	\$2,913,877	\$2,913,877	TRC Net Benefits with Adder	(O x L)		\$50,290,410
Measurement and Verification	N/A	\$2,211,077	\$2,211,077	\$2,211,077	TRC Net Benefits without Adder	(O x (L - M))		\$31,795,560
Subtotal	N/A	\$80,327,918	\$80,327,918	\$80,327,918	Utility Program Cost per kWh Lifetime			\$0.0162
Utility Revenue Reduction					Utility Program Cost per kW at Gen			\$1,351
Revenue Reduction - Electric	N/A	N/A	\$305,632,048	N/A				
Subtotal	N/A	N/A	\$305,632,048	N/A				
Participant Costs								
Incremental Capital Costs	\$121,036,002	N/A	N/A	\$111,756,022				
Incremental O&M Costs	\$0	N/A	N/A	\$0				
Subtotal	\$121,036,002	N/A	N/A	\$111,756,022				
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BUSINESS PROGRAM TOTAL					2017	ELECTRIC	GOAL	
2017 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals			
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW			
	Test	Test	Impact	TRC	Lifetime (Weighted on Generator kWh)	A	16 years	
			Test	Test	Annual Hours	B	8760	
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Gross Customer kW	C	1 kW	
Benefits					Generator Peak Coincidence Factor	D	59.77%	
Avoided Revenue Requirements					Gross Load Factor at Customer	E	50.23%	
Generation Capacity	N/A	\$31,592,641	\$31,592,641	\$31,592,641	Net-to-Gross (Energy)	F	93.0%	
Trans. & Dist. Capacity	N/A	\$3,955,899	\$3,955,899	\$3,955,899	Net-to-Gross (Demand)	G	92.8%	
Marginal Energy	N/A	\$96,386,151	\$96,386,151	\$96,386,151	Transmission Loss Factor (Energy)	H	6.500%	
Avoided Emissions (CO2)	N/A	N/A	N/A	\$0	Transmission Loss Factor (Demand)	I	6.500%	
Subtotal				\$131,934,691	Installation Rate (Energy)	J	100.0%	
Non-Energy Benefits Adder (10%)				\$13,193,469	Installation Rate (Demand)	K	100.0%	
Subtotal	N/A	\$131,934,691	\$131,934,691	\$145,128,160	MTRC Net Benefit (Cost)	L	\$728	
Other Benefits					MTRC Non-Energy Benefit Adder	M	\$240	
Bill Reduction - Electric	\$217,951,328	N/A	N/A	N/A	Net coincident kW Saved at Generator	(G x C x K) x D / (1 - I)		0.5935 kW
Incentives	\$24,117,429	N/A	N/A	\$24,117,429	Gross Annual kWh Saved at Customer	(B x E x C)		4,400 kWh
Incremental Capital Savings	\$0	N/A	N/A	\$0	Net Annual kWh Saved at Customer	(F x (B x E x C x J))		4,093 kWh
Incremental O&M Savings	\$1,844,977	N/A	N/A	\$1,528,902	Net Annual kWh Saved at Generator	(F x (B x E x C x J)) / (1 - H)		4,377 kWh
Subtotal	\$243,913,734	N/A	N/A	\$25,646,331	Program Summary All Participants			
Total Benefits					Total Budget	N	\$44,074,268	
Costs					Gross kW Saved at Customer	O	55,029 kW	
Utility Project Costs					Net coincident kW Saved at Generator	(G x O x K) x D / (1 - I)		32,659 kW
Program Planning & Design	N/A	\$82,000	\$82,000	\$82,000	Gross Annual kWh Saved at Customer	(B x E x O)		242,133,296 kWh
Administration & Program Deliv	N/A	\$15,634,608	\$15,634,608	\$15,634,608	Gross Installed Annual kWh Saved at Custome	(B x E x O x J)		242,133,296 kWh
Advertising/Promotion/Custom	N/A	\$3,021,196	\$3,021,196	\$3,021,196	Net Annual kWh Saved at Customer	(F x (B x E x O x J)		225,225,803 kWh
Participant Rebates and Incentiv	N/A	\$24,117,429	\$24,117,429	\$24,117,429	Net Annual kWh Saved at Generator	(F x (B x E x O x J)) / (1 - H)		240,883,211 kWh
Equipment & Installation	N/A	\$329,473	\$329,473	\$329,473	TRC Net Benefits with Adder	(O x L)		\$40,046,891
Measurement and Verification	N/A	\$889,562	\$889,562	\$889,562	TRC Net Benefits without Adder	(O x (L - M))		\$26,853,422
Subtotal	N/A	\$44,074,268	\$44,074,268	\$44,074,268	Utility Program Cost per kWh Lifetime			\$0.0114
Utility Revenue Reduction					Utility Program Cost per kW at Gen			\$1,350
Revenue Reduction - Electric	N/A	N/A	\$201,948,171	N/A				
Subtotal	N/A	N/A	\$201,948,171	N/A				
Participant Costs								
Incremental Capital Costs	\$93,036,896	N/A	N/A	\$86,653,333				
Incremental O&M Costs	\$0	N/A	N/A	\$0				
Subtotal	\$93,036,896	N/A	N/A	\$86,653,333				
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RESIDENTIAL PROGRAM TOTAL					2017	ELECTRIC	GOAL
2017 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW		
	Test	Test	Impact	TRC	Lifetime (Weighted on Generator kWh)	A	7 years
			Test	Test	Annual Hours	B	8760
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Gross Customer kW	C	1 kW
Benefits							
Avoided Revenue Requirements							
	Generation Capacity	N/A	\$14,706,168	\$14,706,168	Generator Peak Coincidence Factor	D	22.62%
	Trans. & Dist. Capacity	N/A	\$1,841,176	\$1,841,176	Gross Load Factor at Customer	E	14.86%
	Marginal Energy	N/A	\$29,172,640	\$29,172,640	Net-to-Gross (Energy)	F	88.5%
	Avoided Emissions (CO2)	N/A	N/A	N/A	Net-to-Gross (Demand)	G	83.4%
	Subtotal			\$45,719,984	Transmission Loss Factor (Energy)	H	7.480%
	Non-Energy Benefits Adder (10%)			\$4,571,998	Transmission Loss Factor (Demand)	I	7.637%
Subtotal	N/A	\$45,719,984	\$45,719,984	\$50,291,982	Installation Rate (Energy)	J	96.7%
Other Benefits							
	Bill Reduction - Electric	\$113,932,218	N/A	N/A	Installation Rate (Demand)	K	98.2%
	Incentives	\$11,893,300	N/A	\$11,893,300	MTRC Net Benefit (Cost)	L	\$171
	Incremental Capital Savings	\$0	N/A	\$0	MTRC Non-Energy Benefit Adder	M	\$36
	Incremental O&M Savings	\$89,859	N/A	\$0	Net coincident kW Saved at Generator	(G x C x K) x D / (1 - I)	
Subtotal	\$125,915,377	N/A	N/A	\$11,893,300	Gross Annual kWh Saved at Customer	(B x E x C)	
Total Benefits \$125,915,377 \$45,719,984 \$45,719,984 \$62,185,282							
Costs							
Utility Project Costs							
	Program Planning & Design	N/A	\$16,193	\$16,193	Net Annual kWh Saved at Customer	(F x (B x E x C x J))	
	Administration & Program Deliv	N/A	\$6,944,814	\$6,944,814	Net Annual kWh Saved at Generator	(F x (B x E x O x J)) / (1 - H)	
	Advertising/Promotion/Custom	N/A	\$2,332,905	\$2,332,905	TRC Net Benefits with Adder	(O x L)	
	Participant Rebates and Incentiv	N/A	\$11,893,300	\$11,893,300	TRC Net Benefits without Adder	(O x (L - M))	
	Equipment & Installation	N/A	\$146,904	\$146,904			
	Measurement and Verification	N/A	\$307,933	\$307,933			
Subtotal	N/A	\$21,642,049	\$21,642,049	\$21,642,049			
Utility Revenue Reduction							
	Revenue Reduction - Electric	N/A	N/A	\$95,732,505	Utility Program Cost per kWh Lifetime		
Subtotal	N/A	N/A	\$95,732,505	N/A	Utility Program Cost per kW at Gen		
Participant Costs							
	Incremental Capital Costs	\$20,544,609	N/A	\$18,580,492			
	Incremental O&M Costs	\$0	N/A	\$354,125			
Subtotal	\$20,544,609	N/A	N/A	\$18,934,617			
Total Costs \$20,544,609 \$21,642,049 \$117,374,554 \$40,576,666							
Net Benefit (Cost) \$105,370,768 \$24,077,935 (\$71,654,570) \$21,608,616							
Benefit/Cost Ratio 6.13 2.11 0.39 1.53							

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

LOW-INCOME PROGRAM TOTAL					2017	ELECTRIC	GOAL
2017 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW		
	Test	Test	Impact	TRC	Lifetime (Weighted on Generator kWh)	A	12 years
			Test	Test	Annual Hours	B	8760
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Gross Customer kW	C	1 kW
Benefits					Generator Peak Coincidence Factor	D	21.39%
					Gross Load Factor at Customer	E	18.93%
Avoided Revenue Requirements					Net-to-Gross (Energy)	F	100.1%
Generation Capacity	N/A	\$609,443	\$609,443	\$609,443	Net-to-Gross (Demand)	G	100.1%
Trans. & Dist. Capacity	N/A	\$76,309	\$76,309	\$76,309	Transmission Loss Factor (Energy)	H	7.412%
Marginal Energy	N/A	\$1,796,884	\$1,796,884	\$1,796,884	Transmission Loss Factor (Demand)	I	7.563%
Avoided Emissions (CO2)	N/A	N/A	N/A	\$0	Installation Rate (Energy)	J	86.6%
Subtotal				\$2,482,636	Installation Rate (Demand)	K	90.9%
Non-Energy Benefits Adder (25%)				\$620,659	MTRC Net Benefit (Cost)	L	-\$497
Subtotal	N/A	\$2,482,636	\$2,482,636	\$3,103,296	MTRC Non-Energy Benefit Adder	M	\$174
Other Benefits					Net coincident kW Saved at Generator	(G x C x K) x D / (1 - I) 0.2105 kW	
Bill Reduction - Electric	\$6,477,284	N/A	N/A	N/A	Gross Annual kWh Saved at Customer	(B x E x C) 1,658 kWh	
Incentives	\$3,021,167	N/A	N/A	\$3,021,167	Net Annual kWh Saved at Customer	(F x (B x E x C x J)) 1,437 kWh	
Incremental Capital Savings	\$0	N/A	N/A	\$0	Net Annual kWh Saved at Generator	(F x (B x E x C x J)) / (1 - H) 1,552 kWh	
Incremental O&M Savings	\$141,144	N/A	N/A	\$87,977			
Subtotal	\$9,639,595	N/A	N/A	\$3,109,143			
Total Benefits	\$9,639,595	\$2,482,636	\$2,482,636	\$6,212,439			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$0	\$0	\$0			
Administration & Program Deliv	N/A	\$364,371	\$364,371	\$364,371			
Advertising/Promotion/Custom	N/A	\$298,610	\$298,610	\$298,610			
Participant Rebates and Incentiv	N/A	\$3,021,167	\$3,021,167	\$3,021,167			
Equipment & Installation	N/A	\$0	\$0	\$0			
Measurement and Verification	N/A	\$89,939	\$89,939	\$89,939			
Subtotal	N/A	\$3,774,087	\$3,774,087	\$3,774,087			
Utility Revenue Reduction							
Revenue Reduction - Electric	N/A	N/A	\$5,870,541	N/A			
Subtotal	N/A	N/A	\$5,870,541	N/A			
Participant Costs							
Incremental Capital Costs	\$4,209,728	N/A	N/A	\$4,211,200			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$4,209,728	N/A	N/A	\$4,211,200			
Total Costs	\$4,209,728	\$3,774,087	\$9,644,628	\$7,985,286			
Net Benefit (Cost)	\$5,429,867	(\$1,291,450)	(\$7,161,991)	(\$1,772,847)			
Benefit/Cost Ratio	2.29	0.66	0.26	0.78			

Program Summary All Participants		
Total Budget	N	\$3,774,087
Gross kW Saved at Customer	O	3,565 kW
Net coincident kW Saved at Generator	(G x O x K) x D / (1 - I)	750 kW
Gross Annual kWh Saved at Customer	(B x E x O)	5,911,625 kWh
Gross Installed Annual kWh Saved at Custome	(B x E x O x J)	5,120,498 kWh
Net Annual kWh Saved at Customer	(F x (B x E x O x J)	5,124,172 kWh
Net Annual kWh Saved at Generator	(F x (B x E x O x J)) / (1 - H)	5,534,354 kWh
TRC Net Benefits with Adder	(O x L)	(\$1,772,847)
TRC Net Benefits without Adder	(O x (L - M))	(\$2,393,506)
Utility Program Cost per kWh Lifetime		\$0.0593
Utility Program Cost per kW at Gen		\$5.030

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

DR PORTFOLIO TOTAL					2017	ELECTRIC	GOAL	
2017 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals			
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW			
	Test	Test	Impact	TRC	Lifetime (Weighted on Generator kWh)	A	15 years	
			Test	Test	Annual Hours	B	8760	
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Gross Customer kW	C	1 kW	
Benefits					Generator Peak Coincidence Factor	D	34.26%	
Avoided Revenue Requirements					Gross Load Factor at Customer	E	0.03%	
	Generation Capacity	N/A	\$14,793,155	\$14,793,155	Net-to-Gross (Energy)	F	100.0%	
	Trans. & Dist. Capacity	N/A	\$0	\$0	Net-to-Gross (Demand)	G	100.0%	
	Marginal Energy	N/A	\$48,356	\$48,356	Transmission Loss Factor (Energy)	H	7.690%	
	Avoided Emissions (CO2)	N/A	N/A	N/A	Transmission Loss Factor (Demand)	I	7.690%	
	Subtotal			\$14,841,511	Installation Rate (Energy)	J	100.0%	
	Non-Energy Benefits Adder (10%)			\$1,484,151	Installation Rate (Demand)	K	100.0%	
Subtotal	N/A	\$14,841,511	\$14,841,511	\$16,325,662	MTRC Net Benefit (Cost)	L	\$168	
Other Benefits					MTRC Non-Energy Benefit Adder	M	\$34	
	Bill Reduction - Electric	\$191,867	N/A	N/A	Net coincident kW Saved at Generator	(G x C x K) x D / (1 - I)		0.3711 kW
	Incentives	\$10,150,000	N/A	N/A	Gross Annual kWh Saved at Customer	(B x E x C)		3 kWh
	Incremental Capital Savings	\$0	N/A	N/A	Net Annual kWh Saved at Customer	(F x (B x E x C x J))		3 kWh
	Incremental O&M Savings	\$0	N/A	N/A	Net Annual kWh Saved at Generator	(F x (B x E x C x J)) / (1 - H)		3 kWh
Subtotal	\$10,341,867	N/A	N/A	\$10,150,000	Program Summary All Participants			
Total Benefits					Total Budget	N	\$19,180,133	
Costs					Gross kW Saved at Customer	O	43,439 kW	
Utility Project Costs					Net coincident kW Saved at Generator	(G x O x K) x D / (1 - I)		16,120 kW
	Program Planning & Design	N/A	\$60,800	\$60,800	Gross Annual kWh Saved at Customer	(B x E x O)		113,707 kWh
	Administration & Program Deliv	N/A	\$6,036,729	\$6,036,729	Gross Installed Annual kWh Saved at Custome	(B x E x O x J)		113,707 kWh
	Advertising/Promotion/Custom	N/A	\$2,457,410	\$2,457,410	Net Annual kWh Saved at Customer	(F x (B x E x O x J)		113,707 kWh
	Participant Rebates and Incentiv	N/A	\$10,150,000	\$10,150,000	Net Annual kWh Saved at Generator	(F x (B x E x O x J)) / (1 - H)		123,179 kWh
	Equipment & Installation	N/A	\$300,194	\$300,194	TRC Net Benefits with Adder	(O x L)		\$7,295,529
	Measurement and Verification	N/A	\$175,000	\$175,000	TRC Net Benefits without Adder	(O x (L - M))		\$5,811,378
Subtotal	N/A	\$19,180,133	\$19,180,133	\$19,180,133	Utility Program Cost per kWh Lifetime			\$10.3806
Utility Revenue Reduction					Utility Program Cost per kW at Gen			\$1,190
	Revenue Reduction - Electric	N/A	N/A	\$191,867				
Subtotal	N/A	N/A	\$191,867	N/A				
Participant Costs								
	Incremental Capital Costs	\$0	N/A	N/A				
	Incremental O&M Costs	\$0	N/A	N/A				
Subtotal	\$0	N/A	N/A	\$0				
Total Costs								
	\$0	\$19,180,133	\$19,372,000	\$19,180,133				
Net Benefit (Cost)								
	\$10,341,867	(\$4,338,622)	(\$4,530,489)	\$7,295,529				
Benefit/Cost Ratio								
	INF	0.77	0.77	1.38				

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

PORTFOLIO TOTAL					2017	GAS	GOAL
2017 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Assumptions:		
	Test	Test	Impact	TRC	Lifetime (Weighted on Dth)	A	15.26 years
	(\$Total)	(\$Total)	Test	Test	Net-to-Gross (Weighted on Dth)	B	100.00%
			(\$Total)	(\$Total)	Install Rate (Weighted on Dth)	C	90.1%
Benefits					Program Totals:		
Avoided Revenue Requirements					Total Dth/Yr Saved	D	636,078
Commodity Cost Reduction	N/A	\$24,837,392	\$24,837,392	\$24,837,392	Utility Costs per Net Dth/Yr	E	\$20.67
Variable O&M Savings	N/A	\$296,840	\$296,840	\$296,840	Net Benefit (Cost) per Gross Dth/Yr	F	\$25.13
Demand Savings	N/A	\$2,770,942	\$2,770,942	\$2,770,942	Non-Energy Benefits Adder per Gross Dth/Yr	G	\$3.19
Subtotal				\$27,905,175	Annual Dth/\$M	(\$1M / E)	48,391
Non-Energy Benefits Adder (7.3%)				\$2,031,809	Total Utility Budget	(E x D)	\$13,144,577
Subtotal	N/A	\$27,905,175	\$27,905,175	\$29,936,983	Total MTRC Net Benefits with Adder	(D x F)	\$15,985,803
Other Benefits					Total MTRC Net Benefits without Adder	(F - G) x D	\$13,953,994
Bill Reduction - Gas	\$55,332,929	N/A	N/A	N/A	Utility Program Cost per Net Dth Lifetime		
Incentives	\$7,341,755	N/A	N/A	\$7,341,755	(E / A)		\$1.35
Incremental Capital Savings	\$0	N/A	N/A	\$0			
Incremental O&M Savings	\$21,775,603	N/A	N/A	\$11,621,433			
Subtotal	\$84,450,287	N/A	N/A	\$18,963,188			
Total Benefits							
	\$84,450,287	\$27,905,175	\$27,905,175	\$48,900,171			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$118,226	\$118,226	\$118,226			
Administration & Program Deliv	N/A	\$3,919,699	\$3,919,699	\$3,919,699			
Advertising/Promotion/Custom	N/A	\$723,433	\$723,433	\$723,433			
Participant Rebates and Incentiv	N/A	\$7,341,755	\$7,341,755	\$7,341,755			
Equipment & Installation	N/A	\$202,864	\$202,864	\$202,864			
Measurement and Verification	N/A	\$838,600	\$838,600	\$838,600			
Subtotal	N/A	\$13,144,577	\$13,144,577	\$13,144,577			
Utility Revenue Reduction							
Revenue Reduction - Gas	N/A	N/A	\$51,891,324	N/A			
Subtotal	N/A	N/A	\$51,891,324	N/A			
Participant Costs							
Incremental Capital Costs	\$21,163,747	N/A	N/A	\$19,769,791			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$21,163,747	N/A	N/A	\$19,769,791			
Total Costs							
	\$21,163,747	\$13,144,577	\$65,035,900	\$32,914,368			
Net Benefit (Cost)							
	\$63,286,540	\$14,760,598	(\$37,130,726)	\$15,985,803			
Benefit/Cost Ratio							
	3.99	2.12	0.43	1.49			

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

BUSINESS PROGRAM TOTAL					2017	GAS	GOAL
2017 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Assumptions:		
	Test	Test	Impact	TRC	Lifetime (Weighted on Dth)	A	18.32 years
	(\$Total)	(\$Total)	Test	Test	Net-to-Gross (Weighted on Dth)	B	94.15%
			(\$Total)	(\$Total)	Install Rate (Weighted on Dth)	C	100.0%
Benefits					Program Totals:		
Avoided Revenue Requirements					Total Dth/Yr Saved	D	212,820
Commodity Cost Reduction	N/A	\$9,839,687	\$9,839,687	\$9,839,687	Utility Costs per Net Dth/Yr	E	\$14.03
Variable O&M Savings	N/A	\$113,348	\$113,348	\$113,348	Net Benefit (Cost) per Gross Dth/Yr	F	\$15.90
Demand Savings	N/A	\$1,058,081	\$1,058,081	\$1,058,081	Non-Energy Benefits Adder per Gross Dth/Yr	G	\$2.59
Subtotal				\$11,011,116	Annual Dth/\$M	(\$1M / E)	71,252
Non-Energy Benefits Adder (5%)				\$550,556	Total Utility Budget	(E x D)	\$2,986,871
Subtotal	N/A	\$11,011,116	\$11,011,116	\$11,561,672	Total MTRC Net Benefits with Adder	(D x F)	\$3,383,115
Other Benefits					Total MTRC Net Benefits without Adder	(F - G) x D	\$2,832,559
Bill Reduction - Gas	\$21,827,798	N/A	N/A	N/A	Utility Program Cost per Net Dth Lifetime		
Incentives	\$1,399,110	N/A	N/A	\$1,399,110	(E / A)		\$0.77
Incremental Capital Savings	\$0	N/A	N/A	\$0			
Incremental O&M Savings	\$1,865,431	N/A	N/A	\$1,834,142			
Subtotal	\$25,092,339	N/A	N/A	\$3,233,251			
Total Benefits	\$25,092,339	\$11,011,116	\$11,011,116	\$14,794,923			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$10,000	\$10,000	\$10,000			
Administration & Program Deliv	N/A	\$1,232,123	\$1,232,123	\$1,232,123			
Advertising/Promotion/Custom	N/A	\$36,157	\$36,157	\$36,157			
Participant Rebates and Incentiv	N/A	\$1,399,110	\$1,399,110	\$1,399,110			
Equipment & Installation	N/A	\$116,481	\$116,481	\$116,481			
Measurement and Verification	N/A	\$193,000	\$193,000	\$193,000			
Subtotal	N/A	\$2,986,871	\$2,986,871	\$2,986,871			
Utility Revenue Reduction							
Revenue Reduction - Gas	N/A	N/A	\$20,555,207	N/A			
Subtotal	N/A	N/A	\$20,555,207	N/A			
Participant Costs							
Incremental Capital Costs	\$8,952,404	N/A	N/A	\$8,424,938			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$8,952,404	N/A	N/A	\$8,424,938			
Total Costs	\$8,952,404	\$2,986,871	\$23,542,078	\$11,411,809			
Net Benefit (Cost)	\$16,139,935	\$8,024,245	(\$12,530,962)	\$3,383,115			
Benefit/Cost Ratio	2.80	3.69	0.47	1.30			

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

RESIDENTIAL PROGRAM TOTAL					2017	GAS	GOAL
2017 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Assumptions:		
	Test	Test	Impact	TRC	Lifetime (Weighted on Dth)	A	13.33 years
	(\$Total)	(\$Total)	Test	Test	Net-to-Gross (Weighted on Dth)	B	93.23%
			(\$Total)	(\$Total)	Install Rate (Weighted on Dth)	C	83.1%
Benefits					Program Totals:		
Avoided Revenue Requirements					Total Dth/Yr Saved	D	353,485
Commodity Cost Reduction	N/A	\$12,156,958	\$12,156,958	\$12,156,958	Utility Costs per Net Dth/Yr	E	\$15.47
Variable O&M Savings	N/A	\$149,433	\$149,433	\$149,433	Net Benefit (Cost) per Gross Dth/Yr	F	\$34.34
Demand Savings	N/A	\$1,394,930	\$1,394,930	\$1,394,930	Non-Energy Benefits Adder per Gross Dth/Yr	G	\$1.94
Subtotal				\$13,701,322	Annual Dth/\$M	(\$1M / E)	64,631
Non-Energy Benefits Adder (5%)				\$685,066	Total Utility Budget	(E x D)	\$5,469,292
Subtotal	N/A	\$13,701,322	\$13,701,322	\$14,386,388	Total MTRC Net Benefits with Adder	(D x F)	\$12,140,357
Other Benefits					Total MTRC Net Benefits without Adder	(F - G) x D	\$11,455,291
Bill Reduction - Gas	\$27,566,195	N/A	N/A	N/A	Utility Program Cost per Net Dth Lifetime		
Incentives	\$3,065,177	N/A	N/A	\$3,065,177	(E / A)		\$1.16
Incremental Capital Savings	\$0	N/A	N/A	\$0			
Incremental O&M Savings	\$17,624,924	N/A	N/A	\$8,514,787			
Subtotal	\$48,256,297	N/A	N/A	\$11,579,964			
Total Benefits	\$48,256,297	\$13,701,322	\$13,701,322	\$25,966,352			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$3,858	\$3,858	\$3,858			
Administration & Program Deliv	N/A	\$1,700,618	\$1,700,618	\$1,700,618			
Advertising/Promotion/Custom	N/A	\$306,058	\$306,058	\$306,058			
Participant Rebates and Incentiv	N/A	\$3,065,177	\$3,065,177	\$3,065,177			
Equipment & Installation	N/A	\$86,383	\$86,383	\$86,383			
Measurement and Verification	N/A	\$307,198	\$307,198	\$307,198			
Subtotal	N/A	\$5,469,292	\$5,469,292	\$5,469,292			
Utility Revenue Reduction							
Revenue Reduction - Gas	N/A	N/A	\$25,400,950	N/A			
Subtotal	N/A	N/A	\$25,400,950	N/A			
Participant Costs							
Incremental Capital Costs	\$9,197,656	N/A	N/A	\$8,356,703			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$9,197,656	N/A	N/A	\$8,356,703			
Total Costs	\$9,197,656	\$5,469,292	\$30,870,242	\$13,825,995			
Net Benefit (Cost)	\$39,058,640	\$8,232,030	(\$17,168,920)	\$12,140,357			
Benefit/Cost Ratio	5.25	2.51	0.44	1.88			

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

LOW-INCOME PROGRAM TOTAL					2017	GAS	GOAL
2017 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Assumptions:		
	Test	Test	Impact	TRC	Lifetime (Weighted on Dth)	A	15.74 years
	(\$Total)	(\$Total)	Test	Test	Net-to-Gross (Weighted on Dth)	B	100.00%
			(\$Total)	(\$Total)	Install Rate (Weighted on Dth)	C	91.0%
Benefits					Program Totals:		
Avoided Revenue Requirements					Total Dth/Yr Saved	D	69,503
Commodity Cost Reduction	N/A	\$2,831,941	\$2,831,941	\$2,831,941	Utility Costs per Net Dth/Yr	E	\$47.47
Variable O&M Savings	N/A	\$33,944	\$33,944	\$33,944	Net Benefit (Cost) per Gross Dth/Yr	F	\$24.01
Demand Savings	N/A	\$316,865	\$316,865	\$316,865	Non-Energy Benefits Adder per Gross Dth/Yr	G	\$11.45
Subtotal				\$3,182,750	Annual Dth/\$M	(\$1M / E)	21,065
Non-Energy Benefits Adder (25%)				\$795,688	Total Utility Budget	(E x D)	\$3,299,393
Subtotal	N/A	\$3,182,750	\$3,182,750	\$3,978,438	Total MTRC Net Benefits with Adder	(D x F)	\$1,668,640
Other Benefits					Total MTRC Net Benefits without Adder	(F - G) x D	\$872,952
Bill Reduction - Gas	\$5,916,763	N/A	N/A	N/A	Utility Program Cost per Net Dth Lifetime		
Incentives	\$2,580,568	N/A	N/A	\$2,580,568	(E / A)		\$3.02
Incremental Capital Savings	\$0	N/A	N/A	\$0			
Incremental O&M Savings	\$2,285,248	N/A	N/A	\$1,272,504			
Subtotal	\$10,782,579	N/A	N/A	\$3,853,072			
Total Benefits							
	\$10,782,579	\$3,182,750	\$3,182,750	\$7,831,510			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$0	\$0	\$0			
Administration & Program Deliv	N/A	\$409,347	\$409,347	\$409,347			
Advertising/Promotion/Custom	N/A	\$183,312	\$183,312	\$183,312			
Participant Rebates and Incentiv	N/A	\$2,580,568	\$2,580,568	\$2,580,568			
Equipment & Installation	N/A	\$0	\$0	\$0			
Measurement and Verification	N/A	\$126,166	\$126,166	\$126,166			
Subtotal	N/A	\$3,299,393	\$3,299,393	\$3,299,393			
Utility Revenue Reduction							
Revenue Reduction - Gas	N/A	N/A	\$5,916,763	N/A			
Subtotal	N/A	N/A	\$5,916,763	N/A			
Participant Costs							
Incremental Capital Costs	\$2,863,478	N/A	N/A	\$2,863,478			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$2,863,478	N/A	N/A	\$2,863,478			
Total Costs							
	\$2,863,478	\$3,299,393	\$9,216,156	\$6,162,871			
Net Benefit (Cost)							
	\$7,919,101	(\$116,643)	(\$6,033,405)	\$1,668,640			
Benefit/Cost Ratio							
	3.77	0.96	0.35	1.27			

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

EE PORTFOLIO TOTAL					2018	ELECTRIC	GOAL
2018 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW		
	Test	Test	Impact	TRC			
	(\$Total)	(\$Total)	(\$Total)	(\$Total)			
Benefits							
Avoided Revenue Requirements							
Generation Capacity	N/A	\$44,728,953	\$44,728,953	\$44,728,953			
Trans. & Dist. Capacity	N/A	\$5,663,925	\$5,663,925	\$5,663,925			
Marginal Energy	N/A	\$130,486,131	\$130,486,131	\$130,486,131			
Avoided Emissions (CO2)	N/A	N/A	N/A	N/A			
Subtotal				\$180,879,009			
Non-Energy Benefits Adder (10.2%)				\$18,470,815			
Subtotal	N/A	\$180,879,009	\$180,879,009	\$199,349,824			
Other Benefits							
Bill Reduction - Electric	\$351,841,300	N/A	N/A	N/A			
Incentives	\$40,202,083	N/A	N/A	\$40,202,083			
Incremental Capital Savings	\$0	N/A	N/A	\$0			
Incremental O&M Savings	\$2,158,299	N/A	N/A	\$1,344,515			
Subtotal	\$394,201,683	N/A	N/A	\$41,546,598			
Total Benefits	\$394,201,683	\$180,879,009	\$180,879,009	\$240,896,422			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$605,193	\$605,193	\$605,193			
Administration & Program Deliv	N/A	\$26,297,253	\$26,297,253	\$26,297,253			
Advertising/Promotion/Custome	N/A	\$6,867,456	\$6,867,456	\$6,867,456			
Participant Rebates and Incentiv	N/A	\$40,202,083	\$40,202,083	\$40,202,083			
Equipment & Installation	N/A	\$1,748,636	\$1,748,636	\$1,748,636			
Measurement and Verification	N/A	\$1,983,446	\$1,983,446	\$1,983,446			
Subtotal	N/A	\$77,704,067	\$77,704,067	\$77,704,067			
Utility Revenue Reduction							
Revenue Reduction - Electric	N/A	N/A	\$311,718,626	N/A			
Subtotal	N/A	N/A	\$311,718,626	N/A			
Participant Costs							
Incremental Capital Costs	\$114,977,225	N/A	N/A	\$106,012,460			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$114,977,225	N/A	N/A	\$106,012,460			
Total Costs	\$114,977,225	\$77,704,067	\$389,422,693	\$183,716,528			
Net Benefit (Cost)	\$279,224,458	\$103,174,942	(\$208,543,684)	\$57,179,894			
Benefit/Cost Ratio	3.43	2.33	0.46	1.31			

Lifetime (Weighted on Generator kWh)	A	12 years
Annual Hours	B	8760
Gross Customer kW	C	1 kW
Generator Peak Coincidence Factor	D	30.86%
Gross Load Factor at Customer	E	23.90%
Net-to-Gross (Energy)	F	91.2%
Net-to-Gross (Demand)	G	88.3%
Transmission Loss Factor (Energy)	H	6.931%
Transmission Loss Factor (Demand)	I	7.337%
Installation Rate (Energy)	J	98.5%
Installation Rate (Demand)	K	99.1%
MTRC Net Benefit (Cost)	L	\$288
MTRC Non-Energy Benefit Adder	M	\$93
Net coincident kW Saved at Generator	(G x C x K) x D / (1 - I)	
Gross Annual kWh Saved at Customer	(B x E x C)	
Net Annual kWh Saved at Customer	(F x (B x E x C x J))	
Net Annual kWh Saved at Generator	(F x (B x E x C x J)) / (1 - H)	
Program Summary per Participant		
Total Budget	N	\$77,704,067
Gross kW Saved at Customer	O	198,547 kW
Net coincident kW Saved at Generator	(G x O x K) x D / (1 - I)	
Gross Annual kWh Saved at Customer	(B x E x O)	
Gross Installed Annual kWh Saved at Custome	(B x E x O x J)	
Net Annual kWh Saved at Customer	(F x (B x E x O x J))	
Net Annual kWh Saved at Generator	(F x (B x E x O x J)) / (1 - H)	
TRC Net Benefits with Adder	(O x L)	
TRC Net Benefits without Adder	(O x (L - M))	
Utility Program Cost per kWh Lifetime		
Utility Program Cost per kW at Gen		

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

BUSINESS PROGRAM TOTAL					2018	ELECTRIC	GOAL	
2018 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals			
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW			
	Test	Test	Impact	TRC	Lifetime (Weighted on Generator kWh)	A	16 years	
			Test	Test	Annual Hours	B	8760	
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Gross Customer kW	C	1 kW	
Benefits								
Avoided Revenue Requirements								
Generation Capacity	N/A	\$28,600,532	\$28,600,532	\$28,600,532	Generator Peak Coincidence Factor	D	56.83%	
Trans. & Dist. Capacity	N/A	\$3,637,524	\$3,637,524	\$3,637,524	Gross Load Factor at Customer	E	50.38%	
Marginal Energy	N/A	\$96,932,704	\$96,932,704	\$96,932,704	Net-to-Gross (Energy)	F	93.3%	
Avoided Emissions (CO2)	N/A	N/A	N/A	\$0	Net-to-Gross (Demand)	G	93.1%	
Subtotal				\$129,170,759	Transmission Loss Factor (Energy)	H	6.500%	
Non-Energy Benefits Adder (10%)				\$12,917,076	Transmission Loss Factor (Demand)	I	6.500%	
Subtotal	N/A	\$129,170,759	\$129,170,759	\$142,087,835	Installation Rate (Energy)	J	100.0%	
					Installation Rate (Demand)	K	100.0%	
					MTRC Net Benefit (Cost)	L	\$816	
					MTRC Non-Energy Benefit Adder	M	\$244	
Other Benefits					Net coincident kW Saved at Generator (G x C x K) x D / (1 - I)			0.5661 kW
Bill Reduction - Electric	\$223,111,764	N/A	N/A	N/A	Gross Annual kWh Saved at Customer (B x E x C)			4,413 kWh
Incentives	\$22,031,361	N/A	N/A	\$22,031,361	Net Annual kWh Saved at Customer (F x (B x E x C x J))			4,118 kWh
Incremental Capital Savings	\$0	N/A	N/A	\$0	Net Annual kWh Saved at Generator (F x (B x E x C x J)) / (1 - H)			4,405 kWh
Incremental O&M Savings	\$1,927,142	N/A	N/A	\$1,610,556				
Subtotal	\$247,070,268	N/A	N/A	\$23,641,917				
Total Benefits	\$247,070,268	\$129,170,759	\$129,170,759	\$165,729,753				
Costs								
Utility Project Costs								
Program Planning & Design	N/A	\$90,000	\$90,000	\$90,000	Total Budget			N \$41,956,268
Administration & Program Deliv	N/A	\$15,475,691	\$15,475,691	\$15,475,691	Gross kW Saved at Customer			O 52,902 kW
Advertising/Promotion/Custome	N/A	\$3,005,224	\$3,005,224	\$3,005,224	Net coincident kW Saved at Generator (G x O x K) x D / (1 - I)			29,948 kW
Participant Rebates and Incentiv	N/A	\$22,031,361	\$22,031,361	\$22,031,361	Gross Annual kWh Saved at Customer (B x E x O)			233,480,457 kWh
Equipment & Installation	N/A	\$445,078	\$445,078	\$445,078	Gross Installed Annual kWh Saved at Custome (B x E x O x J)			233,480,457 kWh
Measurement and Verification	N/A	\$908,914	\$908,914	\$908,914	Net Annual kWh Saved at Customer (F x (B x E x O x J))			217,862,952 kWh
Subtotal	N/A	\$41,956,268	\$41,956,268	\$41,956,268	Net Annual kWh Saved at Generator (F x (B x E x O x J)) / (1 - H)			233,008,505 kWh
					TRC Net Benefits with Adder (O x L)			\$43,181,498
					TRC Net Benefits without Adder (O x (L - M))			\$30,264,422
Utility Revenue Reduction					Utility Program Cost per kWh Lifetime			\$0.0114
Revenue Reduction - Electric	N/A	N/A	\$207,296,524	N/A	Utility Program Cost per kW at Gen			\$1,401
Subtotal	N/A	N/A	\$207,296,524	N/A				
Participant Costs								
Incremental Capital Costs	\$86,375,925	N/A	N/A	\$80,591,986				
Incremental O&M Costs	\$0	N/A	N/A	\$0				
Subtotal	\$86,375,925	N/A	N/A	\$80,591,986				
Total Costs	\$86,375,925	\$41,956,268	\$249,252,793	\$122,548,255				
Net Benefit (Cost)	\$160,694,343	\$87,214,491	(\$120,082,034)	\$43,181,498				
Benefit/Cost Ratio	2.86	3.08	0.52	1.35				

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

RESIDENTIAL PROGRAM TOTAL					2018	ELECTRIC	GOAL	
2018 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals			
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW			
	Test	Test	Impact	TRC	Lifetime (Weighted on Generator kWh)	A	6 years	
			Test	Test	Annual Hours	B	8760	
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Gross Customer kW	C	1 kW	
Benefits								
Avoided Revenue Requirements								
Generation Capacity	N/A	\$14,959,978	\$14,959,978	\$14,959,978	Generator Peak Coincidence Factor	D	22.13%	
Trans. & Dist. Capacity	N/A	\$1,880,086	\$1,880,086	\$1,880,086	Gross Load Factor at Customer	E	14.73%	
Marginal Energy	N/A	\$30,797,796	\$30,797,796	\$30,797,796	Net-to-Gross (Energy)	F	88.5%	
Avoided Emissions (CO2)	N/A	N/A	N/A	\$0	Net-to-Gross (Demand)	G	83.4%	
Subtotal				\$47,637,861	Transmission Loss Factor (Energy)	H	7.475%	
Non-Energy Benefits Adder (10%)				\$4,763,786	Transmission Loss Factor (Demand)	I	7.637%	
Subtotal	N/A	\$47,637,861	\$47,637,861	\$52,401,647	Installation Rate (Energy)	J	96.9%	
					Installation Rate (Demand)	K	98.3%	
					MTRC Net Benefit (Cost)	L	\$180	
					MTRC Non-Energy Benefit Adder	M	\$36	
					Net coincident kW Saved at Generator	(G x C x K) x D / (1 - I)		0.1965 kW
					Gross Annual kWh Saved at Customer	(B x E x C)		1,290 kWh
					Net Annual kWh Saved at Customer	(F x (B x E x C x J))		1,106 kWh
					Net Annual kWh Saved at Generator	(F x (B x E x C x J)) / (1 - H)		1,196 kWh
Program Summary per Participant								
Total Budget					N	\$22,334,879		
Gross kW Saved at Customer					O	133,909 kW		
Net coincident kW Saved at Generator					(G x O x K) x D / (1 - I)			26,319 kW
Gross Annual kWh Saved at Customer					(B x E x O)			172,745,160 kWh
Gross Installed Annual kWh Saved at Custome					(B x E x O x J)			167,347,475 kWh
Net Annual kWh Saved at Customer					(F x (B x E x O x J))			148,168,674 kWh
Net Annual kWh Saved at Generator					(F x (B x E x O x J)) / (1 - H)			160,139,471 kWh
TRC Net Benefits with Adder					(O x L)			\$24,076,543
TRC Net Benefits without Adder					(O x (L - M))			\$19,312,757
Utility Program Cost per kWh Lifetime								\$0.0217
Utility Program Cost per kW at Gen								\$849
Participant Costs								
Incremental Capital Costs	\$20,045,530	N/A	N/A	\$18,108,258				
Incremental O&M Costs	\$0	N/A	N/A	\$354,018				
Subtotal	\$20,045,530	N/A	N/A	\$18,462,276				
Total Costs								
	\$20,045,530	\$22,334,879	\$117,662,753	\$40,797,155				
Net Benefit (Cost)								
	\$110,491,118	\$25,302,982	(\$70,024,892)	\$24,076,543				
Benefit/Cost Ratio								
	6.51	2.13	0.40	1.59				

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

LOW-INCOME PROGRAM TOTAL					2018	ELECTRIC	GOAL
2018 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW		
	Test	Test	Impact	TRC	Lifetime (Weighted on Generator kWh)	A	11 years
	Test	Test	Test	Test	Annual Hours	B	8760
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Gross Customer kW	C	1 kW
Benefits					Generator Peak Coincidence Factor	D	21.41%
Avoided Revenue Requirements					Gross Load Factor at Customer	E	18.95%
	Generation Capacity	N/A	\$613,951	\$613,951	Net-to-Gross (Energy)	F	100.1%
	Trans. & Dist. Capacity	N/A	\$76,882	\$76,882	Net-to-Gross (Demand)	G	100.1%
	Marginal Energy	N/A	\$1,861,925	\$1,861,925	Transmission Loss Factor (Energy)	H	7.412%
	Avoided Emissions (CO2)	N/A	N/A	N/A	Transmission Loss Factor (Demand)	I	7.564%
	Subtotal			\$2,552,757	Installation Rate (Energy)	J	86.6%
	Non-Energy Benefits Adder (25%)			\$638,189	Installation Rate (Demand)	K	90.9%
Subtotal	N/A	\$2,552,757	\$2,552,757	\$3,190,947	MTRC Net Benefit (Cost)	L	-\$483
Other Benefits					MTRC Non-Energy Benefit Adder	M	\$179
	Bill Reduction - Electric	\$6,706,824	N/A	N/A	Net coincident kW Saved at Generator	(G x C x K) x D / (1 - I)	
	Incentives	\$3,040,846	N/A	\$3,040,846	Gross Annual kWh Saved at Customer	(B x E x C)	
	Incremental Capital Savings	\$0	N/A	\$0	Net Annual kWh Saved at Customer	(F x (B x E x C x J))	
	Incremental O&M Savings	\$141,144	N/A	\$87,977	Net Annual kWh Saved at Generator	(F x (B x E x C x J)) / (1 - H)	
Subtotal	\$9,888,814	N/A	N/A	\$3,128,823			
Total Benefits	\$9,888,814	\$2,552,757	\$2,552,757	\$6,319,769	Program Summary per Participant		
Costs					Total Budget	N	\$3,813,087
Utility Project Costs					Gross kW Saved at Customer	O	3,567 kW
	Program Planning & Design	N/A	\$0	\$0	Net coincident kW Saved at Generator	(G x O x K) x D / (1 - I)	
	Administration & Program Deliv	N/A	\$382,243	\$382,243	Gross Annual kWh Saved at Customer	(B x E x O)	
	Advertising/Promotion/Custome	N/A	\$298,610	\$298,610	Gross Installed Annual kWh Saved at Custome	(B x E x O x J)	
	Participant Rebates and Incentiv	N/A	\$3,040,846	\$3,040,846	Net Annual kWh Saved at Customer	(F x (B x E x O x J))	
	Equipment & Installation	N/A	\$0	\$0	Net Annual kWh Saved at Generator	(F x (B x E x O x J)) / (1 - H)	
	Measurement and Verification	N/A	\$91,388	\$91,388	TRC Net Benefits with Adder	(O x L)	
Subtotal	N/A	\$3,813,087	\$3,813,087	\$3,813,087	TRC Net Benefits without Adder	(O x (L - M))	
Utility Revenue Reduction					Utility Program Cost per kWh Lifetime		
	Revenue Reduction - Electric	N/A	N/A	\$6,131,377	\$0.0616		
Subtotal	N/A	N/A	\$6,131,377	N/A	Utility Program Cost per kW at Gen		
Participant Costs					\$5,074		
	Incremental Capital Costs	\$4,229,407	N/A	\$4,230,879			
	Incremental O&M Costs	\$0	N/A	\$0			
Subtotal	\$4,229,407	N/A	N/A	\$4,230,879			
Total Costs	\$4,229,407	\$3,813,087	\$9,944,464	\$8,043,966			
Net Benefit (Cost)					\$5,659,407	(\$1,260,330)	(\$7,391,707)
Benefit/Cost Ratio					2.34	0.67	0.26

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

DR PORTFOLIO TOTAL					2018	ELECTRIC	GOAL	
2018 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals			
	Participant	Utility	Rate	Modified	Program Inputs per Customer kW			
	Test	Test	Impact	TRC	Lifetime (Weighted on Generator kWh)	A	15 years	
			Test	Test	Annual Hours	B	8760	
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Gross Customer kW	C	1 kW	
Benefits								
Avoided Revenue Requirements								
Generation Capacity	N/A	\$15,088,980	\$15,088,980	\$15,088,980	Generator Peak Coincidence Factor	D	34.26%	
Trans. & Dist. Capacity	N/A	\$0	\$0	\$0	Gross Load Factor at Customer	E	0.03%	
Marginal Energy	N/A	\$50,949	\$50,949	\$50,949	Net-to-Gross (Energy)	F	100.0%	
Avoided Emissions (CO2)	N/A	N/A	N/A	\$0	Net-to-Gross (Demand)	G	100.0%	
Subtotal				\$15,139,929	Transmission Loss Factor (Energy)	H	7.690%	
Non-Energy Benefits Adder (10%)				\$1,513,993	Transmission Loss Factor (Demand)	I	7.690%	
Subtotal	N/A	\$15,139,929	\$15,139,929	\$16,653,922	Installation Rate (Energy)	J	100.0%	
					Installation Rate (Demand)	K	100.0%	
					MTRC Net Benefit (Cost)	L	\$169	
					MTRC Non-Energy Benefit Adder	M	\$35	
					Net coincident kW Saved at Generator	(G x C x K) x D / (1 - I)		0.3711 kW
					Gross Annual kWh Saved at Customer	(B x E x C)		3 kWh
					Net Annual kWh Saved at Customer	(F x (B x E x C x J))		3 kWh
					Net Annual kWh Saved at Generator	(F x (B x E x C x J)) / (1 - H)		3 kWh
Program Summary per Participant								
Total Budget					N	\$20,625,501		
Gross kW Saved at Customer					O	43,439 kW		
Net coincident kW Saved at Generator					(G x O x K) x D / (1 - I)			16,120 kW
Gross Annual kWh Saved at Customer					(B x E x O)			113,707 kWh
Gross Installed Annual kWh Saved at Customer					(B x E x O x J)			113,707 kWh
Net Annual kWh Saved at Customer					(F x (B x E x O x J))			113,707 kWh
Net Annual kWh Saved at Generator					(F x (B x E x O x J)) / (1 - H)			123,179 kWh
TRC Net Benefits with Adder					(O x L)			\$7,350,421
TRC Net Benefits without Adder					(O x (L - M))			\$5,836,428
Utility Program Cost per kWh Lifetime								\$11.1629
Utility Program Cost per kW at Gen								\$1,280
Other Benefits								
Bill Reduction - Electric	\$204,938	N/A	N/A	N/A				
Incentives	\$11,322,000	N/A	N/A	\$11,322,000				
Incremental Capital Savings	\$0	N/A	N/A	\$0				
Incremental O&M Savings	\$0	N/A	N/A	\$0				
Subtotal	\$11,526,938	N/A	N/A	\$11,322,000				
Total Benefits	\$11,526,938	\$15,139,929	\$15,139,929	\$27,975,922				
Costs								
Utility Project Costs								
Program Planning & Design	N/A	\$0	\$0	\$0				
Administration & Program Deliv	N/A	\$6,260,758	\$6,260,758	\$6,260,758				
Advertising/Promotion/Custome	N/A	\$2,548,360	\$2,548,360	\$2,548,360				
Participant Rebates and Incentiv	N/A	\$11,322,000	\$11,322,000	\$11,322,000				
Equipment & Installation	N/A	\$331,883	\$331,883	\$331,883				
Measurement and Verification	N/A	\$162,500	\$162,500	\$162,500				
Subtotal	N/A	\$20,625,501	\$20,625,501	\$20,625,501				
Utility Revenue Reduction								
Revenue Reduction - Electric	N/A	N/A	\$204,938	N/A				
Subtotal	N/A	N/A	\$204,938	N/A				
Participant Costs								
Incremental Capital Costs	\$0	N/A	N/A	\$0				
Incremental O&M Costs	\$0	N/A	N/A	\$0				
Subtotal	\$0	N/A	N/A	\$0				
Total Costs	\$0	\$20,625,501	\$20,830,439	\$20,625,501				
Net Benefit (Cost)	\$11,526,938	(\$5,485,572)	(\$5,690,510)	\$7,350,421				
Benefit/Cost Ratio	INF	0.73	0.73	1.36				

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

PORTFOLIO TOTAL					2018	GAS	GOAL
2018 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Assumptions:		
	Test	Test	Impact	TRC	Lifetime (Weighted on Dth)	A	14.57 years
	(Total)	(Total)	(Total)	(Total)	Net-to-Gross (Weighted on Dth)	B	2094.24%
					Install Rate (Weighted on Dth)	C	88.7%
Benefits					Program Totals:		
Avoided Revenue Requirements					Total Dth/Yr Saved	D	573,136
Commodity Cost Reduction	N/A	\$22,713,694	\$22,713,694	\$22,713,694	Utility Costs per Net Dth/Yr	E	\$22.33
Variable O&M Savings	N/A	\$299,466	\$299,466	\$299,466	Net Benefit (Cost) per Gross Dth/Yr	F	\$30.01
Demand Savings	N/A	\$2,421,903	\$2,421,903	\$2,421,903	Non-Energy Benefits Adder per Gross Dth/Yr	G	\$3.42
Subtotal				\$25,435,063	Annual Dth/\$M	(1M / E)	44,788
Emissions Non-Energy Benefits Adder (7.7%)				\$1,961,808	Total Utility Budget	(E x D)	\$12,796,667
Subtotal	N/A	\$25,435,063	\$25,435,063	\$27,396,871	Total MTRC Net Benefits with Adder	(D x F)	\$17,202,315
Other Benefits					Total MTRC Net Benefits without Adder	(F - G) x D	\$15,240,506
Bill Reduction - Gas	\$50,660,651	N/A	N/A	N/A	Utility Program Cost per Net Dth Lifetime		
Incentives	\$7,174,434	N/A	N/A	\$7,174,434	(E / A)		\$1.53
Incremental Capital Savings	\$0	N/A	N/A	\$0			
Incremental O&M Savings	\$22,279,066	N/A	N/A	\$12,124,825			
Subtotal	\$80,114,151	N/A	N/A	\$19,299,258			
Total Benefits	\$80,114,151	\$25,435,063	\$25,435,063	\$46,696,130			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$108,858	\$108,858	\$108,858			
Administration & Program Deliv	N/A	\$3,839,709	\$3,839,709	\$3,839,709			
Advertising/Promotion/Custom	N/A	\$697,494	\$697,494	\$697,494			
Participant Rebates and Incentiv	N/A	\$7,174,434	\$7,174,434	\$7,174,434			
Equipment & Installation	N/A	\$252,954	\$252,954	\$252,954			
Measurement and Verification	N/A	\$723,218	\$723,218	\$723,218			
Subtotal	N/A	\$12,796,667	\$12,796,667	\$12,796,667			
Utility Revenue Reduction							
Revenue Reduction - Gas	N/A	N/A	\$47,450,363	N/A			
Subtotal	N/A	N/A	\$47,450,363	N/A			
Participant Costs							
Incremental Capital Costs	\$17,925,400	N/A	N/A	\$16,697,148			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$17,925,400	N/A	N/A	\$16,697,148			
Total Costs	\$17,925,400	\$12,796,667	\$60,247,029	\$29,493,815			
Net Benefit (Cost)	\$62,188,751	\$12,638,397	(\$34,811,966)	\$17,202,315			
Benefit/Cost Ratio	4.47	1.99	0.42	1.58			

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

BUSINESS PROGRAM TOTAL					2018	GAS	GOAL
2018 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Assumptions:		
	Test	Test	Impact	TRC	Lifetime (Weighted on Dth)	A	17.08 years
	(Total)	(Total)	(Total)	(Total)	Net-to-Gross (Weighted on Dth)	B	93.78%
					Install Rate (Weighted on Dth)	C	100.0%
Benefits					Program Totals:		
Avoided Revenue Requirements					Total Dth/Yr Saved	D	143,681
Commodity Cost Reduction	N/A	\$6,597,316	\$6,597,316	\$6,597,316	Utility Costs per Net Dth/Yr	E	\$17.32
Variable O&M Savings	N/A	\$73,140	\$73,140	\$73,140	Net Benefit (Cost) per Gross Dth/Yr	F	\$24.15
Demand Savings	N/A	\$682,752	\$682,752	\$682,752	Non-Energy Benefits Adder per Gross Dth/Yr	G	\$2.56
Subtotal				\$7,353,208	Annual Dth/\$M	(1M / E)	57,737
Emissions Non-Energy Benefits Adder (5%)				\$367,660	Total Utility Budget	(E x D)	\$2,488,524
Subtotal	N/A	\$7,353,208	\$7,353,208	\$7,720,868	Total MTRC Net Benefits with Adder	(D x F)	\$3,469,787
Other Benefits					Total MTRC Net Benefits without Adder	(F - G) x D	\$3,102,127
Bill Reduction - Gas	\$14,683,885	N/A	N/A	N/A	Utility Program Cost per Net Dth Lifetime		
Incentives	\$1,084,975	N/A	N/A	\$1,084,975	(E / A)		\$1.01
Incremental Capital Savings	\$0	N/A	N/A	\$0			
Incremental O&M Savings	\$2,324,294	N/A	N/A	\$2,293,005			
Subtotal	\$18,093,154	N/A	N/A	\$3,377,980			
Total Benefits	\$18,093,154	\$7,353,208	\$7,353,208	\$11,098,849			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$0	\$0	\$0			
Administration & Program Deliv	N/A	\$1,107,984	\$1,107,984	\$1,107,984			
Advertising/Promotion/Custom	N/A	\$27,257	\$27,257	\$27,257			
Participant Rebates and Incentiv	N/A	\$1,084,975	\$1,084,975	\$1,084,975			
Equipment & Installation	N/A	\$155,308	\$155,308	\$155,308			
Measurement and Verification	N/A	\$113,000	\$113,000	\$113,000			
Subtotal	N/A	\$2,488,524	\$2,488,524	\$2,488,524			
Utility Revenue Reduction							
Revenue Reduction - Gas	N/A	N/A	\$13,780,866	N/A			
Subtotal	N/A	N/A	\$13,780,866	N/A			
Participant Costs							
Incremental Capital Costs	\$5,487,561	N/A	N/A	\$5,140,538			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$5,487,561	N/A	N/A	\$5,140,538			
Total Costs	\$5,487,561	\$2,488,524	\$16,269,390	\$7,629,062			
Net Benefit (Cost)	\$12,605,593	\$4,864,684	(\$8,916,182)	\$3,469,787			
Benefit/Cost Ratio	3.30	2.95	0.45	1.45			

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

RESIDENTIAL PROGRAM TOTAL					2018	GAS	GOAL
2018 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Assumptions:		
	Test	Test	Impact	TRC	Lifetime (Weighted on Dth)	A	13.32 years
	(\$Total)	(\$Total)	(\$Total)	(\$Total)	Net-to-Gross (Weighted on Dth)	B	93.24%
					Install Rate (Weighted on Dth)	C	83.2%
Benefits					Program Totals:		
Avoided Revenue Requirements					Total Dth/Yr Saved	D	357,816
Commodity Cost Reduction	N/A	\$13,018,448	\$13,018,448	\$13,018,448	Utility Costs per Net Dth/Yr	E	\$15.66
Variable O&M Savings	N/A	\$187,218	\$187,218	\$187,218	Net Benefit (Cost) per Gross Dth/Yr	F	\$36.31
Demand Savings	N/A	\$1,411,836	\$1,411,836	\$1,411,836	Non-Energy Benefits Adder per Gross Dth/Yr	G	\$2.04
Subtotal				\$14,617,502	Annual Dth/\$M	(\$1M / E)	63,872
Emissions Non-Energy Benefits Adder (5%)				\$730,875	Total Utility Budget	(E x D)	\$5,602,053
Subtotal	N/A	\$14,617,502	\$14,617,502	\$15,348,377	Total MTRC Net Benefits with Adder	(D x F)	\$12,990,764
Other Benefits					Total MTRC Net Benefits without Adder	(F - G) x D	\$12,259,889
Bill Reduction - Gas	\$29,499,831	N/A	N/A	N/A	Utility Program Cost per Net Dth Lifetime		
Incentives	\$3,156,866	N/A	N/A	\$3,156,866	(E / A)		\$1.18
Incremental Capital Savings	\$0	N/A	N/A	\$0			
Incremental O&M Savings	\$17,669,524	N/A	N/A	\$8,559,315			
Subtotal	\$50,326,220	N/A	N/A	\$11,716,181			
Total Benefits	\$50,326,220	\$14,617,502	\$14,617,502	\$27,064,558			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$3,858	\$3,858	\$3,858			
Administration & Program Deliv	N/A	\$1,722,120	\$1,722,120	\$1,722,120			
Advertising/Promotion/Custom	N/A	\$300,881	\$300,881	\$300,881			
Participant Rebates and Incentiv	N/A	\$3,156,866	\$3,156,866	\$3,156,866			
Equipment & Installation	N/A	\$97,646	\$97,646	\$97,646			
Measurement and Verification	N/A	\$320,682	\$320,682	\$320,682			
Subtotal	N/A	\$5,602,053	\$5,602,053	\$5,602,053			
Utility Revenue Reduction							
Revenue Reduction - Gas	N/A	N/A	\$27,197,912	N/A			
Subtotal	N/A	N/A	\$27,197,912	N/A			
Participant Costs							
Incremental Capital Costs	\$9,318,936	N/A	N/A	\$8,471,741			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$9,318,936	N/A	N/A	\$8,471,741			
Total Costs	\$9,318,936	\$5,602,053	\$32,799,965	\$14,073,794			
Net Benefit (Cost)	\$41,007,285	\$9,015,449	(\$18,182,463)	\$12,990,764			
Benefit/Cost Ratio	5.40	2.61	0.45	1.92			

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

LOW-INCOME PROGRAM TOTAL					2018	GAS	GOAL
2018 Net Present Cost Benefit Summary Analysis For All Participants					Input Summary and Totals		
	Participant	Utility	Rate	Modified	Program Assumptions:		
	Test	Test	Impact	TRC	Lifetime (Weighted on Dth)	A	15.81 years
	(\$Total)	(\$Total)	Test	Test	Net-to-Gross (Weighted on Dth)	B	100.00%
			(\$Total)	(\$Total)	Install Rate (Weighted on Dth)	C	91.3%
Benefits					Program Totals:		
Avoided Revenue Requirements					Total Dth/Yr Saved	D	71,280
Commodity Cost Reduction	N/A	\$3,085,427	\$3,085,427	\$3,085,427	Utility Costs per Net Dth/Yr	E	\$47.17
Variable O&M Savings	N/A	\$38,955	\$38,955	\$38,955	Net Benefit (Cost) per Gross Dth/Yr	F	\$27.22
Demand Savings	N/A	\$325,894	\$325,894	\$325,894	Non-Energy Benefits Adder per Gross Dth/Yr	G	\$12.10
Subtotal				\$3,450,276	Annual Dth/\$M	(\$1M / E)	21,200
Emissions Non-Energy Benefits Adder (25%)				\$862,569	Total Utility Budget	(E x D)	\$3,362,353
Subtotal	N/A	\$3,450,276	\$3,450,276	\$4,312,845	Total MTRC Net Benefits with Adder	(D x F)	\$1,940,086
Other Benefits					Total MTRC Net Benefits without Adder	(F - G) x D	\$1,077,517
Bill Reduction - Gas	\$6,445,458	N/A	N/A	N/A	Utility Program Cost per Net Dth Lifetime		
Incentives	\$2,635,793	N/A	N/A	\$2,635,793	(E / A)		\$2.98
Incremental Capital Savings	\$0	N/A	N/A	\$0			
Incremental O&M Savings	\$2,285,248	N/A	N/A	\$1,272,504			
Subtotal	\$11,366,499	N/A	N/A	\$3,908,297			
Total Benefits	\$11,366,499	\$3,450,276	\$3,450,276	\$8,221,142			
Costs							
Utility Project Costs							
Program Planning & Design	N/A	\$0	\$0	\$0			
Administration & Program Deliv	N/A	\$414,320	\$414,320	\$414,320			
Advertising/Promotion/Custom	N/A	\$183,312	\$183,312	\$183,312			
Participant Rebates and Incentiv	N/A	\$2,635,793	\$2,635,793	\$2,635,793			
Equipment & Installation	N/A	\$0	\$0	\$0			
Measurement and Verification	N/A	\$128,928	\$128,928	\$128,928			
Subtotal	N/A	\$3,362,353	\$3,362,353	\$3,362,353			
Utility Revenue Reduction							
Revenue Reduction - Gas	N/A	N/A	\$6,445,458	N/A			
Subtotal	N/A	N/A	\$6,445,458	N/A			
Participant Costs							
Incremental Capital Costs	\$2,918,703	N/A	N/A	\$2,918,703			
Incremental O&M Costs	\$0	N/A	N/A	\$0			
Subtotal	\$2,918,703	N/A	N/A	\$2,918,703			
Total Costs	\$2,918,703	\$3,362,353	\$9,807,811	\$6,281,056			
Net Benefit (Cost)	\$8,447,796	\$87,923	(\$6,357,535)	\$1,940,086			
Benefit/Cost Ratio	3.89	1.03	0.35	1.31			

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

Appendix A – List of Acronyms

Acronym	Meaning
ACEEE	American Council for an Energy Efficient Economy
AFUE	Annual Fuel Utilization Efficiency
ASHRAE	American Society of Heating Refrigeration & Air Conditioning Engineers
BOMA	Building Owners and Managers Association
BSC	Business Solutions Center
CEE (Minnesota)	Center for Energy and the Environment
CEE (Boston)	Consortium for Energy Efficiency
CEO	Colorado Energy Office
CFL	Compact Fluorescent Light Bulb
CFM	Cubic Feet Per Minute
CoPUC	Colorado Public Utilities Commission
DOE	U.S. Department of Energy
DSM	Demand-Side Management
DSMCA	Demand-Side Management Cost Adjustment
EEBC	Energy Efficiency Business Coalition
EER	Energy Efficiency Ratio
EF	Energy Factor
EIA	Energy Information Administration
EMS	Energy Management System
EM&V	Evaluation, Measurement & Verification
EOC	Energy Outreach Colorado
EPA	U.S. Environmental Protection Agency
ESCO	Energy Services Company
GAMA	Gas Appliance Manufacturer's Association
GPM	Gallons per Minute
HERS	Home Energy Rating System
HVAC	Heating, Ventilation, and Air Conditioning
IPMVP	International Performance Measurement and Verification Protocol
LIHEAP	Low-Income Home Energy Assistance Program
M&V	Measurement and Verification
NAIOP	National Association of Industrial and Office Properties
NEMA	National Electrical Manufacturers Association
NTG	Net-to-Gross
O&M	Operations and Maintenance
RAP	Resource Action Programs
RESNET	Residential Energy Services Network
RR	Realization Rate
SEER	Seasonal Energy Efficiency Ratio
TRC	Total Resource Cost test
VC	Verification Contractor
VFD	Variable Frequency Drive

Appendix B – Key Terms

Plan – Gas Rule 4751(i) states that ““DSM plan” means the DSM programs, goals, and budgets over a specified DSM period, generally considered in one year increments, as may be proposed by the utility.” C.R.S. 40-3.2-103 (3)(a) dictates that “...each gas utility shall: (a) Develop and begin implementing a set of cost-effective DSM programs for its full service customers. Such programs shall be of the gas utility's choosing, taking into account the characteristics of the gas utility and its customers...” The Company submits DSM plans on an annual or biennial basis to obtain Commission approval of specific DSM programs, pilots, annual energy savings and peak demand reduction goals, and annual budgets, in accordance with Paragraph 170 of Decision No. C08-0560 which states that the Commission “concur with Public Service’s plan to file DSM plans biennially and to combine electric and gas DSM into one filing.”

Portfolio – Gas Rule 4757(e) states that, “A utility has the discretion and the responsibility of managing the portfolio of DSM programs to meet the benefit to cost ratio and the energy and savings targets. In implementing DSM programs, a utility shall use reasonable efforts to maximize energy savings consistent with the approved DSM plan.” Consistent with the use of the term portfolio in Gas Rule 4757(e), the Company uses the term DSM “portfolio” when referring to the entire group of electric or gas programs, products, and measures that the Company implements in a given plan-year.

Program – C.R.S. 40-1-102(6) states that ““Demand-side management programs” or “DSM programs” means energy efficiency, conservation, load management, and demand response programs or any combination of these programs.” Gas Rule 4751(j) states that ““DSM program” means any combination of DSM measures, information and services offered to customers to reduce natural gas usage.” Consistent with these definitions, depending on the context, the Company may use the term “program” to refer to the entire group of energy efficiency, conservation, load management, and demand response programs it offers, to only one of the described initiatives, as in the case of the Interruptible Service Option Credit program, or Third-Party Demand Response Program, or to a subset of the energy efficiency products it provides as in the case of the Residential, Business and Low-Income and Indirect gas and electric energy efficiency programs.

Product – The term “product” is used by the Company to refer to one of the approximately three dozen DSM offerings that are included as the principal components of the business, residential, and low-income programs included in the DSM plan and offered to customers.

For example, Commercial Refrigeration Efficiency and Lighting Efficiency are individual products within the Business Program under the electric energy efficiency portfolio.

Measure – Gas Rule 4751(g) states that ““DSM measure” means an individual component or technology, such as attic insulation or replacement of equipment.” The Company uses the term “measure” when referring to individual components or technologies offered as part of a specific product. For example, each of the energy efficient lighting technologies offered as part of the Lighting Efficiency product are considered to be individual “measures.”

Third-Party Implementer – The Company considers third-party implementers to be contracted agents that support DSM product delivery. This does not include trade partners or other consultants.

Goal – The Company refers to “goal” as the Commission-approved annual GWh savings goal for the Company’s electric portfolio, such as those ordered in Proceeding No. 13A-0686EG for years 2015 through 2020.

Targets – The Company refers to “targets” as the Company’s estimated achievements for a given year for our portfolio, programs, and products.

Appendix C – Product Rankings

DSM Product rankings are established by determining market segments that could participate in the product, customer classes available, total projected savings, cost-effectiveness, and participation rates (as a number and a percent of the market). This ranking is a requirement from Gas Rules 723-4, Docket No. 07R-371G. The table below shows the product rankings.

2017/2018	Rank
Home Lighting & Recycling	1
Lighting Efficiency	2
School Education Kits	3
Energy Feedback Residential	4
Multifamily Buildings	5
Lighting - Small Business	6
Energy Efficient Showerhead	7
Motor & Drive Efficiency	8
Refrigerator & Freezer Recycling	9
Commercial Refrigeration Efficiency	10
Process Efficiency	11
Residential Heating	12
ENERGY STAR New Homes	13
Evaporative Cooling	14
Cooling	15
New Construction	16
Computer Efficiency	17
Data Center Efficiency	18
Energy Savings Kit	19
Self Direct	20
Energy Management Systems	21
Recommissioning	22
Home Energy Squad	23
Compressed Air Efficiency	24
High Efficiency Air Conditioning	25
ENERGY STAR Retail Products Platform Pilot	26
Custom Efficiency	27
Single-Family Weatherization	28
LED Street Lighting	29
Insulation & Air Sealing	30
Heating Efficiency	31
Home Performance with ENERGY STAR	32
Water Heating	33
Non-Profit Energy Efficiency	34
Multi-Family Weatherization	35

Appendix D – Budget Categories

The Company uses the following six budget categories to track and report its annual expenditures for DSM programs and products within its portfolio:

1. Program Planning and Design

Expenditures for:

- Labor for product development and product managers.
- Expenditures related to product development, planning, and design.

2. Administration and Program Delivery

Expenditures for:

- Labor for product managers, sales representatives, call center, rebate processing, technical consulting, and other fulfillment activities associated with delivering a product directly to the customer.
- Labor for installation contractors, vendors, technical consultants, fulfillment contractors, and alternative providers that Xcel Energy contracts with to provide DSM services.
- Project fulfillment, implementation and program support activities associated with delivering a program directly to the customer.

3. Advertising / Promotion / Customer Education

Expenditures for:

- Labor for communication staff and others.
- TV, radio, newspaper, and print media; direct promotion and sales support materials; postage, promotional events; contracted outbound telephone sales.
- Customer education through seminars, pamphlets, videos, and computer games.

4. Participant Rebates and Incentives

Expenditures for:

- Customer rebates, finance interest subsidies, subsidies for engineering studies, trade incentives, and incentives given in the form of subsidized products or equipment.

5. Equipment and Installation

Expenditures for:

- The costs to purchase energy efficient equipment and to install efficiency equipment at the customer site.

6. Measurement and Verification

Expenditures for:

- Labor for market research and load research.
- Labor product development staff, product development, external consultants, and product development research activities.
- Customer surveys, program evaluation expenses.

Appendix E – Avoided Cost Assumptions

The following sections summarize the avoided cost assumptions Public Service has made in order to perform the cost-effectiveness tests for electric and gas programs, and for which the Company is asking for approval of for use in the status reports and incentives calculations for 2017 and 2018 achievements.

Electric Programs

In order to determine the cost-effectiveness of its electric energy efficiency and load management programs, Public Service must first calculate the avoided generation, transmission, distribution, and marginal energy costs these programs avoid. Below are tables showing the avoided cost assumptions used in this plan.

1. Estimated Annual Avoided Generation Capacity Costs (*Source: Public Service Resource Planning*)

Capacity costs reflect current generic capacity cost estimates used in Phase I of the Public Service Company of Colorado’s 2016 Electric Resource Plan (Docket No. 16A-0396E) for a gas-fired combustion turbine (CT) referred to as a “Large CT” in compliance with paragraph 96 in Decision C14-0731 (Docket No. 13A-0686EG). These values exclude the ancillary services adjustments per paragraph 97 in this same decision.

	CT		CT
Year	Gen Capacity \$/kW-yr	Year	Gen Capacity \$/kW-yr
2017	\$85.04	2028	\$105.73
2018	\$86.74	2029	\$107.85
2019	\$88.47	2030	\$110.00
2020	\$90.24	2031	\$112.20
2021	\$92.05	2032	\$114.44
2022	\$93.89	2033	\$116.73
2023	\$95.76	2034	\$119.07
2024	\$97.68	2035	\$121.45
2025	\$99.63	2036	\$123.88
2026	\$101.62	2037	\$126.36
2027	\$103.66		

2. Estimated Annual Avoided Transmission and Distribution (T&D) Capacity Costs (*Source: Public Service Resource Planning*)

Paragraph 97 in Decision C14-0731 (Docket No. 13A-0686EG) required the Company to “....study the avoided transmission and distribution capacity costs and propose values in its DSM Biennial Plan for 2015 through 2016.” Consistent with the Commission’s decision in C15-0735, the Company undertook a study, specific to its own territory, utilizing the system planning approach to estimate T&D costs. The study is included as attachment SMW-6 to the direct testimony of Shawn White accompanying this Plan. The table below documents the annual values of avoided T&D costs from this study:

Avoided Capacity \$/kW-yr				Avoided Capacity \$/kW-yr			
Year	Transmission	Distribution	T&D	Year	Transmission	Distribution	T&D
2017	\$8.37	\$2.27	\$10.64	2028	\$10.41	\$2.83	\$13.24
2018	\$8.54	\$2.32	\$10.86	2029	\$10.62	\$2.89	\$13.51
2019	\$8.71	\$2.37	\$11.08	2030	\$10.83	\$2.95	\$13.78
2020	\$8.88	\$2.42	\$11.30	2031	\$11.05	\$3.01	\$14.06
2021	\$9.06	\$2.47	\$11.53	2032	\$11.27	\$3.07	\$14.33
2022	\$9.24	\$2.51	\$11.76	2033	\$11.49	\$3.13	\$14.62
2023	\$9.43	\$2.57	\$11.99	2034	\$11.72	\$3.19	\$14.91
2024	\$9.62	\$2.62	\$12.23	2035	\$11.96	\$3.25	\$15.21
2025	\$9.81	\$2.67	\$12.48	2036	\$12.20	\$3.32	\$15.51
2026	\$10.01	\$2.72	\$12.73	2037	\$12.44	\$3.38	\$15.82
2027	\$10.21	\$2.78	\$12.98				

3. Estimated Annual Avoided Energy Costs (*Source: Public Service Resource Planning Analytics*)

In order to determine avoided energy costs, the Company's Resource Planning Analytics group produced two Strategist runs, one with and one without the current approved goal level of DSM of 400 GWh/yr expected to be acquired from January 1, 2017 through 2037. These runs simulated the economic dispatch of the Company's generation fleet using assumptions regarding must-run plants, must-take resources, minimum and maximum generator output capability, unit heat rates, and unit fuel prices. Consistent with the method proposed by the Company in Proceeding No. 13A-0686EG, the avoided energy costs attributable to future DSM were determined using a comparison of the annual total system variable costs (with and without future DSM), to the annual total energy served (MWh) with and without future DSM. Including variable O&M, fuel (including a gas price volatility mitigation adder (GPVM)), and dump energy.

4. Estimated Annual Avoided Emissions Costs (includes CO₂) (Source: Public Service Resource Planning)

In the Public Services Company of Colorado's 2016 Electric Resource Plan (Docket No. 16A-0396E), the base-case assumed zero cost for CO₂ emissions. This value is set to \$0 for all future years.

Simple-Average Hourly DSM Avoided Energy			
Year	\$/MWh	Year	\$/MWh
2017	\$25.61	2028	\$45.94
2018	\$30.71	2029	\$48.17
2019	\$31.69	2030	\$49.73
2020	\$36.24	2031	\$52.35
2021	\$41.59	2032	\$53.36
2022	\$43.55	2033	\$54.13
2023	\$47.41	2034	\$57.55
2024	\$48.12	2035	\$57.35
2025	\$49.95	2036	\$59.48
2026	\$50.37	2037	\$60.20
2027	\$44.46		

Gas Programs

In order to determine the cost-effectiveness of its gas programs, Public Service must calculate the avoided commodity cost of gas, avoided capacity costs and any avoided variable O&M costs associated with the gas energy efficiency savings. Below are tables showing the avoided cost assumptions used in this Plan.

1. Estimated Commodity Cost of Gas (Source: Public Service Gas Resource Planning)

The following table outlines the current gas price forecast as of February 2016 using a market snapshot for short-term prices and a quantitative average of projections from well-known forecasting services for the long-term forecast prices. Distinct costs are identified for Business and Residential customers with these values being applied to Business and Residential gas programs respectively.

\$/Dth			\$/Dth		
Year	Residential	Business	Year	Residential	Business
2017	\$2.60	\$2.59	2028	\$5.29	\$5.28
2018	\$2.75	\$2.74	2029	\$5.52	\$5.51
2019	\$2.98	\$2.96	2030	\$5.68	\$5.66
2020	\$3.57	\$3.55	2031	\$5.93	\$5.92
2021	\$4.03	\$4.01	2032	\$6.19	\$6.18
2022	\$4.21	\$4.19	2033	\$6.38	\$6.37
2023	\$4.38	\$4.37	2034	\$6.55	\$6.53
2024	\$4.50	\$4.49	2035	\$6.70	\$6.69
2025	\$4.65	\$4.64	2036	\$6.84	\$6.83
2026	\$4.81	\$4.80	2037	\$6.97	\$6.96
2027	\$5.04	\$5.03			

2. Estimated Avoided Variable O&M Costs (Source: Public Service Pricing and Planning)

The company used the following value provided by the Company's Pricing and Planning department to determine variable O&M costs avoided with a reduction in gas usage.

Year	\$/Dth
2017-2037	\$0.05

3. Estimated Annual Avoided Reservation Costs (used to estimate capacity savings – Peak Day Dth savings estimated as 1% of annual Dth savings) (Source: Public Service Gas Resource Planning)

The following annual avoided reservation costs was used to determine the cost of service to transport incremental gas supplies to the metropolitan Denver area. The Company uses the CIG firm transportation rate to estimate this cost.

Year	\$/Dth
2017-2037	\$46.67

Appendix F – Natural Gas DSM \$/Therm and ALR Methodology

The Company proposes the following dollar per therm values applicable to natural gas DSM programs provided to its residential and non-residential customers, respectively:

Proposed Dollar per Therm Values for the DSMCA factors to be effective July 1, 2016:

DTVR = \$0.08401
DTVNR = \$0.10192

The dollar per therm values proposed have been used to calculate the lost revenues sought to be recovered through the Gas-Demand Side Management Cost Adjustment (G-DSMCA) filed on April 1, 2016 to be effective July 1, 2016.

The methodology for calculating the dollar per therm values set forth above is as follows:

The following methodology is proposed for calculation of the Dollar per Therm Values (DTV) that is required to calculate the Acknowledgement of Lost Revenue (ALR) value in accordance with Public Service gas Demand-Side Management Cost Adjustment (DSMCA). Two dollar per therm values are required, one for residence service, which is herein labeled “DTVR”, and one for non residence service, which is herein labeled “DTVNR”.

Calculation of the Residence Service Dollar per Therm Value (DTVR):

Calculation Components:

1. Residential Base Rate per Therm (RBR)
2. Variable Cost per Therm (VCT)

Formula: DTVR = RBR minus VCT

Calculation of the Non Residence Service Dollar per Therm Value (DTVNR):

Calculation Components:

1. Commercial Small Gas Service Base Rate per Therm (CSGBR)
2. Commercial Large Gas Service Base Rate per Therm (CLGBR)
3. Interruptible Industrial Gas Service Base Rate per Therm (IGBR)
4. CSG Sales (CSGS)
5. CLG Sales (CLGS)
6. IG Sales (IGS)
7. Total of CSG + CLG + IG Sales (TS)
8. VCT

Formula: DTVNR = {[CSGBR times (CSGS/TS)] + [CLGBR times (CLGS/TS)] + [IGBR times (IGS/TS)]} minus VCT

Calculation of the VCT

[Note: the VCT is the same for both the DTVR and DTVNR formula]:

Calculation Components:

1. Total Variable Costs (VC)
2. Weather Normalized throughput in Therms (WNT)

Formula: $VCT = VC/WNT$

Proposed VCT to be effective January 1, 2015:

VCT = \$0.000391

As stipulated in Service Company's gas tariff, these Dollar per Therm Values are applied to the gas DSMCA factor calculations as follows:

"The RDSM ALR Value is the sum of multiplying the dollar per therm value, as approved by the Commission for residential service, (DTVNR) times the annual number of therms lost from all residential programs executed during the program year under consideration.

"The NDSMCA ALR Value is the sum of multiplying the dollar per therm value, as approved by the Commission for non-residential services (DTVNR), times the annualized number of therms lost from all non-residential programs executed during the program year under consideration."

Appendix G – Technical Reference Manual

The Technical Reference Manual (TRM) section contains the deemed savings technical assumptions and forecasts for the direct savings products in the DSM portfolio. The deemed savings technical assumptions describe the calculation methodology and assumptions that will be used to determine actual savings, costs, and other values for each product rebate. These calculation methodologies and assumptions are then applied to the population and the number of participants anticipated for each product, to produce an electric and gas forecast of impacts. The forecast is utilized to conduct the cost-benefit analysis of this Plan.

The following algorithms are consistent in their applicability across all deemed savings technical assumptions and therefore are shown here and not repeated within each product's individual deemed savings sheet:

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
Net Dth = Gross Dth x NTG

Where, Net-to-Gross (NTG) is the ratio equal to the net impact divided by the gross impact. This factor is applied to gross savings to determine each product's net impact.

The following constants are consistent in their applicability across all deemed savings technical assumptions and therefore are shown here and not repeated within each product's individual deemed savings sheet:

Business TDLF = 6.50%
Residential TDLF = 7.69%

Where,

- Transmission/Distribution Loss Factor (TDLF) is the percentage loss of electricity as it flows from the power plant to the customer.
- Business TDLF is applicable to measures installed at premises on a business rate schedule.
- Residential TDLF is applicable to measures installed at premises on a residential rate schedule.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Energy Efficient Showerhead - CO

Description:

Residential customers are eligible to receive a free kit containing a high-efficiency showerhead, kitchen aerator, and bathroom aerator to reduce energy and water use. First time participants receive a kit containing 2 showerheads, 2 bathroom aerators, and 1 kitchen aerator.

Equations:

Showerhead or Aerator Natural Gas Savings (Gross Dth/unit)	= $\text{GPY_DHW_Savings} \times \text{Water_Heater_Delta_T} \times 8.33 / \text{Gas_Water_Heater_Efficiency} / 1,000,000 \times \text{Gas_Split_Factor}$
Showerhead or Aerator Energy Savings (Gross Annual kWh Saved at Customer/unit)	= $\text{GPY_DHW_Savings} \times \text{Water_Heater_Delta_T} \times 8.33 / \text{Electric_Water_Heater_Efficiency} / 3,412 \times (1 - \text{Gas_Split_Factor})$
Water_Heater_Delta_T	= $\text{Water_Heater_Temperature} - \text{City_Mains_Temperature}$
Showerhead or Aerator Demand Savings (Gross kW Saved at Customer/unit)	= $\text{Customer_kWh} / 8,760$
Showerhead or Aerator Demand Savings (Gross Generator kW)	= $\text{Customer_kW} \times \text{Coincidence_Factor}$

Variable ID	Value	Description
GPY_DHW_Savings	See Table 1	Gallons per year of hot water saved with high-efficiency showerhead or aerator.
Water_Heater_Temperature	120	Water heater setpoint temperature °F. (Reference 1)
City_Mains_Temperature	51.4	Water temperature of city water entering the water heater °F. (Reference 2)
Gas_Water_Heater_Efficiency	80%	Assumed gas water heater efficiency without standby losses. This only includes combustion efficiency.
Electric_Water_Heater_Efficiency	100%	Assumed electric water heater efficiency without standby losses.
Gas_Split_Factor	See Table 2	Gas_Electric_Split_Factor is based on customer response to showerhead post card. The
Coincidence_Factor	See Table 1	Amount of Customer_kW demand that will coincide with peak utility system demand.
NTG	99%	Net to Gross is assumed to be 99%

Inputs:

Verified during M&V:

Showerhead received by customer	Yes
Showerhead installed by customer	Yes
Water Heating Fuel provided by Customer	Yes

Assumptions:

Baseline Flowrates	Baseline showerhead flowrate is assumed to be 2.5GPM per federal minimum standards. Kitchen and bathroom aerator baseline flowrates are assumed to be 2.2GPM per federal minimum standards.	
Heat content of 1 gallon water	8.34	Btu/gal °F
Conversion from Btu to kWh	3,412	1 kWh = 3,412 Btuh
Conversion from Btu to Dth	1,000,000	1 Dth = 1,000,000 Btuh
Measure Life	10	Lifetime of showerhead and aerator measures. (Reference 3)
Incremental Costs	See Table 1	Actual costs provided by vendor; cost per showerhead is assumed for the material costs for cost/benefit calculation purposes.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 1	Showerhead	Showerhead 2nd	Kitchen Aerator	Bathroom Aerator	Bathroom Aerator 2nd
GPY_DHW_Savings	2,749	2,395	309	361	361
Total Water Savings/Year - Gallons	3,519	3,066	368	462	462
Coincidence_Factor (Reference 1)	64%	64%	124%	124%	124%
O&M Savings	\$22.45	\$19.56	\$2.35	\$2.95	\$2.95
Incremental Costs 2017*	\$ 3.10	\$ 3.10	\$ 1.50	\$ 0.48	\$ 0.48
Incremental Costs 2018*	\$ 3.21	\$ 3.21	\$ 1.56	\$ 0.52	\$ 0.52

*Note that these incremental costs are estimates. Actual incremental costs will be used when they are known.

Table 2	Gas_Split_Factor
Gas Water Heater	100%
Electric Water Heater	0%
Unknown Water Heater	93%

References:

1. Development of Standardized Deomestic Hot Water Event Schedules for Residential Buildings; R. Hendron and J. Burch; NREL/CP-550-40874
2. Denver Water's 2006 Treated Water Quality Summary Report; <http://www.denverwater.org/docs/assets/9A12FBC5-BCDF-1B42-D1BC5F0B1CE3B115/TreatedWQSummaryReport20061.pdf>
3. DEER Database for Energy Efficient Resources version 2014; www.deeresources.com
4. Denver Water 2016 Rate Schedule; <http://www.denverwater.org/BillingRates/RatesCharges/2016-rates/>
5. City and County of Denver Sanitary Sewer Rate Schedule; <https://www.denvergov.org/content/denvergov/en/wastewater-management/billing-and-rates/wastewater-rates.html>
6. Xcel Energy New Mexico Residential Shower Use Study
7. The Effect of Efficiency Standards on Water Use and Water Heating Energy Use in the U.S.: A Detailed End-use Treatment; J Koomey, C Dunham, J Lutz; LBL-35475
8. Residential Energy Consumption Survey 2009; <http://www.eia.gov/consumption/residential/>
9. 2010 Xcel Energy Colorado Home Use Study (PS Co Service Area)

Changes from Recent Filing:

1. Updated incremental costs and water rates

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Residential Energy Feedback

Description:

Program will deliver energy use feedback via print, email and online web portal access to customer groups and measure the difference in energy use between Participants and an appropriately sized Control Group that does not receive energy use feedback. Program will include residential customers with both gas and electric service from Xcel Energy.

Algorithms:

Monthly Electrical Energy Savings (Gross_Treatment_Monthly_kWh)	The development of the savings by each variable group (Print, Email, Online) follow this basic formula: = (Control_kWh_usage_post_treatment - Group_Rebate_Product_Participation) - (Treatment_kWh_usage_post_treatment - Group_Rebate_Product_Participation)
Electrical Energy Savings (Gross_Annual_kWh)	= sum of each month of Monthly Electrical Energy Savings
Electrical Demand Savings (Gross_Coincident_kW)	= Gross_kW * CF
Electrical Demand Savings (Gross_kW)	= Customer_kW_Max
Coincidence Factor (CF)	= Customer_kW_Peak_Month / Customer_kW_Max
Monthly Natural Gas Energy Savings (Gross_Treatment_Monthly_Dth)	The development of the savings by each variable group (Print, Email, Online) follow this basic formula: = (Control_Dth_usage_post_treatment - Group_Rebate_Product_Participation) - (Treatment_Dth_usage_post_treatment - Group_Rebate_Product_Participation)
Natural Gas Energy Savings (Gross_Annual_Dth)	= Sum of each month of the Monthly Natural Gas Energy Savings
Behavioral Adjustment	= -2/3 * Gross_kW; This adjustment is applied to reduce the first year savings to 1/3 of the actual savings in compliance with ordered treatment.

Variables:

Treatment_Print	= Group of electric and gas customers receiving periodic paper reports providing feedback on their energy use.
Treatment_Email	= Group of electric and gas customers receiving internet delivered reports that provide feedback on their energy use.
Treatment_Online	= Group electric and gas customers (unknown size) who choose to opt-in to a web feedback portal that provides feedback on their energy use.
Control_Print	= Group of electric and gas customers who are similar in structure (demographics, life stage, house size, geography) to the participant Group, but receive no contact from Xcel or its contractors.
Control_Email	= Group of electric and gas customers who are similar in structure (demographics, life stage, house size, geography) to the participant Group, but receive no contact from Xcel or its contractors.
Control_Online	= Group of electric and gas customers who are similar in structure (demographics, life stage, house size, geography) to the participant Group, but receive no contact from Xcel or its contractors
Treatment_kWh_usage_post_treatment	= Electrical energy use of the Treatment Group as determined through multi-variate regression analysis.
Control_kWh_usage_post_treatment	= Electrical energy use of the Control Group as determined through multi-variate regression analysis.
Treatment_Dth_usage_post_treatment	= Natural gas energy use of the Treatment Group as determined through multi-variate regression analysis.
Control_Dth_usage_post_treatment	= Natural gas energy use of the Control Group as determined through multi-variate regression analysis.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Group_Rebate_Product_Participation	= Energy savings generated by participation in Xcel's rebate products for both Treatment and Control groups, kWh and Dth. Rebated product participation from other products, (e.g.new furnace), are savings that will be included in the regression analysis and deducted from the EFP results if statistically significant.	
Gross_Treatment_Monthly_kWh_Saved	Provided by Vendor	= monthly MWh savings provided by the vendor for all homes in the treatment group.
Customer_kW_Peak_Month	Provided by Vendor	= Average electrical demand savings per household achieved in the month, day, and hour that contained the peak demand on Xcel Energy's system. Actual value calculated each year.
Customer_kW_Max	Provided by Vendor	= The maximum of the peak electrical demand savings per household achieved in the summer months: June, July, August, and September. Actual value calculated each year. Formula for each monthly Customer_kW = Customer_Daily_kWh * Treatment_Percent_Savings * Peak_Factor * Daily_Usage_at_Peak
Gross_Treatment_Monthly_Dth_Saved	Provided by Vendor	= monthly therm savings provided by the vendor for all homes in the treatment group.
Peak_Factor	Provided by Vendor	= The ratio of energy usage in peak hour to average hourly energy use. Actual value calculated each year.
Daily_Usage_at_Peak	Provided by Vendor	= Percentage of energy usage in peak hour to daily total energy use. Actual value calculated each year.
Measure Life	= Assumed to be 1.0 year since there is no equipment purchase - just behavior changes.	
Measure Life (Behavioral Adjustment)	= is set to zero in order to not affect the lifetime net benefits	
Incremental Cost	= Assumed to be zero since the program induces behavior change which has no capital cost.	
Operation & Maintenance (O&M) Savings	= Assumed to be zero.	
Net-to-Gross Factor (NTG)	= 100%	

References:

Savings data from Xcel Colorado Opower pilot, June 2011 - July 2014. File "Xcel_Monthly Results Summary_Through July 2014"

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Energy Savings Kit

Description:

A package of home energy efficiency measures in a kit that will be distributed to low-income customers. Each participant receives a kit containing a high-efficiency showerhead, two high efficiency sink aerators (1.0 GPM and 1.5 GPM), and eight LED bulbs, 10 Watts each.

Program References:

Measures "Provide Efficient Showerhead"	Refer to Program "Energy Efficient Showerhead - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PCkW, etc. for the "Efficient Showerhead" measures.
Measures "Provide Efficient Kitchen Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PCkW, etc. for the "Efficient Kitchen Faucet Aerator" measure.
Measures "Provide Efficient Bath Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PCkW, etc. for the "Efficient Bath Faucet Aerator" measure.
Replace incandescent lamps with LEDs	Refer to Program CO Home Lighting & Recycling to find formulas for Customer kW, Customer kWh, Customer PCkW for the "Replace incandescent lamp with LED".
Measure "Provide Efficient Showerhead"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Gas Split Factor", "Measure Life", "Hours", "Coincidence Factor", etc values.
Measures "Provide Efficient Kitchen Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Gas Split Factor", "Measure Life", "Hours", "Coincidence Factor", etc values.
Measures "Provide Efficient Bath Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Gas Split Factor", "Measure Life", "Hours", "Coincidence Factor", etc values.
Measure "LED"	Refer to Program "Home Lighting and Recycling - CO" to find references and tables for "Measure Life", "Hours", "Coincidence Factor", etc values.
Measure "Provide Efficient Showerhead"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for Operation and Maintenance cost savings value due to water savings.
Measures "Provide Efficient Kitchen Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for Operation and Maintenance cost savings value due to water savings.
Measures "Provide Efficient Bath Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Operation and Maintenance cost savings", value due to water savings.

Algorithms:

All measures	Refer to Source Programs for energy savings calculation algorithms.
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Variables:

Energy O&M savings	= Savings attributed to savings of fuel not served by Xcel Energy. Varies by customer depending on customer type and water heating fuel.
Net-to-Gross Factor (NTG)	= We will use 100% as these kits would not be available without the product.
Install Rate	= Installation rates will be determined during the year.
Incremental Costs for all measures	= costs provided by vendor.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Inputs:

Provided by Vendor/customer:	Verified during M&V:
Number of kits distributed	Yes
Number of LEDs installed	Yes
Showerhead Installed	Yes
Kitchen aerator installed	Yes
Bath aerator installed	Yes

Assumptions:

Savings shown above include homes with either electric or gas water heaters. The Energy Efficient Showerhead - CO program monitors and establishes a gas split factor for use in homes where the water heater type is unknown. Energy Savings Kits will use the Energy Efficient Showerhead - CO program's gas split factor for unknown water heater types to calculate and claim energy savings.

Tables:

See Reference Programs

References:

See Reference Programs
Energy Efficient Showerhead - CO
Home Lighting and Recycling - CO

Changes from Recent Filing

Update to EISA baseline wattages for LED measures
Update to add LED measure and remove CFLs
Updated to 2017-2018 Utility Cost Information
Updated for latest Denver water rates in Showerhead program
Updated lighting hours and expected life
Updated savings from showerheads and aerators

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: ENERGY STAR New Homes

Description:

The CO ENERGY STAR New Homes (ESNH) product provides residential homebuilders with an incentive to build new single-family, small multi-family and town homes that are at least 10% more energy-efficient than what local building codes require. Builders are encouraged to consider a "whole-house" approach and have the flexibility to install any combination of efficient technologies and building techniques to meet the program requirements and qualify for rebate. The product utilizes Performance testing per Residential Energy Services Network (RESNET) Home Energy Rating System (HERS) and each home will be modeled by a certified RESNET energy rater using the widely adopted REM/Rate™ software application or a Company approved equivalent.

Program References:

LEDs	Refer to Program "Home Lighting & Recycling" to find formulas for (Customer kW, Customer kWh, Customer PCKW, etc.) for the "LED" measure.
LEDs	Refer to Program "Home Lighting & Recycling" to find reference table for "Existing lighting wattage for residential lights" values.
LEDs	Refer to Program "Home Lighting & Recycling" to find reference table for "Average Cost" values.
LEDs	Refer to Program "Home Lighting & Recycling" to find reference table for "Measure Life" values.

Algorithms:

Gross kW Saved at Customer Envelope Measures	= The maximum of (summer peak kW savings ; winter peak kW savings) Data for the summer and winter peak kW savings are included in the software model for each individual home as provided by the House Rating Agent.
Gross Coincident kW Saved at Customer Envelope Measures	= (Gross kW Saved at Customer) x 90% Coincidence Factor
Gross Annual kWh Saved at Customer Envelope measure	= Total Reference Home kWh - Total As-built Home kWh Data for The Reference Home and As-Built Home kWh are included in the software model for each individual Home As provided by the House Rating Agent and based on Local codes.
Gross Dth/Yr Envelope Measures	= (Total Reference Home Therms - Total As-built Home Therms) / 10 Data for The Reference Home and As-Built Home Therms are included in the software model for each individual Home as provided by the House Rating Agent and based on Local codes.
Gross kW Saved at Customer	= Gross Annual kWh / Hours
Gross Coincident kW Saved at Customer	= Gross kW Saved at Customer * CF
As-Built_Home_MMBTU	As-Built Home's annual energy use calculated by the Home Rater using a software modeling tool, in units of MMBTU. = (As-Built Heating (kWh) + As-Built Cooling (kWh) + As-Built Lights & Appliances (kWh)) x 3412 / 1000000 + (As-Built Heating (therms) + As-Built Water Heating (therms) + As-Built Lights & Appliances (therms)) / 10
Ref_Home_MMBTU	Reference Home's annual energy use calculated by the Home Rater using a software modeling tool, in units of MMBTU. = (Reference Heating (kWh) + Reference Cooling (kWh) + Reference Lights & Appliances (kWh)) x 3412 / 1000000 + (Reference Heating (therms) + Reference Water Heating (therms) + Reference Lights & Appliances (therms)) / 10

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

%_BTC	As-built Home's Percent Improvement over local energy code requirements. = (Ref_Home_MMBTU - As-Built_Home_MMBTU) / Ref_Home_MMBTU
ICC_Adj_Factor	= Incremental Capital Cost Adjustment Factor for Envelope HERS Index based Measures = 1 + (ICC_ADJ_a x LN (Home_Size) + ICC_ADJ_b)
As-built_ICC/SF	= As-built Incremental Capital Cost per Square Foot for Envelope Measures based on Percent Better than Code (. As-Built_ICC/SF = (ICC/SF_a x %_BTC^2 + ICC/SF_b x %_BTC + ICC/SF_c) x ICC_Adj_Factor
summer peak kW savings	= Summer Peak kW (Reference) - Summer Peak kW (As Built)
winter peak kW savings	= Winter Peak kW (Reference) - Winter Peak kW (As Built)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Variables:	Value	Description
As-Built_HERS	Customer Input	As-Built Home's HERS Index Score calculated by the Home Rater using a software modeling tool and provided under HERS Index (Final)
Baseline Energy Code	Customer Input	Home Rater identified Baseline Energy Code for the jurisdiction in which the home is being built. IECC 2006, IECC 2009, IECC 2012, IECC 2015
Home_Size	Customer Input	Home's conditioned square footage, provided by the home rater.
ICC/SF_a ICC/SF_b ICC/SF_c	See Table 2	Constants for use in calculating an Incremental Cost / Square Foot of home. The cost curve is derived from information provided by Residential Science Resources estimates and home modeling of the most common measures implemented to improve the envelope performance over local codes. Curves are developed for IECC 2006/2009 and IECC 2012/2015.
ICC_ADJ_a ICC_ADJ_b	See Table 3	Constants for use in calculating an adjustment factor to correct the incremental cost for home size. An increase in homes size reduces the cost per square foot for the same set of measures due to economies of scale. This factor is used in conjunction with the As-built_ICC/SF cost formula
Clothes washer electric energy savings (Gross Annual kWh)	See Table 1	Energy savings for the clothes washer are based on the ENERGY STAR Clothes Washer Savings Calculator: http://www.energystar.gov/index.cfm?c=clotheswash.pr_clothes_washers . This will vary based on source for domestic hot water heat; gas or electric.
Clothes washer Hours	312	Assumed Hours of operation for a clothes washer, based on number of duty cycles and a duty cycle of 1 hour.
Clothes washer natural gas savings (Gross Dth/Yr)	0.12	Energy savings for the clothes washer are based on the ENERGY STAR Clothes Washer Savings Calculator: http://www.energystar.gov/index.cfm?c=clotheswash.pr_clothes_washers . For homes with gas domestic hot water heat.
Quantity_LEDs	See Table 4	Deemed quantity of high efficacy lamps used in the LED measures.
Eff_LED_Lamp_Wattage	See Table 4	Deemed efficient lamp wattage used in the LED measures. Based on weighted average lamps sold under the Home Lighting and Recycling program
Baseline_Lamp_Wattage	See Table 4	Deemed baseline lamp wattage used in the LED measures. Based on weighted average baseline lamps for the associated Eff_LED_Lamp_Wattages from the Home Lighting and Recycling program.
Refrigerator electric energy savings (Gross Annual kWh)	16	Energy savings for the refrigerator were based on the ENERGY STAR Refrigerator Savings Calculator: http://www.energystar.gov/index.cfm?c=refrig.pr_refrigerators .
Refrigerator Hours	8,760	Assumed Hours of operation for a refrigerator.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Incremental Cost Energy Star Certification	\$ 505.00	Incremental cost for completing the construction measures necessary and the paperwork required to achieve Energy Star Certification. This covers the additional costs incurred by the builder for the paperwork portion of achieving the certification. The cost of the actual construction measures that result in the energy savings will be captured in the as-built home incremental cost.
Non-energy O&M savings	See Table 1	Water Savings per year for an Energy Star Clothes Washer
CF Clothes Washer	See Table 1	Coincidence Factor of an energy star Clothes Washer
CF Refrigerator	100%	Coincidence Factor of an energy star Refrigerator
Measure Life As-built Home	20 Years (Reference 1)	Envelope Measures
Measure Life Refrigerator	13 Years (Reference 14)	Life of an energy star refrigerator
Measure Life Clothes Washer	11 Years (Reference 16)	Life of an energy star Clothes Washer

Inputs:

Home As-built energy model and the reference home energy model are developed by the House Rater using a modeling software tool. The model output represents the total home's thermal envelope influence on energy use including secondary impacts from lights and appliances. A list of the data that will be used as calculator inputs are as follows (note: this may vary depending on the software tool used to rate the home):

Home Size (Square Footage)
HERS Index (Final)
Baseline Energy Code
Reference Heating (therms)
Reference Heating (kWh)
Reference Cooling (kWh)
Reference Water Heating (therms)
Reference Lights & Appliances (therms)
Reference Lights & Appliances (kWh)
As-Built Heating (therms)
As-Built Heating (kWh)
As-Built Cooling (kWh)
As-Built Water Heating (therms)
As-Built Lights & Appliances (therms)
As-Built Lights & Appliances (kWh)
Reference Summer Peak kW
As-Built Summer Peak kW
Reference Winter Peak kW
As-Built Winter Peak kW
Energy Star Certification
Water Heater Fuel
Clothes Washer Installed
Refrigerator Installed

Quantity high efficacy lamps Installed (Minimum 20) for IECC 2006 or IECC 2009 baseline homes

100% high efficacy lamps Installed for IECC 2012 or IECC 2015 baseline homes

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Assumptions:

Tables:

Table 1 Clothes Washer

Total Water Savings/Year - Gallons	1,180
kWh Savings in home with electric water heater	32
kWh Savings in home with gas water heater	6
Coincidence Factor (CF)	3.37%
Non-Energy O&M Savings	\$ 7.53
Incremental Cost	\$ 30.00

Table 2

Inc Cost / SF Formula Constants	ICC/SF_a	ICC/SF_b	ICC/SF_c
IECC 2006 Cost / SF Curve:	2.532679697	1.686152873	-0.035377136
IECC 2009 Cost / SF curve:	2.532679697	1.686152873	-0.035377136
IECC 2012 Cost / SF Curve:	17.13726794	-2.192988956	0.10462244
IECC 2015 Cost/SF Curve:	17.13726794	-2.192988956	0.10462244

Table 3

Cost / SF Adjustment Factor Constants	ICC_ADJ_a	ICC_ADJ_b
IECC 2006 Size Cost Adjustment:	-0.634826085	5.109336125
IECC 2009 Size Cost Adjustment:	-0.634826085	5.109336125
IECC 2012 Size Cost Adjustment:	-0.851357281	7.007863967
IECC 2015 Size Cost Adjustment	-0.851357281	7.007863967

Table 4

	Quantity LED Lamps	Eff Wattage LED Lamps	Baseline Wattage	Coincidence Factor
IECC 2009 or earlier code	20	10.73	50.05	8%
IECC 2012 or newer code	10	10.73	50.05	8%

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

References:

1. California Measurement Advisory Committee (CALMAC) Protocols, Appendix F (www.calmac.org/events/APX_F.pdf).
2. 2006 Residential Energy Use Colorado Service Area - Xcel: Bruce Neilson
3. American Housing Survey for Denver - US Census Bureau
4. Xcel Energy CO DSM Potential 2006 - prepared by Kema
5. National Energy Efficiency Best Practices Study - Residential Single-Family Comprehensive Weatherization Best Practices Report from December 2004.
6. RS Means Repair and Remodeling 2007 at a cost of \$0.028 per square foot per increase in R-value.
7. National Energy Audit Tool (NEAT) and Frontier estimates.
8. EEBP web site - Tacoma Residential Weatherization program.
9. US Lighting Market Characterization Study performed for the Department of Energy in 2002
10. MEEA/ES Change A Light campaign info
11. Xcel Energy estimate
12. Draft Technical Support Document: Energy Conservation Standards for Residential Furnaces and Boilers, Efficiency Standards for Consumer Products
Prepared for US DOE, September 2006
13. California Energy Commission's Database for Energy Efficient Resources (DEER)
14. www.energystar.gov
15. DOE 2007
16. Appliance Magazine, September 2007
17. Incremental cost data are estimates from Residential Science Resources

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Evaporative Cooling

Description:

Prescriptive rebates will be offered for the purchase and installation of evaporative coolers. Three tiers of rebates are offered based on the Evaporative Efficacy of the unit and the type of media. The rebates and analyses are based on a nominal 3 ton cooling load. Tier 1 units are standard efficiency evaporative coolers. Tier 2 units are high efficiency evaporative coolers (see assumptions for details). Tier 3 is an integrated HVAC system rebate that compares the "whole house" conventional HVAC with an integrated heating and evaporative cooling system in new homes or homes with major remodeling. Credit will be calculated based on the number and type of units installed, the type of the existing unit and the location of the home

Program References:

Baseline Product Consumption	Refer to Program "HEAC" to find all applicable formulas and assumptions for baseline product consumption for all evaporative cooling measures.
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Algorithms:

Tier 1: 13 SEER 3 Ton to Tier 1 evap cooling savings:

Energy Savings (Gross Annual kWh Saved at Customer per unit) Front Range	= 3Ton A/C - Tier 1 Evap Cooling energy = 1,317 kWh
Demand Savings (Gross Annual kW Saved at Customer per unit) Front Range	= 3Ton A/C - Tier 1 Evaporative cooler demand = 2.83 kW
Energy Savings (Gross Annual kWh Saved at Customer per unit) Western Slope	= 3Ton A/C - Tier 1 Evap Cooling energy = 1,352 kWh
Demand Savings (Gross Annual kW Saved at Customer per unit) Western Slope	= 3Ton A/C - Tier 1 Evaporative cooler demand = 2.83 kW

Tier 2: 13 SEER 3 Ton to Tier 2 evap cooler savings:

Energy Savings (Gross Annual kWh Saved at Customer per unit) Front Range	= 3Ton A/C - Tier 2 Evaporative cooling energy = 1,317 kWh
Demand Savings (Gross Annual kW Saved at Customer per unit) Front Range	= 3Ton A/C - Tier 2 Evaporative cooler demand = 2.83 kW
Energy Savings (Gross Annual kWh Saved at Customer per unit) Western Slope	= 3Ton A/C - Tier 2 Evaporative cooling energy = 1,352 kWh
Demand Savings (Gross Annual kW Saved at Customer per unit) Western Slope	= 3Ton A/C - Tier 2 Evaporative cooler demand = 2.83 kW

Tier 3: Whole house conventional HVAC to Integrated Evap Cooler

Energy Savings (Gross Annual kWh Saved at Customer per unit) Front Range	= 3Ton A/C - Whole house evap energy = 1,144 kWh
Demand Savings (Gross Annual kW Saved at Customer per unit) Front Range	= 3Ton A/C - Whole house evap demand = 2.46 kW
Energy Savings (Gross Annual kWh Saved at Customer per unit) Western Slope	= 3Ton A/C - Whole house evap energy = 1,174 kWh
Demand Savings (Gross Annual kW Saved at Customer per unit) Western Slope	= 3Ton A/C - Whole house evap demand = 2.46 kW

Electrical Energy Savings (Gross Generator kWh)	= Customer kWh / (1-TDLF)
Electrical Demand Savings (Gross Coincident kW Saved at Customer per Unit)	= Cust_kW * CF / (1-TDLF)
Electrical Energy Savings (Net Generator kWh)	= Gross Generator kWh x NTG
Electrical Demand Savings (Net Coincident kW Saved at Generator per Unit)	= Gross Coincident kW x NTG

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Variables:

13 SEER 3 Ton energy	=Energy use of 13 SEER 3 Ton AC unit = 1,498 kWh (Front Range) 1,538 kWh (Western Slope)
13 SEER 3 Ton demand	=Demand of 13 SEER 3 Ton AC unit = 3.22 kW
Tier 1 Evaporative cooler energy	= Motor HP x 0.746 x Load Factor / Motor Eff x OpHr = 180 kWh (Front Range), 185 kWh (Western Slope)
Tier 1 Evaporative cooler demand	= Motor HP x 0.746 x Load Factor / Motor Eff = 0.388 kW
Tier 2 Evaporative cooler energy	= Motor HP x 0.746 x Load Factor / Motor Eff x OpHr for Hi and Lo speeds additively = 180 kWh (Front Range), 185 kWh (Western Slope)
Tier 2 Evaporative cooler demand	= Motor HP x 0.746 x Load Factor / Motor Eff = 0.388 kW
Tier 3 Evaporative cooler energy	= Motor HP x 0.746 x Load Factor / Motor Eff x OpHr for Hi and Lo speeds additively = 354 kWh (Front Range), 363 kWh (Western Slope)
Tier 3 Evaporative cooler demand	= Motor HP x 0.746 x Load Factor / Motor Eff = 0.761 kW
EFLH Front Range/Denver	= 465
EFLH Western Slope	= 478

MotorHP	Motor Horsepower - We will use 0.52 hp for tier 1 units. We will use 0.52 hp for tier 2 units and 1.02 Hp for tier 3 units represent the motor size for an evaporative cooler which corresponds to the cooling output of a 3 ton AC unit. (Reference 5)
0.746	Standard conversion from HP to kW
Load Factor	Load factor for motor - We will use 80% for tier 1 and 80% on high and 10% on low for tier 2.
Motor Eff	Efficiency of the evaporative cooler motor - We will use 80% (Reference 3)
CF_AC	= Coincidence factor for the refrigerated air system, the probability that peak demand of the AC unit will coincide with peak utility system demand. 0.70 will be used. (Program Evaluation 2010)
TDLF	Transmission Distribution Loss Factor = 7.7% , the percentage loss of electricity as it flows from the power plant to the customer, calculated using factors from Enhanced DSM Filing SRD-2
NTG	Net-to-Gross Factor = We will use 52% for tier 1 and 59% for tier 2 replacements, 70% for tier `1 and tier 2 first time installations, and 100% for tier 3 based on Xcel Energy product experience.
Incremental Costs	= Incremental cost of efficient technology over baseline technology. Values listed in Table 1
O&M savings	= Operation and Maintenance savings related to water use are listed in Table 2.
Measure Life	= 15 years (Program Evaluation 2010)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 1. Incremental Cost of Evaporative Coolers (Reference 6,7,8)

	Cost	Incremental Cost
13 SEER AC 3 T (Baseline System)	\$ 1,931	
Tier 1 Evaporative Cooling Unit	\$ 1,222	\$ (709)
Tier 2 HE Evaporative Cooling Unit	\$ 2,239	\$ 308
Tier 3 Whole House Integrated Evap Cooling Unit	\$ 3,626	\$ 1,695

Table 2. Operation and Maintenance Savings (Reference 9)

Base System	New System	O&M Savings
13 SEER AC 3 T	Standard Evap Cooling (Tier 1)	\$ (19.92)
13 SEER AC 3 T	High Efficient Evap Cooling (Tier 2)	\$ (8.37)
Conventional 3 Ton HVAC; gas furn; elec cen AC	Gas furnace; integrated evap cooling (Tier 3)	\$ (8.37)

Provided by Customer:

Type of unit installed (Tier 1 or Tier 2) or installation type (Tier 3).

Verified during M&V

Yes

Assumptions:

Baseline AC equipment is matched to the HEAC program. Please see the HEAC program for more information

The installed unit is assumed to have a 0.52 HP motor for Tier 1 and 2, and a 1.02 HP motor for Tier 3 (commonly available unit, confirmed through metering) .

Qualifying equipment must be new and be a permanently installed direct (Tier 1 or 2), indirect or two-stage evaporative cooling unit. Portable coolers or systems with vapor compression equipment are not eligible, nor is used or reconditioned equipment.

Tier 1: Qualifying evaporative cooling units must have a minimum Industry Standard Rated airflow of 2,500 CFM

Tier 2: Qualifying evaporative cooling units must meet tier 1 requirements and additionally have a minimum Media Saturation Effectiveness of 85%. The units must be installed with a remote thermostat and a periodic purge water control.

Tier 3: Integrated HVAC system rebate that compares the "whole house" conventional HVAC with an integrated heating and evaporative cooling system in new homes or homes with major remodeling. Tier 3 evaporative cooling units must be indirect or indirect/direct combination units. Units utilizing only direct cooling units do not qualify

Tier 3 incremental cost data from 2015 program invoices

The technical assumptions for the Evaporative Cooling Rebate product were developed assuming that a standard 13 SEER central air conditioning system was replaced or displaced by either a standard evaporative cooling system or a high efficiency evaporative cooling unit with the same capacity. These units have a measure life of 15 years.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

References:

1. ESPRE 2.1 engineering model: Simplified energy analysis methods for residential buildings
2. Building America, Research Benchmark Definitions, Pg 9, http://www.eere.energy.gov/buildings/building_america/pdfs/37529.pdf
3. Average motor efficiency for 0.75 hp motor from NEMA, http://www.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/small_motors_tsd.pdf
4. Kinney, Larry. New Evaporative Cooling Systems: An Emerging Solution for Homes in Hot Dry Climates with Modest Cooling Loads. SWEEP 2007
5. Web site information - Grainger Evap Cooler - Essick Model N28W; Pheonix Mfg Corp; Model PD4231
6. An average of the price for a 13 SEER Goodman (<http://www.acfactoryoutlet.com/home.asp?p=listgoodman.asp&cat=73&sort=1&ah=1>) and the price as noted in the DOE's AC calculator spreadsheet (www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/Calc_CAC.xls) is assumed.
7. http://www.google.com/products?q=home+depot+evaporative+cooler+cost&ie=UTF-8&oe=utf-8&rls=org.mozilla:en-US:official&client=firefox-a&um=1&sa=X&oi=product_result_group&resnum=1&ct=title
8. <http://www.toolbase.org/TechInventory/techDetails.aspx?ContentDetailID=750>: "A two-stage evaporative cooler with a cooling capacity equivalent to a three-ton conventional system retails for about \$1,800." The California Energy Commission states that installation costs are equivalent to refrigerated air systems, so only equipment cost is included in this analysis (http://www.consumerenergycenter.org/home/heating_cooling/evaporative.html: "Installation costs of swamp coolers are comparable to air conditioning units").
9. SWEEP 2007 Report. O&M Savings based on manufacturers water use data and an assumed \$3.82/thousand gallons cost for water (Denver Water Board).
10. ASHRAE Applications 2007 p.36.3 Used AC window unit as estimate for evaporative cooler.
11. <http://www.denverwater.org/BillingRates/RatesCharges/2016-rates/>
12. <https://www.denvergov.org/content/denvergov/en/wastewater-management/billing-and-rates/wastewater-rates.html>

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: High Efficiency Air Conditioning

Description:

Prescriptive rebates will be offered for new cooling equipment. Rebates for most measures are dependent on size and on meeting a minimum efficiency. Plan A is defined as central air conditioning (CAC) or air-source heat pump (ASHP) systems installed in new homes, existing homes without CAC or ASHP systems or homes with CAC or ASHP systems that are inoperable or unrepairable. Plan B is for existing CAC or ASHP systems that are operable or made operable for a reasonable cost (\$500 to \$1500). The equations for calculating savings are identical between Plan A and Plan B, but the baseline unit efficiencies are different as described below. Ground Source Heat Pumps will be rebated with a Quality Install (appropriate for GSHP) in new homes or when replacing electric resistance heating equipment in existing homes. For new Mini-Split Heat Pumps (MSHP) it is assumed that the MSHP is being installed in either new construction or to supplement an existing heating and cooling system. The MSHP rebate is intended to incent customers to install a high efficiency MSHP rather than the code level baseline unit.

Algorithms:

Conversions:

Seasonal Energy Efficiency Ratio (SEER)	= Total seasonal cooling output (kBtuh) / Total electrical input (kWh); for estimating seasonal performance
Energy Efficiency Ratio (EER)	= Rated cooling output (kBtuh) / Rated electrical input (kW) for equipment tested at 95F estimating peak cooling performance; $EER = -0.02 \times SEER^2 + 1.12 \times SEER$. This equation relating EER to SEER applies to all equipment in this product, and will be used if EER rating is not available. (Reference 1)
HSPF	= Total seasonal heating output (kBtuh) / Total electrical input (kWh); for estimating seasonal performance
kW/ton	= 12 / Energy Efficiency Ratio
Heating Seasonal Performance Factor (HSPF)	= 3.412 x Heat Energy Output (Btu) / Energy Input to Compressor (Btu)
Coefficient of Performance (COP) Heating	= Heat Energy Output (Btu) / Energy Input to Compressor (Btu) or HSPF / 3412 x 1000
For Cooling by Split System Air Conditioners and Air Source Heat Pumps and Ground Source Heat Pumps:	
kW_No_QI_Standard (Plan A and Plan B)	= Size x 12/(EER_Standard x (1 - Sizing_Loss))
kW_No_QI_Eff	= Size x 12/(EER_Eff x (1 - Sizing_Loss))
kW_QI_Standard (Plan A and Plan B)	= Size x (1 - Sizing_Loss_QI) x 12/EER_Standard
kW_QI_Eff	= Size x (1 - Sizing_Loss_QI) x 12/EER_Eff
kWh_No_QI_New_Home_Standard	= Size x EFLH_New x 12/(SEER_Standard x (1 - Loss_No_QI_New))
kWh_No_QI_Existing_Home_Standard	= Size x EFLH_Existing x 12/(SEER_Standard x (1 - Loss_No_QI_Exist))
kWh_No_QI_New_Home_Eff	= Size x EFLH_New x 12/(SEER_Eff x (1 - Loss_No_QI_New))
kWh_No_QI_Existing_Home_Eff	= Size x EFLH_Existing x 12/(SEER_Eff x (1 - Loss_No_QI_Exist))
kWh_No_QI_New_Home_Eff_GSHP	= Size x EFLH_New x 12/(SEER_Eff x (1 - Loss_No_QI_New_GSHP))
kWh_No_QI_Existing_Home_Eff_GSHP	= Size x EFLH_Existing x 12/(SEER_Eff x (1 - Loss_No_QI_Exist_GSHP))
kWh_QI_New_Home_Standard	= Size x EFLH_New x 12/(SEER_Standard x (1 - Uncorr_Loss_New))
kWh_QI_New_Home_Eff	= Size x EFLH_New x 12/(SEER_Eff x (1 - Uncorr_Loss_New))
kWh_QI_Existing_Home_Standard	= Size x EFLH_Existing x 12/(SEER_Standard x (1 - Uncorr_Loss_Exist))
kWh_QI_Existing_Home_Eff	= Size x EFLH_Existing x 12/(SEER_Eff x (1 - Uncorr_Loss_Exist))
New Equipment Electrical Energy Savings_New_Home (Customer kWh)	= kWh_No_QI_New_Home_Standard - kWh_No_QI_New_Home_Eff
New Equipment Electrical Energy Savings_Existing_Home (Customer kWh)	= kWh_No_QI_Existing_Home_Standard - kWh_No_QI_Existing_Home_Eff
New Equipment Electrical Energy Savings_New_Home_GSHP (Customer kWh)	= kWh_No_QI_New_Home_Standard - kWh_No_QI_New_Home_Eff_GSHP
New Equipment Electrical Energy Savings_Existing_Home_GSHP (Customer kWh)	= kWh_No_QI_Existing_Home_Standard - kWh_No_QI_Existing_Home_Eff_GSHP

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

New Equipment Electrical Demand Savings (Customer kW)	= kW_No_QI_Standard - kW_No_QI_Eff
Quality Install Electrical Energy Savings New Home_Standard (Customer kWh)	= kWh_No_QI_New_Home_Standard - kWh_QI New Home_Standard
Quality Install Electrical Energy Savings New Home_Eff (Customer kWh)	= kWh_No_QI_New_Home_Eff - kWh_QI New Home_Eff
Quality Install Electrical Energy Savings Existing Home_Standard (Customer kWh)	= kWh_No_QI_Existing_Home_Standard - kWh_QI Existing Home_Standard
Quality Install Electrical Energy Savings Existing Home_Eff (Customer kWh)	= kWh_No_QI_Existing_Home_Eff - kWh_QI Existing Home_Eff
Quality Install Electrical Energy Savings New Home_Eff_GSHP (Customer kWh)	= kWh_No_QI_New_Home_Eff_GSHP - kWh_QI New Home_Eff
Quality Install Electrical Energy Savings Existing Home_Eff_GSHP (Customer kWh)	= kWh_No_QI_Existing_Home_Eff_GSHP - kWh_QI Existing Home_Eff
Quality Install Electrical Demand Savings (Customer kW)	= kW_No_QI_Eff - kW_QI_Eff

Quality Install Incremental Cost	= Quality_Install_Cost_Existing_Home - Size x AC_Cost_Per_Ton x Sizing_Loss_QI (or minimum value of \$75)
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Present Value (\$)	=Future Value * (1+rate) ^ (number of periods * -1)
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For Heating by Forced Air Electric Resistance Heating, and Air Source Heat Pumps and Ground Source Heat Pumps:

kW_No_QI_Standard	= Size x (1 + Sizing_Loss) /Standard_COP / 3412
kW_QI_Eff	= Size / GSHP_COP / 3412
kWh_QI_New_Home_Standard	= Btu_Heat_New / 3412 x 3.412 / (HSPF_Standard x (1 - Uncorr_Loss_New))
kWh_QI_Existing_Home_Standard	= Btu_Heat_Exist / 3412 / (1 x (1 - Uncorr_Loss_Exist))
kWh_QI_New_Home_Eff_GSHP	= Btu_Heat_New / GSHP_COP x (1 - Uncorr_Loss_New)) / 3412
kWh_QI_Existing_Home_Eff_GSHP	= Btu_Heat_Exist / GSHP_COP x (1 - Uncorr_Loss_Existing)) / 3412
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

For Cooling by Mini-Split Heat Pumps (MSHP):

New Equipment Electrical Energy Savings (Gross Annual kWh Saved at Customer)	=(Size x EFLH x (12/SEER_Standard - 12/SEER_Eff))/(1-Loss_No_QI_MSHP)
New Equipment Electrical Demand Savings (Gross kW Saved at Customer)	= Size x (12/EER_Standard - 12/EER_Eff)

For Heating by Mini-Split Heat Pumps (MSHP)

New Equipment Electrical Energy Savings (Gross Annual kWh Saved at Customer)	=(Size_Heat / 1000 x MSHP_EFLHH x (1/HSPF_Standard - 1/HSPF_Eff))(1-Loss_No_QI_MSHP)
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For Both Heating and Cooling by Mini-Split Heat Pumps (MSHP)

New Equipment Electrical Energy Savings (Gross Annual kWh Saved at Customer)	= Cooling Electrical Energy Savings + Heating Electrical Energy Savings
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DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Variables:

Size	= The new equipment capacity in tons for cooling, provided by customer
EFLH_New	= The Equivalent Full Load Hours of cooling load. We will use 488 for new homes which is the cooling load of a 2460 SF new home in CO. All homes were modeled with a 2.5 ton SEER 13 AC unit. Ton-hrs cooling was determined by modeling (Reference 4)
EFLH_Existing	= The Equivalent Full Load Hours of cooling load. We will use 383 for existing homes which is the cooling load of a 2206 SF existing home in CO. All homes were modeled with a 3 ton SEER 10 AC unit. Ton-hrs cooling was determined by modeling (Reference 4)
Btu_Heat_New	= The annual heating load in Btu. We will use 37400000 for new homes which is the heating load of a 2460 SF new home in CO. Btu heating was determined by modeling (Reference 4).
Btu_Heat_Exist	= The annual heating load in Btu. We will use 70200000 for new homes which is the heating load of a 2206 SF existing home in CO. Btu heating was determined by modeling (Reference 4).
SEER_Standard (Plan A)	= Seasonal Energy Efficiency Ratio of baseline equipment, based upon the minimum Federal standard for efficiency as manufactured. For residential AC units we will use 13 SEER. For ASHP we will use 14 SEER. For GSHP we will use a 13 SEER AC unit. For MSHP we will use the federal standard of 14 SEER.
SEER_Standard (Plan_B)	= Seasonal Energy Efficiency Ratio of existing equipment based upon the minimum Federal standard for efficiency manufactured between 1992 and 2006. For existing residential AC units, we will use 10 SEER.
SEER_Eff	= Seasonal Energy Efficiency Ratio of High Efficiency equipment that the customer will install, provided by the customer. For GSHP this may be provided as EER and will have to be converted to SEER.
EER_Standard (Plan A)	= EER of standard equipment, based upon the minimum Federal acceptable efficiency. We will use 11.18 based on the federal standard 13 SEER and the conversion listed above. For MSHP, we will use 8.28, based on converting the 14 SEER to EER using a curve fit from AHRI database data (see EER_Eff)
EER_Standard (Plan B)	= EER of existing equipment, based upon the 1992 to 2006 minimum Federal acceptable efficiency. We will use 9.2 based on the federal standard 10 SEER and the conversion listed above.
EER_Eff	= EER of High Efficiency that the customer will install, provided by customer. If value is not provided by the customer we will use the conversion listed above. For forecasting purposes the EER for MSHPs will be determined by the following empirical formula based on AHRI information: $= (-0.0003*(SEER/ton)^3 + 0.0101*(SEER/ton)^2 + 0.5264*(SEER/ton) - 0.0233)*tons$
GSHP_EER	= EER of High Efficiency that the customer will install, provided by customer. If not provided we will assume EER of 14.1.
GSHP_SEER	= SEER of High Efficiency that the customer will install, provided by customer. If not provided we will assume SEER of 19.
Standard_COP	= Coefficient of Performance of electric resistance heater = 1.00 The COP of an airsource heatpump in an existing home = 2.26 The COP of an airsource heatpump in a new home = 2.4
GSHP_COP	= Coefficient of Performance of GSHP equipment that the customer will install, provided by the customer. We will use COP if EER is not available. Baseline GSHP COP assumed to be 3.3.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

HSPF_Standard	= Heating Season Performance Factor for a new Air Source Heat Pump. The HSPF of an airsource heatpump (ASHP) in an existing home = 8.2
GSHP_Size	= Size of Ground Source Heat Pump, provided by customer.
Size_Heat	= Heating Capacity of Mini Split Heat Pump, in BTU/h, provided by customer
MSHP_EFLHH	= Mini-Split Heat Pump Equivalent Full Load Hours Heating: The equivalent number of hours that MSHP equipment would be running at Full Load over the course of the year for heating. We will use 1013 EFLH, from the Residential Heating program for an existing home that is the average of a weatherized and non-weatherized home
HSPF_Standard	= Heating Seasonal Performance Factor (HSPF) of standard equipment, based upon the minimum Federal standard for efficiency as manufactured. For MSHP we will use 8.2 HSPF.
HSPF_Eff	= Heating Seasonal Performance Factor (HSPF) of High Efficiency equipment that the customer will install, provided by the customer
Sizing_Loss_New_Home	= Specific losses from non-QI that affects peak load = 0%
Sizing_Loss_Exist_Home	= Specific losses from non-QI that affects peak load = 2.5%
Sizing_Loss_QI	= Reduction in equipment size due to quality install = 10%
Uncorr_Loss_New	= Uncorrectable duct leakage losses. For new homes = 0%
Uncorr_Loss_Exist	= Uncorrectable duct leakage losses. For existing homes = 12.7%
Loss_No_QI_New	= Efficiency of average unit lost due to improper installation for new home. We will use 9% which is the summation of the following losses: Equipment sizing = 0 Refrigeration Charge = 7% Improper air flow = 2% Duct leaks = 0%
Loss_No_QI_Exist	= Efficiency of average unit lost due to improper installation. We will use 33.1% which is the summation of the following losses: Equipment sizing = 2.5%, Refrigeration Charge = 7%, Improper air flow = 2%, Duct leaks = 21.6%
Loss_No_QI_New_GSHP	= Efficiency of average unit lost due to improper installation for new home with GSHP. We will use 2% which is the summation of the following losses: Equipment sizing = 0 %, Refrigeration Charge = 0% , Improper air flow = 2% Duct leaks = 0%
Loss_No_QI_Exist_GSHP	= Efficiency of average unit lost due to improper installation for existing home with GSHP. We will use 26.1% which is the summation of the following losses: Equipment sizing = 2.5 %, Refrigeration Charge = 0% , Improper air flow = 2% Duct leaks = 21.6%
Loss_No_QI_MSHP, Loss_QI_MSHP	= Loss_No_QI_MSHP and Loss_QI_MSHP will be equal to 0%.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

CF	= Coincidence Factor, the probability that peak demand savings will coincide with peak utility system demand. 90% will be used for new homes and 90% will be used for existing homes. GSHP and MSHP heating CF values will be 0
3.412	= Conversion between BTU/h and Watts
3412	= Conversion between BTU/h and kilowatts
12000	= Conversion between BTU/h and tons
Measure Life	= Measure life is taken at 15 years for all Plan A cooling equipment and 7.5 years for all Plan B cooling equipment, Quality Installations (Reference 2), and WCCD. Plan Life for GSHP is 20 years (Reference 3). Measure life for MSHP is 18 years (Reference 9)
TDLF	Transmission-Distribution Loss Factor = 7.69%, the percentage loss of electricity as it flows from the power
NTG	Net-to-gross; we will use 67.6% for AC units which is calculated from High Efficiency AC Program Evaluation conducted in 2012. We will use 100% for GSHP.
Western Cooling Control Device (WCCD)	Savings Deemed for retrofit based on internal analysis at 73 kWh and 0.13 kW
Future Value	Estimated cost of the standard replacement equipment at expected end of life of current equipment
Rate	Assumed interest rate. 7.88% used for discounting the future purchase price and 2.57% used for inflation to
Number of Periods	Number of years expected until existing equipment end of life
Incremental operation and maintenance cost	= 0 - conservative approach, taking no credit for improved mean time between failure.
Incremental Capital Cost	Incremental cost of efficient equipment. Values listed in table 1 below. Values will be scaled existing or new homes. Plan A and Plan B incremental capital costs include \$167 for new homes and \$462 for existing homes for quality install. (Reference 6)
Plan B Baseline Cost	The present value of a SEER 13 unit eight years in the future was calculated using a 10-year average inflation
GSHP Incremental Cost Split	Incremental Costs were split according to percentage of annual energy used for heating (81%) and
Quality_Install_Cost_Existing_Home	See Table 1
AC_Cost_Per_Ton	See Table 1

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 1. Incremental Capital Costs

SEER	AC Base Cost per Ton	Incremental Cost per Ton	ASHP Base Cost per Ton	Incremental Cost per Ton	GSHP Base Cost per Ton	Incremental Cost per Ton
13 SEER	\$ 423				\$ 423	
14/14.5 SEER	\$ 515	\$ 92	\$ 778			\$ 584
15 SEER	\$ 607	\$ 184	\$ 960	\$ 183		
16 SEER	\$ 699	\$ 276	\$ 1,143	\$ 366		
17 SEER	\$ 791	\$ 369	\$ 1,326	\$ 548		

Quality Installation Measures	New Home	Existing Home*
	\$ 117	\$ 287

*note the above equation (Quality Install Incremental Cost) regarding Existing Homes

Mini-Split Heat Pump	Current Year Purchase Price	Incremental cost per ton Cooling
Mini-Split Heat Pump (15-20 SEER, 9-12 HSPF)	\$ 3,303	\$ 375
Mini-Split Heat Pump (21-26 SEER, 9-12 HSPF)	\$ 3,536	\$ 608

Incremental costs for unit sizes not listed will be interpolated/extrapolated from listed values

Incremental costs for GSHP to High Efficient GSHP will use the incremental cost table for standard A/C Units. This is due to a GSHP to HE GSHP the loop cost are the same so that cost is ignored. When the baseline system has electric resistance heat or is an air source heat pump the cost for the ground loop is included. The cost to install a GSHP loop is approximately \$2,005 per ton.

Minisplit Costs from Reference 8

Provided by Customer: Plan A and Plan B

New cooling equipment type

New cooling equipment size (tons)

New cooling equipment efficiency (SEER, EER)

Type of home (Existing or New Construction)

Type of Existing Heating system (GSHP)

MSHP heating efficiency (HSPF)

Primary use, cooling or heating (MSHP)

Verified during M&V

Yes

Yes

Yes

Yes

Yes

Yes

Provided By Installing Contractor: Plan B or GSHP

Make, model and serial number from existing condensing unit

Unit SEER and/or EER rating or COP for GSHP as given by the manufacturer

M&V Process

Evidence of Manual J load cal'cs and equipment sizing

Acceptable refrigerant charge

Yes

Yes

Table 2. Plan B baseline present value

Discount Rate	7.88%
10 Yr. Avg. Inflation Rate	2.57%
SEER =	13 3 Ton Unit
2016 Cost	\$ 1,269 NPV Cost
2017	\$ 1,301 \$ 1,206
2018	\$ 1,335 \$ 1,147
2019	\$ 1,369 \$ 1,090
2020	\$ 1,404 \$ 1,037
2021	\$ 1,440 \$ 986
2022	\$ 1,478 \$ 937
2023	\$ 1,516 \$ 891
2024	\$ 1,555 \$ 847

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Acceptable air flow at coil
Acceptable range of duct leakage

Yes
Yes

Assumptions:

Baseline equipment meets applicable minimum Federal standards for efficiency
Baseline equipment installation (for QI) has 33.1% efficiency losses
Baseline equipment installation in Existing Homes has 26.75% efficiency losses
High efficiency equipment exceeds minimum Federal standards for efficiency
Installed equipment does not operate at optimum efficiency until a Quality Installation is completed.
To qualify for a rebate, each piece of equipment must meet the minimum EER and SEER requirements. The customer should provide both the EER and SEER values for the particular piece of equipment. If the customer is unable to provide both values, the value(s) not provided will be calculated using the equations shown above. If a value is not provided by the customer, the calculated value still must meet the minimum requirement.

10-year Average Inflation Rate = 2.57% (InflationData.com)
CO Weighted Average Cost of Capital = 7.88%

Average Cost of Central AC Repair=\$750 (EEBC)
GSHP New Home REMRATE Modeling = Larger, more tightly built, better insulated new home was modeled with GSHP COP of 3.3
GSHP Existing Home REMRATE modeling = Smaller, less tightly built, poorly insulated existing home was modeled with GSHP of 3.3.

GSHP Installed Loop Cost/Ton = \$2004 per loop per Ton
GSHP Baseline Equipment Cost combines AC unit and electric resistance heating
GSHP appropriate Quality Install savings included in modeling
No Heating kW saving are claimed for GSHP or MSHP during winter, only summer cooling kW savings are claimed.
Assumed \$50 each for contractor to complete right sizing calculations and air flow work on AC and HP units.

References:

1. For equation to convert SEER to EER "Building America, Research Benchmark Definitions, 2010", see p. 10. <http://www.nrel.gov/docs/fy10osti/47246.pdf>
2. ASHRAE, 2007, Applications Handbook, Ch. 37, table 4, Comparison of Service Life Estimates
3. For estimated life of GSHP see http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12640 (indoor components up to 25 years; ground loop =50)
4. Building loads were estimated using Building Energy Optimization (BEOpt) software version 2.5.0.0. The model was run Jan 2016. See "Model Data New" and "Model Data Existing" tabs for assumptions.
5. For losses with air flow see Neme, Proctor, Nadel, ACEEE, 1999. Energy Savings Potential From Addressing Residential Air Conditioner and Heat Pump Installation Problems. <http://aceee.org/research-report/a992>
6. Costs obtained from "2010-2012 WO017 Ex Ante Measure Cost Study Final Report", by Itron, May 2014. These are used in the DEER 2016 database.
7. DOE Appliance Standards Website, Residential Central Air Conditioners and Heat Pumps. https://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/75
8. Incremental costs for MSHPs were determined from the NEEP Incremental Cost Study Phase 2 Report
9. MSHP equipment life is from Measure Life Report Residential and Commercial/Industrial Lighting and HVAC Measures; <http://library.cee1.org/content/measure-life-report->
10. For assumptions on GSHP efficiencies and conversion from EER to SEER see "ENERGY STAR Geothermal Heat Pumps Key Product Criteria"; www.energystar.gov
11. For losses with equipment sizing see ENERGY STAR Quality Installation. https://www.energystar.gov/index.cfm?c=hvac_install.hvac_install_index
12. For assumptions on duct leak losses see "NREL 2011 Measure Guideline Sealing and Insulating Ducts in Existing Homes". <http://www.nrel.gov/docs/fy12osti/53494.pdf>
13. For assumptions on losses related to overcharge or undercharge on refrigerant see "Sensitivity Analysis of Installation Faults on Heat Pump Performance", by P. Domanski, et. al., Sept 2014. <http://www.acca.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=f02c1f61-4d1d-4a24-971d-cc9ea3e626b2&forceDialog=0>

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Residential Heating - CO

Description:

Residential natural gas customers receive a cash rebate for purchasing high-efficiency heating equipment. Residential electric customers can receive an additional cash rebate for purchasing an electronically commutated motor (ECM) furnace fan with their heating system.

Equations:

New Furnace Savings (Gross Dth)	= ((BTUH x EFFp / EFFb) - BTUH) x Hours / 1,000,000
ECM Furnace Fan Efficiency Electric Demand Savings (Gross kW saved at Customer)	= ECM_Baseline_kW - ECM_Proposed_kW
ECM Furnace Fan Efficiency Electric Demand Savings (Gross Generator kW)	= ECM_Customer_kW * Coincidence_Factor
ECM Furnace Fan Efficiency Electric Energy Savings (Gross Annual kWh Saved at Customer)	= ECM_Customer_kW x ECM_Operating_Hours
ECM Heating O&M Penalty	= ECM_Heating_Penalty

Variable ID	Value	Description
BTUH	Customer Input	Rated new furnace or boiler Input BTUH nameplate data provided by customer on rebate form.
EFFb	80%	Efficiency of baseline code minimum furnace (Reference 1)
EFFp	Customer Input	Efficiency for higher efficiency furnace will be provided by the customer on the rebate form.
Hours	1,159	Equivalent Full Load Heating Hours assumed for installed high efficiency furnace equipment
Conversion from Btu to Dth	1,000,000	1 Dth = 1,000,000 Btuh
ECM_Baseline_kW	See Table 2	Average PSC furnace fan kW (Reference 3, 4)
ECM_Proposed_kW	See Table 2	Average ECM furnace fan kW (Reference 3, 4)
ECM_Operating_Hours	See Table 2	ECM furnace fan hours of operation
ECM_Heating_Penalty	See Table 2	O&M Dollars spent in additional gas use to offset heating done by fan during winter
Coincidence_Factor	See Table 3	Percentage of Customer_kW savings that will coincide with peak summer kW savings
NTG	See Table 1 & 3	Net to Gross

Inputs:

Verified during M&V:

Furnace Efficiency	Yes
Furnace Nameplate Capacity of new unit at sea level (BTUH, Input)	Yes
Was ECM furnace fan motor provided	Yes
Does residence have central air conditioning	Yes

Table 1	Measure Life (Reference 2)	Incremental Cost (Reference 4)	NTG
Furnace	18	\$ 922.38	77%

Table 2	ECM_Baseline_kW	ECM_Proposed_kW	ECM_Operating_Hours	ECM_Heating_Penalty
New ECM w/ AC	0.651	0.457	4,186	\$ (10.15)
New ECM w/o AC	0.571	0.364	3,338	\$ (10.15)
Retrofit ECM w/ AC	0.638	0.387	2,319	\$ (6.06)
Retrofit ECM w/o AC	0.571	0.334	2,046	\$ (6.06)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 3	Measure Life	Incremental Cost	Coincidence _ Factor	NTG
New ECM w/ AC	18	\$212.00	79%	94%
New ECM w/o AC	18	\$212.00	30%	94%
Retrofit ECM w/ AC	7	\$212.00	61%	94%
Retrofit ECM w/o AC	7	\$212.00	26%	94%

References:

1. US Department of Energy; Residential Furnaces and Boilers; http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/72
2. 2015 ASHRAE Handbook - HVAC Applications; Comparison of Service Life Estimates; Page 37.3, Table 4
3. ECM Furnace Impact Assessment Report https://focusonenergy.com/sites/default/files/emcfurnaceimpactassessment_evaluationreport.pdf
4. California Energy Commission's Database for Energy Efficient Resources (DEER) <http://www.energy.ca.gov/deer>
5. Cost information from "2010 - 2012 W0017 Ex Ante Measure Cost Study Final Report.", Itron, May 2014.

Changes from Recent Filing:

1. Updated furnace incremental cost
2. Updated for 80% furnace efficiency baseline
3. Incorporated model results into analysis for EFLH hours for both furnaces and ECM motors.
4. Added ECM Furnace Retrofit measure

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Home Energy Squad - CO

Description:

Residential electric and natural gas customers can have energy efficiency measures directly installed while paying for certain material and/or contractor costs.

Program References:

CFL Lighting Measures	Refer to Product "CO Home Lighting & Recycling" formulas for (Gross kW, Gross Annual kWh, Gross Coincident kW, etc.) for the "Replace incandescent lamps with CFLs" measure, except kW_Savings_per_Bulb will be determined by subtracting the wattage of the direct-installed bulb from the actual bulb removed.
CFL Lighting Measures	Refer to Product "CO Home Lighting & Recycling" reference table for "CFL" values.
LED Lighting Measures	Refer to Product "CO Home Lighting & Recycling" formulas for (Gross kW, Gross Annual kWh, Gross Coincident kW, etc.) for the "Replace incandescent lamps with LEDs" measure, except kW_Savings_per_Bulb will be determined by subtracting the wattage of the direct-installed bulb from the actual bulb removed.
LED Lighting Measures	Refer to Product "CO Home Lighting & Recycling" reference table for "LED" values.
Measure "Direct Install - Low-Flow Showerhead"	Refer to Product "CO Energy Efficient Showerhead" formulas for (Gross kW, Gross Annual kWh, Gross Coincident kW, etc.) for the "Provide Efficient Showerhead" measure.
Measure "Direct Install - Low-Flow Showerhead"	Refer to Product "CO Energy Efficient Showerhead" reference table for "Low-Flow Showerhead" values.
Measure "Direct Install - Kitchen Aerator"	Refer to Product "CO Energy Efficient Showerhead" formulas for (Gross kW, Gross Annual kWh, Gross Coincident kW, etc.) for the "Provide Kitchen Faucet Aerator" measure.
Measure "Direct Install - Kitchen Aerator"	Refer to Product "CO Energy Efficient Showerhead" reference table for "Kitchen Aerator" values.
Measure "Direct Install - Bath Aerator"	Refer to Product "CO Energy Efficient Showerhead" formulas for (Gross kW, Gross Annual kWh, Gross Coincident kW, etc.) for the "Provide Bath Faucet Aerator" measure.
Measure "Direct Install - Bath Aerator"	Refer to Product "CO Energy Efficient Showerhead" reference table for "Bath Aerator" values.
Measure "Weatherstrip Door"	Refer to Product "CO Insulation" formulas for (Gross kW, Gross Annual kWh, Gross Coincident kW, etc.) for the "Air Sealing" measure.
Measure "Weatherstrip Door"	Refer to Product "CO Insulation" reference table for "Air Sealing" values with the following exceptions: CFM50_Baseline and CFM50_Proposed are calculated below in the equations section.

Equations:

TV & Electronics Controller Electrical Energy Savings (Gross Annual kWh)	$= (\text{Measured_Watts_WO} - \text{Measured_Watts_WITH}) / 1000 \times \text{Controller_Hours}$
TV & Electronics Controller Electrical Demand Savings (Gross kW)	$= (\text{Measured_Watts_WO} - \text{Measured_Watts_WITH}) / 1000$
Programmable Thermostat Electrical Energy Savings (Gross Annual kWh)	$= \text{Cooling_Delta_T} \times \text{kWh_Savings_per_Degree}$
Programmable Thermostat Electric Demand Savings (Gross kW)	$= \text{Cooling_Delta_T} \times \text{kW_Savings_per_Degree}$
Programmable Thermostat Gas Savings (Gross Dth/Yr)	$= \text{Heating_Delta_T} \times \text{Dth_Savings_per_Degree}$
Water Heater Blanket Electrical Energy Savings (Gross Annual kWh)	$= (\text{WH_Tank_Size} / 45) \times (\text{HLF before} - \text{HLF with blanket}) \times 8760 / \text{HE_Elec} / 3412$
Water Heater Blanket Electrical Demand Savings (Gross kW)	$= (\text{WH_Tank_Size} / 45) \times (\text{HLF before} - \text{HLF with blanket}) \times 8760 / \text{HE_Elec} / 3412 / \text{Hr_WH_Operation}$
Water Heater Blanket Gas Savings (Gross Dth/Yr)	$= (\text{WH_Tank_Size} / 45) \times (\text{HLF before} - \text{HLF with blanket}) \times 8760 / \text{HE_Gas} / 1,000,000$
Water Heater Temperature Setback Gas Savings (Gross Dth/Yr)	$= (\text{WH_S_Baseline} - \text{WH_S_Proposed}) / 10$
CFM50_Baseline	$= (\text{Air_Gap_Base} \times \text{Gap_Length}) / \text{LAF}$, CFM at 50 pascals similar to blower door tests results. For use in "Air Sealing" equations.
CFM50_Proposed	$= (\text{Air_Gap_Eff} \times \text{Gap_Length}) / \text{LAF}$, CFM at 50 pascals similar to blower door test results. For use in "Air Sealing" equations.

Variable ID	Value	Description
Measured_Watts_WO	Vendor Input	Measured demand for appliances that will be connected to controller before controller is installed
Measured_Watts_WITH	Vendor Input	Measured demand for controller with appliances connected when controller is in off state
Controller_Hours	Vendor Input	Hours of operation for the controller determined for each customer based on interview results.
HE_Elec	1.00	Heat generation efficiency for electric water heater based on steady-state water heater efficiency.
HE_Gas	0.80	Heat generation efficiency for gas water heater based on steady-state water heater efficiency.
Hr_WH_Operation	8760	Annual water heater "on" time
HLF_Before	237	Heat loss in BTU/hr based on a 45 gallon average of water heater sizes with 2" of polyurethane insulation at 135 F degrees.
HLF_with_blanket	138	Heat loss in BTU/hr based on a 45 gallon average of water heater sizes with 2" of polyurethane insulation at 135 F degrees plus an additional 2.5" fiberglass blanket.
WH_Tank_Size	Vendor Input	Tank Size of customer's Water Heater

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

WH_S_Baseline	26.18	Baseline gas water heater shell losses, Therms/year
WH_S_Proposed	22.44	Proposed gas water heater shell losses, with -10 F adjustment of setpoint, Therms/year
Cooling_Delta_T	Vendor Input	One-week weighted average temperature difference between normal operation and cooling setback temperature in degrees F, based on information provided by the customer during the interview.
kW_Savings_per_Degree	0.106	kW per degree F of setback (Reference 1, 2)
kWh_Savings_per_Degree	88.61	kWh per degree F of setback (Reference 1, 2)
kW_Savings_per_Degree_2	0.053	kW per degree F of setback for second thermostat = half of savings for first thermostat (Reference 1, 2)
kWh_Savings_per_Degree_2	44.30	kWh per degree F of setback for second thermostat = half of savings for first thermostat (Reference 1, 2)
Heating_Delta_T	Vendor Input	One-week weighted average temperature difference between normal operation and heating setback temperature in degrees F, based on information provided by the customer during the interview.
Dth_Savings_per_Degree	1.754	Dth per degree F of setback (Reference 1, 2)
Dth_Savings_per_Degree_2	0.877	Dth per degree F of setback for second thermostat = half of savings for first thermostat (Reference 1, 2)
Air_Gap_Base	0.56	Effective Air Leakage Area per foot of door gap for door without weatherstripping. (Reference 5)
Air_Gap_Eff	0.15	Effective Air Leakage Area per foot of door gap for door with weatherstripping. (Reference 5)
Gap_Length	Vendor Input	Length of weatherstripping installed. Provided by contractor.
Air_Density	See Table 2	Density of air, Lbm / ft^3. Values for different climate zones provided in Table 2.
LAF	See Table 2	Leakage Area Factor calculated from formula below for use in calculating CFM50 from a gap area in the building envelope. Values for different climate zones provided in table 2. " = 0.186 X SQRT (Air_Density / (2 X Ref_Pressure)) / Discharge_Coefficient
Ref_Pressure	0.20	Reference pressure, inches WC, equivalent to 50 Pa
Discharge_Coefficient	1.00	Discharge coefficient for opening, dimensionless
Coincidence Factor	See Table 1	Coincidence Factor for lighting, programmable thermostat, door weatherstrip, and water heater blanket.
Measure Life	See Table 1	Measure life for lighting, programmable thermostat, door weatherstrip, and water heater blanket.
Incremental Cost	See Table 1	Incremental cost for lighting, second programmable thermostat, second door weatherstrip.
NTG	100%	Net-to-gross factor. Assumed to be 100% for a new program.

Table 1: Measure Life, Coincidence Factor, and Hours (Reference 3)

Type of measure:	Measure life:	Incremental Cost:	Coincidence Factor:	Hours of Operation	
Programmable thermostat (Cooling)	10	\$ 30	76%		Reference 6
Programmable thermostat (Heating)	10	\$ 30	0%		
Weatherstripping (electrically heated and cooled homes)	10	\$ 10	19%		Reference 10
Weatherstripping (electrically cooled and gas heated homes)	10	\$ 10	90%		Reference 2
Water heater blanket elec HW	7.5	na	100%	8760	
Water heater temperature setback	8	\$ 0			
TV & Electronics Controller	5	\$ 20	80%		

Table 2: Leakage Area Factor (Reference 4)

	Front Range	Western Slope	Mountain
Air Density	0.0619	0.0629	0.0565
Leakage Area Factor	0.0730	0.0736	0.0698

References:

1. Energy Information Administration's (EIA) 2009 Residential Energy Consumption Survey (RECS)
2. Bin analysis using RECS data for thermostat operation and typical CO home cooling and heating conditions.
3. Consumer Electronics Characteristics <http://standby.lbl.gov/summary-table.html>
4. 2013 ASHRAE Fundamentals, Chapter 16
5. Door leakage from Colorado Energy Office website: http://www.coloradoenergy.org/procorner/stuff/window_air_leakage.htm
6. Lifetime of 5 years for door weatherstripping and 10 years for programmable T-Stats from "Measure Life Report Residential and Commercial/Industrial Lighting and HVAC Measures", June 2007 by GDS Associates.
7. Lifetime of 5 years for TV controller/timer based on DEER database from READI v2.3.0 for Res-Plug-AdvPwrStrip Ex Ante 2015
8. These numbers are based on "CO Home Lighting & Recycling" analysis and references provided in that program.

Changes from 2015 / 2016 Plan

Revised weatherstripping savings calculations so they are consistent with changes in air sealing calculations.
Updated savings methodology for water heater blankets and setback of gas water heater temperature setpoint.
Removed CFL lamps from the program
Added LED lamps to the program

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Home Lighting & Recycling

Description:

Home Lighting product encourages the purchase of compact fluorescent lamps (CFLs) and Light Emitting Diodes (LEDs) and recycling of all fluorescent lamps.

Algorithms:

Electrical Energy Savings (Gross Annual kWh Saved at Customer per unit)	=Number_of_Bulbs x (kW_Savings_per_Bulb) x Hours
Electrical Demand Savings (Gross kW Saved at Customer per unit)	=Number_of_Bulbs x (kW_Savings_per_Bulb)
Electrical Energy Savings (Gross Generator kWh)	= Customer kWh / (1-TDLF)
Electrical Demand Savings (Gross Coincident kW Saved at Customer per Unit)	= Customer kW x CF / (1-TDLF)
Electrical Energy Savings (Net Generator kWh)	= Gross Generator kWh x NTG x Realization Rate
Electrical Demand Savings (Net Coincident kW Saved at Generator per Unit)	= Gross Generator kW x NTG x Realization Rate

Variables:

Number_of_Bulbs	= Number of bulbs sold
kW_Savings_per_Bulb	= kW savings per replaced bulb. We will subtract the manufacturer provided wattage for each CFL/LED from the wattage of the halogen bulb it replaces. The halogen wattages will be determined based on the CFL/LED wattage as seen in Table 1.
Hours of operation	= Hours of operation per year for the bulb. Hours of operation for residential installations is assumed to be LED - 2.49 hours per day (909 hrs) and CFL - 2.34 hours per day (854 hrs) Hours of operation for non-residential purchases are 5,187 hours 94% of all bulbs purchased are assumed to be residential and 6% are assumed to be non-residential. Reference 4, 5

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Measure Life	<p>= The Measure Life for LEDs and CFLs is determined by the planned elimination of the baseline halogen bulbs. The analysis assumes that that halogens will be available to install for 2 years after they can no longer be sold (January 1, 2020). The lifetime is therefore = minimum of the lamp life divided by the annual hours or 2023 +(Halogen Lamp Life/annual hours of operation) - program year.</p> <p>CFL lifetime hours = 10,000 LED lifetime hours = 20,000 for 2017, 15,000 for 2018 Value LED lifetime hours = 10,000 Halogen Lamp Life = 1,000 hours</p>
CF	<p>= Probability that peak demand of the bulb will coincide with peak utility system demand. 0.08 will be used for all residential CFLs\LEDs 0.636 will be used for all non residential CFLs\LEDs. (From business program) Reference 1, 5</p>
TDLF	= Total Distribution Loss Factor, Residential = 7.69%, Non-residential = 6.51%
Incremental Cost of Bulbs	= See Table 2
Net-to-Gross Factor	= We will use 79% for CFLs, 91% for LEDs, and 85% for Value LEDs
Realization Rate	= Future savings for bulbs purchased and put in storage and installed in later years. The net present value of the saving for all bulbs purchased = 99% of the savings if all bulbs are installed when purchased
O&M savings	= Operation and Maintenance savings are assumed to be zero.

Provided by product Vendor:

Number and type of bulbs purchased

Verified during M&V:

Yes

Assumptions:

The baseline bulb is a blend between the EISA standards (Halogen bulbs) and available incandescent bulbs
The baseline bulb cost is deemed as stated in table 2 below
The efficient LED bulb cost and wattage will be tracked and updated at the end of the year to account for the rapidly evolving market and cost for LED bulbs.
Non EISA impacted lights will use incandescent baseline

Table 1 - Baseline wattage for residential lights

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Lumens	EISA Baseline Wattage (halogen)	Non-EISA Baseline Wattage (incandescent)
310-749	29	40
750-1049	43	60
1050-1489	53	75
1490-2600	72	100

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 2 - Average Cost Table					
	CFLs	LEDs 2017*	LEDs 2018*	Value LEDs 2017*	Value LEDs 2018*
Gross Retail (per bulb)	\$2.29	\$9.56	\$8.61	\$3.46	\$3.11
Baseline (per bulb)	\$1.28	\$2.19	\$2.19	\$1.24	\$1.24
Incremental	\$1.00	\$7.37	\$6.41	\$2.22	\$1.87
Rebate	\$1.15	\$5.25	\$4.75	\$1.50	\$1.50
Net Retail	-\$0.15	\$2.12	\$1.66	\$0.72	\$0.37

* = See note above on LED costs throughout the program year.

Table 3 - Baseline Costs					
	EISA Baseline Wattage (halogen)			(Incandescent)	
Lumens	LED Watts*	CFL Watts	Baseline Cost	LED Watts*	Baseline Cost
310-749	5-7	9	\$1.24	5-8	\$2.32
750-1049	8-12	13	\$1.24	9-12	\$3.32
1050-1489	13-15	17	\$1.49	14-15	\$8.97
1490-2600	18-22	23	\$1.49	16-23	\$9.97

* = See note above on LED wattage throughout the program year.

References:

1. Michaels Tech Assumptions Review 2016
2. 2015 Program Results compiled by WECC (program administrator)
3. Market survey 2015 (homedepot.com, lowes.com, samsclub.com, target.com, walmart.com, etc)
4. Illinois 2015 Technical Reference Manual, ComEd PY5/PY6 Residential Lighting Program Evaluation conducted by Navigant in 2015
5. CO Lighting Efficiency Program

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Home Performance with ENERGY STAR

Description:

Home Performance with Energy Star program, residential natural gas and electric customers receive a cash rebate for implementing multiple energy efficiency improvements.

The Home Performance with ENERGY STAR Product provides a "systems approach" to comprehensive energy improvements. Public Service uses this approach by requiring an upgraded home "shell," including code level attic insulation and a reduction in air infiltration coupled with a combustion safety check if naturally vented combustion appliances (furnace/boiler or water heater) remain in the home after product participation.

Low-income customers may participate in this product, but also have dedicated product offerings.

Program References:

Measures "Attic Insulation", "Wall Insulation", and "Air Sealing"	Refer to Program "Insulation and Air Sealing - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCKW, etc.) for all "Attic Insulation", "Wall Insulation", and "Air Sealing" measures.
Measures "Heating Efficiency", "High Efficiency Furnace"	Refer to Program "Residential Heating - CO" to find formulas and variables for (Customer Dth, Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCKW, etc.) for all "Heating Efficiency" measures.
Measures for "LED"	Refer to Program "Home Lighting and Recycling - CO" to find formulas and variables for (Customer PCKW, Coincidence Factor, Baseline Lamp Watts, etc.) for all "LED" measures.
Measures for "Energy Star Clothes Washer"	Refer to Program "Energy Star New Homes - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCKW, etc.) for all "Energy Star Clothes Washer" measures.
Measures for "Water Heating Efficiency"	Refer to Program "Water Heating - CO" to find formulas and variables for (Customer Dth, Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCKW, etc.) for all "Water Heating Efficiency" measures including condensing water heaters, instantaneous water heaters, and heat pump water heaters.
Measures for "Refrigerator Replacement", "Removal of Primary Refrigerator"	Refer to Program "Refrigerator and Freezer Recycling - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCKW, etc.) for "Refrigerator Replacement", and "Removal of Primary Refrigerator" measures.
Measures for "Air Conditioning" and "Ground Source Heat Pumps"	Refer to Program "High Efficiency Air Conditioning - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCKW, etc.) for all "Air Conditioning", "Ground Source Heat Pump" and "Quality Install" measures.
Measures for "Evaporative Cooling"	Refer to Program "Evaporative Cooling - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCKW, etc.) for all "Evaporative Cooling" measures.

Algorithms:

LED_kW (kW Saved at Customer)	= (kW_Bulb_Existing - kW_Bulb_New) x (Qty_LED_After - Qty_LED_Before)
LED_kWh (Annual kWh Saved at Customer)	= (kW_Bulb_Existing - kW_Bulb_New) x (Qty_LED_After - Qty_LED_Before) x (Hours_Per_Bulb)
Setback_Thermostat_kW Saved at Customer	= Setback_Thermostat_kWh / Hours_Electric_Cooling
Setback_Thermostat_PCKW (Coincident kW Saved at Customer)	= Setback_Thermostat_kW x CF

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Variables:

Effn	Customer Input	= Efficiency of the newly installed natural gas heating unit. We will use the nameplate value provided by the customer.
BTUH	Customer Input	= Size of the newly installed natural gas heating unit. We will use the nameplate value provided by the customer.
Qty_LED_After	Customer Input	= Number of LED bulbs present in the home after the upgrade (minimum of 20), provided by the customer
Qty_LED_Before	Customer Input	= Number of LED bulbs present in the home before upgrade, provided by the customer
kW_Bulb_Existing	43	EISA baseline wattage associated with the average new bulb wattage, Reference Home Lighting and Recycling Program.
kW_Bulb_New	9.65	Average new LED lamp wattage as determined by sales in the Home Lighting and Recycling program.
Setback_Thermostat_Dtherm (Customer Dth Savings per year)	4.19	Annual energy savings for heating due to an average temperature setback of 2.4 degree F for Heating Season and baseline home heating is 61.6 DTherms / year. Savings is = 4.19 DTherms / year.
Setback_Thermostat_kWh (Customer kWh Savings per year)	118	Annual energy savings for cooling energy due to average temperature setback of 1.33 Degree F for Cooling Season. Baseline cooling energy per year is 1,901 kWh and the annual savings is 118 kWh / year.
Setback Thermostat Coincidence Factor	76%	CF for cooling only per T-Stat Setback Bin Calcs
Setback Thermostat Measure Life	10	Reference 2
Setback Thermostat Incremental Cost	\$50.00	Reference 3
Hours_Electric_Cooling (Setback Thermostat Measure)	Refer to Program "Air Conditioning - CO" to find reference for Cooling Hours.	
3412	Conversion from BTU to kWh, 1kWh = 3412 BTU	
NTG	Net-to-Gross Factor = We will use 116% based on Reference 1.	

Inputs:

Reference Stand-alone programs for a complete list of required customer inputs	
Identify all implemented measures	Customer Input
Qty_LED_After	Customer Input
Qty_LED_Before	Customer Input
Quantity Refrigerators Removed	Customer Input
Example Inputs from Standalone Programs:	
Actual cost of Attic Insulation	Customer Input
Attic Square Footage Insulated	Customer Input
Attic Insulation R-Value Pre Project	Customer Input
Attic Insulation R-Value Post-Project	Customer Input
Actual Cost of Air Sealing	Customer Input
BTUH size of new fuel fired heating equipment	Customer Input
EFFn of new heating equipment	Customer Input
EFFn of new domestic water heating equipment	Customer Input
Blower Door Test-in CFM50	Customer Input
Blower Door Test-out CFM50	Customer Input
Climate Zone (Front Range, Western Slope, or Mountains)	Customer Input

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Number of Stories above grade in Home	Customer Input
Conditioned Square Footage	Customer Input

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Assumptions:

Any home with an existing ACH natural of 0.45 ACH will not be eligible for the air sealing measure.

A Blower Door Test will be required for all participating homes.

The Attic Bypass Air Sealing energy savings will be captured with Air Sealing and Weather Stripping measure.

TMY3 Climate Data used for the following areas: Front Range = Denver; Western Slope = Grand Junction; Mountains = Alamosa

The NTG for the Tier 1 evaporative coolers is 59.7%. This was determined in the 2006 Summit Blue Consulting report. The NTG for the Tier 2 evaporative coolers

Qualifying Evaporative Cooling Equipment must be new and be a permanently installed direct (Tier 1 or 2), indirect or two-stage evaporative cooling unit. Portable coolers or systems with vapor compression equipment are not eligible, nor is used or reconditioned equipment.

References:

1. COLORADO HOME PERFORMANCE WITH ENERGY STAR® PROGRAM EVALUATION Printed May 2014

2. Lifetime of 10 years for programmable T-Stats from "Measure Life Report Residential and Commercial/Industrial Lighting and HVAC Measures", June 2007 by GDS Associates

3. Xcel Energy estimate

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Insulation and Air Sealing Rebate

Description:

Residential natural gas and/or electric customers receive a cash rebate for installing insulation in their existing single-family home or one-to-four unit property.

Wall Insulation Equations:

Customer Dth	$= (1 / R_Wall_Base - 1 / R_Wall_Proposed) * Wall_Area * HDD * 24 / 1,000,000 / Heating_Eff_Gas$
Cooling_kWh	$= (1 / R_Wall_Base - 1 / R_Wall_Proposed) * Wall_Area * CDD * 24 / 3,412 / Cooling_Eff$
Heating_kWh	$= (1 / R_Wall_Base - 1 / R_Wall_Proposed) * Wall_Area * HDD * 24 / 3,412 / Heating_Eff_Elec$
Gross Annual kWh Saved at Customer	$= Cooling_kWh + Heating_kWh$
Customer kW (Gross kW)	$= Gross_Annual_kWh_Saved_at_Customer / (Cooling_Hours + Heating_Hours)$
Customer PCkW	$= Cooling_kWh / Cooling_Hours$

Attic Insulation Equations:

Customer Dth	$= (1 / (2 + R_Attic_Base) - 1 / (2 + R_Attic_Proposed)) * Attic_Area * HDD * 24 / 1,000,000 / Heating_Eff_Gas$
Cooling_kWh	$= (1 / (2 + R_Attic_Base) - 1 / (2 + R_Attic_Proposed)) * Attic_Area * CDD * 24 / 3,412 / Cooling_Eff$
Heating_kWh	$= (1 / (2 + R_Attic_Base) - 1 / (2 + R_Attic_Proposed)) * Attic_Area * HDD * 24 / 3,412 / Heating_Eff_Elec$
Gross Annual kWh Saved at Customer	$= Cooling_kWh + Heating_kWh$
Customer kW (Gross kW)	$= Gross_Annual_kWh_Saved_at_Customer / (Cooling_Hours + Heating_Hours)$
Customer PCkW	$= Cooling_kWh / Cooling_Hours$

Air Sealing Equations:

Customer Dth	$= (CFM50_Baseline - CFM50_Proposed) / N_Winter * ATF * HDD * 24 / Heating_Eff_Gas / 1,000,000$
Cooling_kWh	$= (CFM50_Baseline - CFM50_Proposed) / N_Summer * ATF * CDD * 24 / Cooling_Eff / 3,412$
Heating_kWh	$= (CFM50_Baseline - CFM50_Proposed) / N_Winter * ATF * HDD * 24 / Heating_Eff_Elec / 3,412$
Gross Annual kWh Saved at Customer	$= Cooling_kWh + Heating_kWh$
Customer kW (Gross kW)	$= Gross_Annual_kWh_Saved_at_Customer / (Cooling_Hours + Heating_Hours)$
Customer PCkW	$= Cooling_kWh / Cooling_Hours$

Variable ID	Value	Description
R_Wall_Base	4.41	R-Value for baseline wall insulation, calculated assuming no cavity insulation
R_Wall_Proposed	13.09	R-Value for proposed wall insulation, calculated assuming R-11 cavity insulation
Wall_Area	Customer Input	Square footage of wall insulation added, provided by customer
R_Attic_Base	Customer Input	R-Value for baseline attic insulation, provided by customer
R_Attic_Proposed	Customer Input	R-Value for proposed attic insulation, provided by customer
Attic_Area	Customer Input	Square footage of attic insulation added, provided by customer
Heating_Efficiency_Gas	See Table 1	Heating efficiency is determined based on the customer's heating system type
Cooling_Eff	See Table 2	Cooling efficiency is determined based on the customer's cooling system type
Heating_Efficiency_Elec	See Table 1	Heating efficiency is determined based on the customer's heating system type
CFM50_Baseline	Customer Input	Blower Door test air leakage rate at 50 pascals maintained pressure, measured in cubic feet per minute. The contractor will capture actual readings.
CFM50_Proposed	Customer Input	Blower Door test air leakage rate at 50 pascals maintained pressure, measured in cubic feet per minute. The contractor will capture actual readings.
N_Winter	See Table 3	Conversion factor used to relate actual measured CFM leakage rate (taken at a reference pressure of 50 pascals) to a natural CFM of infiltration. (Reference 2)
N_Summer	See Table 3	Conversion factor used to relate actual measured CFM leakage rate (taken at a reference pressure of 50 pascals) to a natural CFM of infiltration. (Reference 2)
ATF	See Table 4	Air Transfer Factor is a conversion factor for calculating BTU/hour from airflow in CFM
HDD	See Table 4	Heating Degree Days base 65, based on TMY3 data.
CDD	See Table 4	Cooling Degree Days base 65, based on TMY3 data.
Cooling_Hours	329	Full load cooling hours per Residential Heating program
Heating_Hours	1159	Full load heating hours per Residential Heating program
Conversion from Btu to Dth	1,000,000	1 Dth = 1,000,000 Btu
Conversion from Btu to kWh	3,412	1 kWh = 3,412 Btu
Incremental Cost	Customer Input	Cost of the insulation or air sealing is provided by the customer
Measure Lifetime	See Table 5	(Reference 1)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 1	Heating_Eff_Gas	Heating_Eff_Elec
Air Source Heat Pump		2.26
Electric Resistance		1.00
Ground Source Heat Pump		3.30
Natural Gas	0.78	

Table 2	Cooling_Eff
AC/Air Source Heat Pump	3.93
Evap or None	0.00
Ground Source Heat Pump	4.13

Table 3	N_Winter			N_Summer		
Stories	Front Range	Western Slope	Mountain	Front Range	Western Slope	Mountain
1	14.328	16.021	15.138	19.313	18.405	18.321
2	11.282	12.405	11.520	16.449	15.969	14.762
3	9.713	10.577	9.730	14.932	14.712	12.890

Table 4	Front Range	Western Slope	Mountain
ATF	0.891	0.906	0.813
HDD	6,016	5,580	9,015
CDD	1,116	1,452	434

Table 5	Lifetime	
Wall Insulation	20	Reference 1
Attic Insulation	20	Reference 1
Air Sealing	10	Reference 1

References:

1. California Measurement Advisory Committee (CALMAC) Protocols, Appendix F (www.calmac.org/events/APX_F.pdf).
2. ASHRAE 2013 Fundamentals, Chapter 16, Equations (41) defining Equivalent Air Leakage Area and (48) defining airflow rate from infiltration.
3. Engineering Toolbox; Air Densities; http://www.engineeringtoolbox.com/air-altitude-density-volume-d_195.htmlPKPK*26
4. Existing Equipment Efficiencies from Table 5 of "Building America Research Benchmark Definition", January 2010. R. Hendron and C. Engebrecht. <http://www.nrel.gov/docs/fy10osti/47246.pdf>
5. 2013 ASHRAE Fundamentals; Page 16.23 Table 4 Defining Stack Coefficient C_s
6. 2013 ASHRAE Fundamentals; Page 16.24 Table 6, defining basic model Wind Coefficient, C_w . Assumed Colorado is classified as Shelter Class 3.
7. R-Value estimate for wall insulation based on 2013 ASHRAE Fundamentals; Page 26.20, Table 10

Changes from Recent Filing:

Updated heating and cooling efficiencies for consistency

Assumptions

1. For minimum attic R-value, we are assuming non-vented attic for a minimum R-value of 4.74. Any inputs into the calculator that are under 2.74 will use 4.74 instead (2.74+2)
2. Roof assembly R-value approximated to R=2. Asphalt Shingles, Sheathing, and Air space may or may not apply depending on attic ventilation.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Refrigerator Recycling

Description:

Rebates will be offered for pickup of a primary or secondary working refrigerator or freezer that will be demanufactured and re-cycled.

Algorithms:

Refrigerator Electrical Energy Savings (Gross Annual kWh Saved at Customer per unit)	= Base kWh - Efficient kWh
Refrigerator Electrical Demand Savings (Gross kW Saved at Customer per unit)	= Customer kWh / Hours_of_operation
Electrical Energy Savings (Gross Generator kWh)	= Customer kWh / (1-TDLF)
Electrical Demand Savings (Gross Coincident kW Saved at Customer per Unit)	= Customer kW x CF / (1-TDLF)
Electrical Energy Savings (Net Generator kWh)	= Gross Generator kWh * NTG
Electrical Demand Savings (Net Coincident kW Saved at Generator per Unit)	= Gross Coincident kW x NTG

Variables:

Baseline Product Consumption - Base kWh	= Baseline Product Consumption is the predicted future consumption of refrigerator being removed as seen in Table 1 based on the year of manufacture which will be provided by the vendor for each refrigerator. (Reference 1)
Efficient Product Consumption - Efficient kWh	= Efficient Product Consumption is 0 kWh when unit has been demanufactured. All units are removed from service and recycled so they can not be installed at another location.
Measure Life	= Measure life is assumed to be the remaining service life of the existing secondary refrigerators that are removed under this program. =8 years (Reference 2). Primary refrigerators and freezers =9.4 years (Reference 4) and freezers = 6.2 years
Incremental Costs	= \$0.00
TDLF	= Energy Loss Factor = 7.69%, the percentage loss of electricity as it flows from the power plant to the customer
O&M savings	= Operation and Maintenance savings are assumed to be zero for refrigerator recycling.
CF	= Coincidence Factor = 63.84% ;probability that refrigerator will be operating during the peak period. (Reference 6)
Hours of Operation	= 5592 hours per year
Freezer Product Consumption	= 85% of the refrigerator usage (Reference 3)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

NTG	= Net to gross will be 64% for secondary refrigerator recycling and will be 52.5% for primary units (Reference 4)
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Needed from Customer/Vendor/Administrator for Calculations:

Confirm removal of working refrigerator
Year of manufacture for the working refrigerator

Assumptions:

Rebates are available only for working units. Primary units, secondary units and standalone freezers
Primary Units are removed and recycled under the assumption if they were not recycled they would become a secondary unit
Several Baseline scenarios exist. HO can keep and use working secondary unit; HO can sell/give away unit into secondary market and unit will remain on grid; HO can take unit to recycling center and pay for recycling. Since options have positive and negative cash consequences for HO, assume \$0.00 Baseline cost on average.

Table 1
Deemed Savings by Age of Refrigerator (Reference 1)

Year of Manufacture	Deemed Savings kWh
1970	2,288
1971	2,274
1972	2,261
1973	2,189
1974	2,153
1975	2,069
1976	1,949
1977	1,882
1978	1,835
1979	1,707
1980	1,598
1981	1,477
1982	1,469
1983	1,423
1984	1,389
1985	1,282
1986	1,293
1987	1,167
1988	1,148
1989	1,105
1990	1,103
1991	1,097
1992	1,090
1993	778

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

1994	773
1995	769
1996	772
1997	774
1998	776
1999	779
2000	781
2001	540
2002	539
2003	538
2004	526
2005	515
2006	528
2007	521
2008	512
2009	505
2010	518
2011	515
2012	517
2013	504
2014	419

References:

1. Baseline kWh and Average to peak kW ratio from 1995 and 2012 versions of Residential Energy Data Sourcebook for the U.S. Residential Sector. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-40297
2. Data on expected life for savings on secondary refrigerators, "9th year Persistence Study for Southern California Edison", KEMA, 2004
3. Estimate for annual energy use for freezers as percent of refrigerator use. See Table Final Estimates on page 6-15 of report by KEMA-XENERGY (2004). "Final Report, Measurement and Evaluation Study of 2002 Statewide Residential Appliance Recycling Program." February 13, 2004
4. Data on NTG numbers in Table 2, "*Primary Refrigerators: An Examination of Appliance Recycling Program Design*", Kate Bushman, The Cadmus Group, Inc., Portland, OR. <http://www.iepec.org/conf-docs/papers/2011PapersTOC/papers/038B.pdf#page=1>
6. Data to support CF of 63.8% from "Domestic Refrigerators: Field Studies and Energy Efficiency Improvement", M. Siddhartha Bhatt, CPRI, July 2001.
7. Data on Efficiency Standards, "Technical Support Document Refrigerators and Freezers", DOE, 2014.
8. Shipment Weighted Efficiencies from Residential Energy Databook, Years 1950 - 1995, <http://enduse.lbl.gov/Projects/RED.html>
9. Refrigerator-Freezer Sizes and Energy Factors (Shipment-Weighted Averages), Residential Energy Databook, Years 1972 - 2010, <http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=5.7.5>
10. California Measurement Advisory Committee (CALMAC) Protocols, Appendix F (www.calmac.org/events/APX_F.pdf).
11. Energy Star Program Requirements for Refrigerators. https://www.energystar.gov/ia/partners/product_specs/program_reqs/refrig_prog_req.pdf
12. 2015 program data

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: School Education Kit

Description:

A package of home energy efficiency measures in a kit that can be distributed to 5th or 6th grade students. . Each participant receives a kit containing eight LED bulbs, a high efficiency showerhead, and two high efficiency sink aerators (kitchen and bath).

Program References:

Measures "Provide Efficient Showerhead"	Refer to Program "Energy Efficient Showerhead - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PCkW, etc. for the "Efficient Showerhead" measures.
Measures "Provide Efficient Kitchen Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PCkW, etc. for the "Efficient Kitchen Faucet Aerator" measure.
Measures "Provide Efficient Bath Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PCkW, etc. for the "Efficient Bath Faucet Aerator" measure.
Measures "Replace incandescent lamps with LEDs"	Refer to Program CO Home Lighting & Recycling to find formulas for Customer kW, Customer kWh, Customer PCkW for the "LED" measure.
Measure "Provide Efficient Showerhead"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Gas Split Factor", "Measure Life", "Hours", "Coincidence Factor", etc values.
Measures "Provide Efficient Kitchen Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Gas Split Factor", "Measure Life", "Hours", "Coincidence Factor", etc values.
Measures "Provide Efficient Bath Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Gas Split Factor", "Measure Life", "Hours", "Coincidence Factor", etc values.
Measures "Replace incandescent lamps with LEDs"	Refer to Program "Home Lighting and Recycling - CO" to find references and tables for "Measure Life", "Hours", "Coincidence Factor", etc values.
Measure "Provide Efficient Showerhead"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for Operation and Maintenance cost savings value due to water savings.
Measures "Provide Efficient Kitchen Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for Operation and Maintenance cost savings value due to water savings.
Measures "Provide Efficient Bath Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Operation and Maintenance cost savings", value due to water savings.

Algorithms:

Gas Savings (Gross Dth)	= Customer Dth x (# kits distributed)
Gas Savings (net Dth)	= Customer Dth x NTG
Electrical Energy Savings (Net Gen kWh)	= Customer Generator kWh x NTG x Install Rate
Electrical Demand Savings (Net Gen kW)	= Customer Generator kW x NTG x Install Rate

Variables:

Incremental Costs	= costs provided by vendor.
Net-to-Gross Factor (NTG)	= We will use 100% for school education kits as these kits would not be available without the
Install Rate	= Actual Installation Rates will be collected as part of the M&V exercise. For these assumptions, an install rate of 60% for LEDs and 40% for showerheads and aerators has been assumed.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Inputs:

Provided by Customer:

Number of kits distributed
Was LED installed
Was showerhead installed
Was Kitchen aerator installed
Was Bath aerator installed

Verified during M&V:

Yes
Yes
Yes
Yes
Yes

Assumptions:

Savings shown above include homes with either electric or gas water heaters. The Energy Efficient Showerhead - CO program monitors and establishes a gas split factor for use in homes where the water heater type is unknown. School Education Kits will use the Energy Efficient Showerhead - CO program's gas split factor for unknown water heater types to calculate and claim energy savings.

Showerhead savings are based on the Energy Efficient Showerhead - CO program's primary showerhead assumptions.

Tables:

See Reference Programs

References:

See Reference Programs
Energy Efficient Showerhead - CO
Home Lighting and Recycling - CO

Changes from Recent Filing

Update to EISA baseline Wattages for LED measures
Replaced CFL measures with LED measures
Updated to latest Utility Information
Updated annual hours for lighting
Updated savings for showerheads and aerators
Updated vendor costs for materials provided in the kits

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Low Income SF Weatherization

Description:

Residential income-qualified natural gas and electricity customers have energy efficiency measures performed at no cost.

Program References:

Measures "Refrigerator Replacements"	Refer to Program "Refrigerator Recycling - CO" to find formulas for (Customer Dth, Customer kW, Customer kWh, Customer PckW, etc.) for all "Refrigerator Replacements" measures.
Measures "Heating Efficiency" and "EC Motor Furnace Fan"	Refer to Program "Residential Heating - CO" to find formulas for (Customer Dth, Customer kW, Customer kWh, Customer PckW, etc.) for all "Heating Efficiency" measures.
Measures for "Water Heating Efficiency"	Refer to Program "Water Heating - CO" to find formulas for (Customer Dth, Customer kW, Customer kWh, Customer PckW, etc.) for all "Water Heating Efficiency" measures.
Measures "Attic Insulation", "Wall Insulation", and "Air Sealing"	Refer to Program "Insulation Rebates - CO" to find formulas for (Customer kW, Customer kWh, Customer PckW, etc.) for all "Attic Insulation", "Wall Insulation", and "Air Sealing" measures.
Measures "CFLs"	Refer to Program "Home Lighting and Recycling - CO" to find formulas for (Customer kW, Customer kWh, Customer PckW, etc.) for the "CFL" measure.
Measures "LEDs"	Refer to Program "Home Lighting and Recycling - CO" to find formulas for (Customer kW, Customer kWh, Customer PckW, etc.) for the "LED" measures.
Measures "Provide Efficient Showerhead"	Refer to Program "Energy Efficient Showerhead - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PckW, etc. for the "Efficient Showerhead" measures.
Measures "Provide Efficient Kitchen Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PckW, etc. for the "Efficient Kitchen Faucet Aerator" measure.
Measures "Provide Efficient Bath Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PckW, etc. for the "Efficient Bath Faucet Aerator" measure.
Measures "Install New Thermostat"	Refer to Program "Home Energy Squad - CO" to find formulas for Customer Dth, Customer kWh, customer kW, customer PckW, etc. for the "Install New Thermostat" measure.
Measures "Heating Efficiency" and "EC Motor Furnace Fan"	Refer to Program "Residential Heating - CO" to find values for Heating Hours, Coincidence Factors, Measure Life, EC Motor Baseline Watts and EC Motor Efficient Watts and EC Motor Operating Hours.
Measures "CFLs"	Refer to Program "Home Lighting and Recycling - CO" to find values for kW_Bulb_Existing, kW_Bulb_New, CF, and Average CFL Hours per lamp, Measure Life.
Measures "Attic Insulation", "Wall Insulation", "Crawl Space Wall", and "Air Sealing"	Refer to Program "Insulation Rebates - CO" to find reference table for Measure Life, Deemed and Customer Inputs, Heating and Cooling Degree Days, Climate Zone data, Heating and Cooling Hour Data values, Measure Life.
Measures "Storm Windows"	Refer to Program "Residential Heating - CO" to find values for Heating Hours, Measure Life. For use in the Storm Windows Customer kW calculation.
Measure "Provide Efficient Showerhead"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Gas Split Factor", "Measure Life", "Hours", "Coincidence Factor", etc values.
Measures "Provide Efficient Kitchen Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Gas Split Factor", "Measure Life", "Hours", "Coincidence Factor", etc values.
Measures "Provide Efficient Bath Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Gas Split Factor", "Measure Life", "Hours", "Coincidence Factor", etc values.
Measures "Water Heating Efficiency"	Refer to Program "Water Heating - CO" to find references for baseline water heater efficiency, tank sizes, Measure Life, incremental costs.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Measures "Install New Thermostat"	Refer to Program "Home Energy Squad - CO" to find references and deemed savings values, Measure Life for the "Install New Thermostat" measure.
Measure "Provide Efficient Showerhead"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for Operation and Maintenance cost savings value due to water savings.
Measures "Provide Efficient Kitchen Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for Operation and Maintenance cost savings value due to water savings.
Measures "Provide Efficient Bath Faucet Aerator"	Refer to Program "Energy Efficient Showerhead - CO" to find reference table for "Operation and Maintenance cost savings", value due to water savings.

Algorithms:

Crawl Space Wall Insulation:

Customer Dth	$= (1 / R_{\text{Crawl_Space_Wall_Base}} - 1 / R_{\text{Crawl_Space_Wall_Proposed}}) * \text{Wall_Area} * \text{HDD_Insulation} * 24 / 1,000,000 / \text{Heating_Eff_Gas}$
Customer kWh	$= (1 / R_{\text{Crawl_Space_Wall_Base}} - 1 / R_{\text{Crawl_Space_Wall_Proposed}}) * \text{Wall_Area} * \text{HDD_Insulation} * 24 / 3,412 / \text{Heating_Eff_Elec}$
Customer kW	$= \text{Customer kWh} / (\text{Heating_Hours})$
Customer PckW	$= \text{Customer kW} * \text{CF}$

Storm Window Equations:

Storm Windows Customer kWh	$= \text{Customer kWh} / \text{Heating_Hours}$
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Refrigerator Recycling Equations:

Customer kW	$= \text{Customer kWh} / (\text{Operating_Hours})$
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Variables:

R_Crawl_Space_Wall_Base	4.41	R-Value for baseline wall insulation, calculated assuming no cavity insulation
R_Crawl_Space_Wall_Proposed	20.34	R-Value for proposed crawl space wall insulation, calculated assuming R-19 cavity
CF	0%	Insulation Coincidence Factor in electrically heated homes.
Crawlspace Insulation Measure Life	20.00	Measure Life for crawl space insulation. Reference 5

Storm Window Variables:

Customer kWh Savings	See Table 3	Storm window savings in electrically heated homes.
Customer Dth savings	See Table 2	Storm window savings in gas heated homes.
CF	0%	Storm window Coincidence Factor in electrically heated homes.
Storm Window Installation	\$1225 (Reference 8)	Incremental Cost for Storm window installation.
Storm Window Measure Life	20.00	Life of the installed Storm Windows. Reference 5

Refrigerator Recycling Variables:

Customer kWh Refrigerator Recycling	871	Refrigerator replacement energy savings kWh
Refrigerator Hours	5,592	Operating Hours for the refrigerator
CF	64%	Coincidence Factor for Refrigerator measures
Refrigerator Replacement Measure Life	18	Measure Life for Refrigerator Replacement measure based on program data
Incremental Cost	See Table 4	The incremental costs for equipment only in low income program.

CFL Variables:

kW_Bulb_New	Customer Input	Efficient Lamp Wattage provided by Vendor.
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LED Variables:

kW_Bulb_New	Customer Input	Efficient Lamp Wattage provided by Vendor.
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New Programmable T-Stat:

Heating_Delta_T	3.37	Deemed one-week weighted average temperature difference between normal operation and heating setback temperature in degrees F.
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Inputs:

Inputs as required by referenced programs	
Wattage of CFLs Installed	Customer Input

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Quantity of CFLs Installed by wattage	Customer Input	
Quantity of Refrigerators Replaced	Customer Input	
R-Value of existing Attic Insulation	Customer Input	R-value of existing insulation without adjustments for structure or air films.
R-Value of as-built Attic Insulation	Customer Input	Overall R-value of insulation at completion of work; existing plus new insulation.
Attic Insulation Square Feet Installed	Customer Input	
Wall Insulation Square Feet Installed	Customer Input	
Crawl Space Insulation Square Feet Installed	Customer Input	
BTUH size of new fuel fired heating equipment	Customer Input	
EFFn of new heating equipment	Customer Input	
EFn of new domestic water heating equipment	Customer Input	
Blower Door Test-in CFM50	Customer Input	
Blower Door Test-out CFM50	Customer Input	
Conditioned Square Footage	Customer Input	
Climate Zone (Front Range, Western Slope, or Mountains)	Customer Input	
Quantity of Storm Windows Installed	Customer Input	
Quantity of Showerhead or Aeroator Installed	Customer Input	
New Thermostat Installed	Customer Input	Assume that only one T-stat will be provided per home.
Wattage of LED A-Style Lamps Installed	Customer Input	
Quantity of LED A-Style Lamps Installed by wattage	Customer Input	
Wattage of LED BR-Style Lamps Installed	Customer Input	
Quantity of LED BR-Style Lamps Installed by wattage	Customer Input	

Assumptions:

Work performed in coordination with the Governors Energy Office

Tables:

Table 1: Home Characteristics (Reference 1)

Category	Characteristic	Evaluation Result	Units	Home Type
Envelope and Mechanical Systems	Home Type	Mobile and Site Built		Specified
	Location	Multiple Regions		Both
	Conditioned Floor Area	961	SF	Mobile
		1451	SF	Site Built
	Number of Bedrooms	Two		Mobile
		Three		Site Built
	Foundation Type	Open Crawlspace		Mobile
		Enclosed Crawlspace		Site Built
	Foundation Wall Type	Mobile Home Skirt		Mobile
		R-11 Draped Insulation		Site Built
	Home Complexity	Four Corners		Both
	Nominal Ceiling Height	7.6	FT	Mobile
		8.2	FT	Site Built
	Ceiling Type	REM/Rate Default		Mobile
	Baseline	R-11 + Grade III		Site Built
	Above Grade Wall Type	REM/Rate Default		Mobile
	Baseline	Empty Cavity Insulation		Site Built
		R-4.37 Grade III		
	Foundation Floor	R-9.3		Mobile

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

	Type	Uninsulated		Site Built
	Door Type	R-1.7		Both
	Infiltration Rate	0.8 ACH		Both
	Window Properties	U Value 0.86		Mobile
		SHGC 0.72		
		U Value 0.75		Site Built
		SHGC 0.67		
		108.25 sqft		Mobile
		144.15 sqft		Site Built
Refrigerators	Adjusted Volume	22	CU FT	Both
	Survival Rate	9.4		Both
	Degradation	1.006		Both
CFLs	Coincidence Factor	8%		Both

Table 2: Gas Energy Savings by Region (Reference 1)*

Measure	Denver	Dillon	Eagle	Grand Junction	Leadville
Storm Window Installation	16.3	29.0	23.1	14.8	33.7

*SB = Site Built, MH = Mobile Home. All others are not expected to be affected by home type.

Table 3: Electric Energy Savings by Measure (Reference 1)*, **

Measure	Denver	Dillon	Eagle	Grand Junction	Leadville
Storm Window Installation	3,794	6,771	5,384	3,454	7,873

*SB = Site Built, MH = Mobile Home. All others are not expected to be affected by home type.

** envelope measures contribute electric savings when an electric heating source is utilized. Assumed efficiency is 98%.

Table 4: Incremental Equipment Cost by Measure (Reference 11)

Measure	Incremental Cost
Refrigerator Replacement (2014 standard)	\$ 630.00
CFL per lamp	\$ 1.75
LED A-style per lamp	\$ 5.00
LED BR-style per lamp	\$ 8.00
Storm Windows	\$ 1,225.00
High Efficiency Furnace	\$ 550.00
EC Motor Furnace Fan	\$ 200.00
67% EF Storage Water Heater	\$ 300.00
Efficient Showerhead	\$ 3.10
Efficient Kitchen Faucet Aerator	\$ 1.50
Efficient Bath Faucet Aerator	\$ 0.48
Water Heater Blanket	\$ 75.00
Programmable T-Stat	\$ 125.00
Attic insulation to code minimum	\$ 715.00
Air Sealing & Weather-stripping (25% reduction)	\$ 200.00
Wall Insulation from R-0 to R11	\$ 670.00
crawl space wall insulation R-0 to R-19	\$ 175.00

References:

References:

- 1) 2011 Program Evaluation by Cadmus Group
- 2) US Lighting Market Characterization Study performed for the Department of Energy in 2002
- 3) Reference Removed
- 4) Xcel Energy Water Heater Rebate Program

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: CO - Water Heating

Description:

Residential natural gas customers receive a cash rebate for purchasing high-efficiency natural gas water heating equipment. Residential electric customers with standard electric water heaters can receive a rebate for replacing it with a heat pump water heater.

Equations:

Hot_Water_Energy	= Hot_Water_Demand / Standard_Tank_Size x Water_Heater_Delta_T x 365 x 8.33 x Proposed_Tank_Size
Water_Heater_Delta_T	= Water_Heater_Temperature - City_Mains_Temperature

Gas Equations:

Customer_Dth	= Baseline_Dth - Proposed_Dth
Baseline_Dth	= Hot_Water_Energy / Baseline_Eff_Gas / 1,000,000
Proposed_Dth	= Hot_Water_Energy / Proposed_Eff / 1,000,000
Baseline_Eff_Gas (Reference 4) - Tank Size >= 20gal, <=55gal	= 0.675 - .0015 x Proposed_Tank_Size

Electric Equations:

Gross Annual kWh Saved at Customer	= Baseline_kWh - Proposed_kWh + Cooling_Benefit - Heating_Penalty
Baseline_kWh	= Hot_Water_Energy / Baseline_Eff_Electric / 3,412
Proposed_kWh	= Hot_Water_Energy / Proposed_Eff / 3,412
Baseline_Eff_Electric (Reference 4) - Tank Size >= 20gal, <=55gal	= 0.96 - .0003 x Proposed_Tank_Size
Gross kW saved at Customer	= Baseline_kW - Proposed_kW
Baseline_kW	= Standard_Water_Heater_kW + Cooling_Benefit / Cooling_Hours
Proposed_kW	= Standard_Water_Heater_kW - (Baseline_kWh - Proposed_kWh) / 8760
Customer_PCKW	= Customer_kW x Coincidence_Factor

Variable ID	Value	Description
Hot_Water_Demand	64.3	Average gallons per day of hot water use. (Reference 1)
Water_Heater_Temperature	135	Water heater setpoint temperature °F. (Reference 1)
City_Mains_Temperature	51.4	Water temperature of city water entering the water heater °F. (Reference 2)
Standard_Tank_Size	45	Average hot water tank size of 45 gallons based on program historical data.
Heat content of 1 gallon water	8.33	Btu/gal °F
Conversion from Btu to Dth	1,000,000	1 Dth = 1,000,000 Btuh
Conversion from Btu to kWh	3,412	1 kWh = 3,412 Btuh
Heating_Penalty	See Table 1	Heating penalty due to heat pump water heater operating during heating season.
Cooling_Benefit	See Table 1	Cooling savings due to heat pump water heater operating during cooling season.
Standard_Water_Heater_kW	4.5	Assumed kW for a typical electric resistance water heater.
Cooling_Hours	957	Number of hours in a TMY3 year above 77°F.
Coincidence_Factor	100%	The coincidence factor is 100%. We are using the average water heater savings over the summer hours.
Proposed_Tank_Size	Customer Input	Storage capacity for tank type water heaters.
Type of Proposed Water Heater	Customer Input	Type of proposed water heater. (i.e. Storage, Tankless, Heat Pump)
Home Heating and Cooling Type for HP Water Heaters	Customer Input	Source for the home's heating and cooling. See Table 1.
Proposed_Eff	Customer Input	Efficiency Factor for proposed water heater.
Measure Life	See Table 2	Lifetime of water heaters. (Reference 3)
Incremental Costs	See Table 2	Incremental cost of efficient technology over baseline technology.
NTG	See Table 2	Net to Gross

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 1

Heating Type	Cooling Type	Cooling_Benefit kWh	Heating_Penalty kWh	O&M \$
Natural Gas	Air Source	89.3	0	\$ (36.52)
Electric Resistance	Air Source	89.3	1,593	\$ -
Heat Pump	Air Source	89.3	706	\$ -
Natural Gas	None	0.0	0	\$ (36.52)
Electric Resistance	None	0.0	1,593	\$ -
Heat Pump	None	0.0	706	\$ -

Table 2

Water Heater Type	Equipment Cost	Incremental Cost	Lifetime	NTG
62% EF Gas Storage	\$ 1,101.46			
67% EF Storage Water Heater	\$ 1,230.54	\$ 129.09	13	90%
90% EF Tankless Water Heater	\$ 1,539.74	\$ 438.29	20	90%
95% EF Elec Storage	\$ 879.22			
Heat Pump Water Heater	\$ 2,466.74	\$ 1,587.52	10	100%

References:

1. Energy Conservation Program for Consumer Products: Test Procedure for Water Heaters; United States Department of Energy; <http://www.gpo.gov/fdsys/pkg/FR-1998-05-11/pdf/98-12296.pdf>
2. Denver Water's 2006 Treated Water Quality Summary Report; <http://www.denverwater.org/docs/assets/9A12FBC5-BCDF-1B42-D1BC5F0B1CE3B115/TreatedWQSummaryReport20061.pdf>
3. Energy Star Residential Water Heaters -Final Criterial Analysis, April 2008. http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/WaterHeaterAnalysis_Final.pdf
4. US Department of Energy; Residential Water Heater Standards; http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/27
5. US Department of Energy; Residential Heat Pump Water Heaters; <http://energy.gov/eere/femp/covered-product-category-residential-heat-pump-water-heaters>
6. US Department of Energy; Residential Air Conditioners and Heat Pumps; http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/75
7. US Department of Energy; Residential Furnace Standards. https://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/72#standards

Changes from Recent Filing:

1. Updated incremental costs
2. Updated hot water heater temperature to be consistent with Energy Factor testing methodology.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: ENERGY STAR Retail Products Platform Pilot

Description:

This program will engage retailers through midstream incentive payments to increase the demand for and supply of the most energy efficient residential plug-load and appliance products on the market driving greater sales of select ENERGY STAR® certified products to customers.

Algorithms:

After comparison to existing products offered in the Company's portfolio as well as the state TRM, the company has elected to adopt assumptions developed by the Cadmus Group on behalf of the ENERGY STAR Retail Products Platform for the purposes of quantifying impacts related to this pilot (See Reference 1). These assumptions have been reviewed by multiple utilities across the country as well as by their respective commissions and the Environmental Protection Agency. See Table 1 for the results of this analysis and accompanying product information sheets for background analysis.

Inputs:

Product Category
Quantity of units purchased per product category
Store Zip Code

Assumptions:

For the purpose of the pilot program period, all purchases are assumed to be made by residential customers.

Tables:

Table 1: Deemed Energy Savings, Costs, and Lifetimes per unit for each product measure (Reference 1)

Measure	Electric Energy Savings (kWh)	Natural Gas Energy Savings (Dth)	Incremental Product Cost (\$)	Measure Life (yrs)
Sound Bars	66.0	0.0	\$ -	7
Freezers	14.9	0.0	\$ 10.11	11
Gas Clothes Dryers	7.7	0.5	\$ 270.16	12
Electric Clothes Dryers	160.4	0.0	\$ 224.91	12
Air Cleaners	213.9	0.0	\$ 56.00	9
Room Air Conditioners	48.7	0.0	\$ 114.45	9

Table 2: Demand Savings and Coincidence Factors

Measure	Electric Demand Savings (kW) (Reference 1)	Coincidence Factors (%)
Sound Bars	0.008	100% (Reference 2)
Freezers	0.004	(Reference 3)
Gas Clothes Dryers	0.027	(Reference 4)
Electric Clothes Dryers	0.567	(Reference 4)
Air Cleaners	0.037	100% (Reference 5)
Room Air Conditioners	0.074	(Reference 6)

References:

1. Cadmus Group analysis for the ESRPP team (see Product Information Sheets)
2. Demand savings for Sound Bars are calculated as an average value for all operating hours (8760), which allows a CF value of 100%
3. See Company's assumptions for the Freezer Replacement measure in the Home Energy Savings Program
4. See Company's assumptions for Clothes Washers under the Home Performance with Energy Star product
5. Per Reference 1, Air Cleaners are expected to operate continuously throughout the year
6. See Company's assumptions for Window Air Conditioner Replacement measure in the Home Energy Savings Program

Product: Commercial Refrigeration

Description:

Prescriptive rebates will be offered for the installation of reach-in cases with doors, evaporator fan motor controls, night curtains on refrigerator and freezer cases, EC Motors for Refrigeration Evaporators (retrofit only), Anti-Sweat Heater Controls (retrofit only) and/or replacement of standard refrigeration case doors with No Heat Case Doors, Retrofit of open multi-deck refrigerated cases with no heat doors, and replacement lighting equipment. Prescriptive rebates will also be offered for retrofitting open multideck coolers or freezers with solid glass doors.

Program References:

Measure "LED Refrigerated Case Lighting"	Refer to Program "CO - Lighting Efficiency" to find formulas for (Customer kW, Customer kWh, Customer PckW, etc.) for the "LED Refrigerated Case Lighting" measure.
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Algorithms:

Enclosed Reach-In Cases	
Enclosed Reach-in Case Electrical Baseline Demand (Customer kW)	= Baseline kWh / 8760 hours
Enclosed Reach-in Case Baseline Electrical Energy (Customer kWh)	= 0.22 x TDA + 1.95
Enclosed Reach-in Case Electrical Proposed Demand (Customer kW)	= (Btuh_ee x LF x 1/COP) / 3412
Enclosed Reach-in Case Proposed Electrical Energy (Customer kWh)	= (Btuh_ee x LF x 1/COP) / 3412 x 8760 Hours
Evaporative Fan Motor Controls	
Evaporator Fan Motor Control Electrical Demand Savings (Customer kW)	= Baseline Fan Watts x (1-ESF) / 1000 x (1 + 1 / COP)
Evaporator Fan Motor Control Electrical Demand Savings (Customer kWh)	= Baseline Fan Watts x (1-ESF) x Efficient Hours / 1000 x (1 + 1 / COP)
Night Curtains	
Night Curtains Electrical Demand Savings (Customer kW)	= (Btuh_base x LF x 1/COP) / 3412 - (Btuh_base x LF x 1/COP) / 3412 = 0
Night Curtains Electrical Energy Savings (Customer kWh)	= (Btuh_base x LF x 1/COP) / 3412 * Hrs * (Hours_base - Hours_ee)
CHW Pre-Rinse	
CHW Pre-Rinse Electric (Customer kWh)	= EnergyToHeatWater / EF_electric / ConversionFactor
CHW Pre-Rinse Electric (Customer kW)	= Unit kWh Savings per Year / 8,760 hours
EnergyToHeatWater	= SpecificHeat x Density x WaterSaved x (Tset - Tcold)
WaterSaved	= (Flow_base x Hours_base - Flow_eff x Hours_eff) x Days
CHW-Aerator-Electric	
CHW Aerator Electric (Customer kWh)	= EnergyToHeatWater / EF_electric / ConversionFactor
CHW Aerator Electric (Customer kW)	= Unit kWh Savings per Year / 8,760 hours
WaterSaved	= (Flow_base - Flow_eff) x hours_base / 60 min/hr x Days
EnergyToHeatWater	= SpecificHeat x Density x WaterSaved x (Tfaucet - Tcold)
EPG	= Density x SpecificHeat x (Tfaucet - Tcold) / (ReEff x ConversionFactor)
Unit Dth Savings per Year	= EnergyToHeatWater / EF_gas / ConversionFactor

Open to Closed Refrigerated Cases	
Customer kWh	= kWh_open x Linear Feet - kWh_closed x Linear Feet = 521.95 kWh/ft x Linear Feet for Coolers and 1572.34 kWh x Linear Feet for Freezers
Customer kW	= Customer kWh / Hours
kWh_open	= (PC x FI_open) x (LF x 1 / 3412 x Hours x 1 / COPrefrig) - HVAC_kWh = (1500 x 0.818) x (0.62 x 1/3412 x 8760 x 1/2.28) - HVAC_kWh = 627.65 kWh for coolers, 1913.63 Wh for freezers
kWh_closed	= (PC x FI_closed) x (LF x 1 / 3412 x Hours x 1 / COPrefrig) - HVAC_kWh = (1500 x 0.138) x (0.62 x 1/3412 x 8760 x 1/2.28) - HVAC_kWh = 105.70 kWh for coolers, 341.29 kWh for freezers
HVAC_kWh ("free" from refig system)	= HVAC_kW x Clg_Hrs = 0.078635 kW/ft x 2908 hrs = 229 kWh/ft for open cooler cases, 38.5 kWh/ft for closed cooler cases, 285 kWh/ft for open freezer cases, and 73 kWh/ft for closed freezer cases.
HVAC_kW ("free" from refig system)	= Refr_Infil x 1 / COPvac x 1 / 3412 x Clg Duty Cyc = 1226.52 x 1/3.2 x 1/3412 x .7 = .078635 kW/ft for open cooler cases and 0.0132404 kW/ft for closed cooler cases, 0.098159 kW/ft for open freezers and 0.017504 kW/ft for closed freezers.
Refr_Infil (using FI_open or FI_closed)	= (PC x FI) = 1500 x .818 = 1226.52 btu/h-ft for open cooler cases and = 1500 x 0.138 = 206.52 btu/h-ft for closed cooler cases. It is 1850 x 0.8276 = 1531.06 btu/h-ft for open freezers and 1850 x 0.14758 = 273.02 btu/h-ft for closed freezers
Unit Dth Savings per Year	= Dth_open x Linear Feet - Dth_closed x Linear Feet = 6.74 Dth/ft x Linear FT for coolers and 8.31 Dth/ft x Linear FT for freezers.
Dth consumption per foot (open or closed)	= Refr_Infil x Htg_Hrs x 1 / 1,000,000 x 1 / heatingeff = 1227 x 5155 x 1/1000000 x 1/0.78 = 8.109 Dth/ft for open coolers, 0.00026538 x 5155 = 1.368 Dth/ft for closed coolers, 0.00196282 x 5155 = 10.118 Dth/ft for open freezers, 0.00035 x 5155 = 1.805 Dth/ft for closed freezers
Algorithms:	
Anti-Sweat Heater Controls kW Savings (Customer kW)	= ASHC_kWh/ASHC_Hours
Anti-Sweat Heater Controls kWh Savings (Customer kWh)	= ASHC_kWh = ASHC_Baseline_kW x Refrigeration_Factor x ASHC_Hours x %_Off
Electronically Commutated Motor Electrical Demand Savings (Customer kW)	= (ECM_Baseline_Fan_Watts - ECM_Efficient_Fan_Watts) x Refrigeration_Factor
Electronically Commutated Motor Electrical Demand Savings (Customer kWh)	= (ECM_Baseline_Fan_Watts - ECM_Efficient_Fan_Watts) x Refrigeration_Factor x ECM_Hours
No Heat Case Doors (Customer kW, NHD_kW)	= (NHD_Baseline_kW - NHD_Efficient_kW) x Refrigeration_Factor
No Heat Case Doors (Customer kWh)	= NHD_kW x NHD_Hours
Refrigeration_Factor	= Multiplier to include interactive effects of refrigeration energy to remove heat from the motor. Reduction in motor energy results in a reduction in refrigeration energy. = 1 + R_H/COP (See assumptions for values)
Electrical Demand Savings (Customer kW)	= (kW_Base - kW_EE) x HVAC_cooling_kW savings_factor
Electrical Energy Savings	= (kW_Base - kW_EE) x Hrs x HVAC_cooling_kWh savings_factor
Electrical Energy Savings	= Customer kWh / (1-TDLF)
Electrical Demand Savings	= Customer kW x CF / (1-TDLF)
Electrical Energy Savings	= Gross Generator kWh x NTG
Electrical Demand Savings	= Gross Generator kW x NTG

Variables:	
Common	
3412	= Conversion 1kWh = 3412 BTU
COP	= Coefficient of performance of compressor in the cooler/freezer. COP = 2.28 for cooler, COP = 1.43 for freezer (Reference. 1)
SpecificHeat	= Specific Heat of Water; 1.0 btu / (lb x °F)
Density	=8.34 pounds per gallon
T Faucet, T Set	= 105 F
TDLF	= Transmission-Distribution Loss Factor = 6.5%, the percentage loss of electricity as it flows from the power plant to the customer, calculated using factors from Enhanced DSM Filing SRD-2.
LF	= Load Factor of refrigeration system. Assumed to be 0.62 for coolers, 0.8 for freezers (Reference 2)
EF_electric	= Efficiency of electric water heater, 0.98
EF_gas	= Efficiency of gas water heater, 0.8 (Reference 3)
ConversionFactor	= 1,000,000 Btu/Dth (gas water heater), 3412 BTU/kWh (electric water heater)
CHW Pre-Rinse	
Flow_base	=1.6 GPM
Hours_base, Hours_Eff	=.605 hours per day
Flow_Eff	=1.28 GPM
CHW Aerator	
Flow_base	=2.2 GPM
Hours_base, Hours_Eff	=0.5 hours per day bathroom, 0.167 hours per day kitchen
Flow_Eff	=0.6 GPM bathroom, 1.5 GPM kitchen
Enclosed Reach-In Cases	
TDA	= Total Display area per linear foot. Assumed to be 5.5 square feet based
Btuh_ee	= Btuh load of the high efficiency Referencerigerated case. 262 btuh/ft for medium temp (Reference 5)
Incremental cost	= Incremental cost of efficient measures = \$1010.77, Reference 21.
Evaporative Fan Motor Controls	
Speed Reduction	= new speed as a percent of full speed; 25% (Reference 15)
Measure Life	= 15 years (Reference 1)
ESF	=Energy Savings Factor = (Speed Reduction) ^{2.5} = 3.13%
Baseline Fan Watts	=Average input watts for shaded pole motor; 95.08 (Reference 15)
Control Time	=percent of time motor operates at reduced speed based on control setting; 38% for coolers, 20% for freezers
Baseline Hours	=8585
Efficient Hours	=Annual hours at reduced speed = baseline hours * control time
Incremental cost	= Incremental cost of efficient measures = \$351.49, Reference 1.
Night Curtains	
Btuh_base	= Btuh load of the existing Referencerigerated case. 1,500 btuh/ft for open cases (Reference 3)
Hours_base	= Annual operating hours before the night curtains= 2920 (8 hr/day)
Hours_ee	= Annual operating hours after the night curtains = 1825
CF	= Coincidence Factor = 0
Measure Life	= 4 years (Reference 16)
Persistence Factor	= Percent of time the covers are used = 60%. (Reference 15)
O&M Savings	= (\$3.16) based on 60 seconds per 15 feet to install or remove curtains (.41 hrs/yr) at CO Minimum wage of \$7.78/hr
Incremental cost	= Incremental cost of efficient measures = \$42.00, Reference 21.

Open to Closed Cases	
Linear Feet	= Length of open case being retrofit with doors, in feet, provided by customer
Hours	= Annual hours of operation of refrigerated case, assumed to be 8,760 hours
PC	= Refrigerated Case Total Load, BTU/h/ft, 1500 for coolers, 1850 for freezers (Ref 33)
FI_Open, FI_Closed	= Fraction of Refrigerated Case Load that is infiltration, 81.77% for open cooler cases, 82.76% for open freezer cases, 13.77% for closed coolers, 14.76% for closed freezers. Adapted from Ref 33 with modifications to allow for calculation of both open and closed energy consumption, since Ref 33 only computes the difference. The reduction in infiltration from open to closed, 68%, is the same as in Ref 33. The motor and lighting loads from Ref 35, 0.009 kW/ft and 0.014 kW/ft, were used in developing the 81.77% and 82.76% values. FI_Open is 1- FCR- (PL + PM) / PC. FI_Closed is FI_Open - 68%.
FCR	= Fraction of Refrigerated Case Load that is conduction and radiation, 13% for all cases (Ref 33)
LF	= Load Factor/Duty Cycle of refrigeration system compressors, 62% for coolers, 80% for freezers. (Ref 33)
Cig_Hrs	= Number of hours per year that facility is in cooling mode, based on using a location-specific bin hours calculation and an assumed facility balance point of 60 F, = 2,908 hours per year for Denver.
Cig Duty Cyc	= Cooling compressor duty cycle, assumed to be 70%
COPvac	= Coefficient of Performance for facility HVAC system, specifically cooling, assumed to be 3.2 from Ref 33. This assumes a DX rooftop unit or similar
COPrefrig	= Coefficient of Performance for the refrigeration system = 2.28 for coolers and 1.43 for freezers, Ref 33.
Htg_hrs	= Number of hours per year that facility is in heating mode, based on using a location-specific bin hours calculation and an assumed facility balance point of 60 F, with a 5 degree economizing dead band before heating starts at 55 F, = 5,155 hours per year for Denver.
heatingeff	= Efficiency of heating system, 78% from Ref 33
CF	= Coincidence Factor, 1, based on 8,760 hour run time per year
Measure Life	= 12 years (Ref 11)
Incremental cost	= Incremental cost of efficient measures = \$497.82 / linear foot (Ref 34) The incremental cost is split by avoided revenue requirements between gas and electric cost. 47.64% of the incremental cost is electric for coolers and 68.96% is electric cost for freezers.
Anti-Sweat Heater Controls:	
ASHC_Baseline_kW	= Average anti-sweat heater kW per door without controls, Table 4 (Reference 23 and 24)
ASHC_Hours	= Hours per year for anti-sweat heaters, Table 4 (Reference 23)
CF	= Coincidence Factor, Table 4 (Reference 15)
%_Off	= Percent of time the anti-sweat heaters are turned off by the controller, Table 4 (Reference 15)
Incremental cost	= Incremental cost of efficient measures; See Tables 4
EC Motors for Refrigeration Evaporators:	
ECM_Baseline_Fan_Watts	= Average input watts for shaded pole or permanent split capacitor motor, Table 3 (Reference 15)
ECM_Efficient_Fan_Watts	= Average input watts for efficient motor, Table 3 (Reference 15)
ECM_Hours	= Hours per year (freezer subtracts defrost time), Table 3 (Reference 15)
Incremental cost	= Incremental cost of efficient measures; See Table 3

No Heat Case Doors:	
NHD_Baseline_kW	= Average kW for a standard case door, Table 5 (Reference 23 and 24)
NHD_Efficient_kW	= Average kW for a no heat case door, Table 5 (Reference 2)
NHD_Hours	= Hours per year for no heat case doors, Table 5 (Reference 2)
NHD_kW	= No heat case doors kW savings
R_H	= Residual Heat fraction; estimated percentage of the heat produced by the heaters or motors that remains in the freezer or cooler case and must be removed by the refrigeration unit. = 100% for evaporator motors and 35% for anti-sweat heaters and no heat doors
Coincidence Factor	= Refer to Table 7
Measure Life	= Length of time the measure will be operational: 15 years for EC Motors, (Reference 17); 12 years for ASHC (Reference 21); 10 years for No Heat Case Doors (Reference 20).
NTG	Net-To-Gross = 100%
Incremental cost	= Incremental cost of efficient measures; See Table 5
Lighting:	Refer to the Lighting Efficiency Product Deemed savings for calculations and assumptions.

Required inputs from customer/contractor:

Evaporative Fan Motor Controls

Capacity (tons) of Refrigeration Unit

CHW Pre-Rinse

Gas or electric water heater, customer ZIP code

CHW-Aerator

Gas or electric water heater, customer ZIP code

For Electronically Commutated Evaporator Fan Motors:

Size of motor

Application of motor (Display Case or Walk-in)

Case or Walk-in temperature (Medium Temp or Low Temp)

For Walk-in's: Fan diameter (<= 15 inches or >15 inches

Cost

For Anti-Sweat Heaters:

Number of doors controlled

Number of controllers

Cost

For No Heat Doors:

Number of doors replaced

Door kW

Cost

Lighting

Number of Fixtures

Lighting equipment type

Building type

Open to Closed Case Retrofit

Length of Case(s)

Freezer or Cooler?

Verified during M&V:

Yes

Yes

Yes

Yes

Yes

Yes

Yes

Yes

Yes

Yes

Yes

Yes

Yes

Yes

Assumptions:

Enclosed Reach-In Cases, Open to Closed Case Retrofit

Existing case must be either a freezer or cooler multi-deck case.
Existing specialty, self-contained, and island cases do not qualify.

This measure is for replacement of open cases with new cases that include a case door.

Replacement cases must have doors, be tied into a central refrigeration system, and be purchased new.

Open to Closed Case retrofits must use "no heat" doors

Night Curtains

Install night curtains on open refrigerated cases to reduce heat transfer and mixing of air inside and outside the case.

Applies to professionally-installed, "permanent", low emissivity (reflective) night curtain products only. (per linear foot)

EC Motors

Each motor is replaced with the same size on a 1 for 1 basis.

Rebates do not apply to rewound or repaired motors.

Lighting

- Each replacement lighting fixture is going in on a one-for-one basis for existing fixtures. New construction fixtures are put in on a one-for-one basis instead of lower efficiency options.
- In the Technical Assumptions, one will note that the Operating Hours does not appear, but rather a modified version. the methodology defines kW Savings on the basis of difference In kW with the HVAC Cooling Demand factor.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Company Owned LED Street Lights

Description:

Prescriptive rebates will be offered for company owned LED Street Lights

Algorithms:

Electrical Demand Savings (Customer kW)	= (kW_Base - kW_EE)
Electrical Energy Savings (Customer kWh/yr)	= (kW_Base - kW_EE) x Hrs
Electrical Energy Savings (Net Generator kWh)	= Gross Generator kWh x NTG
Electrical Demand Savings (Net Generator kW)	= Gross Generator kW x NTG

Variables:

Hrs	= Annual Operating Hours. Hours to be obtained from Table 1. The type of facility is to be supplied by Night Time Exterior.
kW_Base	= Baseline fixture wattage (kW per fixture) determined from stipulated fixture wattages from Standard Fixture information. Fixture type provided by Night Time Exterior.
kW_EE	= High Efficiency fixture wattage (kW per fixture) determined from stipulated fixture wattages from Standard Fixture information.
CF	= Coincidence Factor, the probability that peak demand of the lights will coincide with peak utility system demand. CF will be determined based on building type in table 1.
Measure Life	= Length of time the lighting equipment will be operational, see Table 2 for Measure Lifetimes
Baseline Cost	= Cost of the baseline technology. For Retrofit, the cost is \$0.00 since the baseline is to continue to operate the existing system. For New Construction, the cost is that of the lower efficiency option. Costs by (Reference 1) and vendors.
High Efficiency Cost	= Cost of the High Efficiency technology.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

NTG	Net-to-gross =90% for prescriptive measures
Incremental operation and maintenance cost	= Other annual savings or costs associated with the electrical savings. For exterior lighting, this is \$0.

Assumptions:

Each replacement lighting fixture is going in on a one-for-one basis for existing fixtures. New construction fixtures are put in on a one-for-one basis instead of lower efficiency options.
Each LED fixture is required to be listed on the DesignLights Consortium Qualified Products list, and therefore must meet their minimum specification.
Customer must be on a company owned metered rate to qualify for program

Info needed from Customer/Vendor Administrator for Calculations:

Number of fixtures being installed

Verified during M&V:

Yes

Lighting equipment type (baseline and efficient for Retrofit; efficient for New Construction)

Yes

Table 1: Coincident Peak Demand Factors and Annual Operating Hours by Building Type (Reference 2, 3, and 5)

Space Type	CF	Hrs
Night Time Exterior	0%	4140

Table 2: Measure Lifetimes in Years (Reference 1,4)

Measure	Lifetime in Years
LED Fixtures	15

References:

1. Deemed Savings Database, Minnesota Office of Energy Security, 2008. CF, Hours, kW, Costs, Measure life
2. Arkansas Deemed Savings Quick Start Program Draft Report Commercial Measures Final Report, Nexant. CF
3. Technical Reference User Manual No. 2004-31, Efficiency Vermont, 12/31/04. CF
4. LED Fixture measure life based on Xcel Energy Minnesota Lighting Efficiency Program average replacement fixture lifetime
5. Schedule SL, Tariff Sheet No. 85; Decision Nos. R15-1251/C15-1318. Hours

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Compressed Air - CO

Description:

Custom and prescriptive rebates will be offered under the compressed air product. Prescriptive rebates are available for Variable Frequency Drive Compressors that are less than 50 hp, installing a smaller VFD controlled air compressor than the current air compressor used, no air loss drain (NALD) valves, cycling refrigerated dryers, mist eliminator filters, and dewpoint demand control for heatless dessicant regenerative dryers. Other measures may receive rebates through the Custom Efficiency product. Each custom efficiency project will be analyzed individually by Xcel Energy. Engineering variables required for the analysis will be obtained from the customer or vendor. Analysis will be based on standard engineering methodologies. Funding is also available for compressed air system studies.

Equations:

VFD Compressors (Gross kW Saved at Customer/Unit)	$= \text{Eq.Horsepower} * \text{P_Service_Factor} * 0.746 * ((\text{Eq.Baseline_Load} / \text{Eq.Baseline_Efficiency}) - (\text{Eq.Proposed_Load} / \text{Eq.Proposed_Efficiency})) * \text{I_Qty_Prop_Equip}$
VFD Compressors (Gross Annual kWh Saved at Customer/Unit)	$= \text{Eq.Horsepower} * \text{P_Service_Factor} * 0.746 * ((\text{Eq.Baseline_Load} / \text{Eq.Baseline_Efficiency}) - (\text{Eq.Proposed_Load} / \text{Eq.Proposed_Efficiency})) * \text{Eq.Hours} * \text{I_Qty_Prop_Equip}$
F_CompHP_Reduction_kW (Gross kW Saved at Customer/Unit)	$= \text{P_Service_Factor} * 0.746 * (\text{Existing_Model_r.Horsepower} * (\text{F_CompHP_Reduction_Base_Load} / \text{Existing_Model_r.Baseline_Efficiency}) - \text{Eq.Horsepower} * (\text{Eq.Proposed_Load} / \text{Eq.Proposed_Efficiency} / \text{Eq.VFD_Efficiency}))$
F_CompHP_Reduction_Base_Load	$= \text{P_CompHP_Red_x2} * (\text{F_CompHP_Reduction_Base_Flow} ^ 2) + \text{P_CompHP_Red_x} * \text{F_CompHP_Reduction_Base_Flow} + \text{P_CompHP_Red_b}$
F_CompHP_Reduction_Base_Flow	$= \text{Equipment_Model_r.Percent_Flow} * \text{Equipment_Model_r.Horsepower} / \text{Existing_Model_r.Horsepower}$
HP Reduction (Gross Annual kWh Saved at Customer/Unit)	$= \text{F_CompHP_Reduction_kW} * \text{Eq.Hours}$
No Air Loss Drain (Gross Annual kWh Saved at Customer/Unit)	$= \text{I_Qty_Prop_Equip} * \text{kW_per_Drain} * \text{Drain_Hours}$
No Air Loss Drain (Gross kW Saved at Customer/Unit)	$= \text{I_Qty_Prop_Equip} * \text{kW_per_Drain}$
Cycling Dryer Electrical Energy Savings (Gross Annual kWh Saved at Customer/Unit)	$= \text{I_Qty_Prop_Equip} * \text{Eq.kWh_Savings}$ *Historical system information gathered through four years of compressed air study data was utilized to estimate savings. Based on dryer size, an average connected system flowrate was determined. Savings due to the reduction in average operating kW for the cycling dryer are proportional to the average flowrate divided by the dryer rated flowrate. See Table 1 for savings results.
Cycling Dryer Electrical Demand Savings (Gross kW Saved at Customer/Unit)	$= \text{I_Qty_Prop_Equip} * \text{Eq.kW_Savings}$ * Historical system information gathered through four years of compressed air study data was utilized to estimate savings. Based on dryer size, an average connected system flowrate was determined. Savings due to the reduction in average operating kW for the cycling dryer are proportional to the average flowrate divided by the dryer rated flowrate. See Table 1 for savings results.
Mist Eliminator Filter Electrical Energy Savings (Gross Annual kWh Saved at Customer/Unit)	$= \text{I_Qty_Prop_Equip} * \text{Eq.kWh_Savings}$ *Historical system information gathered through four years of compressed air study data was utilized to estimate savings. Based on filter size, an average connected system flowrate and compressor discharge pressure were determined. Savings are due to the reduction in compressor discharge pressure resulting from a smaller pressure drop across the dryer. See Table 2 for savings results.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Mist Eliminator Filter Electrical Demand Savings (Gross kW Saved at Customer/Unit)	= I_Qty_Prop_Equip * Eq.kW_Savings *Historical system information gathered through four years of compressed air study data was utilized to estimate savings. Based on filter size, an average connected system flowrate and compressor discharge pressure were determined. Savings are due to the reduction in compressor discharge pressure resulting from a smaller pressure drop across the dryer. See Table 2 for savings results.
Dewpoint Demand Control Electrical Energy Savings (Gross Annual kWh Saved at Customer/Unit)	= I_Qty_Prop_Equip * Eq.kWh_Savings *Historical system information gathered through four years of compressed air study data was utilized to estimate savings. Based on dryer size, an average connected system flowrate was determined. Savings are due to the reduction in required purge air to regenerate the dessicant bed. See Table 3 for savings results.
Dewpoint Demand Control Electrical Demand Savings (Gross kW Saved at Customer/Unit)	= I_Qty_Prop_Equip * Eq.kW_Savings *Historical system information gathered through four years of compressed air study data was utilized to estimate savings. Based on dryer size, an average connected system flowrate was determined. Savings are due to the reduction in required purge air to regenerate the dessicant bed. See Table 3 for savings results.

Variable ID	Value	Description
0.746	0.746	Standard conversion from HP to kW.
CF_NALD	72.6%	No Air Loss Drain Coincidence Factor - Probability that the measure peak demand reduction will occur at the same time as the grid peak demand. Based on historic custom compressed air projects in CO.
CF_VFD	88.80%	Small VFD Compressor Coincidence Factor - Probability that the measure peak demand reduction will occur at the same time as the grid peak demand. Based on historic small VFD compressor projects in MN and
Eq.Baseline_Efficiency	see Table 4	Efficiency of existing compressor motor as determined by customer provided HP.
Eq.Baseline_Load	87.43%	Average percent loading for baseline compressor as calculated on VFD Air Comp Calcs tab.
Eq.Horsepower	Customer Input	Nominal horsepower of new compressor for new & upgrade situations.
Eq.Hours	see Table 4	Operating hours of new compressors.
Eq.Proposed_Efficiency	see Table 4	Efficiency of proposed compressor motor as determined by customer provided HP.
Eq.Proposed_Load	61.05%	Average percent loading for upgrade and new VFD compressors.
Eq.Proposed_Load	73.68%	Average percent loading for HP reduction VFD compressors.
Eq.VFD_Efficiency	95.00%	Efficiency of VFD.
Equipment_Model__r.Horsepower	Customer Input	Nominal horsepower of new compressor for HP Reduction situations.
Equipment_Model__r.Percent_Flow	70.00%	Average percent flow for proposed VFD compressor.
Existing_Model__r.Baseline_Efficiency	see Table 4	Efficiency of existing compressor motor as determined by customer provided HP.
Existing_Model__r.Horsepower	Customer Input	Nominal horsepower of baseline compressor.
Hours_Drain	6,996	Operating hours of compressed air systems. Based on an average of completed CO custom compressed air project hours.
I_Qty_Prop_Equip	Customer Input	Quantity of proposed equipment installed.
Incremental Cost of Efficient Equipment	see Table 1, 2, 3, & 5	Incremental cost of efficient measures compared to the do-nothing option.
kW_per_Drain	0.517	kW savings per no air loss drain.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Lifetime	see Table 6	Lifetimes for individual measures.
NTG_Prescriptive	73.0%	Net-to-Gross for all prescriptive products (Reference 8).
NTG_Study&Custom	87.0%	Net-to-Gross for studies and custom projects (Reference 8).
P_CompHP_Red_x2	-0.5196	Baseline load curve fit equation coefficient.
P_CompHP_Red_x	1.0853	Baseline load curve fit equation coefficient.
P_CompHP_Red_b	0.4216	Baseline load curve fit equation coefficient.
P_Service_Factor	1.1	Service factor of the motor (Reference 1).

Inputs:

Provided by Customer:

Quantity of No Air Loss Drains
Compressor HP, Quantity
Cycling Dryer CFM and Quantity
Mist Eliminator CFM and Quantity
Dew Point Demand Controls CFM and Quantity

Verified during M&V:

Yes
Yes
Yes
Yes
Yes

Assumptions:

VFD Compressors<50 hp

Compressed air system in which VFD compressor is installed must have a nominal rating < 50hp.
Existing compressor was a non-reciprocating load/no load type with 2 gallon of storage per cfm capacity or less, or modulation with or without unload.
To qualify for a HP reduction rebate the combined HP of the system (including backups) must be lower after the installation of the new VFD unit.
For HP reduction Baseline unit may greater than or equal to 50HP, but HP reduction cannot exceed 20HP.
HP reduction rebate will require documented removal of a compressor.

No Air Loss Drains

2.74 SCFM loss from existing timed drain (Reference 3).
Existing timed drain is open 15 seconds every 7.5 minutes (Reference 3).

Cycling Dryer

Rated Flowrate of Dryer is equal to the connected system peak flowrate.
Non-cycling dryer load factor of 100% (Reference 3).

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Mist Eliminator Filter

Rated Flowrate of filter is equal to the connected system peak flowrate.
Baseline filter pressure drop of 4 psig (Reference 3, confirmed by Ref 9).
Efficient filter pressure drop of 0.75 psig (Reference 3, confirmed by Ref 9).
Filter element life expectancy of 5 - 10 years.

Dewpoint Demand Control

Rated Flowrate of Dryer is equal to the connected system peak flowrate.
Uncontrolled dryer purge rate of 17% (Reference 3) for heatless dessicant dryers.
Heated or heated blower dessicant dryers are not eligible.

Hours

Hours for NALDs, cycling dryers, mist eliminators, and dew point demand controls are based on the equipment CFM and historical system information gathered through four years of compressed air study data. Variations in forecast hours between these measures is due to the anticipated quantity per CFM range of these products we will process.

Tables:

Table 1: Energy Savings and Costs For Cycling Dryers (Reference 4 & 7)

Dryer CFM	Customer kW	Customer kWh	Incremental Cost	Incremental O&M
75 CFM to 99 CFM Cycling Dryer - CO	0.193	1,311	\$554	\$0
100 CFM to 124 CFM Cycling Dryer - CO	0.380	2,582	\$580	\$0
125 CFM to 149 CFM Cycling Dryer - CO	0.450	3,060	\$461	\$0
150 CFM to 199 CFM Cycling Dryer - CO	0.564	3,839	\$637	\$0
200 CFM to 249 CFM Cycling Dryer - CO	0.514	3,517	\$1,203	\$0
250 CFM to 299 CFM Cycling Dryer - CO	0.848	5,827	\$860	\$0
300 CFM to 399 CFM Cycling Dryer - CO	1.011	6,981	\$1,047	\$0
400 CFM to 499 CFM Cycling Dryer - CO	1.386	9,690	\$1,187	\$0
500 CFM to 599 CFM Cycling Dryer - CO	1.462	10,380	\$1,095	\$0
600 CFM to 699 CFM Cycling Dryer - CO	1.719	12,415	\$629	\$0
700 CFM to 799 CFM Cycling Dryer - CO	2.214	16,306	\$883	\$0
800 CFM to 999 CFM Cycling Dryer - CO	2.167	16,319	\$2,080	\$0
1000 CFM to 1199 CFM Cycling Dryer - CO	2.447	19,362	\$1,785	\$0
1200 CFM to 1599 CFM Cycling Dryer - CO	2.215	18,533	\$2,536	\$0
1600 CFM to 1999 CFM Cycling Dryer - CO	0.202	1,771	\$3,857	\$0
2000 CFM to 2399 CFM Cycling Dryer - CO	0.449	3,931	\$5,811	\$0
2400 CFM and above Cycling Dryer - CO	1.348	11,808	\$3,498	\$0

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 2: Energy Savings and Costs for Mist Eliminator Filters (Reference 4 & 7)

Filter CFM	Customer kW	Customer kWh	Incremental Cost	Incremental O&M
125 CFM to 249 CFM Mist Eliminator Filter	0.376	2,554	\$3,397	(\$13)
250 CFM to 499 CFM Mist Eliminator Filter	0.590	4,046	\$3,230	\$43
500 CFM to 799 CFM Mist Eliminator Filter	0.936	6,603	\$3,691	\$70
800 CFM to 1099 CFM Mist Eliminator Filter	1.497	11,034	\$4,862	\$67
1100 CFM to 1499 CFM Mist Eliminator Filter	2.059	15,927	\$5,307	\$85
1500 CFM to 1899 CFM Mist Eliminator Filter	2.808	23,167	\$6,621	\$78
1900 CFM and above Mist Eliminator Filter	3.556	31,073	\$8,568	\$111

Table 3: Energy Savings and Costs for Dewpoint Demand Control (Reference 4 & 7)

Dryer CFM	Customer kW	Customer kWh	Incremental Cost	Incremental O&M
90 CFM to 119 CFM Dewpoint Demand Control	2.807	19,046	\$3,148	\$0
120 CFM to 159 CFM Dewpoint Demand Control	3.579	24,324	\$3,176	\$0
160 CFM to 199 CFM Dewpoint Demand Control	4.469	30,449	\$3,210	\$0
200 CFM to 249 CFM Dewpoint Demand Control	5.285	36,120	\$3,515	\$0
250 CFM to 299 CFM Dewpoint Demand Control	6.092	41,810	\$3,286	\$0
300 CFM to 399 CFM Dewpoint Demand Control	6.834	47,120	\$3,335	\$0
400 CFM to 499 CFM Dewpoint Demand Control	8.201	57,168	\$3,375	\$0
500 CFM to 599 CFM Dewpoint Demand Control	9.857	69,549	\$3,438	\$0
600 CFM to 799 CFM Dewpoint Demand Control	11.820	84,539	\$3,438	\$0
800 CFM to 999 CFM Dewpoint Demand Control	15.787	116,331	\$3,473	\$0
1000 CFM to 1249 CFM Dewpoint Demand Control	19.714	150,000	\$3,858	\$0
1250 CFM to 1499 CFM Dewpoint Demand Control	24.662	195,517	\$3,678	\$0
1500 CFM to 1999 CFM Dewpoint Demand Control	29.570	243,985	\$3,725	\$0
2000 CFM and above Dewpoint Demand Control	39.427	345,381	\$3,861	\$0

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 4. Motor Efficiencies & Operating Hours

Compressor HP	Motor Description	New Unit Baseline Motor Efficiency	Upgrade Unit Existing Compressor Motor Efficiency	New and Upgrade Unit Proposed Motor Efficiency	Operating Hours
10	10 HP 1800 RPM ODP	91.7%	89.5%	91.7%	2,131
15	15 HP 1800 RPM ODP	93.0%	91.0%	93.0%	2,131
20	20 HP 1800 RPM ODP	93.0%	91.0%	93.0%	2,131
25	25 HP 1800 RPM ODP	93.6%	91.7%	93.6%	3,528
30	30 HP 1800 RPM ODP	94.1%	92.4%	94.1%	3,528
40	40 HP 1800 RPM ODP	94.1%	93.0%	94.1%	3,528
50	50 HP 1800 RPM ODP	n/a	93.0%	n/a	n/a
60	60 HP 1800 RPM ODP	n/a	93.6%	n/a	n/a

Upgrade Compressor Motor Efficiency and New Compressor Motor Efficiency values are from NEMA EPACT and Premium (New Compressors only) motors standards (Reference 5).

United States Industrial Electric Motor Systems Market Opportunities Assessment, EERE, US DOE, Dec 2002 - Source for operating hours for industrial motors and source for load factor (Reference 6).

Table 5. Incremental Costs for Efficient Measures

Measure	Upgrade & HP Reduction Units	New Unit
10 HP VFD Compressor	\$10,338	\$2,577
15 HP VFD Compressor	\$12,277	\$2,694
20 HP VFD Compressor	\$15,086	\$3,609
25 HP VFD Compressor	\$17,639	\$5,149
30 HP VFD Compressor	\$20,345	\$7,212
40 HP VFD Compressor	\$22,986	\$7,468
No Air Loss Drain	\$448	

Compressor prices are the average price from three retailers plus \$1500 for installation.

NALD price is average of nine retailers prices as calculated on Forecast NALD tab

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 6. Measure Lifetimes

Measure	Lifetime, Years
Compressed Air Efficiency Study	5
Cycling Dryers	20
Dewpoint Controls	15
Mist Eliminators	15
No Air Loss Drain	13
VFD Air Compressor New	20
VFD Air Compressor Upgrade	20
HP Reduction	20
Custom Efficiency - Compressed Air	20

References:

-
- (1) Service factor (1.1) from Compressed Air & Gas Institute (CAGI) standards comparing Nameplate HP to actual BHP @ 100% Full rated pressure and flow
 - (2) National Energy Efficiency Best Practices Report (<http://www.eebestpractices.com>)
 - (3) Historic compressed air product experience
 - (4) Analysis of Compressed Air Study participants 2008 - 2011
 - (5) National Electric Manufacturers Association. Motor efficiency standards from Pre-EPA Act 2005 and after.
 - (6) United States Industrial Electric Motor Systems Market Opportunities Assessment. US DOE, Dec 2002, Appendix B2
 - (7) Various anonymous retailer and vendor quotes
 - (8) per page iv of "Tetra Tech, Process and Impact Evaluation of the Compressed Air Efficiency Program — Colorado, January 21 2014"
 - (9) Massachusetts Technical Reference Manual 2013-2015 Program Years
 - (10) Compressed Air Challenge (Best Practices Guide): source for baseline compressor curves, % efficiency/psi reduction, SCFM per orifice
 - (11) Massachusetts Joint Utilities "Measure Life Study". Energy & Resource Solutions. Table 1-1. 2005. Source for NALD Lifetime

Changes from 2015-16 Filing

Cleaned up formatting of all analysis sheets
 Updated motor efficiencies to NEMA Premium for new compressor measures
 Updated Modulating Compressor with Unload curve to match Custom Rebates Model
 Adjusted lifetime for NALD measure to 13 years to match the source being cited previously
 Adjusted CF for NALD to match other measures
 Updated O&M savings for Mist Eliminators
 Updated coincidence factor for leaks
 Various minor updates to cycling dryer kW, kWh and costs data
 Updated lifetime for dewpoint controls

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Computer Efficiency

Description:

Manufacturer incentives will be offered for desktop computers that are either Energy Star or 80 Plus labeled at a bronze, silver, gold, and platinum levels. Incentives are administered via Ecos Plug Load Solutions PLS. Prescriptive rebates offered for end-use customers for installing VDI (Virtual Desktop Infrastructure) devices, also known as "Thin Client" systems instead of new PCs. PC Power Management is a prescriptive measure for an office-type occupancy which will provide customers with rebates for installing centralized PC power management software. Commercial customer incentives for installing servers with power supplies rated higher than Silver. At the moment, Silver efficiency power supplies are most commonplace in the market and will serve as the baseline. Gold, Platinum, and Titanium power supplies are eligible for incentive. All eligible servers are required to have redundant power supplies.

Algorithms:

General:

Gross Coincident kW Saved at Customer per Unit (kW)	= Customer kW x CF
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Upstream Manufacturer Incentives:

Gross kW Saved at Customer per Unit (kW)	= (Baseline Computer kW - Efficient PS Computer kW) * Cooling kW factor * Quantity
Gross Annual kWh Saved at Customer per Unit (kWh/yr)	= (Baseline Computer kWh - Efficient PS Computer kWh) * Cooling kWh factor * Quantity
UMI Energy O&M Savings	= Customer kWh * Heating Penalty Factor * Gas Cost * Quantity

Desktop PC Virtualization:

Gross kW Saved at Customer per Unit (kW)	= (Baseline Computer kW - Virtualized kW) * Cooling kW factor * Quantity
Gross Annual kWh Saved at Customer per Unit (kWh/yr)	= (Baseline Computer kWh - Virtualized kWh) * Cooling kWh factor * Quantity
VDI Energy O&M Savings	= (Customer kWh * Heating Penalty Factor * Gas Cost * Quantity) + (Quantity * (O&M - Hours Savings + O&M - License Cost))

Network PC Power Management:

Gross kW Saved at Customer per Unit (kW)	= (kW_Base - kW_EE) x Cooling kW factor * Quantity
Gross Annual kWh Saved at Customer per Unit (kWh/yr)	= (kW_Base - kW_EE) x Hours x Cooling kWh factor * Quantity
VDI Energy O&M Savings	= (Customer kWh * Heating Penalty Factor * Gas Cost * Quantity) + (Quantity * O&M - License Cost)

High Efficiency Power Supply Server:

Power Supply reduction kW	= Baseline Power Supply kW - Proposed Power Supply kW
Power Supply Output Wattage	= input wattage * number of power supplies * load factor
Baseline Power Supply kW	= Power Supply Output Wattage / (1000 * Silver Efficiency)
Baseline Power Supply kWh	= Baseline kW * hours of operation
Proposed Power Supply kW	= Power Supply Output Wattage / (1000 * Proposed Efficiency)
Proposed Power Supply kWh	= Proposed kW * hours of operation
Cooling Interaction kW	= PS Cooling Load (tons) * Cooling System kW/ton [per temperature bin]
Cooling Interaction kWh	= Cooling Interaction kW * Cooling System Hours [per temperature bin]
PS Cooling Load (tons)	= Power Supply Reduction (kW) * 3413 / 12000
Gross kW Saved at Customer per Unit (kW)	= Power Supply Reduction + Cooling Interaction kW
Gross Coincident kW Saved at Customer per Unit (kW)	= Gross kW Saved at Customer per Unit * Coincidence Factor
Gross Annual kWh Saved at Customer per Unit (kWh/yr)	= (Power Supply Reduction * Hours of Operation) + Cooling Interaction kWh

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Variables:

General:

Customer kW	Calculated	Per measure kW savings value.
CF	Table 8	Probability that the calculated 'customer kW' will coincide with the period of generator peak operation
Cooling kW factor	Table 7	Average annual demand of cooling system necessary to cool the heat gain from the equipment (Ref. 10).
Cooling kWh factor	Table 7	= Average annual energy of cooling system necessary to cool the heat gain from the equipment (Ref. 10).
Heating Penalty Factor (Dth/kWh)	Table 7	= Average annual energy of heating system necessary to compensate for the negative heat gain associated with the more efficient equipment (Reference 10).
Gas Cost	\$5.56	=Average Forecast Utility Cost (\$/Dth) of Commercial Gas

Upstream Manufacturer Incentives:

Baseline Computer kW	Table 3	Average baseline computer energy demand (= Baseline Computer kWh / 8760 *Quantity)
Baseline Computer kWh	Table 3	Average baseline computer energy usage (= UEC * PC Frequency * Quantity)
PC Frequency	Table 2	PC Frequency of Operating Patterns = Assumed % of the population that enables power management software in one of four available configurations (power management enabled, computer turned off; power management not enabled, computer turned off; power management enabled, computer left on; power management not enabled, computer left on (Reference 4); this is used to estimate average kWh usage over the entire population.
UEC	Table 3	Unit Energy Consumption = Sum of the products of the wattages and the annual hours in the four states of operation (active, idle, sleep, off) = (Active Wattage *Active Annual Hours of Operation)+(Idle Wattage * Idle Annual Hours of Operation)+(Sleep Wattage * Sleep Annual Hours of Operation)+(Off Wattage*Off Annual Hours of Operation) = Wattages are shown in Table 1 and Hours in each state are shown in Table 2.
Efficient PS Computer kW	Table 3	Average wattage demand of High Efficiency Power Supply
Efficient PS Computer kWh	Table 3	Average energy usage of High Efficiency Power Supply
Quantity		# of computers with a more efficient power supply
Measure Life	5 years	Average life of desktop computers (Reference 1)
Incremental Cost	Table 1	Cost of high efficiency model over baseline model
Net-to-Gross	88%	Reference 17

Desktop PC Virtualization:

Baseline Computer kW	Table 5	Societal aggregate baseline computer energy demand (= Baseline Computer kWh / 8760 *Quantity)
Baseline Computer kWh	Table 5	Societal aggregate of baseline computer energy usage * Quantity
Incremental Server kW	0.00401	Average energy usage per virtualized server = 273W (per Server) / 68 Virtual Machines (per Server) - Ref8
Hours	8760	Average 'on' hours for a virtualized server
Quantity		# of VDI (thin client) devices installed instead of a desktop PC computer
VDI kW		kW of VDI product (provided by the customer) (Ref 25 for forecasting)
Measure Life	10 years	(Reference 9)
Incremental Cost	\$117.00	Cost of high efficiency model over baseline model (Reference 6)
Net-to-Gross	88%	Calculated by applying a market penetration % of the efficient computer power supplies to the wattage and kilowatt-hour savings amount at five baseline levels. If our program was not in place, some of the customers that bought VDI boxes would have bought desktop computers at ESTAR 5 or higher.
O&M - Hours Savings	1/2	Hours Per Year per desktop @ \$85/hr
O&M - License Cost	\$12.00	Software License Fee per year per desktop

Network PC Power Management:

kW_Base	Table 5	Average weighted computer kW WITHOUT centralized power management.
kWh_Base	Table 5	Average weighted computer kWh WITHOUT centralized power management.
kW_EE	Table 5	Average weighted computer kW WITH centralized power management.
kWh_EE	Table 5	Average weighted computer kWh WITH centralized power management.
Hours	Table 6	Average PC hours broken out by operational state
Quantity		# of computers to be equipped with network power management control
Measure Life	6 Years	Length of time software will be utilized (Reference 16)
Baseline Cost	\$0.00	Cost of the baseline technology. (The baseline is to continue to operate the existing system.)
Incremental Efficiency Cost	\$14.64	Cost of the High Efficiency technology = average of various vendor products(Reference 12)
Net-to-Gross	88%	Aligns with the Computer Efficiency program as a whole
O&M - License Cost	\$2.74	Software License Fee per year per desktop

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

High Efficiency Power Supply Server:

Proposed Efficiency	See Table 8	Power supply efficiency is dependent on efficiency level and loading
Power Supply input wattage	750	rated wattage of the power supply
HVAC System Type	Chilled Water	HVAC system type serving the data center where the power supplies will be installed. There are five options and the customer must indicate which option best matches their system. The options are shown in Table 10 below.
Load Factor	See Table 9	Power supply load factor
Number of Power Supplies	2	each power supply contains two power supplies for 100% redundancy. Load factors take the redundancy into account.
Hours of operation	8760	Servers operate all hours of the year
Chiller Efficiency (COP)	5.55	Assumed efficiency of data center central centrifugal chiller (ASHRAE 90.1-2001 (150-300 tons, centrif) page 34, Table 6.2.1L). Converted to kW/ton for use in the analysis.
DX Efficiency (EER)	9.5	Assumed efficiency of DX CRAC units (ASHRAE 90.1-2001 ($\geq 240,000$ BTU/h and $< 760,000$ BTU/h, air cooled DX) page 27, Table 6.2.1A). Converted to kW/ton for use in the analysis
Glycol-Cooled DX Efficiency (EER)	11	Assumed efficiency of glycol (water) cooled DX CRAC units (ASHRAE 90.1-2001 ($\geq 240,000$ BTU/h, water cooled air conditioners) page 27, Table 6.2.1A). Converted to kW/ton for use in the analysis.
Cooling Tower Fan Energy (GPM/HP)	20	ASHRAE maximum cooling tower fan energy requirement (ASHRAE 90.1-2001 Centrif. Cooling Tower Fan Power, page 32, Table 6.2.1G) used to determine the cooling tower fan power/ton, along with the GPM/ton assumption.
Cooling Tower Sizing Factor (GPM/ton)	3	Standard cooling tower sizing rule of thumb (Ref 19,20,21)
Primary Chilled Water Pump Power (HP)	5	Assumed, based on assumed chiller size and typical primary pump size
Primary Chilled Water Pump Load	75%	Assumed, based on rule-of-thumb for pump load factor
Primary Chilled Water Pump Motor Efficiency	89.50%	Assumed, based on NEMA Premium motor efficiency for 5-hp motors
Chiller Size (tons)	150	Assumed, based on minimum chiller size within range used for chiller efficiency determination. This and the primary chilled water pump assumptions only affect the primary pump analysis and are only a very small portion of the total savings for this measure.
Measure Life (Retrofit)	5	Lifetime (in years) of the measure. Ref 18.
Desired Chilled Water Temperature (F)	45	Chilled water supply temperature. This is a typical value for most chilled water systems.
Cooling Tower Approach (F)	7	Cooling tower approach (difference between outdoor air wet bulb temperature and condensing temperature). Values can range from 4-12 F, but 7 is typical.
Cooling Tower Design Wet Bulb Temperature (F)	69	Assumed design wet bulb temperature for cooling towers installed in the relevant location (69 F used for CO), based on weather data.
Chiller Minimum Efficiency Dry Bulb Temperature (F)	93	Assumed design dry bulb temperature for chiller in the relevant location (93 F used for CO), based on weather data.
Chiller Maximum Efficiency Dry Bulb Temperature (F)	30	Assumed dry bulb temperature below which the chiller's efficiency will not decrease any further.
Dry Cooler Dry Bulb Approach Temperature (F)	15	Dry cooler approach (difference between outdoor air dry bulb temperature and condensing temperature). 15 F is the most common value (Ref 23)
Cooling Equipment Temperature-based Efficiency Improvement (%/F)	0.50%	Assumed efficiency improvement for chiller and DX systems (and, for simplicity, cooling tower fans) based on outdoor dry bulb temperature decrease (due to lower condenser pressure). Standard Xcel Energy assumption for cooling interaction.
Net-to-Gross	88%	To match overall program. Program will be evaluated in 2016.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Tables:

Table 1: Desktop Computer Wattages

	Avg Active Watts (W)	Idle (W)	Sleep (W)	Off /Standby (W)	Incremental Cost (reference 5)	Notes
Desktop Computer						
Baseline Aggregate	68.69	32.29	1.89	0.70		References 5,28,29
ES 6.0 or 80 Plus Bronze Qualified	58.48	24.93	1.60	0.57	\$9.00	Reference 5
ES 6.0 or 80 Plus Silver Qualified	56.63	24.14	1.60	0.57	\$14.00	Reference 5
ES 6.0 or 80 Plus Gold Qualified	55.40	23.62	1.60	0.57	\$16.00	Reference 5
ES 6.0 or 80 Plus Platinum Qualified	54.17	23.09	1.60	0.57	\$22.00	Reference 5

Table 2: Annual Hours in each Operational State and Frequency of PC Operation Patterns (PC Frequency)

Computer State	Active (Hrs/year)	Idle (Hrs/year)	Sleep (Hrs/year)	Standby / Off (Hrs/year)	PC Frequency	Notes
Power managed (local), turned off	175	5,011	431	3,143	18.7%	Reference 3
Not power managed (local), turned off	175	5,442	0	3,143	66.3%	Reference 3
Power managed (local), left on	175	5,687	2,898	0	3.3%	Reference 3
Not power managed (local), left on	175	8,585	0	0	11.7%	Reference 3

Table 3: Energy and Demand Savings (Reference 1-5, 28, 29)

Desktop Computer	UEC	Computer Watts	Computer kWh/yr	Cooling Watts	Cooling Peak kWh	Customer kW Savings	Customer kWh Savings	Heating Dth Penalty
Baseline Aggregate	N/A	23.7	207	7.8	27			
ES 6.0 or 80 Plus Bronze Qualified	666	18.4	161	6.1	21	0.0070	52.2	-0.023
ES 6.0 or 80 Plus Silver Qualified	645	17.8	156	5.9	20	0.0078	57.9	-0.026
ES 6.0 or 80 Plus Gold Qualified	632	17.4	153	5.8	20	0.0083	61.7	-0.028
ES 6.0 or 80 Plus Platinum Qualified	618	17.1	149	5.6	19	0.0088	65.5	-0.029

Table 4: Computer Annual kWh and Average kW (Reference 11, 15, 26, 27)

Desktop PC	No centralized PC Power Management		With centralized PC Power		% of Program Participation
	kWh_Base	kW_Base	kWh_EE	kW_EE	
ENERGY STAR 3.0 Desktop PC	337.66	0.0385	117.04	0.0134	0.00%
ENERGY STAR 4.0 Desktop PC	319.03	0.0364	111.65	0.0127	4.50%
ENERGYSTAR 5.0 Desktop PC	255.13	0.0291	91.45	0.0104	12.00%
ENERGYSTAR 6.0 Desktop PC	174.16	0.0199	65.99	0.0075	83.50%
Aggregate of Society	190.40	0.0217	71.10	0.0081	100.00%

Table 5: Hours of Operation (Reference 11, 13, 14 & Table 2 - for non-network aggregate operation.)

Desktop PC	Active	Idle	Sleep	Off	Total
Not network power managed, left on	175	8,150	435	0	8,760
Not network power managed, turned off	175	5,377	65	3,143	8,760
Network power managed, left on	175	1,631	6,954	0	8,760
Network power managed turned off	175	1,631	431	6,523	8,760

Table 6: Secondary Cooling/Heating Values

Location	kW	kWh	Dth/kWh	Notes
Front Range	1.33	1.13	-0.000508	Reference 10
Western Slope	1.33	1.137	-0.000508	Reference 10
Mountain	1.33	1.098	-0.000704	Reference 10

Table 7: Per Measure Coincidence Factors

Upstream Manufacturer Incentives	100%
Desktop PC Virtualization	100%
PC Power Management	0%
High Efficiency Server Power Supply	100%

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 8: Power Supply Efficiency

Loading	Silver	Gold	Platinum	Titanium
5%	75.1%	80.2%	85.6%	90.6%
10%	79.0%	83.4%	87.9%	92.1%
15%	82.9%	86.5%	90.2%	93.5%
20%	86.8%	89.6%	92.5%	94.9%
30%	88.0%	90.6%	93.1%	95.3%
40%	89.2%	91.5%	93.7%	95.8%
50%	90.4%	92.5%	94.3%	96.2%
60%	90.1%	92.2%	94.0%	95.9%
70%	89.8%	92.0%	93.7%	95.6%
80%	89.5%	91.8%	93.4%	95.3%
90%	89.2%	91.5%	93.2%	95.1%
100%	88.9%	91.3%	92.9%	94.8%

Ref 18, 22

Table 9: Power Supply Load Factor

Loading	% operating hours	
	Hi Performance	Bus Computing
5%	5%	10%
10%	10%	55%
15%	55%	30%
20%	30%	5%
30%	0%	0%
40%	0%	0%
50%	0%	0%
60%	0%	0%
70%	0%	0%
80%	0%	0%
90%	0%	0%
100%	0%	0%

Ref 18, 22

Table 10: Cooling System Efficiencies

HVAC System Type	Efficiency	kW/ton	Notes
Chilled Water	5.55 COP	0.634	kW/ton is the rated efficiency
DX	9.5 EER	1.263	kW/ton is the rated efficiency
Glycol-Cooled DX	11 EER	1.091	kW/ton is the rated efficiency
Glycol-Cooled DX with Waterside Economizer	N/A	0.756	kW/ton is calculated from weather data and includes free cooling
Chilled Water with Waterside Economizer	N/A	0.407	kW/ton is calculated from weather data and includes free cooling

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 11: Cooling Efficiency Table (kW/Ton)

Temperature	Water-Cooled Chiller	DX	Water-Cooled DX	Water-Cooled DX w/ WS Economizer	Water-Cooled Chiller w/WS Economizer
Determinate Temperature: (dB/wB)	Wet Bulb	Dry Bulb	Dry Bulb	Dry Bulb	Wet Bulb
-3	0.4584	0.8653	0.8316	0.1231	0.0036
-1	0.4584	0.8653	0.8316	0.1231	0.0036
1	0.4584	0.8653	0.8316	0.1231	0.0036
3	0.4584	0.8653	0.8316	0.1231	0.0036
5	0.4584	0.8653	0.8316	0.1231	0.0036
7	0.4584	0.8653	0.8316	0.1231	0.0036
9	0.4584	0.8653	0.8316	0.1231	0.0043
11	0.4584	0.8653	0.8316	0.1231	0.0052
13	0.4584	0.8653	0.8316	0.1231	0.0065
15	0.4584	0.8653	0.8316	0.1231	0.0083
17	0.4584	0.8653	0.8316	0.1231	0.0108
19	0.4591	0.8653	0.8316	0.1231	0.0145
21	0.4601	0.8653	0.8316	0.1231	0.0202
23	0.4613	0.8653	0.8316	0.1231	0.0297
25	0.4645	0.8653	0.8316	0.1231	0.0468
27	0.4766	0.8653	0.8316	0.1231	0.0817
29	0.4903	0.8653	0.8316	0.1231	0.1141
31	0.4993	0.8716	0.8377	0.2252	0.1141
33	0.5202	0.8842	0.8498	0.3307	0.1141
35	0.5468	0.8968	0.8619	0.4397	0.1141
37	0.5924	0.9095	0.8741	0.5522	0.1141
39	0.6314	0.9221	0.8862	0.6682	0.6314
41	0.6385	0.9347	0.8984	0.7876	0.6385
43	0.6492	0.9474	0.9105	0.9105	0.6492
45	0.6514	0.9600	0.9226	0.9226	0.6514
47	0.6587	0.9726	0.9348	0.9348	0.6587
49	0.6735	0.9853	0.9469	0.9469	0.6735
51	0.6808	0.9979	0.9591	0.9591	0.6808
53	0.6871	1.0105	0.9712	0.9712	0.6871
55	0.6971	1.0232	0.9833	0.9833	0.6971
57	0.7086	1.0358	0.9955	0.9955	0.7086
59	0.7167	1.0484	1.0076	1.0076	0.7167
61	0.7172	1.0611	1.0198	1.0198	0.7172
63	0.7284	1.0737	1.0319	1.0319	0.7284
65	0.7303	1.0863	1.0440	1.0440	0.7303
67	0.7302	1.0989	1.0562	1.0562	0.7302
69	0.7512	1.1116	1.0683	1.0683	0.7512
71	N/A	1.1242	1.0805	1.0805	N/A
73	N/A	1.1368	1.0926	1.0926	N/A
75	N/A	1.1495	1.1047	1.1047	N/A
77	N/A	1.1621	1.1169	1.1169	N/A
79	N/A	1.1747	1.1290	1.1290	N/A
81	N/A	1.1874	1.1412	1.1412	N/A
83	N/A	1.2000	1.1533	1.1533	N/A
85	N/A	1.2126	1.1654	1.1654	N/A
87	N/A	1.2253	1.1776	1.1776	N/A
89	N/A	1.2379	1.1897	1.1897	N/A
91	N/A	1.2505	1.2019	1.2019	N/A
93	N/A	1.2632	1.2140	1.2140	N/A
95	N/A	1.2632	1.2140	1.2140	N/A
97	N/A	1.2632	1.2140	1.2140	N/A
99	N/A	1.2632	1.2140	1.2140	N/A
101	N/A	1.2632	1.2140	1.2140	N/A
103	N/A	1.2632	1.2140	1.2140	N/A

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 12: Power Supply Costs and Market Share

Watts	Silver	Gold	Platinum	Titanium	Market Share
300	\$ 30.00	\$ 37.50	\$ 50.00	\$ 67.50	10%
500	\$ 40.00	\$ 47.50	\$ 60.00	\$ 77.50	50%
750	\$ 50.00	\$ 57.50	\$ 70.00	\$ 87.50	25%
1400	\$ 65.00	\$ 72.50	\$ 85.00	\$ 102.50	15%

Ref 18, 23

Table 13: Incremental Cost per Power Supply (\$)

Server Efficiency	min	max	avg
silver to gold	\$ 5.00	\$ 10.00	\$ 7.50
gold to platinum	\$ 10.00	\$ 15.00	\$ 12.50
platinum to titanium	\$ 15.00	\$ 20.00	\$ 17.50

Ref 18, 23

Table 14 Incremental Cost per Server

Server Efficiency	Server Wattage Range			
	<400	400-600	600-1000	>1000
Gold	\$ 11.63	\$ 13.88	\$ 16.13	\$ 18.38
Platinum	\$ 31.00	\$ 37.00	\$ 43.00	\$ 49.00
Titanium	\$ 58.13	\$ 69.38	\$ 80.63	\$ 91.88

Ref 24

Table 15: Assumed Allocation of Cooling Systems (For Forecasting purposes)

Type of Cooling System	% Allocation
Chiller	20%
DX	20%
Water-Cooled DX	20%
Water-Cooled DX with WSE	20%
Chiller with WSE	20%

References:

1. Koomey, J., M. Cramer, M.A. Piette and J. Eto. 1995. "Efficiency Improvements in U.S. Office Equipment: Expected Policy Impacts and Uncertainties." Lawrence Berkeley Laboratory. LBL-37383. December. Table 3.
2. Energy Star Calculator Tool; LBNL 2007 or Energy Star Specification
3. Hours of operation for desktop computers from office desktops/laptops and office monitors from Piette, M. A., M. Cramer, J. Eto and J. Koomey. 1995. "Office Technology Energy Use and Savings Potential in New York."
4. LBNL Estimate based on Reference 3
5. Ecos Consulting information from manufacturers
6. Vendor data; see "Ref Cost-PC Virt" worksheet
7. Baseline desktop PC cost assumed at \$600; info from the internet indicates a PC with keyboard averages between \$300-\$1,000 or \$650; assumed the keyboard is \$50 of that (Ref 6)
8. Server Wattages from Custom Efficiency program participant; average wattage of 42 models. (Wattages last confirmed in 2014)
9. 10-year life for thin-client and zero-client based on conversation with MN vendor Nowmicro
10. Based upon Rundquist Method Calculation (Matches Colorado Commercial Lighting Program)
11. Ecos Consulting (now Ecova), 2009
12. Various Equipment Vendors
13. Measured Energy Savings and Performance of Power-Managed Personal Computers and Monitors, 1996, Lawrence Berkeley National Laboratory
14. PC and Monitor Night Status: Power Management Enabling and Manual Turn-off, 1998, Lawrence Berkeley National Laboratory
15. ENERGY STAR, 2012
16. Xcel Energy Custom Efficiency projects
17. 2014 Michaels Energy (independent 3rd party) NTG review.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

References (continued):

18. Ecova, multiple discussions
19. Cooling Plant Optimization (<http://academic.udayton.edu/kissock/http/EEB/LecturesAndHomework/23-CoolingPlantOptimization/CoolingPlantOptimization.docx>)
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24. Internal adjustment by Xcel energy to distribute power supply cost in a commensurate with wattage served. Values will be reviewed over time as additional information becomes available
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26. Energy Star Office Equipment Calculator, accessed 12/21/15 from: <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/save-energy/purchase-energy-saving-product>
27. Energy Star 5.0 Product Database, downloaded on 12/21/15 from historical archive
28. ECOVA - Sales market share analysis, Feb. 2016.
29. 2013 EPA Study for Energy Usage of Average Computer Sold

Changes from Previous Filing:

1. Adjusted average societal baseline for PC Power Management and VDI Measures to increase shift to ES 5.0 computers. Refer to Table 5.
2. Revised the NTG to match the findings of the 2014 third-party review.
3. Addition of High Efficiency Power Supply Server Measure
4. Adjusted baselines for PC Virt, PC power management, and upstream power supplies to account for changing societal baseline and energy efficiency programs (Energy Star)
5. Reformatted Forecast worksheets to include forecast lines at top, remove unnecessary material, and improve usability
6. Added ENERGY STAR 6.0 to PC Power Management, Virtualization, and Upstream Power Supplies
7. Adjusted ENERGY STAR 5.0 wattage values using new data
8. Consolidated "Forecast Measures" worksheets for several products into their "Forecast kW kWh" worksheets for simplicity
9. Updated Upstream program to use ES 6.0 Bronze Power Supply baseline

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Cooling

Description:

Prescriptive rebates will be offered for new cooling equipment. Rebates may be dependent on equipment size or load that is offset and on meeting minimum efficiency requirements. Additional rebates may be available for efficiencies better than the minimum qualifying efficiencies. For new Mini-Split Heat Pumps (MSHP) it is assumed that the MSHP is being installed in either new construction or to supplement an existing heating and cooling system. The MSHP rebate is intended to incent customers to install a high efficiency MSHP rather than the code level baseline unit.

Prescriptive rebates will be offered for the installation of EC Motors for Refrigeration Evaporators (retrofit only) and/or Anti-Sweat Heater Controls (retrofit only), along with closing multi-deck cases with solid doors. Prescriptive rebates will also be offered for retrofitting open multideck coolers or freezers with solid glass doors.

Custom rebates are available for cooling-related improvements that are not covered by the aforementioned prescriptive rebates. These would include such applications as heat recovery.

Program References:

Measure "ECM" in refrigerated cases	Refer to Program "CO - Refrigeration" to find formulas for (Customer kW, Customer kWh, Customer PCKW, etc.) for the "ECM" measures in refrigerated cases.
Measure "Anti-Sweat Heater Controls"	Refer to Program "CO - Refrigeration" to find formulas for (Customer kW, Customer kWh, Customer PCKW, etc.) for the "Anti-Sweat Heater Controls" measure.
Measure "ECM" in refrigerated cases	Refer to Program CO - Refrigeration to find references and tables for measure life, ECM_Baseline_Fan_ Watts, ECM_Efficient_Fan_Watts , ECM_Hours, CF, Refrigeration Factor, and Incremental Cost values, etc..
Measure "Anti-Sweat Heater Controls"	Refer to Program CO - Refrigeration to find references and tables for measure life, ASHC_Baseline_kW, ASHC_Hours, CF, %_Off, Refrigeration Factor, and Incremental Cost values, etc..
Measure "Retrofit of Open Multideck Cooler (or Freezer) Cases with Solid Glass Doors"	Refer to Program CO - Refrigeration to find references and tables for measure life, FI_Open, FI_Closed, FCR, COPhvac, COPrefrig, hours, CF, incremental costs, etc.

Conversions:

Energy Efficiency Ratio	In cases where the EER is not known or provided it will be assumed based on the following equation: $EER = -0.02 \cdot SEER^2 + 1.12 \cdot SEER$ (Ref 8) For forecasting purposes the EER for MSHPs will be determined by the following empirical formula based on AHRI information: $= (-0.0003 \cdot (SEER/ton)^3 + 0.0101 \cdot (SEER/ton)^2 + 0.5264 \cdot (SEER/ton) - 0.0233) \cdot tons$
Seasonal Energy Efficiency Ratio	In cases where the SEER is not known or provided, it will be assumed based on this commonly accepted approximation: $SEER = EER / 0.85$
kW/ton	$= 12 / \text{Energy Efficiency Ratio}$
Energy Efficiency Ratio	$= 3.412 \times \text{Coefficient of Performance}$
Heating Seasonal Performance Factor (HSPF)	$= 3.412 \times \text{Heat Energy Output (Btu)} / \text{Energy Input to Compressor (Btu)}$

Algorithms:

For Rooftop Units, Water Source Heat Pumps, Split Systems, Condensing Units, PTACs	
Gross Annual kWh Saved at Customer	$= \text{Size} \times EFLH \times (12/SEER_Standard - 12/SEER_Eff)$ Note: IEER replaces SEER for most RTUs and SEER = EER for water source heat pumps
Gross kW Saved at Customer	$= \text{Size} \times (12 / EER_Standard - 12 / EER_Eff)$
For Chillers	
Gross Annual kWh Saved at Customer	$= \text{Size} \times EFLH \times (IPLV_Standard - IPLV_Eff)$
Gross kW Saved at Customer	$= \text{Size} \times (FLV_Standard - FLV_Eff)$
For Centrifugal Chillers	

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

FLV_standard	=FLV_ARI / Kadj
IPLV_standard	=IPLV_ARI / Kadj
Kadj	=A x B
A	=0.00000014592 x (Lift)^4 - 0.0000346496 x (Lift)^3 + 0.00314196 x (Lift)^2 - 0.147199 x (Lift) + 3.9302
B	=0.0015 x Lvg_Evap_T +0.934
Lift	=Lvg_Cond_T - Lvg_Evap_T

For VFDs on Centrifugal Chillers

Gross Annual kWh Saved at Customer	= Size x EFLH x (IPLV_Baseline - IPLV_VFD_Eff)
Gross kW Saved at Customer	= Size x (FLV_Baseline - FLV_VFD_Eff)

For Direct Evaporative Pre-cooling for Air Cooled Condensers (DEPACC)

Gross Annual kWh Saved at Customer	= tons x EFLH x EFLH_Factor x kW_per_ton_Eff_Avg
Gross kW Saved at Customer	= tons x kW_per_ton_Eff_Peak
Incremental O&M Cost	= Incremental_O&M_Cost_Factor x EFLH x EFLH_Factor x Tons

For Mini-split Heat Pumps

New Equipment Electrical Cooling Energy Savings (Gross Annual kWh Saved at Customer)	= Size x EFLH x (12 / SEER_Standard - 12 / SEER_Eff)
New Equipment Electrical Demand Savings (Gross kW Saved at Customer)	= Size x (12 / EER_Standard - 12 / EER_Eff)
New Equipment Electrical Heating Energy Savings (Gross Annual kWh Saved at Customer)	= Size_Heat / 1000 x MSHP_EFLHH x (1 / HSPF_Standard - 1 / HSPF_Eff)
New Equipment Electrical Energy Savings (Gross Annual kWh Saved at Customer)	= Heating Energy Savings + Cooling Energy Savings

Variables:

General Water & Air Cooling Variables:

Size	Customer Input	= The equipment capacity in tons, provided by customer. The maximum size unit for MSHPs is 5 tons
EFLH	See Table 2	= Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year. Values are shown in Table 2 for different building types and locations, to be provided by the customer.
SEER_Standard, IEER_Standard	See Table 1	= Seasonal (or Integrated) Energy Efficiency Ratio in Btu/Wh of standard equipment, based upon the minimum acceptable efficiency defined by International Energy Conservation Code, 2015 (Reference 6). Value determined from table 1 based on customer provided equipment type and size.
SEER_Eff, IEER_Eff	Customer Input	= Seasonal (or Integrated) Energy Efficiency Ratio in Btu/Wh of High Efficiency equipment that the customer will install, provided by customer.
EER_Standard	See Table 1	= EER of standard equipment, based upon the minimum acceptable efficiency defined by the International Energy Conservation Code, 2015, for a specific type of equipment and size. Table 1.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

EER_Eff	Customer Input	= EER of High Efficiency that the customer will install, provided by customer.
FLV_Standard	See Table 1	= Full load cooling efficiency in kW/ton of standard equipment, based upon the minimum acceptable efficiency defined by International Energy Conservation Code, 2015, Table 403.2.3(7) for selected centrifugal chiller type, size, condensing and chilled water temperature (provided by customer). Table 1, excerpt. NOTE: For non-centrifugal chillers, FLV_Standard is the value in IECC Table 403.2.3(7), without variation for condenser and chilled water temperatures and condenser water flow rate.
FLV_ARI (same as IPLV_ARI)		= IECC minimum acceptable FLV (or IPLV) at the ARI standard rated condition of 85 F condensing water temperature, 3 gpm/ton condenser flow, 44 F chilled water temperature, and 2.4 gpm/ton evaporator flow.
Lvg_Evap_T	Customer Input	= The full load chilled water temperature leaving the evaporator, in deg F
Lvg_Cond_T	Customer Input	= The full load condenser water temperature leaving the condenser, in deg F
FLV_VFD_Baseline	Customer Input	= Full Load Value cooling efficiency in kW/ton, representing the efficiency of existing chiller without a VFD at 100% load, provided by customer.
FLV_VFD_Eff	Customer Input	= Full Load Value cooling efficiency in kW/ton, representing the efficiency of existing chiller with a VFD at 100% load, provided by customer.
IPLV_VFD_Baseline	Customer Input	= Integrated Part Load Value (representing the average efficiency over a range of loaded states) cooling efficiency in kW/ton of existing chiller without a VFD, provided by customer.
IPLV_VFD_EFF	Customer Input	= Integrated Part Load Value (representing the average efficiency over a range of loaded states) cooling efficiency in kW/ton of existing chiller with VFD, provided by customer.
FLV_Eff	Customer Input	= Full Load Value cooling efficiency in kW/ton, representing the efficiency at design conditions, provided by customer.
IPLV_Standard	See Table 1	= Integrated Part Load Value (representing the average efficiency over a range of loaded states) cooling efficiency in kW/ton of standard equipment, based upon the minimum acceptable efficiency defined by International Energy Conservation Code, 2015 for chiller type and size (type and size provided by customer). Table 1
IPLV_Eff	Customer Input	= Integrated Part Load Value (representing the average efficiency over a range of loaded states) cooling efficiency in kW/ton of High Efficiency equipment, provided by customer.
Size_Heat	Customer Input	= Heating Capacity of Mini Split Heat Pump, in BTU/h, provided by customer
MSHP_EFLHH	950 EFLH	= Mini-Split Heat Pump Equivalent Full Load Hours Heating: The equivalent number of hours that MSHP equipment would be running at Full Load over the course of the year for heating.
HSPF_Standard	8.2 HSPF	= Heating Seasonal Performance Factor (HSPF) of standard equipment, based upon the minimum Federal standard for efficiency as manufactured.
MSHP_Primary_Use	Customer Input	= Mini-Split Heat Pump Primary use will be a picklist item of Heating or Cooling, provided by the customer.
HSPF_Eff	Customer Input	= Heating Seasonal Performance Factor (HSPF) of High Efficiency equipment that the customer will install, provided by the customer
3.412		= Conversion between BTU/h and Watts

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

3412	= Conversion between BTU/h and kilowatts
12000	= Conversion between BTU/h and tons
CF	= Coincidence Factor, the probability that peak demand of the unit will coincide with peak utility system demand. 90% will be used for prescriptive rebates except VFD Chillers (Reference 1). For VFD Chillers we will use 0%.
Measure Life	Measure life is taken at 15 years for all prescriptive RTU and PTAC cooling equipment and 20 years for all other cooling equipment. (Reference 2). Custom measure lifetime derived from past projects. 18 years for MSHPs.(Reference 12)
NTG	Net-to-gross = We will use 92% for all cooling equipment except MSHP units, Anti-Sweat Heaters and ECM measures which will be 100%. We will use 87% for all custom cooling projects (Reference 4).
Incremental operation and maintenance cost	= \$0 for all cooling system types (except direct evaporative pre-cooling)
Baseline Cost of Equipment	The cost of equipment that would exactly meet code requirements.
Incremental Cost of Equipment	=The incremental cost of equipment above the code requirements, typically expressed on a dollar per ton basis.

For Direct Evaporative Pre-cooling for Air Cooled Condensers (DEPACC) (Reference 5)

kW_per_ton_Eff_Avg	0.167 kW/ton	= 262.74 kWh/ ton / 1574 DEPACC Operating hours = Efficiency improvement of incumbent air-cooled condensers in kW per ton resulting from installation of condenser evaporative pre-cooler averaged for annual cooling hours.
EFLH_Factor	1.38875	= DEPACC_Operating_Hours_Office / EFLH for Front Range Office (w/economizer)
DEPACC_Operating_Hours_Office	1574 hrs/yr	= Estimated annual hours of operation of the DEPACC system for an office in the Front Range Used to scale DEPACC operating hours to A/C EFLH by segment
kW_per_ton_Eff_Peak	0.334 kW/ton	= Efficiency improvement of incumbent air-cooled condensers in kW per ton resulting from installation of condenser evaporative pre-cooler at summer cooling design conditions: 1% design temperatures @ DIA = 92°F DB and 60°F WB
Incremental_O&M_Cost_Factor	\$0.0012579 / ton-hour	= (\$1.18 / Ton) / 1574 DEPACC Hours = Factor used to calculate Incremental annual non-energy Operations and Maintenance cost per ton-hr for water usage.
Baseline Cost of Equipment	= \$0 because the baseline option is to do nothing.	
Incremental Cost of Equipment	See Table 3	= Tons x Incremental cost of DEPACC equipment from Table 3.
Tons	Customer Input	Tons of cooling shown on the rated faceplate of the existing cooling equipment

Inputs:

Information Provided by Customer:

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Rooftop Units / Split Systems / Air Cooled

Chillers / PTAC / Water Source Heat

Pumps / MSHP

	Verified during M&V:
Cooling equipment type	Yes
County / Zone	Yes
Market segment	Yes

Cooling equipment size [tons]	Yes
Quantity of Cooling equipment by Size	Yes
Cooling equipment efficiency (EER or FLV in kW/ton - dependent on the technology)	Yes
Cooling equipment efficiency (SEER or IPLV in kW/ton - dependent on the technology)	Yes
Primary use, cooling or heating (MSHP)	

Centrifugal Chillers:

County / Zone	Yes
Market segment	Yes
Chiller Size [tons]	Yes
Chiller FLV [kW/ton] at full load	Yes
Chiller IPLV [kW/ton] at full load	Yes
Chill water supply temperature [°F] at full load	Yes
Condenser water entering temperature [°F] at full load	Yes
Chilled water leaving temperature [°F]	Yes
Chill water flow [gpm/ton] at full load	Yes
Condenser water flow [gpm/ton] at full load	Yes

VFDs on Centrifugal Chillers

	Verified during M&V:
County / Zone	Yes
Market segment	Yes
Chiller Size [tons]	Yes
Chiller FLV [kW/ton] at full load	Yes
Chiller IPLV [kW/ton] at full load	Yes
Chiller with VFD FLV [kW/ton] at full load	Yes
Chiller with VFD IPLV [kW/ton] at full load	Yes
Quantity of same size Chillers with VFD Retrofit	Yes

For DEPAAC Provided by Customer:

	Verified during M&V:
Cooling equipment type	Yes
Climate zone	Yes
Building type	Yes
Cooling equipment size (tons)	Yes

For Electronically Commutated Evaporator Fan Motors:

	Verified during M&V:
Size of motor	Yes
Application of motor (Display Case or Walk-in)	Yes
Case or Walk-in temperature (Medium Temp or Low Temp)	Yes
For Walk-in's: Fan diameter (<= 15 inches or >15 inches)	Yes
Cost	

For Anti-Sweat Heaters:

Number of doors controlled	Yes
Number of controllers	Yes
Cost	

Open to Closed Case Retrofit

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Length of Case(s)	Yes
Freezer or Cooler?	Yes

Assumptions:

- Each piece of cooling equipment is going in instead of a machine of the same size that only met minimum International Energy Conservation Code, 2015
 - Prescriptive rebates are not given for backup cooling equipment.
 - Small units assumed to have gas heat
- No Heating kW saving are claimed for MSHP during winter, only summer cooling kW savings are claimed.

DEPACC:

Minimum equipment size that DEPACC can be installed on is 10 ton.

Qualifying evaporative cooling units must have a minimum Media Saturation Effectiveness of 75% and above. The units must be installed with a remote thermostat, outside air temp sensor and a periodic purge water control if sump is used.

Units should have outdoor air, humidity and controls to determine operation of spray nozzles to wet media. If sump is used, periodic purge control would need to be installed.

Condenser fan energy costs due to DEPACC media are not expected to increase measurably due to media decreasing condenser fan cfm.

Denver Water 2016 estimated rates <http://www.denverwater.org/BillingRates/RatesCharges/2016-rates/> at \$2.68/1000 gal

DEPACC estimate of water consumed by the evaporative pre-condensing system .28 gallons per ton-hour of cooling based on manufacturer's data.

EC Motors:

Each motor is replaced with the same size on a 1 for 1 basis.

Rebates do not apply to rewind or repaired motors.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Tables:

Table 1. Deemed Baseline Efficiencies (IECC 2015)
EQUIPMENT MINIMUM BASELINE EFFICIENCIES REQUIRED BY CODE, AND INCREMENTAL COSTS ASSOCIATED WITH EXPECTED HIGHER EFFICIENCIES NOTE: For Rooftop Units Larger Than 5.4 Tons, Add 0.2 to Both IEER and EER for Units That Have No Heat or Electric Heat

Equipment	Equipment Classification	SEER/IEER	EER	FLV (kW/ton)	IPLV (kW/ton)	Incremental Cost per Ton, \$/ton (References 8, 9, 11)
Rooftop Units less than 5.4 tons	Standard Efficiency	14.00	11.76			See Table 4
Split Systems less than 5.4 tons	Standard Efficiency	13.00	11.18			See Table 4
Rooftop Units Condensing Units & Split Systems 5.5-11.3 tons	Standard Efficiency	12.60	11.00			See Table 4
Rooftop Units & Split Systems 11.4-19.9 tons & Condensing Units > 11.4 tons	Standard Efficiency	12.20	10.80			See Table 4
Rooftop Units & Split Systems 20-63.3 tons	Standard Efficiency	11.40	9.80			See Table 4
Rooftop Units greater than 63.3 tons	Standard Efficiency	11.00	9.50			See Table 4
Water-source Heat Pumps	Standard Efficiency	13.00	13.00			See Table 4
PTAC	Standard Efficiency	9.59	8.15			See Table 4
scroll/screw chiller < 75 tons	Standard Efficiency			0.750	0.600	
	High Efficiency					\$128.00
scroll/screw chiller >=75 to < 150 tons	Standard Efficiency			0.720	0.560	
	High Efficiency					\$128.00
scroll/screw chiller >=150 to <300 tons	Standard Efficiency			0.660	0.540	
	High Efficiency					\$70.00
scroll/screw chiller >= 300 to <600 tons	Standard Efficiency			0.610	0.520	
	High Efficiency					\$70.00
scroll/screw chiller >= 600 tons	Standard Efficiency			0.560	0.500	
	High Efficiency					\$70.00
Centrifugal Chillers < 150 tons	ARI rated Efficiency			0.610	0.550	
	High Efficiency					\$177.00
Centrifugal Chillers >= 150 to < 300 tons	ARI rated Efficiency			0.610	0.550	
	High Efficiency					\$177.00
Centrifugal Chillers >=300 tons to < 400 tons	ARI rated Efficiency			0.560	0.520	
	High Efficiency					\$177.00

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Centrifugal Chillers >=400 tons to < 600 tons	ARI rated Efficiency			0.560	0.500	
	High Efficiency					\$177.00
Centrifugal Chillers >= 600 tons	ARI rated Efficiency			0.560	0.500	
	High Efficiency					\$177.00
Air-Cooled Chillers - < 150 tons	Standard Efficiency	10.100	13.700			See Table 4
Air-Cooled Chillers - >= 150 tons	Standard Efficiency	10.100	14.000			See Table 4

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

VFD's for Chillers	Existing Chiller Efficiency			Customer Provided	Customer Provided	
	Existing Chiller with VFD Efficiency			Customer Provided	Customer Provided	\$71.88
Mini-Split Heat Pump (15-20 SEER, 9-12 HSPF)	Standard Efficiency	14.00	8.75			\$375.35
	High Efficiency					
Mini-Split Heat Pump (21-26 SEER, 9-12 HSPF)	Standard Efficiency	14.00	8.75			
	High Efficiency					\$608.47

NOTES

* Bold values indicates direct sourcing to IECC 2015, tables 403.2.3(x), otherwise estimated by using the equation listed above to get EER, or dividing EER by .85 to get SEER. For water-sourced heat pumps only, the EER is set equal to the SEER because the condenser is cooled by cooling towers in most cases, meaning that the heat pump EER is not dependent on dry bulb seasonal temperature.

* High Efficiency IEER, SEER and EER values are supplied by Customer.

* ARI rated efficiency is converted to Standard efficiency as per Table 403.2.3(7)

* Values for Centrifugal Chillers assumed to be at ARI rating conditions of 85 degrees condensing temperature, 44 degrees chilled water temperature, 2.4 gpm/ton chill water flow, and 3 gpm/ton condenser water flow. Reference International Energy Conservation Code (IECC), 2015, Sec. 403.2.3.1

* Values for PTAC from IECC 2015 formula, Table 403.2.3(3) for Cooling Mode, Replacements.

* Chiller categories are now aligned with the IECC 2015.

Table 2. Equivalent Full Load Hours by Building Type

Building Type / Market Segment	Front Range EFLH	Front Range EFLH w/ Economizer	Western Slope EFLH	Western Slope EFLH w/ Economizer	Mountain EFLH	Mountain EFLH w/ Economizer
Education	724	521	744	553	915	598
Health/ Medical	1,371	987	1,407	1,046	1,125	736
Lodging	940	677	965	717	734	480
Office	1,574	1,133	1,616	1,201	1,224	801
Retail	715	515	735	546	562	368
Mixed Use (office and retail)	1,073	772	1,102	819	837	548
Data Centers	8,760	8,760	8,760	8,760	8,760	8,760
Process Loads	5,840	5,840	5,840	5,840	5,840	5,840

NOTES:

* EFLH- Zone 1 (Front Range/Denver); Zone 2 (Western State as represented by Grand Junction) and Zone 3 (Mountain Areas as represented by Alamosa)

* Market segment hours scaled from Minnesota OES data (Reference 10) with Office value calculated for Denver and Grand Junction Typical Meteorological Year data. Distributions developed from CBECS data (Reference 3)

* WSHP's will use Non-Economizer hours for all projects.

* Air Cooled Chillers and RTU's will use Economizer hours for all projects.

* PTAC's will use Non-Economizer Lodging hours for all projects.

Table 3. DEPAACC Incremental Cost (Reference 5)

System Tons	\$/ton
40	\$ 248.27
80	\$ 219.91
120	\$ 209.23
160	\$ 202.80
320	\$ 190.49

Notes:

Ref files: (Large computer files available for reference)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Xcel DEPACC Notes 111312 R2.docx
EproModel 150ksf OfficeData Center 010313REV 7.xlsx
EnergyPro http://www.energysoft.com/main/page_energypro_ep_information.htm

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

EnergyPro User's Manual, EnergyPro Version 5 by EnergySoft, LLC July 2011 p. 120

Table 4 Midstream Minimum Qualifying Tiers and Incremental Costs

Equipment	Equipment Rebate Tier	Min Qualifying SEER/IEER	Min Qualifying EER	Incremental Cost per Ton, \$/ton (Reference 8)
Rooftop Units less than 5.4 tons	Tier 1	15.00	12.00	\$144.54
Rooftop Units less than 5.4 tons	Tier 2	16.00	12.00	\$235.51
Rooftop Units less than 5.4 tons	Tier 3	17.00	12.00	\$383.73
Rooftop Units less than 5.4 tons	Tier 4	18.00	12.00	\$625.24
Split Systems less than 5.4 tons	Tier 1	15.00	12.80	\$144.54
Split Systems less than 5.4 tons	Tier 2	16.00	12.80	\$235.51
Split Systems less than 5.4 tons	Tier 3	17.00	12.80	\$383.73
Split Systems less than 5.4 tons	Tier 4	18.00	12.80	\$625.24
Rooftop Units Condensing Units & Split Systems 5.5-11.3 tons	Tier 1	13.00	11.50	\$78.59
Rooftop Units Condensing Units & Split Systems 5.5-11.3 tons	Tier 2	13.80	11.50	\$122.44
Rooftop Units Condensing Units & Split Systems 5.5-11.3 tons	Tier 3	14.60	11.50	\$190.73
Rooftop Units Condensing Units & Split Systems 5.5-11.3 tons	Tier 4	18.00	11.50	\$297.13
Rooftop Units & Split Systems 11.4-19.9 tons & Condensing Units > 11.4 tons	Tier 1	12.60	11.40	\$83.32
Rooftop Units & Split Systems 11.4-19.9 tons & Condensing Units > 11.4 tons	Tier 2	13.40	11.40	\$135.02
Rooftop Units & Split Systems 11.4-19.9 tons & Condensing Units > 11.4 tons	Tier 3	14.00	11.40	\$218.82
Rooftop Units & Split Systems 11.4-19.9 tons & Condensing Units > 11.4 tons	Tier 4	17.50	11.40	\$354.62
Rooftop Units & Split Systems 20-63.3 tons	Tier 1	12.00	10.10	\$50.51
Rooftop Units & Split Systems 20-63.3 tons	Tier 2	12.60	10.10	\$81.38
Rooftop Units & Split Systems 20-63.3 tons	Tier 3	13.30	10.10	\$131.12
Rooftop Units & Split Systems 20-63.3 tons	Tier 4	15.00	10.10	\$211.27
Rooftop Units greater than 63.3 tons	Tier 1	12.00	9.90	\$94.37
Rooftop Units greater than 63.3 tons	Tier 2	12.80	9.90	\$157.23
Rooftop Units greater than 63.3 tons	Tier 3	14.00	9.90	\$261.97
Rooftop Units greater than 63.3 tons	Tier 4	16.00	9.90	\$436.47
Water-source Heat Pumps	Tier 1	13.50	13.50	\$163.64
Water-source Heat Pumps	Tier 2	15.00	15.00	\$245.45
Water-source Heat Pumps	Tier 3	16.00	16.00	\$327.27
Water-source Heat Pumps	Tier 4	18.00	18.00	\$490.91
PTAC	Tier 1		11.0	\$172.34
PTAC	Tier 2		11.5	\$254.77
PTAC	Tier 3		12.0	\$376.64
Air-Cooled Chillers - < 150 tons	Tier 1	10.2	14.5	\$48.86
Air-Cooled Chillers - < 150 tons	Tier 2	10.2	15.0	\$75.68
Air-Cooled Chillers - < 150 tons	Tier 3	10.2	16.0	\$105.05
Air-Cooled Chillers - < 150 tons	Tier 4	10.2	18.0	\$191.88
Air-Cooled Chillers - >= 150 tons	Tier 1	10.2	14.5	\$48.86
Air-Cooled Chillers - >= 150 tons	Tier 2	10.2	15.0	\$75.68
Air-Cooled Chillers - >= 150 tons	Tier 3	10.2	16.0	\$105.05
Air-Cooled Chillers - >= 150 tons	Tier 4	10.2	18.0	\$191.88

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

References:

1. NYSERDA (New York State Energy Research and Development Authority); NY Energy Smart Programs Deemed Savings Database - Source for coincidence factor
2. ASHRAE, 2007, Applications Handbook, Ch. 36, table 4, Comparison of Service Life Estimates
3. CBECS (Commercial Buildings Energy Consumption Survey), 2012 - Total Floor space of Cooled Buildings by Principal Building Activity - source of market segment distributions
4. NTG for custom cooling is historical and not changed.
5. Cypress, Ltd.
6. International Energy Conservation Code 2015
7. Building America, Research Benchmark Definitions, 2010 (see p. 10). <http://www.nrel.gov/docs/fy10osti/47246.pdf>
8. Midstream Vendor Data
9. California DEER Database 2008
10. Minnesota Office of Energy Security (MOES) 2008 Cooling Equivalent Full Load Hours
11. Incremental costs for MSHPs were determined from the NEEP Incremental Cost Study Phase 2 Report
12. MSHP equipment life is from Measure Life Report Residential and Commercial/Industrial Lighting and HVAC Measures; <http://library.cee1.org/content/measure-life-report-residential-and-commercialindustrial-lighting-and-hvac-measures>

Changes from 2015 / 2016 Plan

Rooftop Units, Split Systems, Water Source Heat Pump, Air cooled chillers, and PTAC rebates are earned in new Tier structure.
Incremental cost are adjusted according to updated information from registered distributors.
Equivalent Full Load Hours updated to merge several categories.
Flat Plate Heat Exchanger (Waterside Economizer) is removed from the prescriptive program and only available through custom applications.
Mini-Split Heat Pump added to the prescriptive program

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Custom Efficiency

Description:

Customer may apply for rebate under the Custom Efficiency product for gas or electric projects not listed under prescriptive rebate products. Each Custom Efficiency project will be analyzed individually by Xcel Energy. Technical variables required for the analysis will be obtained from the customer or vendor. Analysis will be based on standard engineering methodologies.

Algorithms:

Electrical energy savings and electrical demand savings will be calculated based on the project specific details. Each project will undergo an engineering review in accordance with standard engineering practices. The review will be in accordance with the calculation methodologies detailed in the prescriptive products where applicable.

Variables:

Operation and Maintenance Savings will be calculated for each specific project based on project details.

Measure lifetime will be calculated for each specific project based on project details.

Incremental equipment cost will be calculated for each specific project based on project details.

Inputs:

All variables for each project (equipment wattage, equipment efficiency, hours of operation, etc.) will be calculated for each specific project based on project details.

Assumptions:

A net-to-gross factor of 87% will be used for electric custom projects, referenced National Energy Efficiency Best Practices Report (<http://www.eebestpractices.com>)

Changes from Previous Filing

None

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Data Center Efficiency

Description:

Holistic: Customers may apply for rebates under the Data Center Efficiency product for measures not listed under prescriptive rebate products for this program.
Custom: Each Data Center efficiency project will be analyzed individually by Xcel Energy. Technical variables required for the analysis will be obtained from the customer or vendor. Analysis will be based on standard engineering methodologies.
Prescriptive: Commercial customers receive a rebate for installing electrically-commutated, backward-curved plug fans on computer room air conditioning units' (CRAC) supply fans in data centers instead of baseline forward-curved AC centrifugal fans in new or retrofit applications.

Program References:

Holistic Program Savings	Refer to the appropriate program to find all applicable formulas (Customer kW, Customer kWh, Customer PkW, etc.) or assumptions (Hours, Runtime, etc.) for prescriptive measures savings claimed through the holistic data center product architecture.
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Algorithms:

Custom Calculations:	Non-prescriptive electrical energy savings and electrical demand savings will be calculated based on the project-specific details. Each project will undergo an engineering review in accordance with standard engineering practices. Where prescriptive elements exist, the review will be in accordance with the calculation methodologies detailed in the prescriptive products.
Fan Power Reduction (kW)	= (Baseline Fan Power - Efficient Fan Power) * Typical % of CRAC Units in Use
Baseline Fan Power (kW)	= Fan HP * 0.7457 kW/HP
Efficient Fan Power (kW)	= Fan HP * 0.7457 kW/HP * Comparison Load Factor
Comparison Load Factor	= (Base Efficiency Adjustment Factor / Proposed Efficiency Adjustment Factor) - Underfloor Distribution Savings Factor (when applicable)
Base Efficiency Adjustment Factor	= Baseline Fan Efficiency * Baseline Belt Efficiency * Baseline Motor Efficiency
Proposed Efficiency Adjustment Factor	#REF!
Cooling Interaction kW	= Fan Cooling Load (tons) * Cooling System kW/ton [per temperature bin]
Cooling Interaction kWh	= Cooling Interaction kW * Cooling System Hours [per temperature bin]
Fan Cooling Load (tons)	= Fan Power Reduction (kW) * 3413 / 12000
Gross kW Saved at Customer per Unit (kW)	= Fan Power Reduction + Cooling Interaction kW
Gross Coincident kW Saved at Customer per Unit(kW)	= Gross kW Saved at Customer per Unit * Coincidence Factor
Gross Annual kWh Saved at Customer per Unit (kWh/yr)	= (Fan Power Reduction * Fan Hours of Operation) + Cooling Interaction kWh

Algorithms For Plate and Frame Heat Exchangers:

Gross Annual kWh Saved at Customer	= (Coeff_A * (T_WB_Onset ^ 2) + Coeff_B * (T_DB_Balance ^ 2) + Coeff_C * T_WB_Onset * T_DB_Balance + Coeff_D * T_WB_Onset + Coeff_E * T_DB_Balance + Coeff_F) * EFLH_Segment / Coeff_G * Chiller IPLV_Existing / BaseCase IPLV * FPHX_Tons / 100
Gross kW Saved at Customer	= Gross Annual kWh Saved at Customer / FPHX_EFLH
FPHX_EFLH	= Gross Annual kWh Saved at Customer / Chiller_IPLV_Existing / FPHX_Tons
FPHX_Slope	= (Chiller_Peak_Tons - Zero_Load) / (T_DB_Design - T_DB_Balance)
FPHX_Intercept	= Chiller_Peak_Tons - (FPHX_Slope * T_DB_Design)
FPHX_Tons	= Minimum of (FPHX_Slope * T_DB_Onset + FPHX_Intercept OR HX_Actual_Tons)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Variables:	Value	Description
Custom Project - Operation and Maintenance Savings	#	Will be calculated for each specific project based on project details.
Custom Project - Measure Lifetime	#	Will be calculated for each specific project based on project details.
Custom Project - Incremental Cost	#	Will be calculated for each specific project based on project details.
Underfloor Distribution Savings Factor	13.30%	Additional Fan Energy Savings Caused by Mounting EC Fans Below the CRAC Unit For Underfloor Air Distribution (Derived from Results in Ref 2). This value is not used if the efficient fans will not be installed underfloor.
Baseline Fan Efficiency	53.81%	Efficiency of baseline forward-curved fans. Computed by taking the average of two values: the efficiency given by Ref 7 for the input motor size and the societal average value used in California given by Ref 8
Baseline Belt Efficiency	95%	Percentage of energy input into the belt drive from the baseline fan motor that passes to the impeller, averaged over the lifetime of the belt, since the belt's efficiency deteriorates over time (Ref 7)
Baseline Motor Efficiency	91.18%	Efficiency of baseline fan motor. This value is dependent on the motor size and is calculated by interpolating within the NEMA Premium Motor Efficiency Table and using the motor type (number of poles, open/closed) distribution assumption to find the average NEMA Premium efficiency for that motor size. (Ref 10)
Proposed Fan Efficiency	65.97%	Efficiency of efficient (EC) fan motor. This value is derived from manufacturer efficiency data on various sizes of EC fan collected from several sources (Ref 8, 11, 12).
Proposed Drive Efficiency	99.50%	Percentage of energy input into the motor drive from the EC fan motor that passes to the impeller, averaged over the lifetime of the drive, since the drive's efficiency deteriorates over time (Ref 7)
Proposed Motor Efficiency	88.96%	Efficiency of the EC fan motor. This value is dependent on the motor size and is calculated by inputting the motor size into each of three motor efficiency cubic curve fits derived from curves in Ref 5 and applying the motor type (number of poles) distribution assumption below to find the average EC motor efficiency for that motor size.
Coincidence Factor	100%	Assumed, based on the fact that most data centers operate 24/7
Existing CRAC Unit Age	10	Assumed age of existing CRAC unit that the fan(s) will be installed in, based on information in Ref 3. This value is used to determine the Retrofit measure lifetime value.
Typical % of CRAC Units In Use	83%	Assumed % of total CRAC units in the facility that will be operating simultaneously. Many data centers use redundancy for backup capacity, meaning some fans installed in CRAC units will be installed in units that do not operate regularly. To account for this in forecasting and for Net-to-Gross, a %-in-use value is used. This value was derived from a sample of custom rebate projects in Colorado involving CRAC units in data centers.
Average Cost per Fan, Retrofit	\$4,386.00	Estimated average cost of retrofitting an EC fan onto an existing CRAC unit. Derived from a sample of custom rebate projects in Colorado involving EC fan replacements.
Average Cost per Fan, New (Incremental)	\$1,700.00	Estimated average cost of selecting an EC fan option over a baseline fan option when purchasing a new CRAC unit. This comes from a Colorado custom rebate project.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Variables For Plate and Frame Heat Exchangers:

T_DB_Design	93.5°F	Design Temperature for Front Range cooling calculations.
	96.6°F	Design Temperature for Western Slope cooling calculations.
	84.2°F	Design Temperature for Mountain cooling calculations.
EFLH_Segment	See Table 3	= Equivalent Full Load Hours. The equivalent number of hours that the equipment would be running at full load over the course of the year.
Zero_Load	0	Chiller load when no call for cooling in building. Used in calculation of building chiller load profile.
FPHX_Coeff_A through FPHX_Coeff_G	See Table 4	= Values for the coefficients based on customer Market Segment. Coefficients resulted from a multivariable data regression analysis to estimate the energy savings based on Flat Plate HX Onset Wetbulb Temperature and the building balance point for a FPHX sized to offset 100 tons building load. The resulting savings are scaled based on market segment hours and customer provided HX tons as part of the overall FPHX formula above.
BaseCase_IPLV	0.57	kW/ton assumed in building the multivariable regression for Flat Plate Heat Exchanger kWh savings.
Added Tower kW/ton	0.1 kW/ton (Reference 5)	Average additional power use of the Cooling Tower due to the installation of the heat exchanger (tower fans will need to run more to bring down the water temperature to meet the cooling load directly as opposed to providing normal condenser water temps for the chiller). This is built into the regression analysis and part of the estimated kWh savings.

Inputs:	Default Value	Description
Custom Project	#	All variables for each project (equipment wattage, equipment efficiency, hours of operation, etc.) will be calculated for each specific project based on project details.
Number of Fans	#	Number of fans installed in this project, customer input
Fan Power (HP)	#	Rated/nominal baseline forward curved fan motor power, customer input
Distribution Type	In-unit or Below-Floor	Air distribution type/fan location, either in-unit or underfloor. Customer must indicate whether the new EC fans will be installed in unit or underfloor
HVAC System Type	Chilled Water	HVAC system type serving the data center/CRAC units where the fans will be installed. There are five options and the customer must indicate which option best matches their system. The options are shown in Table 1 below.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Inputs For Plate & Frame Heat Exchangers (in addition to Default Value)		Description
T_WB_Onset	#	Onset Wet Bulb Temperature provided by the customer. This is the dry bulb temperature at which the chiller will be turned off and the FPHX turned on to make chill water.
T_DB_Balance	#	Building Balance Point Temperature, the outside air dry bulb temperature at which there is no cooling load. Not used to calculate Process and Data Center Market Segment loads which are assumed constant and independent of OSA DB temperature. This value is assumed to be -20 deg F for data center applications.
Chiller_Peak_Tons	#	Existing Chiller plant's maximum load in tons on a design summer day. If chiller nameplate tons are provided, clarification on quantity and manner of operation will also be required. For single chillers with only nameplate data an 85% factor will be applied to account for oversizing.
HX_Actual_Tons	#	Actual HX Capacity
Chiller_IPLV_Existing	#	Integrated Part Load Value (in kW/ton) for the existing chiller plant.
County / Zone	#	
Quantity Flat Plate Heat Exchangers	#	
Market segment	Data Center	

Assumptions:	Value	Description
Study-Based 'Custom Project NTG	100%	A net-to-gross factor of 100% will be used for Data Center projects that follow the study path.
Custom Project NTG	87%	A net-to-gross factor of 87% will be used for custom measures implemented in data centers to be consistent with the Custom product.
Holistic Prescriptive NTG	Per Program	Prescriptive products not associated with the study track will utilize the net-to-gross value indicated in their end use.
Fan Hours of Operation	8,760	Hours of operation for the CRAC unit fans
Chiller Efficiency (COP)	5.55	Assumed efficiency of data center central centrifugal chiller (ASHRAE 90.1-2001 (150-300 tons, centrif) page 34, Table 6.2.1L). Converted to kW/ton for use in the analysis.
DX Efficiency (EER)	9.5	Assumed efficiency of DX CRAC units (ASHRAE 90.1-2001 ($\geq 240,000$ BTU/h and $< 760,000$ BTU/h, air cooled DX) page 27, Table 6.2.1A). Converted to kW/ton for use in the analysis
Glycol-Cooled DX Efficiency (EER)	11	Assumed efficiency of glycol (water) cooled DX CRAC units (ASHRAE 90.1-2001 ($\geq 240,000$ BTU/h, water cooled air conditioners) page 27, Table 6.2.1A). Converted to kW/ton for use in the analysis.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Assumptions (Continued):	Value	Description
Cooling Tower Fan Energy (GPM/HP)	20	ASHRAE maximum cooling tower fan energy requirement (ASHRAE 90.1-2001 Centrif. Cooling Tower Fan Power, page 32, Table 6.2.1G) used to determine the cooling tower fan power/ton, along with the GPM/ton assumption.
Cooling Tower Sizing Factor (GPM/ton)	3	Standard cooling tower sizing rule of thumb (Ref 13,14,15)
Primary Chilled Water Pump Power (HP)	5	Assumed, based on assumed chiller size and typical primary pump size
Primary Chilled Water Pump Load	75%	Assumed, based on rule-of-thumb for pump load factor
Primary Chilled Water Pump Motor Efficiency	89.50%	Assumed, based on NEMA Premium motor efficiency for 5-hp motors
Chiller Size (tons)	150	Assumed, based on minimum chiller size within range used for chiller efficiency determination. This and the primary chilled water pump assumptions only affect the primary pump analysis and are only a very small portion of the total savings for this measure.
Measure Life (Retrofit)	10	Lifetime (in years) of the retrofit measure. This is based on subtracting the average CRAC unit age from the new construction lifetime.
Measure Life (New Construction)	20	Lifetime (in years) of the new construction measure. This is based on the primary cooling equipment lifetimes used in other Xcel Colorado programs, along with the California DEER 2013 lifetime for new chillers.
Desired Chilled Water Temperature (F)	45	Chilled water supply temperature. This is a typical value for most chilled water systems.
Cooling Tower Approach (F)	7	Cooling tower approach (difference between outdoor air wet bulb temperature and condensing temperature). Values can range from 4-12 F, but 7 is typical.
Cooling Tower Design Wet Bulb Temperature (F)	69	Assumed design wet bulb temperature for cooling towers installed in the relevant location (69 F used for CO), based on weather data.
Chiller Minimum Efficiency Dry Bulb Temperature (F)	93	Assumed design dry bulb temperature for chiller in the relevant location (93 F used for CO).
Chiller Maximum Efficiency Dry Bulb Temperature (F)	30	Assumed dry bulb temperature below which the chiller's efficiency will not decrease any further.
Dry Cooler Dry Bulb Approach Temperature (F)	15	Dry cooler approach (difference between outdoor air dry bulb temperature and condensing temperature). 15 F is the most common value (Ref 7)
Cooling Equipment Temperature-based Efficiency Improvement (%/F)	0.50%	Assumed efficiency improvement for chiller and DX systems (and, for simplicity, cooling tower fans) based on outdoor dry bulb temperature decrease (due to lower condenser pressure). Standard Xcel Energy assumption for cooling interaction.
Distribution of AC Motors by Type	16.67%	Assumed distribution of the six AC motor types: TEFC with 2, 4, and 6 poles, and ODP with 2, 4, and 6 poles. For simplicity, it is assumed that all six occur with equal frequency.
Distribution of EC Motors by Type	33.33%	Assumed distribution of the three EC motor types: 2, 4, and 6-poles. For simplicity, it is assumed that all three occur with equal frequency.
Existing Motor Load Factor	75.00%	Assumed load factor on existing CRAC/CRAH fan. This value is consistent with our other prescriptive programs for constant speed fans.
Deemed Baseline Motor BHP for New Construction	11.55	Assumed baseline motor HP for new construction applications.
Existing HX Redundancy	N/A	No other airside or waterside economizers are in operation
Reasons for HX Peak Coincident Operation	N/A	Projects will not have peak kW savings as wet bulb temp will be too high to provide a reasonable chill water supply temperature during peak summer periods.
HX Installation Location	N/A	Heat exchanger is installed in parallel with the chiller and will use existing cooling towers when in operation.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 1: Cooling System Efficiencies

HVAC System Type	Rated Efficiency	kW/ton	Notes
Chilled Water	5.55 COP	0.634	kW/ton is the rated efficiency
DX	9.5 EER	1.263	kW/ton is the rated efficiency
Glycol-Cooled DX	11 EER	1.091	kW/ton is the rated efficiency
Glycol-Cooled DX with Waterside Economizer	N/A	0.756	kW/ton is calculated from weather data and includes free cooling
Chilled Water with Waterside Economizer	N/A	0.407	kW/ton is calculated from weather data and includes free cooling

Table 2: Cooling Efficiency Table (kW/ton)

Temperature	Chilled Water	DX	Water-Cooled DX	Water-Cooled DX w/ WS Economizer	Chilled Water w/WS Economizer
Determinate Temperature: (dB/wB)	Wet Bulb	Dry Bulb	Dry Bulb	Dry Bulb	Wet Bulb
-3	0.4584	0.8653	0.8316	0.1231	0.0036
-1	0.4584	0.8653	0.8316	0.1231	0.0036
1	0.4584	0.8653	0.8316	0.1231	0.0036
3	0.4584	0.8653	0.8316	0.1231	0.0036
5	0.4584	0.8653	0.8316	0.1231	0.0036
7	0.4584	0.8653	0.8316	0.1231	0.0036
9	0.4584	0.8653	0.8316	0.1231	0.0043
11	0.4584	0.8653	0.8316	0.1231	0.0052
13	0.4584	0.8653	0.8316	0.1231	0.0065
15	0.4584	0.8653	0.8316	0.1231	0.0083
17	0.4584	0.8653	0.8316	0.1231	0.0108
19	0.4591	0.8653	0.8316	0.1231	0.0145
21	0.4601	0.8653	0.8316	0.1231	0.0202
23	0.4613	0.8653	0.8316	0.1231	0.0297
25	0.4645	0.8653	0.8316	0.1231	0.0468
27	0.4766	0.8653	0.8316	0.1231	0.0817
29	0.4903	0.8653	0.8316	0.1231	0.1141
31	0.4993	0.8716	0.8377	0.2252	0.1141
33	0.5202	0.8842	0.8498	0.3307	0.1141
35	0.5468	0.8968	0.8619	0.4397	0.1141
37	0.5924	0.9095	0.8741	0.5522	0.1141
39	0.6314	0.9221	0.8862	0.6682	0.6314
41	0.6385	0.9347	0.8984	0.7876	0.6385
43	0.6492	0.9474	0.9105	0.9105	0.6492
45	0.6514	0.9600	0.9226	0.9226	0.6514
47	0.6587	0.9726	0.9348	0.9348	0.6587
49	0.6735	0.9853	0.9469	0.9469	0.6735

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 2: Cooling Efficiency Table (kW/ton) (Continued)

Temperature	Chilled Water	DX	Water-Cooled DX	Water-Cooled DX w/ WS Economizer	Chilled Water w/WS Economizer
Determinate Temperature: (dB/wB)	Wet Bulb	Dry Bulb	Dry Bulb	Dry Bulb	Wet Bulb
51	0.6808	0.9979	0.9591	0.9591	0.6808
53	0.6871	1.0105	0.9712	0.9712	0.6871
55	0.6971	1.0232	0.9833	0.9833	0.6971
57	0.7086	1.0358	0.9955	0.9955	0.7086
59	0.7167	1.0484	1.0076	1.0076	0.7167
61	0.7172	1.0611	1.0198	1.0198	0.7172
63	0.7284	1.0737	1.0319	1.0319	0.7284
65	0.7303	1.0863	1.0440	1.0440	0.7303
67	0.7302	1.0989	1.0562	1.0562	0.7302
69	0.7512	1.1116	1.0683	1.0683	0.7512
71	N/A	1.1242	1.0805	1.0805	N/A
73	N/A	1.1368	1.0926	1.0926	N/A
75	N/A	1.1495	1.1047	1.1047	N/A
77	N/A	1.1621	1.1169	1.1169	N/A
79	N/A	1.1747	1.1290	1.1290	N/A
81	N/A	1.1874	1.1412	1.1412	N/A
83	N/A	1.2000	1.1533	1.1533	N/A
85	N/A	1.2126	1.1654	1.1654	N/A
87	N/A	1.2253	1.1776	1.1776	N/A
89	N/A	1.2379	1.1897	1.1897	N/A
91	N/A	1.2505	1.2019	1.2019	N/A
93	N/A	1.2632	1.2140	1.2140	N/A
95	N/A	1.2632	1.2140	1.2140	N/A
97	N/A	1.2632	1.2140	1.2140	N/A
99	N/A	1.2632	1.2140	1.2140	N/A
101	N/A	1.2632	1.2140	1.2140	N/A
103	N/A	1.2632	1.2140	1.2140	N/A

Table 3. Equivalent Full Load Hours by Building Type

Building Type / Market Segment	Front Range EFLH	Mountain EFLH
Data Centers	8,760	8,760

EFLH*- Zone 1 (Front Range/Denver); Zone 2 (Western State as represented by Grand Junction) and Zone 3 (Mountain Areas as represented by Alamosa)

Table 4: Plate and Frame Savings Formula Coefficients

	FPHX_Coeff_A	FPHX_Coeff_B	FPHX_Coeff_C	FPHX_Coeff_D	FPHX_Coeff_E	FPHX_Coeff_F	FPHX_Coeff
Data Center	(19.61)	-	-	10,079.26	-	(173,921.79)	8,760

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

References:

1. Lawrence Berkeley Laboratory Study: Demonstration of Intelligent Control and Fan Improvements in Computer Room Air Handlers (http://hightech.lbl.gov/documents/data_centers/lbnl-6007e.pdf)
2. Technical Note: Using EC Plug Fans to Improve Energy Efficiency of Chilled Water Cooling Systems in Large Data Centers, by Emerson Power Network (http://shared.liebert.com/SharedDocuments/White%20Papers/PlugFan_Low060608.pdf)
3. Bick Group Website FAQ (<http://www.bickgroup.com/data-center-ec-fans-for-data-centers.asp?w=1>)
4. "Energy Conservation and the Electronically Communicated Fan" from Rocky Mountain Utility Efficiency Exchange (<http://www.utilityexchange.org/rmuae/2013/ppt/Hegwood%20revised%20102513.pdf>)
5. EBM-Papst ASHRAE Presentation for Connecticut Chapter on 12/9/2010 (http://ctashrae.org/downloads/ashrae_2010_12_09_1.pdf)
6. Energy Tips: Replace V-Belts with Cogged or Synchronous Belt Drives (<http://www.nrel.gov/docs/fy00osti/27833.pdf>)
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9. York VDCF Direct-Drive Remote Air-Cooled Fluid Coolers Product Specifications (<https://cgproducts.johnsoncontrols.com/YorkDoc/195.29-EG2.pdf>)
10. Energy Savings Potential and Opportunities for High-Efficiency Electric Motors in Residential and Commercial Equipment, December 2013, US DOE (<http://energy.gov/sites/prod/files/2014/02/f8/Motor%20Energy%20Savings%20Potential%20Report%202013-12-4.pdf>)
11. Ziehl Abegg Fan Selection Tool (fanselect.net)
12. EBM-Papst Fan Selection Tool
13. Clg Plant Optimization (<http://academic.udayton.edu/kissock/http/EEB/LecturesAndHomework/23-CoolingPlantOptimization/CoolingPlantOptimization.docx>)
14. Georgia Tech Student Thesis (<http://www-old.me.gatech.edu/energy/students/liuthesis.pdf>)
15. Condenser Water Energy Savings (http://web.stanford.edu/group/narratives/classes/08-09/CEE215/ReferenceLibrary/Chillers/York%20Engineering%20Updates/Reduced%20condenser-water%20flow%20rate_energy-saving%20miracle%20or%20mirage.pdf)
16. Data from historic Xcel Energy Custom Efficiency cooling tower projects

Changes from Recent Filing

Added Plate/Frame Prescriptive TAs directly from cooling program as non-data center plate and frame HX's are now custom.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Business New Construction

Description:

This is a custom product including electric and gas measures. This product relies heavily on expert consultants in the design process; however, we will perform independent project review in accordance with standard engineering methods. Customer may apply for rebate under the New Construction product.

Algorithms:

Electrical and gas energy savings and electrical demand savings will be calculated based on the project-specific details. Each project will undergo an engineering review in accordance with standard engineering practices. Prescriptive items within the project will be handled through their respective deemed products.

Variables:

Net To Gross	Gas EDA NTG is 99% and Gas Energy Efficient Building track is 97%. Electric NTG for EDA and EEB are both 95%. Product requirements are well above code, so we feel free-ridership will be negligible.
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Assumptions:

Operation and Maintenance Savings will be calculated for each specific project based on project details.
Life of product is 20 years for gas and electric measures.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Energy Management Systems

Description:

This is a custom product including both gas and electric measures. Customer may apply for rebate under the EMS product. Each EMS project will be analyzed individually by Xcel Energy. Technical variables required for the analysis will be obtained from the customer or vendor. Analysis will be based on good engineering practices and standards.

Calculations:

Electrical and gas energy savings and electrical demand savings will be calculated based on the project-specific details. Each project will undergo an engineering review in accordance with standard engineering practices.

Assumptions:

A net-to-gross factor of 87% will be used for electric measures and a net-to-gross factor of 90% will be used for gas EMS projects.

A net-to-gross factor of 100% will be used for EIS measures, as they are new to the product.

Operation and Maintenance Savings will be calculated for each specific project based on project details.

Product life for automatically controlled measures is 15 years.

Lifetime for recommissioning measures is 7 years.

Lifetime for manual adjustments will be verified through on-site metering and will not exceed the term of the customer's enrollment in the program.

References:

1. 2015 CO EMS project data

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Heating Efficiency

Description:

Prescriptive rebates will be offered for Hot Water Boilers (Condensing and non-condensing), Commercial Water Heaters and various heating system improvements, high efficiency furnaces, high efficiency unit heaters that are either: power vented (83% efficiency), condensing ($\geq 90\%$ efficiency), or low-intensity tube radiant heaters. Electric rebates will be offered for furnaces with ECM fans, both for new furnaces and for retrofitting existing furnaces.

Gas Savings Algorithms:

New High Efficiency Boiler Savings (Gross Dth)	$= \text{Input Capacity} \times \text{Alt} \times (\text{Effb} / (\text{Effh} - \text{Adj}) - 1) \times \text{EFLH} / 1,000,000$
Boiler Tune Up savings (Gross Dth)	$= \text{Input Capacity} \times \text{Alt} \times (\text{Effb} / \text{Effh} - 1) \times \text{EFLH} / 1,000,000$
Outdoor Air Reset savings (Gross Dth)	$= \text{Input Capacity} \times \text{Alt} \times (1 - \text{Effh} / \text{Effb}) \times \text{EFLH} / 1,000,000$
Stack Dampers savings (Gross Dth)	$= \text{Input Capacity} \times \text{Alt} \times (1 - \text{Effh} / \text{Effb}) \times \text{EFLH} / 1,000,000$
Modulating Burner Controls savings (Gross Dth)	$= \text{Input Capacity} \times \text{Alt} \times (1 - \text{Effh} / \text{Effb}) \times \text{EFLH} / 1,000,000$
O2 Trim Control savings (Gross Dth)	$= \text{Input Capacity} \times \text{Alt} \times (1 - \text{Effh} / \text{Effb}) \times \text{EFLH} / 1,000,000$
New High Efficiency Furnace Savings (Gross Dth)	$= \text{Input Capacity} \times \text{Alt} \times (\text{Effb} / \text{Effh} - 1) \times \text{EFLH} / 1,000,000$
Steam Traps savings (Gross Dth)	$= \text{Leak_Rate} \times \text{Leak_Hours} \times \text{BTU_per_Pound} / \text{EFFb} / 1,000,000$
New Water Heater Savings (Dth)	$= (\text{Input Capacity} \times \text{Alt} \times (\text{Effh} / \text{Effb} - 1) \times \text{EFLH} + (\text{SLb} / \text{Effb} - \text{SLe} / \text{Effh}) \times \text{SLHrs}) / 1,000,000$
Pipe Insulation Savings (Dth)	$= \text{LF} \times \text{Hrs} \times (\text{BTU_per_foot_U} - \text{BTU_per_foot_I}) \times \text{Existing} / \text{EFFb}$
BTU_per_Foot_U	<p>= Heat loss per foot of uninsulated pipe</p> <p>$= [\text{Coef0} + (\text{Coef1} \times \text{DeltaT}) + (\text{Coef2} \times \text{DeltaT}^2) + (\text{Coef3} \times \text{DeltaT}^3)] / \text{EFFb}$</p> <p>'where the coefficients are selected based on the pipe size and an insulation thickness (both provided by customer).</p> <p>'Coefficient values are listed in Table 7.</p>
BTU_per_Foot_I	<p>= Heat loss per foot of uninsulated pipe</p> <p>$= [\text{Coef0} + (\text{Coef1} \times \text{DeltaT}) + (\text{Coef2} \times \text{DeltaT}^2) + (\text{Coef3} \times \text{DeltaT}^3)] / \text{EFFb}$</p> <p>'where the coefficients are selected based on the pipe size (provided by customer) and an insulation thickness of zero.</p> <p>'Coefficient values are listed in Table 7.</p>
DeltaT	$= (\text{Tfluid} - \text{Tambient})$
Unit Heater Savings (Dth)	$= \text{Output Capacity} \times \text{Alt} \times (1 / \text{Effb} - 1 / \text{Effh}) \times \text{EFLH-UH} / 1,000,000$
Dth_eff_radiant	$= \text{Rad Input Capacity} \times \text{Alt} \times \text{EFLH-UH} \times (1 - \text{IR Factor}) - \text{Dth_fan}$
EFLH-UH	$= \text{HDD} \times (24 \text{ Hrs/Day}) \times (\text{Oversize Factor_heat}) \times [1 / (\text{T_indoor} - \text{T_design})]$
HDD	$= \% \text{Conditioned} \times \text{Sum} (\text{T_indoor} - \text{T_avg})^{*}_{365 \text{ days}}$
Dth_fan	$= \text{Fan_kW} \times 3412 \times \text{FLH} / 1,000,000$
Fan_kW	$= \text{Fan_HP} \times 0.746 \times \text{LF} / \text{Mtr_eff}$
Fan_HP	$= \text{kBtu/hr_heat} \times \text{HP/BTUh} \times 1000$

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Custom Boiler savings (Dth)	Gas energy savings and any associated savings or increase in electrical energy will be calculated based on the project specific details. Each project will undergo an engineering review in accordance with standard engineering practices. The review will be in accordance with the calculation methodologies detailed in the prescriptive products where applicable.
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Electric Savings Algorithms:

EC Fan Savings Customer kWh	$=(\text{Heating_kW_PSC} - \text{Heating_kW} \times \text{Heat_EFLH} + (\text{Cooling_kW_PSC} - \text{Cooling_kW}) \times \text{Cool_EFLH} + (\text{Ventilation_kW_PSC} - \text{Ventilation_kW}) \times \text{Ventilation_Only_Hours} + \text{Cooling_kWh_Savings})$				
	Area	Cooling	Without Cooling	with Cooling	without Cooling
	Denver / Front Range	1474	1464	1134	1150
	Alamosa / Mountain	1616	1636	1131	1175
	Grand Junction / Western Slope	1469	1643	1155	1360
EC Fan Savings Customer kW					
	Area	New Units With Cooling	New Units Without Cooling	Retrofit Units with Cooling	Retrofit Units without Cooling
	Denver / Front Range	0.412	0.455	0.317	0.358
	Alamosa / Mountain	0.430	0.453	0.301	0.325
	Grand Junction / Western Slope	0.395	0.524	0.311	0.433

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Cooling_kWh_Savings	$= \text{Cooling_kW_Savings} \times \text{Cool_EFLH}$ $= \text{New_Motor_Hp} \times 172 \text{ for Denver / Front Range}$ $= \text{New_Motor_HP} \times 104 \text{ for Alamosa / Mountain}$ $= \text{New_Motor_HP} \times 244 \text{ for Grand Junction / Western Slope}$
Cooling_kW_Savings	$= \text{kW/ton} \times (\text{Cooling_kW_PSC} - \text{Cooling_kW}) \times 3.413 / 12 = \text{New_Motor_HP} \times 0.225$
Peak Coincident KW	$= \text{Customer kW} \times \text{Coincidence Factor}$
Heating Penalty	$= -(\text{Heating_kW_PSC} - \text{Heating_kW}) \times 3413 \times \text{Heat_EFLH} / 1,000,000 / \text{EFFb},$ $= \text{New_Motor_HP} \times \$-8.04 \text{ for Denver / Front Range}$ $= \text{New_Motor_HP} \times \$-11.82 \text{ for Alamosa / Mountain}$

Variables:

Input Capacity	$= \text{Rated input BTUH nameplate data for the new boiler, furnace, unit heater, or water heater.}$
Alt	$= \text{Altitude Adjustment factor to adjust the sea level manufacturer's rated input for altitude effects} = 0.891$
EFFb	$= \text{Efficiency of Baseline equipment. Refer Table 1 below}$
EFFh	$= \text{Efficiency for higher efficiency equipment. Refer Table 1 below.}$
Adj	$= \text{Adjustment for operation at less than nominal efficiency}$ $= 5\% \text{ for condensing boilers (Ref 29)}$ $= 0\% \text{ for all other equipment}$
EFLH	$= \text{The equivalent full load heating hours for the boiler, furnace, or unit heater. Refer to Table 2 below.}$
1,000,000	$= \text{Conversion from BTU to Dth}$
Leak_Rate	$= \text{Leakage rate, pounds of steam per hour. High Pressure} = 11, \text{ Low Pressure} = 5 \text{ (Reference 24)}$
Leak_Hours	$= \text{Annual hours boiler lines are pressurized} = 6000 \text{ hours (Based on estimate of 30\% installed on systems operate year round, and 70\% installed on heating only systems.)}$

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

BTU_Per_Pound	<p><u>Low Pressure Applications:</u> = 1164 BTU per pound for lost to atmosphere, 964 BTU per pound lost to condensate. Assume 50/50 mix = 1064 BTU per pound. (Reference 24)</p> <p><u>High Pressure Applications:</u> = 1181 BTU per pound for lost to atmosphere, 981 BTU per pound lost to condensate. Assume 50/50 mix = 1081 BTU per pound. (Reference 24)</p>
Input Capacity	= Rated input capacity of the hot water heater (provided by customer)
Effh	= The rated efficiency of the new water heater, provided by the customer
Effb	= The minimum water heater thermal efficiency allowed by the federal standard = 80%
SLb	= Standby Losses for baseline storage water heater = 13.21 BTUH per gallon of storage (Ref 23)
Sle	= Standby Losses for efficient water heater = 8.90 BTUH per gallon of storage (ref 23)
SLHrs	= Standby loss hours for commercial water heaters = 8,760 hrs/yr
LF	= Linear feet of insulation installed, provided by the customer.
Hrs	=The operating hours for the boiler system. Refer to Table 3 below.
T _{fluid}	= Average temperature of the fluid in the pipe receiving insulation in degrees F, provided by the customer.
T _{ambient}	= Average temperature of the space surrounding the pipe. We will ask the customer if the pipe is in a conditioned space or outside. We will use 70 degrees for conditioned spaces and 51 degrees for outside domestic hot water (full year average) and 44 degrees for outside space heating (average excluding June-September) which are the average TMY3 temperatures for Colorado. (Ref 10)
Existing	= Pipe insulation savings multiplier to determine credit if existing deteriorated insulation is being replaced. We will use 1 if no existing insulation is present and 0.25 if existing insulation is being replaced.
kBtu/hr_heat	= Rated output kBTU/h of the unit heater; provided by customer.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Rad Input Capacity	= Rated capacity/input of the new radiant heater, in kBTU/h, provided by customer
%conditioned	= Percentage of the time during heating season the space is heated, provided by customer
T_indoor	= Space temperature set point of space being heated, provided by customer
T_avg	= Average daily outdoor dry bulb temperature for the given location for each day of the year, calculated from TMY3 weather data
HP/BTUh	=Average fan power (rated) per BTU/h of heating output. Taken from manufacturer data for 38 unit heaters from Trane and Sterling. =1.8990E-6 for axial/propeller fans, 4.0377E-6 for centrifugal/blower fans.
Oversize Factor_heat	= Factor to account for design oversize commonly found on unit heater installations. = 0.9 (Ref 1)
T_design	= Design temperature for the given location, = -1.5 F for Denver (Ref 2)
LF	= Design load factor of fan motor, deemed at 0.8 based on typical engineering assumption
Heat_base	= Thermal efficiency of the baseline, non-power-vented, code-compliant unit heater. = 0.8 (Ref 3)
Heat_eff	= Thermal efficiency of the new, efficient unit heater. Refer to Table 1 below.
Heat_eff_radiant	= Thermal efficiency of the new, radiant heater. = 0.80, same as baseline because the radiant heaters do not have specific combustion efficiency improvements over the baseline unit heater, their savings are all from radiation heat transfer versus convection. Also, Ref 5 uses this value.
Radiation Size Factor	= Factor to account for the fact that radiant heaters should be designed smaller than an equivalent standard unit heater due to radiation heat transfer being more effective at producing thermal comfort. This also accounts for the lower room temperature afforded by radiant heaters. = 0.85 (Ref 4)
Mtr_eff	= Average efficiency of 6 unit heater fans, calculated by taking the manufacturer-provided (Reznor, Sterling, and Trane) current draw to calculate power consumption and working backwards with the rated motor power and an assumed load factor of 0.8 to compute the efficiency for each fan and then taking the average of all of the fans. = 0.296 and includes both axial and centrifugal fans.
0.746	= Conversion factor from HP to kW
1,000	= Conversion factor from kBTU/h to BTU/h

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

3,412	= Conversion factor from kW to BTU/h
heat EFLH	= Annual Equivalent Full Load Hours (EFLH) of the furnace for heating = 950 (same as efficient furnace measure) for Denver/Front Range, 1396 for Alamosa/Mountain, and 856 for Grand Junction/Western Slope.
Occ Hours	= Annual operating hours of the space served by the furnace, assumed to be equal to the operating hours of a typical office, as used in the Lighting Efficiency program (2567 hours)
Op_Hrs	= Combined heating and cooling full load hours occurring during unoccupied hours plus Occ Hours. Calculated using bin hours and the assumed balance point of 57F. This value is location specific. For projects without cooling, this value does not include any cooling full load hours. For projects with cooling, in Denver/Front Range: 3579 hours, in Alamosa/Mountain: 3755, in Grand Junction/Western Slope: 3717. For projects without cooling, in Denver/Front Range: 3215 hours, in Alamosa/Mountain: 3611 hours, in Grand Junction/Western Slope: 3139 hours
Heating_kW_PSC	0.707
Cooling_kW_PSC	0.880
Ventilation_kW_PSC	0.747
Cool EFLH	= Annual Equivalent Full Load Hours of the furnace in cooling mode, calculated by estimating building loads based on outdoor conditions and building balance point (balance point set by heating EFLH analysis at 57F) = 765 Hours for Denver/Front Range, 460 hours for Alamosa/Mountain, and 1083 hours for Grand Junction/Western Slope.
Ventilation Only Hours	= Annual Hours of the furnace in ventilation mode, calculated by subtracting the cooling and heating EFLH occurring during occupied hours from Op Hrs, = 1865 hours in Denver/Front Range, 1900 hours in Alamosa/Mountain, and 1779 hours in Grand Junction/Western Slope with cooling and 2265 hours with no cooling in Denver/Front Range, 2215 hours with no cooling in Alamosa/Mountain, and 2567 hours with no cooling in Grand Junction/Western Slope
kW/ton	= Efficiency of air conditioning system, calculated by taking new baseline SEER of 13, dividing by 1.1 to get EER and then taking 12/EER to get kW/ton (1.015)
Cooling_kW	0.709
Heating_kW	0.271
Ventilation_kW	0.285
condeff	= Assumed efficiency of condensing furnace that EC fan will be installed in. Deemed at 90%, a typical value for thermal efficiency of a condensing furnace.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

3.413	= Conversion from Watts of power to BTU/h of heat
12,000	= Conversion from BTU/h to tons of cooling
ECM Coincidence Factor	= Ratio of average kW to peak kW (including cooling interactive effects) = 79.7% for Denver with Cooling, 100% for Denver without cooling, 47.9% for Mountain Areas with Cooling, 100% for Mountain Areas without Cooling, and 100% for the Western Slope with our Without Cooling.
Measure Life	= Length of time the boiler (or furnace) equipment will be operational = See table 10.
Incremental Cost	= Refer to Tables 3 to 8.
NTG	Net-to-gross = 86% Per 2011 Cadmus Program Evaluation and Michaels Energy Review.

Needed from Customer/Vendor/Administrator for Calculations:

For boilers:

Boiler size rated at sea level (BTUH)

New boiler type (Non-Condensing or Condensing)

Boiler Use (Space heating and/or water heating)

For steam traps:

High or low pressure

Incremental cost

For all but boilers, steam traps, and pipe insulation:

Heating Efficiency

Colorado

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Boiler size (BTUH)

Implemented measure

Incremental cost

For Insulation:

Linear feet of insulation added

Nominal diameter of pipe

Thickness of insulation

Insulation R-Value or thermal conductivity (k)

Average fluid temperature

Pipe location (conditioned space or not)

Pipe use (Space heating and/or water heating)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Was existing insulation replaced
Incremental cost

For Water Heaters:

Building type
Square footage served by water heater
Storage capacity (gallons); 0 if tankless
BTUH input
Other Water Heater BTUH Input
Thermal efficiency rating

For Furnaces:

New furnace size (BTUH)
New furnace efficiency

For Furnace fans:

New furnace fan size (hp)

For non-radiant unit heaters:

Space temperature set point
% of the time the space is heated
Output capacity of the unit heater in kBTU/h
Fan type (blower/propeller)

For radiant heaters:

Space temperature set point
% of the time the space is heated
Input capacity of the heater in kBTU/h

Assumptions:

- Each boiler or furnace is replaced with the same size on a 1 for 1 basis.
 - Only boilers used for space and/or domestic water heating can receive prescriptive rebates; other boilers must go through Custom Efficiency.
 - Assumed savings for boiler tune-up = 2% for non condensing boiler. This is an average value of the two years, 4% initial to no savings at the end of the two years. Life of product is 2 years. DOE states up to 5%.
 - Assumed savings for outdoor air reset on non condensing boilers = 3%. Life of product is 20 years. The Natural Gas consortium states up to 5% savings
 - Assumed savings for installing Stack dampers on non condensing boilers = 1%. Life of product is 20 years. Canada energy council, up to 4%
 - Assumed savings for modulating burner controls on non condensing boilers = 3%. Life of product is 20 years. The Natural Gas consortium states up to 4% savings
 - Assumed savings for O2 trim controls on non condensing boilers = 2%. Life of product is 20 years. The Natural Gas consortium states of 2 to 4% savings
 - The baseline efficiency for the furnace is based on 2015 IECC, minimum of 80%.
 - Thermal Efficiency as defined in ASHRAE 90.1-2007 indicates the total efficiency of the boiler equal to 100% fuel energy minus all losses.
 - Prescriptive rebates are only given for furnaces put into service, rebates are not given for backup furnaces.
 - Furnaces must have a minimum efficiency of 92% AFUE for a rebate, and 94% AFUE or higher efficiency will receive a larger rebate.
- Infrared heater is vented (has exhaust to exterior)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

"% Conditioned" is the percentage of the time that the space temperature set point is maintained

The infrared heater has no fan energy consumption (it may have a very small (<100W) fan to distribute hot exhaust, but that is ignored)

The fan full load hours equal the heating full load hours

Fan power per BTU/h is constant, regardless of fan size for each fan type

Heat produced by the fan is beneficial to heating the space

Fan motor efficiency is constant

Radiant heaters are low-intensity tube type

- Furnace fan will operate for ventilation during all business hours, assumed to be equal to the "office" lighting hours for the business lighting program technical assumption
- For furnace fan measure, cooling is assumed to be 13 SEER and heating 90% efficient
- The baseline PSC furnace fan motor is 2/3 the size of the new motor, based on Ref 20 and 21
- Furnace fan measure: there is no ventilation during unoccupied hours
- Climate zone assumed to be Denver, unless otherwise specified

Table 1: Heating Equipment Efficiencies				
	Baseline Efficiency (EFFb)	Efficient Efficiency (EFFh)	Unit	Reference
New Boilers (Non-Condensing) <300,000 BTU/h	80.0%	85.0%*	AFUE	Ref. 11
New Boilers (Non-Condensing) >= 300,000 BTU/h and <=2,500,000 BTU/h	80.0%	85.0%*	Et (Thermal Eff)	Ref. 11
New Boilers (Non-Condensing) >2,500,000 BTU/h	82.0%	85.0%*	Ec (Combustion Eff)	Ref. 11
New Boilers (Condensing) <300,000 BTU/h	80.0%	92.0%*	AFUE	Ref. 11
<=2,500,000 BTU/h	80.0%	92.0%*	Et (Thermal Eff)	Ref. 11
New Boilers (Condensing) >2,500,000 BTU/h	82.0%	92.0%*	Ec (Combustion Eff)	Ref. 11
Boiler Tune Up (Non-Condensing)	78.0%	80.0%		Ref. 12
Boiler Tune Up (Condensing)	87.2%	88.0%		Ref. 29
Outdoor Air Reset	80.0%	83.0%		Ref. 13
Stack Dampers	80.0%	81.0%		Ref. 14
Modulating Burner Controls	80.0%	83.0%		Ref. 15
O2 Trim Control	80.0%	82.0%		Ref. 16
Steam Traps	80.0%	N/A		Ref. 17
Commercial Furnaces	78.0%	92.0%*	AFUE	Ref. 3
	80.0%	92.0%*	Et (Thermal Eff)	Ref. 3
Water Heaters	80.0%	92.0%*		Ref. 18
Unit Heater (Non-condensing)	80.0%	83.0%*		Ref. 3
Unit Heater (Condensing)	80.0%	90.0%*		Ref. 3

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Pipe Insulation	80.0%	N/A	Ref 17
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*High efficiency boiler and furnace efficiencies are per customer. Listed efficiencies are minimum qualifying efficiencies.

Table 2: Effective Full Load Heating Hours			
Equipment	Use	Hours	Explanation
Boiler	Space Heating Only	769	Based on Bin Analysis assuming 30% oversizing for boiler plant. See "Forecast Boiler Op Hours " tab.
	Domestic Hot Water Only	674	
	Space Heating and Domestic Hot Water	1,443	Based on Bin Analysis assuming 30% oversizing for boiler plant. See "Forecast Boiler Op Hours " tab.
Furnace	All	950	
Commercial Water Heaters	All	1,092	Based on historical custom rebate projects from MN

Is this eligible? It isn't

Table 3: Hours for Pipe Insulation			
Use of Pipe	Location	Pipe Insulation Hours	Explanation
Domestic Hot Water	Inside	5,558	Hours when outside temp is above building balance point. Heat loss from pipe is wasted.
Domestic Hot Water	Outside	8,760	Domestic hot water available year round, outside temp is always less than 120 F.
Space Heating	Inside	1,648	Hours when boiler is running but outdoor temp is above building balance point
Space Heating	Outside	4,791	Hours that boiler is running

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Lighting - Small Business

Description:

Prescriptive rebates will be offered for replacement lighting equipment. New Construction rebates will be offered for new facilities or spaces overhauled for a new purpose. Custom rebates are available for lighting-related improvements that are not prescriptive.

Algorithms:

Electrical Demand Savings (Customer kW)	$= (kW_Base - kW_EE) \times HVAC_cooling_kWhsavings_factor$
Electrical Energy Savings (Customer kWh/yr)	$= (kW_Base - kW_EE) \times Hrs \times HVAC_cooling_kWhsavings_factor$
Natural Gas Savings (Dth)	$= (kW_Base - kW_EE) \times Hrs \times HVAC_heating_penalty_factor$
Lighting Controls -Electrical Energy Savings (Customer kWh/yr)	$= (kW_connected) \times (1-PAF) \times Hrs \times HVAC_cooling_kWhsavings_factor$
Lighting Controls -Electrical Demand Savings (Customer kW)	$= (kW_connected) \times (1-PAF) \times HVAC_cooling_kWhsavings_factor$
Lighting Controls -Natural Gas Savings (Dth)	$= (kW_connected) \times (1-PAF) \times Hrs \times HVAC_heating_penalty_factor$
Electrical Energy Savings (Gross Generator kWh)	$= Customer\ kWh / (1-TDLF)$
Electrical Demand Savings (Gross Generator kW)	$= Customer\ kW \times CF / (1-TDLF)$
Electrical Energy Savings (Net Generator kWh)	$= Gross\ Generator\ kWh \times NTG$
Electrical Demand Savings (Net Generator kW)	$= Gross\ Generator\ kW \times NTG$

Variables:

Hrs	= Annual Operating Hours. Hours to be obtained from Table 2. The type of facility is to be supplied by the customer.
kW_Base	= Baseline fixture wattage (kW per fixture) determined from stipulated fixture wattages from Standard Fixture information. Fixture type provided by customer. Table 4-5
kW_EE	= High Efficiency fixture wattage (kW per fixture) determined from stipulated fixture wattages from Standard Fixture information. Fixture type provided by customer. Table 4-5
HVAC_cooling_kWhsavings_factor	= Cooling system energy savings factor resulting from efficient lighting from Table 1. Reduction in lighting energy results in a reduction in cooling energy, if the customer has air conditioning. Existence of air conditioning to be provided by customer.
HVAC_cooling_kWhsavings_factor	= Cooling system demand savings factor resulting from efficient lighting from Table 1. Reduction in lighting demand results in a reduction in cooling demand, if the customer has air conditioning. Existence of air conditioning to be provided by customer.
HVAC_heating_kWhsavings_factor	= Heating system penalty factor resulting from efficient lighting. Reduction in lighting demand results in an increase in heating usage, if the customer has gas heating. A value of -0.000508 Dth/kWh given by (Reference 4).
CF	= Coincidence Factor, the probability that peak demand of the lights will coincide with peak utility system demand. CF will be determined based on customer provided building type in table 2.
Measure Life	= Length of time the lighting equipment will be operational, see Table 3 for Measure Lifetimes
Baseline Cost	= Cost of the baseline technology. For Retrofit, the cost is \$0.00 since the baseline is to continue to operate the existing system. For New Construction, the cost is that of the lower efficiency option. Costs by (Reference 4) and vendors.
High Efficiency Cost	= Cost of the High Efficiency technology. Costs given in tables 4-6 (Reference 4, 8) and vendors.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

kW connected	Total connected fixture load, determined as the sum of stipulated fixture wattages from Deemed Fixture Table 6.
PAF	Stipulated power adjustment factor based on control type from Table 7.
TDLF	Transmission Distribution Loss Factor = 6.50% , the percentage loss of electricity as it flows from the power plant to the customer, calculated using factors from Enhanced DSM Filing SRD-2
NTG	Net-to-gross = 84% for prescriptive measures (Reference 5) and 96% for Custom Efficiency Lighting and Lighting Redesign based on the additional influence.
Incremental operation and maintenance cost	= Other annual savings or costs associated with the electrical savings. For Lighting, this consists of additional natural gas for heating. Methodology given by Reference 2.

Provided by Customer:

Verified during M&V:

Number of Fixtures	Yes
Lighting equipment type	Yes
Building type	Yes
Existence of air conditioning	Yes

Assumptions:

- Each replacement lighting fixture is going in on a one-for-one basis for existing fixtures. New construction fixtures are put in on a one-for-one basis instead of lower efficiency options.
- In the Technical Assumptions, one will note that the Operating Hours does not appear, but rather a modified version. The methodology defines kW Savings on the basis of difference in kW with the HVAC Cooling demand factor. The Annual Energy Savings takes into account any heating that has to be added.

Table 1: HVAC Interactive Factors (Reference 2)

HVAC system	HVAC_cooling_kWhsavings_factor	HVAC_cooling_kW savings_factor	Heating Penalty	kW/Ton	COP
Heating only	1.00	1.00	-0.000508	-	-
Heating and cooling	1.10	1.26	-0.000508	-	-
Cooler Door Retrofit to LED Secondary Benefits Factor	1.44	1.44	0.000000	1.54	2.28
Freezer Door Retrofit to LED Secondary Benefits Factor	1.70	1.70	0.000000	2.46	1.43

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 2: Coincident Peak Demand Factors and Annual Operating Hours by Building Type (Reference 1 and 3 and 13)

Building Type	CF	Annual Operating Hours
24-Hour Facility	100%	8760
College	81%	3540
Cooler Door Retrofit to LED	87%	8760
Elementary School	71%	2422
Secondary School	58%	4311
Freezer Door Retrofit to LED	87%	8760
Grocery (All) / Big Box Retail (larger than 50,000 SF)	90%	5802
Health	75%	5095
Hospital	75%	6038
Hotel/Motel	21%	3044
Manufacturing	92%	5200
Night Time Exterior	0%	4903
Office	70%	4439
Other/Misc.	66%	4576
Restaurant	80%	3673
Retail	83%	4719
Safety or Code Required (Including Exit Signs)	100%	8760
Traffic Signals	50%	4380
Warehouse	70%	4746
Company Owned Street Lights	0%	4140

Table 3: Measure Lifetimes in Years (Reference 4,6,7)

Measure	Lifetime in Years
LED Interior Lamps	12
LED Interior Fixtures	20
LED Exterior Fixtures	20
Low Wattage T8 Lamps	8
Ballasted CFLs	20
Integrated 25W Ceramic Metal Halide	7
T8 Lighting Systems	20
T5 Lighting Systems	20
Lighting Controls	8
Stairwell Fixtures with Occupancy Sensors	14.4
LED Tubes (Insta-fit type only)	10
HID Fixture	20

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

LED High-bay Lamps	9.52
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Tables 4-7: Lighting Efficiency Technical Assumption Updates

The Company has historically filed an exhaustive list with specific lighting retrofit pairings for eligible equipment in the Lighting Efficiency rebate program (for example: CMH-GEN-20-1-Fixt-EB-XX-XX-XX, which is a xxx type of bulb with an xxx type of wattage). Given that LED pairing options are rapidly entering the marketplace and evolving at a fast pace, the Company is transitioning to providing the technical assumptions—bulb qualification criteria, rebate factors, preconditions, and others—rather than listing out each pairing in the Plan. This solution will provide continued transparency while allowing the program to evolve as new LED specifications enter the market. However, the Company will continue to maintain a full list of the pairings, updated on a quarterly basis, on our website: http://www.xcelenergy.com/Save_Money_&_Energy/Rebates/Lighting_Efficiency_-_CO

Lighting Pairing Technical Assumptions for Lamps, Fixtures and Controls:

Fluorescent:

A. Low-wattage T8 Fluorescent Lamps

Rebates are based on replacing 32W T8 lamps with 28W or 25W lamps.

B. Lighting Optimization

Rebates are based on the permanent removal of the equivalent of at least one 4-foot (T8) lamp from an 8-foot or 4-foot fixture as a result of a retrofit. Rebate amount is per fixture, based on the final quantity of lamps installed in each fixture. Reducing the quantity of fixtures does not qualify. In order to qualify, the fixture must be retrofitted such that the existing ballast(s) must be disconnected and removed, new lamp-quantity appropriate high-efficiency electronic ballast is installed, and the sockets for the eliminated lamps are removed. In addition, the customer may not remove more than 50% of the existing lamp quantity (e.g., replacing a 3-lamp system with a 1-lamp system is not allowed). High-efficiency electronic ballasts are required for all 4-foot T8 optimization rebates. A list of qualified ballasts can be found at <http://library.cee1.org/content/commercial-lighting-qualifying-products-listsh>. Customer must sign the line below the optimization rebate on page 4 of the rebate application to verify that optimization has occurred. Although Xcel Energy recommends customer follow IES guidelines, the final light levels are the responsibility of the customer.

C. High-Efficiency Ballast

New fixtures that include high-efficiency electronic ballasts qualify for this rebate. Approved ballasts must be listed by CEE at <http://library.cee1.org/content/commercial-lighting-qualifying-products-lists> to qualify. The high-efficiency ballast cannot be in addition, or added to, the optimization rebates. The high-efficiency ballast is already incorporated into the optimization rebate.

D. High-Bay Fluorescent T8, T8VHO and T5HO Lamps with High-Efficiency Electronic Ballasts

Rebates are based on a one-for-one replacement of HID fixtures (including mercury vapor, high-pressure sodium, metal halide, or pulse-start metal halide) ranging in size from 175W to 1000W. Rebates are available for T8, T8VHO systems or T5HO systems. High-efficiency electronic ballasts are required for all fixtures using 4-foot, 4-lamp or less T8 ballasts. Other fixture configurations will be considered under the Custom Efficiency program.

E. Compact Fluorescent Fixtures

Rebates are based on one-for-one replacement of incandescent fixtures with new hard-wired (dedicated) or modular fixtures containing pin-based compact fluorescent lamps (CFLs). For fixtures that house more than one lamp, the rebate is based on the total fixture wattage (i.e., one fixture that houses two 18W CFLs would be rebated as one 36W CFL fixture). Screw-base (integral) CFLs do not qualify. Two-foot low-wattage CFL rebate is paid per lamp.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

LED:

F. LED and LEC Exit Signs

Rebates are based on one-for-one replacement of incandescent exit signs to LED or LEC exit signs. CFL and photoluminescent exit signs do not qualify for a rebate. LED

G. LED Lamps and Luminaires (ENERGY STAR-qualified)

Rebates are based on one-for-one replacement of incandescent or halogen lamps with ENERGY STAR-qualified LED lamps (screw-based or pin-based). Rebates are based on wattage per lamp, not total fixture wattage. LED lamps and commercial downlight luminaires are required for prescriptive rebates. This is a midstream incentive implemented by a third-party and the incentive is paid directly to participating distributors. Small Business Lighting also has a Direct Install program which is completed by a third-party during site audits.

H. Commercial LED Downlight Luminaires (hardwired and screw in/retrofit) (ENERGY STAR-qualified)

Rebates are based on one-for-one full fixture replacement of incandescent fixtures with ENERGY STAR-qualified commercial LED hardwired and screw-in downlight luminaires. Rebates are based on HID lamp wattage and total fixture wattage (Fixture must be a commercial downlight; not all products listed qualify for rebates).

I. Exterior LED Canopy, Soffit and Wall Pack Fixtures (DLC QPL Required)

Rebates are based on one-for-one replacement of HID canopy, soffit or wall pack fixtures with LED fixtures rated for exterior use. Rebates are based on total fixture wattage. Wall packs can be installed in parking garages, however parking garage ceiling fixtures do not qualify for this rebate, but can be analyzed through Custom Efficiency. Wall packs must include wall pack terminology on spec sheet to qualify for rebate.

J. Refrigerated LED Case Lighting (DLC QPL Required)

Rebates are based on replacement of T12 or T8 linear 5 to 6 foot fluorescent refrigerated case door lighting with 5 to 6 foot LED refrigerated case door strip lighting. Rebates are per door, not per lamp. Linear LED tube lights do not qualify for this rebate, but can be analyzed through Custom Efficiency.

K. LED Troffer Fixture & Retrofit Kits (DLC QPL Required)

New fixtures and retrofit kits must be listed on the current DLC QPL to qualify for rebates. Rebates are based on a one-for-one fixture and retrofit kit replacement of existing linear fluorescent troffer systems to qualify for rebates. Eligible LED fixture types are 2X2, 2X1, 2X4, 1X4, and retrofit kits. LED T8 tubes do not qualify for the retrofit kit, but can be analyzed through Custom Efficiency.

L. LED Parking Garage Fixture (DLC QPL Required)

Eligible parking garage structures need to be either underground or semi-enclosed above ground. The lighting within the garage must operate 24 hours a day. Rebates are based on a one-for-one replacement of HID (including mercury vapor, high-pressure sodium, metal halide, or pulse-start metal halide) ranging in size from 100W–250W. LED retrofit kits are not available for prescriptive rebates, but can be analyzed through Custom Efficiency.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

M. Street and Area LED Lighting (DLC QPL Required)

Rebates are based on one-for-one replacement of HID fixture with LED fixtures rated for exterior use. Rebates are based on total fixture wattage.

N. LED High Bay Fixtures or Retrofit Kits (DLC QPL Required)

Rebates are based on one-for-one replacement of HID fixture with an LED fixture in a high-bay interior space. Retrofit kits that work within the existing HID fixture but use LED lamps are included in this measure, but use separate cost and energy assumptions. New construction fixtures are also included, using separate assumptions. Rebates for LED high bay type A replacement lamps will be based on a one-for-one replacement of an HID lamp with an LED lamp using the HID ballast, requiring only a lamp replacement with no re-wiring of the fixture.

O. LED Tubes (Linear lamps) (DLC QPL Required)

Rebates are based on one-for-one replacement of linear T8 fluorescent lamps with LED lamps in interior fixtures. Three different types of LED linear lamps are included using separate assumptions: insta-fit type lamps (require no re-wiring of fixture), direct-wired type lamps (requires re-wiring of fixture and removal of the ballasts), and external driver lamps (require removal of ballasts and installation of separate driver).

P. LED Downlight Fixtures

Each replacement lighting fixture is going in on a one-for-one basis for existing fixtures. New construction fixtures are put in on a one-for-one basis instead of lower efficiency options. These kits replace CFL downlights by entirely replacing the existing downlight fixture with an LED fixture.

Q. LED Plug Lamps (DLC QPL Required)

Each replacement lighting lamp is going in on a one-for-one basis for existing lamps. New construction lamps are put in on a one-for-one basis instead of lower efficiency options. Each LED lamp is required to be listed on the DesignLights Consortium Qualified Products list, and therefore must meet their minimum specification. These lamps replace 2-pin and 4-pin CFL lamps in a variety of fixtures.

R. LED Direct Linear Ambient Luminaires

Suspended- or surface-mounted luminaires or recessed luminaires, no wider than 12", designed to provide direct lighting in indoor spaces. Products may be designed to be installed end-to-end to create long chains, and may be described as direct, indirect, semi-direct, semi-indirect, or general ambient, depending on intended lighting distribution. Utilitarian "strip" style fixtures are also eligible under this category. Products intended for cove lighting are not currently eligible under this category.

S. Fixture identity with "Over"

Applied for lighting technologies where there is a discrete set of fixture options which results in a non-continuous set of input wattages. Customer was initially over lit, and we have deemed that an intermediate step to reduce the over lit condition was made before the decision to reduce input wattage again with LED retrofit fixture. Baseline input wattage is adjusted to deemed value and the replacement fixture cost is subtracted from the LED fixture cost to determine the project incremental cost. Examples

T. Fixture identity with "Under"

Applied for lighting technologies where there is a discrete set of fixture options which results in a non-continuous set of input wattages. Customer was initially under lit, and we have deemed that an intermediate step to increase the under lit condition was made before the decision to reduce input wattage with LED retrofit fixture. Baseline input wattage is adjusted to deemed value and the replacement fixture cost is subtracted from the LED fixture cost to determine the project incremental cost. Examples

U. Fixture identity with "Not-On-the-List"

Applied for lighting technologies where the range of available input wattages for a technology is relatively narrow (as compared to HID fixtures) and can essentially be viewed as a continuous range (there are many possible of lamps and ballasts for example). This approach essentially allows all baseline choices to be considered whether

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

or not they are listed in the choice list for any particular proposed input wattage. The deemed value for the “Not-On-the-List” identity is the average value derived from all

Automatic Controls:

V. Occupancy Sensors, Photocells and Stairwell Fixtures

Rebate is based on the type of sensor (wall vs. ceiling mount) as well as the connected load of each sensor. Stairwell fixtures may be 2–3 lamp T8 or 20W–30W LED and be controlled via an integrated occupancy sensor or step-dimming ballast. Fixture must operate in low-standby light level during vacancy and switch to full light output upon occupancy. The fixture cannot exceed 35% of full wattage during unoccupied periods. Low mode setting should be chosen so that the surface illumination levels are code compliant.

W. Standalone:

Occupancy sensors may be wall or ceiling mounted, and must be permanently installed; they can be passive infrared, ultrasonic or dual technology sensors. Photocells can only qualify for a rebate when controlling interior fixtures.

X. Integrated:

Automatic controls must be permanently integrated into the fixture to qualify for this rebate.

References:

1. State of Illinois Energy Efficiency Technical Reference Manual Final Technical Version as of July 18th, 2012. Effective June 1st, 2012, pg 139. (Hours)
2. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Colorado, presented on page 28 of
3. Database of Energy Efficient Resources 2008 Measure Energy Analysis Revisions Version (CF values)2008.2.05-09-11 Planning/Reporting Version
4. Deemed Savings Database, Minnesota Office of Energy Security, 2008. CF, Hours, kW, Costs, Measure life
5. Net-to-Gross factor from 2008 Xcel Energy Lighting Efficiency Program Evaluation
6. LED Lamp measure life based on average 2009 custom project LED life of 45,000 hours / weighted hours of operation average
7. LED Fixture measure life based on Xcel Energy Minnesota Lighting Efficiency Program average replacement fixture lifetime
8. LED Fixture costs based on Xcel Energy Custom Lighting Efficiency project costs
9. LED high bay and linear LED costs come from Xcel Energy Custom Lighting Efficiency projects, ShineRetrofits.com, LightingAtlanta.org, 1000bulbs.com, grainger.com, Pro Lighting.com
10. LED high bay and linear LED wattages come from Reference 9 and the Western Area Power Administration, San Diego Gas & Electric, the

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Lighting Efficiency

Description:

Prescriptive rebates will be offered for replacement lighting equipment. New Construction rebates will be offered for new facilities or spaces overhauled for a new purpose. Custom rebates are available for lighting-related improvements that are not prescriptive.

Algorithms:

Electrical Demand Savings (Customer kW)	= (kW_Base - kW_EE) x HVAC_cooling_kW_savings_factor
Electrical Energy Savings (Customer kWh/yr)	= (kW_Base - kW_EE) x Hrs x HVAC_cooling_kW_savings_factor
Natural Gas Savings (Dth)	= (kW_Base - kW_EE) x Hrs x HVAC_heating_penalty_factor
Lighting Controls -Electrical Energy Savings (Customer kWh/yr)	=(kW_connected) x (1-PAF) x Hrs x HVAC_cooling_kW_savings_factor
Lighting Controls -Electrical Demand Savings (Customer kW)	=(kW_connected) x (1-PAF) x HVAC_cooling_kW_savings_factor
Lighting Controls -Natural Gas Savings (Dth)	=(kW_connected) x (1-PAF) x Hrs x HVAC_heating_penalty_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

Variables:

Hrs	= Annual Operating Hours. Hours to be obtained from Table 2. The type of facility is to be supplied by the customer.
kW_Base	= Baseline fixture wattage (kW per fixture) determined from stipulated fixture wattages from Standard Fixture information. Fixture type provided by customer. Table 4-5
kW_EE	= High Efficiency fixture wattage (kW per fixture) determined from stipulated fixture wattages from Standard Fixture information. Fixture type provided by customer. Table 4-5
HVAC_cooling_kW_savings_factor	= Cooling system energy savings factor resulting from efficient lighting from Table 1. Reduction in lighting energy results in a reduction in cooling energy, if the customer has air conditioning. Existence of air conditioning to be provided by customer.
HVAC_cooling_kW_savings_factor	= Cooling system demand savings factor resulting from efficient lighting from Table 1. Reduction in lighting demand results in a reduction in cooling demand, if the customer has air conditioning. Existence of air conditioning to be provided by customer.
HVAC_heating_kW_savings_factor	= Heating system penalty factor resulting from efficient lighting. Reduction in lighting demand results in an increase in heating usage, if the customer has gas heating. A value of -0.000508 Dth/kWh given by (Reference 4).
CF	= Coincidence Factor, the probability that peak demand of the lights will coincide with peak utility system demand. CF will be determined based on customer provided building type in table 2.
Measure Life	= Length of time the lighting equipment will be operational, see Table 3 for Measure Lifetimes
Baseline Cost	= Cost of the baseline technology. For Retrofit, the cost is \$0.00 since the baseline is to continue to operate the existing system. For New Construction, the cost is that of the lower efficiency option. Costs by (Reference 4) and vendors.
High Efficiency Cost	= Cost of the High Efficiency technology. Costs given in tables 4-6 (Reference 4, 8) and vendors.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

kW connected	Total connected fixture load, determined as the sum of stipulated fixture wattages from Deemed Fixture Table 6.
PAF	Stipulated power adjustment factor based on control type from Table 7.
TDLF	Transmission Distribution Loss Factor = 6.50% , the percentage loss of electricity as it flows from the power plant to the customer, calculated using factors from Enhanced DSM Filing SRD-2
NTG	Net-to-gross = 99.2% (Reference 5)
Incremental operation and maintenance cost	= Other annual savings or costs associated with the electrical savings. For Lighting, this consists of additional natural gas for heating. Methodology given by Reference 2.

Provided by Customer:

Verified during M&V:

Number of Fixtures	Yes
Lighting equipment type	Yes
Building type	Yes
Existence of air conditioning	Yes

Assumptions:

- Each replacement lighting fixture is going in on a one-for-one basis for existing fixtures. New construction fixtures are put in on a one-for-one basis instead of lower efficiency options.
- In the Technical Assumptions, one will note that the Operating Hours does not appear, but rather a modified version. The methodology defines kW Savings on the basis of difference in kW with the HVAC Cooling demand factor. The Annual Energy Savings takes into account any heating that has to be added.

Table 1: HVAC Interactive Factors (Reference 2)

HVAC system	HVAC_cooling_kWhsavings_factor	HVAC_cooling_kW savings_factor	Heating Penalty	kW/Ton	COP
Heating only	1.00	1.00	-0.000508	-	-
Heating and cooling	1.10	1.26	-0.000508	-	-
Cooler Door Retrofit to LED Secondary Benefits Factor	1.44	1.44	0.000000	1.54	2.28
Freezer Door Retrofit to LED Secondary Benefits Factor	1.70	1.70	0.000000	2.46	1.43

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 2: Coincident Peak Demand Factors and Annual Operating Hours by Building Type (Reference 1 and 3 and 13)

Building Type	CF	Annual Operating Hours
24-Hour Facility	100%	8760
College	81%	3540
Cooler Door Retrofit to LED	87%	8760
Elementary School	71%	2422
Secondary School	58%	4311
Freezer Door Retrofit to LED	87%	8760
Grocery (All) / Big Box Retail (larger than 50,000 SF)	90%	5802
Health	75%	5095
Hospital	75%	6038
Hotel/Motel	21%	3044
Manufacturing	92%	5200
Night Time Exterior	0%	4903
Office	70%	4439
Other/Misc.	66%	4576
Restaurant	80%	3673
Retail	83%	4719
Safety or Code Required (Including Exit Signs)	100%	8760
Traffic Signals	50%	4380
Warehouse	70%	4746
Company Owned Street Lights	0%	4140

Table 3: Measure Lifetimes in Years (Reference 4,6,7)

Measure	Lifetime in Years
LED Interior Lamps	12
LED Interior Fixtures	20
LED Exterior Fixtures	20
Low Wattage T8 Lamps	8
Ballasted CFLs	20
Integrated 25W Ceramic Metal Halide	7
T8 Lighting Systems	20
T5 Lighting Systems	20
Lighting Controls	8
Stairwell Fixtures with Occupancy Sensors	14.4
LED Tubes (Insta-fit type only)	10
HID Fixture	20

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

LED High-bay Lamps	9.6
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Tables 4-7: Lighting Efficiency Technical Assumption Updates

The Company has historically filed an exhaustive list with specific lighting retrofit pairings for eligible equipment in the Lighting Efficiency rebate program (for example: CMH-GEN-20-1-Fixt-EB-XX-XX-XX, which is a xxx type of bulb with an xxx type of wattage). Given that LED pairing options are rapidly entering the marketplace and evolving at a fast pace, the Company is transitioning to providing the technical assumptions—bulb qualification criteria, rebate factors, preconditions, and others—rather than listing out each pairing in the Plan. This solution will provide continued transparency while allowing the program to evolve as new LED specifications enter the market. However, the Company will continue to maintain a full list of the pairings, updated on a quarterly basis, on our website: http://www.xcelenergy.com/Save_Money_&_Energy/Rebates/Lighting_Efficiency_-_CO

Lighting Pairing Technical Assumptions for Lamps, Fixtures and Controls:

Fluorescent:

A. Low-wattage T8 Fluorescent Lamps

Rebates are based on replacing 32W T8 lamps with 28W or 25W lamps.

B. Lighting Optimization

Rebates are based on the permanent removal of the equivalent of at least one 4-foot (T8) lamp from an 8-foot or 4-foot fixture as a result of a retrofit. Rebate amount is per fixture, based on the final quantity of lamps installed in each fixture. Reducing the quantity of fixtures does not qualify. In order to qualify, the fixture must be retrofitted such that the existing ballast(s) must be disconnected and removed, new lamp-quantity appropriate high-efficiency electronic ballast is installed, and the sockets for the eliminated lamps are removed. In addition, the customer may not remove more than 50% of the existing lamp quantity (e.g., replacing a 3-lamp system with a 1-lamp system is not allowed). High-efficiency electronic ballasts are required for all 4-foot T8 optimization rebates. A list of qualified ballasts can be found at <http://library.cee1.org/content/commercial-lighting-qualifying-products-listsh>. Customer must sign the line below the optimization rebate on page 4 of the rebate application to verify that optimization has occurred. Although Xcel Energy recommends customer follow IES guidelines, the final light levels are the responsibility of the customer.

C. High-Efficiency Ballast

New fixtures that include high-efficiency electronic ballasts qualify for this rebate. Approved ballasts must be listed by CEE at <http://library.cee1.org/content/commercial-lighting-qualifying-products-lists> to qualify. The high-efficiency ballast cannot be in addition, or added to, the optimization rebates. The high-efficiency ballast is already incorporated into the optimization rebate.

D. High-Bay Fluorescent T8, T8VHO and T5HO Lamps with High-Efficiency Electronic Ballasts

Rebates are based on a one-for-one replacement of HID fixtures (including mercury vapor, high-pressure sodium, metal halide, or pulse-start metal halide) ranging in size from 175W to 1000W. Rebates are available for T8, T8VHO systems or T5HO systems. High-efficiency electronic ballasts are required for all fixtures using 4-foot, 4-lamp or less T8 ballasts. Other fixture configurations will be considered under the Custom Efficiency program.

E. Compact Fluorescent Fixtures

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Rebates are based on one-for-one replacement of incandescent fixtures with new hard-wired (dedicated) or modular fixtures containing pin-based compact fluorescent lamps (CFLs). For fixtures that house more than one lamp, the rebate is based on the total fixture wattage (i.e., one fixture that houses two 18W CFLs would be rebated as one 36W CFL fixture). Screw-base (integral) CFLs do not qualify. Two-foot low-wattage CFL rebate is paid per lamp.

LED:

F. LED and LEC Exit Signs

Rebates are based on one-for-one replacement of incandescent exit signs to LED or LEC exit signs. CFL and photoluminescent exit signs do not qualify for a rebate. LED

G. LED Lamps and Luminaires (ENERGY STAR-qualified)

Rebates are based on one-for-one replacement of incandescent or halogen lamps with ENERGY STAR-qualified LED lamps (screw-based or pin-based). Rebates are based on wattage per lamp, not total fixture wattage. LED lamps and commercial downlight luminaires are required for prescriptive rebates. This is a midstream incentive implemented by a third-party and the incentive is paid directly to participating distributors.

H. Commercial LED Downlight Luminaires (hardwired and screw in/retrofit) (ENERGY STAR-qualified)

Rebates are based on one-for-one full fixture replacement of incandescent fixtures with ENERGY STAR-qualified commercial LED hardwired and screw-in downlight luminaires. Rebates are based on HID lamp wattage and total fixture wattage (Fixture must be a commercial downlight; not all products listed qualify for rebates).

I. Exterior LED Canopy, Soffit and Wall Pack Fixtures (DLC QPL Required)

Rebates are based on one-for-one replacement of HID canopy, soffit or wall pack fixtures with LED fixtures rated for exterior use. Rebates are based on total fixture wattage. Wall packs can be installed in parking garages, however parking garage ceiling fixtures do not qualify for this rebate, but can be analyzed through Custom Efficiency. Wall packs must include wall pack terminology on spec sheet to qualify for rebate.

J. Refrigerated LED Case Lighting (DLC QPL Required)

Rebates are based on replacement of T12 or T8 linear 5 to 6 foot fluorescent refrigerated case door lighting with 5 to 6 foot LED refrigerated case door strip lighting. Rebates are per door, not per lamp. Linear LED tube lights do not qualify for this rebate, but can be analyzed through Custom Efficiency.

K. LED Troffer Fixture & Retrofit Kits (DLC QPL Required)

New fixtures and retrofit kits must be listed on the current DLC QPL to qualify for rebates. Rebates are based on a one-for-one fixture and retrofit kit replacement of existing linear fluorescent troffer systems to qualify for rebates. Eligible LED fixture types are 2X2, 2X1, 2X4, 1X4, and retrofit kits. LED T8 tubes do not qualify for the retrofit kit, but can be analyzed through Custom Efficiency.

L. LED Parking Garage Fixture (DLC QPL Required)

Eligible parking garage structures need to be either underground or semi-enclosed above ground. The lighting within the garage must operate 24 hours a day. Rebates are based on a one-for-one replacement of HID (including mercury vapor, high-pressure sodium, metal halide, or pulse-start metal halide) ranging in size from 100W–250W. LED retrofit kits are not available for prescriptive rebates, but can be analyzed through Custom Efficiency.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

M. Street and Area LED Lighting (DLC QPL Required)

Rebates are based on one-for-one replacement of HID fixture with LED fixtures rated for exterior use. Rebates are based on total fixture wattage.

N. LED High Bay Fixtures or Retrofit Kits (DLC QPL Required)

Rebates are based on one-for-one replacement of HID fixture with an LED fixture in a high-bay interior space. Retrofit kits that work within the existing HID fixture but use LED lamps are included in this measure, but use separate cost and energy assumptions. New construction fixtures are also included, using separate assumptions.

O. LED Tubes (Linear lamps) (DLC QPL Required)

Rebates are based on one-for-one replacement of linear T8 fluorescent lamps with LED lamps in interior fixtures. Three different types of LED linear lamps are included using separate assumptions: insta-fit type lamps (require no re-wiring of fixture), direct-wired type lamps (requires re-wiring of fixture and removal of the ballasts), and external driver lamps (require removal of ballasts and installation of separate driver).

P. LED Downlight Fixtures

Each replacement lighting fixture is going in on a one-for-one basis for existing fixtures. New construction fixtures are put in on a one-for-one basis instead of lower efficiency options. These kits replace CFL downlights by entirely replacing the existing downlight fixture with an LED fixture.

Q. LED Plug Lamps (DLC QPL Required)

Each replacement lighting lamp is going in on a one-for-one basis for existing lamps. New construction lamps are put in on a one-for-one basis instead of lower efficiency options. Each LED lamp is required to be listed on the DesignLights Consortium Qualified Products list, and therefore must meet their minimum specification. These lamps replace 2-pin and 4-pin CFL lamps in a variety of fixtures.

R. LED Direct Linear Ambient Luminaires

Suspended- or surface-mounted luminaires or recessed luminaires, no wider than 12", designed to provide direct lighting in indoor spaces. Products may be designed to be installed end-to-end to create long chains, and may be described as direct, indirect, semi-direct, semi-indirect, or general ambient, depending on intended lighting distribution. Utilitarian "strip" style fixtures are also eligible under this category. Products intended for cove lighting are not currently eligible under this category.

S. Fixture identity with "Over"

Applied for lighting technologies where there is a discrete set of fixture options which results in a non-continuous set of input wattages. Customer was initially over lit, and we have deemed that an intermediate step to reduce the over lit condition was made before the decision to reduce input wattage again with LED retrofit fixture. Baseline input wattage is adjusted to deemed value and the replacement fixture cost is subtracted from the LED fixture cost to determine the project incremental cost. Examples include HID wall packs which have a range of 35 to 400 watts or more but are available only in input wattages of 35, 45, 70, 100, 125, 150, 175, 250 and 400 Watts (nominal values meant to illustrate baseline wattages, other input wattages exist).

T. Fixture identity with "Under"

Applied for lighting technologies where there is a discrete set of fixture options which results in a non-continuous set of input wattages. Customer was initially under lit, and we have deemed that an intermediate step to increase the under lit condition was made before the decision to reduce input wattage with LED retrofit fixture. Baseline input wattage is adjusted to deemed value and the replacement fixture cost is subtracted from the LED fixture cost to determine the project incremental cost. Examples include HID wall packs which have a range of 35 to 400 watts or more but are available only in input wattages of 35, 45, 70, 100, 125, 150, 175, 250 and 400 Watts (nominal values meant to illustrate baseline wattages, other input wattages exist).

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

U. Fixture identity with "Not-On-the-List"

Applied for lighting technologies where the range of available input wattages for a technology is relatively narrow (as compared to HID fixtures) and can essentially be viewed as a continuous range (there are many possible of lamps and ballasts for example). This approach essentially allows all baseline choices to be considered whether or not they are listed in the choice list for any particular proposed input wattage. The deemed value for the "Not-On-the-List" identity is the average value derived from all choices extant for a particular proposed input wattage selection. In other words, the several baseline choices for a proposed input wattage of 32 watts for an LED fixture has the available baseline choices averaged and the baseline cost reduced to determine kW savings and incremental cost and adjusts for both the over or under conditions. This process allows any baseline to be considered for a particular proposed input wattage obviating the need for a custom preapproval.

Automatic Controls:

V. Occupancy Sensors, Photocells and Stairwell Fixtures

Rebate is based on the type of sensor (wall vs. ceiling mount) as well as the connected load of each sensor. Stairwell fixtures may be 2–3 lamp T8 or 20W–30W LED and be controlled via an integrated occupancy sensor or step-dimming ballast. Fixture must operate in low-standby light level during vacancy and switch to full light output upon occupancy. The fixture cannot exceed 35% of full wattage during unoccupied periods. Low mode setting should be chosen so that the surface illumination levels are code compliant.

W. Standalone:

Occupancy sensors may be wall or ceiling mounted, and must be permanently installed; they can be passive infrared, ultrasonic or dual technology sensors. Photocells can only qualify for a rebate when controlling interior fixtures.

X. Integrated:

Automatic controls must be permanently integrated into the fixture to qualify for this rebate.

References:

1. State of Illinois Energy Efficiency Technical Reference Manual Final Technical Version as of July 18th, 2012. Effective June 1st, 2012, pg 139. (Hours)
2. HVAC Interactive Factors developed based on the Rundquist Simplified HVAC Interaction Factor method for Colorado, presented on page 28 of the 11/93 issue of the ASHRAE Journal - "Calculating lighting and HVAC interactions".
3. Database of Energy Efficient Resources 2008 Measure Energy Analysis Revisions Version (CF values)2008.2.05-09-11 Planning/Reporting Version
4. Deemed Savings Database, Minnesota Office of Energy Security, 2008. CF, Hours, kW, Costs, Measure life
5. Net-to-Gross factor from Evaluation of Xcel Energy's Lighting Efficiency Program. Dec 29 2015. The Cadmus Group, Inc.
6. LED Lamp measure life based on average 2009 custom project LED life of 45,000 hours / weighted hours of operation average
7. LED Fixture measure life based on Xcel Energy Minnesota Lighting Efficiency Program average replacement fixture lifetime
8. LED Fixture costs based on Xcel Energy Custom Lighting Efficiency project costs
9. LED high bay and linear LED costs come from Xcel Energy Custom Lighting Efficiency projects, ShineRetrofits.com, LightingAtlanta.org, 1000bulbs.com, grainger.com, Pro Lighting.com
10. LED high bay and linear LED wattages come from Reference 9 and the Western Area Power Administration, San Diego Gas & Electric, the Department of Veteran's Affairs, the Wisconsin Focus on Energy Technical Reference Manual, the Delaware Technical Reference Manual, the Mid-Atlantic Technical Reference Manual, e3tnw.org, and Delany, John. "Cost Effectiveness of Solid State Lighting" ComEd.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Motor & Drive Efficiency

Description:

Prescriptive rebates will be offered for new motors and replacement of currently operating motors up to 200 HP, installation of new variable frequency drives (VFD) up to 200 HP, installation of new VFD's on previously throttled water well pumps up to 200 HP, and installation of constant speed motor controllers (CSMC) on select applications from 5 HP up to 500HP.

Algorithms:

Motor Electrical Energy Savings (Customer kWh)	= HP x LF_Motors x Conversion x (1 / Standard_Eff - 1 / High_Eff) x Hrs x Refrigeration_Factor
Motor Electrical Demand Savings (Customer kW)	= HP x LF_Motors x Conversion x (1 / Standard_Eff - 1 / High_Eff) x Refrigeration_Factor
VFD Electrical Energy Savings (Customer kWh)	= HP x LF_Drives x Conversion x (1 / Standard_Eff) x Hrs x %_Savings_Drives x Refrigeration_Factor
VFD Electrical Demand Savings (Customer kW)	= HP x LF_Drives x Conversion x (1 / Standard_Eff) x %_Savings_Drives x Refrigeration_Factor
CSMC Electrical Energy Savings (Customer kWh)	= HP x kW_per_HP x Hrs
CSMC Electrical Demand Savings (Customer kW)	= HP x kW_per_HP
Water Well Pump VFD Algorithms:	
Well Pump VFD Electrical Energy Savings (Customer kWh)	= (Base_kW - VFD_kW) x Well Hours
Well Pump VFD Electrical Demand Savings (Customer kW)	= Base_kW - VFD_kW
VFD_kW	= VFD_BHP / Standard_Eff / VFD_Eff x Conversion
Base_kW	= Base_BHP / Standard_Eff x Conversion
VFD_BHP	= (Flow x VFD_Head) / (3960 x Design_Pump_Eff)
Base_BHP	= (Flow x Base_Head) / (3960 x Base_Pump_Eff)
Base_Pump_Eff	= -0.40205 x (%_Flow)^2 + 1.00876 x %_Flow + 0.20113
VFD_Head	= Static_Head + Flow_Coeff x (Flow)^2
Base_Head	= %_Design_Head x Design_Head
Static_Head	= % Flow x (Max_Well_Depth - Average_Well_Depth) + Average_Well_Depth
Flow_Coeff	= Peak_Dynamic_Head / (Design_Flow)^2
%_Design_Head	= -0.11656 x (%_Flow)^2 - 0.34465 x %_Flow + 1.46170
%_Flow	= Flow / Design_Flow
Peak_Dynamic_Head	= Design_Head - Max_Well_Depth

Variables:

Variable ID	Value	Description
Hrs	See Tables 1, 2, & 3	Annual operational hours per year of the motor. Deemed values are used for hours based on the type and use of the motor. The customer provides the following information on the rebate form: HP, industrial/non-industrial, building type, and compressor/pump/fan/other.
LF_Motors	75%	Motor load factor as a percentage. ³
LF_PumpDrives	75%	Pump drive load factor as a percentage. ⁵ Excludes water well pump VFD's.
LF_FanDrives	65%	Fan drive load factor as a percentage. ⁵
HP	Customer Input	Rated motor horsepower.
High_Eff	See Table 6	Efficiency of high efficiency replacement motor as a percentage. New Enhanced and Upgrade Enhanced are NEMA Premium plus 1%. The customer will provide the model and serial number of the motor along with actual nameplate efficiency from the new motor. If the actual efficiency is not provided by the customer, it will be determined from specification sheet.
Standard_Eff	See Table 6	Efficiency of standard replacement motor as a percentage. New Enhanced is NEMA Premium. Upgrade Enhanced are EPACT. Based on customer provided motor size, speed, and enclosure type.
%_Savings_Drives	33%	Average savings achieved by installing a VFD on a fan or pumping motor. ⁵
kW_per_HP_Escalator	0.066	Demand savings per HP for CSMC's on escalators. ^{9, 18}
kW_per_HP_Other	0.012	Demand savings per HP for CSMC's for all other qualifying applications. ^{7, 8, 9, 10}
Refrigeration_Factor	1+1/COP	Multiplier to include interactive effects of refrigeration or cooling energy to remove heat from the motor. Reduction in motor energy results in a reduction in refrigeration/cooling energy.
COP	See Table 4	Coefficient of Performance = Refrigeration/Cooling Capacity (BTU/hr) / Energy Input (BTU/hr)

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Well Pump VFD Variables:		
Well Hours	See Table 5	Number of hours per year the well pump will operate. Deemed values are used for hours based on the well pump application that will be provided by the customer.
VFD_Eff	97%	Drive efficiency of a VFD, deemed to be 97% using a table of drive efficiency versus percent of rated power using the motor rated power. ¹³
3960	3,960	Pump power equation constant used to convert units of feet of water and gallons per minute to HP.
Base_Pump_Eff	Calculated Value	Percent efficiency of the water well pump at a given percent of design flow rate. The algorithm is defined above and comes from a linear regression of a second-order polynomial on pump curve data (normalized to design head and flow) from Xcel well pump custom rebate projects. ¹⁴
Design_Pump_Eff	80.8%	Pumping efficiency at given conditions (% Flow). This algorithm comes from a second-order polynomial curve fit of achievable pump efficiency versus flow rate from custom rebates and their associated pump curves. The design pump efficiency is a constant value used at all flow rates for VFD driven pumps. ¹⁴
Design_Flow	Customer Input	Flow rate (in GPM) of well pump at design conditions.
Design_Head	Customer Input	Total head (in feet of water) of well pump at design conditions.
Flow	Customer Input	Flow rate (in GPM) of well pump at proposed operating conditions. If there are multiple flow rates at which the pump will operate, this is the time-weighted average of those flow rates.
Average_Well_Depth	Customer Input	Average water level in well, i.e. vertical distance (in feet), between the pump discharge and the water level.
Max_Well_Depth	Customer Input	Minimum level in well at design flow rate, i.e. how far below the pump discharge the water level is (in feet), when the pump is operating at design flow.
%_Design_Head	Calculated Value	Percent of design total pump head occurring at a given percent of design flow rate. The algorithm is defined above and comes from a linear regression of a second-order polynomial on pump curve data (normalized to design head and flow) from seven Xcel well pump custom rebate projects. ¹⁴
Other Variables:		
Conversion	0.746	Standard constant used to convert from HP to kW.
Coincidence Factor	78%	Probability that peak demand of the motor will coincide with peak utility system demand. Excludes water well pump VFD's. ²
Coincidence Factor VFD on Well Pump	38%	Probability that peak demand of well pump motor will coincide with peak utility system demand. ¹⁴
Measure Life_New Motor	20	Length of time the motor will be operational. ^{2, 3, 11}
Measure Life_Upgrade Motor	20	Length of time the motor will be operational. ^{2, 3, 11}
Measure Life_VFD	15	Length of time the VFD will be operational. ^{3, 11} Includes water well pump VFD's.
Measure Life_CSMC	20	Length of time the controller will be operational. ^{2, 11}
Incremental O&M Costs or Savings	\$0.00	
Incremental Cost_Motors	See Table 6	
Incremental Cost_VFD	See Table 7	All VFD's including water well pumps.
Incremental Cost_CSMC	See Table 3	
NTG_CSMC	95%	Net-to-Gross factor for CSMC's. ⁶
NTG_Other	65%	Net-to-Gross factor for motor replacement, VFD's, and custom products. ⁶

Inputs provided by customer:	Verified during M&V:
For Motors:	
New motor model and serial number (HP, efficiency, type, and speed can then be looked up in a database)	Yes
Application of motor (Industrial/non-industrial)	Yes
Building type where motor is installed for non-industrial motors	Yes
Use of motor (pump, fan, other) for non-industrial motors	Yes
Equipment is installed	Yes
For VFD's:	
Size, speed, type and use of motor drive is connected to (if speed & enclosure information is not available we will deem 1800 RPM, and the average between TEFC and ODP for the given motor HP)	Yes
Application of motor (Industrial/non-industrial)	Yes
Building type where motor is installed for non-industrial motors	Yes
Use of motor (pump, fan, other) for non-industrial motors	Yes
Equipment is installed	Yes
For Constant Speed Motor Controllers:	
Size of motor	Yes
Application of motor (Escalator/Other that qualify)	Yes
For Water Well Pump VFD's:	
Pump Rated HP	Yes
Design Flow (GPM)	Yes
Design Head (ft)	Yes
Well Depth (ft)	No
Max Well Depth at design flow (ft)	No
Average Flow Rate (GPM)	No
Application of well pump (agriculture, golf course, municipal, etc.)	Yes

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Assumptions:

- Each motor is replaced with the same size on a 1 for 1 basis. Motors replaced with different sizes can participate in the Custom Efficiency product.
- Prescriptive rebates are only given for motors put into service, rebates are not given for backup motors.
- Prescriptive rebates are only given to VFD's installed on centrifugal pump or fan applications.
- Rebates do not apply to rewind or repaired motors.
- Constant speed motor controllers are only eligible if installed on escalators, or industrial/commercial applications that cannot be shut off or slowed down during normal business operation, and operate at a load factor of less than 20% more than 65% of the time.
- COP for Low Temperature Applications and Medium Temperature Applications are from our anti-sweat heater projects, EC Motor custom projects, and are consistent with custom projects from various custom refrigeration applications.
- COP for Data Center Applications based on custom projects from various custom data center applications.

Water Well Pump VFD Assumptions:

- Existing system is controlled by a throttling valve.
- Pump efficiency for the proposed VFD case is constant at all flows and equal to the design pump efficiency. The baseline pump efficiency depends on the flow rate.
- Static head varies linearly with flow rate and ranges from static water level to max well depth.
- Backup well pumps do not qualify, only primary pumps.
- On-Peak operation (pump will operate below 100% speed during 9a-9p, M-F in summer).

Table 1: Operating Hours by Motor Size, Industrial Applications⁵

HP	Fans	Pumps	Air Compressor	Other
1	4,550	3,380	1,257	2,435
1.5	4,550	3,380	1,257	2,435
2	4,550	3,380	1,257	2,435
3	4,550	3,380	1,257	2,435
5	4,550	3,380	1,257	2,435
7.5	4,316	4,121	2,131	2,939
10	4,316	4,121	2,131	2,939
15	4,316	4,121	2,131	2,939
20	4,316	4,121	2,131	2,939
25	5,101	4,889	3,528	3,488
30	5,101	4,889	3,528	3,488
40	5,101	4,889	3,528	3,488
50	5,101	4,889	3,528	3,488
60	6,151	5,667	4,520	5,079
75	6,151	5,667	4,520	5,079
100	6,151	5,667	4,520	5,079
125	5,964	5,126	4,685	5,137
150	5,964	5,126	4,685	5,137
200	5,964	5,126	4,685	5,137
250	7,044	5,968	6,148	6,102
300	7,044	5,968	6,148	6,102
350	7,044	5,968	6,148	6,102
400	7,044	5,968	6,148	6,102
450	7,044	5,968	6,148	6,102
500	7,044	5,968	6,148	6,102

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 2: Operating Hours by Application for all products other than motor controllers, Non-Industrial³

Building Type	Operating Hours
Office HVAC Pump	2,000
Retail HVAC Pump	2,000
Hospitals HVAC Pump	2,754
Elem/Sec Schools HVAC Pump	2,190
Restaurant HVAC Pump	2,000
Warehouse HVAC Pump	2,241
Hotels/Motels HVAC Pump	4,231
Grocery HVAC Pump	2,080
Health HVAC Pump	2,559
College/Univ HVAC Pump	3,641
Office Ventilation Fan	6,192
Retail Ventilation Fan	3,261
Hospitals Ventilation Fan	8,374
Elem/Sec Schools Ventilation Fan	3,699
Restaurant Ventilation Fan	4,155
Warehouse Ventilation Fan	6,389
Hotels/Motels Ventilation Fan	3,719
Grocery Ventilation Fan	6,389
Health Ventilation Fan	2,000
College/Univ Ventilation Fan	3,631
Office Other Application	4,500
Retail Other Application	4,500
Hospitals Other Application	4,500
Elem/Sec Schools Other Application	4,500
Restaurant Other Application	4,500
Warehouse Other Application	4,500
Hotels/Motels Other Application	4,500
Grocery Other Application	4,500
Health Other Application	4,500
College/Univ Other Application	4,500
Data Center Pump	8,760
Data Center Fan	8,760
Low Temperature Case Fan	8,629
Medium Temperature Case Fan	8,629

Table 3: Operating Hours & Incremental Cost for Motor Controllers by Application, Non-Industrial³⁰

Building Type & Motor Application	Escalator	Industrial	Incremental Cost
5	4,500	2,435	\$918
7.5	4,500	2,939	\$918
10	4,500	2,939	\$918
15	4,500	2,939	\$918
20	4,500	2,939	\$933
25	4,500	3,488	\$1,012
30	4,500	3,488	\$1,091
40	4,500	3,488	\$1,300
50	4,500	3,488	\$1,497
60	4,500	5,079	\$1,796
75	4,500	5,079	\$1,943
100	4,500	5,079	\$2,389
125	4,500	5,137	\$3,087
150	4,500	5,137	\$3,784
200	4,500	5,137	\$4,655
250	4,500	6,102	\$4,655
300	4,500	6,102	\$4,755
350	4,500	6,102	\$4,855
400	4,500	6,102	\$4,955
450	4,500	6,102	\$5,055
500	4,500	6,102	\$5,155

Table 4: Coefficient of Performance

Application	COP
Low Temperature	1.43
Medium Temperature	2.28
Data Center	4.00

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 5: Operating Hours by Application for Well Pumps^{14, 15, 16, 17}

Application	Operating Hours
Agricultural Irrigation	1,954
Golf & Landscape Irrigation	1,941
Municipal Water Supply	3,177
Other Water Well Pump	3,630

References:

1. CEE (Consortium for Energy Efficiency) Premium Efficiency Motors Initiative - Source for premium motor efficiencies, EPA standard motor efficiencies
2. NYSERDA (New York State Energy Research and Development Authority), Energy Smart Programs Deemed Savings Database - Source for coincidence factor and useful life
3. Efficiency Vermont's Technical Reference User Manual, 2004 - Source for operating hours for non-industrial motors (p.15) and source for measure life, source for load factor
4. Not used
5. Office of Industrial Electric Motor Systems Market Opportunities Assessment : Department of Energy (assessment of 265 Industrial facilities in 1997) - Source for VSD opportunity in the US market along with load factors for fans and pumps along with average savings
6. Net-to-gross factor from Program Evaluation in 2010 by third party and other sources for new products.
7. Example is constructed based on the methodology presented in Esource Document, adapted to 200 hp motor. Originally from: Blake Ogden (January 2006), Senior Applications Engineer, Power Efficiency Corp., 702-697-0377 ext 101, bogden@powerefficiencycorp.com.
8. Installed costs gathered by E-Source presented in TAS-F-1, March 2007 from: Power Efficiency Corp.'s PowerGenius, Blake Ogden (January 2006) [4]; Somar International's Powerboss, Paul Isom(January 2007), Vice President for Business Development, Mialink Companies, paul@mialink.com; Motortronics' XLD Series, Southland Electrical Supply, from www.southlandelectrical.com (January 2007); and Magnetek's RVS-DN Series, Joliett
9. Engineering analysis performed by Xcel energy on installation of 164 controllers, Colorado custom project 404, 2009.
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11. Comprehensive Process and Impact Evaluation of the (Xcel Energy) Colorado Motor and Drive Efficiency Program, FINAL, March 28, 2011, TetraTech
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20. US Motor Online Catalog <http://ecatalog.motorboss.com/>
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US_VFD_PricingTool_Effective August_29_2015.xls
22. AC Drives and Soft Starters 8800PL9701R01/14 Class 8800. Schneider Electric Catalog. <http://www2.schneider-electric.com/resources/sites/SCHNEIDER_ELECTRIC/content/live/FAQS/174000/FA174840/en_US/Price%20Guide%208800PL9701R0114.pdf>
23. Motor and Drive Pricebook. TECO Westinghouse. Effective 6/14/15
24. RS Mean 2016 Cost Data Book

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Stipulated Values

Load Factor ³	75%	(1 HP = .746 kW)
Conversion	0.746	
Coincidence Factor ²	78%	
Measure Life New Motors ^{2, 3, 5}	20	
Measure Life Upgrade Motor ^{2, 3, 5}	20	

Table 6: Motor Efficiency and Incremental Costs^{1, 19, 20}

Motor Tag	HP	Speed	Type	EPACT Motor Efficiency	NEMA Premium Motor Efficiency	NEMA Premium +1% Motor Efficiency	NEMA Premium Installed Cost	NEMA Premium +1% Installed Cost
1 HP 900 RPM ODP	1	900	ODP	74.0%	75.5%	76.5%	\$637	\$769
1.5 HP 900 RPM ODP	1.5	900	ODP	75.5%	77.0%	78.0%	\$682	\$832
2 HP 900 RPM ODP	2	900	ODP	85.5%	86.5%	87.5%	\$680	\$829
3 HP 900 RPM ODP	3	900	ODP	86.5%	87.5%	88.5%	\$706	\$866
5 HP 900 RPM ODP	5	900	ODP	87.5%	88.5%	89.5%	\$740	\$914
7.5 HP 900 RPM ODP	7.5	900	ODP	88.5%	89.5%	90.5%	\$936	\$1,191
10 HP 900 RPM ODP	10	900	ODP	89.5%	90.2%	91.2%	\$1,067	\$1,376
15 HP 900 RPM ODP	15	900	ODP	89.5%	90.2%	91.2%	\$1,973	\$2,393
20 HP 900 RPM ODP	20	900	ODP	90.2%	91.0%	92.0%	\$2,179	\$2,684
25 HP 900 RPM ODP	25	900	ODP	90.2%	91.0%	92.0%	\$2,442	\$3,057
30 HP 900 RPM ODP	30	900	ODP	91.0%	91.7%	92.7%	\$2,639	\$3,335
40 HP 900 RPM ODP	40	900	ODP	91.0%	91.7%	92.7%	\$3,003	\$3,850
50 HP 900 RPM ODP	50	900	ODP	91.7%	92.4%	93.4%	\$3,269	\$4,227
60 HP 900 RPM ODP	60	900	ODP	92.4%	93.0%	94.0%	\$3,981	\$5,233
75 HP 900 RPM ODP	75	900	ODP	93.6%	94.1%	95.1%	\$4,612	\$6,127
100 HP 900 RPM ODP	100	900	ODP	93.6%	94.1%	95.1%	\$5,896	\$7,677
125 HP 900 RPM ODP	125	900	ODP	93.6%	94.1%	95.1%	\$7,057	\$9,319
150 HP 900 RPM ODP	150	900	ODP	93.6%	94.1%	95.1%	\$8,134	\$10,842
200 HP 900 RPM ODP	200	900	ODP	93.6%	94.1%	95.1%	\$9,764	\$13,148
250 HP 900 RPM ODP	250	900	ODP	94.5%	95.0%	96.0%	\$10,815	\$14,636
300 HP 900 RPM ODP	300	900	ODP	94.5%	95.0%	96.0%	\$13,293	\$18,140
350 HP 900 RPM ODP	350	900	ODP	94.5%	95.0%	96.0%	\$24,766	\$34,370
400 HP 900 RPM ODP	400	900	ODP	94.9%	95.1%	96.1%	\$28,224	\$39,260
450 HP 900 RPM ODP	450	900	ODP	95.3%	95.5%	96.5%	\$31,975	\$44,566
500 HP 900 RPM ODP	500	900	ODP	95.3%	95.5%	96.5%	\$33,093	\$46,149
1 HP 1200 RPM ODP	1	1200	ODP	80.0%	82.5%	83.5%	\$637	\$769
1.5 HP 1200 RPM ODP	1.5	1200	ODP	84.0%	86.5%	87.5%	\$682	\$832

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 6: Motor Efficiency and Incremental Costs^{1, 19, 20}

Motor Tag	HP	Speed	Type	EPACT Motor Efficiency	NEMA Premium Motor Efficiency	NEMA Premium +1% Motor Efficiency	NEMA Premium Installed Cost	NEMA Premium +1% Installed Cost
2 HP 1200 RPM ODP	2	1200	ODP	85.5%	87.5%	88.5%	\$680	\$829
3 HP 1200 RPM ODP	3	1200	ODP	86.5%	88.5%	89.5%	\$706	\$866
5 HP 1200 RPM ODP	5	1200	ODP	87.5%	89.5%	90.5%	\$740	\$914
7.5 HP 1200 RPM ODP	7.5	1200	ODP	88.5%	90.2%	91.2%	\$936	\$1,191
10 HP 1200 RPM ODP	10	1200	ODP	90.2%	91.7%	92.7%	\$1,067	\$1,376
15 HP 1200 RPM ODP	15	1200	ODP	90.2%	91.7%	92.7%	\$1,973	\$2,393
20 HP 1200 RPM ODP	20	1200	ODP	91.0%	92.4%	93.4%	\$2,179	\$2,684
25 HP 1200 RPM ODP	25	1200	ODP	91.7%	93.0%	94.0%	\$2,442	\$3,057
30 HP 1200 RPM ODP	30	1200	ODP	92.4%	93.6%	94.6%	\$2,639	\$3,335
40 HP 1200 RPM ODP	40	1200	ODP	93.0%	94.1%	95.1%	\$3,003	\$3,850
50 HP 1200 RPM ODP	50	1200	ODP	93.0%	94.1%	95.1%	\$3,269	\$4,227
60 HP 1200 RPM ODP	60	1200	ODP	93.6%	94.5%	95.5%	\$3,981	\$5,233
75 HP 1200 RPM ODP	75	1200	ODP	93.6%	94.5%	95.5%	\$4,612	\$6,127
100 HP 1200 RPM ODP	100	1200	ODP	94.1%	95.0%	96.0%	\$5,896	\$7,677
125 HP 1200 RPM ODP	125	1200	ODP	94.1%	95.0%	96.0%	\$7,057	\$9,319
150 HP 1200 RPM ODP	150	1200	ODP	94.5%	95.4%	96.4%	\$8,134	\$10,842
200 HP 1200 RPM ODP	200	1200	ODP	94.5%	95.4%	96.4%	\$9,764	\$13,148
250 HP 1200 RPM ODP	250	1200	ODP	95.4%	95.8%	96.8%	\$10,815	\$14,636
300 HP 1200 RPM ODP	300	1200	ODP	95.4%	95.8%	96.8%	\$13,293	\$18,140
350 HP 1200 RPM ODP	350	1200	ODP	95.4%	95.8%	96.8%	\$24,766	\$34,370
400 HP 1200 RPM ODP	400	1200	ODP	95.8%	95.9%	96.9%	\$28,224	\$39,260
450 HP 1200 RPM ODP	450	1200	ODP	96.2%	96.3%	97.3%	\$31,975	\$44,566
500 HP 1200 RPM ODP	500	1200	ODP	96.2%	96.3%	97.3%	\$33,093	\$46,149
1 HP 1800 RPM ODP	1	1800	ODP	82.5%	85.5%	86.5%	\$637	\$769
1.5 HP 1800 RPM ODP	1.5	1800	ODP	84.0%	86.5%	87.5%	\$682	\$832
2 HP 1800 RPM ODP	2	1800	ODP	84.0%	86.5%	87.5%	\$680	\$829
3 HP 1800 RPM ODP	3	1800	ODP	86.5%	89.5%	90.5%	\$706	\$866
5 HP 1800 RPM ODP	5	1800	ODP	87.5%	89.5%	90.5%	\$740	\$914
7.5 HP 1800 RPM ODP	7.5	1800	ODP	88.5%	91.0%	92.0%	\$936	\$1,191
10 HP 1800 RPM ODP	10	1800	ODP	89.5%	91.7%	92.7%	\$1,067	\$1,376
15 HP 1800 RPM ODP	15	1800	ODP	91.0%	93.0%	94.0%	\$1,973	\$2,393
20 HP 1800 RPM ODP	20	1800	ODP	91.0%	93.0%	94.0%	\$2,179	\$2,684
25 HP 1800 RPM ODP	25	1800	ODP	91.7%	93.6%	94.6%	\$2,442	\$3,057
30 HP 1800 RPM ODP	30	1800	ODP	92.4%	94.1%	95.1%	\$2,639	\$3,335
40 HP 1800 RPM ODP	40	1800	ODP	93.0%	94.1%	95.1%	\$3,003	\$3,850

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 6: Motor Efficiency and Incremental Costs^{1, 19, 20}

Motor Tag	HP	Speed	Type	EPACT Motor Efficiency	NEMA Premium Motor Efficiency	NEMA Premium +1% Motor Efficiency	NEMA Premium Installed Cost	NEMA Premium +1% Installed Cost
50 HP 1800 RPM ODP	50	1800	ODP	93.0%	94.5%	95.5%	\$3,269	\$4,227
60 HP 1800 RPM ODP	60	1800	ODP	93.6%	95.0%	96.0%	\$3,981	\$5,233
75 HP 1800 RPM ODP	75	1800	ODP	94.1%	95.0%	96.0%	\$4,612	\$6,127
100 HP 1800 RPM ODP	100	1800	ODP	94.1%	95.4%	96.4%	\$5,896	\$7,677
125 HP 1800 RPM ODP	125	1800	ODP	94.5%	95.4%	96.4%	\$7,057	\$9,319
150 HP 1800 RPM ODP	150	1800	ODP	95.0%	95.8%	96.8%	\$8,134	\$10,842
200 HP 1800 RPM ODP	200	1800	ODP	95.0%	95.8%	96.8%	\$9,764	\$13,148
250 HP 1800 RPM ODP	250	1800	ODP	95.4%	95.8%	96.8%	\$10,815	\$14,636
300 HP 1800 RPM ODP	300	1800	ODP	95.4%	95.8%	96.8%	\$13,293	\$18,140
350 HP 1800 RPM ODP	350	1800	ODP	95.4%	95.8%	96.8%	\$24,766	\$34,370
400 HP 1800 RPM ODP	400	1800	ODP	95.4%	95.8%	96.8%	\$28,224	\$39,260
450 HP 1800 RPM ODP	450	1800	ODP	95.8%	96.2%	97.2%	\$31,975	\$44,566
500 HP 1800 RPM ODP	500	1800	ODP	95.8%	96.2%	97.2%	\$33,093	\$46,149
1 HP 3600 RPM ODP	1	3600	ODP	76.3%	77.0%	78.0%	\$637	\$769
1.5 HP 3600 RPM ODP	1.5	3600	ODP	82.5%	84.0%	85.0%	\$682	\$832
2 HP 3600 RPM ODP	2	3600	ODP	84.0%	85.5%	86.5%	\$680	\$829
3 HP 3600 RPM ODP	3	3600	ODP	84.0%	85.5%	86.5%	\$706	\$866
5 HP 3600 RPM ODP	5	3600	ODP	85.5%	86.5%	87.5%	\$740	\$914
7.5 HP 3600 RPM ODP	7.5	3600	ODP	87.5%	88.5%	89.5%	\$936	\$1,191
10 HP 3600 RPM ODP	10	3600	ODP	88.5%	89.5%	90.5%	\$1,067	\$1,376
15 HP 3600 RPM ODP	15	3600	ODP	89.5%	90.2%	91.2%	\$1,973	\$2,393
20 HP 3600 RPM ODP	20	3600	ODP	90.2%	91.0%	92.0%	\$2,179	\$2,684
25 HP 3600 RPM ODP	25	3600	ODP	91.0%	91.7%	92.7%	\$2,442	\$3,057
30 HP 3600 RPM ODP	30	3600	ODP	91.0%	91.7%	92.7%	\$2,639	\$3,335
40 HP 3600 RPM ODP	40	3600	ODP	91.7%	92.4%	93.4%	\$3,003	\$3,850
50 HP 3600 RPM ODP	50	3600	ODP	92.4%	93.0%	94.0%	\$3,269	\$4,227
60 HP 3600 RPM ODP	60	3600	ODP	93.0%	93.6%	94.6%	\$3,981	\$5,233
75 HP 3600 RPM ODP	75	3600	ODP	93.0%	93.6%	94.6%	\$4,612	\$6,127
100 HP 3600 RPM ODP	100	3600	ODP	93.0%	93.6%	94.6%	\$5,896	\$7,677
125 HP 3600 RPM ODP	125	3600	ODP	93.6%	94.1%	95.1%	\$7,057	\$9,319
150 HP 3600 RPM ODP	150	3600	ODP	93.6%	94.1%	95.1%	\$8,134	\$10,842
200 HP 3600 RPM ODP	200	3600	ODP	94.5%	95.0%	96.0%	\$9,764	\$13,148
250 HP 3600 RPM ODP	250	3600	ODP	94.5%	95.0%	96.0%	\$10,815	\$14,636
300 HP 3600 RPM ODP	300	3600	ODP	95.0%	95.4%	96.4%	\$13,293	\$18,140
350 HP 3600 RPM ODP	350	3600	ODP	95.0%	95.4%	96.4%	\$24,766	\$34,370

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 6: Motor Efficiency and Incremental Costs^{1, 19, 20}

Motor Tag	HP	Speed	Type	EPACT Motor Efficiency	NEMA Premium Motor Efficiency	NEMA Premium +1% Motor Efficiency	NEMA Premium Installed Cost	NEMA Premium +1% Installed Cost
400 HP 3600 RPM ODP	400	3600	ODP	95.4%	95.8%	96.8%	\$28,224	\$39,260
450 HP 3600 RPM ODP	450	3600	ODP	95.8%	96.2%	97.2%	\$31,975	\$44,566
500 HP 3600 RPM ODP	500	3600	ODP	95.8%	96.2%	97.2%	\$33,093	\$46,149
1 HP 900 RPM TEFC	1	900	TEFC	74.0%	75.5%	76.5%	\$637	\$769
1.5 HP 900 RPM TEFC	1.5	900	TEFC	77.0%	78.5%	79.5%	\$682	\$832
2 HP 900 RPM TEFC	2	900	TEFC	82.5%	84.0%	85.0%	\$680	\$829
3 HP 900 RPM TEFC	3	900	TEFC	84.0%	85.5%	86.5%	\$706	\$866
5 HP 900 RPM TEFC	5	900	TEFC	85.5%	86.5%	87.5%	\$740	\$914
7.5 HP 900 RPM TEFC	7.5	900	TEFC	85.5%	86.5%	87.5%	\$936	\$1,191
10 HP 900 RPM TEFC	10	900	TEFC	88.5%	89.5%	90.5%	\$1,067	\$1,376
15 HP 900 RPM TEFC	15	900	TEFC	88.5%	89.5%	90.5%	\$1,973	\$2,393
20 HP 900 RPM TEFC	20	900	TEFC	89.5%	90.2%	91.2%	\$2,179	\$2,684
25 HP 900 RPM TEFC	25	900	TEFC	89.5%	90.2%	91.2%	\$2,442	\$3,057
30 HP 900 RPM TEFC	30	900	TEFC	91.0%	91.7%	92.7%	\$2,639	\$3,335
40 HP 900 RPM TEFC	40	900	TEFC	91.0%	91.7%	92.7%	\$3,003	\$3,850
50 HP 900 RPM TEFC	50	900	TEFC	91.7%	92.4%	93.4%	\$3,269	\$4,227
60 HP 900 RPM TEFC	60	900	TEFC	91.7%	92.4%	93.4%	\$3,981	\$5,233
75 HP 900 RPM TEFC	75	900	TEFC	93.0%	93.6%	94.6%	\$4,612	\$6,127
100 HP 900 RPM TEFC	100	900	TEFC	93.0%	93.6%	94.6%	\$5,896	\$7,677
125 HP 900 RPM TEFC	125	900	TEFC	93.6%	94.1%	95.1%	\$7,057	\$9,319
150 HP 900 RPM TEFC	150	900	TEFC	93.6%	94.1%	95.1%	\$8,134	\$10,842
200 HP 900 RPM TEFC	200	900	TEFC	94.1%	94.5%	95.5%	\$9,764	\$13,148
250 HP 900 RPM TEFC	250	900	TEFC	94.5%	95.0%	96.0%	\$10,815	\$14,636
300 HP 900 RPM TEFC	300	900	TEFC	94.5%	95.0%	96.0%	\$13,293	\$18,140
350 HP 900 RPM TEFC	350	900	TEFC	94.5%	95.0%	96.0%	\$24,766	\$34,370
400 HP 900 RPM TEFC	400	900	TEFC	94.5%	95.0%	96.0%	\$28,224	\$39,260
450 HP 900 RPM TEFC	450	900	TEFC	94.5%	95.0%	96.0%	\$31,975	\$44,566
500 HP 900 RPM TEFC	500	900	TEFC	94.5%	95.0%	96.0%	\$33,093	\$46,149
1 HP 1200 RPM TEFC	1	1200	TEFC	80.0%	82.5%	83.5%	\$637	\$769
1.5 HP 1200 RPM TEFC	1.5	1200	TEFC	85.5%	87.5%	88.5%	\$682	\$832
2 HP 1200 RPM TEFC	2	1200	TEFC	86.5%	88.5%	89.5%	\$680	\$829
3 HP 1200 RPM TEFC	3	1200	TEFC	87.5%	89.5%	90.5%	\$706	\$866
5 HP 1200 RPM TEFC	5	1200	TEFC	87.5%	89.5%	90.5%	\$740	\$914
7.5 HP 1200 RPM TEFC	7.5	1200	TEFC	89.5%	91.0%	92.0%	\$936	\$1,191
10 HP 1200 RPM TEFC	10	1200	TEFC	89.5%	91.0%	92.0%	\$1,067	\$1,376

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Table 6: Motor Efficiency and Incremental Costs^{1, 19, 20}

Motor Tag	HP	Speed	Type	EPACT Motor Efficiency	NEMA Premium Motor Efficiency	NEMA Premium +1% Motor Efficiency	NEMA Premium Installed Cost	NEMA Premium +1% Installed Cost
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20 HP 1200 RPM TEFC	20	1200	TEFC	90.2%	91.7%	92.7%	\$2,179	\$2,684
25 HP 1200 RPM TEFC	25	1200	TEFC	91.7%	93.0%	94.0%	\$2,442	\$3,057
30 HP 1200 RPM TEFC	30	1200	TEFC	91.7%	93.0%	94.0%	\$2,639	\$3,335
40 HP 1200 RPM TEFC	40	1200	TEFC	93.0%	94.1%	95.1%	\$3,003	\$3,850
50 HP 1200 RPM TEFC	50	1200	TEFC	93.0%	94.1%	95.1%	\$3,269	\$4,227
60 HP 1200 RPM TEFC	60	1200	TEFC	93.6%	94.5%	95.5%	\$3,981	\$5,233
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100 HP 1200 RPM TEFC	100	1200	TEFC	94.1%	95.0%	96.0%	\$5,896	\$7,677
125 HP 1200 RPM TEFC	125	1200	TEFC	94.1%	95.0%	96.0%	\$7,057	\$9,319
150 HP 1200 RPM TEFC	150	1200	TEFC	95.0%	95.8%	96.8%	\$8,134	\$10,842
200 HP 1200 RPM TEFC	200	1200	TEFC	95.0%	95.8%	96.8%	\$9,764	\$13,148
250 HP 1200 RPM TEFC	250	1200	TEFC	95.0%	95.8%	96.8%	\$10,815	\$14,636
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DEEMED SAVINGS TECHNICAL ASSUMPTIONS

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300 HP 1800 RPM TEFC	300	1800	TEFC	95.4%	96.2%	97.2%	\$13,293	\$18,140
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1 HP 3600 RPM TEFC	1	3600	TEFC	75.5%	77.0%	78.0%	\$637	\$769
1.5 HP 3600 RPM TEFC	1.5	3600	TEFC	82.5%	84.0%	85.0%	\$682	\$832
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7.5 HP 3600 RPM TEFC	7.5	3600	TEFC	88.5%	89.5%	90.5%	\$936	\$1,191
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50 HP 3600 RPM TEFC	50	3600	TEFC	92.4%	93.0%	94.0%	\$3,269	\$4,227
60 HP 3600 RPM TEFC	60	3600	TEFC	93.0%	93.6%	94.6%	\$3,981	\$5,233
75 HP 3600 RPM TEFC	75	3600	TEFC	93.0%	93.6%	94.6%	\$4,612	\$6,127
100 HP 3600 RPM TEFC	100	3600	TEFC	93.6%	94.1%	95.1%	\$5,896	\$7,677
125 HP 3600 RPM TEFC	125	3600	TEFC	94.5%	95.0%	96.0%	\$7,057	\$9,319
150 HP 3600 RPM TEFC	150	3600	TEFC	94.5%	95.0%	96.0%	\$8,134	\$10,842
200 HP 3600 RPM TEFC	200	3600	TEFC	95.0%	95.4%	96.4%	\$9,764	\$13,148
250 HP 3600 RPM TEFC	250	3600	TEFC	95.4%	95.8%	96.8%	\$10,815	\$14,636
300 HP 3600 RPM TEFC	300	3600	TEFC	95.4%	95.8%	96.8%	\$13,293	\$18,140
350 HP 3600 RPM TEFC	350	3600	TEFC	95.4%	95.8%	96.8%	\$24,766	\$34,370
400 HP 3600 RPM TEFC	400	3600	TEFC	95.4%	95.8%	96.8%	\$28,224	\$39,260
450 HP 3600 RPM TEFC	450	3600	TEFC	95.4%	95.8%	96.8%	\$31,975	\$44,566
500 HP 3600 RPM TEFC	500	3600	TEFC	95.4%	95.8%	96.8%	\$33,093	\$46,149

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Motor & Drive Efficiency
460V, 3 phase, normal duty
HP rated as constant torque
All NEMA 1 enclosure or less

Table 7: ASD Costs^{21, 22, 23, 24}

HP	Avg. Motor MSRP	Motor less discount plus mark-up and inflation	Installed Loaded
1	\$782	\$702	\$1,053
1.5	\$1,234	\$741	\$1,111
2	\$1,299	\$779	\$1,169
3	\$1,433	\$1,578	\$2,367
5	\$1,689	\$1,762	\$2,642
7.5	\$2,075	\$1,891	\$2,837
10	\$2,352	\$2,039	\$3,058
15	\$2,969	\$2,702	\$4,053
20	\$3,804	\$3,477	\$5,216
25	\$4,664	\$4,337	\$6,506
30	\$5,504	\$4,635	\$6,952
40	\$6,770	\$5,262	\$7,893
50	\$8,386	\$7,609	\$11,414
60	\$10,094	\$9,310	\$13,965
75	\$11,814	\$10,509	\$15,764
100	\$15,433	\$11,856	\$17,785
125	\$19,836	\$12,789	\$19,184
150	\$25,897	\$15,101	\$22,651
200	\$35,992	\$19,652	\$29,478

Average % savings ⁵	33%
Measure Life (years) ^{3, 11}	15
Pumping Load Factor ⁵	75%
Fan Load Factor ⁵	65%
Average Load Factor	70%

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Multifamily Buildings - CO

Description:

Multifamily buildings that are electric and natural gas customers can receive an energy assessment and direct-install measures they are eligible for based on the assessment at no additional cost. These customers will also be eligible to participate in larger, capital-intensive projects that offer rebates for custom and prescriptive measures.

Program References:

Measure "Direct Install - LED"	Refer to Product "CO Home Lighting & Recycling" formulas for (Customer kW, Customer kWh, Customer PckW, etc.) for the "Replace incandescent lamps with LEDs" measure.
Measure "Direct Install - LED"	Refer to Product "CO Home Lighting & Recycling" reference table for "LED" values.
Measure "Direct Install - Low-Flow Showerhead"	Refer to Product "CO Energy Efficient Showerheads" formulas for (Customer kW, Customer kWh, Customer PckW, etc.) for the "Install Efficient Showerhead" measure.
Measure "Direct Install - Low-Flow Showerhead"	Refer to Product "CO Energy Efficient Showerheads" reference table for "Low-Flow Showerhead" values.
Measure "Direct Install - Kitchen Aerator"	Refer to Product "CO School Education Kits" formulas for (Customer kW, Customer kWh, Customer PckW, etc.) for the "Install Kitchen Faucet Aerator" measure.
Measure "Direct Install - Kitchen Aerator"	Refer to Product "CO Energy Efficient Showerheads" reference table for "Kitchen Aerator" values.
Measure "Direct Install - Bath Aerator"	Refer to Product "CO Energy Efficient Showerheads" formulas for (Customer kW, Customer kWh, Customer PckW, etc.) for the "Install Bath Faucet Aerator" measure.
Measure "Direct Install - Bath Aerator"	Refer to Product "CO Energy Efficient Showerheads" reference table for "Bath Aerator" values.
Measure "Direct Install - LED Exit Sign"	Refer to Product "CO Lighting Efficiency" formulas for (Customer kW, Customer kWh, Customer PckW, etc.) for the "Exit sign retrofit" measure.
Measure "Direct Install - LED Exit Sign"	Refer to Product "CO Lighting Efficiency" reference table for "LED Exit Sign" values.

Equations:

Water Heater Blanket Electrical Energy Savings (Customer kWh/unit)	$= (\text{HLF before} - \text{HLF with blanket}) \times \text{Hr_Operation} / \text{HE_Elec} / 3412 = 220.2 \text{ kWh}$
Water Heater Blanket Electrical Demand Savings (Customer kW/unit)	$= (\text{HLF before} - \text{HLF with blanket}) \times \text{Hr_Operation} / \text{HE_Elec} / 3412 / \text{Hr Operation} = 0.03 \text{ kW}$
Water Heater Blanket Gas Savings (Customer Dth/unit)	$= (\text{HLF_before} - \text{HLF_after}) \times \text{Hr_Operation} / 1000000 / \text{HE_Gas} = 0.94 \text{ Dth}$
Electrical Energy Savings (Gross Generator kWh)	$= \text{Customer kWh} / (1 - \text{TLDF})$
Electrical Demand Savings (Gross Generator kW)	$= \text{Customer kW} \times \text{CF} / (1 - \text{TLDF})$
Electrical Energy Savings (Net Generator kWh)	$= \text{Gross Generator kWh} \times \text{NTG} \times \text{Install Rate}$
Electrical Demand Savings (Net Generator kW)	$= \text{Gross Generator kW} \times \text{NTG} \times \text{Install Rate}$

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Variable ID	Value	Description
Standard_Tank_Size	45	Assumed a standard hot water tank size of 45 gallons.
HE_Elec	1.00	Heat generation efficiency for electric water heater based on steady-state water heater efficiency.
HE_Gas	0.80	Heat generation efficiency for gas water heater based on steady-state water heater efficiency.
Hr_Operation	8760	Annual water heater "on" time
HLF_before	205	Heat loss from a 45 gallon water heater with 2" OEM-installed fiberglass insulation with water temp at 125 F and room temp at 60F, units = Btu/h
HLF_with blanket	119	Heat loss from a 45 gallon water heater with 2.5" fiberglass blanket insulation with water temp at 125 F and room temp at 60F, units = Btu/h
Conversion from Btu to Dth	1,000,000	1 Dth = 1,000,000 Btuh
Conversion fro Btu to kWh	3,412	1 kWh = 3,412 Btuh
Coincidence_Factor_DI_CFL	8.0%	Coincident factor for CFL lamps, based on CO Home Lighting & Recycling
Coincidence_Factor_DI_LED	8.0%	Coincident factor for LED lamps, based on CO Home Lighting & Recycling
Coincidence_Factor_DI_Lo_Flow_SH	63.6%	Coincident factor for Showerheads based on CO Energy Efficient Showerheads
Coincidence_Factor_DI_Kitchen_Aerator	123.6%	Coincident factor for Kitchen Aerators based on CO Energy Efficient Showerheads
Coincidence_Factor_DI_Bath_Aerator	123.6%	Coincident factor for Bathroom Aerators based on CO Energy Efficient Showerheads
Coincidence_Factor_DI_WH_Blanket	100.0%	Coincident factor for water heater blankets, based on assumption that blanket is permanently installed
Coincidence_Factor_DI_LED_Exit	72.6%	Coincident factor for LED exit signs, based on CO Lighting Efficiency
Coincidence_Factor_EEB	92.8%	Coincident factor for EEB projects, based on CO Energy Design Assistance
NTG	100%	Net-to-gross factor. Assumed to be 100% for a new program.
Showerhead - Regular	\$3.13	Incremental Cost from single vendor contracted for the length of the pilot
Showerhead - Handheld	\$9.74	Incremental Cost from single vendor contracted for the length of the pilot
Bath Aerator	\$0.64	Incremental Cost from single vendor contracted for the length of the pilot
Kitchen Aerator	\$1.31	Incremental Cost from single vendor contracted for the length of the pilot
LED Globe	\$3.78	Incremental Cost from single vendor contracted for the length of the pilot
LED A19 Energy Star rated lamp	\$4.10	Incremental Cost from single vendor contracted for the length of the pilot
"Value" LED A19 lamp	\$1.92	Incremental Cost from single vendor contracted for the length of the pilot
LED Exit Kit	\$22.98	Incremental Cost from single vendor contracted for the length of the pilot
Water Heater Blanket	\$23.54	Incremental Cost from single vendor contracted for the length of the pilot

Inputs Provided by Customer or Vendor:

Verified during M&V:

Wattage of CFLs installed	Yes
Quantity of each Wattage of CFLs installed	Yes
Wattage of LEDs installed	Yes
Quantity of each Wattage of LEDs installed	Yes
Quantity of primary showerheads installed	Yes
Quantity of handheld showerheads installed	Yes
Quantity of kitchen faucet aerators installed	Yes
Quantity of bathroom faucet aerators installed	Yes
Quantity of water heater blankets installed	Yes
Quantity of LED Exit sign retrofits installed	Yes

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

References:

1. US DOE US Lighting Market Characterization Study 2002
2. Composite Wattages, Operating Hours and Coincidence from CFL METERING STUDY FINAL REPORT, Prepared for: Pacific Gas & Electric Company, San Diego Gas & Electric Company, Southern California Edison Company, 2005
3. Xcel Energy Home Lighting and Recycling Program Assumptions
4. "The effects of variation in body temperature on the preferred water temperature and flow rate during showering" Authors: Tadakatsu Ohnaka, Yutaka Tochiara, Yumiko Watanabe. Affiliations: a) Department
5. Handbook of Water Use and Conservation, Denver Water Conservation
6. California Measurement Advisory Committee (CALMAC) Protocols, Appendix F (www.calmac.org/events/APX_F.pdf).
8. Lighting Baseline Watts per Agreement with Minnesota Division of Energy Resources. Based on a EPA Next Generation Lighing Program: Opportunities to Advance Efficient Lighting for a Cleaner Environment
9. DEER Database for Energy Efficient Resources 2011 update to EUL data
10. These numbers are based on "CO Energy Efficient Showerhead" analysis and references provided in that program

Changes from Last Filing

1. Revised CFL measure definition and associated energy savings per unit
2. Reduced LED wattage from 11W to 9W
3. Revised water heater blanket savings to model for a 40 gallon water heater with an R11 blanket
4. Updated all incremental costs to align with what the third-party implementer will be charging for equipmen
5. Accepted all previous red line changes.
6. Updated to latest Utility Information and Forecast Summary Templates
7. Updated annual hours, lifetimes, CF for lighitng measures; updated methodology for showerhead and aerators to account for reduced occupants in MF homes; and updated methodology for water heater blanket

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: CO - Low Income Multifamily Weatherization

Description:

Low Income service agency may apply for a grant to improve the natural gas and electric efficiency measures of low income multi-family housing units and common spaces/systems.

Equations:

Savings will be determined by results of an engineering audit of potential energy savings for the facility and living units. Calculations may include standard energy calculations or hourly energy modeling with recognized software packages. Savings for CFL lighting, refrigerator upgrades or evaporative coolers installed in living units will be deemed per other products for low income participants or prescriptive products.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: CO - Low Income Non-Profit

Description:

Low Income service agency may apply for a grant to improve the natural gas and electric efficiency measures of low income non-profit housing units and common spaces/systems.

Equations

Savings will be determined by results of an engineering audit of potential energy savings for the facility and living units. Calculations may include standard energy calculations or hourly energy modeling with recognized software packages.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Process Efficiency

Description:

The Process Efficiency program targets energy intensive processes at large industrial facilities. Customers who implement identified upgrades may receive rebates for large process changes that are not completed through Custom Efficiency or the prescriptive products. Calculations for prescriptive products will follow the methodologies described in end use program with the exception of net to gross.

Variables:

Net to Gross = 90%

Changes from 2016:

No technical assumption changes

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program Name: Recommissioning

Description:

Recommissioning is a special product that involves a Study phase and an Implementation phase. The customer may apply for rebate under the Recommissioning product. Each Recommissioning project will be analyzed individually by Xcel Energy. A qualified engineering vendor will perform the study and provide a report and technical calculations to Xcel Energy for review. Analysis will be based on standard engineering methodologies. Customer may also submit for implementation a proposed "Fast Track" project without going through the Recommissioning Study phase, as long as they have performed a study. Recommissioning projects do not have to demonstrate a TRC factor greater than one on a project by project basis. In that regard the product is similar to deemed products. In most other respects it is more of a custom product.

Calculations:

Electric and Gas energy savings and electrical demand savings will be calculated by a study vendor based on the project specific details. Each project will undergo an engineering review by Xcel Energy in accordance with standard engineering practices.

Variables:

NTG	A net-to-gross factor of 90% will be used for Recommissioning projects, based on the following justification: Without having completed a Recommissioning study through our product, the customer would not have known about the opportunities. If they would have known about them, they would have done them on their own due to the likelihood they are no/low cost items with very quick paybacks.
TDLF	A transmission distribution loss factor of 6.50% will be used for Recommissioning projects. Reference the Enhanced DSM filing, SRD-2; no significant system changes have been noted since then.
Measure Life	Persistence of the Recommissioning product (product life) is set at 7 years, reference "Recommissioning Persistence - Task 1 Benchmarking Deliverable 040607.pdf"

Changes from 2015/2016

None

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Building Tune-up

Description:

This measure under the Recommissioning product provides a recommissioning-type study at a smaller scale and targeted towards buildings less than 75,000 square feet. Study-driven credit is taken for implementation of quick payback, low cost, no cost and behavioral measures identified by the study.

Calculations:

Electric and Gas energy savings and electrical demand savings will be calculated by a study vendor based on the project specific details. Each project will undergo an engineering review by Xcel Energy in accordance with standard engineering practices.

Variables:

NTG	A net-to-gross factor of 90% will be used for Building Tune-up projects, based on the following justification: Without having completed a Building Tune-up study, the customer would not have known about the opportunities to save energy. If they would have known about them, they would have done them on their own due to the likelihood they are no/low cost items with very quick paybacks.
TDLF	A transmission distribution loss factor of 6.50% will be used for Building Tune-up projects, the same as the Recommissioning product. Reference the Enhanced DSM filing, SRD-2
Measure Life	Persistence of the Building Tune-up product (product life) is set at 7 years, same as the Recommissioning product; reference "Recommissioning Persistence - Task 1 Benchmarking Deliverable 040607.pdf"

Changes from 2015/2016

None

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Saver's Switch - Residential - CO

Description:

Prescriptive rebates will be offered to residential customers who install a Smart Saver's Switch on their AC system.

Algorithms:

Gross kW Saved at Customer/Unit	= I_Qty_Prop_Equip * Eq.kW_Savings
Gross Annual kWh Saved at Customer/Unit	= I_Qty_Prop_Equip * Eq.kWh_Savings
Peak Coincident kW at the Customer (PC_KW_CUST)	= I_Qty_Prop_Equip * Eq.PC_kW_Customer
Eq.kW_Savings	= tons/EER * 12

Variable ID	Value	Description
I_Qty_Prop_Equip	Customer Input	Quantity of smart saver switches installed.
tons	3	Capacity of average residential AC Unit in tons.
EER	11.05	Energy Efficiency Ratio (EER) of average residential AC Unit.
Eq.kWh_Savings	7	kWh savings per year per average residential AC Unit with a smart switch (Reference 1 & 2).
Eq.PC_kW_Customer	0.930	Peak Coincident kW savings per average residential AC Unit with a smart switch (Reference 1).
Life_ResSS	15	Length of time the switch will be operational.
NTG	100%	Net-to-Gross factor for Saver's Switch will be 100% as customers would not have the ability to install a switch without the program.

Inputs:

Provided by Customer:	Verified during M&V:
Number of units with switch installed.	Yes

References:

- (1) DNV GL & AEC, January 2016. Saver's Switch Program, Residential Program, 2015 Impact Evaluation Report.
(2) Xcel Energy, January 2016. Saver's Switch Control History.

Changes from Recent Filing:

- Updated PC kW & kWh savings per unit per event for smart switches. As a result other values such as coincidence factor and hours also updated.
- Updated algorithms to match current practices.

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Self Direct

The Self-Direct product will provide large commercial and industrial customers in Colorado the opportunity to self-fund electric energy conservation projects at their facilities. Customers who engineer, implement, and commission qualifying projects will receive rebates to offset their costs to implement efficient projects.

Calculations:

Electrical energy savings and electrical demand savings will be calculated based on the actual savings from a project.

A net-to-gross factor of 91% will be used for Self-Direct projects. The NTG assumption (91%) was developed based on the weighted average of the net-to-gross factors from our stand alone programs, using the weighting from previously completed self-direct projects.

Measure life and operation and maintenance savings will be calculated for each project.

Changes from 2016:

No changes.

Measure Description	High Efficiency Product Assumptions			Electric Product Detailed Technical Assumptions										Stipulated Output										Economic Assumptions		Technical Assumption	Program Forecast Inputs				Stipulated Forecast Inputs			2017		
				Baseline Product Assumptions				Economic Assumptions																			2017		2018							
Electric Measure Description	Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Incremental Cost Payback Period w/o Rebate (yrs)	Incremental Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)				
																							865,275	4,357,309	891,134	4,583,537				75,583	401,292,852	\$ 39,500,928				
Compressed Air Efficiency Study	Leaks & Waste Found and Repaired	139,898	7,434	Existing System with Leaks & Waste that have not been repaired	148,339	7,434	5.00	\$4,889	\$0	\$12,591	\$ 0.063	39%	3.21	1.96	62,755	\$0.08	\$0.02	8.441	9.028	\$0.00	\$0.00	100.0%	20	20	22	22	87%	100%	100%	157	1,167,840	\$ 97,783				
Cycling Dryers	New Cycling Dryer	1,117	6,937	New Non-Cycling Dryer	1,853	6,937	20.00	\$371	\$4,439	\$832	\$ 0.063	45%	2.60	1.44	5,111	\$0.07	\$0.00	0.737	0.788	\$0.00	\$0.00	100.0%	5	5	5	5	73%	100%	100%	3	19,951	\$ 1,854				
Dew Point Demand Control	Purge Control for Heatless Desiccant Dryers	33,609	6,828	No Purge Control for Heatless Desiccant Dryers	38,337	6,828	15.00	\$1,000	\$0	\$3,316	\$ 0.063	30%	1.64	1.15	32,281	\$0.03	\$0.00	4,728	5,057	\$0.00	\$0.00	100.0%	3	3	4	4	73%	100%	100%	11	75,609	\$ 3,000				
Mist Eliminator Filters	New Mist Eliminator Filter	77,735	7,280	New General Purpose Filter	79,019	7,280	15.00	\$1,980	\$1,280	\$4,327	\$ 0.063	46%	6.71	3.64	9,348	\$0.21	\$0.01	1,284	1,373	\$60.05	\$0.00	100.0%	6	6	8	8	73%	100%	100%	6	43,792	\$ 11,880				
No Air Loss Drain	New No-Air Loss Drains	0	6,996	New Electronic Solenoid/Timed Drains	517	6,996	13.00	\$200	\$125	\$448	\$ 0.063	45%	1.98	1.10	3,616	\$0.06	\$0.00	0.517	0.401	\$0.00	\$0.00	72.6%	16	24	16	24	73%	100%	100%	7	67,760	\$ 4,800				
VFD Air Compressor New	New VFD Compressor	12,492	2,752	New Modulation or load no-load with less than or equal to 2gal of storage per CFM of Capacity	17,888	2,752	20.00	\$2,333	\$15,128	\$4,818	\$ 0.063	51%	4.97	2.46	14,850	\$0.16	\$0.01	5,396	5,125	\$0.00	\$0.00	88.8%	8	10	8	10	73%	100%	100%	37	115,945	\$ 23,333				
VFD Air Compressor Upgrade	New VFD Compressor	13,833	2,981	Existing Modulation or load no-load with less than or equal to 2gal of storage per CFM of Capacity	20,158	2,981	20.00	\$5,587	\$0	\$17,578	\$ 0.063	32%	14.91	10.17	18,858	\$0.30	\$0.01	6,325	6,008	\$0.00	\$0.00	88.8%	22	23	24	25	73%	100%	100%	101	338,641	\$ 128,500				
VFD Air Compressor HP Reduction	New VFD Compressor of lesser HP than Baseline Unit	15,080	2,830	Existing Modulation or load no-load with less than or equal to 2gal of storage per CFM of Capacity	24,807	2,830	20.00	\$5,333	\$0	\$16,445	\$ 0.063	32%	9.56	6.46	27,523	\$0.19	\$0.01	9,727	9,239	\$0.00	\$0.00	88.8%	6	6	6	6	73%	100%	100%	40	128,931	\$ 32,000				
Custom Projects	New Equipment	121,914	5,811	Old or less efficient systems or equipment	148,339	5,811	20.00	\$14,174	\$0	\$58,716	\$ 0.063	24%	6.22	4.74	153,570	\$0.09	\$0.00	26,426	20,519	\$0.00	\$0.00	72.6%	12	12	12	12	87%	100%	100%	214	1,714,731	\$ 170,084				
Upstream Power Supply - Bronze	desktop computer meeting ENERGY STAR version 6.0 spec with an 80 Plus Bronze level power supply	24	7,443	Baseline desktop computer with a standard efficiency power supply	31	7,443	5.00	\$3	\$600	\$9	\$ 0.074	33%	2.42	1.61	52	\$0.06	\$0.01	0.007	0.008	\$0.00	-\$0.13	100.0%	1,000	10,000	1,000	10,000	88%	100%	100%	66	491,682	\$ 30,000				
Upstream Power Supply - Silver	desktop computer meeting ENERGY STAR version 6.0 spec with an 80 Plus Silver level power supply	24	7,443	desktop computer meeting ENERGY STAR version 6.0 spec with an 80 Plus Bronze level power supply	31	7,443	5.00	\$5	\$609	\$14	\$ 0.074	36%	3.39	2.18	58	\$0.09	\$0.02	0.008	0.008	\$0.00	-\$0.14	100.0%	1,000	10,000	1,000	10,000	88%	100%	100%	73	545,249	\$ 50,000				
Upstream Power Supply - Gold	desktop computer meeting ENERGY STAR version 6.0 spec with an 80 Plus Gold level power supply	23	7,443	desktop computer meeting ENERGY STAR version 6.0 spec with an 80 Plus Bronze level power supply	31	7,443	5.00	\$8	\$608	\$18	\$ 0.074	50%	3.63	1.82	62	\$0.13	\$0.03	0.008	0.009	\$0.00	-\$0.15	100.0%	100	1,000	100	1,000	88%	100%	100%	8	58,096	\$ 8,000				
Upstream Power Supply - Platinum	desktop computer meeting ENERGY STAR version 6.0 spec with an 80 Plus Platinum level power supply	23	7,443	desktop computer meeting ENERGY STAR version 6.0 spec with an 80 Plus Bronze level power supply	31	7,443	5.00	\$10	\$609	\$22	\$ 0.074	45%	4.71	2.57	66	\$0.15	\$0.03	0.009	0.009	\$0.00	-\$0.16	100.0%	100	1,000	100	1,000	88%	100%	100%	8	61,667	\$ 10,000				
Zero & Thin Client Installations	Server & software at data center along with thin-client or zero-client device replaces desktop CPU (VM Ware w/ Wyse thin-client system, Pano-Logic zero-client system), meeting Energy Star 6.0 specification	13	7,443	Desktop computers meeting ENERGY STAR 3.0 specifications	29	7,443	10.00	\$60	\$800	\$117	\$ 0.074	51%	3.00	1.46	119	\$0.51	\$0.05	0.016	0.017	\$30.50	-\$0.30	100.0%	5	100	5	100	88%	100%	100%	2	11,178	\$ 6,000				
Network Based PC Power Management	Desktop Computer with network controlled software installed	11	7,443	Desktop Computer with no network controlled software	29	7,443	6.00	\$5	\$0	\$15	\$ 0.040	34%	6.29	4.14	135	\$0.04	\$0.01	0.018	0.000	-\$2.74	-\$0.34	0.0%	2	50	2	50	88%	100%	100%	0	6,344	\$ 250				
Computer Server; with <400W Units with Gold Rated Power Supply	Gold Power Supply	107	8,760	Silver Power Supply	112	8,736	5.00	\$5	\$80	\$12	\$ 0.059	43%	4.60	2.62	43	\$0.12	\$0.02	0.005	0.006	\$0.00	\$0.00	100.0%	50	500	50	500	88%	100%	100%	2	20,170	\$ 2,500				
Computer Server; with 400-600W Units with Gold Rated Power Supply	Gold Power Supply	178	8,760	Silver Power Supply	187	8,736	5.00	\$5	\$80	\$14	\$ 0.059	36%	3.29	2.11	71	\$0.07	\$0.01	0.009	0.009	\$0.00	\$0.00	100.0%	50	500	50	500	88%	100%	100%	4	33,616	\$ 2,500				
Computer Server; with 600-1000W Units with Gold Rated Power Supply	Gold Power Supply	287	8,760	Silver Power Supply	280	8,736	5.00	\$5	\$100	\$16	\$ 0.059	31%	2.55	1.76	107	\$0.05	\$0.01	0.013	0.014	\$0.00	\$0.00	100.0%	50	500	50	500	88%	100%	100%	6	50,425	\$ 2,500				
Computer Server; with >1000W Units with Gold Rated Power Supply	Gold Power Supply	498	8,760	Silver Power Supply	522	8,736	5.00	\$5	\$130	\$18	\$ 0.059	27%	1.56	1.13	200	\$0.02	\$0.00	0.024	0.026	\$0.00	\$0.00	100.0%	50	500	50	500	88%	100%	100%	11	94,126	\$ 2,500				
Computer Server; with <400W Units with Platinum Rated Power Supply	Platinum Power Supply	103	8,760	Silver Power Supply	113	8,713	5.00	\$10	\$80	\$31	\$ 0.059	32%	6.34	4.30	83	\$0.12	\$0.02	0.010	0.011	\$0.00	\$0.00	100.0%	50	500	50	500	88%	100%	100%	5	39,003	\$ 5,000				
Computer Server; with 400-600W Units with Platinum Rated Power Supply	Platinum Power Supply	172	8,760	Silver Power Supply	188	8,713	5.00	\$10	\$80	\$37	\$ 0.059	27%	4.54	3.31	138	\$0.07	\$0.01	0.017	0.018	\$0.00	\$0.00	100.0%	50	500	50	500	88%	100%	100%	8	65,005	\$ 5,000				
Computer Server; with 600-1000W Units with Platinum Rated Power Supply	Platinum Power Supply	257	8,760	Silver Power Supply	283	8,713	5.00	\$10	\$100	\$43	\$ 0.059	23%	3.52	2.70	207	\$0.05	\$0.01	0.025	0.027	\$0.00	\$0.00	100.0%	50	500	50	500	88%	100%	100%	12	97,508	\$ 5,000				
Computer Server; with >1000W Units with Platinum Rated Power Supply	Platinum Power Supply	481	8,760	Silver Power Supply	526	8,713	5.00	\$10	\$130	\$49	\$ 0.059	20%	2.15	1.71	387	\$0.03	\$0.01	0.047	0.050	\$0.00	\$0.00	100.0%	50	500	50	500	88%	100%	100%	22	182,015	\$ 5,000				
Computer Server																																				

Measure Description	Electric Product Detailed Technical Assumptions										Stipulated Output										Economic Assumptions		Technical Assumption	Program Forecast Inputs				Stipulated Forecast Inputs			2017		
	High Efficiency Product Assumptions			Baseline Product Assumptions			Economic Assumptions																	2017		2018							
Electric Measure Description	Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Increment'l Cost Payback Period w/o Rebate (yrs)	Increment'l Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)	
Rooftop Units or Split Systems 11.4-19.9 Tons Tier 1 - 12.6 IEER	DX Unit Size 15.8 tons, 13.1 IEER, 12.1 EER	15,713	421	DX Unit Size 15.8 tons, 12.2 IEER, 10.8 EER	17,537	421	15.00	\$0	\$9,827	\$1,315	\$ 0.070	0%	24.35	24.35	768	\$0.00	\$0.00	1,824	1,755	\$0.00	\$0.00	90.0%	12	42	16	53	92%	100%	100%	68	31,868	\$ -	
Rooftop Units or Split Systems 11.4-19.9 Tons Tier 2 - 13.4 IEER	DX Unit Size 13.9 tons, 13.6 IEER, 12 EER	13,869	677	DX Unit Size 13.9 tons, 12.2 IEER, 10.8 EER	15,432	677	15.00	\$0	\$8,647	\$1,875	\$ 0.070	0%	25.22	25.22	1,058	\$0.00	\$0.00	1,563	1,505	\$0.00	\$0.00	90.0%	15	50	19	62	92%	100%	100%	69	51,871	\$ -	
Rooftop Units or Split Systems 11.4-19.9 Tons Tier 3 - 14 IEER	DX Unit Size 15.6 tons, 14.6 IEER, 12.1 EER	15,403	981	DX Unit Size 15.6 tons, 12.2 IEER, 10.8 EER	17,314	981	15.00	\$0	\$9,702	\$3,410	\$ 0.070	0%	25.89	25.89	1,874	\$0.00	\$0.00	1,911	1,839	\$0.00	\$0.00	90.0%	20	67	25	83	92%	100%	100%	113	122,795	\$ -	
Rooftop Units or Split Systems 11.4-19.9 Tons Tier 4 - 17.5 IEER	DX Unit Size 11.5 tons, 18.7 IEER, 12.2 EER	11,241	1,960	DX Unit Size 11.5 tons, 12.2 IEER, 10.8 EER	12,740	1,960	15.00	\$0	\$7,139	\$4,066	\$ 0.070	0%	19.70	19.70	2,937	\$0.00	\$0.00	1,499	1,443	\$0.00	\$0.00	90.0%	3	9	3	11	92%	100%	100%	12	25,217	\$ -	
Rooftop Units or Split Systems 20-63.3 Tons Tier 1 - 12 IEER	DX Unit Size 27.2 tons, 12.1 IEER, 11 EER	29,600	326	DX Unit Size 27.2 tons, 11.4 IEER, 9.9 EER	33,326	326	15.00	\$0	\$18,857	\$1,375	\$ 0.070	0%	16.10	16.10	1,215	\$0.00	\$0.00	3,725	3,586	\$0.00	\$0.00	90.0%	12	42	16	52	92%	100%	100%	137	49,605	\$ -	
Rooftop Units or Split Systems 20-63.3 Tons Tier 2 - 12.6 IEER	DX Unit Size 30.2 tons, 13 IEER, 11.2 EER	32,259	612	DX Unit Size 30.2 tons, 11.4 IEER, 9.8 EER	36,940	612	15.00	\$0	\$20,903	\$2,455	\$ 0.070	0%	12.20	12.20	2,863	\$0.00	\$0.00	4,682	4,506	\$0.00	\$0.00	90.0%	11	39	14	48	92%	100%	100%	160	108,486	\$ -	
Rooftop Units or Split Systems 20-63.3 Tons Tier 3 - 13.3 IEER	DX Unit Size 36.5 tons, 14.4 IEER, 10.9 EER	40,251	1,352	DX Unit Size 36.5 tons, 11.4 IEER, 9.8 EER	44,666	1,352	15.00	\$0	\$25,274	\$4,783	\$ 0.070	0%	11.40	11.40	5,970	\$0.00	\$0.00	4,415	4,250	\$0.00	\$0.00	90.0%	11	36	14	45	92%	100%	100%	141	211,660	\$ -	
Rooftop Units or Split Systems 20-63.3 Tons Tier 4 - 15 IEER	DX Unit Size 50.9 tons, 16 IEER, 11.1 EER	54,832	1,527	DX Unit Size 50.9 tons, 11.4 IEER, 9.9 EER	62,346	1,527	15.00	\$0	\$35,278	\$10,757	\$ 0.070	0%	13.34	13.34	11,474	\$0.00	\$0.00	7,513	7,232	\$0.00	\$0.00	90.0%	3	10	4	13	92%	100%	100%	68	114,735	\$ -	
Rooftop Units or Split Systems >63.3 Tons Tier 1 - 12 IEER	DX Unit Size 69.1 tons, 12 IEER, 9.9 EER	83,806	1,329	DX Unit Size 69.1 tons, 11 IEER, 9.5 EER	87,335	1,329	15.00	\$0	\$54,067	\$6,525	\$ 0.070	0%	19.79	19.79	4,691	\$0.00	\$0.00	3,529	3,397	\$0.00	\$0.00	90.0%	0	0	0	0	92%	100%	100%	0	0	\$ -	
Rooftop Units or Split Systems >63.3 Tons Tier 2 - 12.8 IEER	DX Unit Size 69.1 tons, 12.8 IEER, 9.9 EER	83,806	2,243	DX Unit Size 69.1 tons, 11 IEER, 9.5 EER	87,335	2,243	15.00	\$0	\$54,067	\$10,871	\$ 0.070	0%	19.54	19.54	7,916	\$0.00	\$0.00	3,529	3,397	\$0.00	\$0.00	90.0%	0	1	0	1	92%	100%	100%	3	7,789	\$ -	
Rooftop Units or Split Systems >63.3 Tons Tier 3 - 14 IEER	DX Unit Size 69.1 tons, 14.8 IEER, 10.5 EER	79,017	1,669	DX Unit Size 69.1 tons, 11 IEER, 9.5 EER	87,335	1,669	15.00	\$0	\$54,067	\$18,112	\$ 0.070	0%	18.57	18.57	13,880	\$0.00	\$0.00	8,318	8,006	\$0.00	\$0.00	90.0%	4	14	5	18	92%	100%	100%	106	196,981	\$ -	
Rooftop Units or Split Systems >63.3 Tons Tier 4 - 16 IEER	DX Unit Size 81.8 tons, 17.1 IEER, 11.3 EER	86,867	1,443	DX Unit Size 81.8 tons, 11 IEER, 9.5 EER	103,326	1,443	15.00	\$0	\$63,968	\$35,703	\$ 0.070	0%	21.39	21.39	23,758	\$0.00	\$0.00	16,459	15,843	\$0.00	\$0.00	90.0%	2	5	2	7	92%	100%	100%	79	126,182	\$ -	
Water Source Heat Pumps Tier 1	Water Source Heat Pump Size 2.3 tons, 14.39 EER	1,919	1,036	Water Source Heat Pump Size 2.3 tons, 13 EER	2,124	1,036	15.00	\$0	\$3,839	\$377	\$ 0.070	0%	25.22	25.22	212	\$0.00	\$0.00	0.205	0.197	\$0.00	\$0.00	90.0%	22	76	23	76	92%	100%	100%	14	15,890	\$ -	
Water Source Heat Pumps Tier 2	Water Source Heat Pump Size 1.97 tons, 15.31 EER	1,545	1,036	Water Source Heat Pump Size 1.97 tons, 13 EER	1,820	1,036	15.00	\$0	\$3,289	\$484	\$ 0.070	0%	24.17	24.17	285	\$0.00	\$0.00	0.275	0.265	\$0.00	\$0.00	90.0%	19	65	20	65	92%	100%	100%	16	18,221	\$ -	
Water Source Heat Pumps Tier 3	Water Source Heat Pump Size 2.51 tons, 16.93 EER	1,776	1,036	Water Source Heat Pump Size 2.51 tons, 13 EER	2,314	1,036	15.00	\$0	\$4,182	\$620	\$ 0.070	0%	20.97	20.97	557	\$0.00	\$0.00	0.537	0.517	\$0.00	\$0.00	90.0%	22	76	23	76	92%	100%	100%	36	41,638	\$ -	
Water Source Heat Pumps Tier 4	Water Source Heat Pump Size 2.89 tons, 18.25 EER	1,897	1,036	Water Source Heat Pump Size 2.89 tons, 13 EER	2,663	1,036	15.00	\$0	\$4,813	\$1,416	\$ 0.070	0%	25.39	25.39	794	\$0.00	\$0.00	0.766	0.737	\$0.00	\$0.00	90.0%	3	11	3	11	92%	100%	100%	7	8,590	\$ -	
PTAC Tier 1	PTAC Unit Size 1.08 tons, 11.23 EER	1,150	800	PTAC Unit Size 1.08 tons, 8.15 EER	1,586	800	15.00	\$0	\$1,796	\$186	\$ 0.070	0%	7.58	7.58	348	\$0.00	\$0.00	0.436	0.419	\$0.00	\$0.00	90.0%	59	200	60	200	92%	100%	100%	77	68,544	\$ -	
PTAC Tier 2	PTAC Unit Size 0.79 tons, 11.57 EER	821	800	PTAC Unit Size 0.79 tons, 8.88 EER	1,070	800	15.00	\$0	\$1,321	\$202	\$ 0.070	0%	14.42	14.42	199	\$0.00	\$0.00	0.249	0.240	\$0.00	\$0.00	90.0%	76	257	77	257	92%	100%	100%	57	50,342	\$ -	
PTAC Tier 3	PTAC Unit Size 0.7 tons, 13.06 EER	647	800	PTAC Unit Size 0.7 tons, 9.1 EER	928	800	15.00	\$0	\$1,174	\$265	\$ 0.070	0%	16.77	16.77	225	\$0.00	\$0.00	0.281	0.271	\$0.00	\$0.00	90.0%	34	114	34	114	92%	100%	100%	28	25,238	\$ -	
Air-cooled Chillers less than 150 tons, Tier 1	Air-cooled Unit Size 46.7 tons, 14.5 IPLV, 10.23kW/ton	54,807	2,483	Air-cooled Unit Size 46.7 tons, 13.7 IPLV, 10.1 kW/ton	55,485	2,483	20.00	\$0	\$51,937	\$2,282	\$ 0.070	0%	19.28	19.28	1,684	\$0.00	\$0.00	0.678	0.653	\$0.00	\$0.00	90.0%	3	9	3	9	92%	100%	100%	5	14,916	\$ -	
Air-cooled Chillers less than 150 tons, Tier 2	Air-cooled Unit Size 81.3 tons, 15.35 IPLV, 10.36kW/ton	94,354	2,580	Air-cooled Unit Size 81.3 tons, 13.7 IPLV, 10.1 kW/ton	96,562	2,580	20.00	\$0	\$90,387	\$6,151	\$ 0.070	0%	15.36	15.36	5,697	\$0.00	\$0.00	2,208	2,125	\$0.00	\$0.00	90.0%	3	11	3	11	92%	100%	100%	22	61,661	\$ -	
Air-cooled Chillers less than 150 tons, Tier 3	Air-cooled Unit Size 85.4 tons, 16.1 IPLV, 10.49kW/ton	98,538	2,843	Air-cooled Unit Size 85.4 tons, 13.7 IPLV, 10.1 kW/ton	101,465	2,843	20.00	\$0	\$94,977	\$8,971	\$ 0.070	0%</																					

Measure Description	Electric Product Detailed Technical Assumptions																				Program Forecast Inputs								Stipulated Forecast Inputs			
	High Efficiency Product Assumptions			Baseline Product Assumptions			Economic Assumptions				Stipulated Output						Economic Assumptions		Technical Assumption	2017		2018		2017								
Electric Measure Description	Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Incremental Cost Payback Period w/o Rebate (yrs)	Incremental Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)
Direct Evaporative Pre-cooling Technology for Air Cooled Condensers on DX units	Reduce air-cooled condensers on DX units energy and usage for 1 ton of cooling capacity	1,937	767	air-cooled condensers on DX units w/o evaporative pre-cooler for 1 ton of cooling capacity	2,271	767	20.00	\$100	\$0	\$204	\$ 0.070	49%	11.83	6.04	263	\$0.38	\$0.02	0.334	0.321	-\$1.18	\$0.00	90.0%	50	4,000	50	4,000	92%	100%	100%	1,183	1,034,085	\$ 400,000
Mini-Split Heat Pump	MSPHP size 1.2 tons, 21.27 SEER, 10.50 HSPF	1,088	1,285	MSPHP size 1.2 tons, 14 SEER, 8.2 HSPF	1,647	1,285	18.00	\$227	\$3,440	\$512	\$ 0.070	44%	10.15	5.65	718	\$0.32	\$0.02	0.559	0.538	\$0.00	\$0.00	90.0%	118	399	120	399	100%	100%	100%	214	306,190	\$ 90,620
Mini-Split AC - Data Center	MSPHP size 1.2 tons, 21.27 SEER	1,088	5,236	MSPHP size 1.2 tons, 14 SEER	1,647	5,236	18.00	\$108	\$3,440	\$512	\$ 0.070	21%	2.49	1.97	2,926	\$0.04	\$0.00	0.559	0.598	\$0.00	\$0.00	100.0%	22	75	22	75	100%	100%	100%	45	233,968	\$ 8,061
Rx Studies	Varies by project	0	0	Varies by project	0	0	0.00	\$2,000	\$0	\$2,667	\$ 0.070	75%	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	0.000	0.000	\$0.00	\$0.00	0.0%	1	5	2	5	87%	100%	100%	0	0	\$ 10,000
Custom Cooling	Varies by project	177,155	2,998	Varies by project	241,815	2,998	18.66	\$25,864	\$133,759	\$62,429	\$ 0.070	41%	4.58	2.68	193,872	\$0.13	\$0.01	64.660	11.672	\$0.00	\$0.00	16.9%	9	30	9	30	87%	100%	100%	305	5,411,819	\$ 775,920
ECM - Medium Temp Display Case	Electronically Commutated Motor (ECM)	24	8,672	Shaded Pole Motor	72	8,672	15.00	\$40	\$0	\$141	\$ 0.068	28%	5.00	3.58	414	\$0.10	\$0.01	0.048	0.051	\$0.00	\$0.00	99.0%	46	156	47	156	100%	100%	100%	8	69,108	\$ 6,240
ECM - Low Temp Display Case	Electronically Commutated Motor (ECM)	28	8,672	Shaded Pole Motor	84	8,672	15.00	\$40	\$0	\$141	\$ 0.068	28%	4.24	3.03	489	\$0.08	\$0.01	0.056	0.060	\$0.00	\$0.00	99.0%	31	104	31	104	100%	100%	100%	6	54,349	\$ 4,160
ECM - Medium Temp Walk-in, Evap fan <= 15" Diameter	Electronically Commutated Motor (ECM)	44	8,585	Shaded Pole Motor	137	8,585	15.00	\$70	\$0	\$269	\$ 0.068	26%	4.99	3.69	793	\$0.09	\$0.01	0.092	0.097	\$0.00	\$0.00	98.0%	4	15	5	15	100%	100%	100%	1	12,724	\$ 1,050
ECM- Low Temp Walk-in, Evap fan <= 15" Diameter	Electronically Commutated Motor (ECM)	52	8,585	Shaded Pole Motor	161	8,585	15.00	\$70	\$0	\$269	\$ 0.068	26%	4.23	3.13	936	\$0.07	\$0.00	0.109	0.114	\$0.00	\$0.00	98.0%	3	10	3	10	100%	100%	100%	1	10,006	\$ 700
Anti-Sweat Heater Controls	Anti-Sweat Heater Controls	18	8,760	Anti-Sweat Heaters running constantly	179	8,760	12.00	\$60	\$0	\$300	\$ 0.070	20%	3.02	2.41	1,414	\$0.04	\$0.00	0.161	0.167	\$0.00	\$0.00	97.0%	29	100	30	100	100%	100%	100%	17	151,255	\$ 6,000
CO - Custom Efficiency - Electric	New Equipment	710,561	5,790	Old or less efficient systems or equipment	732,556	5,790	20.00	\$8,461	\$0	\$16,910	\$ 0.068	15%	6.24	5.29	127,396	\$0.07	\$0.00	22.004	22.366	\$244.44	\$0.00	95.0%	25	45	25	45	87%	100%	100%	876	5,334,276	\$ 380,725
Data Center Efficiency Study <= 5000 sq ft	Data Center Efficiency Study <= 5000 sq ft	0	0	0	0	0	0.00	\$16,301	\$0	\$21,736	#DIV/0!	75%	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	0.000	0.000	\$0.00	\$0.00	0.0%	3	3	3	3	100%	100%	100%	0	0	\$ 48,904
Data Center Efficiency Study > 5000 sq ft	Data Center Efficiency Study > 5000 sq ft	0	0	0	0	0	0.00	\$40,289	\$0	\$53,718	#DIV/0!	75%	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	0.000	0.000	\$0.00	\$0.00	0.0%	4	4	4	4	100%	100%	100%	0	0	\$ 161,155
Data Center Custom Project	Data Center Custom Measures - Study Identified - Historical Averages from past custom projects	832,687	7,932	Historical Averages from past custom projects	941,262	7,932	15.00	\$13,713	\$0	\$245,187	\$ 0.058	6%	2.31	2.18	861,253	\$0.02	\$0.00	108.576	89.438	\$56,217.00	\$0.00	77.0%	2	1	2	2	100%	100%	100%	89	921,127	\$ 13,713
Data Center Bundled Project	Data Center Bundled Projects - Study Identified - Multiple Energy Conservation Measures Implemented	804,958	7,481	Existing Data Center Facility or New Facility with Standard Systems	941,262	7,481	15.00	\$48,510	\$0	\$714,050	\$ 0.059	7%	5.80	5.41	1,019,718	\$0.05	\$0.00	136.304	124.326	\$62,388.43	\$0.00	85.3%	1	1	1	1	100%	100%	100%	124	1,090,608	\$ 48,510
Data Center Prescriptive Project	Data Center Prescriptive Measures - Study Identified - Historical Averages from past Prescriptive projects	0	5,141	Historical Averages from past Prescriptive projects	28,348	5,141	18.00	\$31,566	\$0	\$82,799	\$ 0.070	38%	8.17	5.06	145,737	\$0.22	\$0.01	28.348	24.958	\$0.00	\$0.00	82.3%	2	3	2	3	100%	100%	100%	75	467,606	\$ 94,697
Data Center Custom Project	Data Center Custom Measures - Non-Study Identified - Historical Averages from past custom projects	327,299	8,285	Historical Averages from past custom projects	445,863	8,285	12.00	\$50,032	\$186,350	\$179,244	\$ 0.057	28%	3.04	2.19	982,509	\$0.05	\$0.00	118.585	84.527	\$2,705.60	\$0.00	66.6%	3	4	3	4	87%	100%	100%	294	3,656,827	\$ 200,127
Data Center Prescriptive Project	Data Center Prescriptive Measures - Non-Study Identified - Historical Averages from past Prescriptive projects	0	5,141	Historical Averages from past Prescriptive projects	28,348	5,141	18.00	\$31,566	\$0	\$82,799	\$ 0.070	38%	8.17	5.06	145,737	\$0.22	\$0.01	28.348	24.958	\$0.00	\$0.00	82.3%	2	2	2	2	79%	100%	100%	39	245,486	\$ 63,131
Plate & Frame Heat Exchangers - Data Center	Install plate & frame heat exchanger to allow cooling tower to meet cooling load	33,780	8,760	Chiller-based cooling	53,000	8,760	20.00	\$28,267	\$0	\$65,571	\$ 0.056	43%	6.92	3.94	168,363	\$0.17	\$0.01	19,220	0.000	\$0.00	\$0.00	0.0%	9	6	9	9	75%	100%	100%	0	810,305	\$ 169,600
Retrofit - EC Plug Fans In-Unit	EC Plug Fan	2,151	8,760	Forward-curved Centrifugal Fan with AC motor	2,708	8,671	10.00	\$1,200	\$0	\$2,925	\$ 0.057	41%	11.04	6.51	4,630	\$0.26	\$0.03	0.556	0.595	\$0.00	\$0.00	100.0%	5	70	5	80	100%	100%	100%	42	346,664	\$ 84,000
Retrofit - EC Plug Fans Below-Floor	EC Plug Fan	1,867	8,760	Forward-curved Centrifugal Fan with AC motor	2,789	8,617	10.00	\$1,200	\$0	\$2,925	\$ 0.057	41%	6.66	3.93	7,675	\$0.16	\$0.02	0.922	0.986	\$0.00	\$0.00	100.0%	5	70	5	80	100%	100%	100%	69	574,603	\$ 84,000
New Construction - EC Plug Fans In-Unit	EC Plug Fan	2,151	8,760	Forward-curved Centrifugal Fan with AC motor	2,715	8,679	20.00	\$700	\$0	\$1,700	\$ 0.057	41%	6.31	3.71	4,715	\$0.15	\$0.01	0.563	0.603	\$0.00	\$0.00	100.0%	3	20	3	30	100%	100%	100%	12	100,851	\$ 14,000
New Construction - EC Plug Fans Below-Floor	EC Plug Fan	1,867	8,760	Forward-curved Centrifugal Fan with AC motor	2,786	8,642	20.00	\$700	\$0	\$1,700	\$ 0.057	41%	3.86	2.27	7,717	\$0.09	\$0.00	0.919	0.982	\$0.00	\$0.00	100.0%	2	10	2	20	100%	100%	100%	10	82,531	\$ 7,000
Data Center New Construction	Highly efficient data center	3,600,000	8,760	Standard efficiency new data center	4,000,000	8,760	20.00	\$191,775	\$0	\$639,251	\$ 0.056	30%	3.24	2.27	3,504,000	\$0.05	\$0.00	400,000	347,063	\$0.00	\$0											

Measure Description		Electric Product Detailed Technical Assumptions																												Program Forecast Inputs				Stipulated Forecast Inputs			2017		
		High Efficiency Product Assumptions				Baseline Product Assumptions			Economic Assumptions				Stipulated Output							Economic Assumptions		Technical Assumption																	
Electric Measure Description		Efficient Product Description / Rating		Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Increment Cost Payback Period w/o Rebate (yrs)	Increment Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)					
Integrated Photocell		Lighting System with Integrated Photocell		34	6,324	Lighting Fixture - Manual Switch	53	7,010	8.00	\$8	\$0	\$13	\$ 0.068	64%	1.23	0.44	154	\$0.05	\$0.01	0.019	0.016	\$0.00	\$0.30	78.1%	6	600	6	660	99%	100%	100%	9	98,326	\$ 4,800					
Integrated Occupancy & Photo Cell Sensor		Lighting System with Occupancy & Photo Sensor		32	6,216	Lighting Fixture - Manual Switch	53	6,901	8.00	\$28	\$0	\$50	\$ 0.068	56%	4.59	2.02	166	\$0.17	\$0.02	0.021	0.017	\$0.00	\$0.33	77.2%	6	2,000	6	2,000	99%	100%	100%	34	352,508	\$ 56,000					
LED/LEC Exit Sign		LED		1	8,760	Incandescent	35	8,760	20.00	\$25	\$0	\$82	\$ 0.059	30%	4.69	3.26	297	\$0.08	\$0.00	0.034	0.036	\$0.00	\$0.00	100.0%	50	1,250	50	1,250	99%	100%	100%	45	393,544	\$ 31,250					
T8 Low Wattage Lamps		T8 Low Wattage Lamps		31	4,543	T8 32W Lamp	38	4,543	8.00	\$2	\$0	\$4	\$ 0.059	38%	2.41	1.51	29	\$0.05	\$0.01	0.006	0.004	\$0.00	\$0.08	63.6%	60	30,000	60	30,000	99%	100%	100%	131	935,164	\$ 45,000					
LED Midstream Interior Lamps		LED Lamp		12	5,943	Halogen, Incandescent, or CFL Lamp	35	5,943	5.37	\$11	\$5	\$17	\$ 0.059	66%	2.18	0.74	137	\$0.08	\$0.02	0.023	0.016	\$0.00	\$0.35	63.6%	1,036	108,800	1,036	114,240	99%	100%	100%	1,686	15,765,488	\$ 1,198,900					
LED Interior Fixture		LED Downlight Fixture		45	4,543	Incandescent Fixture	80	4,543	20.00	\$49	\$0	\$189	\$ 0.068	26%	18.25	13.54	159	\$0.31	\$0.02	0.035	0.024	\$0.00	\$0.41	63.6%	2	110	5	110	99%	100%	100%	3	18,536	\$ 5,350					
LED Exterior Wall Pack		LED Wall Pack Fixture		52	4,903	HID Wall Pack Fixture	240	4,903	20.00	\$72	\$0	\$350	\$ 0.068	21%	5.62	4.46	322	\$0.08	\$0.00	0.188	0.000	\$0.00	\$0.00	0.0%	16	1,850	15	1,850	99%	100%	100%	0	1,810,189	\$ 134,000					
LED Parking Garage Wall Pack		LED Wall Pack Fixture		38	8,760	HID Wall Pack Fixture	187	8,760	20.00	\$60	\$0	\$355	\$ 0.059	17%	4.61	3.83	1,303	\$0.05	\$0.00	0.149	0.159	\$0.00	\$0.00	100.0%	4	225	4	225	99%	100%	100%	36	311,072	\$ 13,500					
LED Outdoor Canopy Lighting		LED Canopy Fixture		72	4,903	HD Fixture	328	4,903	20.00	\$113	\$0	\$340	\$ 0.044	33%	6.17	4.13	1,256	\$0.09	\$0.00	0.256	0.000	\$0.00	\$0.00	0.0%	9	400	9	400	99%	100%	100%	0	533,021	\$ 45,000					
LED Parking Garage Lighting		LED Parking Garage Fixture		47	8,760	HD Fixture	199	8,760	20.00	\$138	\$0	\$366	\$ 0.059	38%	4.66	2.91	1,332	\$0.10	\$0.01	0.152	0.163	\$0.00	\$0.00	100.0%	8	2,500	8	2,500	99%	100%	100%	403	5,533,282	\$ 345,000					
LED Ref and Frz Cases 5' or 6' doors		LED Strip Lighting		51	8,760	T8 or T12 Fluorescent	139	8,760	20.00	\$45	\$0	\$164	\$ 0.059	27%	3.60	2.61	771	\$0.06	\$0.00	0.088	0.094	\$0.00	\$0.00	100.0%	20	500	20	1,000	99%	100%	100%	47	409,203	\$ 22,500					
LED Street Lighting		LED Fixtures		129	4,903	HD Fixture	314	4,903	20.00	\$79	\$0	\$360	\$ 0.044	14%	13.97	12.00	914	\$0.09	\$0.00	0.186	0.000	\$0.00	\$0.00	0.0%	8	65	8	65	99%	100%	100%	0	63,034	\$ 5,125					
LED Area Lighting		LED Fixtures		116	4,903	HD Fixture	384	4,903	20.00	\$142	\$0	\$615	\$ 0.044	23%	10.68	8.22	1,313	\$0.11	\$0.01	0.288	0.000	\$0.00	\$0.00	0.0%	15	1,600	15	1,600	99%	100%	100%	0	2,228,747	\$ 227,500					
LED Troffer Fixture		LED Troffer Fixture		55	4,543	Fluorescent Fixture	108	4,543	20.00	\$50	\$0	\$231	\$ 0.068	22%	14.77	11.57	240	\$0.21	\$0.01	0.053	0.036	\$0.00	\$0.62	63.6%	3	7,000	3	10,000	99%	100%	100%	250	1,784,193	\$ 350,000					
LED Troffer Retrofit		LED Troffer Fixture - Retrofit Kit		51	4,543	Fluorescent Fixture	101	4,543	20.00	\$30	\$0	\$166	\$ 0.068	18%	11.10	9.09	230	\$0.13	\$0.01	0.051	0.034	\$0.00	\$0.59	63.6%	3	1,500	3	1,500	99%	100%	100%	51	365,239	\$ 45,000					
T12 LED Troffer Fixture		LED Troffer T12 Fixture - Retrofit Kit		49	4,543	Fluorescent Fixture	90	4,543	20.00	\$50	\$51	\$119	\$ 0.068	42%	9.89	5.74	185	\$0.27	\$0.01	0.041	0.028	\$0.00	\$0.48	63.6%	2	100	2	500	99%	100%	100%	3	19,672	\$ 5,000					
T12 LED Troffer Retrofit		LED Troffer T12 Fixture		53	4,543	Fluorescent Fixture	92	4,543	20.00	\$30	\$51	\$173	\$ 0.068	17%	14.91	12.33	178	\$0.17	\$0.01	0.039	0.027	\$0.00	\$0.46	63.6%	2	100	2	100	99%	100%	100%	3	18,933	\$ 3,000					
LED High Bay Fixture		LED High Bay		301	4,543	HID Fixture	571	4,543	20.00	\$156	\$0	\$684	\$ 0.068	23%	8.56	6.60	1,229	\$0.13	\$0.01	0.271	0.184	\$0.00	\$3.15	63.6%	8	1,010	20	1,768	99%	100%	100%	184	1,317,082	\$ 158,000					
Retrofit Kits for LED High-Bay Fixtures		LED High Bay Retrofit Kit		302	4,543	HID Fixture	587	4,543	20.00	\$58	\$0	\$431	\$ 0.068	13%	5.12	4.44	1,295	\$0.04	\$0.00	0.285	0.194	\$0.00	\$3.32	63.6%	4	420	4	420	99%	100%	100%	81	577,016	\$ 24,200					
LED Tubes (Linear Lamps)		LED Tubes (Linear Lamps)		17	4,543	T8 Fluorescent Lamps	30	4,543	13.09	\$5	\$2	\$37	\$ 0.068	13%	9.86	8.58	57	\$0.08	\$0.01	0.013	0.009	\$0.00	\$0.15	63.6%	400	26,000	400	26,000	99%	100%	100%	220	1,575,048	\$ 124,000					
LED High Bay Fixture		LED High Bay Fixture		408	4,543	HID Fixture	835	4,543	20.00	\$151	\$323	\$866	\$ 0.068	17%	6.88	5.68	1,937	\$0.08	\$0.00	0.426	0.290	\$0.00	\$4.97	63.6%	8	4,000	8	8,000	99%	100%	100%	1,150	8,218,493	\$ 605,000					
LED Interior Fixture		LED Downlight Fixture		34	4,543	Incandescent Fixture	69	4,543	20.00	\$33	\$33	\$130	\$ 0.068	25%	12.94	9.72	155	\$0.21	\$0.01	0.034	0.023	\$0.00	\$0.40	63.6%	2	200	2	200	99%	100%	100%	5	32,876	\$ 8,500					
LED Ref and Frz Cases 5' or 6' doors		LED Strip Lighting		51	8,760	T8 Fluorescent	118	8,760	20.00	\$35	\$38	\$125	\$ 0.059	28%	3.60	2.59	591	\$0.06	\$0.00	0.067	0.072	\$0.00	\$0.00	100.0%	20	1,000	20	1,000	99%	100%	100%	72	627,020	\$ 35,000					
LED Exterior Wall Pack		LED Wall Pack Fixture		51	4,903	HID Wall Pack Fixture	235	4,903	20.00	\$31	\$263	\$84	\$ 0.044	37%	2.12	1.34	903	\$0.03	\$0.00	0.184	0.000	\$0.00	\$0.00	0.0%	16	2,550	16	2,550	99%	100%	100%	0	2,443,682	\$ 78,000					
LED Parking Garage Wall Pack		LED Wall Pack Fixture		38	8,760	HID Wall Pack Fixture	181	8,760	20.00	\$26	\$225	\$131	\$ 0.059	19%	1.78	1.43	1,252	\$0.02	\$0.00	0.143	0.153	\$0.00	\$0.00	100.0%	6	225	6	225	99%	100%	100%	34	298,920	\$ 5,750					
LED Outdoor Canopy Lighting		LED Canopy Fixture		74	4,903	HD Fixture	355	4,903	20.00	\$23	\$261	\$79	\$ 0.044	29%	1.30	0.92	1,377	\$0.02	\$0.00	0.281	0.000	\$0.00	\$0.00	0.0%	6	300	6	300	99%	100%	100%	0	438,358	\$ 6,750					
LED Parking Garage Lighting		LED Parking Garage Fixture		54	8,760	HD Fixture	215	8,760	20.00	\$29	\$259	\$114	\$ 0.059	25%	1.37	1.02	1,411	\$0.02	\$0.00	0.161	0.172	\$0.00	\$0.00	100.0%	8	3,200	8	3,200	99%	100%	100%	547	4,792,003	\$ 92,000					
T8 Low Wattage Lamps		T8 Low Wattage Lamps		31	4,543	T8 32W Lamp	38	4,543	8.00	\$2	\$2	\$2	\$ 0.068	75%	1.05	0.26	29	\$0.05	\$0.01	0.006	0.004	\$0.00	\$0.08	63.6%	20	10,000	20	6,000	99%	100%	100%	44	311,721	\$ 15,000					
High Bay Fluorescent replacing HID																																							

Measure Description	High Efficiency Product Assumptions			Electric Product Detailed Technical Assumptions										Stipulated Output										Economic Assumptions		Technical Assumption	Program Forecast Inputs				Stipulated Forecast Inputs			2017		
				Baseline Product Assumptions			Economic Assumptions			2017																	2018									
Electric Measure Description	Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Increment Cost Payback Period w/o Rebate (yrs)	Increment Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)				
Custom Lighting Project	High Efficiency Lighting	4,537	3,898	Existing Lower Efficiency Lighting	14,860	3,898	16.94	\$5,495	\$1,569	\$12,110	\$ 0.068	45%	4.65	2.54	40,238	\$0.14	\$0.01	10,323	6,694	\$0.00	-\$113.84	60.6%	30	100	30	100	96%	100%	100%	643	4,131,372	\$ 549,530				
Sink Aerator -restroom, elec water heating (per aerator)	8 gallons per minute restroom faucet aerator	84	8,760	2.2 gallons per minute faucet	306	8,760	10.00	\$7	\$0	\$7	\$ 0.068	100%	0.03	0.00	1,951	\$0.00	\$0.00	0.223	0.005	\$94.26	\$0.00	2.1%	90	90	90	90	100%	100%	100%	0	187,816	\$ 603				
Sink Aerator -kitchen, elec water heating (per aerator)	1.5 gallons per minute kitchen faucet aerator	70	8,760	2.2 gallons per minute faucet	102	8,760	10.00	\$7	\$0	\$7	\$ 0.068	100%	0.20	0.00	285	\$0.02	\$0.00	0.032	0.000	\$13.75	\$0.00	0.7%	10	10	10	10	100%	100%	100%	0	3,043	\$ 67				
Lighting Control System	Lighting Control System	0	8,433	Manual Lighting Controls	2,647	8,433	15.00	\$1,579	\$0	\$6,832	\$ 0.068	24%	3.78	2.88	22,324	\$0.07	\$0.00	2,647	0.113	\$0.00	\$245.63	4.0%	2	2	2	2	100%	100%	100%	0	47,751	\$ 3,158				
LED Screw-In Lamps, HID Replacement	LED High Bay Replacement Lamp	146	4,601	HID Fixture	285	4,601	9.52	\$50	\$11	\$178	\$ 0.068	28%	4.28	3.08	940	\$0.08	\$0.01	0.139	0.090	\$0.00	-\$1.64	60.7%	10	150	10	150	100%	100%	100%	14	102,647	\$ 7,450				
LED Plug based CFL Replacement lamp	LED Plug In Lamp	21	4,601	CFL lamp	47	4,601	12.00	\$7	\$1	\$20	\$ 0.068	35%	2.62	1.70	117	\$0.06	\$0.00	0.025	0.017	\$0.00	\$0.30	60.7%	10	500	10	500	100%	100%	100%	8	62,629	\$ 3,500				
LED Interior Fixture (CFL Baseline)	LED Downlight Fixture	33	4,601	CFL Fixture	74	4,601	20.00	\$30	\$0	\$110	\$ 0.068	27%	8.92	6.49	190	\$0.16	\$0.01	0.041	0.027	\$0.00	-\$0.49	60.7%	20	1,000	20	2,000	100%	100%	100%	27	202,987	\$ 30,000				
LED Troffer Fixture (T12 Baseline)	LED Troffer Fixture	55	4,601	T12 Fluorescent Fixture	155	4,601	20.00	\$70	\$0	\$231	\$ 0.068	30%	7.71	5.37	460	\$0.15	\$0.01	0.100	0.065	\$0.00	-\$1.18	60.7%	15	2,500	15	2,500	100%	100%	100%	162	1,229,876	\$ 175,000				
LED Troffer Retrofit (T12 Baseline)	LED Troffer Fixture - Retrofit Kit	51	4,601	T12 Fluorescent Fixture	151	4,601	20.00	\$50	\$0	\$166	\$ 0.068	30%	5.53	3.86	460	\$0.11	\$0.01	0.100	0.065	\$0.00	-\$1.18	60.7%	15	1,500	15	1,500	100%	100%	100%	97	738,624	\$ 75,000				
LED Tubes (Linear Lamps) (T12 Baseline)	LED Tubes (Linear Lamps)	21	4,601	T12 Fluorescent Lamps	57	4,601	14.95	\$14	\$1	\$46	\$ 0.068	30%	4.29	3.00	166	\$0.08	\$0.01	0.036	0.023	\$0.00	-\$0.43	60.7%	45	4,000	45	4,000	100%	100%	100%	94	709,385	\$ 56,000				
LED Ref and Frz Cases 5' or 6' doors (T12 Baseline)	LED Strip lighting	51	8,760	T12 Fluorescent	160	8,760	20.00	\$55	\$0	\$164	\$ 0.068	34%	2.54	1.69	952	\$0.06	\$0.00	0.109	0.116	\$0.00	\$0.00	100.0%	20	950	20	800	100%	100%	100%	110	967,040	\$ 52,250				
LED Linear Ambient (T12 Baseline)	LED Linear Ambient Fixture	70	4,601	T12 Fluorescent Ambient Fixture	148	4,601	20.00	\$127	\$0	\$245	\$ 0.068	52%	10.53	5.08	357	\$0.35	\$0.02	0.078	0.050	\$0.00	-\$0.92	60.7%	3	2,750	3	2,613	100%	100%	100%	139	1,051,012	\$ 348,750				
New Motor Enhanced	NEMA Premium +1% Efficient Motor	2,850	3,306	NEMA Premium	2,903	3,306	20.00	\$69	\$798	\$198	\$ 0.068	35%	16.67	10.89	175	\$0.39	\$0.02	0.053	0.044	\$0.00	\$0.00	78.0%	10	15	10	15	65%	100%	100%	0	1,822	\$ 1,030				
Upgrade Motor Enhanced	NEMA Premium +1% Efficient Motor	4,054	3,582	EPACT Efficient Motor	4,187	3,582	20.00	\$327	\$0	\$1,268	\$ 0.068	26%	39.26	29.15	475	\$0.69	\$0.03	0.133	0.111	\$0.00	\$0.00	78.0%	8	13	8	13	65%	100%	100%	1	4,296	\$ 4,245				
Variable Frequency Drive	Equipment coupled with an ASD/VFD	9,582	4,926	Equipment without an ASD/VFD	14,214	4,926	15.00	\$2,542	\$0	\$5,963	\$ 0.068	43%	3.85	2.21	22,817	\$0.11	\$0.01	4,632	3,864	\$0.00	\$0.00	78.0%	123	490	104	417	65%	100%	100%	1,231	7,772,526	\$ 1,245,560				
VFD on Well Pump	VFD Well Pump	60,222	2,653	Throttled Well Pump	85,155	2,653	15.00	\$6,000	\$0	\$19,773	\$ 0.068	30%	4.40	3.06	66,143	\$0.09	\$0.01	24,933	10,146	\$0.00	\$0.00	38.1%	20	20	20	20	65%	100%	100%	132	919,629	\$ 120,000				
CSMC	Motor with Voltage Controller	5,533	4,768	Motor without Voltage Controller	6,327	4,768	20.00	\$430	\$0	\$1,401	\$ 0.068	31%	5.45	3.77	3,786	\$0.11	\$0.01	0,794	0,662	\$0.00	\$0.00	78.0%	2	8	1	4	95%	100%	100%	5	30,770	\$ 3,441				
CO - Custom Efficiency - Motors	New Equipment	58,566	4,197	Existing or New Efficient	85,875	4,197	16.91	\$10,106	\$1,319	\$53,372	\$ 0.068	19%	6.85	5.55	114,628	\$0.09	\$0.01	27,309	26,410	\$0.00	\$0.00	90.4%	16	16	14	14	65%	100%	100%	275	1,275,009	\$ 161,698				
Compressed air	New Equipment	16,205,550	8,201	Old or less efficient systems or equipment	16,317,432	8,201	20.00	\$35,992	\$0	\$194,839	\$ 0.070	18%	3.04	2.48	917,548	\$0.04	\$0.00	111,883	99,727	\$0.00	\$0.00	83.3%	2	3	2	3	90%	100%	100%	269	2,649,603	\$ 107,976				
Cooling	New Equipment	16,216,443	5,877	Old or less efficient systems or equipment	16,317,432	5,877	15.00	\$42,270	\$0	\$166,870	\$ 0.077	25%	3.60	2.69	593,488	\$0.07	\$0.00	100,990	64,742	\$392.33	\$0.00	59.9%	1	1	1	1	90%	100%	100%	58	571,272	\$ 42,270				
Custom	New Equipment	16,146,814	2,907	Old or less efficient systems or equipment	16,317,432	2,907	20.00	\$20,269	\$0	\$205,693	\$ 0.077	10%	5.38	4.85	496,058	\$0.04	\$0.00	170,618	10,463	\$0.00	\$0.00	5.7%	7	9	7	9	90%	100%	100%	85	4,297,401	\$ 182,419				
EMS	New Equipment	16,211,004	8,576	Old or less efficient systems or equipment	16,317,432	8,576	15.00	\$11,521	\$0	\$71,838	\$ 0.049	16%	1.56	1.31	912,759	\$0.01	\$0.00	106,428	2,946	\$1,584.50	\$0.00	2.8%	2	2	2	2	90%	100%	100%	5	1,757,184	\$ 23,041				
Lighting	New Equipment	16,312,333	6,011	Old or less efficient systems or equipment	16,317,432	6,011	18.00	\$1,788	\$0	\$9,675	\$ 0.076	18%	4.23	3.45	30,651	\$0.06	\$0.00	5,099	3,731	-\$44.70	\$0.00	68.4%	12	12	12	12	90%	100%	100%	40	354,043	\$ 21,454				
Motors	New Equipment	16,280,862	5,083	Old or less efficient systems or equipment	16,317,432	5,083	15.00	\$18,956	\$0	\$42,606	\$ 0.077	44%	2.98	1.65	186,895	\$0.10	\$0.01	36,770	29,361	\$0.00	\$0.00	74.7%	12	47	12	47	90%	100%	100%	1,242	8,455,242	\$ 890,916				
Recommissioning Study	Study Potential Recommissioning measures	413,416	8,532																																	

Measure Description	High Efficiency Product Assumptions				Baseline Product Assumptions				Economic Assumptions				Stipulated Output								Economic Assumptions		Technical Assumption	Program Forecast Inputs				Stipulated Forecast Inputs			2017		
	Electric Measure Description	Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Increment'l Cost Payback Period w/ Rebate (yrs)	Increment'l Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kWh Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)
Provide Energy Efficient Bath Faucet Aerator - 1.0 GPM for second faucet to replace existing 2.2 gpm aerator in home with electric DHW heater	1.0 GPM Bathroom Faucet Aerator	6	6,760	2.2 GPM Bathroom Faucet Aerator	13	6,760	10.00	\$1	\$0	\$1	\$ 0.103	100%	0.06	0.00	60	\$0.01	\$0.00	0.007	0.009	\$2.95	\$0.00	123.6%	0	0	321	1,514	99%	35%	100%	0	0	\$ -	
Envelope Measures with 10% improvement over local code - Combo Customers IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3409 and Percent BTC 13.04%	3,999	1,912	Reference Home Based upon Local Code	4,259	1,912	20.00	\$111	\$0	\$260	\$ 0.103	40%	5.47	3.31	497	\$0.22	\$0.01	0.260	0.207	\$0.00	\$0.00	73.6%	0	0	0	0	92%	100%	100%	0	0	\$ -	
Envelope Measures with 15% improvement over local code - Combo Customers IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3371 and Percent BTC 16.1%	4,405	1,865	Reference Home Based upon Local Code	4,730	1,865	20.00	\$138	\$0	\$407	\$ 0.103	34%	6.53	4.32	606	\$0.23	\$0.01	0.325	0.291	\$0.00	\$0.00	82.6%	26	50	26	50	92%	100%	100%	13	30,198	\$ 6,892	
Envelope Measures with 20% improvement over local code - Combo Customers IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3614 and Percent BTC 22.77%	4,958	1,850	Reference Home Based upon Local Code	5,380	1,850	20.00	\$178	\$0	\$563	\$ 0.103	32%	7.02	4.80	781	\$0.23	\$0.01	0.422	0.393	\$0.00	\$0.00	85.9%	51	100	52	100	92%	100%	100%	36	77,801	\$ 17,795	
Envelope Measures with 25% improvement over local code - Combo Customers IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3931 and Percent BTC 27.40%	6,092	1,599	Reference Home Based upon Local Code	6,748	1,599	20.00	\$246	\$0	\$786	\$ 0.103	31%	7.28	5.00	1,049	\$0.23	\$0.01	0.656	0.620	\$0.00	\$0.00	87.3%	51	100	55	105	92%	100%	100%	57	104,563	\$ 24,595	
Envelope Measures with 30% improvement over local code - Combo Customers IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4361 and Percent BTC 31.62%	7,570	1,427	Reference Home Based upon Local Code	8,522	1,427	20.00	\$313	\$0	\$1,016	\$ 0.103	31%	7.27	5.03	1,359	\$0.23	\$0.01	0.952	0.920	\$0.00	\$0.00	89.2%	41	80	43	82	92%	100%	100%	68	108,316	\$ 25,066	
Envelope Measures with 35% improvement over local code - Combo Customers IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 5040 and Percent BTC 36.90%	8,114	1,313	Reference Home Based upon Local Code	9,360	1,313	20.00	\$441	\$0	\$1,413	\$ 0.103	31%	8.39	5.77	1,636	\$0.27	\$0.01	1,246	1,145	\$0.00	\$0.00	84.8%	26	50	27	51	92%	100%	100%	53	81,511	\$ 22,053	
Envelope Measures with 40% improvement over local code - Combo Customers IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3612 and Percent BTC 44.02%	5,843	1,544	Reference Home Based upon Local Code	7,328	1,544	20.00	\$657	\$0	\$1,928	\$ 0.103	34%	8.17	5.39	2,293	\$0.29	\$0.01	1,485	1,046	\$0.00	\$0.00	65.0%	13	25	13	25	92%	100%	100%	24	57,130	\$ 16,417	
Envelope Measures with 10% improvement over local code - Combo Customers IECC 2012 or Higher	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3409 and Final HERS 12.99%	2,800	3,569	Reference Home Based upon Local Code	3,046	3,569	20.00	\$139	\$0	\$306	\$ 0.103	45%	3.41	1.86	874	\$0.16	\$0.01	0.245	0.195	\$0.00	\$0.00	73.6%	540	1,050	578	1,105	92%	100%	100%	189	914,943	\$ 145,963	
Envelope Measures with 15% improvement over local code - Combo Customers IECC 2012 or Higher	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3371 and Final HERS 17.2%	3,513	2,975	Reference Home Based upon Local Code	3,920	2,975	20.00	\$203	\$0	\$476	\$ 0.103	43%	3.82	2.19	1,211	\$0.17	\$0.01	0.407	0.364	\$0.00	\$0.00	82.6%	514	1,000	554	1,060	92%	100%	100%	335	1,206,860	\$ 202,721	
Envelope Measures with 20% improvement over local code - Combo Customers IECC 2012 or Higher	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3614 and Final HERS 21.88%	3,981	2,646	Reference Home Based upon Local Code	4,464	2,646	20.00	\$283	\$0	\$815	\$ 0.103	35%	6.20	4.05	1,278	\$0.22	\$0.01	0.483	0.449	\$0.00	\$0.00	85.9%	195	380	251	480	92%	100%	100%	157	484,066	\$ 107,577	
Envelope Measures with 25% improvement over local code - Combo Customers IECC 2012 or Higher	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3931 and Final HERS 26.9%	3,237	2,934	Reference Home Based upon Local Code	3,880	2,934	20.00	\$478	\$0	\$1,593	\$ 0.103	30%	8.21	5.74	1,887	\$0.25	\$0.01	0.643	0.608	\$0.00	\$0.00	87.3%	26	50	39	75	92%	100%	100%	28	94,018	\$ 23,895	
Envelope Measures with 30% improvement over local code - Combo Customers IECC 2012 or Higher	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4361 and Final HERS 32.08%	3,336	2,102	Reference Home Based upon Local Code	3,836	2,102	20.00	\$490	\$0	\$1,638	\$ 0.103	30%	15.15	10.62	1,051	\$0.47	\$0.02	0.500	0.487	\$0.00	\$0.00	90.0%	21	40	22	42	92%	100%	100%	18	41,899	\$ 19,585	
Envelope Measures with 35% improvement over local code - Combo Customers IECC 2012 or Higher	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 5040 and Final HERS 36.47%	2,538	4,135	Reference Home Based upon Local Code	3,236	4,135	20.00	\$903	\$0	\$3,004	\$ 0.103	30%	10.09	7.06	2,894	\$0.31	\$0.02	0.700	0.643	\$0.00	\$0.00	84.8%	0	0	0	0	92%	100%	100%	0	0	\$ -	
Envelope Measures with 40% improvement over local code - Combo Customers IECC 2012 or Higher	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3612 and Final HERS 42.35%	1,541	5,191	Reference Home Based upon Local Code	2,241	5,191	20.00	\$1,293	\$0	\$4,306	\$ 0.103	30%	11.52	8.06	3,634	\$0.36	\$0.02	0.700	0.493	\$0.00	\$0.00	65.0%	0	0	0	0	92%	100%	100%	0	0	\$ -	
Energy Star Clothes Washer - Combo Customers w/ Electric DHW	Energy Star Clothes Washer	370	295	Standard Clothes Washer	477	295	11.00	\$30	\$0	\$30	\$ 0.103	100%	2.78	0.00	32	\$0.95	\$0.09	0.107	0.004	\$7.53	\$0.00	3.4%	1	2	1	2	92%	100%	100%	0	63	\$ 60	
Energy Star Clothes Washer - Combo Customers w/ Gas DHW	Energy Star Clothes Washer	111	295	Standard Clothes Washer	132	295	11.00	\$12	\$0	\$12	\$ 0.103	100%	1.52	0.00	6	\$1.97	\$0.18	0.021	0.001	\$7.53	\$0.00	3.4%	90	176	96	184	92%	100%	100%	0	1,104	\$ 2,181	
Energy Star Refrigerator	Energy Star Refrigerator - Side by Side with through door ice and auto defrost	7	8,760	standard refrigerator - Side by Side with through door ice and auto defrost	9	8,760	13.00	\$10	\$0	\$40	\$ 0.103	25%	24.20	18.15	16	\$0.62	\$0.05	0.002	0.002	\$0.00	\$0.00	100.0%	301	585	321	614	92%	100%	100%	1	9,367	\$ 5,850	
100% High Efficacy Lighting in IECC 2012 or IECC 2015 Homes (CFLs or LEDs) - 2017	Average LED Bulb	11	909	Average EISA Standard halogen A Style Bulb	50	909	7.10	\$1	\$2	\$7	\$ 0.104	14%	1.98	1.71	36	\$0.03	\$0.00	0.039	0.003	\$0.00	\$0.00	8.0%	853	1,658	0	0	92%	100%	100%	5	59,036	\$ 1,658	
2009 IECC or lower with CFL or LEDs - Minimum 20 lamps - 2017	Average LED Bulb	11	909	Average EISA Standard halogen A Style Bulb	50	909	7.10	\$1	\$2	\$7	\$ 0.104	14%	1.98	1.71	36	\$0.03	\$0.00	0.039	0.003	\$0.00	\$0.00	8.0%	176	341	0	0	92%	100%	100%	1	12,155	\$ 341	
100% High Efficacy Lighting in IECC 2012 or IECC 2015 Homes (CFLs or LEDs) - 2018	Average LED Bulb	11	909	Average EISA Standard halogen A Style Bulb	50	909	6.10	\$1	\$2	\$6	\$ 0.104	16%	1.73	1.46	36	\$0.03	\$0.00	0.039	0.003	\$0.00	\$0.00	8.0%	0	0	910	1,740	92%	100%	100%	0	0	\$ -	
2009 IECC or lower with CFL or LEDs - Minimum 20 lamps - 2018	Average LED Bulb	11	909	Average EISA Standard halogen A Style Bulb	50	909	6.10	\$1	\$2	\$6	\$ 0.104	16%	1.73	1.46	36	\$0.03	\$0.00	0.039	0.003	\$0.00	\$0.00	8.0%	0	0	187	358	92%	100%	100%	0	0	\$ -	
Evaporative Cooling Replacing 13 SEER central A/C (Tier 1) Replacement	3 Ton Evaporative Cooler	398	465	3T SEER 13 EER 11.16 w/o Quality Installation	3,220	465	15.00	\$200	\$1,931	-\$709	\$ 0.117	-28%	-5.27	-6.76	1,317	\$0.15	\$0.01	2.832	2.148	-\$19.92	\$0.00	70.0%	650	650	650	6							

Measure Description		Electric Product Detailed Technical Assumptions										Program Forecast Inputs										Stipulated Forecast Inputs			2017								
		High Efficiency Product Assumptions			Baseline Product Assumptions			Economic Assumptions				Stipulated Output						Economic Assumptions		Technical Assumption													
Electric Measure Description		Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Incremental Cost Payback Period w/o Rebate (yrs)	Incremental Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)
Quality Install of AC Unit New Home		Provide Quality Installation of new AC 2.5 Ton 13 SEER to 14.99 SEER	2,683	488	Non-Quality Installation of 2.5 Ton 13 SEER AC	2,683	536	15.00	\$0	\$0	\$117	\$ 0.104	0%	8.65	8.65	130	\$0.00	\$0.00	0.000	0.000	\$0.00	\$0.00	90.0%	1	1	1	1	68%	100%	100%	0	95	\$ -
Quality Install of AC Unit New Home		Provide Quality Installation of new AC 2.5 Ton 15 SEER	2,439	465	Non-Quality Installation of 2.5 Ton 15 SEER AC	2,439	511	15.00	\$0	\$0	\$117	\$ 0.104	0%	9.98	9.98	112	\$0.00	\$0.00	0.000	0.000	\$0.00	\$0.00	90.0%	3	3	3	3	68%	100%	100%	0	247	\$ -
Quality Install of AC Unit New Home		Provide Quality Installation of new AC 2.5 Ton16 SEER	2,344	454	Non-Quality Installation of 2.5 Ton AC 16 SEER	2,344	499	15.00	\$0	\$0	\$117	\$ 0.104	0%	10.65	10.65	105	\$0.00	\$0.00	0.000	0.000	\$0.00	\$0.00	90.0%	3	3	3	3	68%	100%	100%	0	231	\$ -
Quality Install of AC Unit New Home		Provide Quality Installation of new AC 2.5 Ton 17 SEER	2,262	443	Non-Quality Installation of 2.5 Ton AC 17 SEER	2,262	496	15.00	\$0	\$0	\$117	\$ 0.104	0%	11.31	11.31	99	\$0.00	\$0.00	0.000	0.000	\$0.00	\$0.00	90.0%	3	3	3	3	68%	100%	100%	0	218	\$ -
Installation of High Efficiency AC equipment Existing Home		Non - QualityInstallation of new AC 3 Ton 15 SEER	2,975	502	Non-Quality Installation of 3 Ton 13 SEER AC	3,278	525	15.00	\$350	\$1,269	\$553	\$ 0.104	63%	23.07	8.46	230	\$1.53	\$0.10	0.303	0.296	\$0.00	\$0.00	90.0%	350	350	375	375	68%	100%	100%	70	58,825	\$ 122,500
Installation of High Efficiency AC equipment Existing Home		Non - QualityInstallation of new AC 3 Ton 16 SEER	2,856	490	Non-Quality Installation of 3 Ton 13 SEER AC	3,278	525	15.00	\$500	\$1,269	\$829	\$ 0.104	60%	24.61	9.77	323	\$1.55	\$0.10	0.422	0.411	\$0.00	\$0.00	90.0%	380	380	410	410	68%	100%	100%	106	89,813	\$ 190,000
Installation of High Efficiency AC equipment Existing Home		Non - QualityInstallation of new AC 3 Ton 17 SEER	2,755	478	Non-Quality Installation of 3 Ton 13 SEER AC	3,278	525	15.00	\$650	\$1,269	\$1,106	\$ 0.104	59%	26.15	10.77	405	\$1.60	\$0.11	0.523	0.510	\$0.00	\$0.00	90.0%	50	50	55	55	68%	100%	100%	17	14,830	\$ 32,500
Quality Install of AC Unit Existing Home		Provide Quality Installation of new AC 3 Ton 13 SEER to 14.99 SEER	2,898	456	Non-Quality Installation of 3 Ton 13 SEER AC	3,278	525	15.00	\$0	\$0	\$146	\$ 0.104	0%	3.49	3.49	401	\$0.00	\$0.00	0.380	0.370	\$0.00	\$0.00	90.0%	40	40	35	35	68%	100%	100%	10	11,745	\$ -
Quality Install of AC Unit Existing Home		Provide Quality Installation of new AC 3 Ton 15 SEER	2,634	434	Non-Quality Installation of 3 Ton 15 SEER AC	2,975	502	15.00	\$0	\$0	\$104	\$ 0.104	0%	2.88	2.88	348	\$0.00	\$0.00	0.341	0.332	\$0.00	\$0.00	90.0%	350	350	375	375	68%	100%	100%	79	89,069	\$ -
Quality Install of AC Unit Existing Home		Provide Quality Installation of new AC 3 Ton 16 SEER	2,531	424	Non-Quality Installation of 3 Ton 16 SEER AC	2,856	490	15.00	\$0	\$0	\$77	\$ 0.104	0%	2.26	2.26	326	\$0.00	\$0.00	0.325	0.317	\$0.00	\$0.00	90.0%	380	380	410	410	68%	100%	100%	81	90,660	\$ -
Quality Install of AC Unit Existing Home		Provide Quality Installation of new AC 3 Ton 17 SEER	2,443	413	Non-Quality Installation of 3 Ton 17 SEER AC	2,755	478	15.00	\$0	\$0	\$49	\$ 0.104	0%	1.54	1.54	307	\$0.00	\$0.00	0.311	0.303	\$0.00	\$0.00	90.0%	50	50	55	55	68%	100%	100%	10	11,227	\$ -
Early Retirement Install High Efficiency A/C		Quality Install Existing Home High Efficiency 14.5 SEER 3 Ton AC (Trade In)	2,692	440	3 Ton 10 SEER AC without Quality Installation	3,992	591	7.50	\$500	\$847	\$830	\$ 0.104	60%	7.54	3.00	1,054	\$0.47	\$0.06	1.300	1.267	\$0.00	\$0.00	90.0%	450	450	500	500	68%	100%	100%	385	347,319	\$ 225,000
Early Retirement Install High Efficiency A/C		Quality Install Existing Home High Efficiency 15 SEER 3 Ton AC (Trade In)	2,634	434	3 Ton 10 SEER AC without Quality Installation	3,992	591	7.50	\$850	\$847	\$1,078	\$ 0.104	79%	9.45	2.00	1,093	\$0.78	\$0.10	1.358	1.324	\$0.00	\$0.00	90.0%	575	575	590	590	68%	100%	100%	514	460,412	\$ 488,750
Early Retirement Install High Efficiency A/C		Quality Install Existing Home High Efficiency 16 SEER 3 Ton AC (Trade In)	2,531	424	3 Ton 10 SEER AC without Quality Installation	3,992	591	7.50	\$1,000	\$847	\$1,327	\$ 0.104	75%	10.91	2.69	1,165	\$0.86	\$0.11	1.460	1.424	\$0.00	\$0.00	90.0%	900	900	925	925	68%	100%	100%	866	767,782	\$ 900,000
Early Retirement Install High Efficiency A/C		Quality Install Existing Home High Efficiency 17 SEER 3 Ton AC (Trade In)	2,443	413	3 Ton 10 SEER AC without Quality Installation	3,992	591	7.50	\$1,150	\$847	\$1,576	\$ 0.104	73%	12.29	3.32	1,228	\$0.94	\$0.12	1.548	1.510	\$0.00	\$0.00	90.0%	130	130	140	140	68%	100%	100%	133	116,909	\$ 149,500
Enhanced Fan Time Delay for Retrofit		3 T, 11 SEER Non-Q/ Unit with Enhanced Evaporator Fan Time Delay	3,554	561	11 SEER Q/ Unit	3,685	561	7.50	\$35	\$0	\$100	\$ 0.104	35%	13.06	8.49	73	\$0.48	\$0.06	0.131	0.128	\$0.00	\$0.00	90.0%	15	15	15	15	100%	100%	100%	2	1,192	\$ 525
Install GSHP Cooling		Quality Installation of 3.1 Ton capacity GSHP with 2.5 ton load, closed loop, 14.1 EER	2,128	488	Non-Quality Installation of 2.5 Ton 13 SEER ASHP with 2.5 ton load	2,683	536	20.00	\$930	\$1,067	\$1,460	\$ 0.104	64%	34.90	12.67	401	\$2.32	\$0.12	0.556	0.542	\$0.00	\$0.00	90.0%	7	7	7	7	100%	100%	100%	4	3,038	\$ 6,510
Install GSHP Cooling		Quality Installation of 4.7 Ton capacity GSHP closed loop, 14.1 EER with 3 ton load	2,553	352	Non-Quality Installation of 3 Ton 13 SEER AC with3ton load, No QI	3,278	525	20.00	\$1,410	\$1,269	\$1,752	\$ 0.104	80%	20.39	3.98	823	\$1.71	\$0.09	0.725	0.707	\$0.00	\$0.00	90.0%	4	4	4	4	100%	100%	100%	3	3,567	\$ 5,640
Install GSHP Heating		Quality Installation of GSHP 3.3 COP 37426 Btu/hr capacity	3,324	999	Non-Quality Installation of New Home ASHP 8.2 HSPF 24 COP 37426 Btu/hr capacity	4,564	1,098	20.00	\$930	\$2,425	\$1,821	\$ 0.104	51%	10.32	5.05	1,690	\$0.55	\$0.03	1.240	1.209	\$0.00	\$0.00	90.0%	5	5	5	5	100%	100%	100%	6	9,156	\$ 4,650
Install GSHP Heating		Quality Installation of GSHP 3.3 COP 55998 Btu/hr capacity	4,973	1,094	Non-Quality Installation of Ducted Electric Resistance Heating	16,822	1,827	20.00	\$1,410	\$1,866	\$2,725	\$ 0.104	52%	1.03	0.50	25,302	\$0.06	\$0.00	11.849	11.552	\$0.00	\$0.00	90.0%	2	2	2	2	100%	100%	100%	23	54,819	\$ 2,820
Install Efficient Mini-Split		MSHP size 1.2 tons, 21.27 SEER, 10.50 HSPF	1,088	1,144	MSHP size 1.2 tons, 14 SEER, 8.2 HSPF	1,647	1,144	18.00	\$200	\$3,440	\$512	\$ 0.104	39%	7.67	4.68	639	\$0.31	\$0.02	0.559	0.545	\$0.00	\$0.00	90.0%	399	399	399	399	100%	100%	100%	217	276,167	\$ 79,736
EC Fan Motor on new Residential Furnace with AC		ECM Furnace Fan	457	4,186	Non-ECM Fan	651	4,186	18.00	\$100	\$236	\$212	\$ 0.103	47%	2.89	1.53	812	\$0.12	\$0.01	0.194	0.166	-\$10.15	\$0.00	79.0%	4,309	4,352	4,309	4,352	94%	100%	100%	679	3,598,521	\$ 435,200
EC Fan Motor on new Residential Furnace no AC		ECM Furnace Fan	364	3,336	Non-ECM Fan	571	3,336	18.00	\$100	\$236	\$212	\$ 0.103	47%	3.48	1.84	691	\$0.14	\$0.01	0.207	0.067	-\$10.15	\$0.00	30.0%	620	628	620	628	94%	100%	100%	52	582,623	\$ 82,800

Measure Description	Electric Product Detailed Technical Assumptions																			Stipulated Output				Economic Assumptions		Technical Assumption	Program Forecast Inputs				Stipulated Forecast Inputs			2017		
	High Efficiency Product Assumptions			Baseline Product Assumptions			Economic Assumptions			2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)																							
Electric Measure Description	Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Increment1 Cost Payback Period w/o Rebate (yrs)	Increment1 Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)				
Tier 2 Air Sealing & Bypass Sealing for minimum 20% ACH Reduction in Electrically Heated and Cooled Home	Home with Tier 2 Air Sealing: CFM50 reading of 2324	5,534	1,194	Baseline home with CFM50 rating of 3223	6,173	1,194	10.00	\$434	\$0	\$960	\$ 0.103	45%	2.96	1.62	3,150	\$0.14	\$0.01	2,639	0.302	\$0.00	\$0.00	10.6%	0	2	0	2	116%	100%	100%	1	7,916	\$ 867				
Tier 2 Air Sealing & Bypass Sealing for minimum 20% ACH Reduction in Natural Gas Heated and Electric Cooled Home	Home with Tier 2 Air Sealing: CFM50 reading of 2324	722	329	Baseline home with CFM50 rating of 3223	1,001	329	10.00	\$38	\$0	\$400	\$ 0.103	10%	42.37	38.33	92	\$0.42	\$0.04	0.279	0.302	\$0.00	\$0.00	100.0%	8	97	8	97	116%	100%	100%	34	11,188	\$ 3,702				
Tier 3 Air Sealing & Bypass Sealing for minimum 30% ACH Reduction in Electric Heated and non-cooled Home	Home with Tier 3 Air Sealing: CFM50 reading of 2078	6,188	1,159	Baseline home with CFM50 rating of 3641	10,841	1,159	10.00	\$92	\$0	\$955	\$ 0.103	10%	1.72	1.56	5,392	\$0.02	\$0.00	4,652	0.000	\$0.00	\$0.00	0.0%	1	8	1	8	116%	100%	100%	0	54,208	\$ 733				
Tier 3 Air Sealing & Bypass Sealing for minimum 30% ACH Reduction in Electrically Heated and Cooled Home	Home with Tier 3 Air Sealing: CFM50 reading of 2078	6,188	1,193	Baseline home with CFM50 rating of 3641	10,841	1,193	10.00	\$550	\$0	\$955	\$ 0.103	58%	1.67	0.71	5,550	\$0.10	\$0.01	4,652	0.519	\$0.00	\$0.00	10.3%	0	3	0	3	116%	100%	100%	2	20,923	\$ 1,650				
Tier 3 Air Sealing & Bypass Sealing for minimum 30% ACH Reduction in Natural Gas Heated and Electric Cooled Home	Home with Tier 3 Air Sealing: CFM50 reading of 2078	638	329	Baseline home with CFM50 rating of 3641	1,117	329	10.00	\$144	\$0	\$400	\$ 0.103	36%	24.67	15.78	158	\$0.91	\$0.09	0.479	0.519	\$0.00	\$0.00	100.0%	10	114	10	114	116%	100%	100%	69	22,596	\$ 16,449				
Wall Insulation from R-0 to R11 in Electric Heated and non-cooled Home	R-11 insulation in wall cavity	2,507	1,159	Empty Wall Cavity	6,420	1,159	20.00	\$482	\$0	\$1,936	\$ 0.103	25%	4.15	3.12	4,536	\$0.11	\$0.01	3,913	0.000	\$0.00	\$0.00	0.0%	1	13	1	13	116%	100%	100%	0	74,096	\$ 6,268				
Wall Insulation from R-0 to R11 in Electrically Heated and Cooled Home	R-11 insulation in wall cavity	2,163	1,230	Empty Wall Cavity	6,420	1,230	20.00	\$405	\$0	\$1,936	\$ 0.103	21%	3.59	2.84	5,238	\$0.08	\$0.00	4,257	1.000	\$0.00	\$0.00	21.7%	0	2	0	2	116%	100%	100%	2	13,165	\$ 810				
Wall Insulation from R-0 to R11 in Natural Gas Heated and Electrically Cooled Home	R-11 insulation in wall cavity	469	329	Empty Wall Cavity	1,392	329	20.00	\$213	\$0	\$932	\$ 0.103	23%	29.82	23.00	304	\$0.70	\$0.04	0.923	1.000	\$0.00	\$0.00	100.0%	11	124	11	124	116%	100%	100%	144	47,336	\$ 26,438				
EC Fan Motor on new Residential Furnace no AC	ECM Furnace Fan	364	3,338	Non-ECM Fan	571	3,338	18.00	\$125	\$236	\$212	\$ 0.103	59%	3.48	1.43	691	\$0.18	\$0.01	0.207	0.067	-\$10.15	\$0.00	30.0%	1	13	1	13	116%	100%	100%	1	11,288	\$ 1,625				
EC Fan Motor on existing Residential Furnace no AC	ECM Furnace Fan	334	2,046	Non-ECM Fan	571	2,046	7.00	\$125	\$0	\$212	\$ 0.103	59%	4.84	1.98	485	\$0.26	\$0.04	0.237	0.067	-\$6.06	\$0.00	26.0%	1	13	1	13	116%	100%	100%	1	7,923	\$ 1,625				
EC Fan Motor on new Residential Furnace with AC	ECM Furnace Fan	457	4,186	Non-ECM Fan	651	4,186	18.00	\$125	\$236	\$212	\$ 0.103	59%	2.89	1.19	812	\$0.15	\$0.01	0.194	0.166	-\$10.15	\$0.00	79.0%	1	12	1	12	116%	100%	100%	2	12,245	\$ 1,500				
EC Fan Motor on existing Residential Furnace with AC	ECM Furnace Fan	397	2,319	Non-ECM Fan	636	2,319	7.00	\$125	\$0	\$212	\$ 0.103	59%	3.94	1.62	582	\$0.21	\$0.03	0.251	0.166	-\$6.06	\$0.00	61.0%	1	12	1	12	116%	100%	100%	2	8,776	\$ 1,500				
Energy Star Clothes Washer - Combo Customers w/ Electric DHW	Energy Star Clothes Washer	370	295	Standard Clothes Washer	477	295	11.00	\$30	\$0	\$30	\$ 0.104	100%	2.77	0.00	32	\$0.95	\$0.09	0.107	0.004	\$7.53	\$0.00	3.4%	0	1	0	1	116%	100%	100%	0	40	\$ 30				
Energy Star Clothes Washer - Combo Customers w/ Gas DHW	Energy Star Clothes Washer	111	295	Standard Clothes Washer	132	295	11.00	\$13	\$0	\$13	\$ 0.104	100%	3.30	0.00	6	\$1.99	\$0.18	0.021	0.001	\$3.15	\$0.00	3.4%	2	19	2	19	116%	100%	100%	0	151	\$ 239				
Heat Pump Water Heater in a home with natural gas heat and air source cooling	45 gallon Heat Pump Water Heater	4,196	6,929	45 gallon code minimum electric Water Heater 94.7 % EF	4,593	6,929	10.00	\$550	\$879	\$1,588	\$ 0.104	35%	6.32	4.13	2,755	\$0.20	\$0.02	0.398	0.431	-\$36.52	\$0.00	100.0%	0	2	0	2	116%	100%	100%	1	6,925	\$ 1,100				
Heat Pump Water Heater in a home with electric resistance heat and air source cooling	45 gallon Heat Pump Water Heater	4,196	2,922	45 gallon code minimum electric Water Heater 94.7 % EF	4,593	2,922	10.00	\$550	\$879	\$1,588	\$ 0.104	35%	13.08	8.55	1,162	\$0.47	\$0.05	0.398	0.431	\$0.00	\$0.00	100.0%	0	0	0	0	116%	100%	100%	0	0	\$ -				
Heat Pump Water Heater in a home with air source heat pump heat and air source cooling	45 gallon Heat Pump Water Heater	4,196	5,154	45 gallon code minimum electric Water Heater 94.7 % EF	4,593	5,154	10.00	\$550	\$879	\$1,588	\$ 0.104	35%	7.42	4.85	2,049	\$0.27	\$0.03	0.398	0.431	\$0.00	\$0.00	100.0%	0	0	0	0	116%	100%	100%	0	0	\$ -				
Refrigerator Replacements	Top Mounted Freezer w/ Auto Defrost Energy Star refrigerator 19.9 Cf	66	5,592	Top Mounted Freezer w/ Auto Defrost Refrigerator 19.9 Cf	74	5,592	18.00	\$15	\$630	\$20	\$ 0.104	75%	4.65	1.16	41	\$0.36	\$0.02	0.007	0.005	\$0.00	\$0.00	63.9%	2	26	2	26	116%	100%	100%	0	1,347	\$ 390				
Removal of primary refrigerator	removal of primary refrigerator	0	0	existing primary unit - age mostly >10 years	156	5,592	9.40	\$50	\$0	\$0	\$ 0.104	#DIV/0!	0.00	-0.55	871	\$0.06	\$0.01	0.156	0.108	\$0.00	\$0.00	63.9%	2	26	2	26	116%	100%	100%	3	28,465	\$ 1,300				
Installation of New High Efficiency AC equipment in Existing Home - 3 Ton 15 SEER	Non - Quality/Installation of new AC 3 Ton 15 SEER	2,975	502	Non-Quality Installation of 3 Ton 15 SEER AC	3,276	525	15.00	\$400	\$1,269	\$553	\$ 0.104	72%	23.07	6.37	230	\$1.74	\$0.12	0.303	0.296	\$0.00	\$0.00	90.0%	0	2	0	2	116%	100%	100%	1	577	\$ 800				
Installation of New High Efficiency AC equipment in Existing Home - 3 Ton 16 SEER	Non - Quality/Installation of new AC 3 Ton 16 SEER	2,856	490	Non-Quality Installation of 3 Ton 16 SEER AC	3,276	525	15.00	\$550	\$1,269	\$829	\$ 0.104	66%	24.61	8.28	323	\$1.70	\$0.11	0.422	0.411	\$0.00	\$0.00	90.0%	0	3	0	3	116%	100%	100%	1	1,217	\$ 1,650				
Installation of New High Efficiency AC equipment in Existing Home - 3 Ton 17 SEER	Non - Quality/Installation of new AC 3 Ton 17 SEER	2,755	478	Non-Quality Installation of 3 Ton 17 SEER AC	3,276	525	15.00	\$700	\$1,269	\$1,106	\$ 0.104	63%	26.15	9.59	405	\$1.73	\$0.12	0.523	0.510	\$0.00	\$0.00	90.0%	0	3	0	3	116%	100%	100%	2	1,527	\$ 2,100				
Quality Install of New AC Unit in Existing Home - 3 ton 15 SEER	Provide Quality Installation of new AC 3 Ton 15 SEER	2,634	434	Non-Quality Installation of 3 Ton 15 SEER AC	2,975	502	15.00	\$0	\$0	\$104	\$ 0.104	0%	2.88	2.88	348	\$0.00	\$0.00	0.341	0.332	\$0.00	\$0.00	90.0%	0	2	0	2	116%	100%	100%	1	873	\$ -				
Quality Install of New AC Unit in Existing Home - 3 ton 16 SEER	Provide Quality Installation of new AC 3 Ton 16 SEER	2,531	424	Non-Quality Installation of 3 Ton 16 SEER AC	2,856	490	15.00	\$0	\$0	\$77	\$ 0.104	0%	2.26	2.26	326	\$																				

Measure Description	Electric Product Detailed Technical Assumptions																				Program Forecast Inputs								Stipulated Forecast Inputs			2017		
	High Efficiency Product Assumptions			Baseline Product Assumptions			Economic Assumptions				Stipulated Output						Economic Assumptions		Technical Assumption	2017		2018		Stipulated Forecast Inputs										
Electric Measure Description	Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Increment'l Cost Payback Period w/o Rebate (yrs)	Increment'l Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)		
High Efficiency Evaporative Replacing 13 SEER A/C 3-ton; (Tier 2) 1st Time Install (Grand Junction/Western Slope)	High Effic. Evaporative Cooler 3 Tons	388	478	3T SEER 13 EER 11-18 w/o Quality Installation	3,220	478	15.00	\$625	\$1,931	\$308	\$ 0.104	203%	2.32	-2.38	1,352	\$0.46	\$0.03	2,832	2,148	-\$8.37	\$0.00	70.0%	0	0	0	0	116%	100%	100%	0	0	\$ -		
High Efficiency Evaporative Replacing 13 SEER central A/C 3-ton; (Tier 3) Replacement (Grand Junction/Western Slope)	Integrated HVAC with Hi Effic. Evap System	761	478	3T SEER 13 EER 11-18 w/o Quality Installation	3,220	478	15.00	\$1,000	\$1,931	\$1,695	\$ 0.104	59%	14.83	6.08	1,174	\$0.85	\$0.06	2,459	1,865	-\$8.37	\$0.00	70.0%	0	0	0	0	116%	100%	100%	0	0	\$ -		
Evaporative Cooling Replacing 13 SEER central A/C (Tier 1) Replacement (Alamosa/Mountain Areas)	3 Ton Evaporative Cooler	388	261	3T SEER 13 EER 11-18 w/o Quality Installation	3,220	261	15.00	\$125	\$1,931	-\$709	\$ 0.104	-18%	-12.38	-14.57	739	\$0.17	\$0.01	2,832	2,148	-\$19.92	\$0.00	70.0%	0	0	0	0	116%	100%	100%	0	0	\$ -		
Evaporative Cooling Replacing 13 SEER central A/C (Tier 1) 1st Time Install (Alamosa/Mountain Areas)	3 Ton Evaporative Cooler	388	261	3T SEER 13 EER 11-18 w/o Quality Installation	3,220	261	15.00	\$275	\$1,931	-\$709	\$ 0.104	-39%	-12.38	-17.19	739	\$0.37	\$0.02	2,832	2,148	-\$19.92	\$0.00	70.0%	0	0	0	0	116%	100%	100%	0	0	\$ -		
High Efficiency Evaporative Replacing 13 SEER A/C 3-ton; (Tier 2) Replacement (Alamosa/Mountain Areas)	High Effic. Evaporative Cooler 3 Tons	388	261	3T SEER 13 EER 11-18 w/o Quality Installation	3,220	261	15.00	\$525	\$1,931	\$308	\$ 0.104	170%	4.48	-3.15	739	\$0.71	\$0.05	2,832	2,148	-\$8.37	\$0.00	70.0%	0	0	0	0	116%	100%	100%	0	0	\$ -		
High Efficiency Evaporative Replacing 13 SEER A/C 3-ton; (Tier 2) 1st Time Install (Alamosa/Mountain Areas)	High Effic. Evaporative Cooler 3 Tons	388	261	3T SEER 13 EER 11-18 w/o Quality Installation	3,220	261	15.00	\$625	\$1,931	\$308	\$ 0.104	203%	4.48	-4.60	739	\$0.85	\$0.06	2,832	2,148	-\$8.37	\$0.00	70.0%	0	0	0	0	116%	100%	100%	0	0	\$ -		
High Efficiency Evaporative Replacing 13 SEER central A/C 3-ton; (Tier 3) Replacement (Alamosa/Mountain Areas)	Integrated HVAC with Hi Effic. Evap System	761	261	3T SEER 13 EER 11-18 w/o Quality Installation	3,220	261	15.00	\$1,000	\$1,931	\$1,695	\$ 0.104	59%	28.90	11.84	642	\$1.56	\$0.10	2,459	1,865	-\$8.37	\$0.00	70.0%	0	0	0	0	116%	100%	100%	0	0	\$ -		
Install and program a new Setback Thermostat	Energy Star Programmable thermostat (set back 1.33 F. derived from RECS2009 data)	2,990	580	standard thermostat - manually adjusted	3,130	592	10.00	\$12	\$0	\$25	\$ 0.104	50%	2.03	1.01	118	\$0.11	\$0.01	0.140	0.116	\$0.00	\$0.00	76.4%	5	64	5	64	116%	100%	100%	9	9,473	\$ 797		
Electric Heat Homes Without Cooling	Home with additional insulation	2,018	1,159	Home with R20 or less existing insulation	4,296	1,159	20.00	\$356	\$0	\$1,232	\$ 0.129	29%	3.61	2.56	2,640	\$0.13	\$0.01	2,278	0.000	\$0.00	\$0.00	0.0%	28	46	28	46	89%	100%	100%	0	117,097	\$ 16,366		
Electric Heat Homes With Cooling	Home with additional insulation	1,269	1,488	Home with R20 or less existing insulation	3,549	1,488	20.00	\$421	\$0	\$1,468	\$ 0.129	29%	3.34	2.38	3,393	\$0.12	\$0.01	2,281	0.563	\$0.00	\$0.00	22.8%	5	8	5	8	89%	100%	100%	4	26,174	\$ 3,371		
Gas Heat Homes With Cooling, Combo Customer	Home with additional insulation	480	329	Home with R20 or less existing insulation	1,044	329	20.00	\$185	\$0	\$793	\$ 0.129	23%	33.05	25.36	185	\$1.00	\$0.05	0.564	0.610	\$0.00	\$0.00	100.0%	243	406	243	406	89%	100%	100%	221	72,576	\$ 74,977		
Electric Heat Homes Without Cooling	R-11 insulation	2,927	1,159	Baseline assumes R-0 in wall cavities as existing level	4,296	1,159	20.00	\$241	\$0	\$803	\$ 0.129	30%	3.91	2.74	1,587	\$0.15	\$0.01	1,369	0.000	\$0.00	\$0.00	0.0%	1	2	1	2	89%	100%	100%	0	3,061	\$ 482		
Electric Heat Homes With Cooling	R-11 insulation	2,524	1,488	Baseline assumes R-0 in wall cavities as existing level	3,549	1,488	20.00	\$385	\$0	\$1,337	\$ 0.129	29%	6.77	4.82	1,525	\$0.25	\$0.01	1,025	0.353	\$0.00	\$0.00	31.8%	1	2	1	2	89%	100%	100%	1	2,941	\$ 770		
Gas Heat Homes With Cooling, Combo Customer	R-11 insulation	369	329	Baseline assumes R-0 in wall cavities as existing level	1,044	329	20.00	\$167	\$0	\$677	\$ 0.129	25%	23.56	17.74	222	\$0.75	\$0.04	0.675	0.731	\$0.00	\$0.00	100.0%	25	42	25	42	89%	100%	100%	27	8,993	\$ 7,031		
Electric Heat Homes Without Cooling	Home with Tier 2 Air Sealing	6,071	1,159	Existing Home Without Air Sealing	8,000	1,159	10.00	\$275	\$0	\$686	\$ 0.129	40%	2.37	1.42	2,235	\$0.12	\$0.01	1,929	0.000	\$0.00	\$0.00	0.0%	14	24	14	24	89%	100%	100%	0	51,721	\$ 6,608		
Electric Heat Homes With Cooling	Home with Tier 2 Air Sealing	6,808	1,488	Existing Home Without Air Sealing	8,000	1,488	10.00	\$320	\$0	\$1,200	\$ 0.129	27%	5.23	3.83	1,774	\$0.18	\$0.02	1,192	0.238	\$0.00	\$0.00	18.4%	2	4	2	4	89%	100%	100%	1	6,843	\$ 1,281		
Gas Heat Homes With Cooling, Combo Customer	Home with Tier 2 Air Sealing	3,773	329	Existing Home Without Air Sealing	4,000	329	10.00	\$102	\$0	\$264	\$ 0.129	39%	27.29	16.69	75	\$1.37	\$0.14	0.227	0.246	\$0.00	\$0.00	100.0%	135	226	135	226	89%	100%	100%	49	16,265	\$ 23,161		
Electric Heat Homes Without Cooling	Home with Tier 3 Air Sealing	4,568	1,159	Existing Home Without Air Sealing	8,000	1,159	10.00	\$314	\$0	\$1,047	\$ 0.129	30%	2.03	1.42	3,977	\$0.08	\$0.01	3,432	0.000	\$0.00	\$0.00	0.0%	11	19	11	19	89%	100%	100%	0	72,858	\$ 5,973		
Electric Heat Homes With Cooling	Home with Tier 3 Air Sealing	1,689	1,488	Existing Home Without Air Sealing	8,000	1,488	10.00	\$212	\$0	\$353	\$ 0.129	60%	0.30	0.12	9,093	\$0.02	\$0.00	6,111	0.903	\$0.00	\$0.00	13.6%	2	3	2	3	89%	100%	100%	2	26,301	\$ 636		
Gas Heat Homes With Cooling, Combo Customer	Home with Tier 3 Air Sealing	3,525	329	Existing Home Without Air Sealing	4,000	329	10.00	\$125	\$0	\$307	\$ 0.129	41%	15.17	8.98	156	\$0.80	\$0.08	0.475	0.514	\$0.00	\$0.00	100.0%	104	174	104	174	89%	100%	100%	80	26,202	\$ 21,792		
Remove second refrigerator from service and recycle	removal of second refrigerator	0	0	existing secondary unit - age mostly >10 years	185	5,592	8.00	\$50	\$0	\$0	\$ 0.104	#DIV/0!	0.00	-0.46	1,034	\$0.05	\$0.01	0.185	0.128	\$0.00	\$0.00	63.8%	4,500	4,500	0	0	64%	100%	100%	368	3,225,875	\$ 225,000		
Removal of primary refrigerator	removal of primary refrigerator	0	0	existing primary unit - age mostly >10 years	156	5,592	9.40	\$50	\$0	\$0	\$ 0.104	#DIV/0!	0.00	-0.55	871	\$0.06	\$0.01	0.156	0.108	\$0.00	\$0.00	63.8%	1,500	1,500	0	0	53%	100%	100%	85	743,243	\$ 75,000		
Removal of freezer	removal of freezer	0	0	existing freezer unit - age mostly >10 years	206	5,592	6.20	\$50	\$0	\$0	\$ 0.104	#DIV/0!	0.00	-0.41	1,155	\$0.04	\$0.01	0.206	0.143	\$0.00	\$0.00	63.8%	1,500	1,500	0	0	53%	100%	100%	112	984,998	\$ 75,000		
Remove second refrigerator from service and recycle	removal of second refrigerator	0	0	existing secondary unit - age mostly >10 years	185	5,592	8.00	\$50	\$0	\$0	\$ 0.104	#DIV/0!	0.00	-0.46	1,034	\$0.05	\$0.01	0.185	0.128	\$0.00	\$0.00	63.8%	0	0	4,500	4,500	64%	100%						

Measure Description	High Efficiency Product Assumptions				Baseline Product Assumptions			Economic Assumptions				Stipulated Output							Economic Assumptions		Technical Assumption	Program Forecast Inputs				Stipulated Forecast Inputs			2017				
	Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)		Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Increment Cost Payback Period w/o Rebate (yrs)	Increment Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)
ROLL-UP: Existing Participant - 2017 Savings	Treatment	1,990	4,120		Control	2,017	4,125	1.00	\$0	\$0	\$0	\$ 0.118	#DIV/0!	0.00	0.00	122	\$0.00	\$0.00	0.027	0.028	\$0.00	\$0.00	93.8%	448,984	448,984	0	0	100%	100%	100%	12,460	59,177,032	\$ -
Behavioral Adjustment-ROLL-UP: Existing Participant - 2017	Treatment	-1,327	4,120		Control	-1,345	4,125	0.00	\$0	\$0	\$0	\$ 0.118	#DIV/0!	0.00	0.00	-81	\$0.00	#DIV/0!	-0.018	-0.019	\$0.00	\$0.00	93.8%	0	448,984	0	0	100%	100%	100%	-8,307	-39,451,355	\$ -
ROLL-UP: New Participant - 2017 Savings	Treatment	2,471	2,699		Control	2,479	2,699	1.00	\$0	\$0	\$0	\$ 0.118	#DIV/0!	0.00	0.00	21	\$0.00	\$0.00	0.008	0.008	\$0.00	\$0.00	93.8%	62,653	62,653	0	0	100%	100%	100%	498	1,432,839	\$ -
Behavioral Adjustment-ROLL-UP: New Participant - 2017	Treatment	-1,547	2,699		Control	-1,653	2,699	0.00	\$0	\$0	\$0	\$ 0.118	#DIV/0!	0.00	0.00	-14	\$0.00	#DIV/0!	-0.005	-0.005	\$0.00	\$0.00	93.8%	0	62,653	0	0	100%	100%	100%	-332	-955,093	\$ -
ROLL-UP: Existing Participant - 2018 Savings	Treatment	1,736	4,065		Control	1,763	4,069	1.00	\$0	\$0	\$0	\$ 0.118	#DIV/0!	0.00	0.00	119	\$0.00	\$0.00	0.027	0.028	\$0.00	\$0.00	93.8%	0	0	438,355	438,355	100%	100%	100%	0	0	\$ -
Behavioral Adjustment-ROLL-UP: Existing Participant - 2018	Treatment	-1,157	4,065		Control	-1,176	4,069	0.00	\$0	\$0	\$0	\$ 0.118	#DIV/0!	0.00	0.00	-79	\$0.00	#DIV/0!	-0.018	-0.019	\$0.00	\$0.00	93.8%	0	0	0	438,355	100%	100%	100%	0	0	\$ -
ROLL-UP: New Participant - 2018 Savings	Treatment	2,408	2,770		Control	2,415	2,770	1.00	\$0	\$0	\$0	\$ 0.118	#DIV/0!	0.00	0.00	21	\$0.00	\$0.00	0.008	0.008	\$0.00	\$0.00	93.8%	0	0	64,297	64,297	100%	100%	100%	0	0	\$ -
Behavioral Adjustment-ROLL-UP: New Participant - 2018	Treatment	-1,605	2,770		Control	-1,610	2,770	0.00	\$0	\$0	\$0	\$ 0.118	#DIV/0!	0.00	0.00	-14	\$0.00	#DIV/0!	-0.005	-0.005	\$0.00	\$0.00	93.8%	0	0	0	64,297	100%	100%	100%	0	0	\$ -
Replace incandescent lamps with LEDs - 2017	8 LEDs: 8 x 10 W	80	909		8 Federal Maximum Wattage Bulbs	344	909	7.10	\$32	\$0	\$32	\$ 0.104	100%	1.27	0.00	240	\$0.13	\$0.02	0.264	0.023	\$0.00	\$0.00	8.0%	4,804	5,813	0	0	100%	53%	100%	70	800,900	\$ 183,684
Provide Efficient Showerhead - Electric Water Heater - 2017	1.5 GPM Showerhead	79	8,760		2.5 GPM Showerhead	131	8,760	10.00	\$3	\$0	\$3	\$ 0.103	100%	0.04	0.00	460	\$0.01	\$0.00	0.053	0.036	\$22.45	\$0.00	63.6%	336	407	0	0	100%	43%	100%	6	87,264	\$ 1,261
Provide Efficient Kitchen Faucet Aerator - Electric Water Heater - 2017	1.5 GPM Kitchen Faucet Aerator	13	8,760		2.2 GPM Kitchen Faucet Aerator	19	8,760	10.00	\$2	\$0	\$2	\$ 0.103	100%	0.20	0.00	52	\$0.03	\$0.00	0.006	0.008	\$2.35	\$0.00	123.6%	336	407	0	0	100%	41%	100%	1	9,344	\$ 610
Provide Efficient Bath Faucet Aerator - Electric Water Heater - 2017	1.0 GPM Bathroom Faucet Aerator	6	8,760		2.2 GPM Bathroom Faucet Aerator	13	8,760	10.00	\$0	\$0	\$0	\$ 0.103	100%	0.05	0.00	60	\$0.01	\$0.00	0.007	0.009	\$2.95	\$0.00	123.6%	336	407	0	0	100%	41%	100%	2	10,920	\$ 195
Provide Efficient Showerhead - Electric Water Heater - 2018	1.5 GPM Showerhead	79	8,760		2.5 GPM Showerhead	131	8,760	10.00	\$3	\$0	\$3	\$ 0.103	100%	0.04	0.00	460	\$0.01	\$0.00	0.053	0.036	\$22.45	\$0.00	63.6%	0	0	336	407	100%	43%	100%	0	0	\$ -
Provide Efficient Kitchen Faucet Aerator - Electric Water Heater - 2018	1.5 GPM Kitchen Faucet Aerator	13	8,760		2.2 GPM Kitchen Faucet Aerator	19	8,760	10.00	\$2	\$0	\$2	\$ 0.103	100%	0.20	0.00	52	\$0.03	\$0.00	0.006	0.008	\$2.35	\$0.00	123.6%	0	0	337	407	100%	41%	100%	0	0	\$ -
Provide Efficient Bath Faucet Aerator - Electric Water Heater - 2018	1.0 GPM Bathroom Faucet Aerator	6	8,760		2.2 GPM Bathroom Faucet Aerator	13	8,760	10.00	\$0	\$0	\$0	\$ 0.103	100%	0.05	0.00	60	\$0.01	\$0.00	0.007	0.009	\$2.95	\$0.00	123.6%	0	0	337	407	100%	41%	100%	0	0	\$ -
Replace incandescent lamps with LEDs - 2018	8 LEDs: 8 x 10 W	80	909		8 Federal Maximum Wattage Bulbs	344	909	6.10	\$30	\$0	\$30	\$ 0.104	100%	1.20	0.00	240	\$0.13	\$0.02	0.264	0.023	\$0.00	\$0.00	8.0%	0	0	4,804	5,813	100%	53%	100%	0	0	\$ -
Refrigerator Replacements	Energy Star standard refrigerator	66	5,592		Existing unit vintage from 7-18 years old	101	5,592	18.00	\$630	\$0	\$630	\$ 0.104	100%	30.67	0.00	197	\$3.20	\$0.18	0.035	0.024	\$0.00	\$0.00	63.8%	132	1,174	567	1,220	100%	100%	100%	29	250,243	\$ 739,620
Compact Fluorescent Lamp - 2017	High efficiency CFL lighting	14	854		incandescent bulbs	47	854	7.17	\$2	\$0	\$2	\$ 0.104	100%	0.61	0.00	28	\$0.06	\$0.01	0.032	0.003	\$0.00	\$0.00	8.0%	449	4,000	0	0	100%	100%	100%	11	120,053	\$ 7,000
Compact Fluorescent Lamp - 2018	High efficiency CFL lighting	14	854		incandescent bulbs	47	854	6.17	\$2	\$0	\$2	\$ 0.104	100%	0.61	0.00	28	\$0.06	\$0.01	0.032	0.003	\$0.00	\$0.00	8.0%	0	0	1,859	4,000	100%	100%	100%	0	0	\$ -
Wall Insulation Heating Effects from R-0 to R11 in Electric Heated Home	R-11 insulation in wall cavity with average area 572 sq. ft.	1,596	1,159		Assume No Insulation in Wall Cavity	4,736	1,159	20.00	\$670	\$0	\$670	\$ 0.104	100%	1.76	0.00	3,640	\$0.18	\$0.01	3.140	0.000	\$0.00	\$0.00	0.0%	2	20	9	20	100%	100%	100%	0	78,859	\$ 13,400
Attic insulation in Electrically Heated Home	Add R-41 to make R 54 total in attic	568	1,159		Estimated existing level = R-11	2,368	1,159	20.00	\$715	\$0	\$715	\$ 0.104	100%	3.28	0.00	2,087	\$0.34	\$0.02	1.801	0.000	\$0.00	\$0.00	0.0%	2	20	9	20	100%	100%	100%	0	45,217	\$ 14,300
Air Sealing & Weather-stripping T2 in Electric Heated Home	Average Home with Proposed CFM50 = 1194	3,022	1,159		Average Home with Baseline CFM50 = 1592	4,029	1,159	10.00	\$200	\$0	\$200	\$ 0.104	100%	1.64	0.00	1,167	\$0.17	\$0.02	1.007	0.000	\$0.00	\$0.00	0.0%	0	3	1	3	100%	100%	100%	0	3,794	\$ 600
Crawl Space wall insulation R-0 to R-19	R-19 insulation in crawl space wall cavity with average area 218 sq. ft.	391	1,159		No Insulation in crawl space wall	1,803	1,159	20.00	\$175	\$0	\$175	\$ 0.104	100%	1.02	0.00	1,636	\$0.11	\$0.01	1.412	0.000	\$0.00	\$0.00	0.0%	2	20	9	20	100%	100%	100%	0	35,451	\$ 3,500
Storm Windows added to single pane windows in electrically heated home	Addition of Storm windows	10,771	1,023		Single Pane Windows	15,260	1,023	22.00	\$1,225	\$0	\$1,225	\$ 0.104	100%	2.56	0.00	4,590	\$0.27	\$0.01	4.489	0.000	\$0.00	\$0.00	0.0%	0	3	1	3	100%	100%	100%	0	14,918	\$ 3,875
Provide new 1.5 gpm showerhead to replace existing 2.5 gpm showerhead in electric DHW heater	1.5 GPM Showerhead	79	8,760		2.5 GPM Showerhead	131	8,760	10.00	\$5	\$0	\$5	\$ 0.104	100%	0.07																			

Electric Product Detailed Technical Assumptions																																
Measure Description	High Efficiency Product Assumptions			Baseline Product Assumptions		Economic Assumptions					Stipulated Output								Economic Assumptions		Technical Assumption	Program Forecast Inputs				Stipulated Forecast Inputs						
																						2017		2018					2017			
Electric Measure Description	Efficient Product Description / Rating	Efficient Product Consumption (watts)	Efficient Hours of Operation (hrs/yr)	Baseline Product Description / Rating	Baseline Product Consumption (watts)	Baseline Hours of Operation (hrs/yr)	Measure Lifetime (years)	Rebate Amount (\$)	Average Baseline Product Cost (\$)	Incremental Cost of Efficient Product (\$)	Assumed Energy Cost (\$/kWh)	Rebate as a % of Incremental Cost (%)	Increment'l Cost Payback Period w/o Rebate (yrs)	Increment'l Cost Payback Period w/ Rebate (yrs)	Annual Customer kWh Savings (kWh/yr)	Rebated Cost / Cust kWh Saved (\$/kWh)	Rebated Lifetime cost /Cust kWh Saved (\$/kWh)	Customer kW Savings (kW)	Generator Peak kW Savings (kW)	Non-Energy O&M Savings (\$)	Energy O&M Savings (\$)	Coincidence Factor (%)	2017 Participants (1)	2017 Units (1)	2018 Participants (1)	2018 Units (1)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Gen kW (kW)	2017 NET Gen kWh (kWh)	2017 Rebate Budget (\$)
Company Owned Street Lights Retrofit Option A	LED Fixture	107	4,140	HID Fixture	230	4,140	15.00	\$0	\$0	\$303	\$ 0.089	0%	6.66	6.66	511	\$0.00	\$0.00	0.123	0.000	\$0.00	\$0.00	0.0%	18	14,700	18	19,700	90%	100%	100%	0	7,232,664	\$ -
Company Owned Street Lights New Option A	LED Fixture	107	4,140	HID Fixture	230	4,140	15.00	\$0	\$97	\$156	\$ 0.094	0%	3.24	3.24	511	\$0.00	\$0.00	0.123	0.000	\$0.00	\$0.00	0.0%	8	300	8	300	90%	100%	100%	0	147,605	\$ -
Sound Bars	ENERGY STAR	3	8,760	Industry Standard	10	8,760	7.00	\$15	\$0	\$0	\$ 0.104	#DIV/0!	0.00	-2.18	66	\$0.23	\$0.03	0.008	0.008	\$0.00	\$0.00	100.0%	3,949	3,949	5,265	5,265	83%	100%	100%	27	234,348	\$ 59,235
Freezers	ENERGY STAR	32	4,181	Industry Standard	36	4,181	11.00	\$20	\$0	\$10	\$ 0.106	198%	6.41	-6.27	15	\$1.34	\$0.12	0.004	0.002	\$0.00	\$0.00	85.0%	3,952	3,952	5,269	5,269	48%	100%	100%	4	30,650	\$ 79,040
Gas Clothes Dryers	ENERGY STAR	121	283	Industry Standard	149	283	12.00	\$7	\$0	\$39	\$ 0.103	19%	48.59	39.60	8	\$0.93	\$0.08	0.027	0.000	\$0.00	\$0.00	1.5%	649	649	865	865	83%	100%	100%	0	4,518	\$ 4,650
Electric Clothes Dryers	ENERGY STAR	2,150	283	Industry Standard	2,717	283	12.00	\$50	\$0	\$225	\$ 0.103	22%	13.62	10.60	160	\$0.31	\$0.03	0.567	0.009	\$0.00	\$0.00	1.5%	9,516	9,516	12,688	12,688	66%	100%	100%	58	1,091,575	\$ 475,800
Air Cleaners	ENERGY STAR	54	5,840	Industry Standard	91	5,840	9.00	\$20	\$0	\$36	\$ 0.104	36%	2.51	1.61	214	\$0.09	\$0.01	0.037	0.040	\$0.00	\$0.00	100.0%	2,099	2,099	2,799	2,799	95%	100%	100%	79	462,027	\$ 41,980
Room Air Conditioners	ENERGY STAR	898	628	Industry Standard	972	628	9.00	\$10	\$0	\$114	\$ 0.129	9%	19.12	17.45	46	\$0.22	\$0.02	0.074	0.072	\$0.00	\$0.00	90.0%	8,055	8,055	10,740	10,740	81%	100%	100%	468	326,782	\$ 80,550

Measure Description	Gas Product Detailed Technical Assumptions										Program Forecast Inputs							Stipulated Forecast Inputs			Program Forecast Outputs			Program Forecast Outputs							
	High Efficiency Product Assumptions		Baseline Product Assumptions		Economic Assumptions						Stipulated Output							Economic Assumptions		2017		2018		Valid Throughout Filing Period			2017			2018	
Natural Gas Measure Description	High Efficiency Product Description / Rating	High Efficiency Product Consumption (Dth/yr)	Baseline Product Description / Rating	Baseline Product Consumption (Dth/yr)	Life of Product (years)	Average Rebate Amount	Average Baseline Product Cost	Average Incremental Cost of Efficient Product	Assumed Energy Cost (\$/Dth)	Rebate as a % of Incremental Cost	Increment'l Cost Payback Period w/o Rebate	Increment'l Cost Payback Period with Rebate	Average Annual Customer Dth Savings	Average rebated cost per Dth Saved	Average rebated Lifetime cost per Dth Saved	Non-Energy O&M Savings	Energy O&M Savings	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Dth (Dth)	2017 Rebate Budget (\$)	2017 Incremental Cost (\$)	2018 NET Dth (Dth)	2018 Rebate Budget (\$)	2018 Incremental Cost (\$)	
CO - Custom Efficiency - Gas	New Equipment	23,311	Old or less efficient systems or equipment	24,033	20	\$2,837	\$0	\$15,996	\$5.56	18%	3.4	2.8	722	\$3.93	\$0.20	\$662	\$0	584,577	1,268,057	525,632	1,150,763	87%	100%	100%	636,078	\$7,085,380	\$21,163,747	573,136	\$6,929,902	\$17,925,400	
Average EDA Project - 2017	More Efficient than Code Building	7,528	Code-Compliant Building	10,000	20	\$11,596	0	110476	\$5.66	10%	7.9	7.1	2,472	\$4.69	\$0.23	0	0	57	57	0	0	95%	100%	100%	133,873	\$660,950	\$6,297,132	0	\$0.00	\$0.00	
Average EDA Project - 2018	More Efficient than Code Building	8,404	Code-Compliant Building	10,000	20	\$7,486	0	70024	\$5.66	11%	7.8	6.9	1,596	\$4.69	\$0.23	0	0	0	0	41	41	95%	100%	100%	0	\$0	\$0	62,165	\$306,915.33	\$2,870,997.49	
Average EEB Project - 2017	More Efficient than Code Building	9,551	Code-Compliant Building	10,000	20	\$3,722	0	17737	\$5.66	21%	7.0	5.5	449	\$8.29	\$0.41	0	0	44	44	0	0	95%	100%	100%	18,772	\$163,759	\$780,413	0	\$0.00	\$0.00	
Average EEB Project - 2018	More Efficient than Code Building	9,654	Code-Compliant Building	10,000	20	\$2,867	0	13360	\$5.66	21%	6.8	5.4	346	\$8.29	\$0.41	0	0	0	0	44	44	95%	100%	100%	0	\$0	\$0	14,459	\$126,131.15	\$587,822.04	
New Energy Management System	New EMS for HVAC control	4,374	obsolete EMS	4,860	15	\$406	0	19832	\$5.56	2%	5.2	5.1	486	\$0.84	\$0.06	1081	0	20	20	20	20	90%	100%	100%	8,749	\$8,126	\$396,632	8,749	\$8,125.51	\$396,632.11	
New Energy Information System for Whole-Building and Sub-System Energy Use Visualization and Monitoring	EIS	0	No EIS	0	5	\$2,173	0	3219	\$5.56	68%	(0.8)	(0.3)	-	#DIV/0!	#DIV/0!	-4023	0	4	6	4	6	100%	100%	100%	0	\$13,035	\$19,311	0	\$13,035.04	\$19,311.17	
Implemented Recommissioning Measures	Implemented recommissioning measure	2,015	existing system	2,032	7	\$0	0	0	\$5.56	#DIV/0!	-	-	17	\$0.00	\$0.00	0	0	4	6	4	6	100%	100%	100%	102	\$0	\$0	102	\$0.00	\$0.00	
2017 Behavioral Measures	EIS	2,015	No EIS	2,032	1	\$0	0	0	\$5.56	#DIV/0!	-	-	17	\$0.00	\$0.00	0	0	2	4	0	0	100%	100%	100%	68	\$0	\$0	0	\$0.00	\$0.00	
2018 Behavioral Measures	EIS	2,015	No EIS	2,032	1	\$0	0	0	\$5.56	#DIV/0!	-	-	17	\$0.00	\$0.00	0	0	0	0	4	8	100%	100%	100%	0	\$0	\$0	135	\$0.00	\$0.00	
2017 Behavioral Correction Measure	EIS	-1,612	No EIS	-1,626	0	\$0	0	0	\$5.56	#DIV/0!	-	-	(14)	\$0.00	#DIV/0!	0	0	0	0	4	0	0	100%	100%	100%	-54	\$0	\$0	0	\$0.00	\$0.00
2018 Behavioral Correction Measure	EIS	-1,612	No EIS	-1,626	0	\$0	0	0	\$5.56	#DIV/0!	-	-	(14)	\$0.00	#DIV/0!	0	0	0	4	0	8	100%	100%	100%	-54	\$0	\$0	-108	\$0.00	\$0.00	
Non-condensing Hot Water Boiler, New 175 MBTUH; for space heating only	85% Efficient Boiler	135	80% Efficient Boiler	143	20	\$131	3000	500	\$5.56	26%	10.7	7.9	8	\$15.61	\$0.78	0	0	1	1	1	1	86%	100%	100%	7	\$131	\$500	7	\$131.25	\$500.00	
Non-condensing Hot Water Boiler, New 500 MBTUH; for space heating only	85% Efficient Boiler	384	80% Efficient Boiler	409	20	\$375	5000	4000	\$5.56	9%	29.9	27.1	24	\$15.61	\$0.78	0	0	6	6	6	6	86%	100%	100%	124	\$2,250	\$24,000	124	\$2,250.00	\$24,000.00	
Non-condensing Hot Water Boiler, New 1 MMBTUH; for space and domestic water heating	85% Efficient Boiler	1,443	80% Efficient Boiler	1,533	20	\$750	7300	4400	\$5.56	17%	8.8	7.3	90	\$8.32	\$0.42	0	0	4	4	4	4	86%	100%	100%	310	\$3,000	\$17,600	310	\$3,000.00	\$17,600.00	
Non-condensing Hot Water Boiler, New 2 MMBTUH; for space and domestic water heating	85% Efficient Boiler	2,886	80% Efficient Boiler	3,066	20	\$1,500	12000	5000	\$5.56	30%	5.0	3.5	180	\$8.32	\$0.42	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00	
Non-condensing Hot Water Boiler, New 4 MMBTUH; for space and domestic water heating	85% Efficient Boiler	5,772	82% Efficient Boiler	5,983	20	\$3,000	24000	10000	\$5.56	30%	8.5	6.0	211	\$14.21	\$0.71	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00	
Condensing Hot Water Boiler, New 175 MBTUH; for space heating only	92% Efficient Boiler	135	80% Efficient Boiler	153	20	\$613	3000	1600	\$5.56	38%	15.6	9.6	19	\$33.10	\$1.66	0	0	12	14	12	14	86%	100%	100%	223	\$8,575	\$22,400	223	\$8,575.00	\$22,400.00	
Condensing Hot Water Boiler, New 500 MBTUH; for space heating only	92% Efficient Boiler	384	80% Efficient Boiler	437	20	\$1,750	5000	6200	\$5.56	28%	21.1	15.1	53	\$33.10	\$1.66	0	0	4	4	4	4	86%	100%	100%	182	\$7,000	\$24,800	182	\$7,000.00	\$24,800.00	
Condensing Hot Water Boiler, New 1 MMBTUH; for space and domestic water heating	92% Efficient Boiler	1,443	80% Efficient Boiler	1,641	20	\$3,500	7300	7700	\$5.56	45%	7.0	3.8	198	\$17.64	\$0.88	0	0	61	66	61	66	86%	100%	100%	11,262	\$231,000	\$508,200	11,262	\$231,000.00	\$508,200.00	
Condensing Hot Water Boiler, New 2 MMBTUH; forspace and domestic water heating	92% Efficient Boiler	2,886	80% Efficient Boiler	3,283	20	\$7,000	12000	14500	\$5.56	48%	6.6	3.4	397	\$17.64	\$0.88	0	0	4	5	4	5	86%	100%	100%	1,706	\$35,000	\$72,500	1,706	\$35,000.00	\$72,500.00	
Condensing Hot Water Boiler, New 4 MMBTUH; forspace and domestic water heating	92% Efficient Boiler	5,772	82% Efficient Boiler	6,405	20	\$14,000	24000	29000	\$5.56	48%	8.2	4.3	633	\$22.10	\$1.10	0	0	2	2	2	2	86%	100%	100%	1,090	\$28,000	\$58,000	1,090	\$28,000.00	\$58,000.00	
Commercial Hot Water Heater Condensing; 160 MBTUH	96% Efficient Water Heater	164	80% Efficient Water Heater	201	15	\$320	3512	1018	\$5.56	31%	4.9	3.4	37	\$8.54	\$0.57	0	0	1	1	1	1	86%	100%	100%	32	\$320	\$1,018	32	\$320.00	\$1,018.46	
Commercial Hot Water Heater Condensing; 199.9 MBTUH	96% Efficient Water Heater	203	80% Efficient Water Heater	248	15	\$400	3450	1000	\$5.56	40%	4.0	2.4	45	\$8.84	\$0.59	0	0	3	4	3	4	86%	100%	100%	156	\$1,599	\$4,001	156	\$1,599.20	\$4,001.45	
Commercial Hot Water Heater Condensing; 300 MBTUH	96% Efficient Water Heater	300	80% Efficient Water Heater	365	15	\$600	5959	1728	\$5.56	35%	4.8	3.1	65	\$9.27	\$0.62	0	0	4	5	4	5	86%	100%	100%	278	\$3,000	\$8,641	278	\$3,000.00	\$8,640.55	
Commercial Tankless Water Heater - Condensing; 150 MBTUH	95% Efficient Water Heater	146	80% Efficient Storage Water Heater	188	15	\$300	4284	1242	\$5.56	24%	5.3	4.1	42	\$7.17	\$0.48	0	0	1	1	1	1	86%	100%	100%	36	\$300	\$1,242	36	\$300.00	\$1,242.36	
Commercial Tankless Water Heater - Condensing; 199.9 MBTUH	97% Efficient Water Heater	195	80% Efficient Storage Water Heater	250	15	\$400	3450	1000	\$5.56	40%	3.2	1.9	56	\$7.16	\$0.48	0	0	6	8	6	8	86%	100%	100%	384	\$3,198	\$8,003	384	\$3,198.40	\$8,002.90	
Pipe Insulation Hot Water System	100 Ft of Pipe with new insulation	10	100 Ft of Pipe with no or old insulation	87	15	\$1,065	0	2307	\$5.56	46%	5.4	2.9	76	\$13.93	\$0.93	0	0	3	4	3	4	86%	100%	100%	263	\$4,260	\$9,226	263	\$4,260.00	\$9,226.11	
Pipe Insulation Steam System	100 Ft of Pipe with new insulation	13	100 Ft of Pipe with no or old insulation	137	15	\$1,335	0	3161	\$5.56	42%	4.6	2.6	124	\$10.74	\$0.72	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00	
C&I Gas Boiler - Tune-Up assumed on 1-HW boiler at 80% eff 175 Mbtuh (Non-condensing)	Boiler Tune-up - 2% additive improvement in efficiency; Boiler now at 80% efficiency	225	Existing boiler at 78% efficiency	231	2	\$250	0	345	\$5.56	72%	10.8	3.0	6	\$43.33	\$21.67	0	0	8	9	8	9	86%	100%	100%	45	\$2,250	\$3,109	45	\$2,250.00	\$3,109.37	
C&I Gas Boiler - Tune-Up assumed on 1-HW boiler at 80% eff 500 Mbtuh (Non-condensing)	Boiler Tune-up - 2% additive improvement in efficiency; Boiler now at 80% efficiency	643	Existing boiler at 78% efficiency	659	2	\$250	0	645	\$5.56	39%	7.0	4.3	16	\$15.17	\$7.58	0	0	11	13	11	13	86%	100%	100%	184	\$3,250	\$8,381	184	\$3,250.00	\$8,381.19	
C&I Gas Boiler - Tune-Up assumed on 1-HW boiler at 80% eff 1 MMButh (Non-condensing)	Boiler Tune-up - 2% additive improvement in efficiency; Boiler now at 80% efficiency	1,286	Existing boiler at 78% efficiency	1,319	2	\$250	0	522	\$5.																						

Measure Description	Gas Product Detailed Technical Assumptions			Economic Assumptions										Stipulated Output				Economic Assumptions		Program Forecast Inputs				Stipulated Forecast Inputs			Program Forecast Outputs			Program Forecast Outputs		
	High Efficiency Product Description / Rating	High Efficiency Product Consumption (Dth/yr)	Baseline Product Description / Rating	Baseline Product Consumption (Dth/yr)	Life of Product (years)	Average Rebate Amount	Average Baseline Product Cost	Average Incremental Cost of Efficient Product	Assumed Energy Cost (\$/Dth)	Rebate as a % of Incremental Cost	Increment'l Cost Payback Period w/o Rebate	Increment'l Cost Payback Period with Rebate	Average Annual Customer Dth Savings	Average rebated cost per Dth Saved	Average rebated Lifetime cost per Dth Saved	Non-Energy O&M Savings	Energy O&M Savings	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Dth (Dth)	2017 Rebate Budget (\$)	2017 Incremental Cost (\$)	2018 NET Dth (Dth)	2018 Rebate Budget (\$)	2018 Incremental Cost (\$)		
Natural Gas Measure Description																		584,577	1,268,057	525,632	1,150,763				636,078	\$7,085,380	\$21,163,747	573,136	\$6,929,902	\$17,925,400		
C&I Gas Boiler - Outdoor Air Reset assumed on 1-HW boiler at 80% eff 2 MMBtuh	83% Efficient Boiler	2,478	80% Efficient existing boiler	2,571	20	\$500	0	1000	\$5.56	50%	1.9	1.0	93	\$5.38	\$0.27	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Stack Dampers assumed on 1-HW boiler at 80% eff 175 Mbtuh	81% Efficient Boiler	222	80% Efficient existing boiler	225	12	\$44	0	500	\$5.56	9%	32.4	29.5	3	\$15.75	\$1.31	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Stack Dampers assumed on 1-HW boiler at 80% eff 500 Mbtuh	81% Efficient Boiler	635	80% Efficient existing boiler	643	12	\$125	0	500	\$5.56	25%	11.3	8.5	8	\$15.75	\$1.31	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Stack Dampers assumed on 1-HW boiler at 80% eff 1 MMBtuh	81% Efficient Boiler	1,270	80% Efficient existing boiler	1,286	12	\$250	0	1000	\$5.56	25%	11.3	8.5	16	\$15.75	\$1.31	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Stack Dampers assumed on 1-HW boiler at 80% eff 2 MMBtuh	81% Efficient Boiler	2,540	80% Efficient existing boiler	2,571	12	\$500	0	1000	\$5.56	50%	5.7	2.8	32	\$15.75	\$1.31	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Modulating Burner Controls, >=5 to 1 turn down assumed on 1-HW boiler at 80% eff 175 Mbtuh	83% Efficient Boiler	217	80% Efficient existing boiler	225	20	\$131	0	3808	\$5.56	3%	84.2	81.3	8	\$16.14	\$0.81	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Modulating Burner Controls, >=5 to 1 turn down assumed on 1-HW boiler at 80% eff 500 Mbtuh	83% Efficient Boiler	620	80% Efficient existing boiler	643	20	\$375	0	3808	\$5.56	10%	29.5	26.6	23	\$16.14	\$0.81	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Modulating Burner Controls, >=5 to 1 turn down assumed on 1-HW boiler at 80% eff 1 MMBtuh	83% Efficient Boiler	1,239	80% Efficient existing boiler	1,286	20	\$750	0	8422	\$5.56	9%	32.6	29.7	46	\$16.14	\$0.81	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Modulating Burner Controls, >=5 to 1 turn down assumed on 1-HW boiler at 80% eff 2 MMBtuh	83% Efficient Boiler	2,478	80% Efficient existing boiler	2,571	20	\$1,500	0	8422	\$5.56	18%	16.3	13.4	93	\$16.14	\$0.81	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Steam Traps Low Pressure - average of 10 and 15 PSI	New Steam Traps	2,441	Existing Boiler, malfunctioning steam traps	2,481	10	\$50	0	200	\$5.56	25%	0.9	0.7	40	\$1.25	\$0.13	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
C&I Gas Boiler - Steam Traps High Pressure - average of 50 PSI and 65 PSI	New Steam Traps	2,392	Existing Boiler, malfunctioning steam traps	2,481	4	\$50	0	200	\$5.56	25%	0.4	0.3	89	\$0.56	\$0.14	0	0	0	0	0	0	86%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
Furnaces (avg size-90,000 Btuh)	93% Efficient Furnace	76	80% Efficient Furnace	89	15	\$94	668	826	\$5.56	11%	11.9	10.6	12	\$7.55	\$0.50	0	0	14	17	14	17	86%	100%	100%	182	\$1,602	\$14,048	182	\$1,601.78	\$14,048.13		
Non-Condensing Power Vent (83% efficiency)	Non-condensing power vent unit heater	200	Non-condensing standard forced-air unit heater	208	20	\$75	1051	202	\$5.56	37%	4.8	3.0	8	\$9.99	\$0.50	0	0	5	10	7	14	86%	100%	100%	65	\$751	\$2,022	91	\$1,052.02	\$2,830.67		
Condensing (>90% efficiency)	Condensing power vent unit heater	185	Non-condensing standard forced-air unit heater	208	20	\$693	1051	1254	\$5.56	55%	9.8	4.4	23	\$29.98	\$1.50	0	0	4	8	5	10	86%	100%	100%	159	\$5,544	\$10,028	199	\$6,930.00	\$12,535.28		
Infrared	Infrared heater	184	Non-condensing standard forced-air unit heater	208	15	\$87	1051	204	\$5.56	43%	1.5	0.9	24	\$3.55	\$0.24	0	0	4	4	5	5	86%	100%	100%	84	\$347	\$815	105	\$433.18	\$1,018.48		
Recommissioning Study	Existing Facility	5,266	Existing Facility	5,266	7	\$1,918	0	2304	\$5.56	83%	#DIV/0!	#DIV/0!	-	#DIV/0!	#DIV/0!	0	0	20	20	20	20	90%	100%	100%	0	\$38,360	\$46,076	0	\$38,360.00	\$46,076.20		
Implementation	Implemented Measures	4,924	Existing Facility	5,266	7	\$120	0	1192	\$5.56	10%	0.6	0.6	342	\$0.35	\$0.05	0	0	10	10	10	10	90%	100%	100%	3,078	\$1,200	\$11,921	3,078	\$1,200.00	\$11,921.00		
Building Tune-up Study	Existing Facility	866	Existing Facility	866	7	\$400	0	422	\$5.56	95%	#DIV/0!	#DIV/0!	-	#DIV/0!	#DIV/0!	0	0	10	10	10	10	90%	100%	100%	0	\$4,004	\$4,217	0	\$4,004.17	\$4,216.67		
Building Tune-up Implementation	Implemented Measures	810	Existing Facility	866	7	\$16	0	194	\$5.56	8%	0.6	0.6	56	\$0.29	\$0.04	-1	0	6	6	6	6	90%	100%	100%	304	\$98	\$1,164	304	\$98.19	\$1,163.85		
Fast Track Recommissioning Implementation	Implemented Measures	5,198	Existing Facility	5,266	7	\$15	0	238	\$5.56	6%	0.6	0.6	68	\$0.21	\$0.03	0	0	1	1	1	1	100%	100%	100%	68	\$15	\$238	68	\$14.60	\$238.42		
CHW Pre-Rinse Sprayer - gas water heating	1.28 gallons per minute sprayer	8	1.60 gallons per minute sprayer	10	5	\$45	\$0	\$45	\$5.56	100%	1.3	-	2	\$22.80	\$4.56	\$23	\$0	12	14	12	14	100%	100%	100%	28	\$630	\$630	28	\$630.00	\$630.00		
Faucet Aerator (Restroom), gas water heating	5 gallons per minute restroom faucet aerator	3	2.2 gallons per minute faucet	11	10	\$7	\$0	\$7	\$5.56	100%	0.0	-	8	\$0.82	\$0.08	\$94	\$0	58	198	58	198	100%	100%	100%	1,615	\$1,327	\$1,327	1,615	\$1,326.60	\$1,326.60		
Faucet Aerator (Kitchen), gas water heating	1.5 gallons per minute kitchen faucet aerator	3	2.2 gallons per minute faucet	4	10	\$7	\$0	\$7	\$5.56	100%	0.3	-	1	\$5.63	\$0.56	\$14	\$0	7	11	7	11	100%	100%	100%	13	\$74	\$74	13	\$73.70	\$73.70		
Retrofit of open multi-deck cooler cases with solid glass doors (per linear foot of case) for Xcel gas customers	Closed Case with Doors	1	Open Case with No Doors	8	12	\$50	\$0	\$261	\$5.56	19%	7.0	5.6	7	\$7.42	\$0.62	\$0	\$0	0	0	0	0	100%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
Retrofit of open multi-deck freezer cases with solid glass doors (per linear foot of case) for Xcel gas customers	Closed Case with Doors	2	Open Case with No Doors	10	12	\$75	\$0	\$155	\$5.56	49%	3.3	1.7	8	\$9.02	\$0.75	\$0	\$0	0	0	0	0	100%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00		
Demand Controlled Ventilation - Gas Only or Combo Customer	Commercial kitchen ventilation hoods with Demand Controlled Ventilation with 8.65 HP Motor	4,267	Commercial kitchen ventilation hoods with Demand Controlled Ventilation with 8.65 HP Motor	4,634	20	\$2,163	\$0	\$10,301	\$5.56	21%	3.3	2.6	366	\$5.91	\$0.30	\$1,130	\$0	2	2	2	2	100%	100%	100%	732	\$4,325	\$20,601	732	\$4,325.00	\$20,601.16		
Commercial Dishwasher - Under Counter, Gas Only or Combo Customer	ENERGY STAR qualified unit	19	Conventional unit as defined by ENERGY STAR	25	10	\$33	\$3,750	\$18	\$5.56	183%	0.2	(0.2)	6	\$5.26	\$0.53	\$54	\$0	1	1	1	1	100%	100%	100%	6	\$33	\$18	6	\$32.64	\$17.84		
Commercial Dishwasher - Door Type, Gas Only or Combo Customer	ENERGY STAR qualified unit	73	Conventional unit as defined by ENERGY STAR	113	15	\$47	\$5,175	\$146	\$5.56	32%	0.3	0.2	40	\$1.19	\$0.08	\$350	\$0	1	1	1	1	100%	100%	100%	40	\$47	\$146	40	\$47.39	\$145.96		
Provide new 1.5 gpm showerhead to replace existing 2.5 gpm showerhead in natural gas DHW unit home	1.5 GPM Showerhead	3	2.5 GPM Showerhead	5	10	\$3	\$0	\$3	\$5.24	100%	0.1	-	2	\$1.58	\$0.16	\$22	\$0	4,905	23,259	0	0	99%	60%	100%	27,129	\$72,103	\$72,103	0	\$0.00	\$0.00		
Provide new 1.5 gpm showerhead for second shower to replace existing 2.5 gpm showerhead in natural gas DHW unit home	1.5 GPM Shower																															

Gas Product Detailed Technical Assumptions																			Program Forecast Inputs				Stipulated Forecast Inputs			Program Forecast Outputs			Program Forecast Outputs		
Economic Assumptions																			2017		2018		Valid Throughout Filing Period			2017			2018		
Measure Description	High Efficiency Product Description / Rating	High Efficiency Product Consumption (Dth/yr)	Baseline Product Description / Rating	Baseline Product Consumption (Dth/yr)	Life of Product (years)	Average Rebate Amount	Average Baseline Product Cost	Average Incremental Cost of Efficient Product	Assumed Energy Cost (\$/Dth)	Rebate as a % of Incremental Cost	Increment'l Cost Payback Period w/o Rebate	Increment'l Cost Payback Period with Rebate	Average Annual Customer Dth Savings	Average rebated cost per Dth Saved	Average rebated Lifetime cost per Dth Saved	Non-Energy O&M Savings	Energy O&M Savings	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Dth (Dth)	2017 Rebate Budget (\$)	2017 Incremental Cost (\$)	2018 NET Dth (Dth)	2018 Rebate Budget (\$)	2018 Incremental Cost (\$)	
																		584,577	1,268,057	525,632	1,150,763				636,078	\$7,085,380	\$21,163,747	573,136	\$6,929,902	\$17,925,400	
Envelope Measures with 20% improvement over local code - Combo Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3468 and Percent BTC 22.77%	80	Reference Home Based upon Local Code	110	20	\$368	\$0	\$1,169	\$5.24	31%	7.4	5.1	30	\$12.21	\$0.61	\$0	\$0	94	100	94	100	92%	100%	100%	2,770	\$36,753	\$116,873	2,770	\$36,753.33	\$116,872.53	
Envelope Measures with 25% improvement over local code - Combo Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3588 and Percent BTC 27.45%	80	Reference Home Based upon Local Code	119	20	\$461	\$0	\$1,474	\$5.24	31%	7.2	4.9	39	\$11.75	\$0.59	\$0	\$0	94	100	99	105	92%	100%	100%	3,614	\$46,145	\$147,423	3,794	\$48,452.05	\$154,794.03	
Envelope Measures with 30% improvement over local code - Combo Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4060 and Percent BTC 31.82%	84	Reference Home Based upon Local Code	136	20	\$546	\$0	\$1,770	\$5.24	31%	6.5	4.5	52	\$10.48	\$0.52	\$0	\$0	75	80	77	82	92%	100%	100%	3,834	\$43,658	\$141,597	3,930	\$44,749.58	\$145,136.69	
Envelope Measures with 35% improvement over local code - Combo Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4040 and Percent BTC 36.55%	79	Reference Home Based upon Local Code	140	20	\$659	\$0	\$2,102	\$5.24	31%	6.6	4.5	61	\$10.83	\$0.54	\$0	\$0	47	50	48	51	92%	100%	100%	2,800	\$32,961	\$105,119	2,856	\$33,620.60	\$107,221.17	
Envelope Measures with 40% improvement over local code - Combo Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3649 and Percent BTC 44.02%	52	Reference Home Based upon Local Code	110	20	\$851	\$0	\$2,486	\$5.24	34%	8.2	5.4	58	\$14.74	\$0.74	\$0	\$0	24	25	24	25	92%	100%	100%	1,327	\$21,266	\$62,147	1,327	\$21,266.09	\$62,146.99	
Envelope Measures with 10% improvement over local code - Gas Only Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 2036 and Percent BTC 12.43%	72	Reference Home Based upon Local Code	85	20	\$200	\$0	\$331	\$5.24	60%	4.8	1.9	13	\$15.19	\$0.76	\$0	\$0	38	40	38	40	92%	100%	100%	484	\$8,000	\$13,239	484	\$8,000.00	\$13,238.69	
Envelope Measures with 15% improvement over local code - Gas Only Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 2831 and Percent BTC 17.53%	81	Reference Home Based upon Local Code	103	20	\$350	\$0	\$664	\$5.24	53%	5.7	2.7	22	\$15.64	\$0.78	\$0	\$0	71	75	71	75	92%	100%	100%	1,544	\$26,250	\$49,797	1,544	\$26,250.00	\$49,796.57	
Envelope Measures with 20% improvement over local code - Gas Only Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3326 and Percent BTC 22.85%	80	Reference Home Based upon Local Code	110	20	\$500	\$0	\$1,029	\$5.24	49%	6.4	3.3	31	\$16.37	\$0.82	\$0	\$0	193	205	80	85	92%	100%	100%	5,760	\$102,500	\$210,935	2,388	\$42,500.00	\$87,460.86	
Envelope Measures with 25% improvement over local code - Gas Only Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3694 and Percent BTC 27.44%	82	Reference Home Based upon Local Code	123	20	\$650	\$0	\$1,316	\$5.24	49%	6.2	3.1	41	\$15.92	\$0.80	\$0	\$0	198	210	38	40	92%	100%	100%	7,887	\$136,500	\$276,459	1,502	\$26,000.00	\$52,658.78	
Envelope Measures with 30% improvement over local code - Gas Only Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4142 and Percent BTC 31.57%	86	Reference Home Based upon Local Code	138	20	\$800	\$0	\$1,608	\$5.24	50%	5.8	2.9	53	\$15.21	\$0.76	\$0	\$0	57	60	31	33	92%	100%	100%	2,904	\$48,000	\$96,503	1,597	\$26,400.00	\$53,076.62	
Envelope Measures with 35% improvement over local code - Gas Only Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3508 and Percent BTC 36.75%	76	Reference Home Based upon Local Code	137	20	\$1,000	\$0	\$1,873	\$5.24	53%	5.9	2.8	60	\$16.58	\$0.83	\$0	\$0	14	15	14	15	92%	100%	100%	832	\$15,000	\$28,091	832	\$15,000.00	\$28,090.53	
Envelope Measures with 40% improvement over local code - Gas Only Customers - IECC 2009 or older	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3690 and Percent BTC 42.35%	50	Reference Home Based upon Local Code	95	20	\$1,400	\$0	\$2,157	\$5.24	65%	9.2	3.2	45	\$31.39	\$1.57	\$0	\$0	5	5	5	5	92%	100%	100%	205	\$7,000	\$10,784	205	\$7,000.00	\$10,783.75	
Envelope Measures with 10% improvement over local code - Combo Customers - IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3993 and Percent BTC 12.59%	88	Reference Home Based upon Local Code	102	20	\$171	\$0	\$376	\$5.24	45%	4.9	2.7	15	\$11.76	\$0.59	\$0	\$0	991	1,050	1,043	1,105	92%	100%	100%	14,016	\$179,086	\$394,610	14,750	\$188,466.26	\$415,280.10	
Envelope Measures with 15% improvement over local code - Combo Customers - IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4009 and Percent BTC 17.2%	80	Reference Home Based upon Local Code	100	20	\$220	\$0	\$517	\$5.24	43%	5.0	2.9	20	\$11.09	\$0.55	\$0	\$0	943	1,000	1,001	1,060	92%	100%	100%	18,258	\$220,159	\$516,669	19,354	\$233,368.64	\$547,668.12	
Envelope Measures with 20% improvement over local code - Combo Customers - IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4202 and Percent BTC 21.88%	73	Reference Home Based upon Local Code	99	20	\$337	\$0	\$970	\$5.24	35%	7.1	4.6	26	\$12.88	\$0.64	\$0	\$0	358	380	453	480	92%	100%	100%	9,142	\$128,023	\$368,603	11,548	\$161,713.19	\$465,603.79	
Envelope Measures with 25% improvement over local code - Combo Customers - IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3954 and Percent BTC 26.9%	70	Reference Home Based upon Local Code	101	20	\$508	\$0	\$1,693	\$5.24	30%	10.3	7.2	31	\$16.22	\$0.81	\$0	\$0	47	50	71	75	92%	100%	100%	1,440	\$25,391	\$84,627	2,161	\$38,085.99	\$126,940.33	
Envelope Measures with 30% improvement over local code - Combo Customers 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3610 and Percent BTC 32.08%	59	Reference Home Based upon Local Code	94	20	\$810	\$0	\$2,711	\$5.24	30%	14.6	10.2	35	\$22.89	\$1.14	\$0	\$0	38	40	40	42	92%	100%	100%	1,303	\$32,415	\$108,445	1,368	\$34,035.93	\$113,867.53	
Envelope Measures with 35% improvement over local code - Combo Customers - IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4666 and Percent BTC 38.47%	62	Reference Home Based upon Local Code	114	20	\$1,097	\$0	\$3,652	\$5.24	30%	13.5	9.4	52	\$21.27	\$1.06	\$0	\$0	0	0	0	0	92%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00	
Envelope Measures with 40% improvement over local code - Combo Customers - IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3890 and Percent BTC 42.35%	50	Reference Home Based upon Local Code	95	20	\$1,257	\$0	\$4,185	\$5.24	30%	17.9	12.5	45	\$28.18	\$1.41	\$0	\$0	0	0	0	0	92%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00	
Envelope Improvement 10% improvement over local code - Gas Only Customers IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3796 and Percent BTC 12.53%	84	Reference Home Based upon Local Code	97	20	\$250	\$0	\$210	\$5.24	119%	3.1	(0.6)	13	\$19.09	\$0.95	\$0	\$0	425	450	496	525	92%	100%	100%	5,422	\$112,500	\$94,599	6,326	\$131,250.00	\$110,365.44	
Envelope Improvement 15% improvement over local code - Gas Only Customers IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4030 and Percent BTC 17.08%	85	Reference Home Based upon Local Code	105	20	\$400	\$0	\$456	\$5.24	88%	4.2	0.5	21	\$19.51	\$0.98	\$0	\$0	340	360	456	483	92%	100%	100%	6,791	\$144,000	\$164,065	9,111	\$193,200.00	\$220,120.95	
Envelope Improvement 20% improvement over local code - Gas Only Customers IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 4116 and Percent BTC 21.32%	78	Reference Home Based upon Local Code	104	20	\$600	\$0	\$841	\$5.24	71%	6.0	1.7	27	\$22.29	\$1.11	\$0	\$0	47	50	93	98	92%	100%	100%	1,238	\$30,000	\$42,053	2,427	\$58,800.00	\$82,423.87	
Envelope Improvement 25% improvement over local code - Gas Only Customers IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3364 and Percent BTC 26.94%	75	Reference Home Based upon Local Code	110	20	\$900	\$0	\$1,439	\$5.24	63%	7.8	2.9	35	\$25.50	\$1.27	\$0	\$0	14	15	100	106	92%	100%	100%	487	\$13,500	\$21,580	3,442	\$95,400.00	\$152,499.67	

Measure Description	Gas Product Detailed Technical Assumptions										Program Forecast Inputs								Stipulated Forecast Inputs			Program Forecast Outputs			Program Forecast Outputs					
	High Efficiency Product Assumptions		Baseline Product Assumptions		Economic Assumptions				Stipulated Output				Economic Assumptions		2017		2018		Valid Throughout Filing Period			2017			2018					
Natural Gas Measure Description	High Efficiency Product Description / Rating	High Efficiency Product Consumption (Dth/yr)	Baseline Product Description / Rating	Baseline Product Consumption (Dth/yr)	Life of Product (years)	Average Rebate Amount	Average Baseline Product Cost	Average Incremental Cost of Efficient Product	Assumed Energy Cost (\$/Dth)	Rebate as a % of Incremental Cost	Incremental Cost Payback Period w/o Rebate	Incremental Cost Payback Period with Rebate	Average Annual Customer Dth Savings	Average rebated cost per Dth Saved	Average rebated Lifetime cost per Dth Saved	Non-Energy O&M Savings	Energy O&M Savings	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Dth (Dth)	2017 Rebate Budget (\$)	2017 Incremental Cost (\$)	2018 NET Dth (Dth)	2018 Rebate Budget (\$)	2018 Incremental Cost (\$)
																		584,577	1,268,057	525,632	1,150,763				636,078	\$7,085,380	\$21,163,747	573,136	\$6,929,902	\$17,925,400
Envelope Improvement 30% improvement over local code - Gas Only Customers IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3690 and Percent BTC 33.27%	59	Reference Home Based upon Local Code	95	20	\$1,300	\$0	\$2,992	\$5.24	43%	16.0	9.1	36	\$36.52	\$1.83	\$0	\$0	0	0	5	5	92%	100%	100%	0	\$0	\$0	164	\$6,500.00	\$14,961.11
Envelope Improvement 35% improvement over local code - Gas Only Customers IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3690 and Percent BTC 39.64%	54	Reference Home Based upon Local Code	95	20	\$2,000	\$0	\$3,994	\$5.24	50%	18.8	9.4	41	\$49.26	\$2.46	\$0	\$0	0	0	0	0	92%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00
Envelope Improvement 40% improvement over local code - Gas Only Customers IECC 2012 & newer	Energy Efficient Home Based Upon REMRate model by House Rater with Average Size 3690 and Percent BTC 42.35%	50	Reference Home Based upon Local Code	95	20	\$2,550	\$0	\$4,185	\$5.24	61%	17.9	7.0	45	\$57.17	\$2.86	\$0	\$0	0	0	0	0	92%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00
Energy Star Clothes Washer - Combo Customers w/ Gas DHW	Energy Star Clothes Washer	0	Standard Clothes Washer	0	11	\$18	\$0	\$18	\$5.24	100%	2.2	-	0	\$152.76	\$13.89	\$8	\$0	166	176	174	184	92%	100%	100%	19	\$3,084	\$3,084	20	\$3,238.10	\$3,238.10
Energy Star Clothes Washer - Gas Only Customers w/ Gas DHW	Energy Star Clothes Washer	0	Standard Clothes Washer	0	11	\$30	\$0	\$18	\$5.24	171%	2.2	(1.5)	0	\$260.79	\$23.71	\$8	\$0	84	89	88	94	92%	100%	100%	9	\$2,673	\$1,566	10	\$2,806.65	\$1,643.96
95% Efficient Furnace	95.4% AFUE Furnace without ECM	96	80% AFUE Federal Standard Efficiency Furnace	116	18	\$120	\$740	\$922	\$5.24	13%	8.9	7.8	20	\$6.08	\$0.34	\$0	\$0	3,127	3,158	3,127	3,158	77%	100%	100%	47,981	\$378,960	\$2,912,865	47,981	\$378,960.00	\$2,912,865.26
Attic Insulation in Natural Gas Heated and Electrically Cooled Home Combo Customer	Existing Home with Attic Insulation added to achieve R-54	4	Existing home with R9 attic insul average heating efficiency of 78% AFUE and average cooling efficiency of 3.93 COP	18	20	\$229	0	786	\$5.24	29%	10.3	7.3	15	\$15.79	\$0.79	0	0	88	225	88	225	116%	100%	100%	3,792	\$51,626	\$176,814	3,792	\$51,625.70	\$176,813.73
Attic Insulation in Natural Gas Heated and non-cooled Home	Existing Home with Attic Insulation added to achieve R-54	4	Existing home with R9 attic insul and average heating efficiency of 78% AFUE	18	20	\$351	0	1508	\$5.24	23%	19.8	15.2	15	\$24.16	\$1.21	0	0	93	237	93	237	116%	100%	100%	3,994	\$83,184	\$357,387	3,994	\$83,183.82	\$357,386.52
Tier 2 Air Sealing & Bypass Sealing for minimum 20% ACH Reduction in Natural Gas Heated and non-cooled Home	Home with Tier 2 Air Sealing CFM50 rating of 2324	31	Baseline home with CFM50 rating of 3223	44	10	\$243	0	960	\$5.24	25%	15.1	11.3	12	\$20.04	\$2.00	0	0	42	107	42	107	116%	100%	100%	1,506	\$26,010	\$102,739	1,506	\$26,009.74	\$102,738.55
Tier 2 Air Sealing & Bypass Sealing for minimum 20% ACH Reduction in Natural Gas Heated and Electric Cooled Home	Home with Tier 2 Air Sealing CFM50 rating of 2324	31	Baseline home with CFM50 rating of 3223	44	10	\$253	0	560	\$5.24	45%	8.8	4.8	12	\$20.85	\$2.08	0	0	38	97	38	97	116%	100%	100%	1,365	\$24,531	\$54,325	1,365	\$24,531.33	\$54,324.80
Tier 3 Air Sealing & Bypass Sealing for minimum 30% ACH Reduction in Natural Gas Heated and non-cooled Home	Home with Tier 3 Air Sealing CFM50 rating of 2078	27	Baseline home with CFM50 rating of 3641	48	10	\$293	0	955	\$5.24	31%	8.8	6.1	21	\$14.19	\$1.42	0	0	47	119	47	119	116%	100%	100%	2,849	\$34,837	\$113,650	2,849	\$34,836.80	\$113,650.20
Tier 3 Air Sealing & Bypass Sealing for minimum 30% ACH Reduction in Natural Gas Heated and Electric Cooled Home	Home with Tier 3 Air Sealing CFM50 rating of 2078	27	Baseline home with CFM50 rating of 3641	48	10	\$237	0	555	\$5.24	43%	5.1	2.9	21	\$11.48	\$1.15	0	0	45	114	45	114	116%	100%	100%	2,729	\$27,009	\$63,238	2,729	\$27,008.79	\$63,238.11
Wall Insulation from R-0 to R11 in Natural Gas Heated and non-cooled Home	R-11 insulation in wall cavity	14	Empty Wall Cavity	42	20	\$405	0	1936	\$5.24	21%	13.1	10.4	28	\$14.40	\$0.72	0	0	66	168	66	168	116%	100%	100%	5,484	\$68,074	\$325,238	5,484	\$68,074.06	\$325,237.92
Wall Insulation from R-0 to R11 in Natural Gas Heated and Electrically Cooled Home	R-11 insulation in wall cavity	14	Empty Wall Cavity	42	20	\$210	0	1004	\$5.24	21%	6.8	5.4	28	\$7.47	\$0.37	0	0	49	124	49	124	116%	100%	100%	4,048	\$26,054	\$124,478	4,048	\$26,054.00	\$124,478.36
High Efficiency Furnace	95.4% AFUE Furnace without ECM	96	80% AFUE Federal Standard Efficiency Furnace	116	18	\$200	740	922	\$5.24	22%	8.9	7.0	20	\$10.14	\$0.56	0	0	12	30	12	30	116%	100%	100%	687	\$6,000	\$27,671	687	\$6,000.00	\$27,671.30
67% EF Storage Water Heater	45 gallon 67% EF Storage Water Heater	24	45 gallon 60.8% EF Storage Water Heater	27	13	\$100	1101	129	\$5.24	77%	9.8	2.2	3	\$39.84	\$3.06	0	0	1	2	1	2	116%	100%	100%	6	\$200	\$258	6	\$200.00	\$258.17
90% EF Tankless Water Heater	45 gallon 90% EF Tankless Water Heater	18	45 gallon 60.8% EF Storage Water Heater	27	20	\$200	1101	438	\$5.24	46%	9.6	5.2	9	\$22.87	\$1.14	0	0	3	8	3	8	116%	100%	100%	81	\$1,600	\$3,506	81	\$1,600.00	\$3,506.28
Energy Star Clothes Washer - Combo Customers w/ Gas DHW	Energy Star Clothes Washer	0	Standard Clothes Washer	0	11	\$17	0	17	\$5.24	100%	3.5	-	0	\$151.64	\$13.79	4	0	7	19	7	19	116%	100%	100%	3	\$331	\$331	3	\$331.43	\$331.43
Energy Star Clothes Washer - Gas Only Customers w/ Gas DHW	Energy Star Clothes Washer	0	Standard Clothes Washer	0	11	\$30	0	17	\$5.24	172%	3.5	(2.5)	0	\$260.79	\$23.71	4	0	0	0	0	0	116%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00
Install and program a new Setback Thermostat	Energy Star Programmable thermostat (assume 2.4 F set back during heating per 2009 RECS Data Analysis)	62	standard thermostat - manually adjusted	66	10	\$13	0	25	\$5.24	50%	1.1	0.6	4	\$2.99	\$0.30	0	0	25	64	25	64	116%	100%	100%	311	\$803	\$1,605	311	\$802.53	\$1,605.05
Gas Heat Homes Without Cooling	Home with additional insulation	12	Home with R20 or less existing insulation	30	20	\$364	\$0	\$1,440	\$5.24	25%	15.6	11.6	18	\$20.64	\$1.03	\$0	\$0	168	253	168	253	89%	100%	100%	3,972	\$92,132	\$364,419	3,972	\$92,131.71	\$364,419.14
Gas Heat Homes With Cooling, Combo Customer	Home with additional insulation	13	Home with R20 or less existing insulation	30	20	\$196	\$0	\$843	\$5.24	23%	9.4	7.2	17	\$11.42	\$0.57	\$0	\$0	269	406	269	406	89%	100%	100%	6,207	\$79,639	\$342,089	6,207	\$79,638.59	\$342,088.88
Gas Heat Homes With Cooling, Gas Only Customer	Home with additional insulation	6	Home with R20 or less existing insulation	30	20	\$203	\$0	\$862	\$5.24	24%	6.9	5.3	24	\$8.51	\$0.43	\$0	\$0	30	46	30	46	89%	100%	100%	974	\$9,320	\$39,641	974	\$9,319.86	\$39,640.68
Gas Heat Homes Without Cooling	R-11 insulation	13	Baseline assumes R-0 in wall cavities as existing level	30	20	\$270	\$0	\$1,310	\$5.24	21%	14.7	11.6	17	\$15.84	\$0.79	\$0	\$0	18	27	18	27	89%	100%	100%	410	\$7,292	\$35,379	410	\$7,291.97	\$35,379.45
Gas Heat Homes With Cooling, Combo Customer	R-11 insulation	9	Baseline assumes R-0 in wall cavities as existing level	30	20	\$178	\$0	\$719	\$5.24	25%	6.7	5.0	21	\$8.64	\$0.43	\$0	\$0	28	42	28	42	89%	100%	100%	769	\$7,467	\$30,215	769	\$7,467.34	\$30,214.84
Gas Heat Homes With Cooling, Gas Only Customer	R-11 insulation	10	Baseline assumes R-0 in wall cavities as existing level	30	20	\$166	\$0	\$838	\$5.24	20%	7.9	6.4	20	\$8.25	\$0.41	\$0	\$0	1	2	1	2	89%	100%	100%	36	\$332	\$1,676			

Measure Description	High Efficiency Product Assumptions		Gas Product Detailed Technical Assumptions			Baseline Product Assumptions			Economic Assumptions			Stipulated Output					Economic Assumptions		Program Forecast Inputs				Stipulated Forecast Inputs			Program Forecast Outputs			Program Forecast Outputs		
	High Efficiency Product Description / Rating	High Efficiency Product Consumption (Dth/yr)	Baseline Product Description / Rating	Baseline Product Consumption (Dth/yr)	Life of Product (years)	Average Rebate Amount	Average Baseline Product Cost	Average Incremental Cost of Efficient Product	Assumed Energy Cost (\$/Dth)	Rebate as a % of Incremental Cost	Increment'l Cost Payback Period w/o Rebate	Increment'l Cost Payback Period with Rebate	Average Annual Customer Dth Savings	Average rebated cost per Dth Saved	Average rebated Lifetime cost per Dth Saved	Non-Energy O&M Savings	Energy O&M Savings	2017 Participants (-)	2017 Units (-)	2018 Participants (-)	2018 Units (-)	NTG (%)	Installation Rate (%)	Realization Rate (%)	2017 NET Dth (Dth)	2017 Rebate Budget (\$)	2017 Incremental Cost (\$)	2018 NET Dth (Dth)	2018 Rebate Budget (\$)	2018 Incremental Cost (\$)	
																		584,577	1,268,057	525,632	1,150,763				636,078	\$7,085,380	\$21,163,747	573,136	\$6,929,902	\$17,925,400	
Online Energy Feedback & Tools	Treatment	70	Control	70	1	\$0	\$0	\$0	\$5.24	#DIV/0!	-	-	0	\$0.00	\$0.00	\$0	\$0	21,823	21,823	21,823	21,823	100%	100%	100%	5,878	\$0	\$0	5,878	\$0.00	\$0.00	
Behavioral Adjustment-Online Energy Feedback & Tools	Treatment	-46	Control	-47	0	\$0	\$0	\$0	\$5.24	#DIV/0!	-	-	(0)	\$0.00	#DIV/0!	\$0	\$0	0	21,823	0	21,823	100%	100%	100%	-3,919	\$0	\$0	-3,919	\$0.00	\$0.00	
ROLL-UP: Existing Participant - 2017 Savings	Treatment	820	Control	821	1	\$0	\$0	\$0	\$5.24	#DIV/0!	-	-	0	\$0.00	\$0.00	\$0	\$0	405,423	405,423	0	0	100%	100%	100%	185,742	\$0	\$0	0	\$0.00	\$0.00	
Behavioral Adjustment-ROLL-UP: Existing Participant - 2017 Savings	Treatment	-547	Control	-547	0	\$0	\$0	\$0	\$5.24	#DIV/0!	-	-	(0)	\$0.00	#DIV/0!	\$0	\$0	0	405,423	0	0	100%	100%	100%	-123,828	\$0	\$0	0	\$0.00	\$0.00	
ROLL UP: New Participant - 2017 Savings	Treatment	736	Control	736	1	\$0	\$0	\$0	\$5.24	#DIV/0!	#DIV/0!	#DIV/0!	-	#DIV/0!	#DIV/0!	\$0	\$0	62,653	62,653	0	0	100%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00	
Behavioral Adjustment-ROLL-UP: New Participant - 2017 Savings	Treatment	-491	Control	-491	0	\$0	\$0	\$0	\$5.24	#DIV/0!	#DIV/0!	#DIV/0!	-	#DIV/0!	#DIV/0!	\$0	\$0	0	62,653	0	0	100%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00	
ROLL-UP: Existing Participant - 2018 Savings	Treatment	813	Control	814	1	\$0	\$0	\$0	\$5.24	#DIV/0!	-	-	0	\$0.00	\$0.00	\$0	\$0	0	0	405,429	405,429	100%	100%	100%	0	\$0	\$0	187,771	\$0.00	\$0.00	
Behavioral Adjustment-ROLL-UP: Existing Participant - 2018 Savings	Treatment	-542	Control	-542	0	\$0	\$0	\$0	\$5.24	#DIV/0!	-	-	(0)	\$0.00	#DIV/0!	\$0	\$0	0	0	0	405,429	100%	100%	100%	0	\$0	\$0	-125,180	\$0.00	\$0.00	
ROLL UP: New Participant - 2018 Savings	Treatment	736	Control	736	1	\$0	\$0	\$0	\$5.24	#DIV/0!	#DIV/0!	#DIV/0!	-	#DIV/0!	#DIV/0!	\$0	\$0	0	0	0	0	100%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00	
Behavioral Adjustment-ROLL-UP: New Participant - 2018 Savings	Treatment	-491	Control	-491	0	\$0	\$0	\$0	\$5.24	#DIV/0!	#DIV/0!	#DIV/0!	-	#DIV/0!	#DIV/0!	\$0	\$0	0	0	0	0	100%	100%	100%	0	\$0	\$0	0	\$0.00	\$0.00	
Provide new 1.5 gpm showerhead to replace existing 2.5 gpm showerhead in natural gas DHW unit home	1.5 GPM Showerhead	3	2.5 GPM Showerhead	5	10	\$3	\$0	\$3	\$5.24	100%	0.1	-	2	\$1.63	\$0.16	\$22	\$0	2,758	7,694	0	0	100%	43%	100%	6,496	\$24,620	\$24,620	0	\$0.00	\$0.00	
Provide Energy Efficient Kitchen Aerator - 1.5 GPM to replace existing 2.2 gpm aerator in home with natural gas DHW heater	1.5 GPM Kitchen Faucet Aerator	0	2.2 GPM Kitchen Faucet Aerator	1	10	\$2	\$0	\$2	\$5.24	100%	0.5	-	0	\$7.48	\$0.75	\$2	\$0	2,758	7,694	0	0	100%	41%	100%	696	\$12,695	\$12,695	0	\$0.00	\$0.00	
Provide Energy Efficient Bath Faucet Aerator - 1.0 GPM to replace existing 2.2 gpm aerator in home with natural gas DHW heater	1.0 GPM Bathroom Faucet Aerator	0	2.2 GPM Bathroom Faucet Aerator	0	10	\$1	\$0	\$1	\$5.24	100%	0.1	-	0	\$2.06	\$0.21	\$3	\$0	2,758	7,694	0	0	100%	41%	100%	813	\$4,078	\$4,078	0	\$0.00	\$0.00	
Provide new 1.5 gpm showerhead to replace existing 2.5 gpm showerhead in natural gas DHW unit home	1.5 GPM Showerhead	3	2.5 GPM Showerhead	5	10	\$3	\$0	\$3	\$5.24	100%	0.1	-	2	\$1.63	\$0.16	\$22	\$0	0	0	2,758	7,694	100%	43%	100%	0	\$0	\$0	6,496	\$24,620.26	\$24,620.26	
Provide Energy Efficient Kitchen Aerator - 1.5 GPM to replace existing 2.2 gpm aerator in home with natural gas DHW heater	1.5 GPM Kitchen Faucet Aerator	0	2.2 GPM Kitchen Faucet Aerator	1	10	\$2	\$0	\$2	\$5.24	100%	0.5	-	0	\$7.48	\$0.75	\$2	\$0	0	0	2,758	7,694	100%	41%	100%	0	\$0	\$0	696	\$12,694.82	\$12,694.82	
Provide Energy Efficient Bath Faucet Aerator - 1.0 GPM to replace existing 2.2 gpm aerator in home with natural gas DHW heater	1.0 GPM Bathroom Faucet Aerator	0	2.2 GPM Bathroom Faucet Aerator	0	10	\$1	\$0	\$1	\$5.24	100%	0.1	-	0	\$2.06	\$0.21	\$3	\$0	0	0	2,758	7,694	100%	41%	100%	0	\$0	\$0	813	\$4,077.73	\$4,077.73	
High Efficiency Furnace	98.4% AFUE Furnace without ECM	96	80% AFUE Federal Standard Efficiency Furnace	116	18	\$550	\$0	\$550	\$5.24	100%	5.3	-	20	\$27.87	\$1.55	\$0	\$0	306	1,085	319	1,150	100%	100%	100%	21,409	\$596,750	\$596,750	22,692	\$632,500.00	\$632,500.00	
67% EF Storage Water Heater	45 gallon 67% EF Storage Water Heater	24	45 gallon 60.8% EF Storage Water Heater	27	13	\$300	\$0	\$300	\$5.24	100%	22.8	-	3	\$119.52	\$9.19	\$0	\$0	32	112	31	112	100%	100%	100%	281	\$33,600	\$33,600	281	\$33,600.00	\$33,600.00	
Attic insulation in Natural Gas Heated Home	Add R-41 to make R 54 total in attic	3	Estimated existing level = R 11	12	20	\$715	\$0	\$715	\$5.24	100%	14.9	-	9	\$78.32	\$3.92	\$0	\$0	304	1,077	303	1,092	100%	100%	100%	9,832	\$770,055	\$770,055	9,969	\$780,780.00	\$780,780.00	
Air Sealing & Weather-stripping T2 In Natural Gas Heated Home	Average Home with Proposed CFM50 = 1206	15	Average Home with Baseline CFM50 = 1592	20	10	\$200	\$0	\$200	\$5.24	100%	7.5	-	5	\$39.16	\$3.92	\$0	\$0	24	86	24	86	100%	100%	100%	439	\$17,200	\$17,200	439	\$17,200.00	\$17,200.00	
Wall Insulation from R-0 to R11 in Natural Gas Heated Home	R-11 insulation in wall cavity with average area 572 sq. ft.	8	Assume No Insulation in Wall Cavity	24	20	\$670	\$0	\$670	\$5.24	100%	8.0	-	16	\$42.08	\$2.10	\$0	\$0	112	398	111	398	100%	100%	100%	6,337	\$266,660	\$266,660	6,337	\$266,660.00	\$266,660.00	
Crawl Space Wall Insulation R-0 to R-19	R-19 insulation in crawl space wall cavity with average area 218 sq. ft.	2	No Insulation in crawl space wall	9	20	\$175	\$0	\$175	\$5.24	100%	4.7	-	7	\$24.45	\$1.22	\$0	\$0	61	216	74	266	100%	100%	100%	1,546	\$37,800	\$37,800	1,904	\$46,550.00	\$46,550.00	
Storm Windows added to single pane windows	Addition of Storm windows	34	Single Pane Windows	53	22	\$1,225	\$0	\$1,225	\$5.24	100%	11.9	-	20	\$62.25	\$2.83	\$0	\$0	19	68	19	68	100%	100%	100%	1,338	\$83,300	\$83,300	1,338	\$83,300.00	\$83,300.00	
New 1.5 gpm Showerhead to replace existing 2.5 gpm showerhead in home with natural gas DHW	1.5 GPM Showerhead	3	2.5 GPM Showerhead	5	10	\$5	\$0	\$5	\$5.24	100%	0.2	-	2	\$2.55	\$0.25	\$22	\$0	493	1,750	486	1,750	100%	100%	100%	3,436	\$8,750	\$8,750	3,436	\$8,750.00	\$8,750.00	
New 1.5 GPM Kitchen Aerator to replace existing 2.2 gpm aerator in home with natural gas DHW	1.5 GPM Kitchen Faucet Aerator	0	2.2 GPM Kitchen Faucet Aerator	1	10	\$3	\$0	\$3	\$5.24	100%	0.9	-	0	\$13.60	\$1.36	\$2	\$0	493	1,750	486	1,750	100%	100%	100%	386	\$5,250	\$5,250	386	\$5,250.00	\$5,250.00	
New 1.0 GPM Bathroom Faucet Aerator to replace existing 2.2 gpm aerator in home with natural gas DHW	1.0 GPM Bathroom Faucet Aerator	0	2.2 GPM Bathroom Faucet Aerator	0	10	\$3	\$0	\$3	\$5.24	100%	0.7	-	0	\$11.64	\$1.16	\$3	\$0	493	1,750	486	1,750	100%	100%	100%	451	\$5,250	\$5,250	451	\$5,250.00	\$5,250.00	
Install New Thermostat	New T-stat w/ Auto setback by 3.37 F for heating	60	Existing non-programmable thermostat	66	10	\$125	\$0	\$125	\$5.24	100%	4.0	-	6	\$21.15	\$2.11	\$0	\$0	49	175	49	175	100%	100%	100%	1,034	\$21,875	\$21,875	1,034	\$21,875.00	\$21,875.00	
Water Heater Blanket - Gas Water Heater	Add commercial insulation wrap R8 around Water Heater Tank	2	No External Insulation on water heater	3	7	\$75	\$0	\$75	\$5.24	100%	13.2	-	1	\$69.20	\$10.65	\$0	\$0	92	325	90	325	100%	100%								