Xcel Energy Minnesota
DSM Market Potential Assessment

Final Report – Volume 3: Appendices I-N

Prepared for

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Minneapolis, MN

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I. Appendix I: Residential On-Site Surveys

2011 Minnesota Market Potential Assessment

Residential On-Site Research Report

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Burlington, MA December 6, 2011

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1. Introduction

KEMA conducted an inventory of energy use at Xcel Energy Minnesota (Xcel Energy MN) residential customer facilities to provide input for the analysis of the potential for energy efficiency savings. KEMA and Xcel Energy staff worked collaboratively to develop a comprehensive instrument to categorize and record all energy-using equipment and systems at customers' sites, a recruitment script and supporting materials, and a sample design; and to inform Xcel Energy staff and customers of this effort. KEMA energy professionals visited a representative sample of 300 residential customer sites, and collected data to the extent permitted by the time constraints imposed by the customer. Electronic data collection tools were used to ensure accuracy and consistency of the data, which was then statistically analyzed to provide direct inputs, or the basis for calibration of secondary source inputs, to KEMA's DSM Assyst™ potential modeling tool. These inputs were reviewed, and modified where necessary, by Xcel Energy staff. This appendix provides a summary of the results of this research.

2. Sample Design

The source of the sample frame was Xcel Energy's residential billing file. Note that the sample unit for this study is a residential household, as defined by a separate entry or observation in the billing file. A total of 1,05,412 records were in the file provided by Xcel Energy.

KEMA designed the residential on-site sample to be representative of the overall customer base and to provide sufficient sample sizes for analysis of specific segments. Xcel Energy MN was interested in characterization of the low income segment. However, a proportionate sample provides too few low income customers to be useful. The on-site investigation "oversampled" this segment to acquire a statistically valid basis for characterizing the energy use of these customers.

Table 1: Low Income-Non-Low Income Sample Allocation

Customer			Sample Sizes	
Group	Customers	Percent	Proportion	LI Oversample
Non-low income	984,902	93.6%	281	246
Low Income	67,610	6.4%	19	54

Xcel Energy was also interested in the differences, if any, between single-family and multi-family energy use. To address this difference, KEMA allocated sample points proportionally to these segments, as shown in Table 2

Table 2: Single Family Multi-family Sample Allocation

Low Inc	Family_Type	Customers	% by LI	LI Oversample
No	Multi-family	264,635	26.9%	66
No	Single-family	720,267	73.1%	180
Yes	Multi-family	29,828	44.1%	24
Yes	Single-family	37,782	55.9%	30

Finally, we looked to have some geographical dispersion of the sample. For this, we used the Xcel Energy Division codes. We placed a minimum requirement of 4 sample points per Low income/family type/division segment and adjusted a few of the larger segment down slightly to compensate. We also excluded from the sample all homes in two remote divisions: SD and ND.

Combined, these divisions account for less than 10,000 customers. The following Table 3 shows the results.

Table 3: Final Sample Allocation

Low Income	Family Type	Division	Customers	% Customers	LI Oversample	% Sample
No	Multi-family	DE	16,903	1.6%	4	1.3%
No	Multi-family	ME	83,971	8.0%	22	7.3%
No	Multi-family	MW	146,065	13.9%	36	12.0%
No	Multi-family	ND	358	0.0%	0	0.0%
No	Multi-family	NT	16,909	1.6%	4	1.3%
No	Multi-family	SD	429	0.0%	0	0.0%
No	Single-family	DE	75,457	7.2%	20	6.7%
No	Single-family	ME	242,149	23.0%	62	20.7%
No	Single-family	MW	324,676	30.8%	80	26.7%
No	Single-family	ND	2,110	0.2%	0	0.0%
No	Single-family	NT	70,692	6.7%	18	6.0%
No	Single-family	SD	5,183	0.5%	0	0.0%
Yes	Multi-family	DE	2,280	0.2%	4	1.3%
Yes	Multi-family	ME	10,842	1.0%	8	2.7%
Yes	Multi-family	MW	14,000	1.3%	8	2.7%
Yes	Multi-family	ND	111	0.0%	0	0.0%
Yes	Multi-family	NT	2,476	0.2%	4	1.3%
Yes	Multi-family	SD	119	0.0%	0	0.0%
Yes	Single-family	DE	3,673	0.3%	4	1.3%
Yes	Single-family	ME	13,665	1.3%	10	3.3%
Yes	Single-family	MW	15,414	1.5%	12	4.0%
Yes	Single-family	ND	241	0.0%	0	0.0%
Yes	Single-family	NT	4,240	0.4%	4	1.3%
Yes	Single-family	SD	549	0.1%	0	0.0%

Once at the income/family-type/division level, we sampled randomly.

Survey expansion weights were developed by dividing the total number of customers in each segment by the number of completed sample points in that segment. The following table shows the calculation.

Table 4: Expansion Weights

Low Income	Family Type	Division	Customers	Completed Surveys	Expansion Weight
No	Multi-family	DE	16,903	4	4238.35
No	Multi-family	ME	83,971	23	3661.80
No	Multi-family	MW	146,065	34	4308.84
No	Multi-family	NT	16,909	3	5653.15
No	Single-family	DE	75,457	20	3811.44
No	Single-family	ME	242,149	61	4010.26
No	Single-family	MW	324,676	82	3999.96
No	Single-family	NT	70,692	17	4200.89
Yes	Multi-family	DE	2,280	5	459.54
Yes	Multi-family	ME	10,842	10	1092.63
Yes	Multi-family	MW	14,000	8	1763.60
Yes	Multi-family	NT	2,476	4	623.81
Yes	Single-family	DE	3,673	4	937.86
Yes	Single-family	ME	13,665	10	1395.68
Yes	Single-family	MW	15,414	12	1311.93
Yes	Single-family	NT	4,240	5	866.11

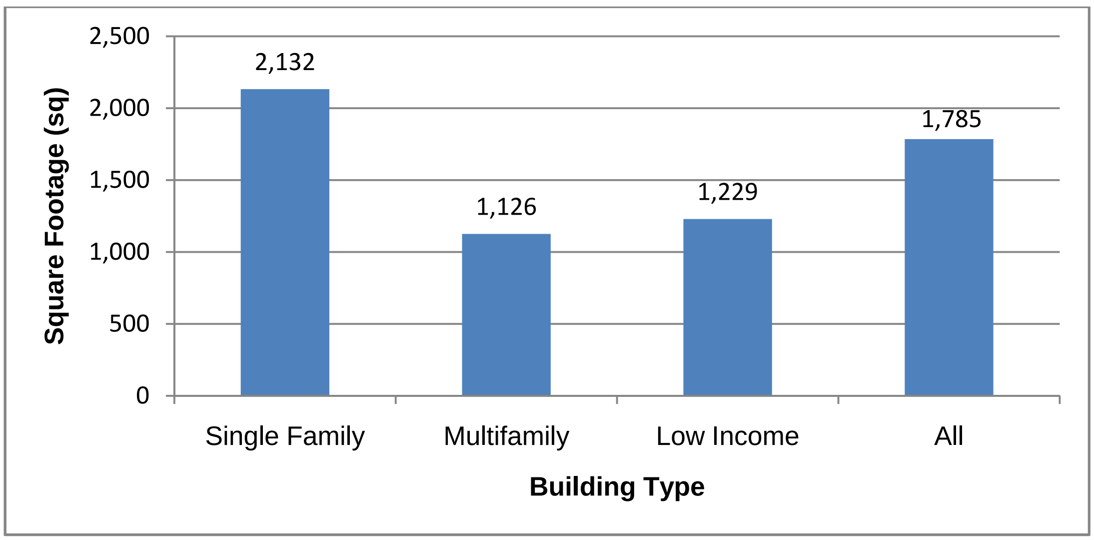
3. Results Summary

This section presents the summary results of the Minnesota Residential on-site surveys that were conducted in the spring of 2011.

3.1 General Home Characteristics

The following table shows the average home size by building type. In the figure below, the average square footage for all homes in the Xcel Energy Minnesota service territory is 1,785 square feet. The average size of a single-family home is 2,132 square feet and multi-family dwellings are 1,000 square feet. Low income homes are slightly larger than multi-family buildings at an average of approximately 1,200 square feet.

Figure 3-1: Dwelling Size



In addition to identifying the average square footage for all homes, KEMA collected data on the age of all building types. We found that 35 percent of homes were built more than 50 years ago and about 48 percent of homes were built between 11 and 50 years ago. Only 8 percent of homes are less than 10 years old. With 70% of homes over 20 years old, there is a greater opportunity for savings. The next table shows a more detailed distribution of building ages across building types.

Table 5: Dwelling Type by Age

Age Group	Single Family	Multifamily	Low Income	Total
Don't know	1%	19%	21%	9%
<10 Years	6%	12%	9%	8%
11-20 years	16%	9%	7%	13%
21-30 years	12%	20%	3%	12%
31-50 years	22%	24%	26%	23%
>50 years	44%	15%	34%	35%

3.1 Heating and Cooling

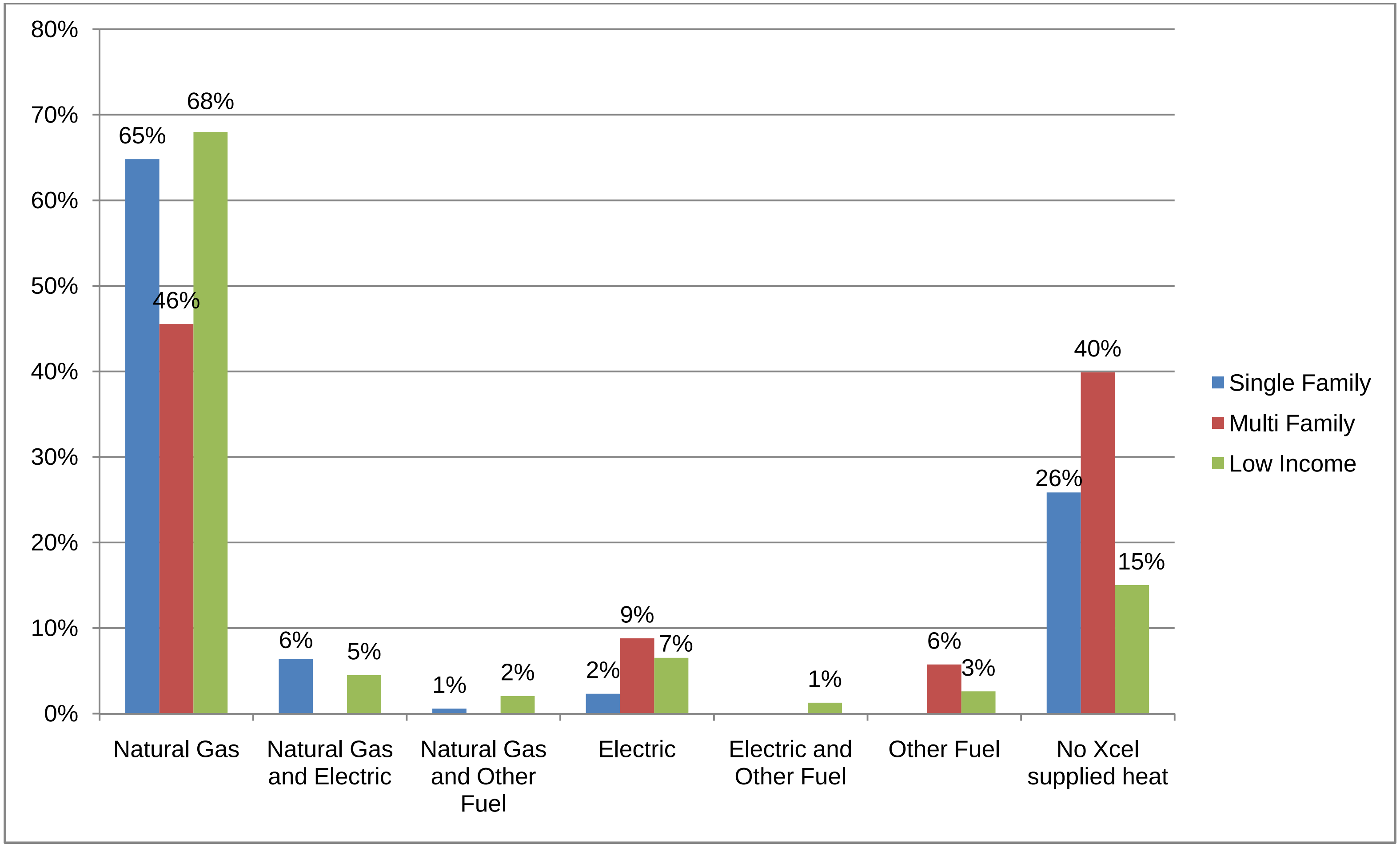
KEMA found that 71 percent of the homes have Xcel Energy supplied heat. Of that 71 percent, we found that 60 percent of homes have natural gas heating and only 4 percent have electric heating.

Table 6: Percent of All Homes by Space Heating Fuel

Space Heating Fuel	Percent of Homes
Natural Gas	60%
Natural Gas and Electric	4%
Natural Gas and Other Fuel	1%
Electric	4%
Other Fuel	2%
No Xcel supplied heat	29%

Next, we distributed the data by building type to gain a better understanding of the presence of space heating fuel across dwelling types. All fuel types, with the exception of natural gas, are rarely employed.

Figure 3-2: Space Heating Fuel Type across Dwelling Type



Additionally, we found that 90 percent of residences have some form of space cooling. The next table shows that 63 percent of homes have central A/C and 18 percent have room A/C.

Table 7: Type of Primary Space Cooling

Cooling Type	Percent of All Residences
Central AC	63%
Central AC and Room AC	2%
Central AC and Other	1%
Room AC	18%
Other	6%
No Cooling	10%

Since central A/C and room A/C are most widespread, we felt it was important to distinguish their presence among each building type. Central A/C units are most commonly found in single family homes, whereas room A/C's are most prevalent in low income homes. Multifamily is almost split across both cooling types.

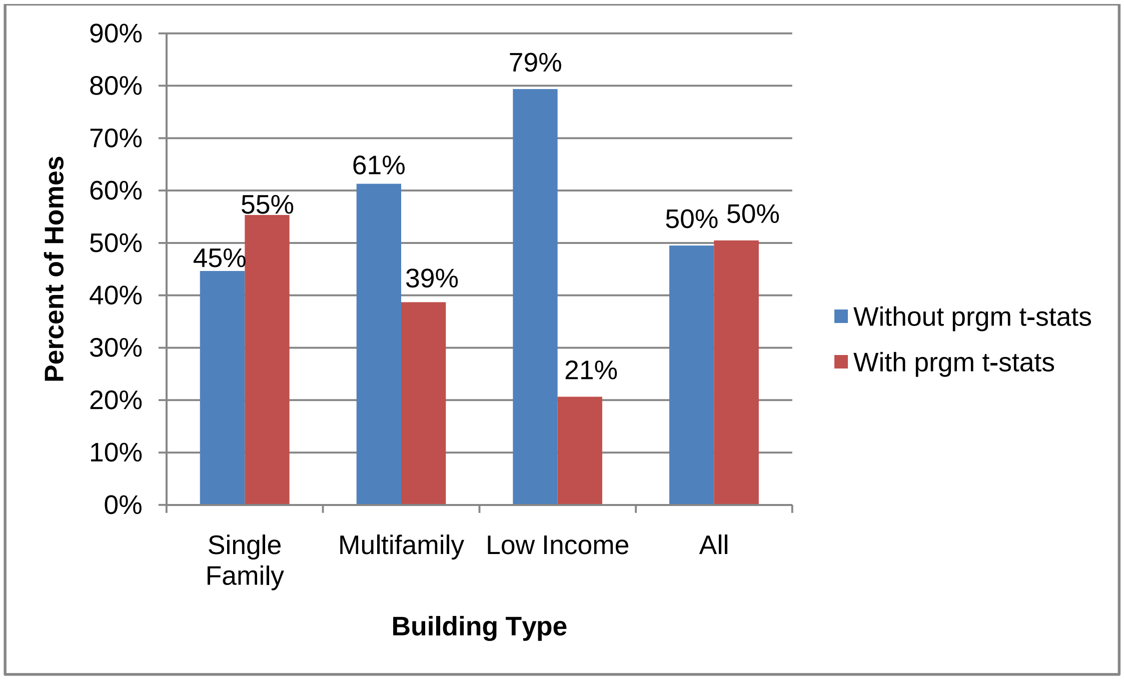
Table 8: Type of Space Cooling by Building Type

Type of A/C	Single Family	Multifamily	Low Income	All
CAC	78%	36%	24%	63%
RAC	10%	31%	48%	18%
Total	88%	67%	73%	81%

3.1.1 Programmable Thermostats

Fifty percent of residences have programmable thermostats for their central air conditioners. We also found that the majority of low income homes (79%) do not have programmable thermostats and the majority of multi-family units (61%) do not have programmable thermostats.

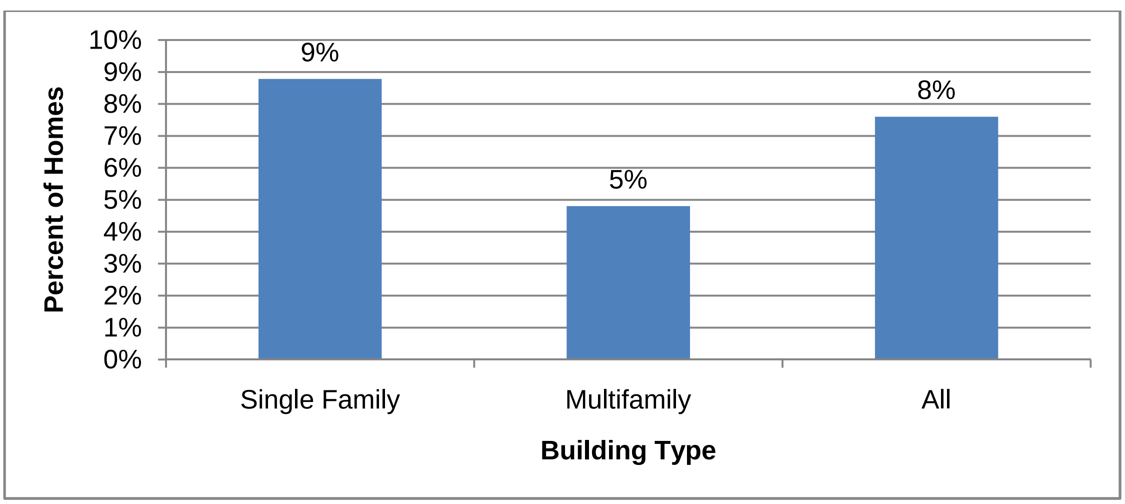
Figure 3-3: Percent of Homes with Programmable Thermostats



3.1.2 Fans

KEMA surveyed residents to determine the presence of whole house fans within their service territory. We found that only 8 percent of residences do have these fans.

Figure 3-4: Presence of Whole House Fans



3.1.3 Ducts

As shown in table below, the majority of residences at 53 percent of have duct insulation that is not observable. It was found that 8 percent of residencies have duct insulation and 29 percent do not have duct insulation.

Table 9: Duct Insulation for All Building Types

Duct Insulation	All
Don't Know	10%
Not observable	53%
Yes	8%
No	29%

3.2 Water Heating

Seven percent of homes have electric water heating and 93 percent of homes employ non-electric water heating.

Table 10: Percent of Residences with Electric Water Heating

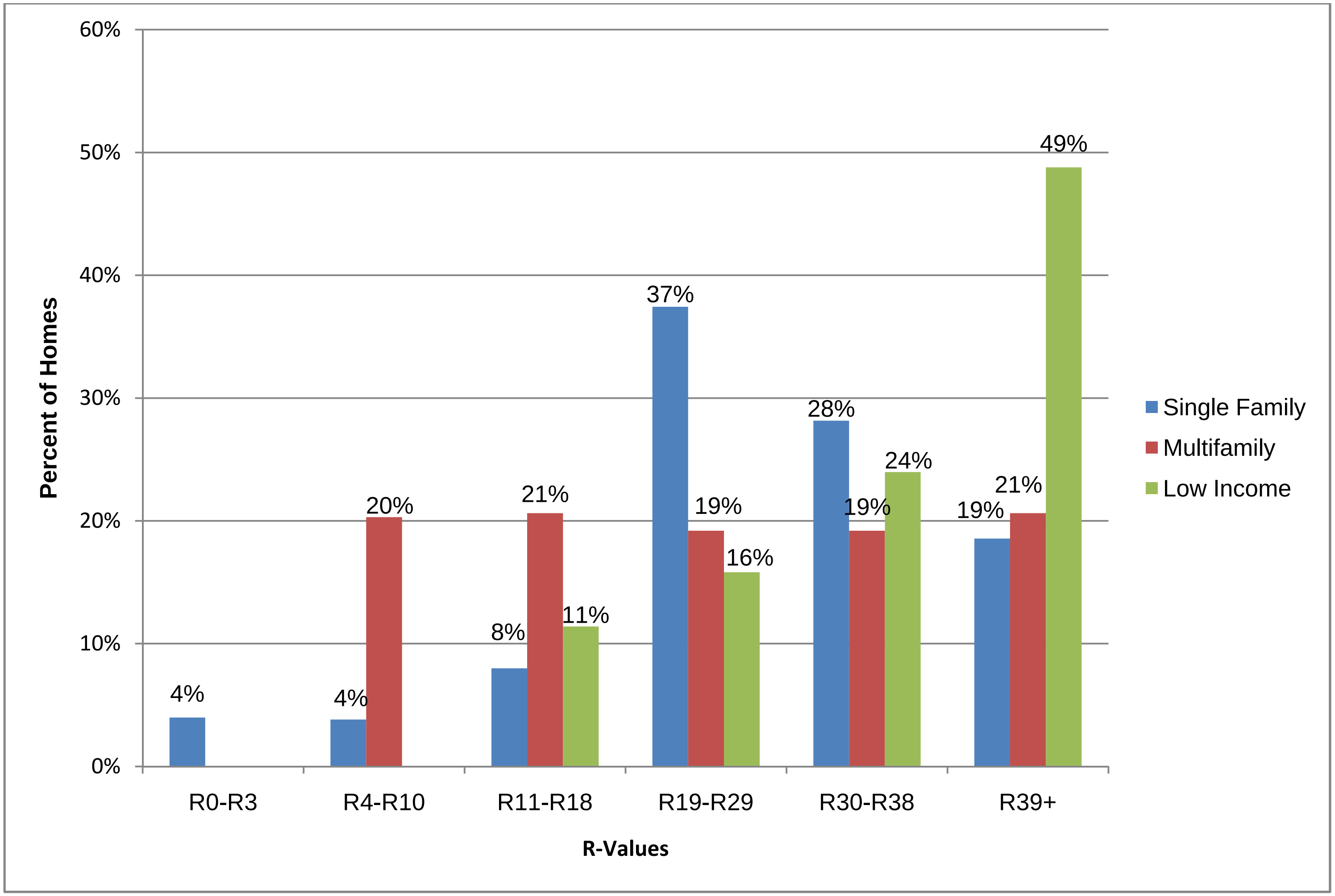
Type of WH	Single Family	Multifamily	Low Income	All
Non-electric WH	92%	92%	97%	93%
Electric WH	8%	8%	3%	7%

3.3 Building Shell

3.3.1 Ceiling Insulation

The most common level of ceiling insulation levels across all homes is R39 or greater. Overall, low income homes had greater levels of insulation across all r-values.

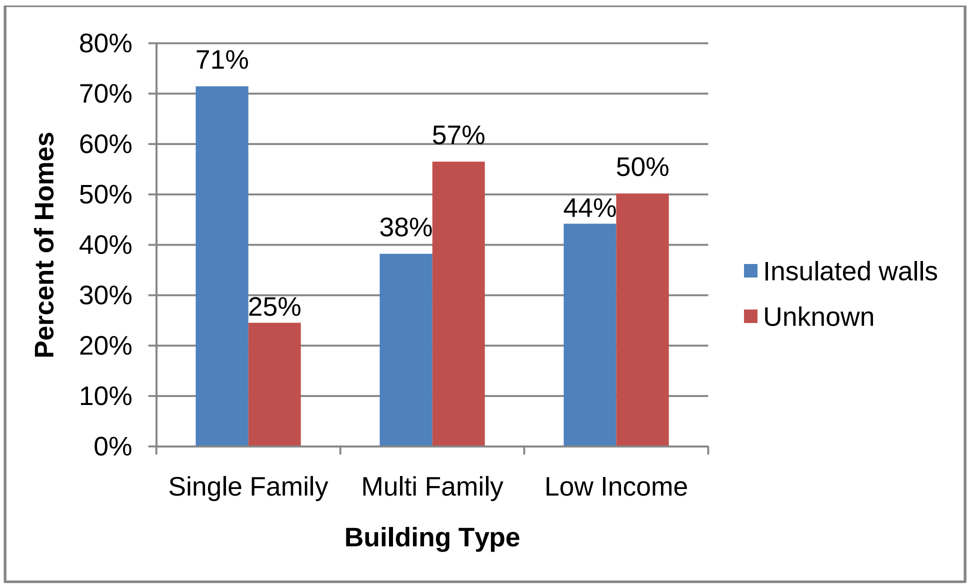
Figure 3-5: Ceiling Insulation across all Building Types



3.3.2 Wall Insulation

Existing levels of wall insulation is greater in single family homes as compared to multifamily or low income residences. The following table shows the distribution of levels of wall insulation across all dwelling types. As indicated in the table, the majority of single family homes have wall insulation. However, over half of the residences for both multifamily and low income units are unsure if their homes have wall insulation.

Figure 3-6: Existing Wall Insulation by Building Type



3.3.3 Windows

Most homes have double pane windows. The table below demonstrates that 86 percent of single family homes, 70 percent of multifamily homes, and 70 percent of low income homes have double paned windows. Single paned windows are less prevalent.

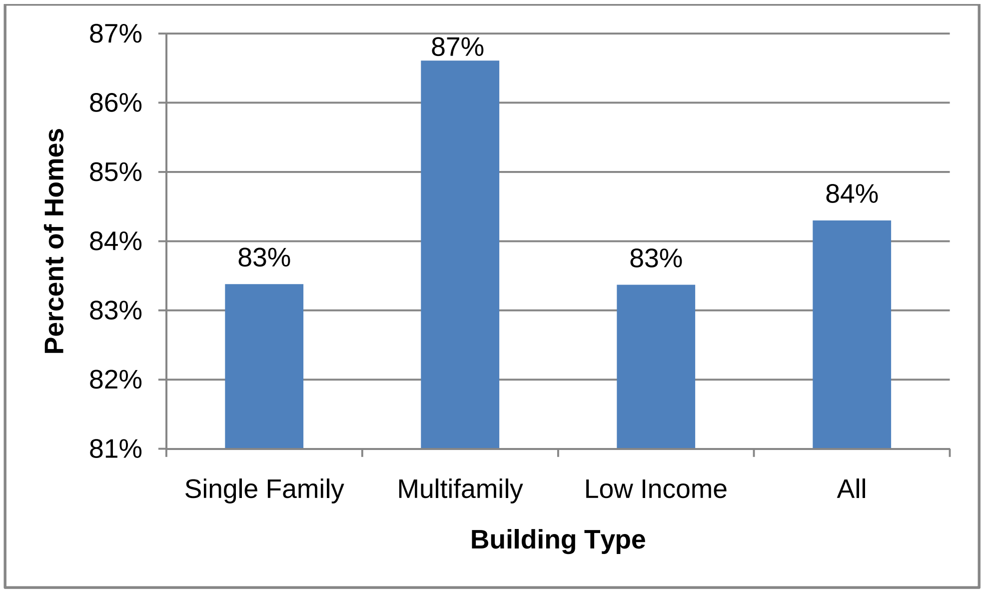
Table 11: Window Type by Building Type

Window Type	Single Family	Multifamily	Low Income
Single Pane	14%	30%	30%
Double Pane	86%	70%	70%

3.4 Laundry

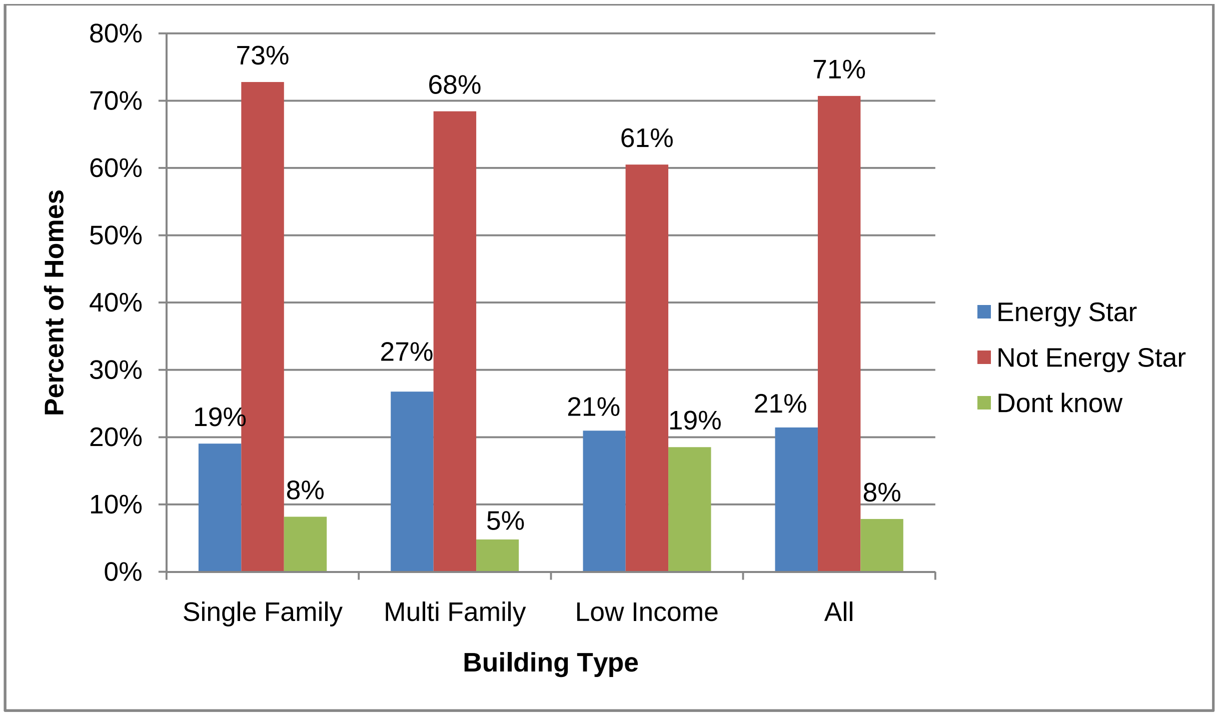
As shown in figure below, 84 percent of all homes have clothes washers.

Figure 3-7: Percent of Clothes Washers by Building Type



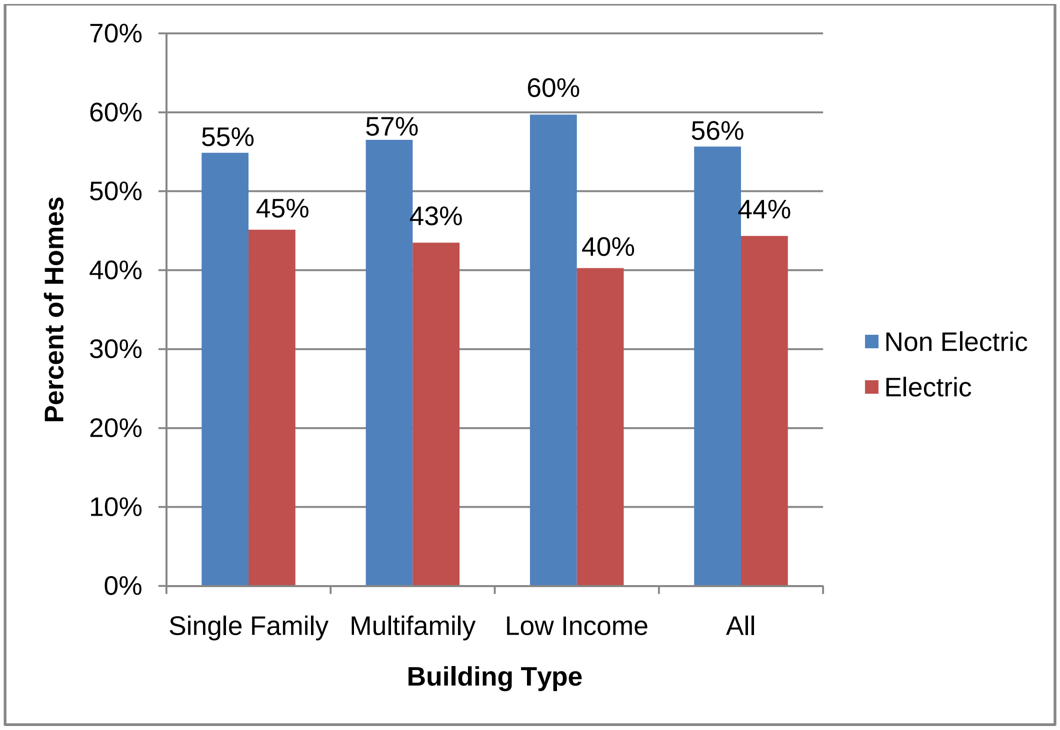
Of the 84 percent of all homes with clothes washer, KEMA found that 71 percent of those homes do not have ENERGY STAR machines and 8 percent were unsure.

Figure 3-8: Percent of ENERGY STAR Clothes Washers by Building Type



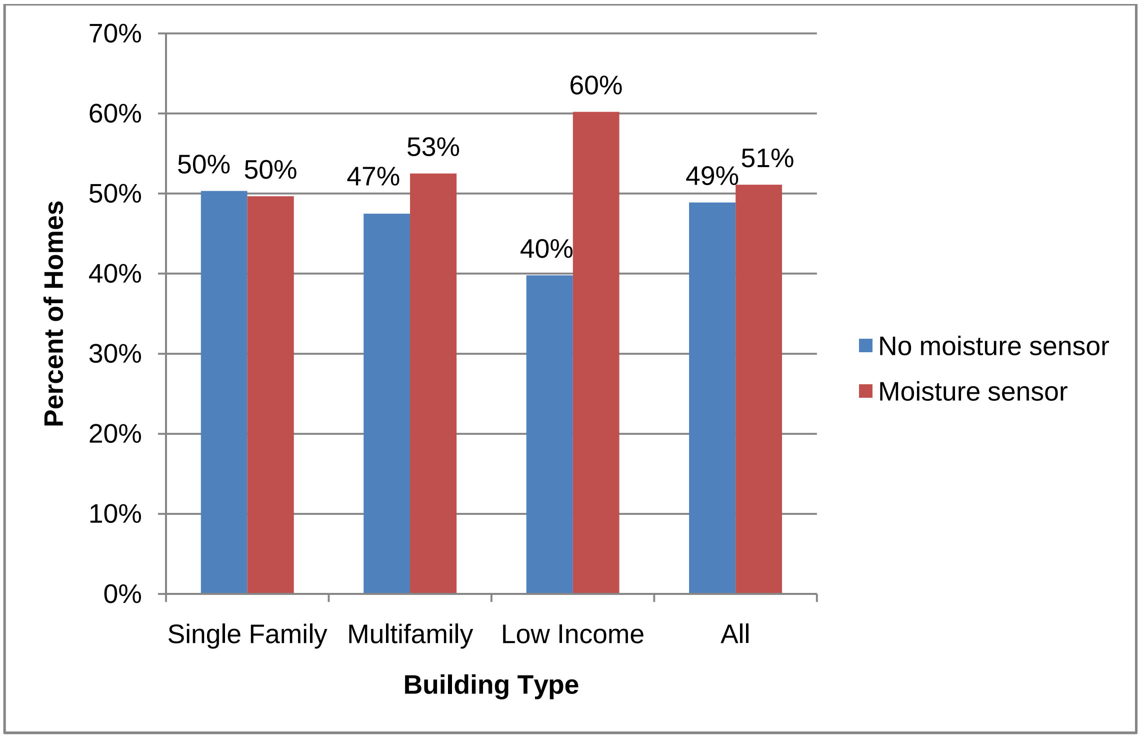
The next figure shows the percent of homes that have electric clothes. For single family homes, 55 percent have electric clothes dryers and 57 percent of multifamily homes have electric dryers. Lastly, 40 percent of low income residents have electric dryers.

Figure 3-9: Percent of Electric Clothes Dryers by Building Type



Next, we collected information on the overall presence of moisture sensors. Overall we found that about half of electric clothes dryers were equipped with moisture sensors.

Figure 3-10: Electric Clothes Dryers with Moisture Sensors



3.5 Lighting

Ninety seven percent of all homes across all building types have incandescent bulbs. Across every building type, 3 percent of the homes in the service territory do not have incandescent bulbs. Alternatively, 75 percent of residents have CFL screw-in bulbs. The table below shows the presence of bulbs by building type.

Figure 3-11: Percent of Bulbs by Building Type

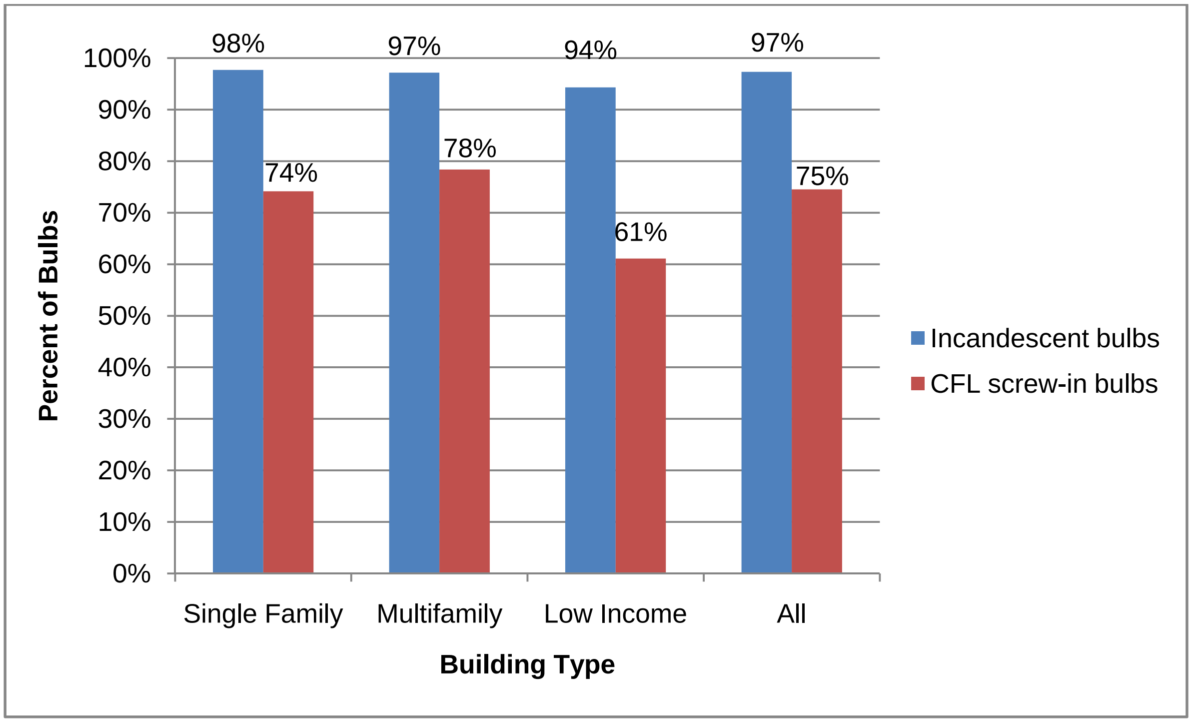


Table 12 outlines the average number of bulbs and sockets per building type. As shown, there are approximately 8 CFLs per home, 24 incandescent bulbs per home, and 42 sockets per home.

Table 12: Average Number of Bulbs and Sockets per Building Type

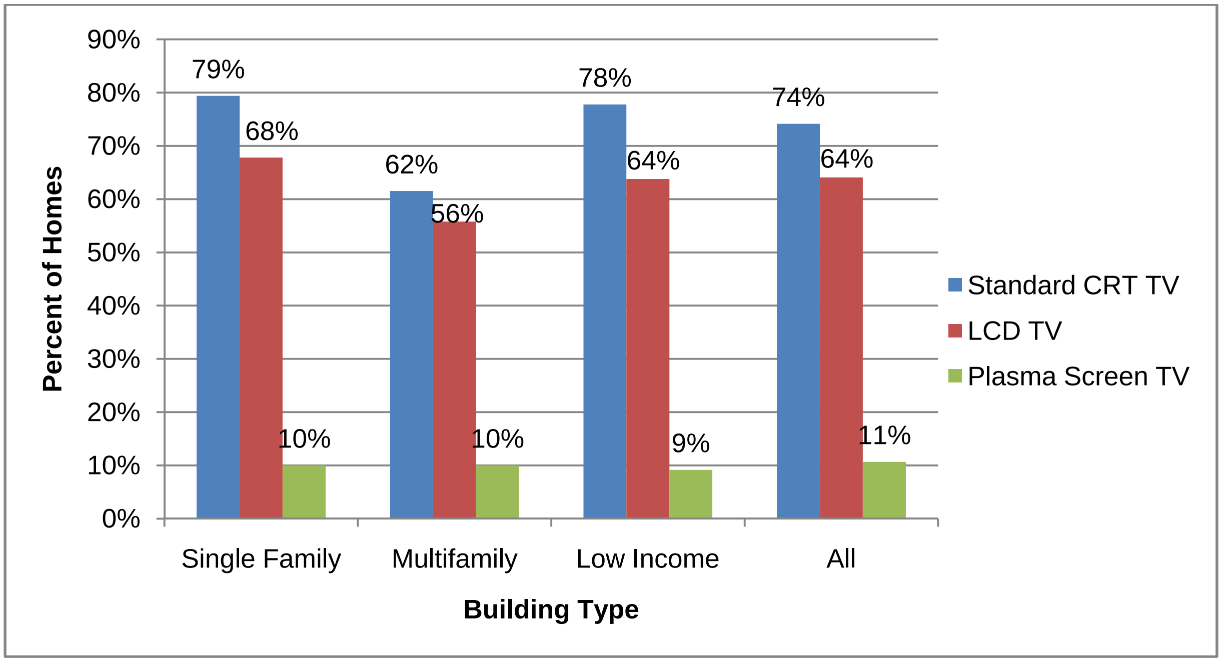
Number of Bulbs/Sockets per Home	Single Family	Multifamily	Low Income	All
CFL Screw in Bulbs	10.35	5.13	6.28	8.61
Incandescent Bulbs	28.83	16.28	14.94	24.39
Other Bulbs	7.69	2.95	2.49	6.02
Sockets	51.22	25.76	25.39	42.38

3.6 Consumer Electronics

3.6.1 Televisions

KEMA found that 74 percent of homes have standard CRT televisions, 64 percent of homes have LCD TV's, and that 11 percent of homes have plasma screen TV's.

Figure 3-12: TV Type by Building Type



Lastly, we found that, on average, there are 2 standard CRTs per home. We also found that there are 1.53 LCDs per home and 1.11 plasma's per home.

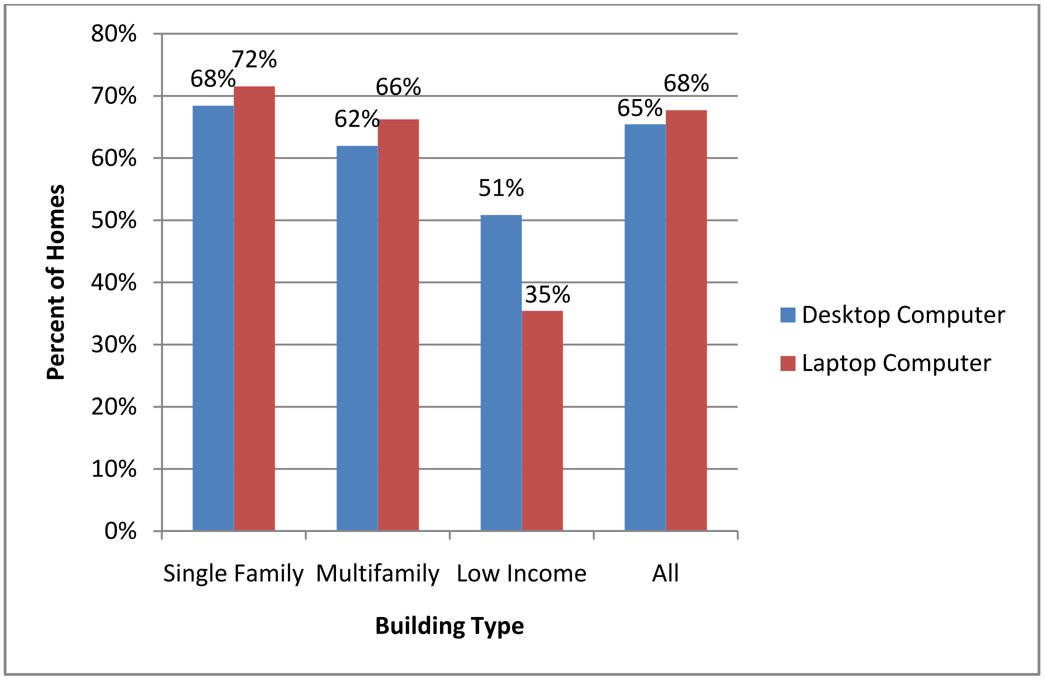
Table 13: Number of TVs per Building Type

TV Type per Home	Single Family	Multifamily	Low Income	All
Standard CRT TVs	2.16	1.43	2.2	1.99
LCD TVs	1.58	1.42	1.5	1.53
Plasma screen tvs	1.11	1.11	1.15	1.11

3.6.2 Computers

Overall, we found that 65 percent of homes have desktop computers and 68 percent of homes have laptop computers.

Figure 3-13: Percent of Computers by Building Type



On average, there are 1.2 desktop computers per home and 1.6 laptop computers per home.

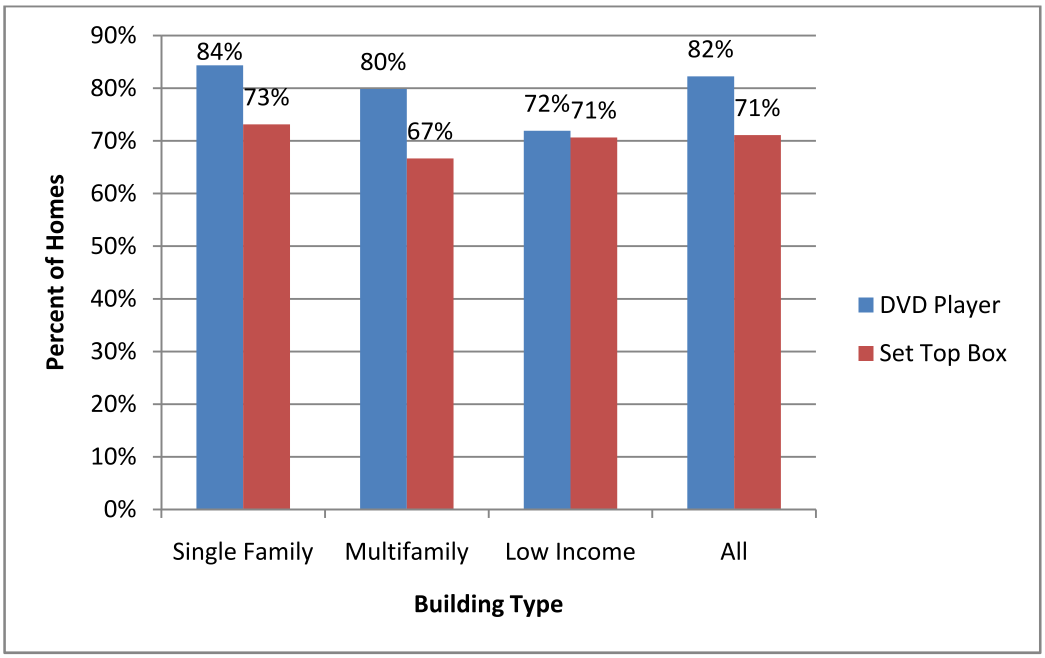
Table 14: Average Number of Computers per Building Type

	Single Family	Multi Family	Low Income	All
Desktop computers	1.25	1.13	1.16	1.21
Laptop computers	1.62	1.66	1.44	1.63

3.6.3 Other Electronics

KEMA found that 82 percent of homes have DVD players. Only 72 percent of low income homes have DVD players, which is less than across all building types. We also found that 71 percent of homes have a set top box.

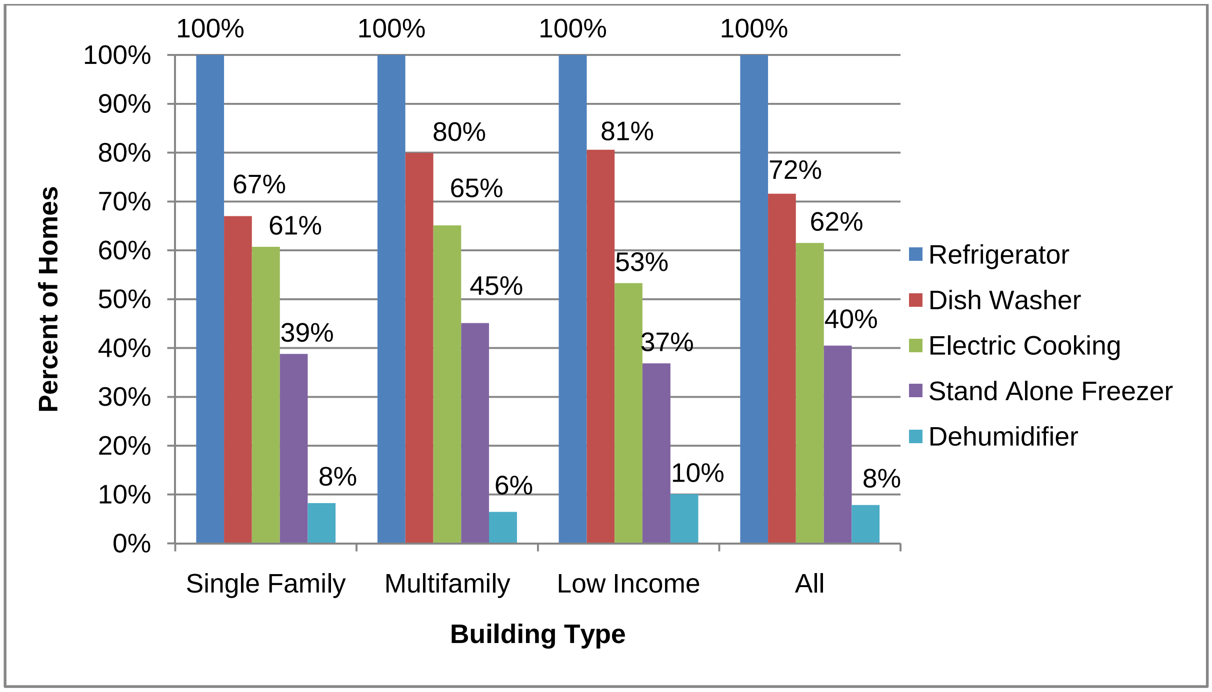
Figure 3-14: Percent of Other Electronics by Building Type



3.7 Appliances

In the Xcel Energy service territory, we found that all residences have a refrigerator. We also found that 72 percent of homes have a dishwasher, 62 percent of homes have electric cooking appliances, and 40 percent have a standalone freezer.

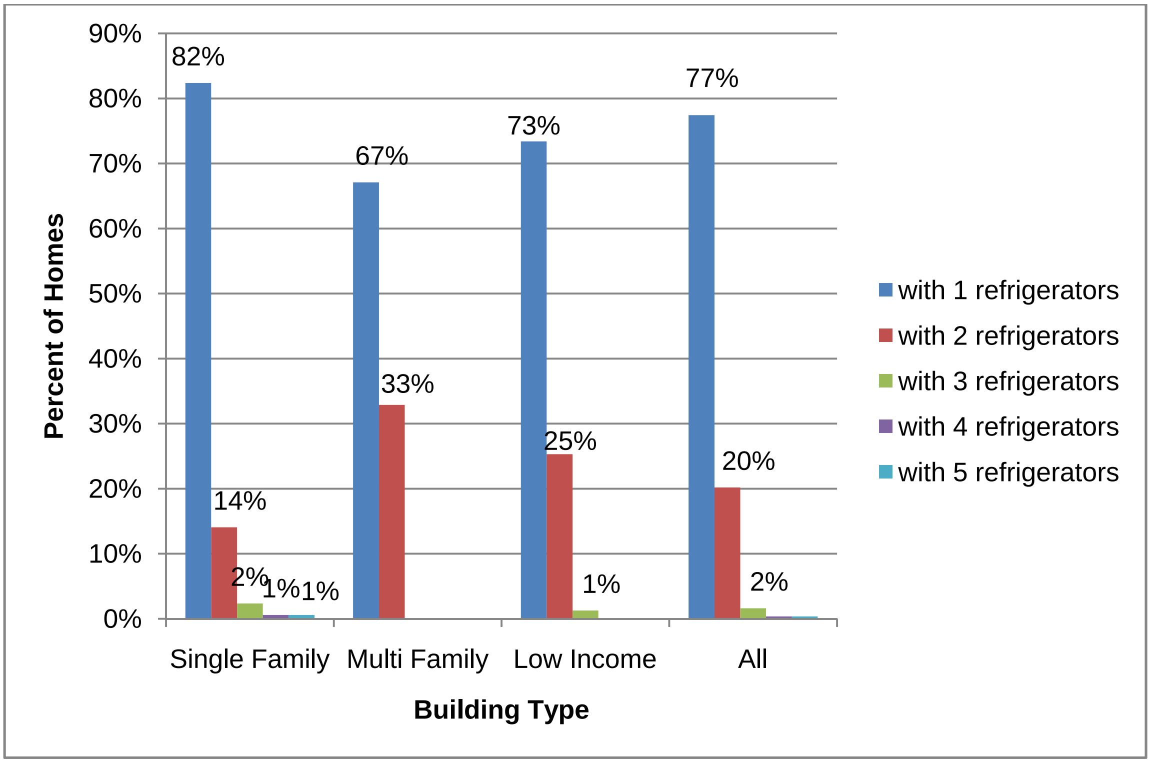
Figure 3-15: Appliance Saturation by Building Type



3.7.1 Refrigerators

Since all residences have a refrigerator, it is important to distinguish how many refrigerators However, among all residents, we found that 20 percent own a second refrigerator. Multifamily residents were the most likely to own a second refrigerator.

Figure 3-16: Presence of Multiple Refrigerators by Building Type



A. On-Site Survey Instrument

Xcel Energy Residential SURVEY
Energy Audit Data Collection Form

Customer:___________________________________
Address:____________________________________
City:_________________ **Zip Code**___________
Audit Date:___________ **Audit time:**_________
Site ID:___________
Auditor:_________________________________

<u>NOTES TO AUDITORS</u>:
Equipment that is a year old or less should be considered 1 year old

✍ indicates to record actual findings; no code required

<u>On-Site Interview</u>

Hello, my name is ____________ with KEMA Inc., working on behalf of Xcel Energy Minnesota. During my visit I'll be asking a few questions about your home and some general demographic information. Then I'll survey your homes HVAC, water, heater, appliances, lighting, and insulation levels. I will be inspecting every room in your home during this visit that generally takes about 1 hour to complete. For your participation you will receive a $50 gift card to show our appreciation. Do you have any questions regarding my visit?

HOME GENERAL INFORMATION

________**H.1. Building type?**
(Categorize condominiums according to configuration)

1 = 1-story Detached
2 = 2-story Detached
3 = 3+-story Detached
4= Split-level house
5 = Duplex
6 = Triplex or quadplex
7 = Mobile home
8 = Apartment w/more than 4 apartments
9 = Other (explain)

________**H.2. ✍ Approximate age of the home?**

________**H.3. ✍ Square footage of home?**
(Conditioned Living area only, do not include garage)

________**H.4. ✍ Number of people living in the home?**

________**H.5. Own or Rent ?**
1 = Own 2 = Rent

_________**H.6.** ✍**How many occupants in the following age ranges occupy the home?**

_________Under 1 year
_________1+ to 5 years
_________6 to 18 years
_________19 to 29 years
_________30 to 49 years
_________50 to 64 years
_________65 or more years

_________**H.7. Are you eligible for or do you participate in the following programs:** (check all)

- ☐ Heating bill assistance (aka energy assistance program)
- ☐ Weatherization assistance
- ☐ Family assistance
- ☐ Food stamps
- ☐ don't know
- ☐ I prefer not to say

_________**H.8. What is the approximate annual income for your household?(check)**

< $25,000
$25,001-$50,000
$50,001-$75,000
$75,001-$100,000
$100,001-$125,000
$125,001-$150,000
>$150,000
Don't know
I prefer not to say

ENERGY STAR AWARENESS

_________**ES.1. Have you ever heard of or seen the Energy Star Label?**

1.	☐ Yes
2.	☐ No
97.	☐ Don't know
98.	☐ Refused to answer

________ES.2. What does the Energy Star label mean to you?

[DO NOT READ. ACCEPT MULTIPLE RESPONSES]

1.	☐ Less pollution
2.	☐ Cost less money/saves money
3.	☐ Uses less energy/saves energy
4.	☐ High quality
5.	☐ Product is tested; meets standards
6.	☐ Government endorsed
7.	☐ Safer
8.	☐ More comfort
9.	☐ Costs more
10.	☐ Other (Specify:____________)
97.	☐ Don't know
98.	☐ Refused to answer

________ES.3. Do you look for the Energy Star label when making purchasing decisions to help select products that use less energy?

1.	☐ Yes
2.	☐ No
97.	☐ Don't know
98.	☐ Refused to answer

________ES.3.b.IF ES.3 is 2 complete this question otherwise skip

1.	☐ Costs too much
2.	☐ No options exist/Not aware of energy star options for equipment desired
3.	☐ Energy star equipment is often not in stock
4.	☐ Concerned about performance of energy star equipment
5.	☐ Savings do not make up for additional cost or hassle
6.	☐ Concerned about not achieving estimated savings
7.	☐ Rebate is not worth the hassle
8.	☐ Need more information on the benefits of energy star
9.	☐ Other product features/design are more important than efficiency
10.	☐ Other (Specify:___________________________)
97.	☐ Don't know
98.	☐ Refused to answer

FANS

________F.1. Number of fans used:

________ ✍ Attic

________ ✍ Portable

________ ✍ Ceiling

________ ✍ Whole-house

________ ✍ Bathroom Fans, How many are Energy star?_______________

CONSUMER ELECTRONICS

________CE.1. ✍ How many of the following consumer electrics are in the home?

Item #	Electronics Types	Quantity	Age (yrs)	How many Energy Star?
1	# of VCRs			
2	# of DVD players			
3	# of DVRs			
4	# of satellite/cable boxes			
5	# of satellite/cable boxes/DVR Combo			
6	# of gaming consoles			
7	# of desktop computers			
8	# of laptop computers			
9	# of printers			
10	# of Standard TVs			
11	# of LCD TVs **			
12	# of Plasma HD TVS**			

________CE.2. ✍ **Complete the following for LCD and Plasma TVs**

Fill out for each LCD TV

LCD TVs				
Count	**Manufacturer**	**Model #**	**High Definition?**	**Backlight LED?**
1			Y N DK	Y N DK
2			Y N DK	Y N DK
3			Y N DK	Y N DK
4			Y N DK	Y N DK
5			Y N DK	Y N DK
6			Y N DK	Y N DK
7			Y N DK	Y N DK
8			Y N DK	Y N DK

Fill out for each Plasma TV

Plasma TVs			
Count	**Manufacturer**	**Model #**	**High Definition?**
1			Y N DK
2			Y N DK
3			Y N DK
4			Y N DK
5			Y N DK
6			Y N DK
7			Y N DK
8			Y N DK

APPLIANCES

_______**A.1. Are any of the following appliances installed in the home? (check)**

- ☐ Dishwasher
- ☐ Clothes washer
- ☐ Refrigerator(s)
- ☐ Clothes Dryer
- ☐ Freezer(s)

_______**A.2. Dishwasher information:** (write “0” for no dishwasher)

_______**A.2a.** ✍What is the age of the dishwasher? (write “99” for don’t know)

________**A.2b.** Is the dishwasher Energy Star? □ Yes □No □DK

________**A.2c.** How many loads of dishes washed in dishwasher per week?

□ <= 1
□ > to <=5
□ >5 to <=10
□ > 10
other_________
don't know

________**A.2d.***Dishwasher product specs*

Manufacturer	
Product Line	
Model #	
Manufacture Date	

________**A.3. Refrigerator information:**

		Codes	Main	Second	Third
A.4.	Style	1 = Standard 2 = Side by side 3 = Single Door 4= Bottom freezer 5= Compact			
A.5.	Size	12 = Very small (<13 cu ft) 15 = Small (13-16 cu ft) 19 = Medium (17-20 cu ft) 21 = Large (21-23 cu ft) 23 = Extra Large (>23 cu ft) 24= Don't know			
A.6.	Type of Defrost	1 = Frost-free 2 = Partial frost-free 3 = Manual			
A.7.	Ice maker	1=Yes 3=don't know 2=No			
A.8.	Age	1 = <1 yr 13 = 11 to 15 yrs 3 = 1 to 5 yrs 18 = 16 to 20 yrs 8 = 6 to 10 yrs 21 = more than 20			
A.9.	Location	1 = Conditioned space 2 = Unconditioned space			
A.10.	Overall Condition	1 = Good, like new 2 = Fair, not perfect but in decent condition 3 = In need of replacement 4 = Not applicable			
A.11.	Energy Star?	1 = Yes 3=don't know 2= No			

________**A.12. *Refrigerator Product specs*:**

	Main	Second
Manufacturer		
Product Line		
Model #		
Manufacture Date		

________**A.12. *Refrigerator Product specs continued*:**

	Third
Manufacturer	
Product Line	
Model #	
Manufacture Date	

________**A.13. Freezer information:** (write “0” for no freezer)

		Codes	Main	Second
A.14.	Style	1 = Chest 2 = Upright		
A.15.	Size	12 = Small (< 13 cu ft) 15 = Medium (13 to 16 cu ft) 19 = Large (> 20 cu ft)		
A.16.	Type of Defrost	1 = Manual 3 = Frost-free		
A.17.	Age	1 = <1 yr 13 = 11 to 15 yrs 3 = 1 to 5 yrs 18 = 16 to 20 yrs 8 = 6 to 10 yrs 21 = more than 201 = <1 yr 13 = 11 to 15 yrs 3 = 1 to 5 yrs 18 = 16 to 20 yrs 8 = 6 to 10 yrs 21 = more than 20		
A.18.	Location	1 = Conditioned space 2 = Unconditioned space		
A.19.	Overall Condition	1 = Good, like new 2 = Fair, not perfect but in decent condition 3 = In need of replacement 4 = Not applicable		
A.20.	Energy Star	1 = Yes 3=don’t know 2= No		

________**A.21. *Freezer Product specs*:**

	Main	Second
Manufacturer		
Product Line		
Model #		
Manufacture Date		

________**A.22. Clothes Washer Information (**write “0” for no clothes washer**)**

________**A.22.a.** ✍What is the age of the clothes washer? (write “99” for don’t know)

________**A.22.b.** Is the clothes washer Energy Star? ☐Yes ☐No ☐DK

________**A.22.c.**Type of washer:

☐ Standard
☐ Horizontal axis
☐Stacked-Horizontal
☐Stacked-Standard

________**A.22.d.** How many loads washed per week?

☐ <= 1	☐ > 10
☐ > to <=5	other_________
☐ >5 to <=10	don’t know

________**A.22.e.** ✍What % are washed in COLD water_______
✍What % are washed in HOT water_______

________**A.22.f.***Clothes washer specs:*

	Main	Second
Manufacturer		
Product Line		
Model #		
Manufacture Date		

________**A.23. Clothes Dryer Information (**write "0" for no clothes dryer)

________**A.23.a.** Do you have a Clothes Dryer? □ Yes □No

________**A.23.b.** Fuel Source ___ Natural Gas ___ Propane ___ Electric

________**A.23.c.** ✍What is the age of the clothes dryer? (write "99" for don't know)

________**A.23.d.** Is the Clothes Dryer Energy Star? □Yes □No □DK

________**A.23.e.** Is there a moisture sensor? □ Yes □No □DK

________**A.23.f**. ✍If **A.23.e.** is Yes, is moisture sensor set to:
1= On 2=Off 3=don't know

________**A.23.g.** How many loads dried per week?

□ <= 1	□ > 10
□ > to <=5	□ other__________
□ >5 to <=10	□ don't know

________**A.23.h.***Clothes dryer specs*:

	Main	Second
Manufacturer		
Product Line		
Model #		
Manufacture Date		

________**A.24. Other kitchen appliances (circle)**

________**A.24a.**Range Fuel Type: Gas Propane Electric None

________**A.24b.** Oven Fuel Type: Gas Propane Duel Fuel Electric None

THERMOSTAT(S)

________**T.1. Thermostat Type: (check)**

#1 □Digital □Hybrid □Mechanical □Home Automation □Not Observable □Other □DK
#2 □Digital □Hybrid □Mechanical □Home Automation □Not Observable □Other □DK
#3 □Digital □Hybrid □Mechanical □Home Automation □Not Observable □Other □DK

________**T.2. Is thermostat(s) Programmable? (check)**

#1 □ Yes □No □don't know
#2 □ Yes □No □don't know
#3 □ Yes □No □don't know

________**T.3. If Programmable is thermostat(s) schedule used in winter? (check)**
#1 □ Yes □No □don't know
#2 Yes □No □don't know
#3 Yes □No □don't know

________**T.4. If Programmable thermostat(s) schedule used in summer? (check)**
#1 □ Yes □No □don't know
#2 Yes □No □don't know
#3 Yes □No □don't know

HEATING SYSTEMS

_______ _**H.1. Does the Home have a heating system fueled by Xcel utility service?**

 Yes No

________**H.2. Heating system #1 Primary fuel type**:

 Gas Wood: cords per year Propane

 Fuel Oil Kerosene Pellets

 Electricity Solar

________**H.2a.Heating system #1 Primary type:**

 Forced Air Furnace Hydronic System

 Split Heat pump w/ electric supplement Floor

 Split Heat pump w/o electric supplement Ceiling Cable

 Packaged Heat pump Woodstove

 Wall Furnace Baseboards

 Mini Split Heat Pump Pellet Stove

 Wall Unit Resistance Fireplace

________**H.2b. If Heating system #1 Primary is a fireplace answer the following:**
What is the fuel Type? (check)

 Natural Gas Propane Electric

 Wood Other Don't Know

How often is fireplace used during the heating season?(check)

 Daily 3-5 days/wk 1-2 days/wk <1 days/wk don't know

Does the fireplace have a heat exchanger?(check)

 Yes No don't know

What floor is the fireplace located on?(check)

 1st floor 2nd floor 3rd floor Other, explain:________________________________

H.2c.Heating system #1 PRIMARY details

Heating System #1		
Unit Location (circle one)	Garage Attic Basement Conditioned Space Outside Other	
Condition of Equipment (circle one)	Good Fair Need Repair Needs Replacement	
% of House Served		
1= Dehumidifier 2= Humidifier	**1 2**	
Fresh Air Ventilation ?	**Yes No**	
Manufacturer		
Model #		
Manufacture Date or System Age		
Supply Fan Control Type	Constant Variable Speed Don't Know	
Input Rating		
Output Rating		**kW kBtu Other____**
Efficiency		**kW kBtu Other____**
		AFUE HSPF COP Other____
Evap Coil Manufacturer		
Evap Coil Model #		
Evap Coil Serial #		
TXV?	**Yes No**	

_________H.2cc.Fresh air ventilation system

If fresh air ventilation system is present record:

Manufacturer_________________________Model#_______________________________

_______**H.3. Heating system #2 SECONDARY fuel type**: (enter “0” for no #2 system)

- Gas
- Wood: cords per year
- Propane
- Fuel Oil
- Kerosene
- Pellets
- Electricity
- Solar

________**H.3a.Heating system #2 Secondary type**:

- Forced Air Furnace
- Hydronic System
- Split Heat pump w/ electric supplement
- Floor
- Split Heat pump w/o electric supplement
- Ceiling Cable
- Packaged Heat pump
- Woodstove
- Wall Furnace
- Baseboards
- Mini Split Heat Pump
- Pellet Stove
- Wall Unit Resistance
- Fireplace

________**H.3b. If Heating system #2 Secondary is a fireplace answer the following**:

What is the fuel Type? (check)

Natural Gas   Propane   Electric

Wood Other Don’t Know

How often is fireplace used?(check)

Daily 3-5 days/wk 1-2 days/wk <1 days/wk don’t know

Does the fireplace have a heat exchanger?(check)

Yes No don’t know

What floor is the fireplace located on?(check0

1st floor   2nd floor   3rd floor Other, explain:___________________

H.3c.Heating system #2 SECONDARY details

Heating System #2		
Unit Location (circle one)	Garage Attic Basement Conditioned Space Outside Other	
Condition of Equipment (circle one)	Good Fair Need Repair Needs Replacement	
% of House Served		
1= Dehumidifier 2= Humidifier	1 2	
Fresh Air Ventilation ?	Yes No	
Manufacturer		
Model #		
Manufacture Date or System Age		
Supply Fan Control Type	Constant Variable Speed Don't Know	
Input Rating		
Output Rating		kW kBtu Other____
Efficiency		kW kBtu Other____
		AFUE HSPF COP Other____
Evap Coil Manufacturer		
Evap Coil Model #		
Evap Coil Serial #		
TXV?	Yes No	

__________H.3cc.Fresh air ventilation system

If fresh air ventilation system is present record:

Manufacturer_________________________Model#________________________________

_______**H.4. Heating system #3 Tertiary fuel type**: (enter “0” for no #3 system)

 Gas Wood: cords per year Propane

 Fuel Oil Kerosene Pellets

 Electricity Solar

________**H.4a.Heating system #3 Tertiary type**:

 Forced Air Furnace Hydronic System

 Split Heat pump w/ electric supplement Floor

 Split Heat pump w/o electric supplement Ceiling Cable

 Packaged Heat pump Woodstove

 Wall Furnace Baseboards

 Mini Split Heat Pump Pellet Stove

 Wall Unit Resistance Fireplace

________**H.4b. If Heating system #3 Tertiary is a fireplace answer the following**:

What is the fuel Type? (check)

 Natural Gas Propane Electric

 Wood Other Don’t Know

How often is fireplace used?(check)

 Daily 3-5 days/wk 1-2 days/wk <1 days/wk don’t know

Does the fireplace have a heat exchanger?(check)

 Yes No don’t know

What floor is the fireplace located on?(check)

 1st floor 2nd floor 3rd floor Other, explain:__________________

H.4c.Heating system #3 TERTIARY details

Heating System #3		
Unit Location (circle one)	Garage Attic Basement Conditioned Space Outside Other	
Condition of Equipment (circle one)	Good Fair Need Repair Needs Replacement	
% of House Served		
1= Dehumidifier 2= Humidifier	**1 2**	
Fresh Air Ventilation ?	**Yes No**	
Manufacturer		
Model #		
Manufacture Date or System Age		
Supply Fan Control Type	Constant Variable Speed Don't Know	
Input Rating		
Output Rating		**kW kBtu Other____**
Efficiency		**kW kBtu Other____**
		AFUE HSPF COP Other____
Evap Coil Manufacturer		
Evap Coil Model #		
Evap Coil Serial #		
TXV?	**Yes No**	

__________**H.4cc.Fresh air ventilation system**

If fresh air ventilation system is present record:

Manufacturer________________________Model#______________________________

DUCTS

D.1. Is there a ducted distribution system located in unconditioned space?

☐ Yes(complete this section) ☐No [Go to next section]

D.2. What is the condition of the ducts?

☐ Good ☐ Fair ☐ Poor ☐ Not observable

D.3. Are ducts insulated?

☐ Yes ☐ No ☐ Don't know ☐ Not observable

COOLING

________**C.1. Do you have an air conditioning/cooling system for your home?**

☐ Yes ☐No [Go to next section]

________**C.2. Air conditioning System #1 type (check one)**

☐ Split System AC ☐ Packaged System Pump

☐ Split Heat Pump ☐ Window/Wall AC

☐ Mini Split Heat Pump ☐ Window/Wall Heat pump

☐ Packaged System AC ☐ Portable- Stand Alone

________**C.2a. Air conditioning System #1 Condition**

☐ Good, like new ☐ Needs repair/maintenance

☐ Fair, not perfect but decent condition ☐ In need of replacement

________**Q.2b. Cooling system #1 details**

Manufacturer		
Model #		
Serial #		
Manufacture Date/Vintage		
Cooling Cap		**Kw kBtu Tons Other**
Efficiency		**SEER EER DK Other**
Notes		

________**Q.2c. If cooling system #1 is a central system does it have a "Savers Switch"?**

☐ Yes ☐ No ☐ Don't know ☐ Not observable

________**C.3. Air conditioning System #2 type (check one)** *enter "0" for no #2 cooling system*

☐ Split System AC ☐ Packaged System Pump

☐ Split Heat Pump ☐ Window/Wall AC

☐ Mini Split Heat Pump ☐ Window/Wall Heat pump

☐ Packaged System AC ☐ Portable- Stand Alone

________**C.3a. Air conditioning System #2 Condition**

☐ Good, like new ☐ Needs repair/maintenance

☐ Fair, not perfect but decent condition ☐ In need of replacement

________**Q.3b. Cooling system #2 details**

Manufacturer		
Model #		
Serial #		
Manufacture Date/Vintage		
Cooling Cap		**Kw kBtu Tons Other**
Efficiency		**SEER EER DK Other**
Notes		

________**Q.3c. If cooling system #2 is a central system does it have a "Savers Switch"?**

☐ Yes ☐ No ☐ Don't know ☐ Not observable

________**C.4. Air conditioning System #3 type (check one)** *enter "0" for no #2 cooling system*

☐ Split System AC ☐ Packaged System Pump

☐ Split Heat Pump ☐ Window/Wall AC

☐ Mini Split Heat Pump ☐ Window/Wall Heat pump

☐ Packaged System AC ☐ Portable- Stand Alone

________**C.4a. Air conditioning System #3 Condition**

☐ Good, like new ☐ Needs repair/maintenance

☐ Fair, not perfect but decent condition ☐ In need of replacement

________Q.4b. Cooling system #3 details

Manufacturer		
Model #		
Serial #		
Manufacture Date/Vintage		
Cooling Cap		Kw kBtu Tons Other
Efficiency		SEER EER DK Other
Notes		

________Q.3c. If cooling system #3 is a central system does it have a "Savers Switch"?

□ Yes □ No □ Don't know □ Not observable

WATER HEATING

________WH.1 ✍ Number of showers in the home without low-flow shower heads?

________WH.2. ✍ Number of showers with low-flow shower heads?

________WH.3. ✍ Number of faucets in the home without low-flow aerators?

________WH.4. ✍ Number of faucets with low-flow aerators?

________WH.5. Domestic Hot water Spec:

	Water Heater #1	Water Heater #2
Manufacturer		
Model #		
Fuel G=Natural Gas**, LP=**Propane, **E=** Electric, **OT**= other	G LP E OT	G LP E OT
Does Water Heater have a "Savers Switch"	Y N DK	Y N DK
Age or Vintage		
Energy Factor		
Location: G=Garage **A**=Attic **C**=Conditioned Space **O**=Outside **M=**MechRoom/Closet(non conditioned space) **OT**=Other		
Equipment Type: S= Standard Storage DHW **I**=Instantaneous(tankless) **B**=Boiler **CH**= =Combined Hydronic **HP**=Heat Pump **OT**= other		
Tank Capacity/Volume		
Rate Input Capacity		
Units for Rate Input Capacity: B=kBtu **W**=watts		
Does Hotwater Tank have external wrap?	YES_(R-value?____) NO	YES_(R-value?____) NO
More than 4' of hot water pipes insulated?	YES NO	YES NO
Recirculation Pump?	YES NO	YES NO
Recirc pump control type: C=Continuous **TM**=Timer **T**=Temp **TT**= Timer/Temp **O**=Other **DK**= Don't know		
Hot Water Temp Setting?	**L=**Low **M=**Medium **H=** High	**L=**Low **M=**Medium **H=** High

Notes:

BASEMENT

________B.1. Basement Type (check all that apply)

- ☐ No Basement(skip to next section)
- ☐ Finished/Conditioned
- ☐ Finished/Unconditioned
- ☐ Unfinished/Conditioned
- ☐ Unfinished/Unconditioned

________B.2. Basement Wall Specs:

	Bwall Type	Insulation Type (circle)	R-value or # Inches
Bwall 1		Loose Batt Rigid None DK Other____	
Bwall 2		Loose Batt Rigid None DK Other____	
Bwall 3		Loose Batt Rigid None DK Other____	
Bwall 4		Loose Batt Rigid None DK Other____	

BASEMENT WALL TYPES			
1	Concrete No Insulation	4	Don't Know
2	Concrete w/Interior Insulation	5	Other_______________
3	Concrete w/Exterior Insulation	6	

B.3. Can more insulation be added?(check)

Bwall 1 ☐ Yes ☐No ☐DK
Bwall 2 ☐ Yes ☐No ☐DK
Bwall 3 ☐ Yes ☐No ☐DK
Bwall 4 ☐ Yes ☐No ☐DK

FOUNDATION/FLOORS

__________FF.1. Foundation/Floor Specs:

	Floor Type	Insulation Type(circle)	R-value or # of Inches	Notes
Floor 1		Loose Batt Rigid None DK Other_____		
Floor 2		Loose Batt Rigid None DK Other_____		
Floor 3		Loose Batt Rigid None DK Other_____		
Floor 4		Loose Batt Rigid None DK Other_____		

Floor Types			
1	Crawl Space	5	Over uncond. Basement
2	Over Open(>4ft)	6	Other____
3	Over Garage	7	Don't Know
4	Slab on Grade	8	Conditioned Crawl Space

__________FF.2. Can more insulation be added?(check)

Floor 1 ☐ Yes ☐No ☐DK
Floor 2 ☐ Yes ☐No ☐DK
Floor 3 ☐ Yes ☐No ☐DK
Floor 4 ☐ Yes ☐No ☐DK

CEILINGS

_______**CG.1. Describe the ceilings.**

Description	Codes	Ceiling 1	Ceiling 2	Ceiling 3
Insulation Material	Refer to insulation Types table			
R-values or # of Inches	✍			
SQ FT	✍			
Is adding more insulation feasible?	**1**=Yes **2**=No **3**=Don't know			
Radiant Barrier Present?	**1**=Yes **2**=No **3**=Don't know			
Attic Ventilation?	**1**=Yes **2**=No **3=**Don't know			
Vapor Barrier Present?	1=Yes 2=No 3=Don't know			

Table INSULATION Types

	Material	R-Value/Inch*	Description
Batt Insulation	1=Fiberglass	3.16	Layered fibers – pink or yellow
	2= Mineral Wool or Rock Wool	3.45	Grayish in color – resembles cotton
	3=Wood Fiber or Silva Wool	3.33	Wood fibers usually with black paper backing
Loose Fill	4=Fiberglass	2.45	Pink, yellow or white – usually shiny
	5=Mineral Wool or Rock Wool	2.91	Gray in color – resembles cotton
	6=Expanded Vermiculite	2.3	Silver/gray pebbles – lightweight and shiny
	7=Wood Fiber or Silva Wool	3.33	Thin wood shavings or fibers
	8=Cellulose	3.7	Gray or light brown in color – usually ground up newspaper
Rigid/Spray Foam	9=Rigid/Spray Foam	3.5	Continuous material- pink or yellow in color

________**CG.2. ✍ Are ceilings/perimeter in need of caulking?**

1=Yes, moderate level
2=Yes, significant level
3=No

________**CG.3.. ✍ Does attic access door need weather stripping?**

1=Yes, moderate level
2=Yes, significant level
3=No

EXTERIOR WALLS

________**EW.1. Describe the exterior wall**

Description	Codes	Wall 1	Wall 2	Wall 3
Insulation Material	Refer to insulation Types table			
R-values or # of Inches	✍			
Total SQ FT (Area)	✍			
Is adding more insulation feasible?	**1**=Yes **2**=No **3**=Don't know			
Radiant Barrier Present?	**1**=Yes **2**=No **3**=Don't know			
Vapor Barrier Present?	**1**=Yes **2**=No **3**=Don't know			

WINDOWS

________W.1. Total Sq ft of window area in home _______

________W.2. Type (by percentage) of windows in home:

NOTE: The percentage should be of the total window area and the total of the percentage should equal 100%

________ **Single pane**
________ **Single pane w/storm**
________ **Double pane**
________ **Double pane w/storm**
________ **Triple pane**

NOTE: The total of the percentages for each survey question W.2.2. through W.5.5. should equal 100%

W.3. Window Frame Type (by percent)

________ **Metal**
________ **Wood**
________ **Vinyl**
________ **Other**

W.4. Window Glass Type (by percent)

________ **Clear**
________ **Tinted**
________ **Reflective**
________ **Low E**

W.5. Additional Window Treatment (by percent)

________ **None**
________ **Window Film**
________ **Sunscreen**

W.6. Windows in need of caulking/weather stripping (by percent)

________ **No**
________ **Yes, moderate level**
________ **Yes, significant level**

LIGHTING

Xcel Res Energy Audit Form

Item #	Location	# of Fixtures	Control Type	Fixture Type	Lamp Type	Base Type	# Lamp/Fixture	Lamp Wattage	Fixture Wattage
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									

LIGHTING KEY

Location	Fixture Type	Lamp Type	Base Type
I= Interior	**C**= ceiling fixture	**I**= Incandescent standard	**SM=** Standard medium screw base
O=Exterior	**CF**=ceiling fan	**I-F**=Incandescent flood	**SS=** Standard small screw base
G=Garage	**FL**= floor lamp	**I-DEC**= Incandescent decorative	**P**=Pin Base
Control Type	**O**=other	**I-OT**= Incandescent other	**O=** Other
S= Switch	**A**=Architecturally integr	**I-UNK**= Incandescent unknown	
D=Dimmer	**W**=wall mount	**CF**=compact fluoresecent screw in	
3= Three way	**R**=recessed can	**CFP**= compact fluorescent pin based	
O=Occupancy Sensor	**R**=recessed other	**CF-OT**= compact fluorescent other	
P=Photocell	**S**=chandelier/Hanging	**CF-UNK**= compact fluorescent unkown	
T=Timer	**TL**=table lamp	**F8**= T8 fluorescent tube	
PM=Photo/motion	**T**=Track lighting	**F12**= T12 fluorescent tube	
OT=Other	**UC**=under cabinet	**F5**= T5 fluorescent tube	
		FC=fluorescent circular	
		HAL= halogen	
		HAL-MR= MR16 pin based halogen	
		HL= Heat lamp	
		HID=high intensity discharge	
		LED-P=LED Par lamp	
		LED-MR=LED MR16	
		LED-R=LED Recessed	
		LED-S= LED standard "A" type	
		LED-SL= LED Strip Light	
		LED-OT= LED other	

J. Appendix J: Commercial On-Site Surveys

2011 Minnesota Market Potential Assessment

Commercial On-Site Research Report

Xcel Energy Services, Inc
Contract Number: 322733
Prepared by KEMA Inc
Burlington, MA December 6, 2011

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1. Introduction

KEMA conducted an inventory of energy use at Xcel Energy Minnesota (Xcel Energy MN) commercial customer facilities to provide input for the analysis of the potential for energy efficiency savings. KEMA and Xcel Energy staff worked collaboratively to develop a comprehensive instrument to categorize and record all energy-using equipment and systems at customers' sites, a recruitment script and supporting materials, and a sample design; and to inform Xcel Energy staff and customers of this effort. KEMA energy professionals visited a representative sample of 150 commercial customer sites, and collected data to the extent permitted by the time constraints imposed by the customer. Electronic data collection tools were used to ensure accuracy and consistency of the data, which was then statistically analyzed to provide direct inputs, or the basis for calibration of secondary source inputs, to KEMA's DSM Assyst™ potential modeling tool. These inputs were reviewed, and modified where necessary, by Xcel Energy staff. This appendix provides a summary of the results of this research.

2. Sample Design

KEMA reviewed billing data provided by Xcel Energy staff to develop the sample design. The following table shows the distribution of accounts and kWh across commercial building types in this data. A proportionate sample (based on kWh) assigns very few sample points to some building types. The adjusted sample assigns a minimum of 11 sample points per building type, with the sample sizes in the Office and Retail building types adjusted downward to compensate.

Figure 1: Sample Design by Building Type

Building Type	# Accts	%	kWh	%	Approx Proportion Sample	Adjusted Sample
College	733	0.80%	299,093,618	2.40%	4	11
Com Misc	8,543	9.80%	1,181,007,404	9.30%	14	14
Grocery	1,859	2.10%	629,625,523	5.00%	7	11
Health	701	0.80%	476,726,003	3.80%	6	11
Lodging	898	1.00%	345,952,865	2.70%	4	11
Office	47,521	54.40%	5,642,228,212	44.50%	66	40
Restaurant	4,715	5.40%	652,125,308	5.10%	8	11
Retail	14,364	16.40%	1,682,997,984	13.30%	20	16
School	1,377	1.60%	559,105,741	4.40%	7	11
Warehouse	6,642	7.60%	1,208,700,827	9.50%	14	14
Total	87,353	100.00%	12,677,563,485	100.00%	150	150

Before selecting the sample, the commercial population was screened to eliminate customers with annual usage below 1,000 kWh and too few or too many billing days (90 and 400 days were utilized), and customers with the do-not-contact flag. (The screening process eliminated less than 2% of the commercial kWh.) In addition, accounts were aggregated up to a "site" based on duplication of service address and the first four letters in the customer name.

Finally, each business type was broken into small and large size categories, based on annual kWh such that there was an approximately equal distribution of kWh between the size categories. The adjusted sample was then allocated evenly to each size category within a business type (with a few exceptions when there were not enough sites in a large category to allow for the target sample).

The following table presents the size-based samples, number of completes and survey sample expansion weights. The table shows the number of sites minimum, average, and maximum, and total kWh for each group, and the adjusted sample size for each group. Note the site counts and kWh amounts differ from the previous table due to site screen and account aggregation steps.

Figure 2: Sample Design and Completes by Building Type and Size

Building Type	Size	Sites	Min kWh	Average kWh	Max kWh	Total kWh	Adjusted Sample	Completed Surveys	Sample Weights
College	Small	578	1,052	253,309	8,026,202	146,412,890	8	8	69.21
College	Large	10	9,040,239	14,172,293	26,527,200	141,722,935	3	3	3.95
Com Misc	Small	6,866	1,008	82,361	1,969,952	565,490,004	7	7	9.18
Com Misc	Large	73	2,016,962	8,085,275	126,844,233	590,225,105	7	8	1114.26
Grocery	Small	1,481	1,090	202,171	2,633,134	299,414,879	5	5	17.41
Grocery	Large	81	2,642,841	3,808,162	11,261,674	308,461,124	6	6	412.45
Health	Small	541	1,046	382,323	3,334,937	206,836,580	5	5	4.51
Health	Large	27	3,582,515	8,461,295	25,994,133	228,454,955	6	5	47.74
Lodging	Small	595	1,012	284,389	1,945,330	169,211,259	5	5	5.23
Lodging	Large	47	1,990,359	4,000,748	20,294,194	188,035,159	6	6	40.20
Office	Small	36,354	1,001	73,786	2,408,098	2,682,428,815	20	20	26.35
Office	Large	328	2,418,355	8,682,522	252,168,305	2,847,867,282	20	20	1238.21
Restaurant	Small	3,528	1,003	91,504	282,855	322,826,533	5	5	118.69
Restaurant	Large	611	283,416	532,017	14,003,316	325,062,320	6	6	582.59
Retail	Small	11,774	1,005	70,032	1,098,129	824,554,394	8	8	30.85
Retail	Large	287	1,098,610	2,905,975	28,474,428	834,014,888	8	8	1981.16
School	Small	911	1,011	298,818	1,243,407	272,222,823	5	5	25.36
School	Large	135	1,247,963	2,124,654	5,293,151	286,828,335	6	6	197.99
Warehouse	Small	5,208	1,001	112,849	2,613,465	587,718,367	7	7	13.62
Warehouse	Large	75	2,614,764	8,125,819	159,567,818	609,436,406	7	7	2206.00

3. Results Summary

This section presents the summary results of the Minnesota Commercial on-site surveys that were conducted in the spring of 2011. The survey results were weighted to the Xcel Energy Minnesota customer populations and thus are presented only as ratios.

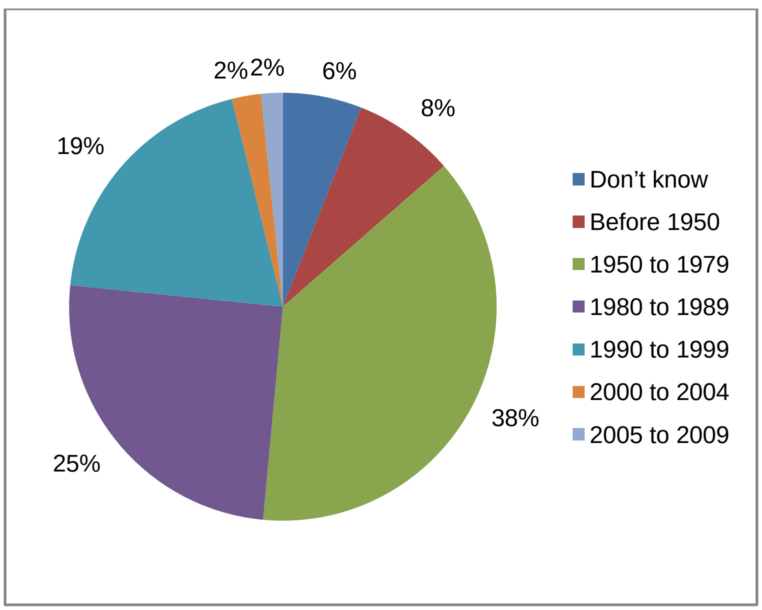
3.1 General Building Characteristics

KEMA surveyed 13 different commercial building types in an effort to collect the most comprehensive data. Of those 13 building types, only the retail stores and offices are determined by the amount of electricity generated per year. Large retail stores and large offices consume 3,000,000kWh or more per year, whereas small retail store stores and small offices consume less than 3,000,000kWh per year.

3.1.1 Age of construction

The following figure shows year of construction among all commercial facilities. It was found that 38 percent of commercial buildings were built between 1950 and 1979, meaning that the majority of buildings were built approximately 30 to 61 years ago. A small percentage of buildings (4 %) were constructed in the last 10 years.

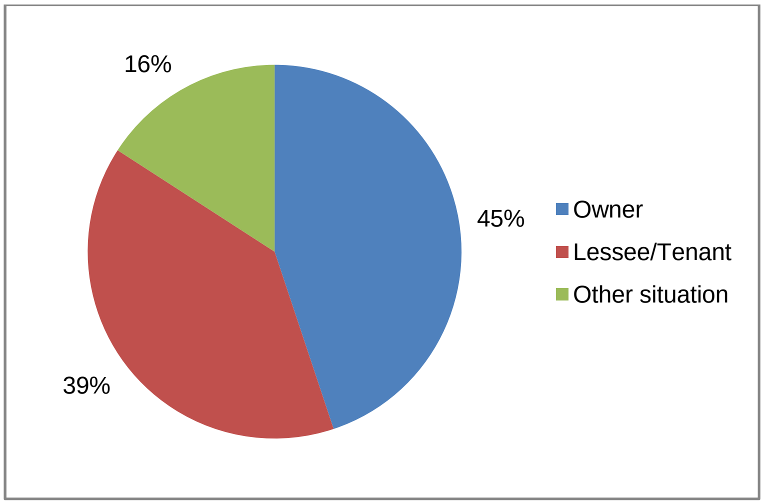
Figure 3: Commercial Building Age



3.1.2 Ownership Status

Figure 4 shows that most commercial facilities are operated by the owner of the facility and 39 percent of commercial facilities are leased.

Figure 4: Ownership Status



3.1.3 Operating hours

The average weekly operating hours across all commercial facilities is 92 hours per week. Hospitals and lodging facilities are open 24 hours a day and 7 days a week, whereas small offices are only in use 57 hours a week.

Table 1: Operating Hours across all Commercial Buildings

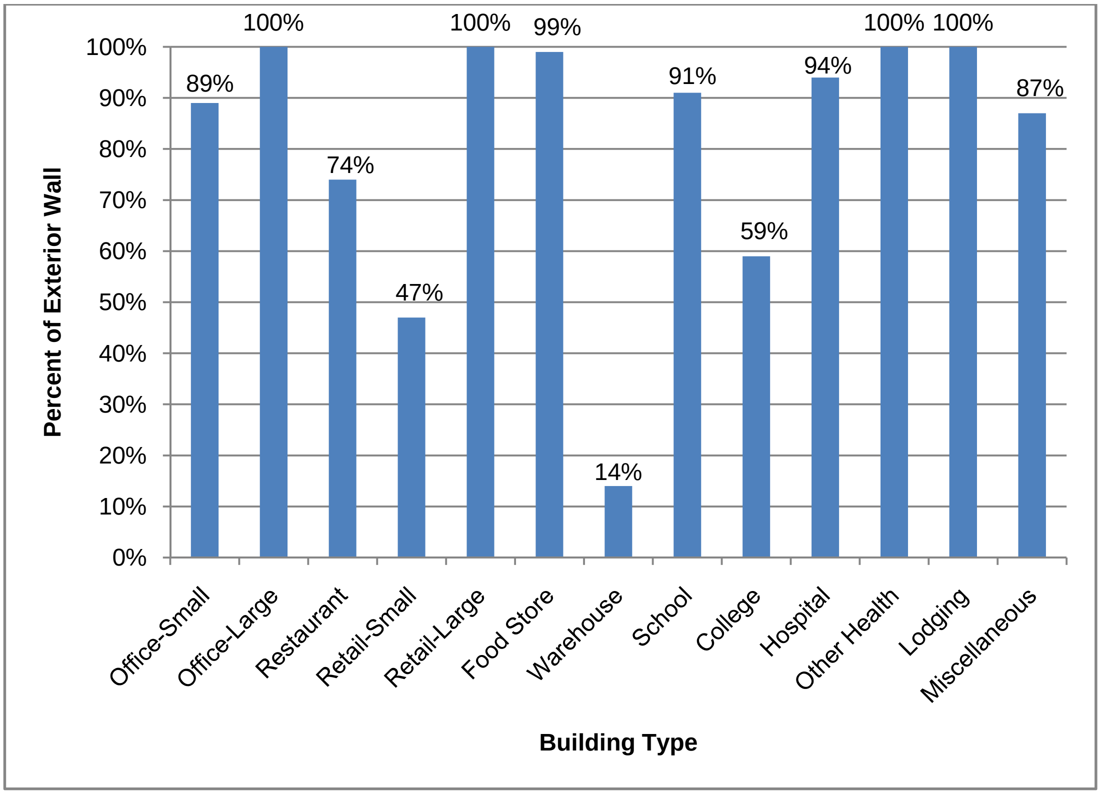
Building Type	Average Weekly Operating Hours
Office-Small	57
Office-Large	61
Restaurant	103
Retail-Small	71
Retail-Large	147
Food Store	164
Warehouse	58
School	96
College	143
Hospital	168
Other Health	78
Lodging	168
Miscellaneous	99
All Buildings	*92*

3.2 Building Envelope

3.2.1 Insulation

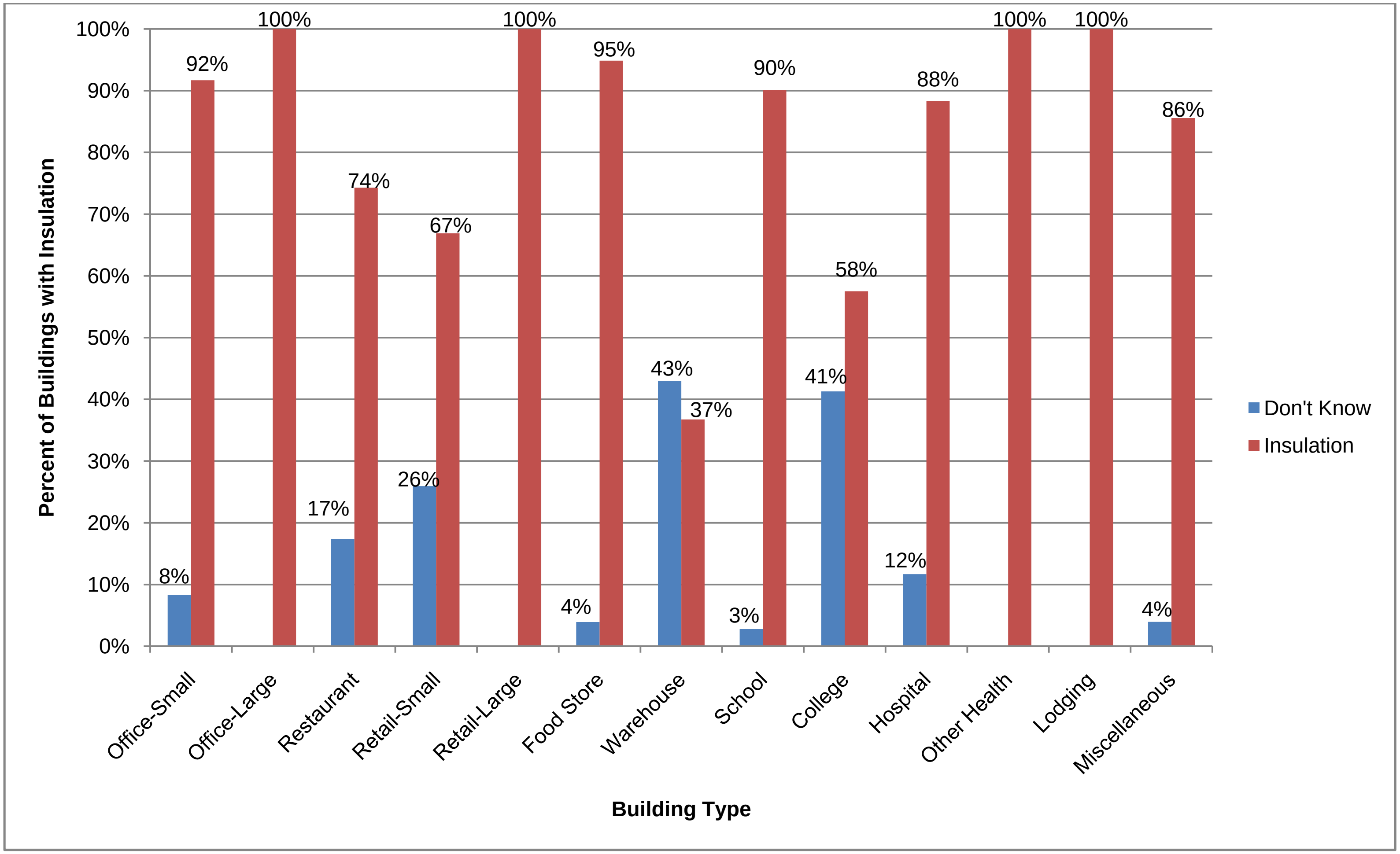
On average, 75 percent of commercial exterior walls are insulated. We also found that, on average, large office exterior walls, large retail exterior walls, lodging exterior walls and health facilities are 100 percent insulated.

Figure 5: Percent of Exterior Wall Insulation by Building Type



On average, 78 percent of all commercial facilities have ceiling and roof insulation. The following figure shows a more detailed description of ceiling insulation levels across all building types. All of the large offices, large retail stores, other health buildings, and lodging facilities have ceiling or roof insulation. About 58 percent of colleges have ceiling or roof insulation and 37 percent of warehouses have ceiling or roof insulation.

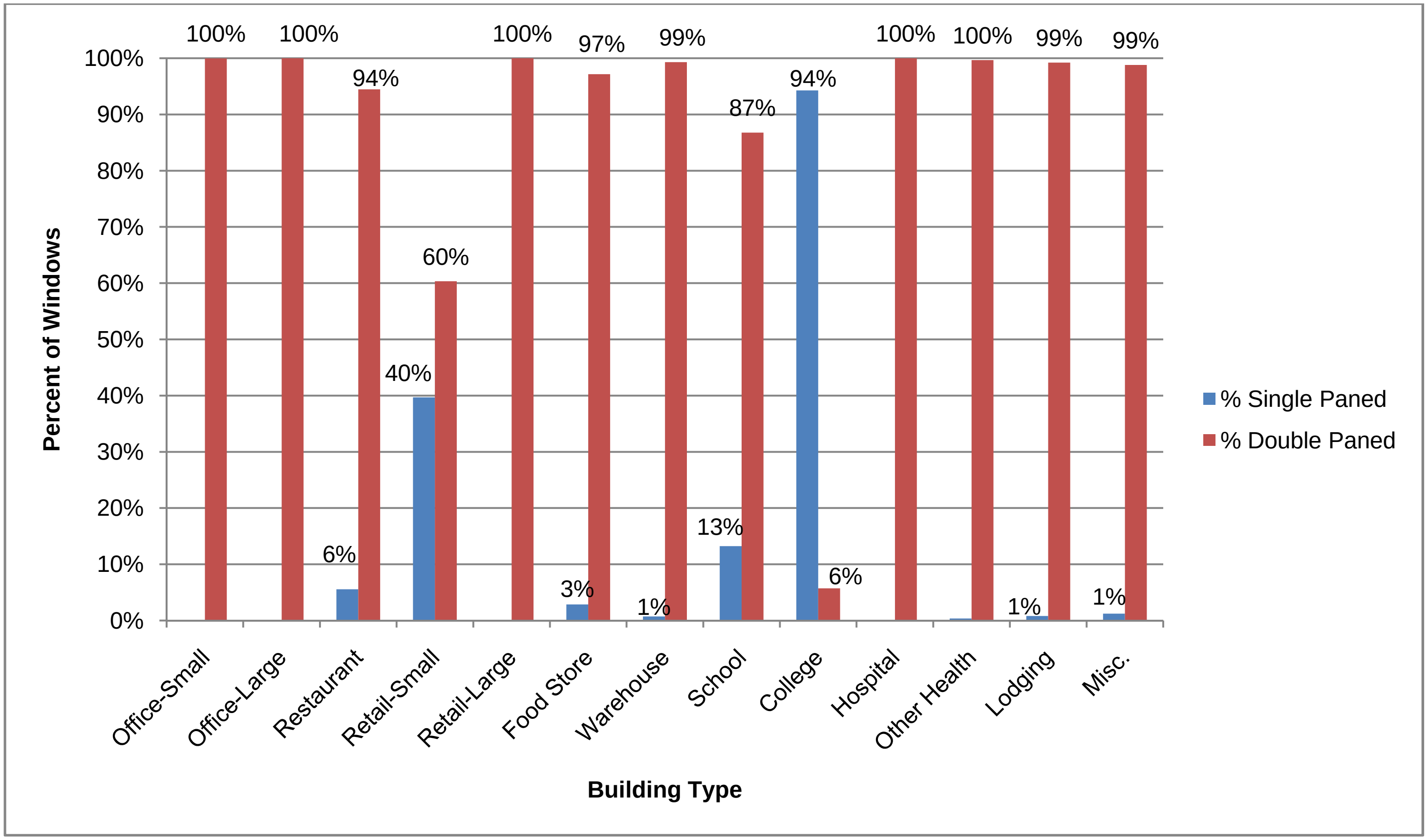
Figure 6: Percent of Commercial Buildings with Ceiling or Roof Insulation



3.2.1 Fenestration

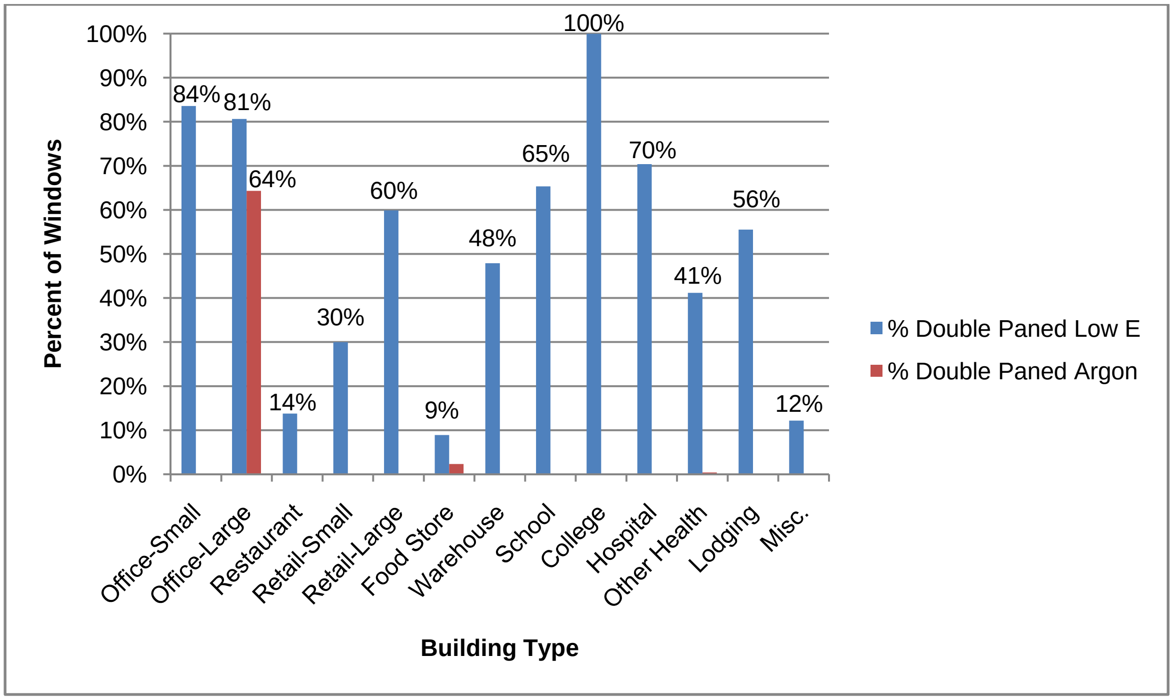
KEMA found that 100 percent of windows in small offices, large offices, large retail stores, hospitals, and other health buildings are double paned. Additionally, 90 percent or more of the windows found in all other building types, with the exception of colleges and small retail stores, are also double paned. Less than 40 percent of windows in small retail stores are single paned and 94 percent of windows in colleges are also single paned. In this study, there were no windows that were triple paned.

Figure 7: Percent of Single Paned and Double Paned Windows by Building Type



Of the facilities with double planed windows, the majority of the double paned windows are low emissivity glass (low e). In the previous figure, we identified that 6 percent of the windows found on college campuses are doubled paned. Of those windows, we found that 100 percent have low e glass. Also noteworthy, 81 percent of the double paned large office windows have low e glass and 64 percent of the double paned large office windows are filled argon gas.

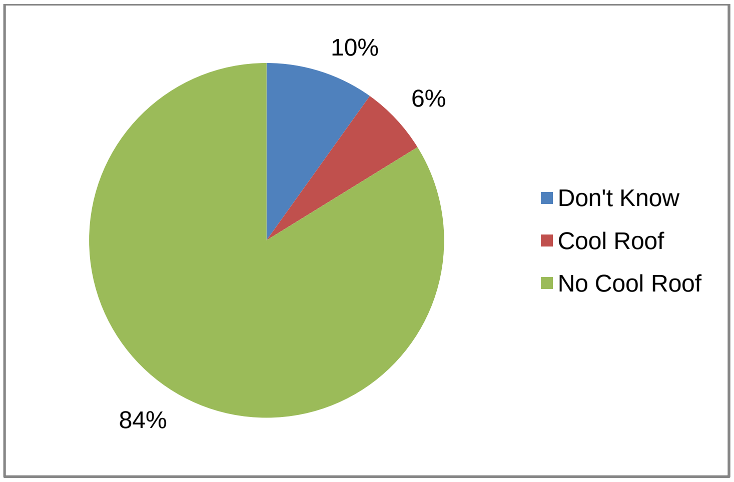
Figure 8: Percent of Double Paned Windows



3.2.2 Cool Roof

The majority of commercial buildings do not have cool roofs, approximately 6 percent of commercial buildings do have cool roofs and 10 percent are unsure.

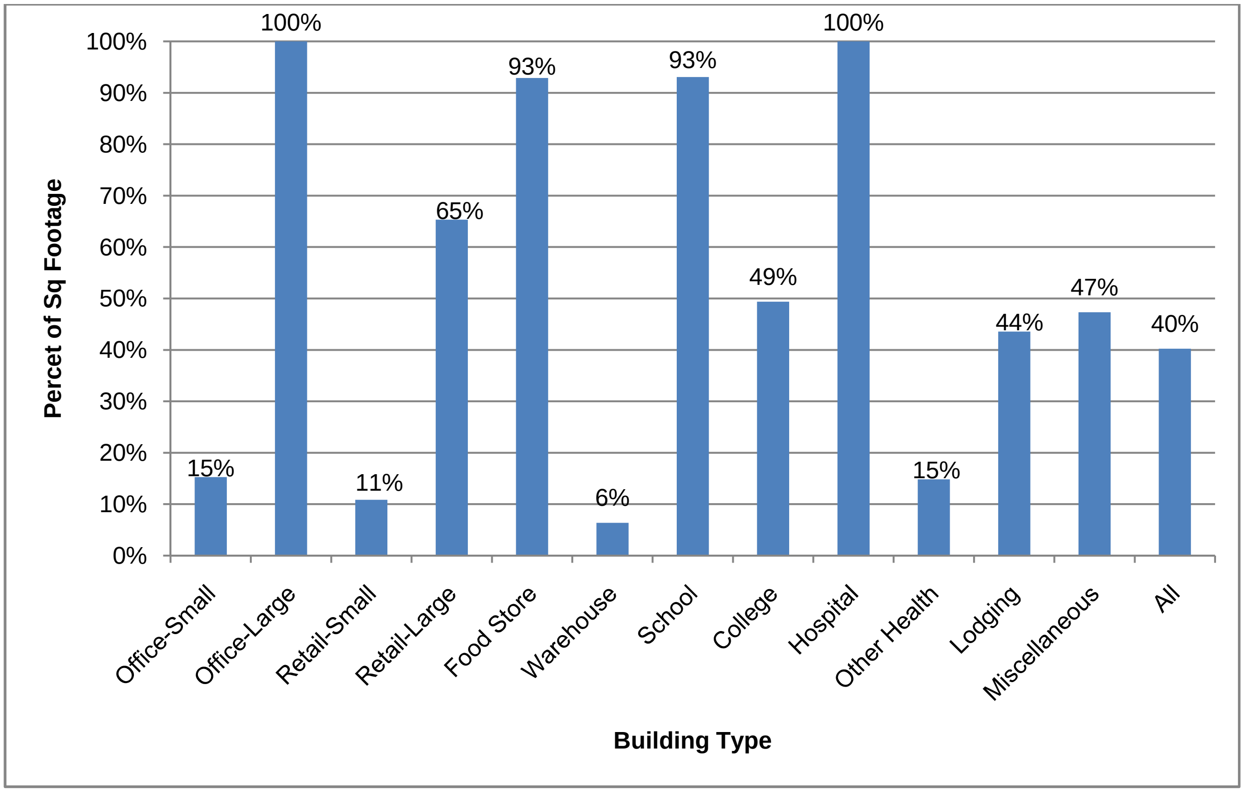
Figure 9: Existence of Cool Roof



3.3 Energy Management Systems

KEMA found that commercial buildings which account for 40% of commercial square footage have an Energy Management System (EMS). It was also found that large office buildings that account for 100 percent of large office square footage have an EMS operating system and hospital buildings which account for 100 percent of the hospital square footage have an EMS operating system.

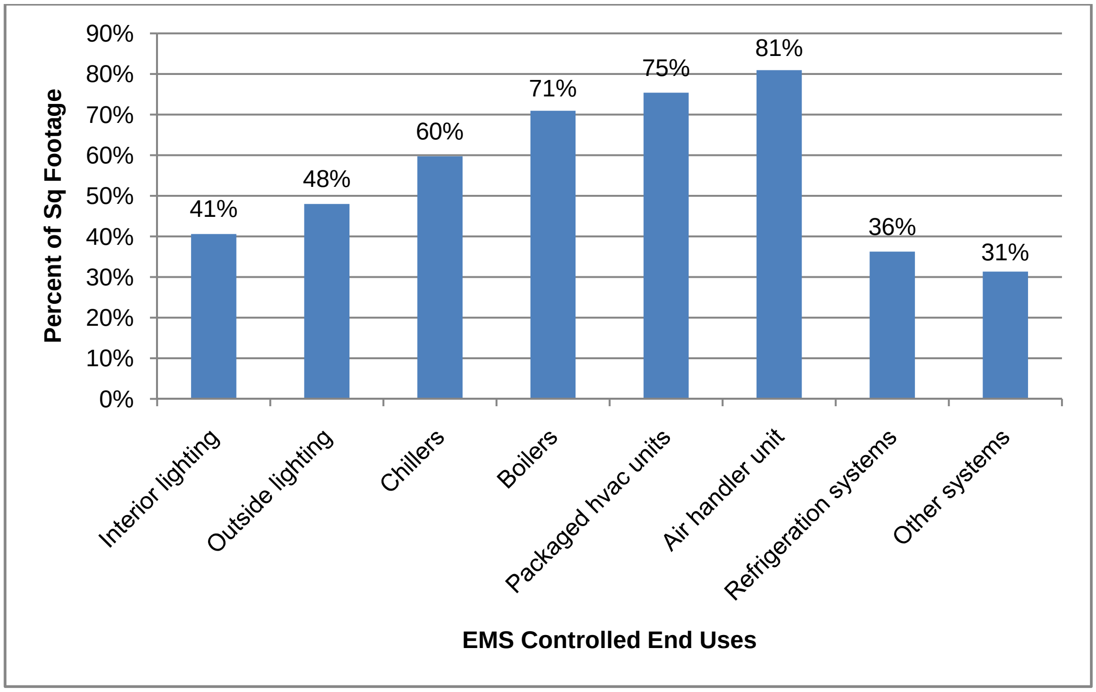
Figure 10: Percent of Energy Management Systems by Building Type



*restaurants were excluded from this figure because there were no restaurants that had EMS units.

Of the 40 percent of commercial square footage with EMS systems, 81 percent of those EMS systems operate an air handler unit, 75 percent of those EMS systems operate packaged HVAC units, and 71 percent of EMS systems operate commercial boilers.

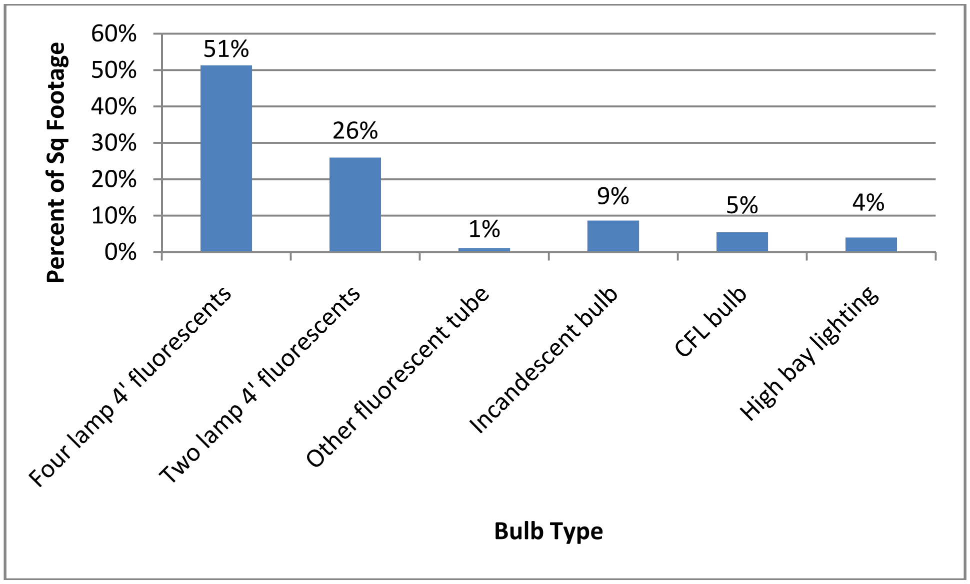
Figure 11: Percent of EMS End Uses



3.4 Lighting

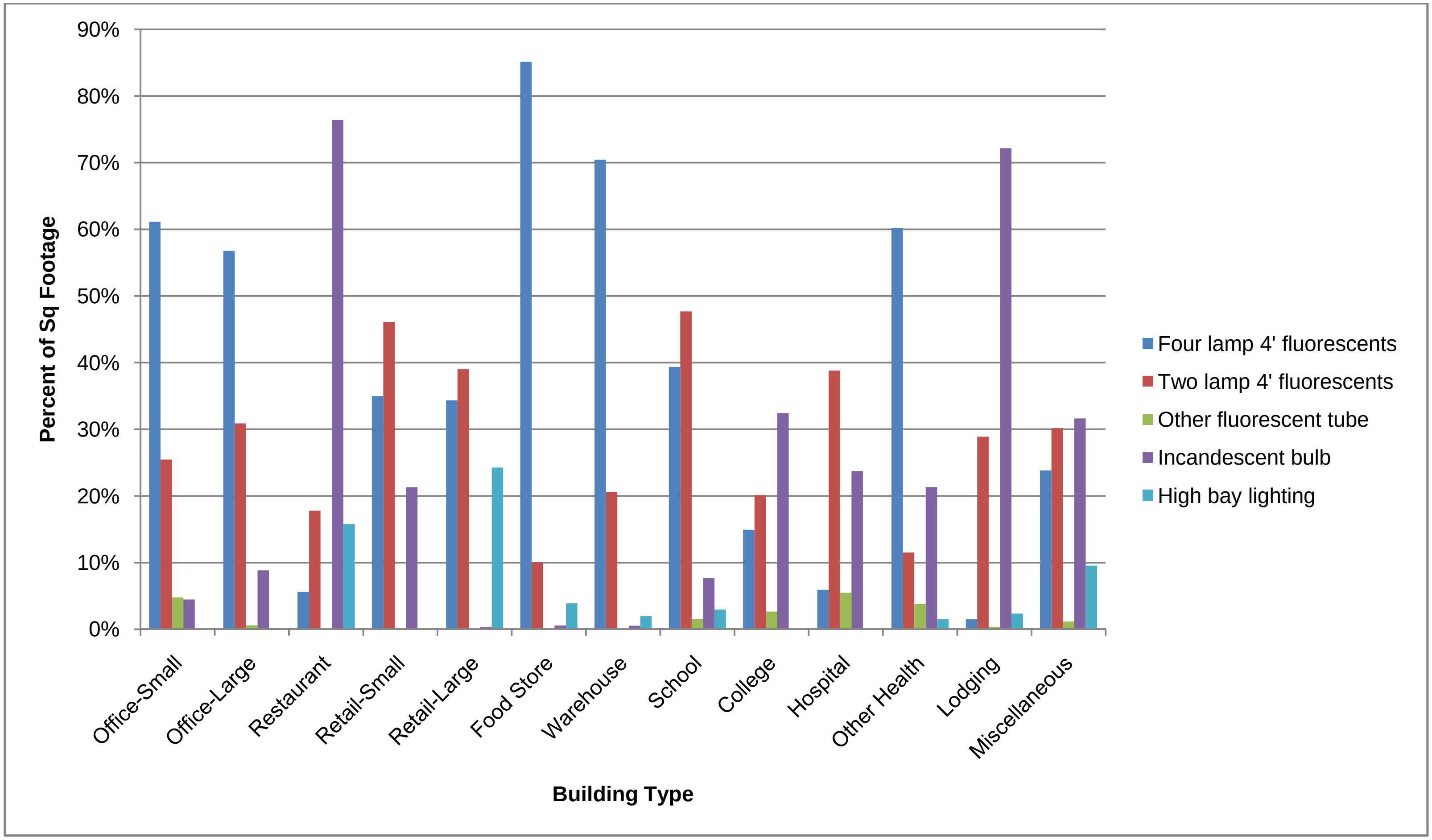
The table below shows the distribution of lighting types in commercial buildings. It was found that 51 percent of commercial square footage is lit with four lamp 4' (4L4) fluorescent bulbs and another 26 percent is lit with two lamp 4' (2L4) fluorescent bulbs. Conversely, 1 percent of commercial square footage is lit with other fluorescent tubes.

Figure 12: Percent of Interior Square Feet by Lamp Type



These characteristics vary by building type. Offices, retail shops, food stores, schools, hospitals, and warehouses are most likely to use four lamp or two lamp fluorescent fixtures while restaurants and lodging facilities primarily utilize incandescent bulbs. The figure below shows this breakout by building type.

Figure 13: Percent of Lighting by Lamp Type and Building



The data presented in Figure 11 can also be found in the following table. We found that 4L4' fixtures are most common in food stores, 2L4' fluorescent fixtures are most common in small retail stores, incandescent are most common in restaurants, and CFLs are most common in lodging facilities. High bay lighting is most commonly found in large retail stores.

Table 2: Percent of Lighting by Lamp Type and Building

Building Type	Four lamp 4' fluorescents	Two lamp 4' fluorescents	Other fluorescent tube	Incandescent bulb	CFL bulbs	High bay lighting
Office-Small	61%	25%	5%	2%	3%	0%
Office-Large	57%	31%	1%	1%	8%	0%
Restaurant	6%	18%	0%	70%	7%	16%
Retail-Small	35%	46%	0%	12%	9%	0%
Retail-Large	34%	39%	0%	0%	0%	24%
Food Store	85%	10%	0%	0%	0%	4%
Warehouse	70%	21%	0%	0%	0%	2%
School	39%	48%	1%	4%	4%	3%
College	15%	20%	3%	23%	10%	0%
Hospital	6%	39%	5%	3%	21%	0%
Other Health	60%	12%	4%	15%	6%	2%
Lodging	2%	29%	0%	9%	64%	2%
Miscellaneous	24%	30%	1%	22%	9%	10%
All Buildings	51%	26%	1%	9%	5%	4%

3.4.1 Fluorescent Lighting

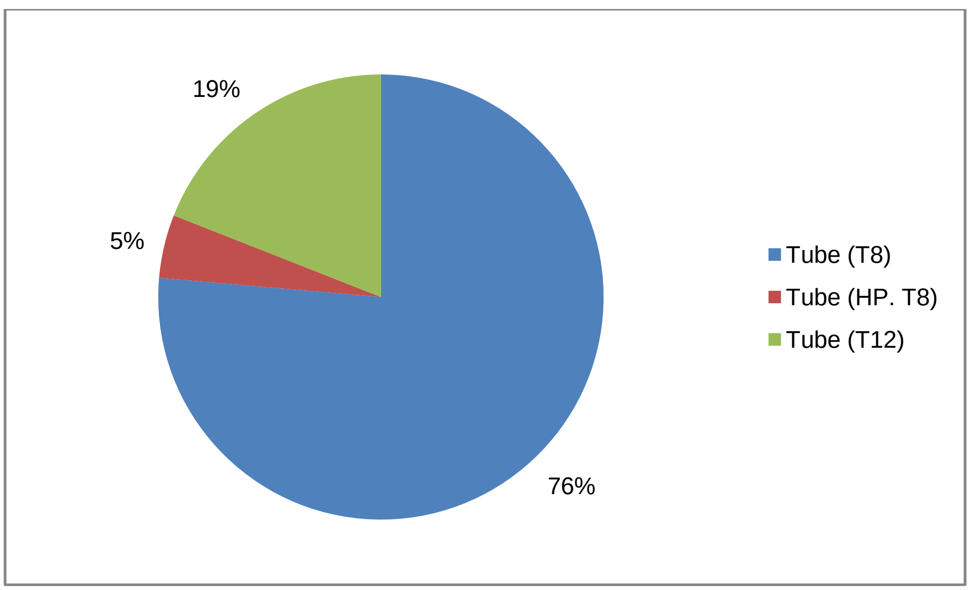
Table 3 below shows the average number of fluorescent fixtures per building by building typehttp://www.greendepot.com/greendepot/#.

Table 3: Average Number of Fluorescents Fixtures per Building

Building Type	4L4' fluorescent fixtures	2L4' fluorescent fixtures	Other fluorescent tube fixtures
Office-Small	91	41	75
Office-Large	2,722	1,817	80
Restaurant	15	22	-
Retail-Small	25	40	1
Retail-Large	1,712	1,578	-
Food Store	568	63	-
Warehouse	87	87	138
School	219	111	9
College	116	216	37
Hospital	104	569	147
Other Health	50	28	214
Lodging	17	199	15
Miscellaneous	60	78	14
All Buildings	92	64	33

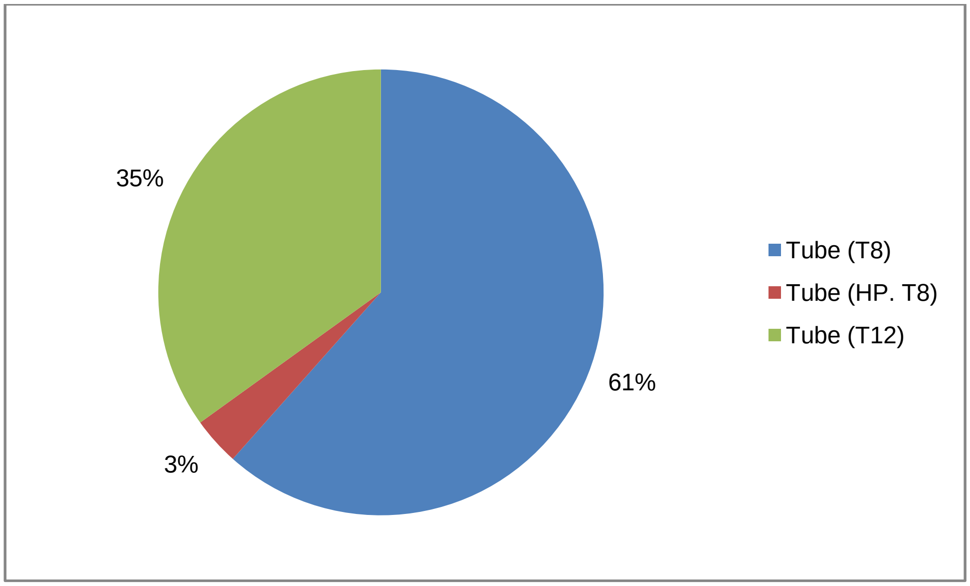
As shown in the following figure, we found that approximately 76 percent of bulbs 4L4' fixtures areT8 fluorescent lights. About 19 percent of bulbs in 4L4' fixtures are T12 fluorescent lights and 5 percent of bulbs are high performance T8's.

Figure 14: 4L4' Foot Fluorescent Tube Lighting



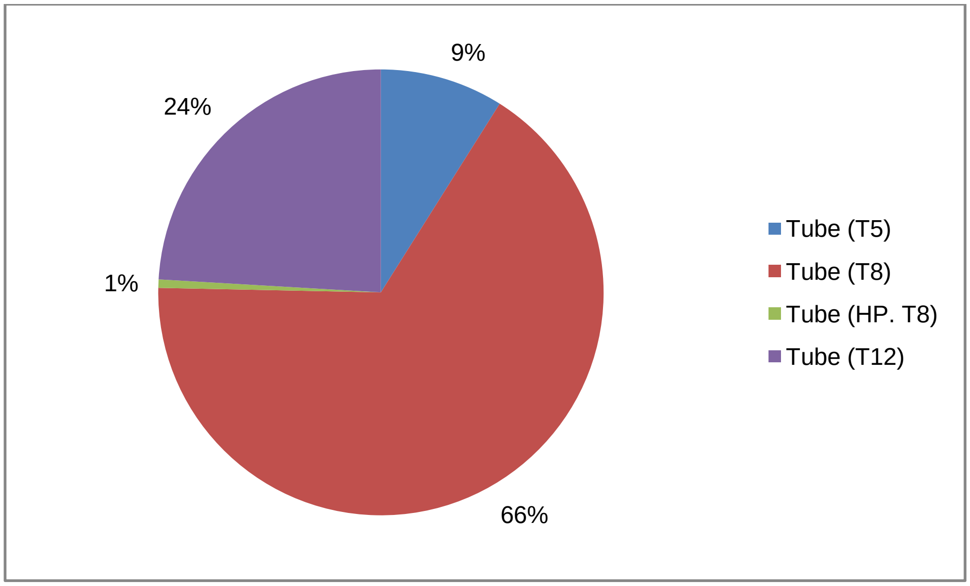
The distribution of two lamp four foot (2L4') fluorescent bulbs is similar to the distribution of the 4L4' fluorescent fixtures. Sixty-one percent of bulbs in 2L4' fixtures are T8 fluorescent bulbs and 35 percent of bulbs in 2L4' fixtures are T12's.

Figure 15: 2L4' Foot Fluorescent Tube Lighting



Additionally, we found that in other fluorescent figure configurations, T8's and T12's were the most prevalent. As the next figure shows, we found that 66 percent of bulbs in the other fluorescent light fixture configurations are T8 fluorescent bulbs. We also found that 24 percent of bulbs in these fixture configurations are T12's and another 9 percent of bulbs in these alternative fixture configurations are T5's.

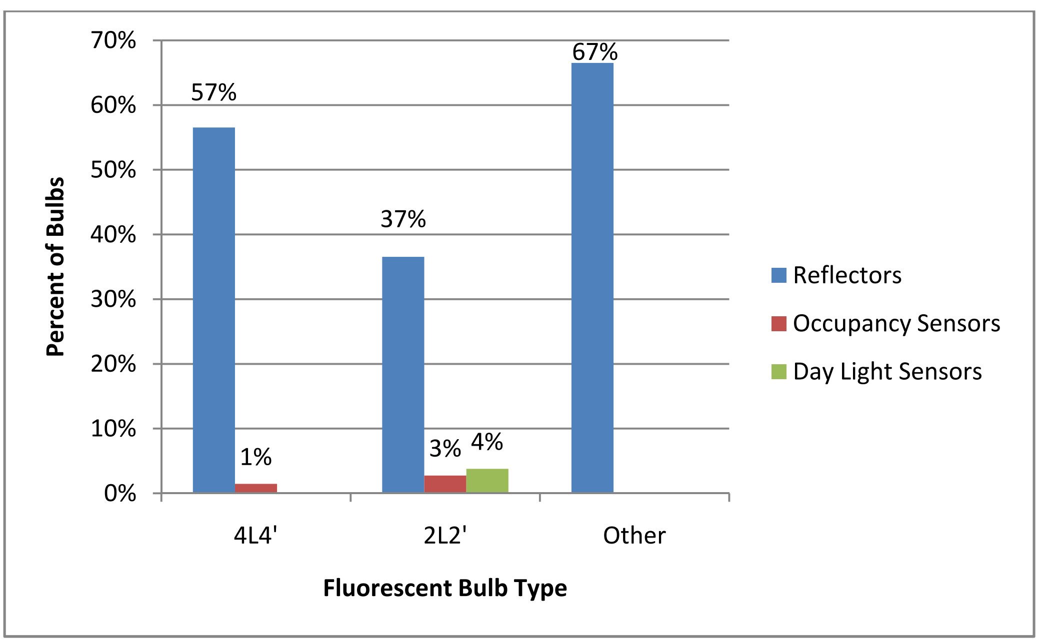
Figure 16: Other Fluorescent Tube Lighting



3.4.1.1 Energy Efficiency Measures for Fluorescent Fixtures

In addition to collecting data on the penetration of fluorescent bulbs, KEMA surveyed commercial buildings for a series of lighting energy efficiency measures. The reflectors are the most common efficiency measure found among all fluorescent bulbs.

Figure 17: Percent of EE Measures for Fluorescents



KEMA found that 98 percent of the 4L4’ fluorescent fixtures with control systems have not had their lighting control systems revisited or tuned to ensure that they are working properly. We also found that the 2L4’ fixtures have not had their lighting control systems revisited or tuned to ensure that they are working properly. Lastly, KEMA found that 96 percent of other fluorescents fixtures have not had their lighting control systems revisited or tuned to ensure that they’re working properly.

3.4.2 High bay Lighting

On average, in the 4 percent of buildings that have high bay lighting, there were 22 high bay lighting fixtures per building type. Additionally, for all facilities with high bay lighting, we found that none of these fixtures have occupancy sensors or daylight sensors installed within the lighting unit.

The following table shows the distribution of high bay lighting types. KEMA found that of the 4 of facilities with high bay lighting fixtures, 78 percent of the high bay lighting fixture lamps are metal halide and 17 percent are high pressure sodium. There were no high bay lighting fixtures with induction lighting lamps.

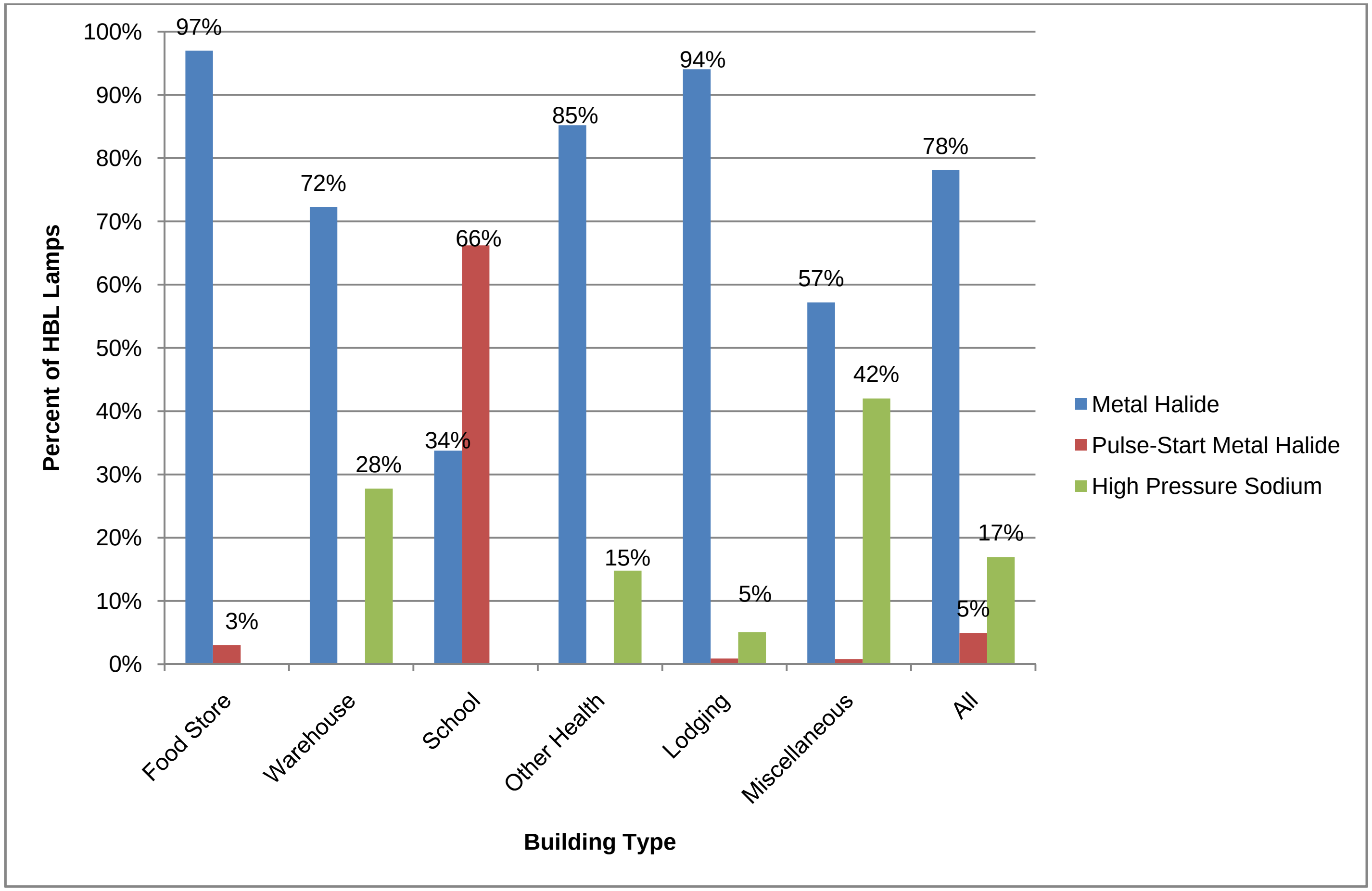
Table 4: High Bay Lighting Lamp Types across All Buildings

HBL lamp types	All
Metal Halide	78%
Pulse-Start Metal Halide	5%
High Pressure Sodium	17%

*There were no buildings with Induction Lighting

Among building types with high bay lighting fixtures, 100 percent of the fixtures within large offices, restaurants and large retail stores are fitted with metal halide bulbs. Similarly, the high bay lighting fixtures within food stores, lodging, and heath facilities are mostly outfitted with metal halide. The exception is colleges, in which none of them have metal halide bulbs within the fixture. Instead, of the high bay lighting fixtures across colleges, 100 percent have high pressure sodium bulbs within the fixture.

Figure 18: Percent of HBL Fixtures by Building Type

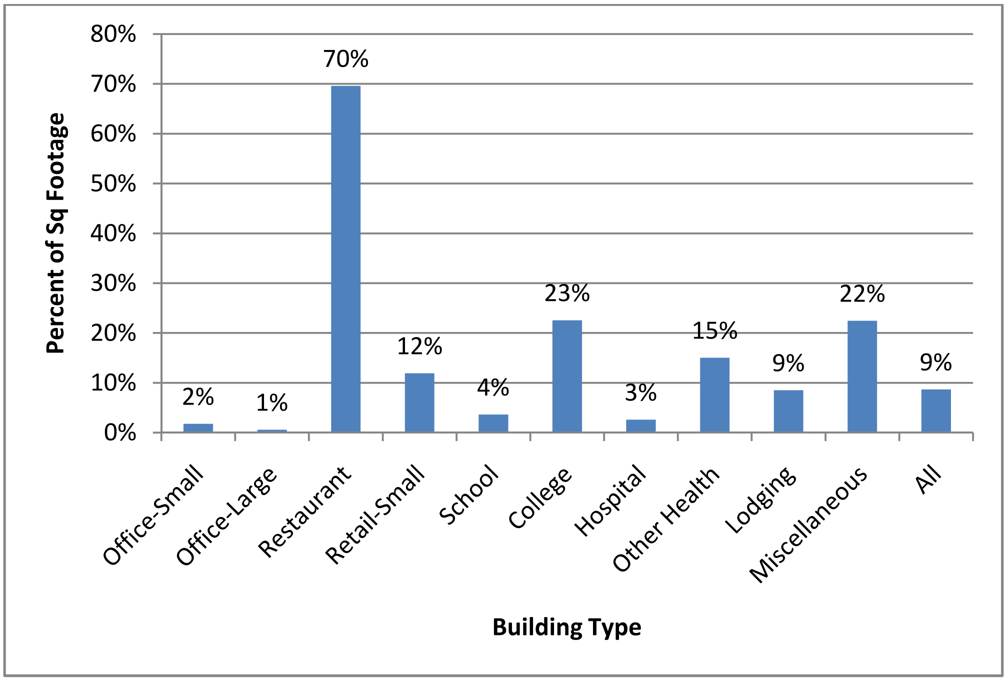


*Large offices, restaurants, and large retail stores were not included in this figure because 100 percent of the high bay lighting fixtures within those facilities are outfitted with metal halide lamps. Colleges was also not included because 100 percent of the fixtures found within college facilities are outfitted with high pressure sodium bulbs

3.4.3 Incandescent Lighting

On average, there are 64 incandescent bulbs per site across all building types. Overall, 9 percent of commercial square footage is lit with incandescent lighting. Seventy percent of restaurant square footage is lit with incandescent bulbs.

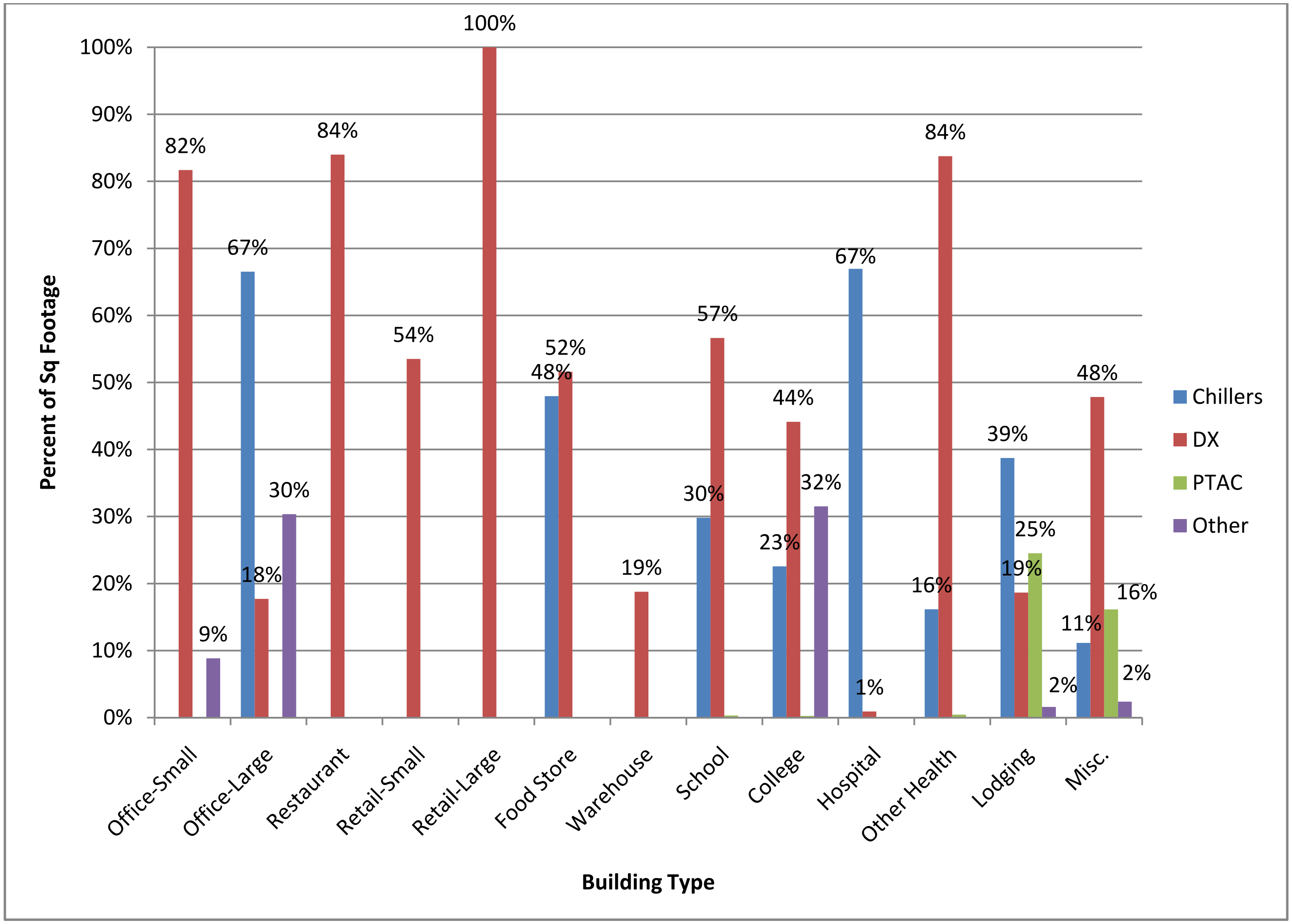
Figure 19: Percent of by Incandescent bulbs Across Building Types



3.5 Cooling

The following table shows the breakout of cooling units by building type. Overall, the direct expansion (DX) unit is the most common among building types. As shown in the figure below, 67 percent of large offices are cooled by chillers and 67 percent of hospitals are cooled by chillers. In direct expansion, we found that 84 percent of restaurant square footage is cooled by DX units as well as 84 percent of other health square footage. The PTAC can only be found in lodging services or miscellaneous commercial facilities.

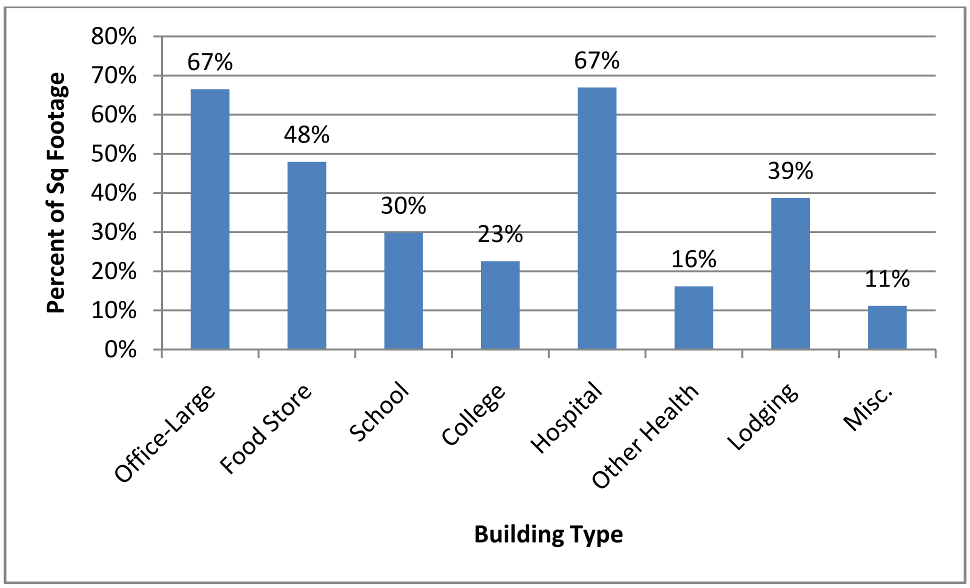
Figure 20: Cooling Type by Building



3.5.1 Chillers

In buildings with chillers, the average capacity of chillers across all building types is approximately 340 tons. Additionally, the average capacity of chillers among colleges is approximately 960 tons and the average capacity of chillers among lodging facilities is about 580 tons. The building type with the least, per average, capacity is health facilities. The following chart shows the percentage of square footage by building type that is cooled by chillers. For instance, 67 percent of large office square footage is cooled by a chiller and 67 percent of hospitals square footage is also cooled with a chiller. Conversely, 11 percent of miscellaneous square footage is cooled by a chiller.

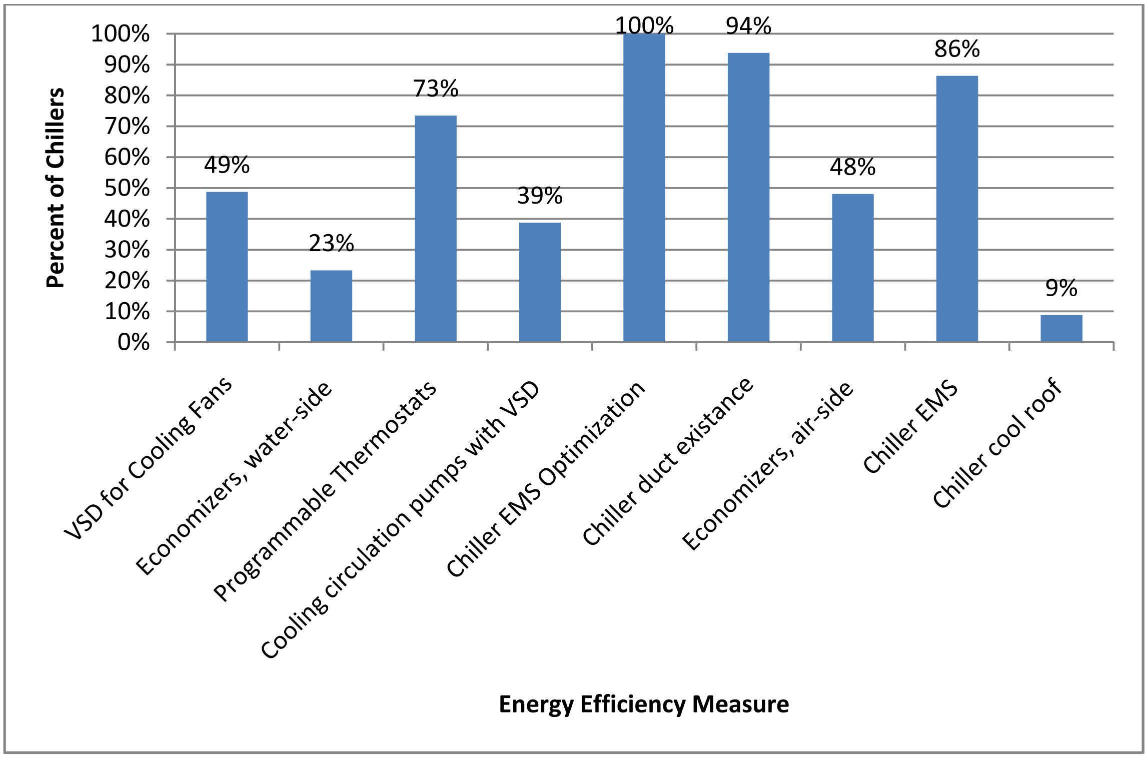
Figure 21: Percent of Buildings Cooling With Chillers



*not included in this table is office-small, restaurant, large retail, small retail, and warehouse – these building types had zero percent applicability for chillers

In the next figure, KEMA found that of the buildings with chillers, 86 percent of commercial square footage is cooled by chillers with EMS systems. The 86 percent of chillers with EMS operating systems, 100 percent of those systems utilize EMS optimization. Of the commercial facilities with chillers, approximately 49 percent of commercial square footage has VSD installed on cooling fans.

Figure 22: Energy Efficiency Measures for Chillers



3.5.2 Direct Expansion

Within the surveyed commercial square footage, KEMA found that the average capacity of a direct expansion (DX) unit is approximately 13 tons. Of the commercial square footage with DX units, we found that large offices have, on average, a DX unit capacity of approximately 30 tons and colleges have, on average, a DX unit capacity of approximately 15 tons. Hospitals, lodging, and warehouses had the smallest capacity (1-5 tons) of DX units per site.

As shown in the table below, commercial facilities with DX units, 97 percent of commercial square footage is cooled with a unit that is located on a building with ceiling insulation. Additionally, 74 percent of commercial square footage is cooled with a unit that has a programmable thermostat installed. KEMA also found that of the commercial facilities with DX units, only 10 percent of the commercial square footage has installed a cool roof on its building.

Table 5: Energy Efficiency Measures for Direct Expansion Units

Description	Complete Factor
Air-Side Economizers	56%
Programmable Thermostats	74%
Cool roof	10%
DX ceiling insulation	97%

*not included in this table is VSD for cooling fans, water-side economizers, premium efficiency pump motors, and cooling circulation with VSD because each of these measures has a complete factor less than 2 percent.

3.6 Space Heating

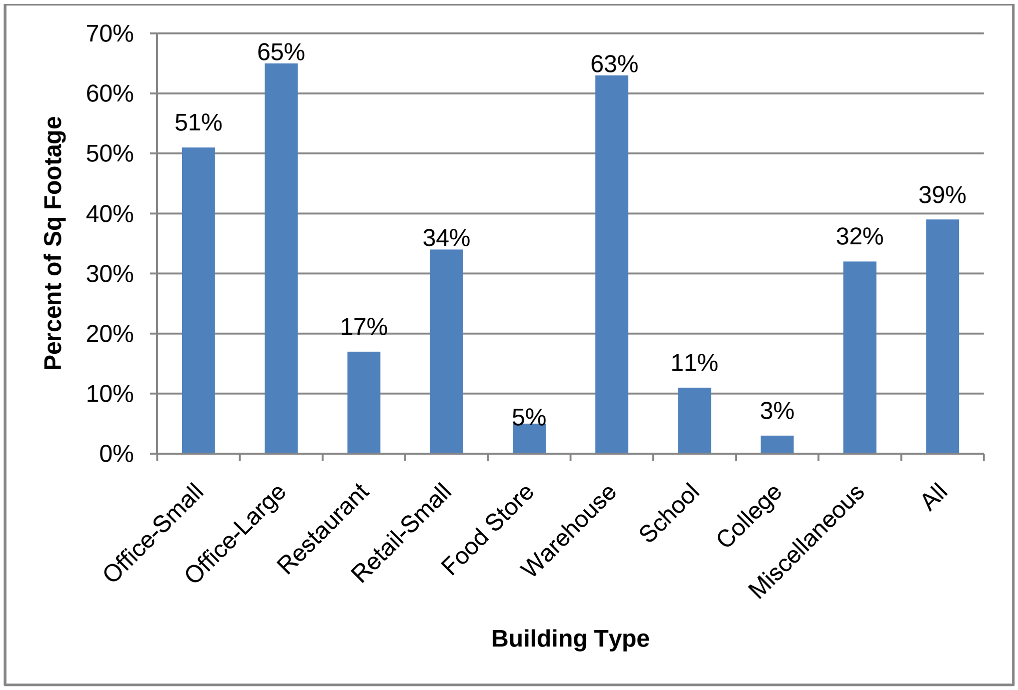
KEMA found electric heating in only five building types, large offices, restaurants, small retail stores, lodging facilities, and other miscellaneous buildings. Of all commercial building types, the largest percentage of electric heating was found in large offices, at thirty-two percent, and lodging, at 30 percent.

Building Type	Electric heating
Office-Large	32%
Restaurant	7%
Retail-Small	1%
Lodging	30%
Miscellaneous	1%

3.7 Water Heating

Across all commercial square footage, 39 percent of commercial square footage is served by electric water heating. In the following figure, the data is separated by building type. Sixty-five percent of large office square footage is served by electric water heating and 63 percent of warehouse square footage uses electric water heaters. Conversely, 5 percent of food store square footage and 3 percent of college square footage employs electric water heat.

Figure 23: Water Heating across Building Types



The following table shows the distribution of energy efficiency measures across all building types. Of the 39 percent of square footage with electric water heating, we found that 45 percent has faucets that are fitted with faucet aerators and another 33 percent that are fitted with tank insulation.

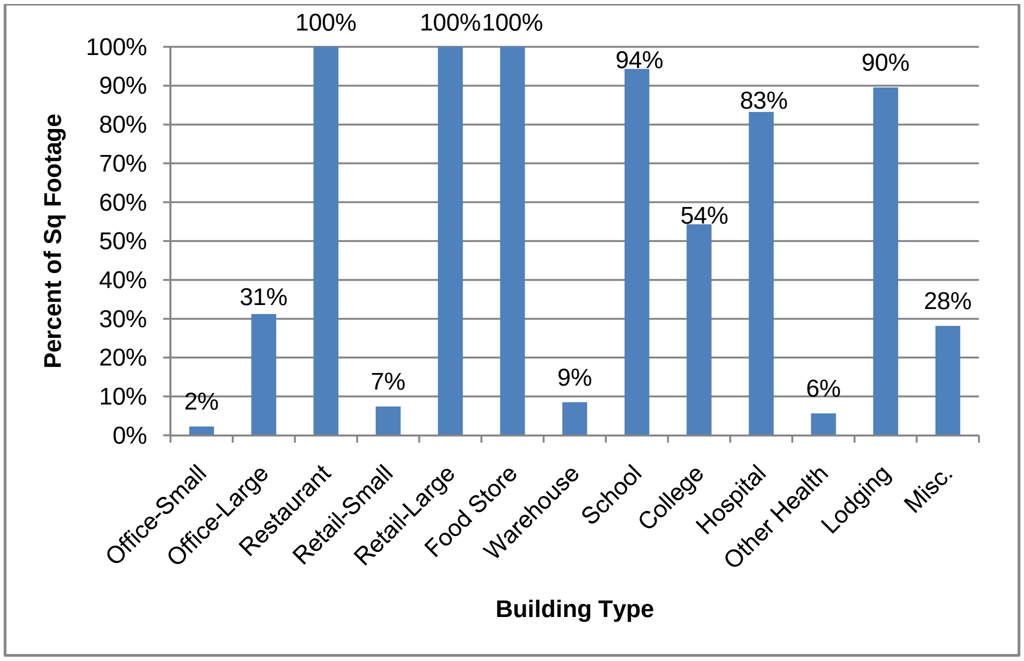
Table 6: Energy Efficiency Measures with Electric Water Heater

Description	Complete
Tank insulation	33%
Pipe insulation	27%
Demand controlled circulation	33%
Faucet aerators	45%

3.8 Refrigeration

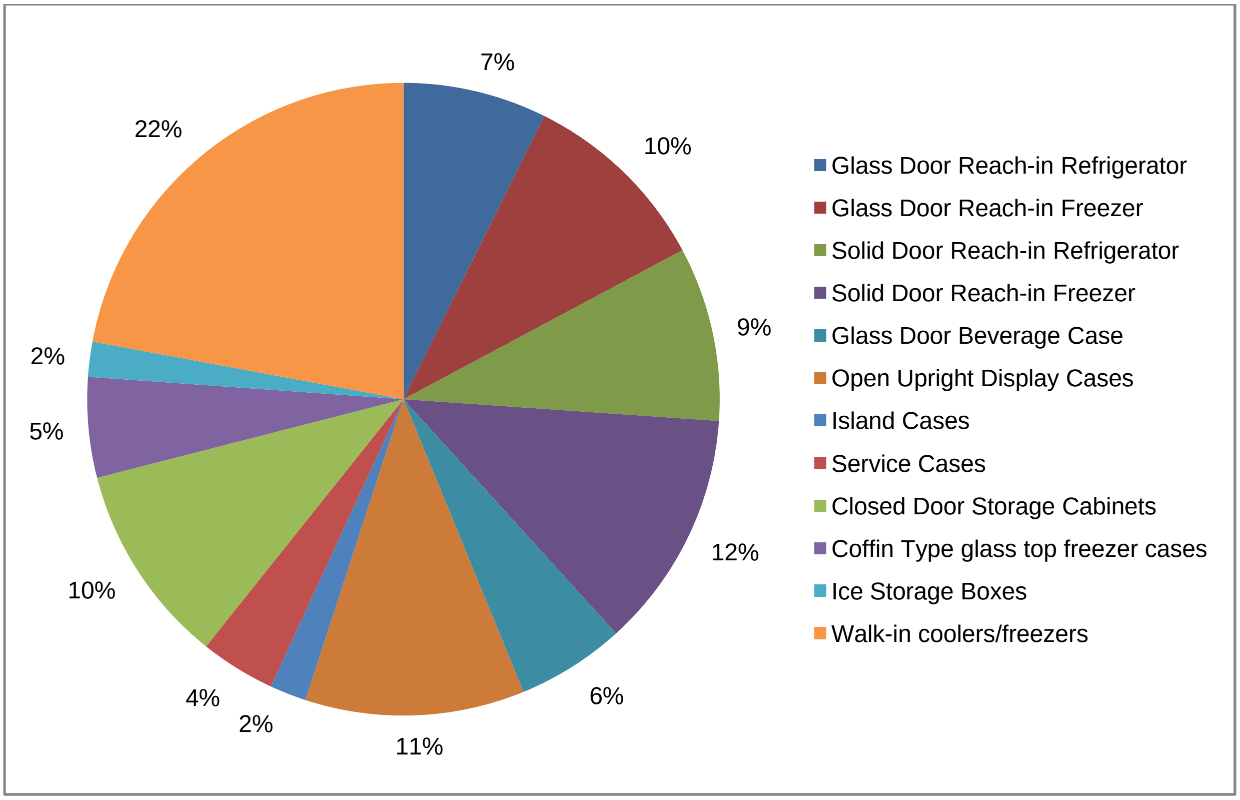
As expected, restaurants, food stores, and large retail stores account for most of the refrigeration. Small offices, small retail shops, and warehouses account for the least amount of refrigerated space by building type.

Figure 24: Percent of Refrigeration across all Building Types



Walk in refrigerators and freezers account for 22 percent of the overall commercial refrigeration equipment across all commercial square footage. Open upright display cases, solid door reach-in freezers, glass door reach-in freezers, and closed door storage cabinets are also present in overall refrigerated space.

Figure 25: Percent of Refrigerated Equipment across All Building Types



Of the 22 percent of walk-in coolers, 15 percent have the evaporator fan controller for walk-ins, 11 percent employ heat recovery, and 8 percent have installed strip curtains. Of the percent of square footage with commercial refrigeration, 1 percent of the commercial facilities with refrigeration equipment have electronically commutated motors installed on their units, and another 1 percent utilize an efficient compressor.

Table 7: Percent of Refrigeration Equipment with Energy Efficient Measures

Description	Percent of Equipment
Strip-curtains for walk-ins	8%
Electronically commutated motors	1%
Evaporator fan controller for walk-ins	15%
Efficient compressor	1%
Heat recovery	11%

*Night covers for display cases are not included in this table because there are no commercial refrigeration units that have night covers.

KEMA found that 97 percent of commercial refrigeration lighting is T8 fluorescent bulbs and the remaining 3 percent is either LED or T5.

3.9 Cooking

It was found that 25 percent of commercial square footage has electric cooking. For sites that have the following electric cooking equipment, the table below lists the average number of units per site found at each building.

Table 8: Number of Cooking Equipment per Site

Cooking Equipment	Restaurant	School	College	Lodging
Fryers	2	1	1	0
Convection ovens	5	3	1	1
Hot food holding cabinets	3	6	2	22
Steamers	1	1	1	0

Of the commercial facilities that have electric cooking, there are four potential energy efficiency measures. The ENERGY STAR fryer and ENERGY STAR convection oven were not located at any facility with commercial cooking equipment. Of the commercial facilities with electric cooking, we found that 73 percent have the ENERGY STAR steamer. Additionally, of the commercial facilities with electric cooking, we found that 13 percent have the ENERGY STAR hot food holding cabinet.

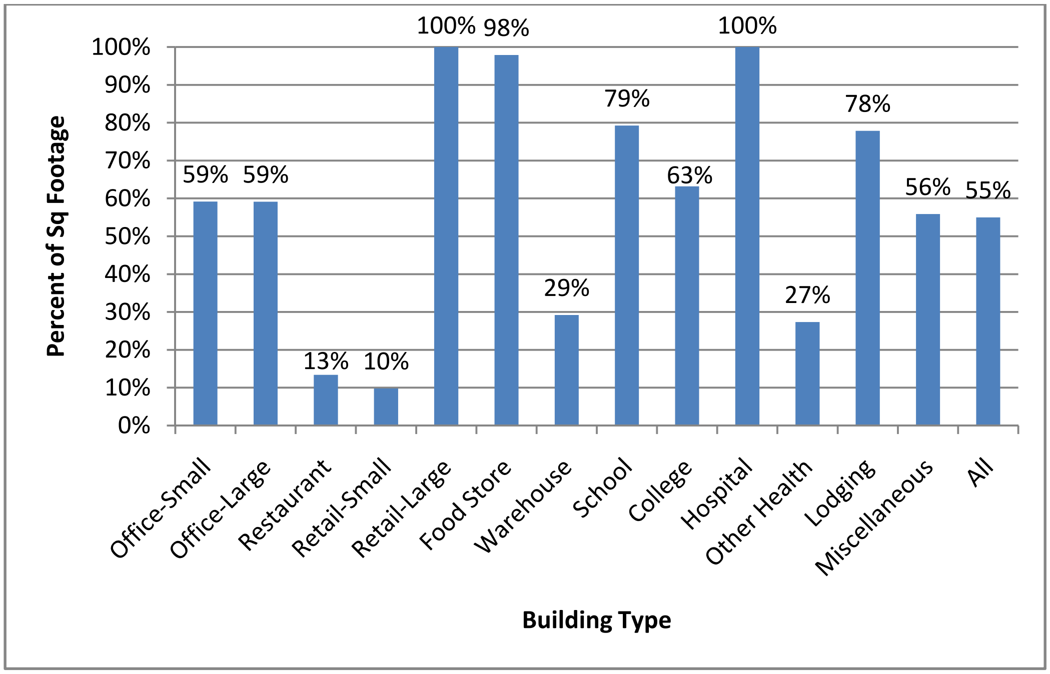
Table 9: Percent of ENERGY STAR Equipment

ENERGY STAR Equipment	Percent of Equipment
ENERGY STAR steamer	73%
ENERGY STAR hot food holding cabinet	13%

3.10 Vending Machines

Commercial facilities that account for 55 percent of total commercial square footage have vending machines.

Figure 26: Percent of Vending Machines



KEMA found that, on average, there were 5 vending machines per commercial facility. Colleges have the most vending machines on average per site (33) and restaurants have the least (1). We also found that there were 2 vending misers, on average, per site with vending machines. In this case, schools have the highest number of vending misers per site (10).

Table 10: Average Number of Vending Machines and Vending Misers per Building

Building Type	Number of vending machines per site	Number of vending misers per site
Office-Small	2	1
Office-Large	7	0
Restaurant	1	0
Retail-Small	3	0
Retail-Large	7	0
Food Store	3	0
Warehouse	3	1
School	14	10
College	33	0
Hospital	7	0
Other Health	2	0
Lodging	10	0
Miscellaneous	2	0
All Buildings	5	2

3.11 Ventilation

Commercial facilities that account for 54 percent of commercial square footage have a five horsepower (hp) ventilation fan for an HVAC system. Commercial facilities that account for 38 percent of commercial square footage have a 15hp ventilation fan and commercial facilities that account for 35 percent of commercial square footage have a 40hp ventilation fan.

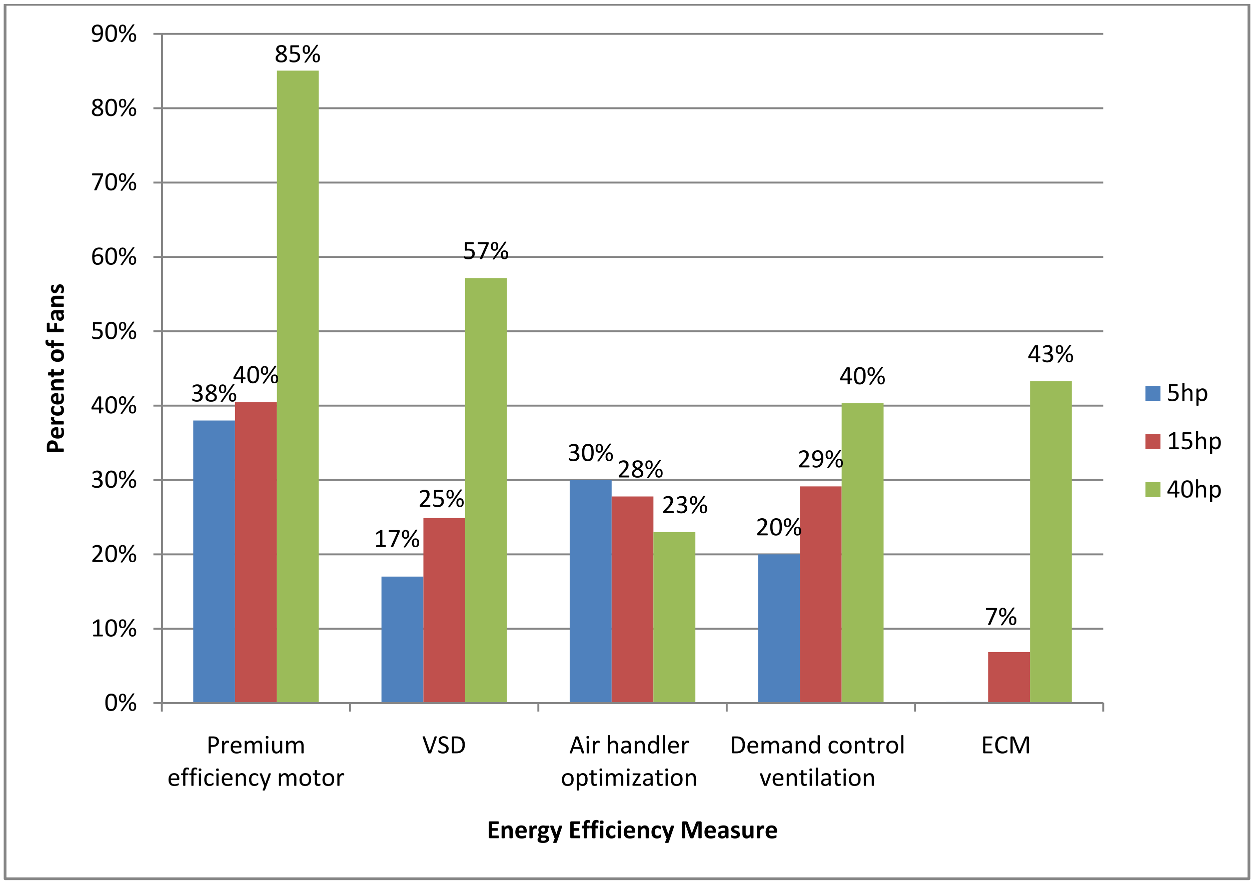
Table 11: Penetration of Ventilation Fans

Description	Percent Applicable
Five HP	54%
Fifteen HP	38%
Forty HP	35%

Overall, we found that most 5hp ventilation fans were without energy efficiency measures. The presence of energy efficiency measures among 15hp ventilation fans varied from the 5hp fans. Of all the fan types, the 40hp ventilation fan is most likely to have installed an energy efficiency measure. Commercial facilities that account for 35 percent of commercial square footage have

40 hp fans for their HVAC systems. Of those HVAC systems, 85 percent have premium efficiency motors, 57 percent have VSD motors and 43 percent have ECM.

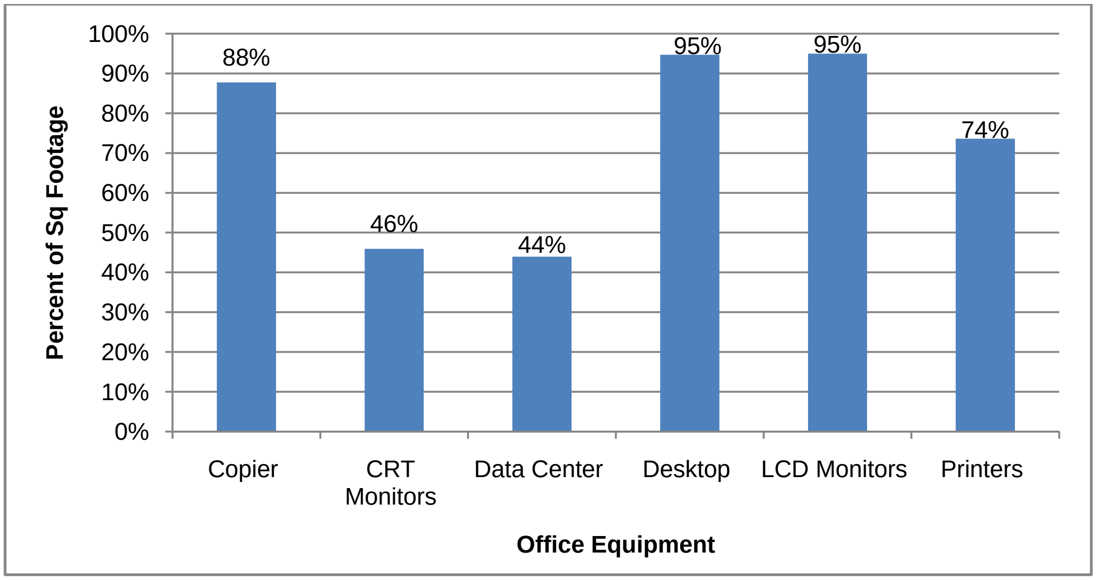
Figure 27: Ventilation Fans with Energy Efficiency Measures



3.12 Office Equipment

KEMA found that, across all building types, most facilities had some kind of office equipment. Offices that account for 95 percent of total office square footage in Xcel Minnesota's service territory have desktop commuters. Additionally, office that's account for 95 percent of office square footage has LCD monitors.

Figure 28: Percent of Office Equipment across all Building Types



Like the preceding table, we found that the average number per site for desktop computers and LCD monitors to be the highest.

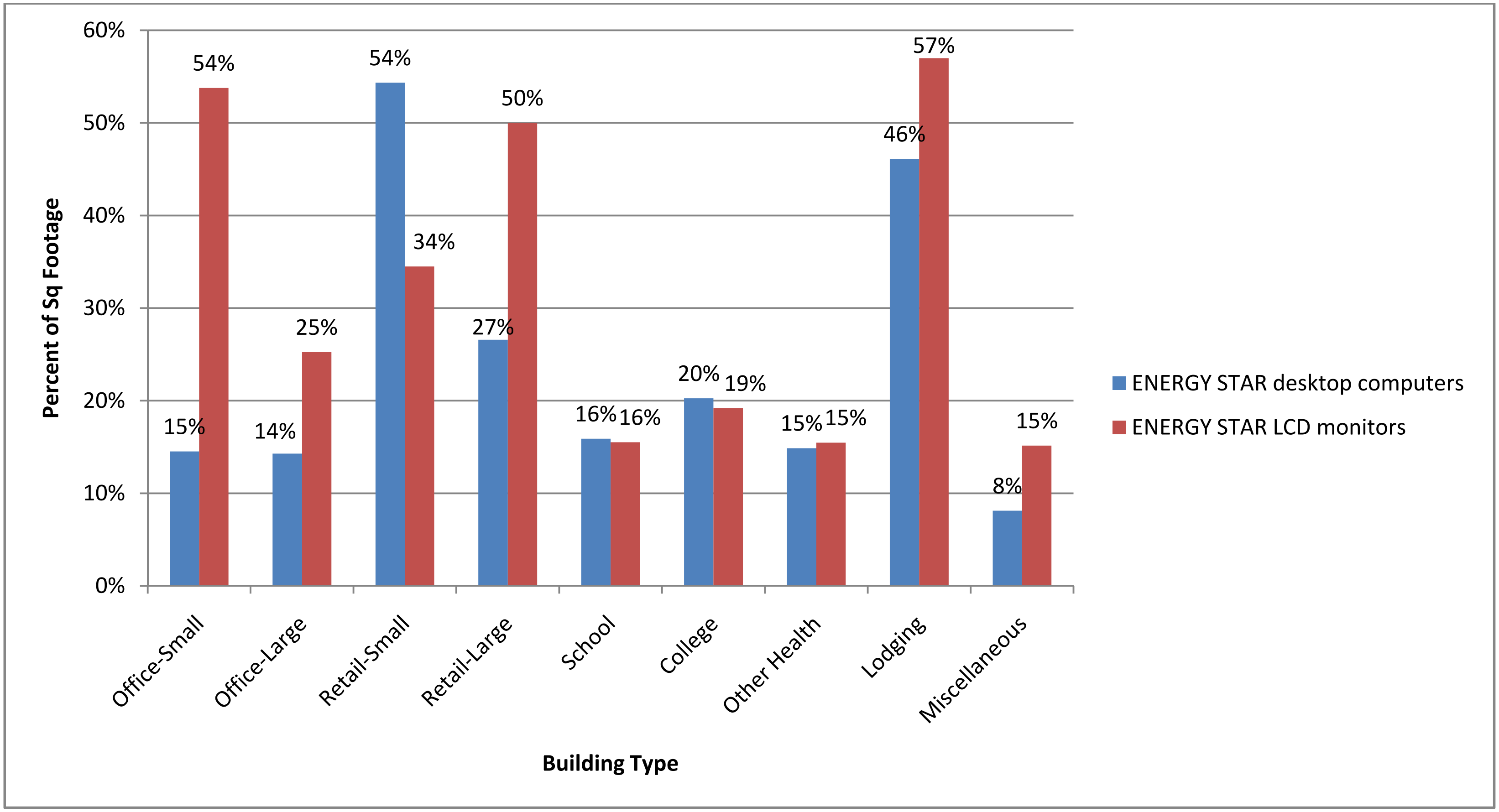
KEMA found that on average, there are 83.54 desktop computers per commercial building that have desktop computers. This is the average over all buildings with a desktop, even if there happens to be an outdated, unused desktop within the facility. Moreover, we found that there is approximately an average of 76 LCD monitors across all buildings that reported having monitors.

Table 12: Average Number of Office Equipment per site

Description	Number per Site
Copiers	3.67
CRT monitors	3.56
Data centers	2.81
Desktop computers	83.54
LCD monitors	75.92
Printers	9.16

The figure below displays the penetration of Energy Star computer equipment across commercial building types. Commercial facilities that account for 95 percent of commercial square footage, we found that 54 percent of small retail square footage has ENERGY STAR desktops and 46 percent of lodging square footage has ENERGY STAR desktops. Commercial square footage that accounts for 95 percent of LCD monitors, we found that 57 percent of lodging facilities have ENERGY STAR LCD monitors and 54 percent of small offices have ENERGY STAR LCD monitors.

Figure 29: Energy Star Computer Equipment



A. On-site Survey Instrument

Xcel Energy Commercial Onsite Survey

SITE INFORMATION	
SITE ID:	
SI1. Building Name:	
SI2. Street Address:	
SI3. City, State:	
SI4. Zip Code:	
SI5. Building Phone:	
SI6. Primary Contact Name:	
SI7. Primary Contact Phone:	
SI8. Primary Contact Email:	
SI9. Primary Contact Fax:	
SI10. Secondary Contact Name:	
SI11. Secondary Contact Phone:	
SI12. Secondary Contact Email:	
SI13. Secondary Contact Fax:	

SURVEY TRACKING INFORMATION		
TASK	**a. DATE**	**b. NAME**
STI1. Field survey completed:		
STI2. Field survey data entry completed:		
STI3. Field survey QC completed:		

TO BE FILLED OUT BY KEMA STAFF
[Surveyors –fill this section out from KEMA supplied data from utility]

GBE. Total Annual Electricity Load	**_______kWh** DK N NA
GBNG. Total Annual Natural Gas Load	**_________therms** DK N NA

GENERAL BUILDING INFORMATION

Primary Site Activity:

	a. Primary Activity Code Refer to Site Activity Code	b. If Site Activity Code = 11, describe:
PSA1. Primary Site Activity	_ _	

Site Activity Codes	
01: Office	07: College
02: Restaurant	08: Hospital
03: Retail Store	09: Other Health Care
04: Food Store	10: Hotel/Motel
05: Warehouse	11: Miscellaneous (Describe)
06: School	

General Building Characteristics:

GB1. Total floor area of building	________ ft^2 DK R
GB2. Total floor area occupied by business	________ ft^2 DK R
GB2a. Total floor area occupied by indoor parking area occupied by business	________ ft^2 DK R
GB2b. [If GB2a>0] Is indoor parking area heated?	Y N DK R
GB3. Total percentage of floor area of business that is cooled	________ % DK R
GB4. Total percentage floor area of business that is heated	________ % DK R
GB5. Time since last major remodel/renovation impacting the building's energy consumption?	________ years DK R
GB6. Building commissioned in past 5 yrs.? Commissioning is the process of overseeing equipment startup and testing to make sure systems are operating as designed.	Y N DK R
GB7. ENERGY STAR certification?	Y N DK R
GB8. LEED certification?	Y N DK R

GB9. What year was this building constructed?
[If there have been major additions, give the year the largest portion of the building was completed]

1. o Before 1950	3. o 1980 to 1989	5. o 2000 to 2004	7. o [If unsure, but can make educated guess] **Provide response:** ________________	97. o Don't know
2. o 1950 to 1979	4. o 1990 to 1999	6. o 2005 to 2009		98. o Refused to answer

GB10. Is this company the owner of the building or does the company lease space?

1. o Owner	3. o Own a part and lease the remainder	97. o Don't know
2. o Lessee/Tenant	4. o Other situation (**Describe:**	98. o Refused to

GB11. Job title or role of primary contact(s) [Allow for multiple responses]

1. o Owner / President / CEO	6. o **[If educational setting]** Principal/Superintendent/Dean
2. o Vice President	7. o Other (**Describe:** ________________)
3. o Manager or Director of Facilities / Maintenance / Buildings & Grounds	97. o Don't know
4. o Energy Manager or Director	98. o Refused to answer
5. o CFO / Controller / Treasurer	

GB12a. Does the company pay for the electricity their space uses?

1. o Yes, company pays all	3. o No, company does not pay a separate electricity bill **(e.g., included in lease payment)**	97. o Don't know
2. o Yes, company pays a portion		98. o Refused to answer

GB12b. Does the company pay for the heating their space uses?

1. o Yes, company pays all	3. o No, company does not pay a separate heating bill **(e.g., included in lease payment)**	97. o Don't know
2. o Yes, company pays a portion		98. o Refused to answer

GB13. How many hours per week is this space normally open?

[Do not consider the business to be open if only maintenance, housekeeping or security are present.]

[Businesses such as hospitals or hotels likely to have operating hours of 24/7 (168 hours)]

Enter # of hours/week: __________ **DK** **R**

GB13.a. What are the Weekday and Weekend operating hours?

Weekday Schedule: open:_______ close:_______	**Saturday Schedule:** open:_______ close:_______	**Sunday Schedule:** open:_______ close:_______	97. o Don't know	98. o Refused to answer

GB14. How many employees work in this space <u>during the main shift</u>, that is, when most employees are present?

[Include volunteer workers, but do not include employees who always work outside the building, such as drivers with delivery routes]

1. o One	5. o 21 to 50	9. o 501 to 1,000	97. o Don't know
2. o 2 to 5	6. o 51 to 100	10. o 1,001 to 3,000	98. o Refused to answer
3. o 6 to 10	7. o 101 to 250	11. o More than 3,000	
4. o 11 to 20	8. o 251 to 500		

GB15. At your request an electronic version of the completed inventory of your location will be provided at the conclusion of KEMA's field research activities for this study. This will be provided solely for your internal use without any warranty or guarantee as to its, accuracy, completeness or suitability for any purposes.

Email address: ____

WEATHERIZATION / BUILDING ENVELOPE

WBE1. What percentage of the exterior walls are insulated?

Enter % of exterior walls insulated: ____________ DK R

WBE2. Is the roof and/or ceiling insulated?

1. o Yes, the roof is insulated (business is on top or only floor)	97. o Don't know
2. o Yes, roof not applicable, but ceiling is insulated (business not on top or only floor)	98. o Refused to
3. o No, no roof and/or ceiling insulation	

WBE3. Is the roof of the building a cool roof?
[Cool Roofs are roofs consisting of materials that reflect the sun's energy from the roof surface. They are usually white in color, but non-white colors are becoming available]

1. o Yes	2. o No	97. o Don't know	98. o Refused to answer

WBE4. Window Characteristics

Window Type	b. Total Size of Windows (sq ft)	d. % Low Emissive (Low E) Windows	e. % Argon or other gas windows
1. Single Pane Windows	________ sq ft DK R		
2. Double Pane Windows	________ sq ft DK R	_ _ _% DK R	_ _ _% DK R
3. Triple Pane Windows	________ sq ft DK R	_ _ _% DK R	_ _ _% DK R

WBE5. What percent of the windows have window film/tinting?

1. o None	2. o 1 to 25%	4. o 51 to 75%	97. o Don't know
	3. o 26 to 50%	5. o 76 to 100%	98. o Refused to answer

WBE6a. Does building have an HVAC duct system?

1. o Yes	
2. o No	**Skip to EMS1**
97. o Don't know	**Skip to EMS1**
98. o Refused to answer	**Skip to EMS1**

WBE6b. Within the last 5 years, have leaky HVAC ducts been sealed or repaired?

1. o Yes	2. o No	97. o Don’t know	98. o Refused to answer

WBE7. What percentage of HVAC ducts in unconditioned spaces are insulated?

1. Enter % _ _ _	DK	R

ENERGY MANAGEMENT SYSTEM (EMS)

[EMS is a computerized building control system that controls equipment operation based on schedules and desired temperature set points]

EMS1. Is there an Energy Management System (EMS) at this facility?

1. o Yes	**Skip to EMS3**
2. o No	
97. o Don't know	**Skip to Light1**
98. o Refused to answer	**Skip to Light1**

EMS2. If there is no EMS, is there another system that controls equipment based on temperature or occupancy schedule besides a programmable thermostat?

1. o Yes	
2. o No	**Skip to Light1**
97. o Don't know	**Skip to Light1**
98. o Refused to answer	**Skip to Light1**

EMS3. Is the system working properly?

1. o Yes
2. o No
97. o Don't know
98. o Refused to answer

EMS4. What end uses are controlled with the EMS (or similar system)?
[Select all that apply]

End Use	1. Yes	2. No	97. Don't know	98. Refused to answer
1. Interior lighting	o	o	o	o
2. Outside lighting	o	o	o	o
3. Chiller	o	o	o	o
4. Boiler	o	o	o	o
5. Packaged HVAC unit	o	o	o	o
6. Air handler unit	o	o	o	o
7. Refrigeration system	o	o	o	o
8. Other (**Describe**: ______________________________)	o	o	o	o

LIGHTING

Light1. Interior Lighting Information

1. # of 4 foot fixtures with 1 or 2 lamps [Exclude high bay lighting] Enter #:________ DK R		
1a. % T5 fixtures: : _ _ _% DK R	1b. % T5 fixtures with reflectors: _ _ _% DK R	1c. % T5 fixtures with occupancy sensors: _ _ _% DK R
2a. % Standard T8 fixtures: : _ _ _% DK R	2b. % Standard T8 fixtures with reflectors: _ _ _% DK R	2c. % Standard T8 fixtures with occupancy sensors: _ _ _% DK R
3a. % High Perf T8 fixtures: : _ _ _% DK R	3b. % High Perf T8 fixtures with reflectors: _ _ _% DK R	3c. % High Perf T8 fixtures with occupancy sensors: _ _ _% DK R
4a. % T12 fixtures: : _ _ _% DK R	4b. % T12fixtures with reflectors: _ _ _% DK R	4c. % T12fixtures with occupancy sensors: _ _ _% DK R

2. # of 4 foot fixtures with 3 or more lamps [Exclude high bay lighting] Enter #:________ DK R		
1a. % T5 fixtures: : _ _ _% DK R	1b. % T5 fixtures with reflectors: _ _ _% DK R	1c. % T5 fixtures with occupancy sensors: _ _ _% DK R
2a. % Standard T8 fixtures: : _ _ _% DK R	2b. % Standard T8 fixtures with reflectors: _ _ _% DK R	2c. % Standard T8 fixtures with occupancy sensors: _ _ _% DK R
3a. % High Perf T8 fixtures: : _ _ _% DK R	3b. % High Perf T8 fixtures with reflectors: _ _ _% DK R	3c. % High Perf T8 fixtures with occupancy sensors: _ _ _% DK R
4a. % T12 fixtures: : _ _ _% DK R	4b. % T12fixtures with reflectors: _ _ _% DK R	4c. % T12fixtures with occupancy sensors: _ _ _% DK R

Light1. Interior Lighting Information (Continued)

3. # of 8 foot fixtures with any # of lamps [Exclude high bay lighting] Enter #:________ DK R		
1a. % Standard T8 fixtures: : _ _ _% DK R	1b. % Standard T8 fixtures with reflectors: _ _ _% DK R	1c. % Standard T8 fixtures with occupancy sensors: _ _ _% DK R
2a. % High Perf T8 fixtures: : _ _ _% DK R	2b. % High Perf T8 fixtures with reflectors: _ _ _% DK R	2c. % High Perf T8 fixtures with occupancy sensors: _ _ _% DK R
3a. % T12 fixtures: : _ _ _% DK R	3b. % T12fixtures with reflectors: _ _ _% DK R	3c. % T12fixtures with occupancy sensors: _ _ _% DK R

4. % of Building Square Footage Illuminated by any type of Tube Fluorescent Lighting [no CFL's or high bay]	__ __ __ % DK R
4a.% of Tube Fluorescents at facility that remains on during off hours:	__ __ __ % DK R

5. Incandescents/CFLs/LEDs	
a. Total # of Incandescents	Enter #:______ DK R
b. Total # of CFL'S	b1. Enter # Screw-in CFL:______ DK R b2. Enter # Hardwired CFL:______ DK R
c. Total # of LEDs	Enter #:______ DK R
d. % Fixtures Feasible for Hardwired CFL's	__ __ __ % DK R
e. % of Building Square Footage Illuminated by any Incandescents or CFLs	__ __ __ % DK R
f. % of Incandescents/CFLs/LEDs that remain on during off hours:	__ __ __ % DK R

Light1. Interior Lighting Information (Continued)

6. High Bay Lighting	a. Total # of Metal Halide	b. Total # of High Pressure Sodium	c. Total # of Mercury Vapor	d. Total # of T8	e. Total # of T5	f. Total # of Induction Lighting
a. Total # of lamps	Enter #:______ DK R	Enter #:______ DK R	Enter #:______ DK R	Enter #:______ DK R	Enter #:______ DK R	Enter #:______ DK R
b. % with occupancy sensors:	_ _ _% **DK R**	_ _ _% **DK R**	_ _ _% **DK R**	_ _ _% **DK R**	_ _ _% **DK R**	_ _ _% **DK R**
c. % of building square footage illuminated by high bay lighting	__ __ __ % DK R					
d. % of high bay lighting that remains on during off hours:	__ __ __ % DK R					

Light2. Lighting System Maintenance

Lighting System	a. How often are lighting control tune-ups performed?* Refer to Control Tune-Up Codes	b. How often is the control strategy revisited? Refer to Strategy Codes	c. [If GB6=Yes] If commissioning was performed in the past 5 years, were lighting controls addressed?
Complete Lighting System	Maintenance Code#: __ __	Strategy Code: __ __	Y N DK R

***Lighting Controls Tune-Up**
Periodically, lighting controls need to be calibrated. Photocell sensors may fall into disrepair over time, occupancy sensor control settings may not be configured to result in maximum energy savings, and time clock controls may not result in sufficient precision. Some buildings may also have light sweeping controls and load shedding dimmer controls for demand reduction that should be tuned up. Spaces can be under-lit as a result of dirty fixtures which should be cleaned as part of a tune up.

Control Tune-Up Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

Strategy Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
97: Don't know
98: Refused to answer

Light3. How many exit signs are installed in the building?

Enter number:__________	**If Light3=0 SKIP TO Light4**
999997. o Don't know	**SKIP TO Light4**
999998. o Refused to answer	**SKIP TO Light4**

Light3a. What percentage of the building's exit signs are…

1. % LED	_ _ _% DK R
2. % CFL	_ _ _% DK R
3. % Incandescent	_ _ _% DK R
4. % Other (Please describe: ______________)	_ _ _% DK R

Light4. Does this building have outdoor lighting?

1. o Yes	
2. o No	**Skip to Cool1**
97. o Don't know	**Skip to Cool1**
98. o Refused to answer	**Skip to Cool1**

Light5. Outdoor Lighting Information

[% of all lighting types should add up to 100% (but can be more)]

LIGHTING TYPE	a. % of all FT2	b. # of Fixtures	c. % Fixture sub-types	d. % w/ Photocells	e. % w/ Timers or Other Controls	f. % of outdoor lights operating 24/7
1. Fluorescent Tubes:	_ _ _ % DK R	Enter #: ________ DK R	% that are T-8 _ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
2. Incandescent / CFL bulbs (Smaller wattage)	_ _ _ % DK R	Enter #: ________ DK R	% that are CFL _ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
3. LED	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
4. Quartz Halogen	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
5. Metal Halide	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
6. Pulse Start Metal Halide	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
7. High Pressure Sodium	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
8. Mercury Vapor	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
9. Other	% of FT2 _ _ _ % DK R	Enter #: ________ DK R	**Please describe:**			

Light6. [If GB2a>0] Indoor Parking Garage Lighting Information
[% of all lighting types should add up to 100% (but can be more)]

LIGHTING TYPE	a. % of all FT2	b. # of Fixtures	c. % Fixture sub-types	d. % w/ Photocells	e. % w/ Timers or Other Controls	f. % of outdoor lights operating 24/7
1. Fluorescent Tubes:	_ _ _ % DK R	Enter #: ________ DK R	% that are T-8 _ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
2. Incandescent / CFL bulbs (Smaller wattage)	_ _ _ % DK R	Enter #: ________ DK R	% that are CFL _ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
3. LED	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
4. Quartz Halogen	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
5. Metal Halide	_ _ _ % DK R	Enter #: ________ DK R		_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
6. Pulse Start Metal Halide	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
7. High Pressure Sodium	_ _ _ % DK R	Enter #: ________ DK R		_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
8. Mercury Vapor	_ _ _ % DK R	Enter #: ________ DK R		_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
9. Other	% of FT2 _ _ _ % DK R	Enter #: ________ DK R	**Please describe:**			

COOLING

Cool1. Does this building contain cooling equipment?

1. o Yes	
2. o No	**Skip to SH1**
97. o Don't know	**Skip to SH1**
98. o Refused to answer	**Skip to SH1**

Cool 2. Cooling Characteristics

Cooling Characteristic	1. System #1	2. System #2
a. Cooling Equipment Refer to Cooling Equipment Codes If Code=12, describe:	**Cooling Code:** __ __ ________________	**Cooling Code:** __ __ ________________
b. Fuel type Refer to Fuel Codes If Code=03, describe:	**Fuel Code#:** __ __ __________	**Fuel Code#:** __ __ __________
c. % of cooled ft^2 cooled by system	__ __ __ % DK R	__ __ __ % DK R
d. Capacity Check unit of measurement: Tons OR BTUs	**Enter #:**__________ o**Tons** o**MMBTUs** DK R	**Enter #:** __________ o**Tons** o**MMBTUs** DK R
e. Age of cooling system *Note average age if system contains different ages of equipment	________ # of years DK R	________ # of years DK R
f. System Condition Refer to System Condition Codes	**System Condition Code:** __ __	**System Condition Code:** __ __
g. Record efficiency rating from nameplate	________ DK R	________ DK R
h. Record cooling equipment model number from nameplate	________ DK R	________ DK R
i. System Condition Refer to System Condition Codes	Y N DK R	Y N DK R
j. How often is maintenance performed? Refer to Maintenance Codes	**Maintenance Code:** __ __	**Maintenance Code:** __ __
k. How many months per year does this system run?	________ **# of months** DK R	________ **# of months** DK R
l. About how many hours is the cooling system running each day it is used? Refer to Cooling Hours Codes	**Cooling Hours Code:** __ __	**Cooling Hours Code:** __ __
m. What is the average set point of the system when in use?	________ Degrees F DK R	________ Degrees F DK R
n. What is the average set point of the system during off hours? If no off hours, circle NA	________ Degrees F	________ Degrees F

Cooling Equipment Codes
01: Water-cooled Chiller (cooling towers or water cooler present)
02: Air-cooled Chiller
03: Packaged heat pumps for cooling
04: Rooftop/Packaged AC (also known as DX or direct expansion units)
05: DX Split Systems
06: Absorption gas or steam (chillers or heat pumps)
07: Packaged Terminal Air Conditioner (PTAC)
08: Individual room air conditioners, other than heat pumps
09. District chilled water piped in from outside the building
10. Ground source heat pump
11. Ductless (mini split) cooling system
12: Other cooling equipment **(Describe)**
97: Don't know
98: Refused to answer
Fuel Codes
01: Electricity
02: Natural Gas
03: Other **(Please describe)**
97: Don't know
98: Refused to answer
System Condition Codes
01: In good condition
02: Needs maintenance/repair
03: Needs replacement
97: Don't know
98: Refused to answer
Maintenance Codes
01: More than once a year
02: Annually
03: Every two years
04: More than two to every five years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer
Cooling Hours Codes
01: Less than 4 hours
02: More than 4 hours to 8 hours
03: More than 8 hours to 12 hours
04: More than 12 hours to 16 hours
05: More than 16 hours to 20 hours
06: More than 20 hours
07: Run continuously
97: Don't know
98: Refused to answer
Note: Hours represent # of hours that the system is in active cooling mode versus setback mode, but not the actual run time of the equipment.

	DK R NA	DK R NA
o. What is the cooling system balance point if you have one? I.E. is there a specific outdoor temperature that triggers the building to go to cooling mode?	Degrees F DK R NA OTH	Degrees F DK R NA OTH

Cool 3. Are any of the following measures installed in the facility?

[See Guidebook for examples of controls and measures]

Cooling System	Measure		
	a. VSD for cooling tower fans	**b. Economizers, air-side**	**c. Economizers, water-side**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Cooling System	Measure		
	d. Programmable thermostat	**e. Premium efficiency pump motors**	**f. Cooling Circulation Pumps with Variable Speed Drives**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

SPACE HEATING

SH1. Does this building contain space heating equipment?

1. o Yes	
2. o No	**Skip to WH1**
97. o Don't know	**Skip to WH1**
98. o Refused to answer	**Skip to WH1**

SH2. Heating Characteristics

Heating Characteristic	1. System #1	2. System #2
a. Heating Equipment **Refer to Heating Equipment Codes** **If Code=10, please describe:**	**Heating Code:** — — ___________	**Heating Code:** — — ___________
b. Fuel type (Refer to Fuel Codes) **If Code=09, please describe:**	**Fuel Code:** — — ___________ **Indicate % electric if mix use** — — — % DK R	**Fuel Code:** — — ___________ **Indicate % electric if mix use** — — — % DK R
c. % of all heating ft^2 heated by system	— — — % DK R	— — — % DK R
d. Capacity **If only one number available, put in the OUTPUT slot.**	**# of kBTUh:** ___________ INPUT ___________ OUTPUT DK R	**# of kBTUh:** ___________ INPUT ___________ OUTPUT DK R
e. Number of units	**Enter #:**________ DK R	**Enter #:**________ DK R
f. Age of heating system ***Note average age if system contains different ages of equipment**	________ # of years DK R	________ # of years DK R
g. Record efficiency rating from nameplate	___________ DK R	___________ DK R
h. Record heating equipment model number from nameplate	___________ DK R	___________ DK R
i. System Condition **Refer to System Condition Codes**	**System Condition Code:** — —	**System Condition Code:** — —
i. How often is maintenance performed? **Refer to Maintenance Codes**	**Maintenance Code:** — —	**Maintenance Code:** — —
j. How many months per year does this system run?	___________ **# of months** DK R	___________ **# of months** DK R
k. About how many hours is the heating system run each day it is used? **Refer to Heating Hours Codes**	**Heating Hours Code:** — —	**Heating Hours Code:** — —
l. What is the average set point of the system when in use?	___________ Degrees F DK R	___________ Degrees F DK R
m. What is the average set point of the system during off hours? **If no off hours, circle NA**	___________ Degrees F DK R NA	___________ Degrees F DK R NA
n. What is the heating system balance point if you have one? I.E. is there a specific outdoor temperature that triggers you to switch the building to heating mode?	___________ Degrees F DK R NA OTH	___________ Degrees F DK R NA OTH

Heating Equipment Codes
01: Furnaces that heat air directly, no steam or water
02: Boilers inside the building that produce steam or hot water
03: Packaged heat pumps for heating
04: Rooftop or packaged heating units, other than heat pumps
05 Split heat pump system
06: Individual space heaters, other than heat pumps
07: District steam or hot water piped in from outside the building
08: Unit heaters
09: Radiant heaters
10: Other heating equipment **(Describe)**
97: Don't know
98: Refused to answer
Fuel Codes
01: Electricity
02: Natural Gas
03: Oil
04: Kerosene
05: Bottled Gas or Propane
06: Wood
07: Coal
08: Solar
09: Other **(Describe)**
97: Don't know
98: Refused to answer
System Condition Codes
01: In good condition
02: Needs maintenance/repair
03: Needs replacement
97: Don't know
98: Refused to answer
Maintenance Codes
01: More than once a year
02: Annually
03: Every two years
04: More than two to every five years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer
Heating Hours Codes
01: Less than 4 hours
02: More than 4 hours to 8 hours
03: More than 8 hours to 12 hours
04: More than 12 hours to 16 hours
05: More than 16 hours to 20 hours
06: More than 20 hours
07: Run continuously
97: Don't know
98: Refused to answer
Note: Hours represent # of hours that the system is in active heating mode versus setback mode, but not the actual run time of the equipment.

SH2a. [If GB2b=Yes] Indoor Parking Garage Heating Characteristics

Heating Characteristic	1. System #1	2. System #2
a. Heating Equipment Refer to Heating Equipment Codes If Code=10, please describe:	**Heating Code:** __ __ __________	**Heating Code:** __ __ __________
b. Fuel type (Refer to Fuel Codes) If Code=09, please describe:	**Fuel Code:** __ __ __________ Indicate % electric if mix use __ __ __ % DK R	**Fuel Code:** __ __ __________ Indicate % electric if mix use __ __ __ % DK R
c. % of all indoor parking area heating ft^2 heated by system	__ __ __ % DK R	__ __ __ % DK R
d. Capacity If only one number available, put in the OUTPUT slot.	**# of kBTUh:** __________ INPUT __________ OUTPUT DK R	**# of kBTUh:** __________ INPUT __________ OUTPUT DK R
e. Number of units	**Enter #:**________ DK R	**Enter #:**________ DK R
f. Age of heating system *Note average age if system contains different ages of equipment	________ # of years DK R	________ # of years DK R
g. Record efficiency rating from nameplate	__________ DK R	__________ DK R
h. Record heating equipment model number from nameplate	__________ DK R	__________ DK R
i. System Condition Refer to System Condition Codes	**System Condition Code:** __ __	**System Condition Code:** __ __
i. How often is maintenance performed? Refer to Maintenance Codes	**Maintenance Code:** __ __	**Maintenance Code:** __ __
j. How many months per year does this system run?	__________ **# of months** DK R	__________ **# of months** DK R
k. About how many hours is the heating system run each day it is used? Refer to Heating Hours Codes	**Heating Hours Code:** __ __	**Heating Hours Code:** __ __
l. What is the average set point of the system when in use?	__________ Degrees F DK R	__________ Degrees F DK R
m. What is the average set point of the system during off hours? If no off hours, circle NA	__________ Degrees F DK R NA	__________ Degrees F DK R NA

Heating Equipment Codes
01: Furnaces that heat air directly, no steam or water
02: Boilers inside the building that produce steam or hot water
03: Packaged heat pumps for heating
04: Rooftop or packaged heating units, other than heat pumps
05 Split heat pump system
06: Individual space heaters, other than heat pumps
07: District steam or hot water piped in from outside the building
08: Unit heaters
09: Radiant heaters
10: Other heating equipment **(Describe)**
97: Don't know
98: Refused to answer
Fuel Codes
01: Electricity
02: Natural Gas
03: Oil
04: Kerosene
05: Bottled Gas or Propane
06: Wood
07: Coal
08: Solar
09: Other **(Describe)**
97: Don't know
98: Refused to answer
System Condition Codes
01: In good condition
02: Needs maintenence/repair
03: Needs replacement
97: Don't know
98: Refused to answer
Maintenance Codes
01: More than once a year
02: Annually
03: Every two years
04: More than two to every five years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer
Heating Hours Codes
01: Less than 4 hours
02: More than 4 hours to 8 hours
03: More than 8 hours to 12 hours
04: More than 12 hours to 16 hours
05: More than 16 hours to 20 hours
06: More than 20 hours
07: Run continuously
97: Don't know
98: Refused to answer
Note: Hours represent # of hours that the system is in active heating mode versus setback mode, but not the actual run time of the equipment.

SH3. Are any of the following measures installed at this facility?
[See Guidebook for examples of controls and measures]

Space Heating System	Measure				
	a. Programmable Thermostat	b. Pipe Insulation	d. Hot water reset [Boilers]	e. Heat Recovery from AC	f. Heat Recovery from Refrigeration
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Space Heating System	Measure				
	g. Stack Heat Exchanger	h. Air-Side Heat Recovery systems	i. Electronically commutated motors [located on furnace fans]	j. Demand Controlled Ventilation	k. VSDs for pumps
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

SH3a. [If GB2b=Yes] Are any of the following measures installed at this facility's indoor parking garage?

Space Heating System	Measure				
	a. Programmable Thermostat	b. Pipe Insulation	d. Hot water reset [Boilers]	e. Heat Recovery from AC	f. Heat Recovery from Refrigeration
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Space Heating System	Measure				
	g. Stack Heat Exchanger	h. Air-Side Heat Recovery systems	i. Electronically commutated motors [located on furnace fans]	j. Demand Controlled Ventilation	k. VSDs for pumps
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

WATER HEATING

WH1. Does this building contain water heating equipment?

1. o Yes	
2. o No	**Skip to RF1**
97. o Don't know	**Skip to RF1**
98. o Refused to answer	**Skip to RF1**

WH2. Water heater characteristics

Water Heater System	a. % of all capacity	b. Water Heater Type Refer to Water Heater Type Codes If Code=07, Please describe:	c. Fuel Type Refer to Fuel Codes If Code=10, describe:	d. Tank Insulation?	e. Pipe Insulation?	f. Pipe Insulation Feasible?	g. Demand Controlled Circulating System?
1. WH #1	___ % DK R	1. Water Heater Type Code: __ __ ____________ 2. If Code =01, high efficiency EF=.93)? Y N DK R	Fuel Code: __ __ ____________ If mix use including electric, indicate % electric __ __ __ % DK R	Y N DK R	Y N DK R	Y N DK R	Y N DK R
2.WH #2	___ % DK R	1. Water Heater Type Code: __ __ ____________ 2. If Code =01, high efficiency EF=.93)? Y N DK R	Fuel Code: __ __ ____________ If mix use including electric, indicate % electric __ __ __ % DK R	Y N DK R	Y N DK R	Y N DK R	Y N DK R

Water Heater Type Codes	
01: Traditional water heater 02: Instantaneous (tankless) 03: Condensing boiler 04: Heat pump water heater 05: Solar water heater 06: Geothermal heat pump	07: Other **(Describe)** 97: Don't know 98: Refused to answer

Fuel Codes	
01: Electric 02: Natural gas 03: Oil 04: Kerosene 05: District steam 06: District hot water	07: Wood 08: Coal 09: Solar 10: Other **(Describe)** 97: Don't know 98: Refused to answer

WH3. How many sinks are in the building space?

Enter # of sinks: ____________________	**IF WH3=0, SKIP TO WH4**
9999997. o Don't know	**SKIP to WH4**
9999998. o Refused to answer	**SKIP to WH4**

WH3a. How many low-flow faucet aerators are installed on these sinks?

[Low-flow is less than 2.5 gallons per minute]

Enter # of low-flow faucet aerators: __________ DK R

WH3b. How many pre-rinse spray valves are installed on these sinks?

Enter # of pre-rinse spray valves: ______________ DK R

WH4. Is drain water heat recovery used?

1. o Yes	3. o Other Describe: __________________	97. o Don't Know
2. o No		98. o Refused to Answer

REFRIGERATION / FREEZERS

Non-Commercial Refrigerators/Freezers

RF1. Does this facility have non-commercial refrigeration or freezer equipment?

1. o Yes	
2. o No	**Skip to RF3**
97. o Don't know	**Skip to RF3**
98. o Refused to answer	**Skip to RF3**

RF2. Are there any of the following non-commercial refrigerators or freezers?

Equipment Description	a. Quantity	b. # Energy Star [Skip if Quantity = 0, DK or R]
1. Compact Refrigerator	Enter #: ______ DK R	Enter #: ______ DK R
2. Standard Refrigerator	Enter #: ______ DK R	Enter #: ______ DK R
3. Stand-alone Freezer	Enter #: ______ DK R	Enter #: ______ DK R
4. Other (Describe :____________________)	Enter #: ______ DK R	Enter #: ______ DK R

Commercial Refrigerators/Freezers

RF3. Does this facility have commercial refrigeration or freezer equipment?

1. o Yes	
2. o No	**Skip to Cook1**
97. o Don't know	**Skip to Cook1**
98. o Refused to answer	**Skip to Cook1**

RF4. What percent of floor space is devoted to activities that use commercial refrigeration (e.g., cafeteria, restaurant, quick-mart, etc.)? [Include both kitchen and dining area for food service activities]

Enter % sq ft:	**IF 0, SKIP to Cook1**
997. o Don't know	**Skip to Cook1**
998. o Refused to answer	**Skip to Cook1**

RF5. Are there any of the following commercial refrigerators or freezers?

Refrigeration Equipment Description	a. Refrigerator Type Refer to Refrigeration Type Codes	b. Total quantity of self-contained units [Skip if Type = 02, DK or R]	c. # Energy Star (self-contained units only) [Skip if Quantity = 0, DK or R]	d. Total Length (ft) of built-up systems [Skip if Type = 01, DK or R]	e. Refrigeration Lighting Refer to Refrigeration Lighting Codes [Select all that apply]
1. Glass Door Reach-In Refrigerator	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
2. Glass Door Reach-In Freezer	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
3. Solid Door Reach-In Refrigerator	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
4. Solid Door Reach-In Freezer	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
5. Glass door beverage cases (e.g. vendor supplied) from 2 to 4 doors	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
6. Open upright display cases (pizza, juice, etc.) usually 4,5,6 ft lengths	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
7. Island cases (cheese, sometimes produce or juice) from 8 to 16 ft long	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
8. Service cases (bakery, sometimes deli) from 4 to 8 ft long	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
9. Closed door storage cabinets (e.g. backbar storage cabinet for wine & beer)	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
10. Coffin type glass top freezer cases (usually ice cream) typically 6 or 8 ft	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
11. Ice storage boxes	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________
12. Walk-in coolers/freezers or cooled prep areas	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter sq ft: ______ DK R	Refrig. Lighting Codes: ________
13. Other (Describe:________________)	Refrig. Type Codes: ________	Enter #: _______ DK R	Enter #: _______ DK R	Enter ft: ________ DK R	Refrig. Lighting Codes: ________

Refrig. Lighting Codes
01: Self-contained system—used in food service
02: Built-up system—e.g. supermarket systems
03: Both self-contained system and built-up system
97: Don't know
98: Refused to answer

Refrig. Lighting Codes
01: LED
02: T8
03: T5
04: Other (Describe)
97: Don't know
98: Refused to answer

RF6. Are any of the following Refrigeration measures installed?

Refrig. System Refer to Refrig. Equipment Codes	Measure				
	a. Strip curtains for walk-ins	b. Night covers for display cases	c. Electronically Commutated Motors (ECM)	d. Evaporator fan controller for walk-ins	e. Efficient compressor
1. System #1 Ref. Equip. Code #s: ________	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R
2. System #2 Ref. Equip. Code #s: ________	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R

Refrig. System Refer to Refrig. Equipment Codes	Measure				
	f. Heat recovery	g. Compressor VSDs	h. Floating head pressure controls	i. Demand hot gas defrost	j. Demand electric defrost
1. System #1 Ref. Equip. Code #s: ________	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R
2. System #2 Ref. Equip. Code #s: ________	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R

Refrig. System Refer to Refrig. Equipment Codes	Measure				
	k. Anti-sweat (humidistat) controls	l. High R-Value Glass Doors	m. Oversized Air-Cooled Condenser	n. Multiplex compressors	o. LED lighting
1. System #1 Ref. Equip. Code #s: ________	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R
2. System #2 Ref. Equip. Code #s: ________	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R	Inst: Y N DK R Feas: Y N DK R

Refrig. Equipment Codes
1: Glass Door Reach-In Refrigerator
2: Glass Door Reach-In Freezer
3: .Solid Door Reach-In Refrigerator
4: Solid Door Reach-In Freezer
5: Glass door beverage cases
6: Open upright display cases
7: Island cases
8: Service cases
9: Closed door storage cabinets
10: Coffin type glass top freezer cases
11: Ice storage boxes
12: Walk-in coolers/freezers or cooled prep areas
13: Other
97: Don't know
98: Refused to answer

COOKING EQUIPMENT

Cook1. Does this building contain commercial cooking equipment?

1. o Yes	
2. o No	**SKIP TO Vend1**
97. o Don't know	
98. o Refused to answer	**SKIP TO Vend1**

Cook2. What percent of the cooking equipment is electric?

1. **Enter Percent:** _ _ _%
97. o Don't know
98. o Refused to answer

Cook3. How many of the following pieces of electric cooking equipment are used at this location?

Electric Equipment Description	**a. Quantity**	**b. # Energy Star** **[Skip if Quantity = 0, DK or R]**
1. Fryer	**Enter #:** _______ **DK R**	**Enter #:** _______ **DK R**
2. Steamer	**Enter #:** _______ **DK R**	**Enter #:** _______ **DK R**
3. Convection Oven	**Enter #:** _______ **DK R**	**Enter #:** _______ **DK R**
4. Hot Food Holding Cabinet	**Enter #:** _______ **DK R**	**Enter #:** _______ **DK R**

Cook4. How many of the following pieces of gas cooking equipment are used at this location?

Gas Equipment Description	**a. Quantity**	**b. # Energy Star** **[Skip if Quantity = 0, DK or R]**
1. Fryer	**Enter #:** _______ **DK R**	**Enter #:** _______ **DK R**
2. Steamer	**Enter #:** _______ **DK R**	**Enter #:** _______ **DK R**
3. Convection Oven	**Enter #:** _______ **DK R**	**Enter #:** _______ **DK R**
4. Hot Food Holding Cabinet	**Enter #:** _______ **DK R**	**Enter #:** _______ **DK R**

VENDING MACHINES

Vend1. How many refrigerated vending machines are at this location?

Enter # of machines: ________________	**If 0, Skip to Vent1**
9999997. o Don't know	**Skip to Vent1**
9999998. o Refused to answer	**Skip to Vent 1**

Vend2. How many of these have vending miser controls?

[Vending miser controls are an energy efficiency product for vending machines that manages the power consumption of a vending machine.]

Enter # of machines with miser controls: ___________ DK R

Vend3. Of vending machines with miser controls how many are still functioning?

Enter # of machines with functioning miser controls: ___________ DK R

Vend4. How many vending machines have had miser controls removed?

Enter # of machines with miser controls removed: ___________ DK R

VENTILATION

Vent1. Does this facility have ventilation equipment?

1. o Yes	
2. o No	**Skip to OE1**
97. o Don't know	**Skip to OE1**
98. o Refused to answer	**Skip to OE1**

Vent2. Ventilation Characteristics

Fan Motor #	a. Fan Motor hp	b. Quantity [Skip if Fan Motor hp = 0, DK or R]
1. Fan Motor System #1	**Enter hp:** _________ **DK R**	**Enter #:** _______ **DK R**
2. Fan Motor System #2	**Enter hp:** _________ **DK R**	**Enter #:** _______ **DK R**
3. Fan Motor System #3	**Enter hp:** _________ **DK R**	**Enter #:** _______ **DK R**

Maintenance Codes	
01: More than once a year 02: Annually 03: Every 2 years 04: More than 2 years to every 5 years 05: More than 5 years	06: As needed 07: Never 97: Don't know 98: Refused to answer

Vent3. Are any of the following ventilation measures installed?

Measure	a. Premium efficiency fan motors	b. VSD Fans	c. Air Handler Optimization	d. Demand Control Ventilator	e. Electronically Commutated Motor (ECM)
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
3. System #3	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

AUXILLARY EQUIPMENT

	1. System #1	2. System #2	3. System #3
Equipment Type:			
Number of Units:			
Size/Input/Rated Amps/Other			
Average Operating Hours/week			
Average Age of Equipment:			

OFFICE EQUIPMENT

OE1. Does this facility have office equipment?

1. o Yes	
2. o No	**End Survey**
97. o Don't know	**End Survey**
98. o Refused to answer	**End Survey**

OE2. How many desktop computers are used in this facility?
[Estimates are fine if exact numbers are difficult to obtain]

Enter # of computers: ___________	**Skip to OE4 if 0**
9999997. o Don't know	**Skip to OE4**
9999998. o Refused to answer	**Skip to OE4**

OE2a. What percentage of the desktop computers are Energy Star rated?

Enter % of desktop computers that are Energy Star rated: _________ DK R

OE3. How many desktop CRT monitors are there?

Enter # of CRT monitors: ___________	**Skip to OE4 if 0**
9999997. o Don't know	**Skip to OE4**
9999998. o Refused to answer	**Skip to OE4**

OE3a. What percentage of desktop CRT monitors are Energy Star rated?

Enter % of CRT monitors that are Energy Star rated: _________ DK R

OE3b. What percentage of desktop CRT monitors are power management enabled?

Enter % of CRT monitors that are power management enabled: _________ DK R

OE4. How many desktop LCD monitors are there? Include separate LCD monitors used for laptops.

Enter # of LCD monitors: ___________	**Skip to OE5 if 0**

9999997. o Don’t know	**Skip to OE5**
9999998. o Refused to answer	**Skip to OE5**

OE4a. What percentage of the LCD monitors are Energy Star rated?

Enter % of LCD monitors that are Energy Star rated: _________ DK R

OE4b. What percentage of desktop LCD monitors are power management enabled?

Enter % of LCD monitors that are power management enabled: _________ DK R

OE5. **How many laptop computers are used at this facility?**
[Don't count laptops used with docking stations and monitors]

Enter # of laptops: ___________	**Skip to OE5 if 0**
9999997. o Don't know	**Skip to OE5**
9999998. o Refused to answer	**Skip to OE5**

OE5a. **What percentage laptops are Energy Star rated?**

Enter % of laptops that are Energy Star rated: _________ DK R

OE5. **How many copiers are used at this facility?**
[This includes copiers, printers, fax machines etc.]

Enter # of office machines: ___________	**Skip to OE6 0**
9999997. o Don't know	**Skip to OE6**
9999998. o Refused to answer	**Skip to OE6**

OE5a. **What percentage of copiers are Energy Star?**

Enter % of Energy Star multifunction machines: ___________ DK R

OE5b. **What percentage of copiers are power management enabled?**

Enter % of copiers that are power management enabled: _________ DK R

OE6. **How many laser printers are used at this facility?**
[This includes copiers, printers, fax machines etc.]

Enter # of office machines: ___________	**Skip to OE7 if 0**
9999997. o Don't know	**Skip to OE7**
9999998. o Refused to answer	**Skip to OE7**

OE6a. **What percentage of laser printers are Energy Star?**

Enter % of Energy Star multifunction machines: ___________ DK R

OE6b. **What percentage of laser printers are power management enabled?**

Enter % of laser printers that are power management enabled: _________ DK R

OE7. **Is there a data center at this facility?**

1. o Yes	2. o No	97. o Don't know	98. o Refused to answer

NOTES:

K. Appendix K: Industrial On-Site Surveys

2011 Minnesota Market Potential Assessment

Industrial On-Site Research Report

Xcel Energy Services, Inc
Contract Number: 322733
Prepared by KEMA Inc
Oakland, March 7, 2012

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1. Introduction

KEMA conducted an inventory of energy use at Xcel Energy Minnesota (Xcel Energy MN) industrial customer facilities to provide input for the analysis of the potential for energy efficiency savings. KEMA and Xcel Energy staff worked collaboratively to develop a comprehensive instrument to categorize and record all energy-using equipment and systems at customers' sites, a recruitment script and supporting materials, and a sample design; and to inform Xcel Energy staff and customers of this effort. KEMA energy professionals visited a representative sample of 50 industrial customer sites, and collected data to the extent permitted by the time constraints imposed by the customer. Electronic data collection tools were used to ensure accuracy and consistency of the data, which was then statistically analyzed to provide direct inputs, or the basis for calibration of secondary source inputs, to KEMA's DSM Assyst™ potential modeling tool. These inputs were reviewed, and modified where necessary, by Xcel Energy staff. This appendix provides a summary of the results of this research.

2. Sample Design

KEMA utilized billing system data provided by Xcel Energy staff to develop the sample design. Before selecting the sample, the industrial population was screened to eliminate customers with annual usage below 50,000 kWh and too few or too many billing days (90 and 400 days were utilized), and customers with the do not contact flag. (The screening process eliminated about 3.3% of the industrial kWh.) In addition, accounts were aggregated up to a "site" based on duplication of service address and the first four letters in the customer name.

Finally, each business type was broken into size categories, based on annual kWh such that there was an approximately equal distribution of kWh between the size categories, although this distribution was not as even as for the commercial sector due to fact that large industrial facilities tended to dominate some business types. The adjusted sample was then allocated fairly evenly to each size category within a business type (except when there were not enough sites in a large category to allow for the target sample).

The following table presents the size-based samples. The table shows the number of sites minimum, average, and maximum, and total kWh for each group, and the adjusted sample size for each group.

The following table shows the distribution of accounts and kWh across industrial categories captured by this data, the sample, number of completes, and sample weighting. A proportionate sample (based on kWh) assigns too few sample points to some business types and too many difficult-to-attain sample points to others, so the sample was adjusted. The adjustment process took into account the number of available sites when looking at a segment to adjust downward. (Note due to sample size limitations, results at the business type level are not be very robust, and hence we mainly relied on the results at the industrial-type level, which distinguishes between assembly and process industries.)

Business Type	Size	Sites	Min MWh	Average MWh	Max MWh	Total MWh	Adjusted Sample	Completed Survey	Sample Weights
Chemicals	Small	146	50.1	951.6	8,673.1	138,928.7	2	2	116.80
Chemicals	Medium	7	8,946.9	34,289.3	100,229.0	240,025.4	1	1	49.84
Chemicals	Large	1	205,903.8	205,903.8	205,903.8	205,903.8	1	0	NA
Electronics	Small	201	50.9	394.2	2,367.5	79,224.7	1	1	612.76
Electronics	Medium	20	2,751.9	5,700.4	17,465.6	114,008.8	2	2	12.66
Electronics	Large	3	32,982.6	42,160.3	51,681.5	126,481.0	1	1	2.4
Fabricated Metals	Small	304	51.0	483.3	2,414.3	146,921.2	1	1	1222.62
Fabricated Metals	Large	25	2,424.4	6,013.5	27,901.3	150,337.7	1	1	53.72
Ind Machinery	Small	509	50.3	455.6	4,199.1	231,875.2	2	2	1692.07
Ind Machinery	Large	18	4,753.9	12,904.1	47,309.6	232,274.1	2	2	13.71
Ind Misc	Small	333	50.1	594.9	4,745.2	198,114.7	2	2	285.87
Ind Misc	Large	16	5,739.3	13,054.8	27,070.7	208,876.4	1	1	18.2
Plastics	Small	177	51.2	1,206.7	6,704.4	213,585.8	1	1	1299.42
Plastics	Large	17	6,794.7	13,001.6	33,353.7	221,026.9	2	2	1.63
Primary Metals	Small	88	50.5	1,573.2	10,939.4	138,441.7	1	2	27.24
Primary Metals	Medium	7	10,979.1	25,987.1	88,357.7	181,909.4	1	1	29.49
Primary Metals	Large	1	247,644.3	247,644.3	247,644.3	247,644.3	1	0	NA
Printing	Small	305	50.0	570.6	5,945.3	174,026.8	2	2	468.65
Printing	Large	12	5,988.8	15,118.3	28,668.1	181,419.3	1	1	14.05
Textiles	Small	45	50.1	135.6	378.4	6,101.6	1	1	105.17
Textiles	Large	6	449.6	3,077.8	10,068.0	18,466.8	1	0	NA
Transp Equip	Small	77	50.2	362.2	3,000.7	27,890.7	1	1	88.98
Transp Equip	Large	7	3,634.6	13,677.7	55,524.2	95,743.6	1	2	1.57
Food	Small	216	52.4	1,084.2	8,981.3	234,182.6	4	4	28.32
Food	Medium	26	8,991.0	15,291.5	26,830.2	397,579.1	2	2	10.57
Food	Large	6	29,338.9	53,841.4	120,840.0	323,048.3	1	1	9.9
Paper	Small	78	58.0	1,180.7	5,278.3	92,095.6	2	2	33.51
Paper	Medium	11	5,320.8	6,988.6	10,251.2	76,874.8	1	1	11.56
Paper	Large	2	106,133.8	109,221.4	112,309.0	218,442.7	1	1	2.06
Petroleum	Small	18	50.3	2,071.1	21,138.8	37,280.6	2	4	358.79
Petroleum*	Large	1	1,037,355.8	1,037,355.8	1,037,355.8	1,037,355.8	1	0	NA
Stone-Clay-Glass	Small	79	51.4	657.0	9,519.9	51,902.4	1	1	55.36
Stone-Clay-Glass	Medium	3	23,659.2	26,935.9	31,313.6	80,807.7	1	1	3.13
Stone-Clay-Glass	Large	1	89,978.5	89,978.5	89,978.5	89,978.5	1	1	1
Wood	Small	145	50.2	282.4	1,424.7	40,946.0	1	1	277.25
Wood	Medium	14	1,435.9	3,193.4	7,918.8	44,707.3	1	2	11.29
Wood	Large	1	78,872.7	78,872.7	78,872.7	78,872.7	1	0	NA

3. Results Summary

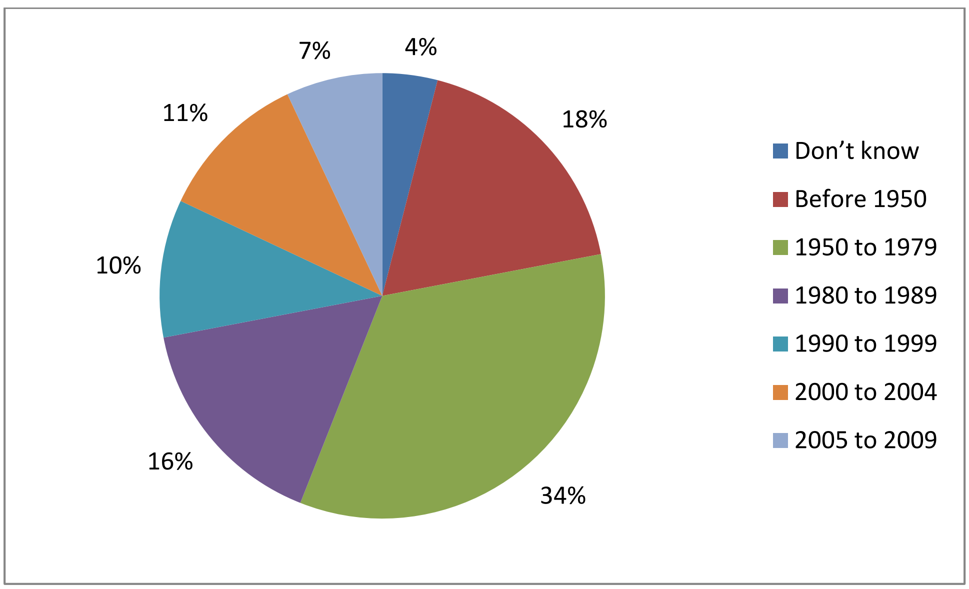
This section presents the summary results of the Minnesota industrial on-site surveys that were conducted in the spring of 2011. The survey results are weighed to the Xcel Energy Minnesota customer population, and results in this report are presented as percentages of the industrial population.

3.1 General Building Characteristics

3.1.1 Age of construction

The following figure shows year of construction for all industrial facilities in Xcel Minnesota's service territory. The percentages are based on electricity consumption, so the chart below show that buildings accounting for 34% of all industrial energy use were built between 1950 and 1975. Just over half of all industrial energy use occurs in facilities were built before 1980.

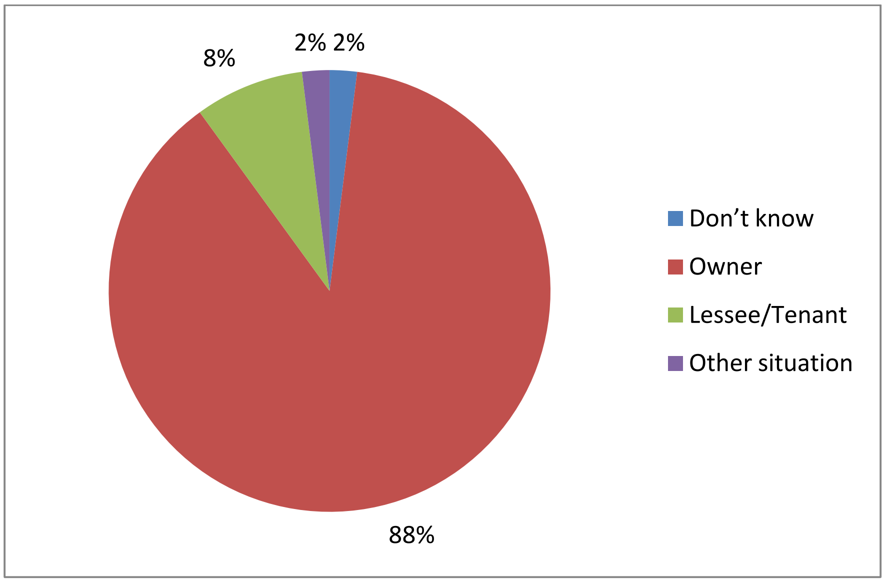
Figure 1: Industrial Building Age



3.1.2 Ownership Status

Figure 2 shows that 88 percent of industrial kWh are consumed by facilities that are operated by the owner of the facility. Thus most of the industrial customers have both the motivation and authority to implement energy efficiency measures.

Figure 2: Ownership Status



3.1.3 Operating hours

Buildings accounting for approximately 77% of electricity use the service territory are operating more than 40 hours a week, with 30% of electricity use occurring at facilities in use 24 hours a day, 7 days a week.

Table 1: Operating Hours across all Industrial Buildings by Week

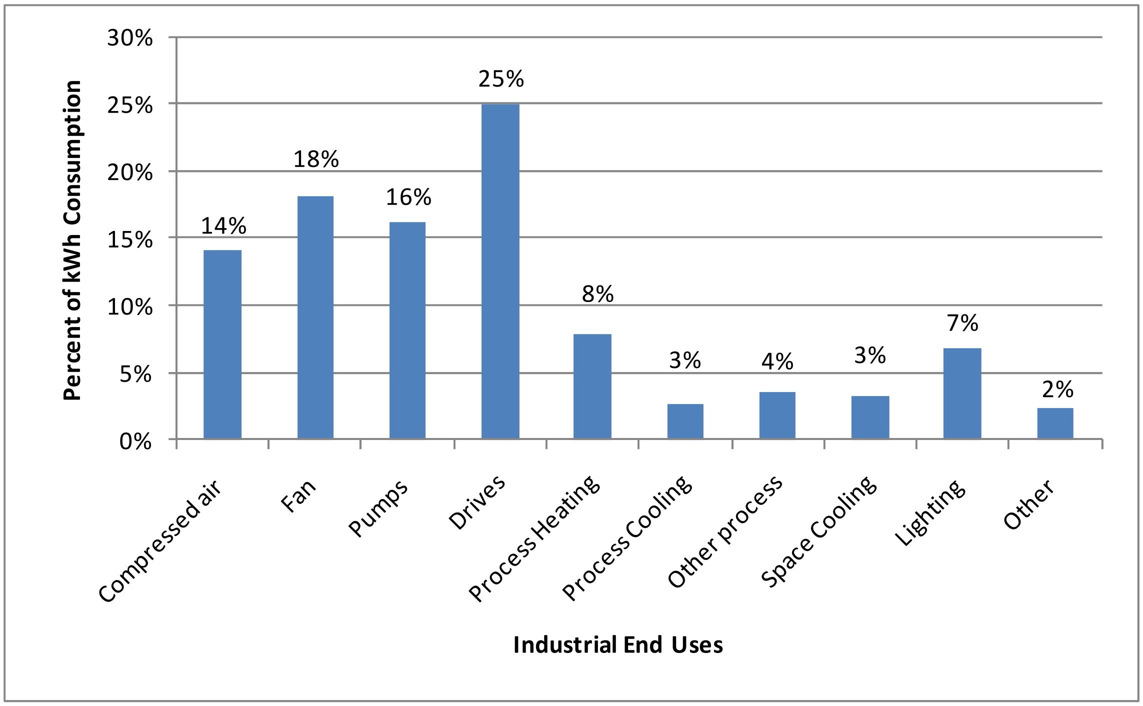
Hours of Operation	Percent of Energy Use
Don't Know	5%
12-40hrs	23%
41-60	27%
61-90	10%
100-144	5%
168	30%

3.2 End Use Summary

Industrial buildings house a wide variety of energy-intensive end uses. This section begins with an overview of the end uses and follows with a description of the survey results for each end use.

In this study, KEMA found that motor-driven processes such as compressed air, fans, pumps, and drives, account for the majority of industrial electricity consumption (73%). At the end-use level the largest consumers are industrial drives (25%) and industrial fans (18%). In the Xcel Energy MN service territory, combined, miscellaneous end uses and process and space cooling account for less than 10% of overall electricity consumption.

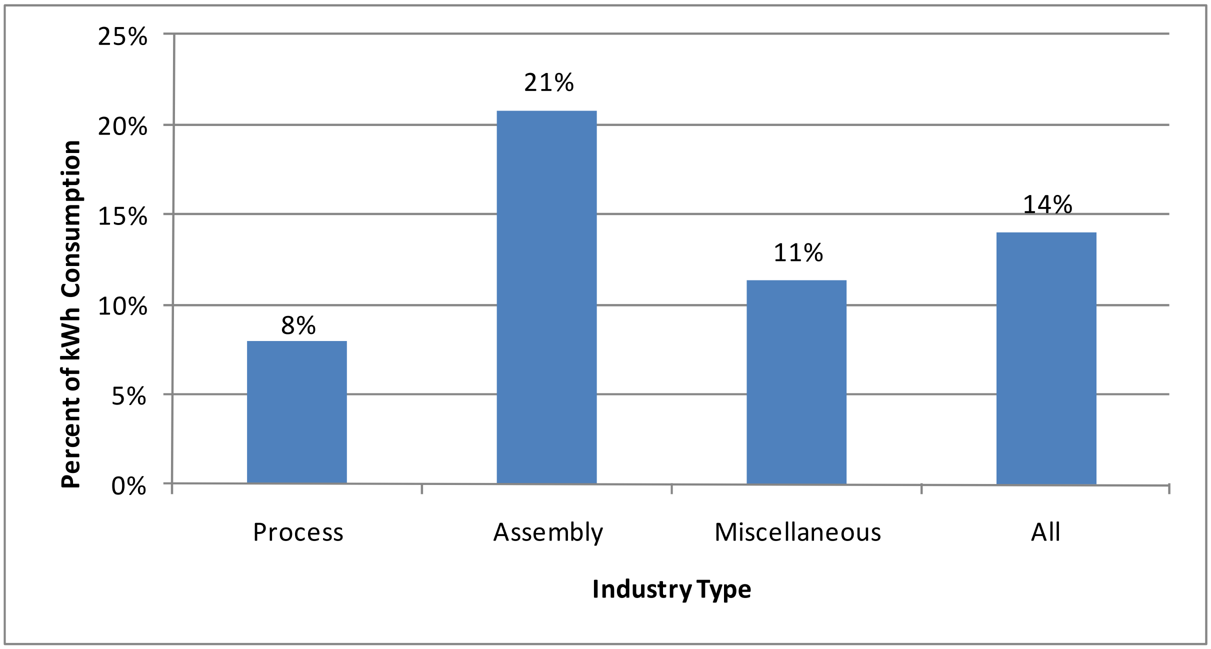
Figure 3: End Use Summary for Industrial Facilities



3.3 Compressed Air

Compressed air is one of the largest end uses in terms of electricity consumption. As shown in the following figure, compressed air accounts for 14 percent of electricity consumption at all industrial facilities in Xcel Minnesota's service territory. More specifically, compressed air accounts for 8 percent of electricity consumption at process industrial facilities, 21 percent of electricity consumption at assembly industrial facilities, and 11 percent of electricity consumption at miscellaneous industrial facilities.

Figure 4: Percent of kWh Consumption from Compressed Air



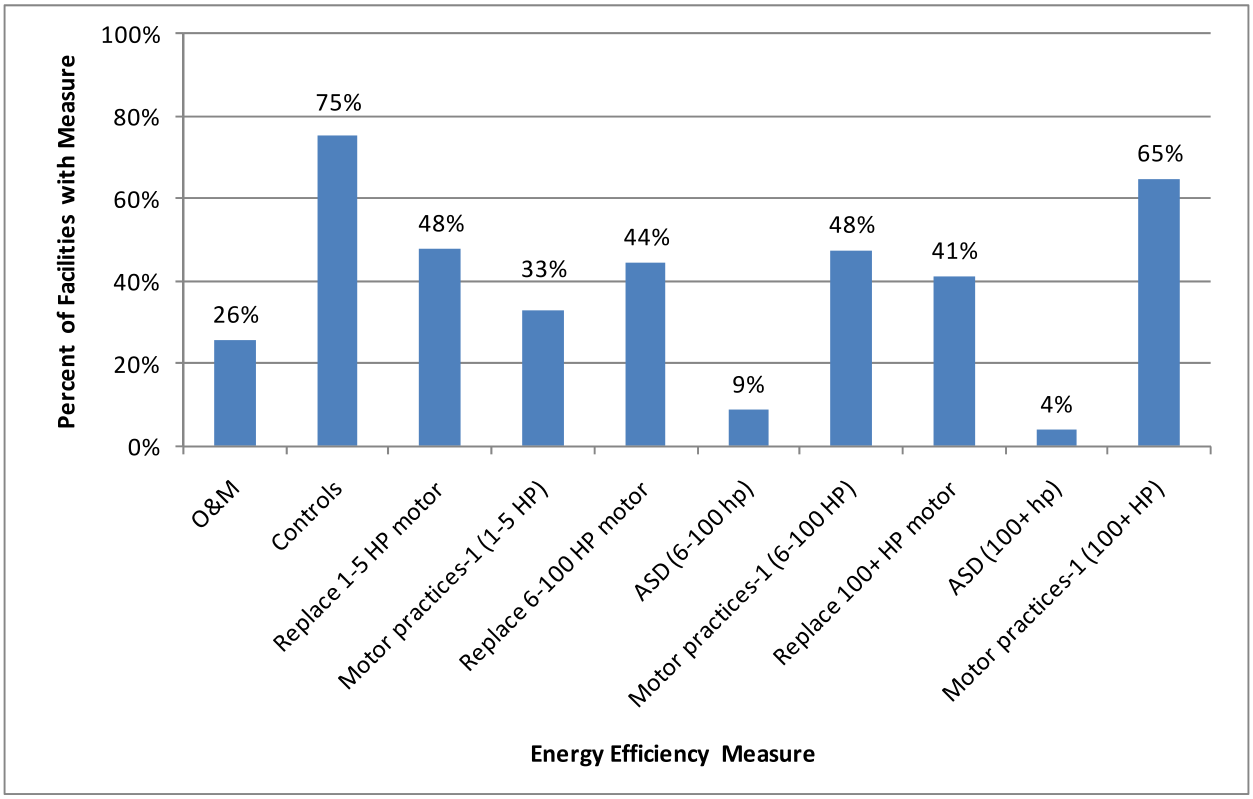
The following figure shows the percent of facilities that installed various energy efficiency measures on their compressed air systems. Overall, 75 percent of facilities have installed controls on one or more of their compressed air systems and 26 percent engage in operation and maintenance practices. By adding controls to the compressed air systems, unneeded compressors will be shut off or delayed until needed.

Fewer than half of the sites with compressed air systems have replaced one or more of their compressor motors with high efficiency motors. Forty-eight percent of facilities with 1-5 horsepower motors have replaced one or more of their compressed air system motors with high efficiency motors. Likewise, 33 percent of facilities with 6-100 horsepower compressed air motors have replaced one or more with high efficiency motors, and 48 percent of facilities with 100+ horsepower motors have replaced one or more of the motors with a high efficiency equivalent.

A small percent of facilities with compressed air have installed adjustable speed drives on their systems. KEMA found that no adjustable speed drives were installed on compressed systems with 1-5 horsepower motors. Only 9 percent of facilities with 6-100 horsepower motors and 4 percent of facilities with 100+ horsepower motors have installed adjustable speed drives.

Better motor practices are a more common efficiency strategy for motors of all sizes. Thirty-three percent of facilities with 1-5 horsepower motors, 44 percent of facilities with 6-100 horsepower motors and 65 percent of facilities with 100+ horsepower motors have engaged in better motor practices. This strategy refers to practicing proper motor maintenance to prevent unexpected downtime of motors and ensure a motor is replaced before shutdown.

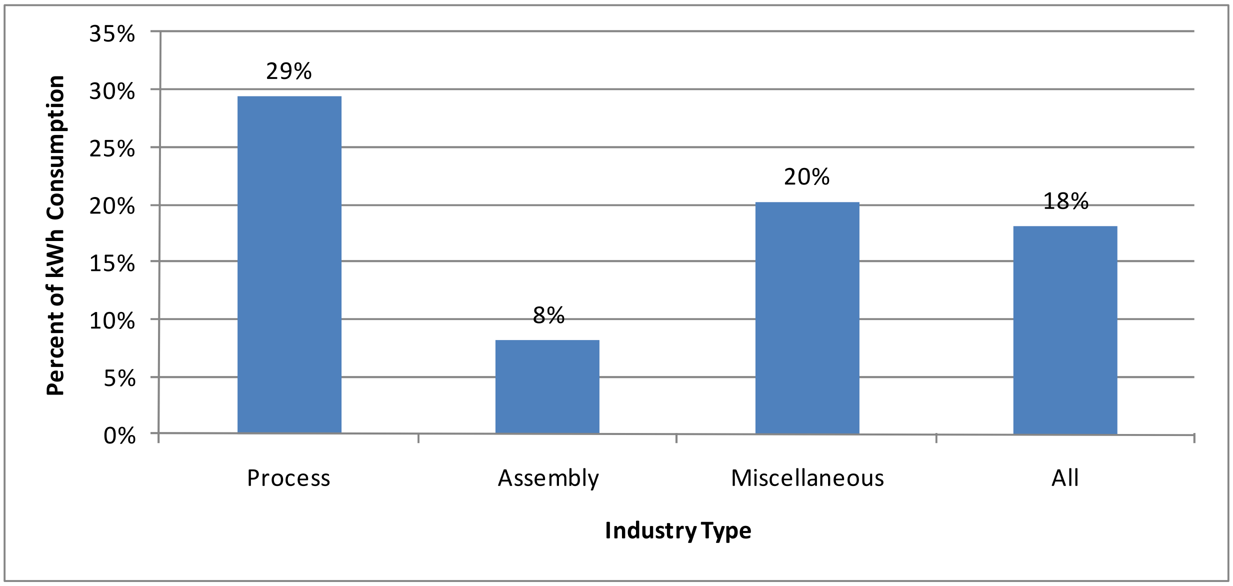
Figure 5: Percent of Facilities with Compressed Air Energy Efficiency Measures Installed



3.4 Fans

Figure 6 shows that industrial fan systems account for 18 percent of electricity consumption at all industrial facilities. Fan systems account for 29 percent of electricity consumption at process industrial facilities, 8 percent at assembly plants, and 20 percent at miscellaneous industrial facilities.

Figure 6: Percent of kWh Consumption from Fan Systems



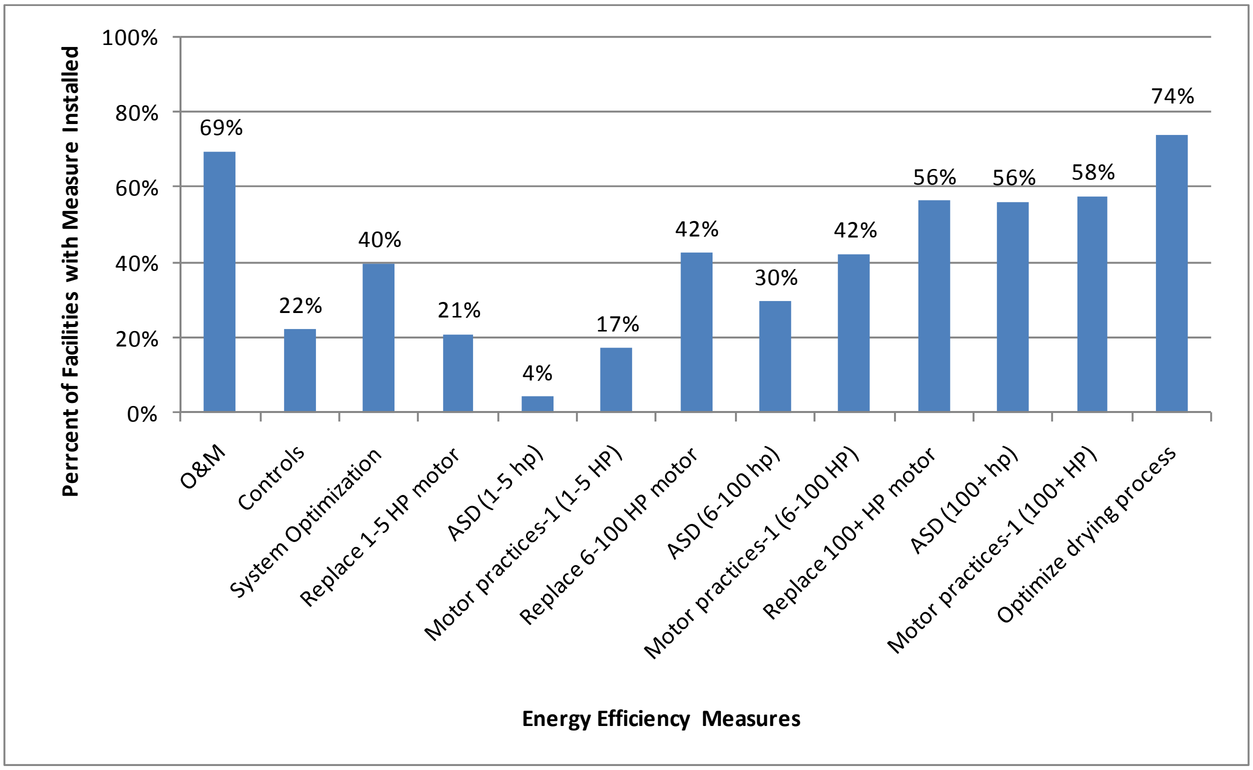
The next figure shows the percent of facilities that have installed various energy efficiency measures on one or more of their fan systems. Overall, 69 percent of facilities with fan systems engage in operation and maintenance practices for these systems, 22 percent have installed controls on one or more of their systems, and 40 percent have optimized the systems. System optimization includes reviewing the system and reducing fan sizing as needed. Seventy-four percent of facilities that have fan systems used for drying processes have reviewed and optimized these processes.

Twenty-one percent of facilities with 1-5 horsepower fan motors have replaced one or more of these motors with high efficiency motors. A larger percentage of facilities with 6-100 horsepower motors, 48 percent, have replaced one or more of these motors with high efficiency motors, followed by 56 percent of facilities with 100+ horsepower motors.

More facilities with drive systems have installed adjustable speed drives on their fan systems than compressed air systems. Four percent of applicable facilities have installed an adjustable speed drive on 1-5 horsepower motor fan systems, while 30 percent of facilities with 6-10 horsepower fan motors and 56 percent with100+ horsepower fan motors have installed adjustable speed drives.

A smaller percentage of facilities with 1-5 horsepower motors engage in better motor practices (17%) than facilities with larger fan motors. Of facilities with 6-100 horsepower fan motors, 42 percent practice better motor maintenance as do 58 percent of those with 100+ horsepower fan motors.

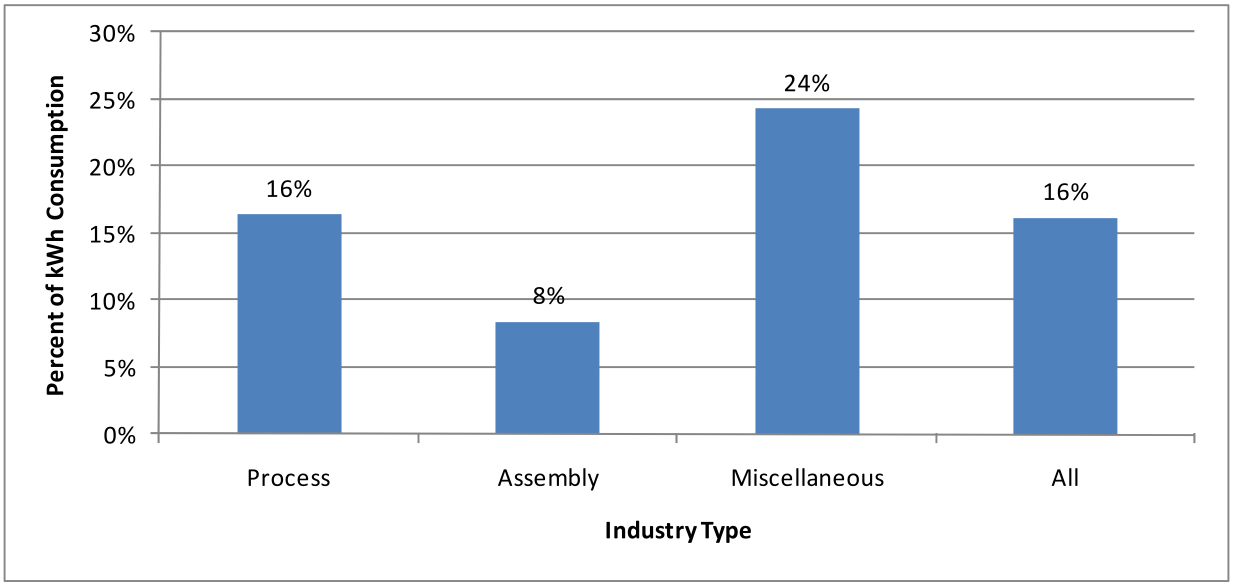
Figure 7: Percent of Energy Efficiency Measures Installed for Fan Systems



3.5 Pumps

KEMA found that pumps account for 16 percent of electricity consumption at all industrial facilities. At process industrial facilities, pumps account for 16 percent of total electricity consumption. At assembly industrial facilities, pumps are only 8 percent of the annual electricity consumption and at miscellaneous they are 24 percent.

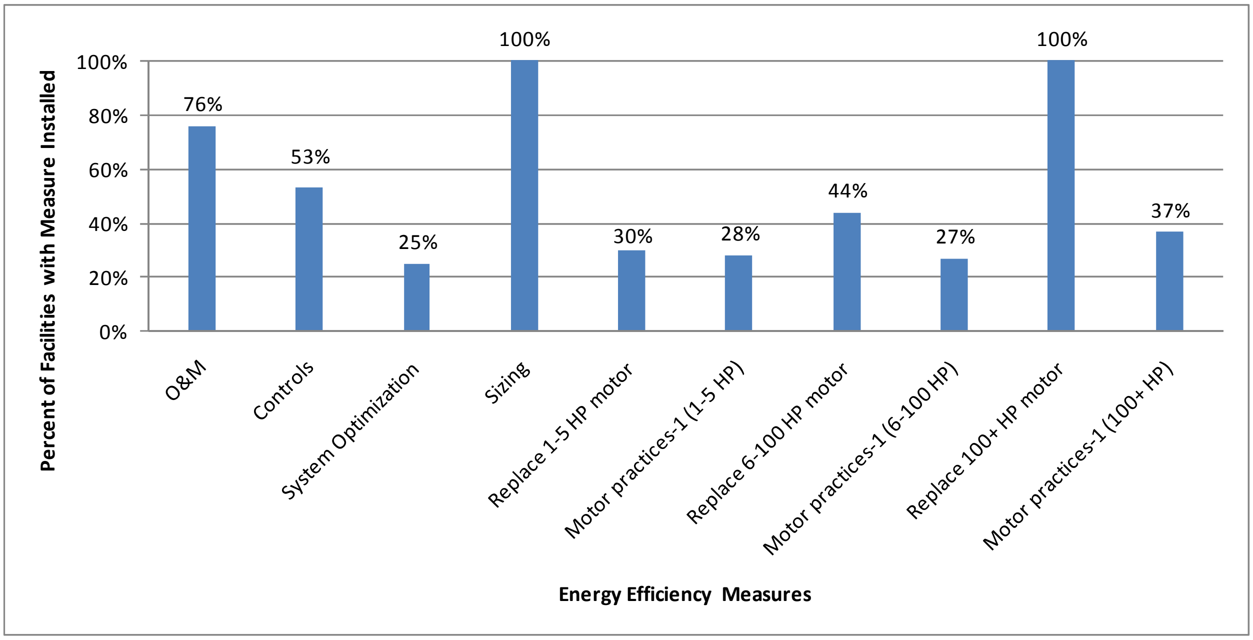
Figure 8: Percent of kWh Consumption from Pumps



Of the facilities with pumping systems, 100 percent reviewed their systems for proper pump sizing and replaced oversized pumps as needed. KEMA also found that 76 percent of facilities with pumping systems engage in operation and maintenance practices, 53 percent have installed controls on one or more of their pumping systems, and 25 percent have conducted system optimization reviews.

A larger percentage of facilities have replaced pump system motors with energy efficient motors than have engaged in better motor practices for these systems. Of facilities with 1-5 horsepower pump motors, 30 percent have replaced these motors while 28 percent engage in better motor practices. Likewise, 44 percent of facilities with 6-100 horsepower motors have installed more efficient pump motors of this size, compared to 28 percent who engage in better motor practices. Finally, 100 percent of facilities with pump motors larger than 100 horsepower have replaced one or more of these motors with an energy efficient replacement, but only 37 percent actively engage in better motor practices for these systems.

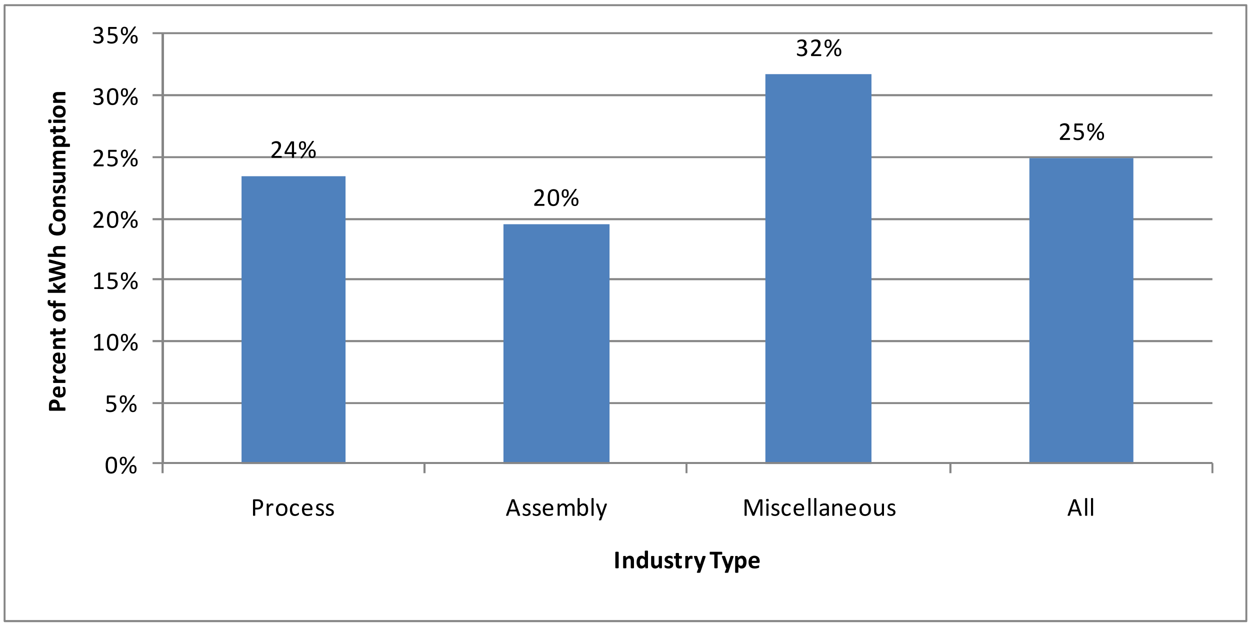
Figure 9: Percent of Energy Efficiency Measures Installed for Pumps



3.6 Drives

KEMA found that process drives account for 25 percent of electricity consumption across all industrial facilities. Further broken down, drives are 20 percent of annual electricity consumption in process industrial facilities, 20 percent in assembly facilities, and 32 percent in miscellaneous facilities. This end use includes all process drives except those used in compressed air, pumping, and fan systems.

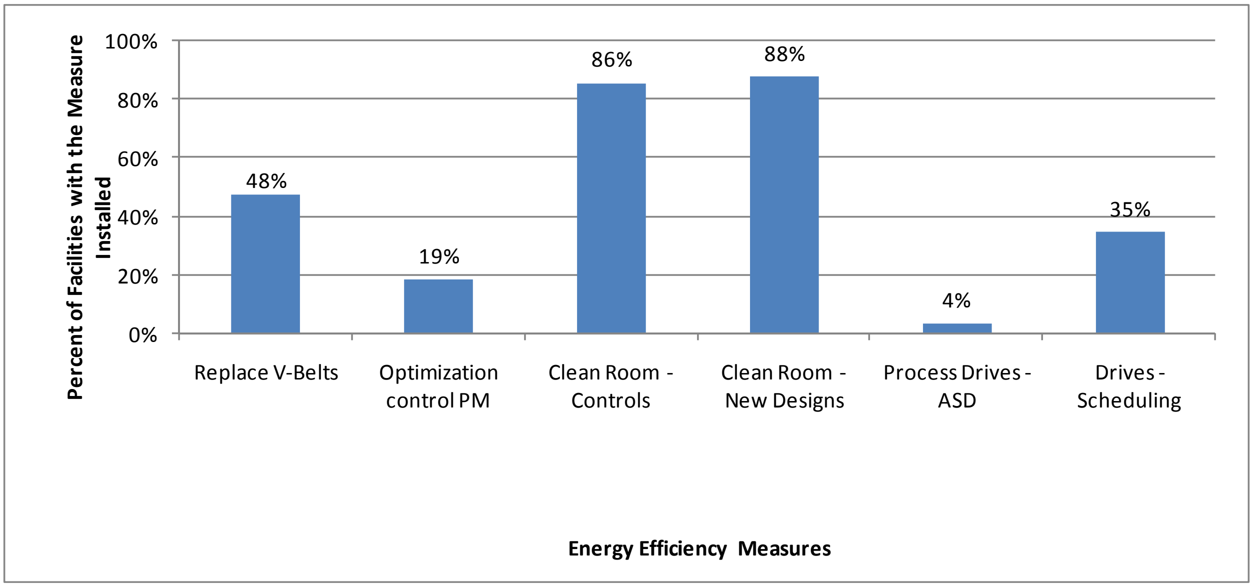
Figure 10: Percent of kWh Consumption from Drives



Industrial drives can be used for a large variety of processes, and as such, there are numerous energy efficiency measures and strategies that can be applied to process drives. Many of these are unique to the various processes a drive is doing. Figure 11 below shows the percent of facilities that have installed an energy efficiency measure on one or more of their applicable systems. For the analysis, KEMA first judged whether a measure would apply to the drive system under review, and then determined whether the measure was installed.

Adjustable speed drives and drive scheduling are two energy efficiency measures and strategies reviewed that can be applied to all process drive systems. As such, KEMA found that only four percent of facilities with process drive systems have installed adjustable speed drives on one or more of their systems and only 35 percent of these facilities have optimized their process drives schedules. The other measures KEMA reviewed during the on-site visits are more process-specific and the results can be seen in the figure below.

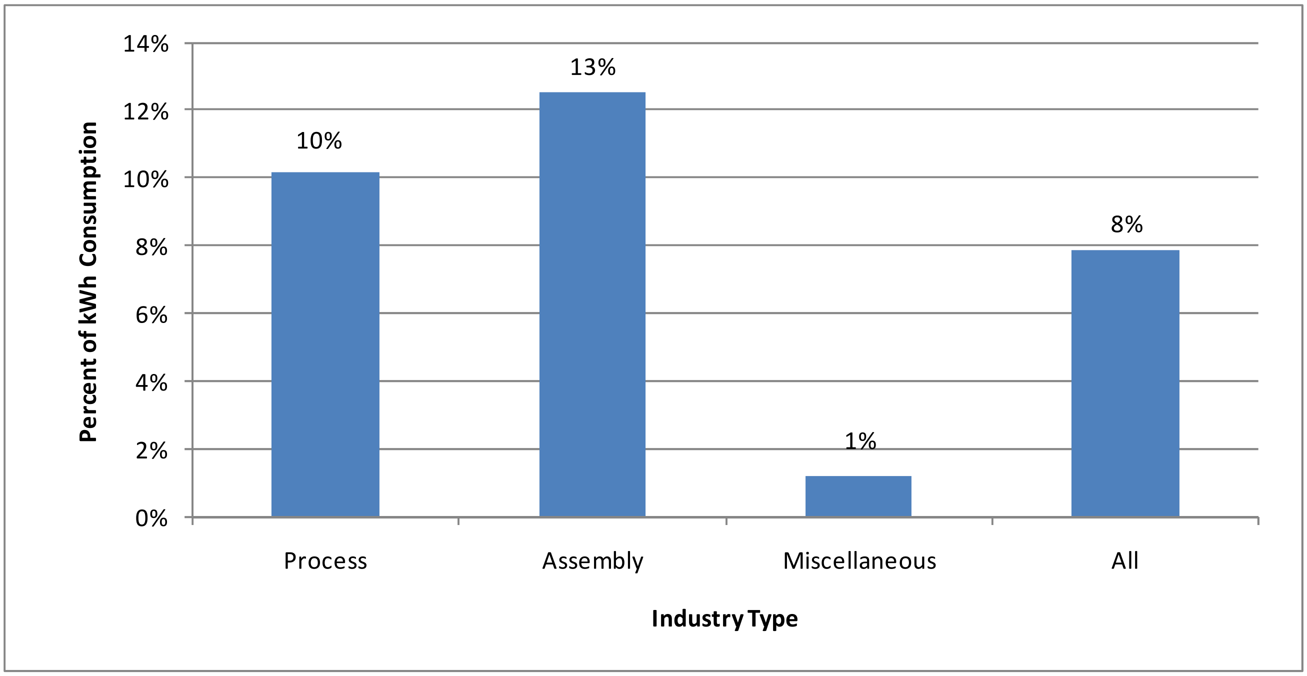
Figure 11: Percent of Energy Efficiency Measures Installed for Drives



3.7 Process Heating

Overall, process heating consumes 8 percent of the electricity used in all industrial facilities. Assembly industries apply 13 percent of their annual electricity consumption to process heating, followed by process facilities at 10 percent and miscellaneous industry at 1 percent.

Figure 12: Percent of kWh Consumption from Heating



Like process drive measures, process heating measures are often process or industry specific and may not apply to all process heating systems. The table below shows the results of the on-site analysis of process heating systems. Notably, none of the facilities with applicable process heating systems have installed top-heating or efficient curing ovens.

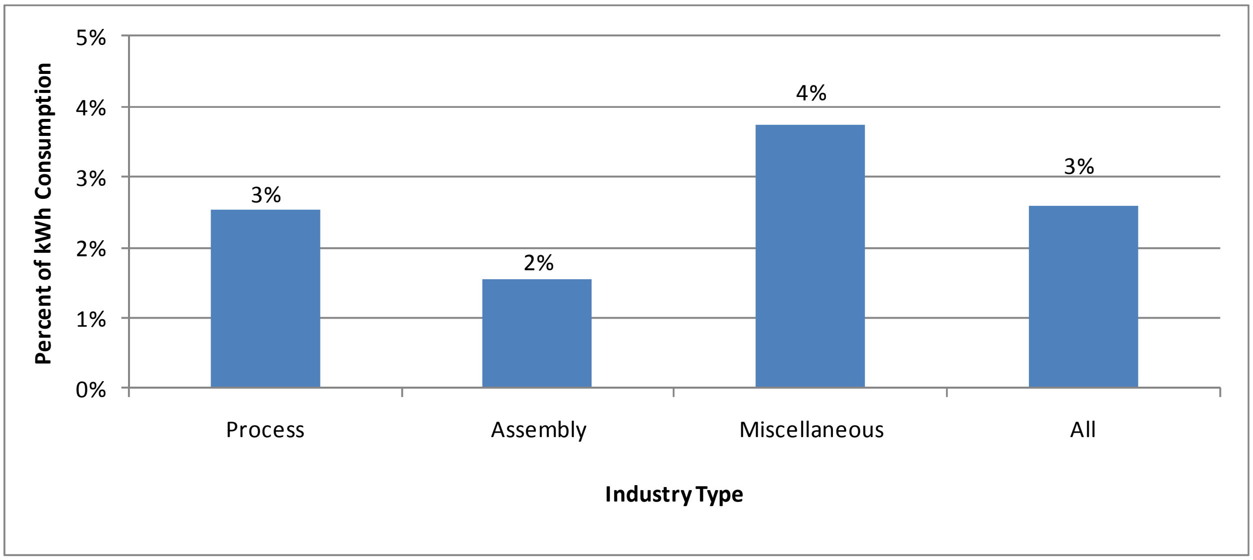
Table 2: Energy Efficiency Measures Installed for Heating

Measure	Facilities representing x% of kWh consumption
Top-heating (glass)	0%
Efficient electric melting	4%
Heating- Process Control	80%
Efficient Curing ovens	0%
Heating- Scheduling	39%

3.8 Process Cooling

Process cooling equipment uses 3 percent of the total electricity consumed in all of Xcel Minnesota's industrial facilities. KEMA found that process cooling accounts for 3 percent of electricity consumption in process facilities, 2 percent in assembly facilities and 4 percent in miscellaneous industrial facilities.

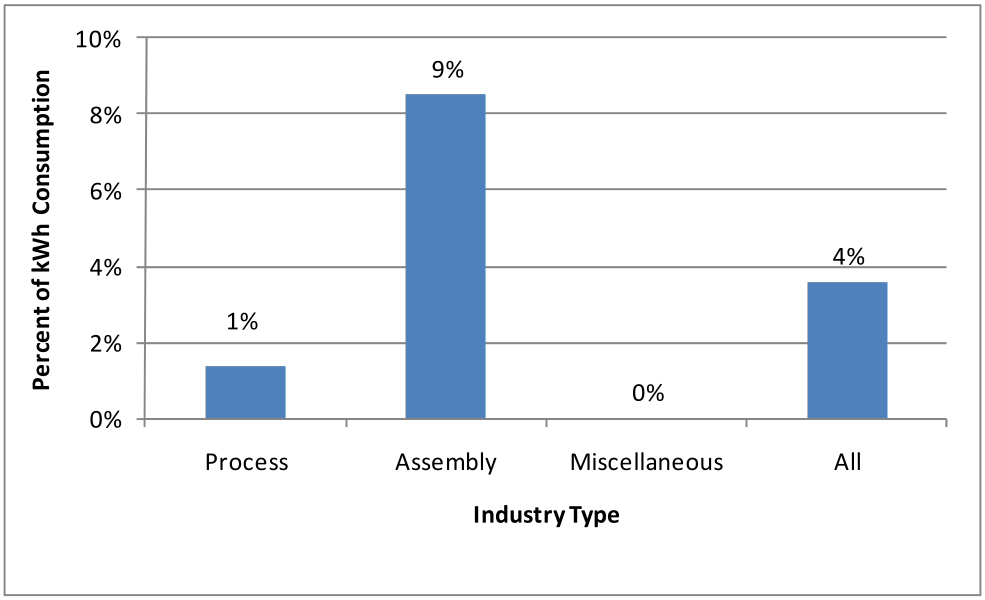
Figure 13: Percent of kWh Consumption from Heating



3.9 Other Process

Four percent of annual electricity consumption is from other process systems, such as desalters and welders. This end use is more prevalent in assembly industrial facilities, where it accounts for 9 percent of the annual electricity consumption. In process industrial facilities, only 1 percent of electricity is used for other process systems and in miscellaneous industrial facilities, this end use was not found.

Figure 14: Percent of kWh Consumption from Other Process



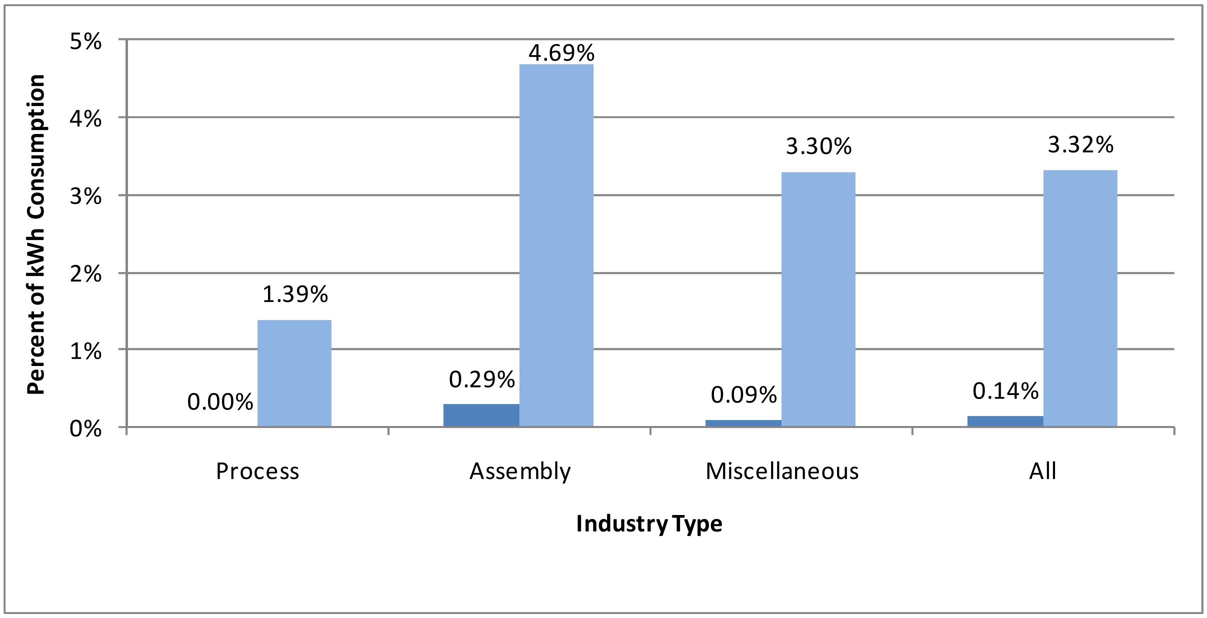
3.10 Space Cooling

KEMA found that chillers account for 0.14 percent of electricity consumption across all industrial facilities and direct expansion units account for 3 percent. Chillers account for 0.29 percent of electricity consumption in assembly facilities and 0.09 percent of electricity consumption in miscellaneous facilities. There were no chillers found in any of the industrial process facilities.

Table 3: Percent of kWh Consumption from Space Cooling

	Process	Assembly	Miscellaneous	All
Chillers	0.00%	0.29%	0.09%	0.14%
DX	1.39%	4.69%	3.30%	3.32%

Figure 15: Percent of Electricity Consumption from Space Cooling



Of the facilities with installed chiller systems, 92 percent of have engaged in tune-up and diagnostics and 65 percent have installed variable speed drives on one or more of their circulating pumps. Additionally, of all facilities with chillers installed, 100 percent have installed efficient chillers that are use at most 0.51kW per ton.

For facilities with DX systems, 92 percent have installed at least one high efficient system. KEMA classified a DX system with a 10.9 EER or higher as high efficiency. Likewise, 84 percent of these facilities have performed tune-ups and advanced diagnostics on their DX systems and 66 percent have a programmable thermostat installed.

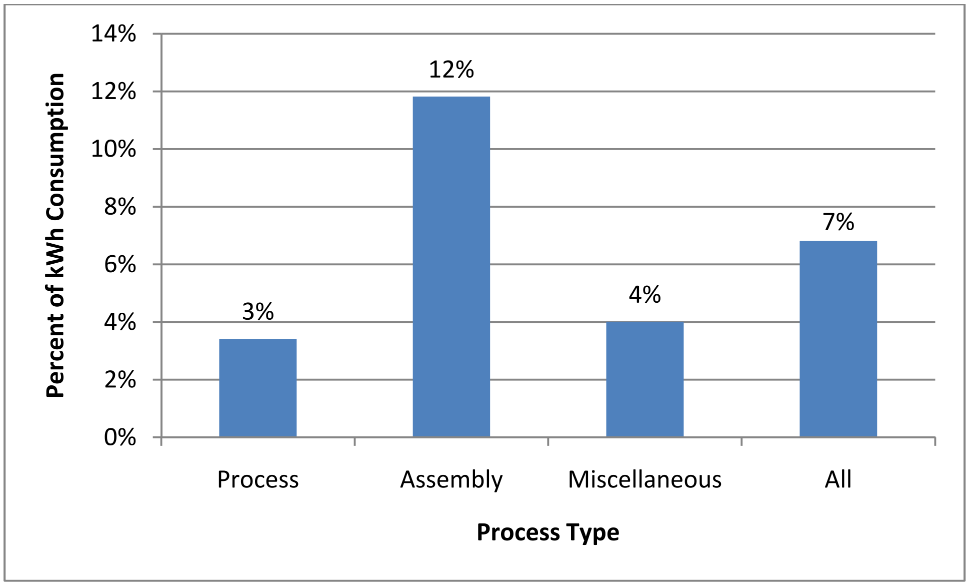
Table 4: Energy Efficiency Measures Installed

Measure	Facilities representing x% of kWh consumption
Chiller Tune Up/Diagnostics	92%
Cooling Circ. Pumps - VSD	65%
DX Tune Up/ Advanced Diagnostics	84%
DX Packaged System, EER=10.9, 10 tons	92%
Prog. Thermostat - DX	66%

3.11 Lighting

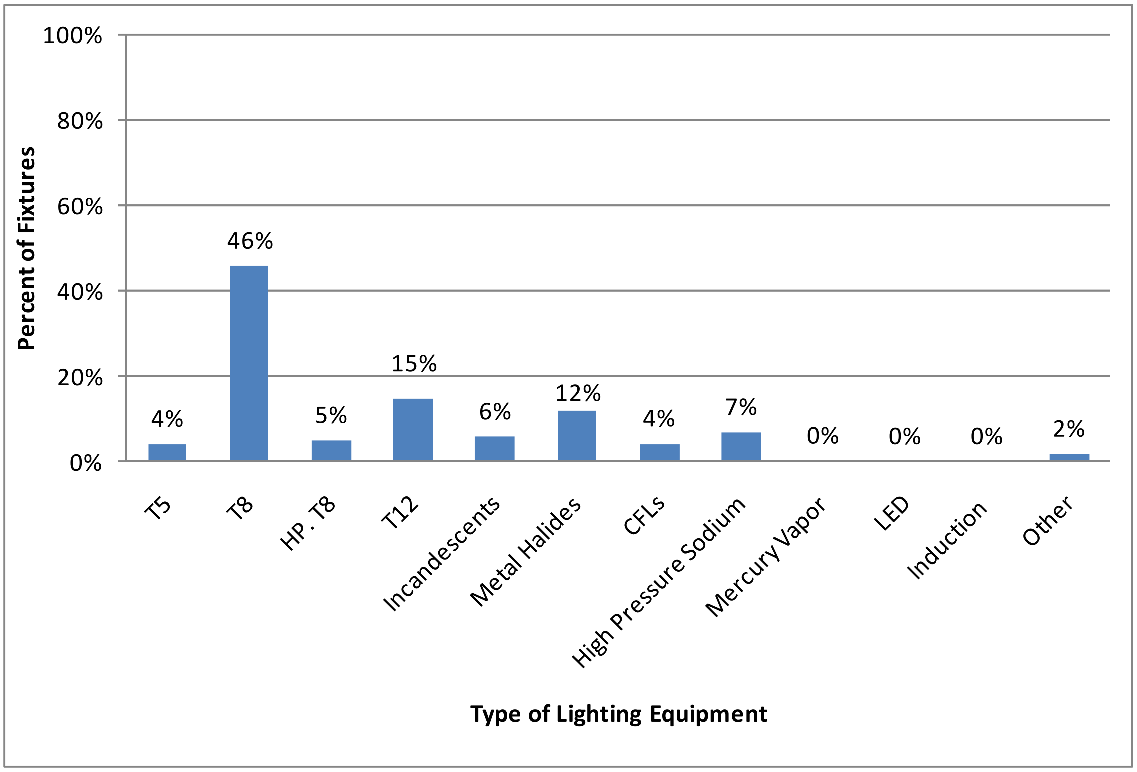
KEMA found that lighting is 7 percent of total industrial electricity consumption. In particular, KEMA found that lighting accounts for 3 percent of electricity consumption at process industrial facilities, 12 percent of at assembly industrial facilities, and 4 percent at miscellaneous industrial facilities.

Figure 16: Percent of Electricity Consumption from Lighting



The figure below shows the distribution of lighting types in all industrial facilities. Of the 7 percent of electricity consumption due to lighting, KEMA found that 46 percent of lighting fixtures are T8 fluorescent bulbs. T12's, metal halides, and high pressure sodium bulbs were the next most prevalent bulb types.

Figure 17: Percent of Lamps by All Building Types



KEMA also presented the same data in a table format to show the percent of fixtures that contained the different lighting types for each industry type. All industry types use T8 bulbs more than any other type of lighting. Process, assembly, and miscellaneous industries have T8 bulbs in 41, 42, and 56 percent of their fixtures, respectively. Conversely, KEMA found that there were no LED's or induction bulbs found within any of the facilities and only process and assembly industries used CFLs, while miscellaneous industries are the only facilities where mercury vapor lamps can be found.

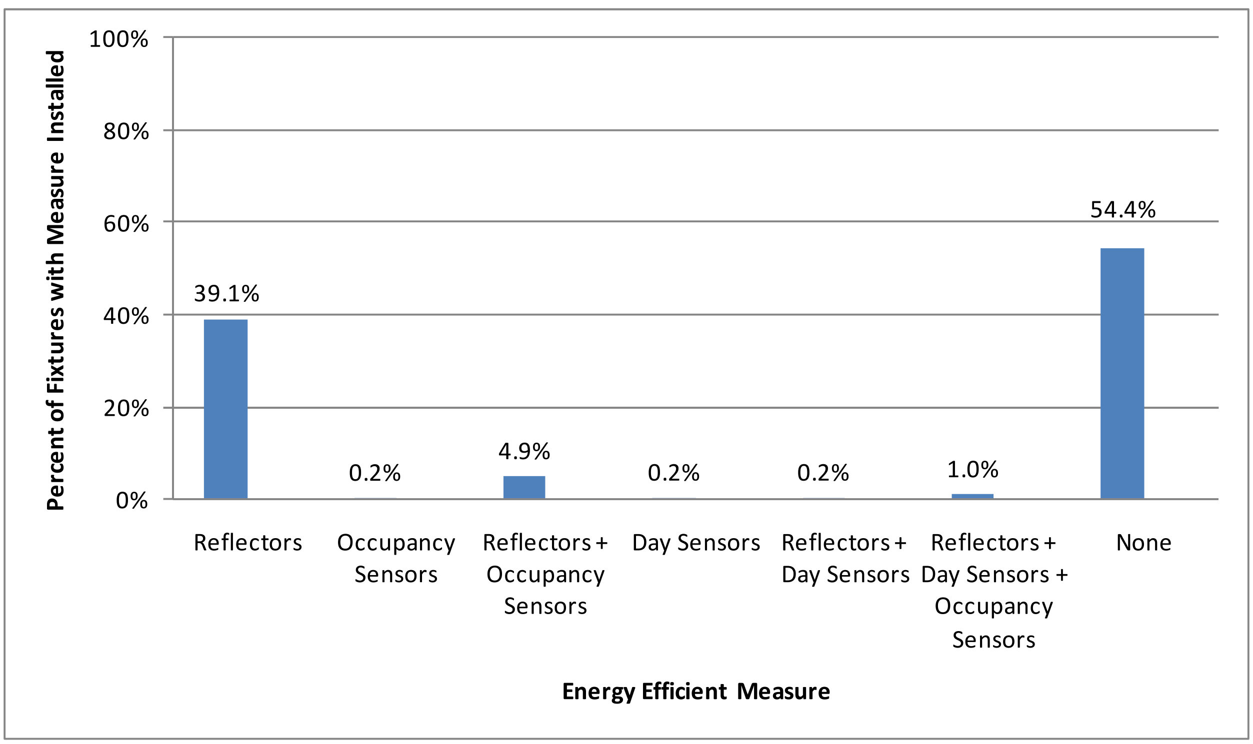
Table 18: Percent of Lighting Types by Building Type

Lamp Type	Process	Assembly	Misc	All
T5	5%	4%	3%	4%
T8	41%	42%	56%	46%
HP. T8	6%	5%	5%	5%
T12	12%	17%	13%	15%
Incandescent	8%	7%	3%	6%
Metal Halides	12%	12%	11%	12%
CFLs	7%	5%	0%	4%
High Pressure Sodium	4%	8%	8%	7%
Mercury Vapor	0%	0%	1%	2%
Other	5%	1%	0%	2%

*LEDs and Induction lamps were not present at any industrial facility.

KEMA also found 45 percent of all lighting fixtures have reflectors. 5 percent of these lighting fixtures have a combination of reflectors and occupancy sensors and 1 percent have a combination of reflectors, day sensors, and occupancy sensors installed on the fixture. Fifty-four percent of fixtures did not have an energy efficient measure.

Figure 19: Percent of Lighting Fixtures with Energy Efficiency Measures



A. Onsite Survey Instrument

Xcel Energy Industrial Onsite Survey

SITE INFORMATION	
SITE ID:	
SI1. Building Name:	
SI2. Street Address:	
SI3. City, State:	
SI4. Zip Code:	
SI5. Building Phone:	
SI6. Primary Contact Name:	
SI7. Primary Contact Phone:	
SI8. Primary Contact Email:	
SI9. Primary Contact Fax:	
SI10. Secondary Contact Name:	
SI11. Secondary Contact Phone:	
SI12. Secondary Contact Email:	
SI13. Secondary Contact Fax:	

SURVEY TRACKING INFORMATION

TASK	a. DATE	b. NAME
STI1. Field survey completed:		
STI2. Field survey data entry completed:		
STI3. Field survey QC completed:		

TO BE FILLED OUT BY KEMA STAFF
[Surveyors –fill this section out from KEMA supplied data from utility]

GBE. Total Annual Electricity Load	**_______kWh** DK N NA
GBNG. Total Annual Natural Gas Load	**_________therms** DK N NA

GENERAL BUILDING INFORMATION

Primary Site Activity: What is the major industrial process at the site?

	a. **Primary Activity Code** **Refer to** **Primary Site Activity Code**	b. **If Primary Site Activity Code = 15, describe:**
PSA1. Primary Site Activity	_ _	

Primary Site Activity Codes
01: Food
02: Textiles- Apparel
03: Lumber- Furniture
04: Paper
05: Chemicals
06: Petroleum
07: Rubber-Plastics
08: Non-metallic minerals
09: Primary Metals
10: Fabricated Metals
11: Industrial Machinery
12: Electronics
13: Transportation Equipment
14: Printing/ Publishing
15: Miscellaneous (Describe)…(e.g., Warehouse, Office)

GB1a. Which of the following fuels or power sources are used in this facility? Do you use…
[Check all that apply]

1. ☐ Electricity	7. ☐ Purchased Steam
2. ☐ Natural Gas	8. ☐ Purchased Hot or Chilled Water
3. ☐ Coal	9. ☐ Other (**Describe**: ______________________________)
4. ☐ Fuel Oil	
5. ☐Propane/LPG, Bottled Gas	97. ☐ Don't Know
6. ☐ Kerosene	98. ☐ Refused to Answer

GB1b. Electricity Consumption

End Use	Percent of Overall kWh Consumption **(Should Total 100%)**
GB1b1. Compressors	Enter %: _ _ _ DK N NA
GB1b2. Pumps	Enter %: _ _ _ DK N NA
GB1b3. Motors	Enter %: _ _ _ DK N NA
GB1b4. Refrigeration/Process Cooling	Enter %: _ _ _ DK N NA
GB1b5. Space Cooling	Enter %: _ _ _ DK N NA
GB1b6. Space Heating	Enter %: _ _ _ DK N NA
GB1b7. Interior Lighting	Enter %: _ _ _ DK N NA
GB1b8. Exterior Lighting	Enter %: _ _ _ DK N NA
GB1b9. Other (Describe: ______________________________)	Enter %: _ _ _ DK N NA

GB1c. Natural Gas Consumption

End Use	Percent of Overall MMBTU Consumption (Should Total 100%)
GB1c1. Process Heat Boilers	Enter %: _ _ _ DK N NA
GB1c2. Process Heat (Non-Boiler)	Enter %: _ _ _ DK N NA
GB1c3. Refrigeration/Process Cooling (Only if heat absorption drives cooling process.)	Enter %: _ _ _ DK N NA
GB1c4. Space Cooling (Only if heat absorption drives cooling process.)	Enter %: _ _ _ DK N NA
GB1c5. Space Heating	Enter %: _ _ _ DK N NA
GB1c6. Other (**Describe**: ______________________________)	Enter %: _ _ _ DK N NA

General Building Characteristics:

GB2. Total floor area of facility	__________**ft²** DK R
GB2a. Total floor area occupied by indoor parking area occupied by business	__________**ft²** DK R
GB2b. [If GB2a>0] Is indoor parking area heated?	Y N DK R
GB3. Total floor area occupied by your facility	__________**ft²** DK R
GB4. Time since last major remodel/renovation impacting the building's energy consumption?	_________ **years** DK R
GB5. Building commissioned within the past 5 yrs.? Commissioning is the process of overseeing equipment startup and testing to make sure systems are operating as designed.	Y N DK R
GB6. Is the Building ENERGY STAR certified?	Y N DK R
GB7. Is the building LEED certified?	Y N DK R

GB8. What year was this facility constructed?
[If there have been major additions, give year largest portion of the building was completed]

1. o Before 1950	4. o 1990 to 1999	7. o [If unsure, but can make educated guess] **Provide best estimate:**
2. o 1950 to 1979	5. o 2000 to 2004	97. o Don't know
3. o 1980 to 1989	6. o 2005 to 2009	98. o Refused to answer

GB9. Is this company the owner of this facility or does the company lease this space?

1. o Owner	3. o Own a part and lease the remainder	97. o Don't know
2. o Lessee/Tenant	4. o Other situation (**Describe:** ______________________________)	98. o Refused to

GB10. Job title or role of primary contact(s) [Can select more than one response]

1. o Owner / President / CEO	7. o Principal or Superintendent (if education setting)
2. o Manager or Director of Facilities / Maintenance / Buildings & Grounds	8. o Vice President
3. o Energy Manager or Director	9. o Other (**Describe**: ____)
4. o Facility Engineer	
5. o CFO / Controller / Treasurer	97. o Don't know
6. o Plant Manager	98. o Refused to answer

GB11a. Does the company pay for the electricity their space uses?

1. o Yes, company pays all	3. o No, company does not pay separate electricity bill (e.g., part of lease payment)	97. o Don't know
2. o Yes, company pays a portion		98. o Refused to answer

GB11b. Does the company pay for the natural gas their space uses?

1. o Yes, company pays all	3. o No, company does not pay separate gas bill (e.g., part of lease payment)	97. o Don't know
2. o Yes, company pays a portion		98. o Refused to answer

GB12. How many hours per week is this facility operating?
[Do not consider the facility to be operating if only maintenance, housekeeping or security personnel are present]
[Note: Facilities operating 24/7 =168 hours]

Enter total operating hours/week: _______	97. o Don't know	98. o Refused to answer

GB12a. What are the Weekday and Weekend operating hours?

Weekday Schedule: open:_______ close:_______	**Saturday Schedule:** open:_______ close:_______	**Sunday Schedule:** open:_______ close:_______	97. o Don't know	98. o Refused to answer

GB13. How many employees work in this facility <u>during the main shift</u>, that is, when most employees are present?
[Include volunteer/part-time workers, but do not include employees who always work outside the building, such as drivers with delivery routes]

1. o 1	5. o 21 to 50	9. o 501 to 1,000	97. o Don't know
2. o 2 to 5	6. o 51 to 100	10. o 1,001 to 3000	98. o Refused to answer
3. o 6 to 10	7. o 101 to 250	11. o More than 3,000	
4. o 11 to 20	8. o 251 to 500		

COMPRESSED AIR

Comp1. Is there compressed air at this facility?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Comp2. Compressed Air Characteristics

Compressor System	a. Age of system*	Compressor Motors		d. What kind of compressor? Refer to Compressed Air Equipment Code If Code=04, describe:	e. Average # of hours/ week in use	f. Better motor practices in place?
		b. Motor Size	c. # of motors			
1. System #1	______ # of years DK R	1. ______ hp DK R 2. ______ hp DK R 3. ______ hp DK R	1. ______ # of motors DK R 2. ______ # of motors DK R 3. ______ # of motors DK R	Compressed Air Code: __ __ ________________	______ Avg # hrs/week DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R
2. System #2	______ # of years DK R	1. ______ hp DK R 2. ______ hp DK R 3. ______ hp DK R	1. ______ # of motors DK R 2. ______ # of motors DK R 3. ______ # of motors DK R	Compressed Air Code: __ __ ________________	______ Avg # hrs/week DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R

***Note average age if system contains different ages of equipment**

Compressed Air Equipment Codes	
01:	Centrifugal
02:	Reciprocating
03:	Screw
04:	Other (**Describe**)
98:	Don't know
99:	Refused to answer

Comp3. Compressed Air Maintenance

Compressor System	a. How often is maintenance performed? Refer to Maintenance Codes	b. Are NEMA premium efficiency motors installed?	c. When motors are replaced, are NEMA premium purchased?	d. Variable Speed Drives
1. System #1	1. Maintenance Code: _ _ 2. Maintenance Code: _ _ 3. Maintenance Code: _ _	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	**1. Inst:** Y N DK R **1. Feas:** Y N DK R **2. Inst:** Y N DK R **2. Feas:** Y N DK R **3. Inst:** Y N DK R **3. Feas:** Y N DK R
2. System #2	1. Maintenance Code: _ _ 2. Maintenance Code: _ _ 3. Maintenance Code: _ _	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	**1. Inst:** Y N DK R **1. Feas:** Y N DK R **2. Inst:** Y N DK R **2. Feas:** Y N DK R **3. Inst:** Y N DK R **3. Feas:** Y N DK R

Maintenance Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

Comp3. Compressed Air Maintenance Continued

Compressor System	e. Do you have a regular leak detection program?	f. [If e is yes] Have leaks been detected and repaired under this program?	g. [If e is yes] Does your leak detection program follow the Maintenance Code interval?	h. [If e is no] When was the last time you had a leak study? A) Last 6 months B) Last year C) Last 5 years D) >5 yrs E) Never	i. [If e is no] When was the last time you had a System study? A) Last 6 months B) Last year C) Last 5 years D) >5 yrs E) Never
1. System #1	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N-how often? DK R ______ 2. Y N-how often? DK R ______ 3. Y N-how often? DK R ______	1. A B C D E DK R 2. A B C D E DK R 3. A B C D E DK R	1. A B C D E DK R 2. A B C D E DK R 3. A B C D E DK R
2. System #2	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N-how often? DK R ______ 2. Y N-how often? DK R ______ 3. Y N-how often? DK R ______	1. A B C D E DK R 2. A B C D E DK R 3. A B C D E DK R	1. A B C D E DK R 2. A B C D E DK R 3. A B C D E DK R

Comp4. [Only ask if Comp3dInstall = No]

Note whether the following strategies were used to reduce energy use in the compressed air system

[See Guidebook for examples of controls and measures]

Compressor System	Strategy	
	a. Load/No Load Compressor Controls	b. Online/Offline Compressor Control
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System #2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

PROCESS FANS and BLOWER SYSTEMS

Fan1. Are there process fans or blower systems at this facility?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Fan2. Process Fans and Blower System Characteristics

Process Fans and Blower System	a. Age of system*	Process Fan Motors b. Fan Motor Size	Process Fan Motors c. # of Fan Motors
1. System #1	________ # of years **DK** **R**	1. _______ hp **DK** **R** 2. _______ hp **DK** **R** 3. _______ hp **DK** **R**	1. _______ # of motors **DK** **R** 2. _______ # of motors **DK** **R** 3. _______ # of motors **DK** **R**
2. System #2	________ # of years **DK** **R**	1. _______ hp **DK** **R** 2. _______ hp **DK** **R** 3. _______ hp **DK** **R**	1. _______ # of motors **DK** **R** 2. _______ # of motors **DK** **R** 3. _______ # of motors **DK** **R**

***Note average age if system contains different ages of equipment**

Fan2. Process Fans and Blower System Characteristics (Cont'd)

Process Fans and Blower System	d. Process Fan Use Refer to Process Fan Codes If Code=06, describe:	e. Average # of hours/ week in use	f. Are fan loads variable?	g. How are fans controlled? Refer to Fan Control Codes If Code=03, describe:	h. Better motor practices in place?
1. System #1	Process Fan Code : _ _ ________________	____ Avg # hrs/week **DK R**	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Fan Control Code : _ _ ________________ 2. Fan Control Code : _ _ ________________ 3. Fan Control Code : _ _ ________________	1. Y N DK R 2. Y N DK R 3. Y N DK R
2. System #2	Process Fan Code : _ _ ________________	____ Avg # hrs/week **DK R**	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Fan Control Code : _ _ ________________ 2. Fan Control Code : _ _ ________________ 3. Fan Control Code : _ _ ________________	1. Y N DK R 2. Y N DK R 3. Y N DK R

Process Fan Codes	
01: Drying 02: Water Mixing/Agitation 03: Cooling 04: Dust Removal 05: Ventilation	06: Other (Please describe) 97: Don't know 98: Refused to answer

Fan Control Codes
01: VSD 02: Inlet/outlet dampers 03: Other (Please describe) 97: Don't know 98: Refused to answer

Fan3. Fan and Blower System Maintenance

Process Fans and Blower System	a. How often is maintenance performed? Refer to Maintenance Codes	b. Are NEMA premium efficiency motors installed?	c. When motors are replaced, are NEMA premium purchased?	d. Has the system been reviewed to determine if components can be improved?	e. [If d is yes] Have the components been improved?	f. Variable Speed Drives
1. System #1	1. Maintenance Code: _ _ 2. Maintenance Code: _ _ 3. Maintenance Code: _ _	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	Y N DK R	Y N DK R	**1. Inst:** Y N DK R **1. Feas:** Y N DK R **2. Inst:** Y N DK R **2. Feas:** Y N DK R **3. Inst:** Y N DK R **3. Feas:** Y N DK R
2. System # 2	1. Maintenance Code: _ _ 2. Maintenance Code: _ _ 3. Maintenance Code: _ _	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	Y N DK R	Y N DK R	**1. Inst:** Y N DK R **1. Feas:** Y N DK R **2. Inst:** Y N DK R **2. Feas:** Y N DK R **3. Inst:** Y N DK R **3. Feas:** Y N DK R

Maintenance Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

Fan4. Note if the following strategies were used to reduce energy use in fan or blower system

[See Guidebook for examples of controls and measures]

Process Fans and Blower System	Strategy				
	a. Installation of controls	**b. System Optimization**	**c. Optimization of Drying Process**	**d. Clean Room Controls**	**e. Clean Room Design**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System #2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

PUMPS

Pump1. Are there pumps used for process loads at this facility?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Pump2. Pump System Characteristics

Pump System	a. Age of system*	Pump Motors		d. What kind of pump? Refer to Pump Codes If Code=03, describe:	e. Primary or Secondary Pump Refer to Primary or Secondary Codes If Code=99, describe	f. Pump Use Refer to Pump Use Codes If Code=05, describe:	g. Variable Speed Drives
		b. Motor Size	c. # of motors				
1. System #1	___ # of years DK R	1. _______ hp DK R 2. _______ hp DK R 3. _______ hp DK R	1. _______ # of motors DK R 2. _______ # of motors DK R	Pump Code: _ _ ____________	Primary/ Secondary Code: _ _ ____________	Pump Use Code: _ _ ____________	1. Inst: Y N DK R 1. Feas: Y N DK R 2. Inst: Y N DK R 2. Feas: Y N DK R 3. Inst: Y N DK R 3. Feas: Y N DK R
2. System #2	___ # of years DK R	1. _______ hp DK R 2. _______ hp DK R 3. _______ hp DK R	1. _______ # of motors DK R 2. _______ # of motors DK R	Pump Code: _ _ ____________	Pump Code: ____________	Pump Use Code: _ _ ____________	1. Inst: Y N DK R 1. Feas: Y N DK R 2. Inst: Y N DK R 2. Feas: Y N DK R 3. Inst: Y N DK R 3. Feas: Y N DK R

***Note average age if system contains different ages of equipment**

Pump Codes	Primary or Secondary Codes	Pump Use Codes
01: Centrifugal 02: Positive Displacement 03: Other (Please describe) 97: Don't know 98: Refused to answer	01: Primary Only 02: Secondary Only 03: Switches from primary and secondary designations 97: Don't know 98: Refused to 99: Other: Explain	01: Hot Water 02: Chilled Water 03: Wastewater 04: Food Product 05: Other (Please describe) 97: Don't know 98: Refused to

Pump2. **(Cont'd)**
Pump System Characteristics

Pump System	g. Average # of hours/ week in use	h. Are pump loads variable?	i. Better motor practices in place?
1. System #1	_______ Avg # hrs/week **DK R**	Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R
2. System # 2	_______ Avg # hrs/week **DK R**	Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R

Pump3. Pump System Maintenance

Pump System	a. How often is maintenance performed? Refer to Maintenance Codes	b. Are NEMA premium efficiency motors installed?	c. When motors are replaced, are NEMA premium purchased?	d. Is the piping layout designed efficiently to reduce friction losses?	e. Has the system been reviewed to determine if the correct sized motors are in place?	f. [If e is yes] Are/have the correct sized motors been installed?
1. System #1	1. Maintenance Code: _ _ 2. Maintenance Code: _ _ 3. Maintenance Code: _ _	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R
2. System # 2	1. Maintenance Code: _ _ 2. Maintenance Code: _ _ 3. Maintenance Code: _ _	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R

Maintenance Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

Pump4. **Note if the following strategies were used to reduce energy use in pump system?**
[See Guidebook for examples of controls and measures]

Pump System	**Strategy**	
	a. **Installation of controls**	**b.** **System Optimization**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System #2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

PROCESS MOTORS

Motor1. Are there process motors used at this facility that are not used for compressed air, fans, blowers or pumps?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Motor2. Process Motor Characteristics

Process Motor System **Describe System Use**	**a. Age of system***	**Process Motors**		**d. Average # of hours/ week in use**	**e. # of Variable Speed Drives installed**	**f. Better motor practices in place?**
		b. Motor Size	**c. # of motors**			
1. System #1 _______________	________ # of years **DK R**	1. _______ hp **DK R** 2. _______ hp **DK R** 3. _______ hp **DK R**	1. _______ # of motors **DK R** 2. _______ # of motors **DK R** 3. _______ # of motors **DK R**	________ Avg # hrs/week **DK R**	1. _______ hp **DK R** 2. _______ hp **DK R** 3. _______ hp **DK R**	1. Y N DK R 2. Y N DK R 3. Y N DK R
2. System #2 _______________	________ # of years **DK R**	1. _______ hp **DK R** 2. _______ hp **DK R** 3. _______ hp **DK R**	1. _______ # of motors **DK R** 2. _______ # of motors **DK R** 3. _______ # of motors **DK R**	________ Avg # hrs/week **DK R**	1. _______ hp **DK R** 2. _______ hp **DK R** 3. _______ hp **DK R**	1. Y N DK R 2. Y N DK R 3. Y N DK R

***Note average age if system contains different ages of equipment**

Motor3. Process Motor Maintenance

Process Motor System	a. How often is maintenance performed? Refer to Maintenance Codes	b. Are NEMA premium efficiency motors installed?	c. When motors are replaced, are NEMA premium purchased?	d. Is motor/drive scheduling in place?
1. System #1	1. Maintenance Code: _ _ 2. Maintenance Code: _ _ 3. Maintenance Code: _ _	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R
2. System # 2	1. Maintenance Code: _ _ 2. Maintenance Code: _ _ 3. Maintenance Code: _ _	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R	1. Y N DK R 2. Y N DK R 3. Y N DK R

Maintenance Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don’t know
98: Refused to answer

Motor4. Note if the following strategies were used to reduce energy use in the process motor systems?
[See Guidebook for examples of controls and measures]

<table>
<tr><th rowspan="2">Process Motor System</th><th colspan="4">Strategy</th></tr>
<tr><th>a.
Replace V Belts w/ cog V-belts
SIC Codes: All</th><th>b.
Improvements to Air Conveying Systems
SIC Codes: 24, 25
24 –Lumber & Wood Products,
25 – Furniture & Fixtures</th><th>c.
Installation of Gap Forming Paper machine
SIC Codes: 26
Paper</th><th>d.
Installation of High Consistency Forming
SIC Codes: 26
Paper</th></tr>
<tr><td rowspan="3">1. System #1</td><td>1. Inst: Y N DK R
1. Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td></tr>
<tr><td>2. Inst: Y N DK R
2. Feas: Y N DK R</td></tr>
<tr><td>3. Inst: Y N DK R
3. Feas: Y N DK R</td></tr>
<tr><td rowspan="3">2. System #2</td><td>1. Inst: Y N DK R
1. Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td></tr>
<tr><td>2. Inst: Y N DK R
2. Feas: Y N DK R</td></tr>
<tr><td>3. Inst: Y N DK R
3. Feas: Y N DK R</td></tr>
</table>

Motor4. **(Cont'd)**
Note if the following strategies were used to reduce energy use in the process motor systems?

[See Guidebook for examples of controls and measures]

Process Motor System	Strategy					
	e. Optimization measures SIC Codes: All	**f.** Installation of Light Cylinders SIC Codes: 27 Printing & Publishing	**g.** Multi-pump extruders/ injection moulding SIC Codes: 30 Rubber/Plastics	**h.** Direct Drive Extruders SIC Codes: 30 Rubber/Plastics	**i.** Injection Moulding-Impulse Cooling SIC Codes: 30 Rubber/Plastics	**j.** Injection Moulding: Replace Hydraulic Drives with Electric Drive and VSD Controls SIC Codes: 30 Rubber/Plastics
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**1. Inst:** Y N DK R **1. Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**1. Inst:** Y N DK R **1. Feas:** Y N DK R
				2. Inst: Y N DK R **2. Feas:** Y N DK R		**2. Inst:** Y N DK R **2. Feas:** Y N DK R
				3. Inst: Y N DK R **3. Feas:** Y N DK R		**3. Inst:** Y N DK R **3. Feas:** Y N DK R
2. System #2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**1. Inst:** Y N DK R **1. Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**1. Inst:** Y N DK R **1. Feas:** Y N DK R
				2. Inst: Y N DK R **2. Feas:** Y N DK R		**2. Inst:** Y N DK R **2. Feas:** Y N DK R
				3. Inst: Y N DK R **3. Feas:** Y N DK R		**3. Inst:** Y N DK R **3. Feas:** Y N DK R

Motor4. **(Cont'd)**
Note if the following strategies were used to reduce energy use in the process motor systems?
[See Guidebook for examples of controls and measures]

<table>
<tr><th rowspan="2">Process Motor System</th><th colspan="4">Strategy</th></tr>
<tr><th>k.
Efficient Grinding
SIC Codes: 32
Stone, Glass, Clay, Concrete</th><th>l.
Efficient Drives for Rolling
SIC Codes: 27
Printing & Publishing</th><th>m.
High Efficiency Bakery Mixing
SIC Codes: 20
Food & Kindred Products</th><th>n.
O and M of Spinning Machines
SIC Codes: 22,23
22 - Textiles
23 – Clothing & Apparel</th></tr>
<tr><td rowspan="3">1. System #1</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td><td>1. Inst: Y N DK R
1. Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td></tr>
<tr><td>2. Inst: Y N DK R
2. Feas: Y N DK R</td></tr>
<tr><td>3. Inst: Y N DK R
3. Feas: Y N DK R</td></tr>
<tr><td rowspan="3">2. System #2</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td><td>1. Inst: Y N DK R
1. Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td><td rowspan="3">Inst: Y N DK R
Feas: Y N DK R</td></tr>
<tr><td>2. Inst: Y N DK R
2. Feas: Y N DK R</td></tr>
<tr><td>3. Inst: Y N DK R
3. Feas: Y N DK R</td></tr>
</table>

Motor5. Does the facility have a printing press?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Motor5a. [If Motor5 = Yes] Are efficient practices in place?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Motor5b. [If Motor5 = Yes] Is the printing press efficient (i.e. has fewer cylinders)?

1. o Yes
2. o No
97. o Don't know
98. o Refused to answer

Motor6. Is there a motor rewind policy in place at this facility?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Motor6a. [If Motor6=Yes] Motor Rewind Policy

Motor Tiers	**a. Do you implement the rewind policy on the following motor sizes?**	**b. How many times would you rewind a standard efficiency motor in each size range before replacing?**	**c. How many times would you rewind a premium efficiency motor in each size range before replacing?**
10 HP or less	Y N DK R	**None 1x 2x 3x 4x 5+x DK R**	**None 1x 2x 3x 4x 5+x DK R**
11 to 25 HP	Y N DK R	**None 1x 2x 3x 4x 5+x DK R**	**None 1x 2x 3x 4x 5+x DK R**
26 to 100 HP	Y N DK R	**None 1x 2x 3x 4x 5+x DK R**	**None 1x 2x 3x 4x 5+x DK R**
101-250 HP	Y N DK R	**None 1x 2x 3x 4x 5+x DK R**	**None 1x 2x 3x 4x 5+x DK R**
250+ HP	Y N DK R	**None 1x 2x 3x 4x 5+x DK R**	**None 1x 2x 3x 4x 5+x DK R**

PROCESS BOILER SYSTEMS

Boil1. Is there a process heat boiler system at this facility?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Boil2. Process Boiler Characteristics and Maintenance

Process Boiler Characteristics and Maintenance	**1. System #1** **Describe System Use** ________________	**2. System #2** **Describe System Use** ________________
a. Age of system ***Note average age if system contains different ages of equipment**	_______ # of years DK R	_______ # of years DK R
b. How many boilers are in this system?	________ # of boilers **DK R**	________ # of boilers **DK R**
c. Fuel Used **Refer to Fuel Codes** **If Code=04, describe:**	**Fuel Code: _ _** **DK R** __________ **If Code = 5, indicate % electric** __ __ __ % DK R	**Fuel Code: _ _** **DK R** __________ **If Code = 5, indicate % electric** __ __ __ % DK R
d. System Capacity	________________ o**kW** o**MMBTU** **DK R**	________________ o**kW** o**MMBTU** **DK R**
e. % of boiler load	_ _ _% **DK R**	_ _ _% **DK R**
f. How often is maintenance performed? **Refer to Maintenance Codes**	**Maintenance Code:** __ __ **DK R**	**Maintenance Code:** __ __ **DK R**
g. Is insulation installed on the distribution pipes?	Y N DK R	Y N DK R
h. Are there leaks in the system that need to be repaired	Y N DK R	Y N DK R

Fuel Codes
01: Electricity
02: Natural Gas
03: #2 Fuel Oil
04: Other (**Describe**)
05: Mixed Gas & Electric
97: Don't know
98: Refused to answer

Maintenance Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

Boil3. Note if the following strategies were used to reduce energy use in the process boiler systems

[See Guidebook for examples of controls and measures]

Process Boiler System	Strategy			
	a. Flue gas heat recovery/ economizer	**b. Blowdown steam heat recovery**	**c. Water Treatment practices**	**d. Thermally Activated heat pump/chiller**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Process Boiler System	**Strategy**			
	e. Automatic steam trap monitoring system	**f. Improved Process Control**	**g. Condensate Return**	**h. Load Control Practices**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

PROCESS HEATING

Heat1. Is there process heating at this facility?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Heat2. Process Heating Characteristics and Maintenance

Process Heating System **Describe System Use**	**a.** **Age of system***	**b.** **How often is maintenance performed?** **Refer to Maintenance Codes**	**c.** **Fuel Used** **Refer to Fuel Codes** **If Code=06, describe:**	**d.** **Are any efficiency measures or practices in place?** **If Yes, describe:**
1. System #1 ________________	_______ # of years **DK R**	**Maintenance Code:** — —	**Fuel Code: _ _** **DK R**	Y N DK R ______________
2. System # 2 ________________	_______ # of years **DK R**	**Maintenance Code:** — —	**Fuel Code: _ _** **DK R** _________	Y N DK R ______________

***Note average age if system contains different ages of equipment**

Process Heating System **Describe System Use**	**e.** **Are process controls installed on the system?**	**f.** **Is insulation installed to reduce heating losses in the system?**	**g.** **Is scheduling implemented for this system?**	**h.** **Are any other controls installed on this system?**
1. System #1	Y N DK R	Y N DK R	Y N DK R	Y N DK R
2. System # 2	Y N DK R	Y N DK R	Y N DK R	Y N DK R

Maintenance Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

Fuel Codes
01: Electricity
02: Natural Gas
03: Oil
04: Kerosene
05: Bottled Gas or Propane
06: Other (**Describe**)
97: Don't know
98: Refused to answer

Heat3. **Note if the following strategies were used to reduce energy use in the process heating systems?**
[See Guidebook for examples of controls and measures]

Process Heating System	Strategy				
	a. **Heat pumps for drying** SIC Codes: 24, 25 24 –Lumber & Wood Products, 25 – Furniture & Fixtures	**b.** **Efficient electric melting system** SIC Codes: 33 Primary Metal Industries	**c.** **Efficient Curing Ovens** SIC Codes: 34, 35, 36, 37, 38 34 – Fabricated metal products, 35 – Industrial machinery & equipment, 36 – Electrical & electronic equipment, 37 – Transportation equipment, 38 – Instruments and related products	**d.** **Top-heating (glass)** SIC Codes: 32 Stone, Clay, Glass, & Concrete Products	**e.** **Efficient Burners** SIC Codes: 32, 33, 34 32 - Stone, Clay, Glass, & Concrete Products 33 – Primary Metal Industries 34 – Fabricated metal products
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Process Heating System	Strategy				
	f. **Heat Recovery System** SIC Codes: All	**g.** **Process Integration** SIC Codes: 20, 26, 28, 29 20 – Food & kindred products 26 – Paper and allied products, 28 – Chemicals and allied products 29 – Petroleum and coal products	**h.** **Efficient Drying Practices** SIC Codes: 20 Food & kindred products	**i.** **Improved Separation Process** SIC Codes: 28 Chemicals and allied products	**j.** **Flare Gas Controls and Recovery** SIC Codes: 29 Petroleum and coal products
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Heat3. **(Cont'd)**
Note if the following strategies were used to reduce energy use in the process heating systems?

[See Guidebook for examples of controls and measures]

Process Heating System	Strategy				
	k. **Fouling Control** SIC Codes: 29 Petroleum and coal products	**l.** **Efficiency improvements to Furnaces** SIC Codes: 29 Petroleum and coal products	**m.** **Oxyfuel furnaces** SIC Codes: 32 Stone, Clay, Glass, & Concrete Products	**n.** **Combustion Controls** SIC Codes: 34 Fabricated metal products	**o.** **Optimization of Furnace Operations** SIC Codes: 34 Fabricated metal products
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

REFRIGERATION / PROCESS COOLING

Ref1. Is there refrigeration / process cooling at this facility?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Ref2. Refrigeration / Process Cooling Characteristics and Maintenance

Refrigeration/ Process Cooling System	a. Age of system*	b. Type of Equipment Refer to Equipment Codes If Code=09, describe:	c. What is the average set point of the system when in use?	d. Equipment Use Refer to Equipment Use Codes If Code=04, describe:	e. Fuel Used Refer to Fuel Codes If Code=03, describe:	f. Size in sq ft	g. Indicate weekly operating hours Enter 168 for 24/7 operation	h. How often is maintenance performed? Refer to Maintenance Codes
1. System #1	___ # of years DK R	**Refrigeration Equipment Code:** — — ________	____ Degrees (F) DK R	**Equipment Use Code:** _ _ ________	**Fuel Code:** _ _ ________	____ Sq ft DK R	____ # of hours DK R	**Maintenance Code:** — —
2. System # 2	___ # of years DK R	**Refrigeration Equipment Code:** — — ________	____ Degrees (F) DK R	**Equipment Use Code:** _ _ ________	**Fuel Code:** _ _ ________	____ Sq ft DK R	____ # of hours DK R	**Maintenance Code:** — —

***Note average age if system contains different ages of equipment**

Equipment Codes
01: Blast/Flash Freezers
02: Refrigerated Warehouse
03: Freezer Warehouse
04: Process Equipment Cooled by Chilled Water
05: Equipment to Make Ice for Skating
06. Refrigerated Walk in/Prep Area (30 to 40°F)
07: Freezer Walk in/Prep Area (0 to -10°F)
08: Chilled Prep Area (50 to 55°F)
09: Other cooling equipment **(Describe)**
97: Don't know
98: Refused to answer

Equipment Use Codes
01: Water-cooled Chiller
02: Air-cooled Chiller
03: District chilled water piped in from outside the building
04: Other **(Describe)**
97: Don't know
98: Refused to answer

Fuel Codes
01: Electricity
02: Natural Gas
03: Other **(Describe)**
97: Don't know
98: Refused to answer

Maintenance Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

Ref3. Note if the following strategies were used to reduce energy use in the refrigeration/process cooling systems.

[See Guidebook for examples of controls and measures]

Refrigeration/ Process Cooling System	Strategy				
	a. Water-cooled condenser	b. Electronically Commutated Motors (ECM)	c. Evaporator fan controller for walk-ins	d. Efficient compressor	e. Heat recovery
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Refrigeration/ Process Cooling System	f. Compressor VSDs	g. Floating head pressure controls	h. Demand hot gas defrost (uses sensor to detect when defrost is needed - automatic)	i. Demand electric defrost (uses sensor to detect when defrost is needed - automatic)	j. Anti-sweat (humidistat) controls
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Refrigeration/ Process Cooling System	k. Multiplex compressors	l. Condenser fan VSD	m. LED lighting	n. Air curtains
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Ref3. **(Cont'd)**
Note if the following strategies were used to reduce energy use in the refrigeration/process cooling systems.

[See Guidebook for examples of controls and measures]

Refrigeration/ Process Cooling System	Strategy			
	o. **Door closers on walk-ins**	**p.** **Door closers on cases**	**q.** **Zero Energy Freezer Doors**	**r.** **Strip curtains for walk-ins**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Refrigeration/ Process Cooling System	**s.** **High Efficiency Centrifugal Chiller (0.51kW/ton)**	**t.** **Cooling Circulation Pumps with Variable Speed Drives**	**u.** **Convert to water-cooled chiller**	**v.** **Premium efficiency pump motors**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Refrigeration/ Process Cooling System	Strategy			
	w. **VSD for cooling tower fans**	**x.** **Oversized cooling towers**	**y.** **Economizers, air-side**	**z.** **Economizers, water-side**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

SPACE COOLING

Cool1. Is there space cooling at this facility?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

Cool 2. Cooling Characteristics

Cooling Characteristic	1. System #1	2. System #2
a. Cooling Equipment Refer to Cooling Equipment Codes If Code=12, describe:	**Cooling Code:** __ __ ________________	**Cooling Code:** __ __ ________________
b. Fuel type Refer to Fuel Codes If Code=03, describe:	**Fuel Code#:** __ __ __________	**Fuel Code#:** __ __ __________
c. % of cooled ft^2 cooled by system	__ __ __% DK R	__ __ __% DK R
d. Capacity Check unit of measurement: Tons OR BTUs	**Enter #:**________ oTons oMMBTUs DK R	**Enter #:** ________ oTons oMMBTUs DK R
e. Age of cooling system *Note average age if system contains different ages of equipment	________ # of years DK R	________ # of years DK R
f. System Condition Refer to System Condition Codes	**System Condition Code:** __ __	**System Condition Code:** __ __
g. Record efficiency rating from nameplate	________ DK R	________ DK R
h. Record cooling equipment model number from nameplate	________ DK R	________ DK R
i. System Condition Refer to System Condition Codes	Y N DK R	Y N DK R
j. How often is maintenance performed? Refer to Maintenance Codes	**Maintenance Code:** __ __	**Maintenance Code:** __ __
k. How many months per year does this system run?	________ **# of months** DK R	________ **# of months** DK R
l. About how many hours is the cooling system running each day it is used? Refer to Cooling Hours Codes	**Cooling Hours Code:** __ __	**Cooling Hours Code:** __ __
m. What is the average set point of the system when in use?	________ Degrees F DK R	________ Degrees F DK R
n. What is the average set point of the system during off hours? If no off hours, circle NA	________ Degrees F DK R NA	________ Degrees F DK R NA
o. What is the cooling system balance point if you have one? I.E. is there a specific outdoor	________ Degrees F DK R NA OTH	________ Degrees F DK R NA OTH

Cooling Equipment Codes
01: Water-cooled Chiller (cooling towers or water cooler present)
02: Air-cooled Chiller
03: Packaged heat pumps for cooling
04: Rooftop/Packaged AC (also known as DX or direct expansion units)
05: DX Split Systems
06: Absorption gas or steam (chillers or heat pumps)
07: Packaged Terminal Air Conditioner (PTAC)
08: Individual room air conditioners, other than heat pumps
09. District chilled water piped in from outside the building
10. Ground source heat pump
11. Ductless (mini split) cooling system
12: Other cooling equipment **(Describe)**
97: Don't know
98: Refused to answer

Fuel Codes
01: Electricity
02: Natural Gas
03: Other **(Please describe)**
97: Don't know
98: Refused to answer

System Condition Codes
01: In good condition
02: Needs maintenance/repair
03: Needs replacement
97: Don't know
98: Refused to answer

Maintenance Codes
01: More than once a year
02: Annually
03: Every two years
04: More than two to every five years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

Cooling Hours Codes
01: Less than 4 hours
02: More than 4 hours to 8 hours
03: More than 8 hours to 12 hours
04: More than 12 hours to 16 hours
05: More than 16 hours to 20 hours
06: More than 20 hours
07: Run continuously
97: Don't know
98: Refused to answer
Note: Hours represent # of hours that the system is in active cooling mode versus setback mode, but not the actual run time of the equipment.

temperature that triggers the building to go to cooling mode?		

Cool 3. **Are any of the following measures installed in the facility?**

[See Guidebook for examples of controls and measures]

Cooling System	Measure		
	a. VSD for cooling tower fans	**b.** Economizers, air-side	**c.** Economizers, water-side
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

Cooling System	Measure		
	d. Programmable thermostat	**e.** Premium efficiency pump motors	**f.** Cooling Circulation Pumps with Variable Speed Drives
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

SPACE HEATING

SpaceHeat1. Is there a space heating system at this facility?

1. o Yes	
2. o No	**Skip to Next Section**
97. o Don't know	**Skip to Next Section**
98. o Refused to answer	**Skip to Next Section**

SH2. Heating Characteristics

Heating Characteristic	1. System #1	2. System #2
a. Heating Equipment Refer to Heating Equipment Codes If Code=10, please describe:	Heating Code: — — ___________	Heating Code: — — ___________
b. Fuel type (Refer to Fuel Codes) If Code=09, please describe:	Fuel Code: — — ___________ Indicate % electric if mix use __ __ __ % DK R	Fuel Code: — — ___________ Indicate % electric if mix use __ __ __ % DK R
c. % of all heating ft^2 heated by system	__ __ __ % DK R	__ __ __ % DK R
d. Capacity If only one number available, put in the OUTPUT slot.	# of kBTUh: ___________ INPUT ___________ OUTPUT DK R	# of kBTUh: ___________ INPUT ___________ OUTPUT DK R
e. Number of units	Enter #:_________ DK R	Enter #:_________ DK R
f. Age of heating system *Note average age if system contains different ages of equipment	________ # of years DK R	________ # of years DK R
g. Record efficiency rating from nameplate	___________ DK R	___________ DK R
h. Record heating equipment model number from nameplate	___________ DK R	___________ DK R
i. System Condition Refer to System Condition Codes	System Condition Code: — —	System Condition Code: — —
i. How often is maintenance performed? Refer to Maintenance Codes	Maintenance Code: — —	Maintenance Code: — —
j. How many months per year does this system run?	___________ # of months DK R	___________ # of months DK R
k. About how many hours is the heating system run each day it is used? Refer to Heating Hours Codes	Heating Hours Code: — —	Heating Hours Code: — —
l. What is the average set point of the system when in use?	___________ Degrees F DK R	___________ Degrees F DK R
m. What is the average set point of the system during off hours? If no off hours, circle NA	___________ Degrees F DK R NA	___________ Degrees F DK R NA
o. What is the cooling system balance point if you have one? I.E. is there a specific outdoor temperature that triggers the building to go to cooling mode?	___________ Degrees F DK R NA OTH	___________ Degrees F DK R NA OTH

Heating Equipment Codes
01: Furnaces that heat air directly, no steam or water
02: Boilers inside the building that produce steam or hot water
03: Packaged heat pumps for heating
04: Rooftop or packaged heating units, other than heat pumps
05 Split heat pump system
06: Individual space heaters, other than heat pumps
07: District steam or hot water piped in from outside the building
08: Unit heaters
09: Radiant heaters
10: Other heating equipment **(Describe)**
97: Don't know
98: Refused to answer
Fuel Codes
01: Electricity
02: Natural Gas
03: Oil
04: Kerosene
05: Bottled Gas or Propane
06: Wood
07: Coal
08: Solar
09: Other **(Describe)**
97: Don't know
98: Refused to answer
System Condition Codes
01: In good condition
02: Needs maintenance/repair
03: Needs replacement
97: Don't know
98: Refused to answer
Maintenance Codes
01: More than once a year
02: Annually
03: Every two years
04: More than two to every five years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer
Heating Hours Codes
01: Less than 4 hours
02: More than 4 hours to 8 hours
03: More than 8 hours to 12 hours
04: More than 12 hours to 16 hours
05: More than 16 hours to 20 hours
06: More than 20 hours
07: Run continuously
97: Don't know
98: Refused to answer
Note: Hours represent # of hours that the system is in active heating mode versus setback mode, but not the actual run time of the equipment.

SH2a. [If GB2b=Yes] Indoor Parking Garage Heating Characteristics

Heating Characteristic	1. System #1	2. System #2
a. Heating Equipment Refer to Heating Equipment Codes If Code=10, please describe:	Heating Code: __ __ ____________	Heating Code: __ __ ____________
b. Fuel type (Refer to Fuel Codes) If Code=09, please describe:	Fuel Code: __ __ ____________ Indicate % electric if mix use __ __ __ % DK R	Fuel Code: __ __ ____________ Indicate % electric if mix use __ __ __ % DK R
c. % of all indoor parking area heating ft^2 heated by system	__ __ __ % DK R	__ __ __ % DK R
d. Capacity If only one number available, put in the OUTPUT slot.	# of kBTUh: ____________ INPUT ____________ OUTPUT DK R	# of kBTUh: ____________ INPUT ____________ OUTPUT DK R
e. Number of units	Enter #:________ DK R	Enter #:________ DK R
f. Age of heating system *Note average age if system contains different ages of equipment	________ # of years DK R	________ # of years DK R
g. Record efficiency rating from nameplate	____________ DK R	____________ DK R
h. Record heating equipment model number from nameplate	____________ DK R	____________ DK R
i. System Condition Refer to System Condition Codes	System Condition Code: __ __	System Condition Code: __ __
i. How often is maintenance performed? Refer to Maintenance Codes	Maintenance Code: __ __	Maintenance Code: __ __
j. How many months per year does this system run?	____________ # of months DK R	____________ # of months DK R
k. About how many hours is the heating system run each day it is used? Refer to Heating Hours Codes	Heating Hours Code: __ __	Heating Hours Code: __ __
l. What is the average set point of the system when in use?	____________ Degrees F DK R	____________ Degrees F DK R
m. What is the average set point of the system during off hours? If no off hours, circle NA	____________ Degrees F DK R NA	____________ Degrees F DK R NA

Heating Equipment Codes
01: Furnaces that heat air directly, no steam or water
02: Boilers inside the building that produce steam or hot water
03: Packaged heat pumps for heating
04: Rooftop or packaged heating units, other than heat pumps
05 Split heat pump system
06: Individual space heaters, other than heat pumps
07: District steam or hot water piped in from outside the building
08: Unit heaters
09: Radiant heaters
10: Other heating equipment (Describe)
97: Don't know
98: Refused to answer
Fuel Codes
01: Electricity
02: Natural Gas
03: Oil
04: Kerosene
05: Bottled Gas or Propane
06: Wood
07: Coal
08: Solar
09: Other (Describe)
97: Don't know
98: Refused to answer
System Condition Codes
01: In good condition
02: Needs maintenence/repair
03: Needs replacement
97: Don't know
98: Refused to answer
Maintenance Codes
01: More than once a year
02: Annually
03: Every two years
04: More than two to every five years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer
Heating Hours Codes
01: Less than 4 hours
02: More than 4 hours to 8 hours
03: More than 8 hours to 12 hours
04: More than 12 hours to 16 hours
05: More than 16 hours to 20 hours
06: More than 20 hours
07: Run continuously
97: Don't know
98: Refused to answer
Note: Hours represent # of hours that the system is in active heating mode versus setback mode, but not the actual run time of the equipment.

SpaceHeat3. Note if the following strategies were used to reduce energy use in the HVAC systems

[See Guidebook for examples of controls and measures]

Space Heating System	Strategy		
	a. Stack Heat Exchanger	**b. Installation of EMS**	**c. EMS Optimization**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

SpaceHeat3a. [If GB2b=Yes] Note if the following strategies were used to reduce energy use in the HVAC systems in facility's indoor parking area.

Space Heating System	Strategy		
	a. Stack Heat Exchanger	**b. Installation of EMS**	**c. EMS Optimization**
1. System #1	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R
2. System # 2	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R	**Inst:** Y N DK R **Feas:** Y N DK R

LIGHTING

Light1. Interior Lighting Information

1. # of 4 foot fixtures with 1 or 2 lamps [Exclude high bay lighting] 2. Enter #:________ DK R		
1a. % T5 fixtures: : _ _ _% DK R	1b. % T5 fixtures with reflectors: _ _ _% DK R	1c. % T5 fixtures with occupancy sensors: _ _ _% DK R
2a. % Standard T8 fixtures: : _ _ _% DK R	2b. % Standard T8 fixtures with reflectors: _ _ _% DK R	2c. % Standard T8 fixtures with occupancy sensors: _ _ _% DK R
3a. % High Perf T8 fixtures: : _ _ _% DK R	3b. % High Perf T8 fixtures with reflectors: _ _ _% DK R	3c. % High Perf T8 fixtures with occupancy sensors: _ _ _% DK R
4a. % T12 fixtures: : _ _ _% DK R	4b. % T12fixtures with reflectors: _ _ _% DK R	4c. % T12fixtures with occupancy sensors: _ _ _% DK R

3. # of 4 foot fixtures with 3 or more lamps [Exclude high bay lighting] Enter #:________ DK R		
1a. % T5 fixtures: : _ _ _% DK R	1b. % T5 fixtures with reflectors: _ _ _% DK R	1c. % T5 fixtures with occupancy sensors: _ _ _% DK R
2a. % Standard T8 fixtures: : _ _ _% DK R	2b. % Standard T8 fixtures with reflectors: _ _ _% DK R	2c. % Standard T8 fixtures with occupancy sensors: _ _ _% DK R
3a. % High Perf T8 fixtures: : _ _ _% DK R	3b. % High Perf T8 fixtures with reflectors: _ _ _% DK R	3c. % High Perf T8 fixtures with occupancy sensors: _ _ _% DK R
4a. % T12 fixtures: : _ _ _% DK R	4b. % T12fixtures with reflectors: _ _ _% DK R	4c. % T12fixtures with occupancy sensors: _ _ _% DK R

Light1. Interior Lighting Information (Continued)

4. # of 8 foot fixtures with any # of lamps [Exclude high bay lighting] Enter #:________ DK R		
1a. % Standard T8 fixtures: : _ _ _% DK R	1b. % Standard T8 fixtures with reflectors: _ _ _% DK R	1c. % Standard T8 fixtures with occupancy sensors: _ _ _% DK R
2a. % High Perf T8 fixtures: : _ _ _% DK R	2b. % High Perf T8 fixtures with reflectors: _ _ _% DK R	2c. % High Perf T8 fixtures with occupancy sensors: _ _ _% DK R
3a. % T12 fixtures: : _ _ _% DK R	3b. % T12fixtures with reflectors: _ _ _% DK R	3c. % T12fixtures with occupancy sensors: _ _ _% DK R

4. % of Building Square Footage Illuminated by any type of Tube Fluorescent Lighting [no CFL's or high bay]	__ __ __% DK R
4a. % of Tube Fluorescents at facility that remains on during off hours:	__ __ __% DK R

5. Incandescents/CFLs/LEDs	
a. Total # of Incandescents	Enter #:______ DK R
b. Total # of CFL'S	b1. Enter # Screw-in CFL:______ DK R b2. Enter # Hardwired CFL:______ DK R
c. Total # of LEDs	Enter #:______ DK R
d. % Fixtures Feasible for Hardwired CFL's	__ __ __% DK R
e. % of Building Square Footage Illuminated by any Incandescents or CFLs	__ __ __% DK R
f. % of Incandescents/CFLs/LEDs that remain on during off hours:	__ __ __% DK R

Light1. Interior Lighting Information (Continued)

6. High Bay Lighting	a. Total # of Metal Halide	b. Total # of High Pressure Sodium	c. Total # of Mercury Vapor	d. Total # of T8	e. Total # of T5	f. Total # of Induction Lighting
a. Total # of lamps	Enter#: ______ DK R	Enter#: ______ DK R	Enter#: ______ DK R	Enter#: ______ DK R	Enter#: ______ DK R	Enter#: ______ DK R
b. % with occupancy sensors:	_ _ _% DK R	_ _ _% DK R	_ _ _% DK R	_ _ _% DK R	_ _ _% DK R	_ _ _% DK R
c. % of building square footage illuminated by high bay lighting	__ __ __ % DK R					
d. % of high bay lighting that remains on during off hours:	__ __ __ % DK R					

Light2. Lighting System Maintenance

Lighting System	a. How often are lighting control tune-ups performed?* Refer to Control Tune-Up Codes	b. How often is the control strategy revisited? Refer to Strategy Codes	c. [If GB5=Yes] If commissioning was performed in the past 5 years, were lighting controls addressed?
Complete Lighting System	Maintenance Code#: __ __	Strategy Code: __ __	Y N DK R

***Lighting Controls Tune-Up**
Periodically, lighting controls need to be calibrated. Photocell sensors may fall into disrepair over time, occupancy sensor control settings may not be configured to result in maximum energy savings, and time clock controls may not result in sufficient precision. Some buildings may also have light sweeping controls and load shedding dimmer controls for demand reduction that should be tuned up. Spaces can be under-lit as a result of dirty fixtures which should be cleaned as part of a tune up.

Control Tune-Up Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

Strategy Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
97: Don't know
98: Refused to answer

Light3. **How many exit signs are installed in the building?**

Enter number:__________	**If Light3=0 SKIP TO Light4**
999997. o Don't know	**SKIP TO Light4**
999998. o Refused to answer	**SKIP TO Light4**

Light3a. **What percentage of the building's exit signs are…**

1. % LED	_ _ _% DK R
2. % CFL	_ _ _% DK R
3. % Incandescent	_ _ _% DK R
4. % Other (Please describe: _______________)	_ _ _% DK R

Light4. Does this building have outdoor lighting?

1. o Yes	
2. o No	**Skip to Cool1**
97. o Don't know	**Skip to Cool1**
98. o Refused to answer	**Skip to Cool1**

Light5. Outdoor Lighting Information
[% of all lighting types should add up to 100% (but can be more)]

LIGHTING TYPE	a. % of all FT2	b. # of Fixtures	c. % Fixture sub-types	d. % w/ Photocells	e. % w/ Timers or Other Controls	f. % of outdoor lights operating 24/7
1. Fluorescent Tubes:	_ _ _ % DK R	Enter #: ________ DK R	% that are T-8 _ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
2. Incandescent / CFL bulbs (Smaller wattage)	_ _ _ % DK R	Enter #: ________ DK R	% that are CFL _ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
3. LED	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
4. Quartz Halogen	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
5. Metal Halide	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
6. Pulse Start Metal Halide	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
7. High Pressure Sodium	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
8. Mercury Vapor	_ _ _ % DK R	Enter #: ________ DK R	N/A	_ _ _ % DK R	_ _ _ % DK R	_ _ _ % DK R
9. Other	% of FT2 _ _ _ % DK R	Enter #: ________ DK R	**Please describe:**			

Light6. [If GB2a>0] Parking Garage Lighting Information
[% of all lighting types should add up to 100% (but can be more)]

LIGHTING TYPE	a. % of all FT2	b. # of Fixtures	c. % Fixture sub-types	d. % w/ Photocells	e. % w/ Timers or Other Controls	f. % of outdoor lights operating 24/7
1. Fluorescent Tubes:	___% DK R	Enter #: ________ DK R	% that are T-8 ___% DK R	___% DK R	___% DK R	___% DK R
2. Incandescent / CFL bulbs (Smaller wattage)	___% DK R	Enter #: ________ DK R	% that are CFL ___% DK R	___% DK R	___% DK R	___% DK R
3. LED	___% DK R	Enter #: ________ DK R	N/A	___% DK R	___% DK R	___% DK R
4. Quartz Halogen	___% DK R	Enter #: ________ DK R	N/A	___% DK R	___% DK R	___% DK R
5. Metal Halide	___% DK R	Enter #: ________ DK R	N/A	___% DK R	___% DK R	___% DK R
6. Pulse Start Metal Halide	___% DK R	Enter #: ________ DK R	N/A	___% DK R	___% DK R	___% DK R
7. High Pressure Sodium	___% DK R	Enter #: ________ DK R	N/A	___% DK R	___% DK R	___% DK R
8. Mercury Vapor	___% DK R	Enter #: ________ DK R	N/A	___% DK R	___% DK R	___% DK R
9. Other	% of FT2 ___% DK R	Enter #: ________ DK R	Please describe:			

OTHER PROCESSES

OP1. Are there other processes performed at this facility?

1. o Yes	
2. o No	**Thank and Terminate Survey**
97. o Don't know	**Thank and Terminate Survey**
98. o Refused to answer	**Thank and Terminate Survey**

OP2. Other Processes

Other Processes	a. Describe the other processes performed by this system	b. Fuel Used Refer to Fuel Codes If Code=03, describe:	c. How often is maintenance performed? Refer to Maintenance Codes	d. Have you implemented any efficient practices for this system in the past five years? If Yes, describe:
1. System #1	____________ DK R	**Fuel Code:** __ __ ____________	**Maintenance Code:** __ __	Y N DK R ____________
2. System # 2	____________ DK R	**Fuel Code:** __ __ ____________	**Maintenance Code:** __ __	Y N DK R ____________
3. System #3	____________ DK R	**Fuel Code:** __ __ ____________	**Maintenance Code:** __ __	Y N DK R ____________

Fuel Codes
01: Electricity
02: Natural Gas
03: Other (**Describe**)
97: Don't know
98: Refused to answer

Maintenance Codes
01: More than once a year
02: Annually
03: Every 2 years
04: More than 2 years to every 5 years
05: More than 5 years
06: As needed
07: Never
97: Don't know
98: Refused to answer

NOTES:

L. Appendix L: Residential Awareness Research Report

2011 Minnesota Market Potential Assessment

Residential Awareness Research Report

Xcel Energy Services, Inc
Contract Number: 322733
Prepared by KEMA Inc
Burlington, MA January 3, 2012

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List of Exhibits:

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1. Overview

In 2011, KEMA conducted 804 CATI-implemented residential surveys for Xcel Energy. The purpose of the surveys was to gain a better understanding of their customers' awareness and attitude with regard to energy efficiency.

For the analysis, the residential population was segmented by three variables: low income indicator, family type, and whether the customer had participated in Xcel Energy programs. The following table shows the customer breakdown and sample sizes by these variables. The first group of rows shows results by all three segmentation variables, while the subsequent sets show results separately by each dimension of the segmentation.

Table 1-1
Sample Design

Customer Segmentation Variables				Population Data		Sample Size		
Low Income	Family Type	Program Participant	Segment Code	Customers	Percent	Proportion	Adjusted	Interviewed
By Low Income, Family Type, and Program Participation								
No	Multi-family	No	NLI-NP-M	262,604	25.0%	200	179	179
No	Multi-family	Yes	NLI-PP-M	2,031	0.2%	2	20	20
No	Single-family	No	NLI-NP-S	646,635	61.4%	491	441	441
No	Single-family	Yes	NLI-PP-S	73,632	7.0%	56	60	60
Yes	Multi-family	No	LI-NP-M	28,388	2.7%	22	30	30
Yes	Multi-family	Yes	LI-PP-M	1,440	0.1%	1	20	20
Yes	Single-family	No	LI-NP-S	31,673	3.0%	24	30	31
Yes	Single-family	Yes	LI-PP-S	6,109	0.6%	5	20	23
By Low Income								
No				984,902	93.6%	749	700	700
Yes				67,610	6.4%	51	100	104
By Family Type								
	Multi-family			294,463	28.0%	224	249	249
	Single-family			758,049	72.0%	576	551	555
By Program Participation								
		No		969,300	92.1%	737	680	650
		Yes		83,212	7.9%	63	120	154
TOTAL						800	800	804

2. General Home Characteristics

The following tables show the general home characteristics for each segment. Table 2-1 shows the breakdown of home type by segment. The sample was primarily made up of 1- and 2- story homes, followed by apartments with more than four units.

Table 2-1
Home Types by Segment

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=23	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
1-story home	3%	32%	5%	35%	1%	36%	10%	35%	25%
2-story home	0%	39%	20%	48%	4%	36%	25%	45%	28%
Split-Level House	0%	10%	0%	4%	3%	17%	0%	13%	11%
Mobile Home	7%	6%	30%	4%	2%	1%	5%	3%	3%
Duplex, triplex, or quadplex	7%	3%	15%	0%	9%	1%	25%	0%	4%
Apartment with more than 4 apartments	80%	0%	20%	0%	53%	0%	5%	0%	15%
Condominium	0%	0%	5%	0%	24%	1%	25%	0%	7%
Townhome	3%	6%	0%	9%	3%	6%	5%	3%	5%
Other	0%	3%	5%	0%	1%	2%	0%	0%	2%
Don't Know	0%	0%	0%	0%	0%	0%	0%	0%	0%

Figure 2-1 below shows the percentage of respondents who indicated that they owned their own homes. The majority of respondents in every segment, save for both Low Income and Not-Low Income non-participant multi-family segments, responded that they owned their homes.

Figure 2-1
Ownership by Segment

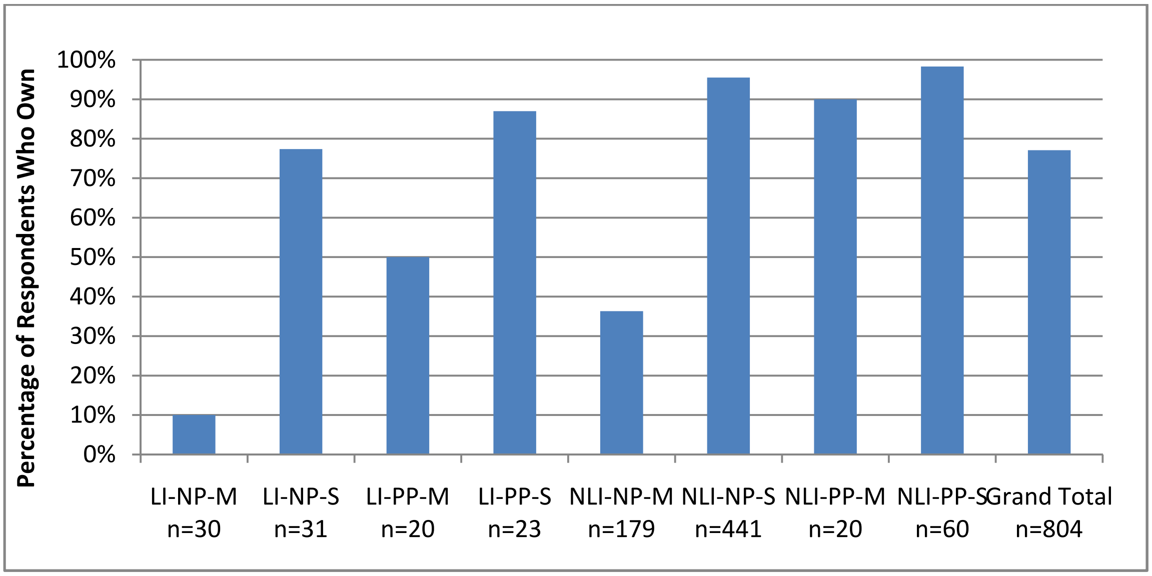


Table 2-2 shows the distribution of homes by age of home. Approximately 8 percent of all homes surveyed are l0 years old or less. About 27% of the homes are 30 years old or younger. Approximately half of the homes were built in the last 50 years. A relatively larger percent of multifamily dwellings have been built in the last 10 years. About a third of respondents' homes are over 50 years old.

Table 2-2
Age of Homes by Segment

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=23	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
2010 - 2011									0.0%
2006 - 2009	6.7%	3.2%			7.8%	2.3%	5.0%	1.7%	3.6%
2001 - 2005	10.0%	3.2%			3.9%	4.8%	5.0%	1.7%	4.2%
1996 - 2000		3.2%			5.0%	4.3%		1.7%	3.7%
1991 - 1995			5.0%	4.3%	1.7%	5.2%		11.7%	4.4%
1986 - 1990	3.3%	3.2%		4.3%	5.0%	5.0%	20.0%	11.7%	5.6%
1981 - 1985	6.7%	9.7%	15.0%	4.3%	7.3%	4.1%	10.0%	3.3%	5.5%
1976 - 1980	6.7%	6.5%	20.0%	4.3%	7.8%	8.4%		8.3%	8.1%
1960 - 1975	26.7%	9.7%	20.0%	4.3%	12.3%	25.4%	5.0%	18.3%	20.1%
Before 1960	10.0%	45.2%	40.0%	69.6%	23.5%	38.1%	50.0%	40.0%	35.4%
Other					0.6%	0.2%			0.2%
Don't Know	30.0%	16.1%		8.7%	25.1%	2.3%	5.0%	1.7%	9.1%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

3. Energy Efficiency Attitudes

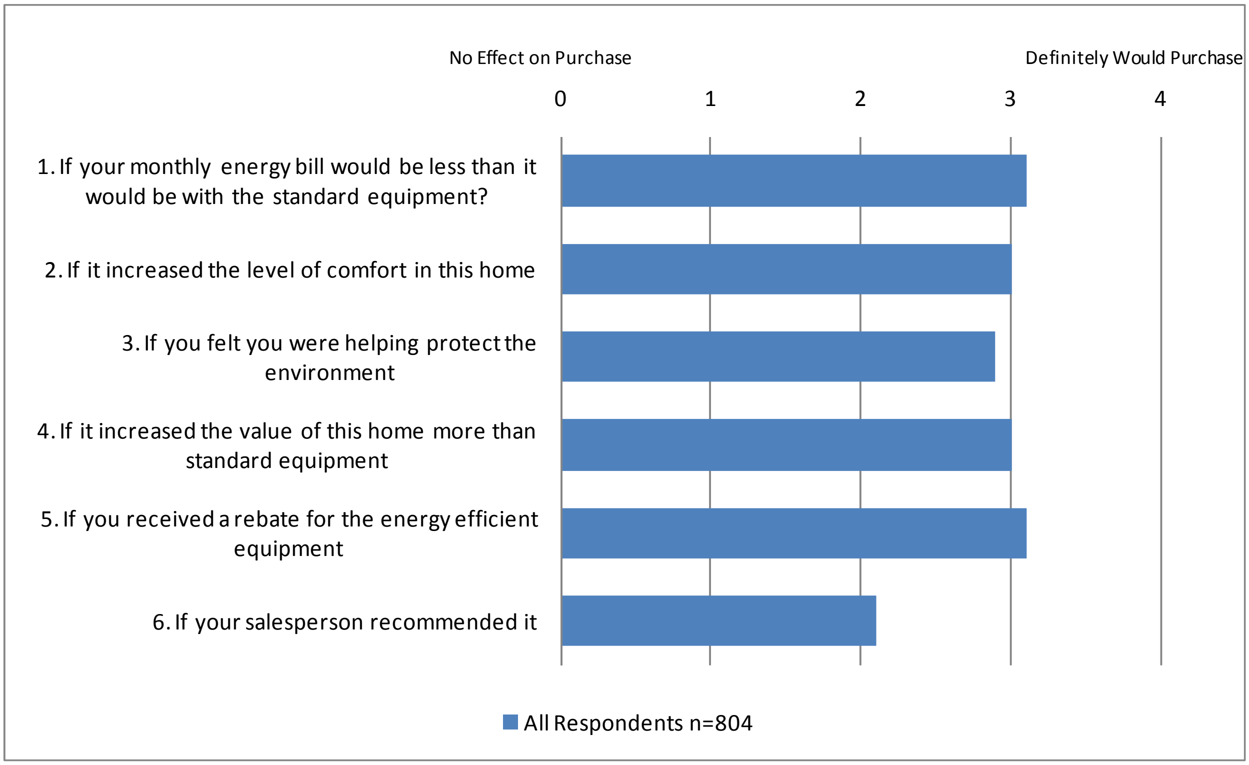
Respondents were asked to comment on their attitudes towards purchasing energy efficient equipment for their homes. They were asked to rate, on a scale of 1 to 4 where 1 means "No effect on purchase" and 4 is "Definitely would purchase," how several factors would affect their choice of energy efficiency equipment versus standard equipment. Table 3-1 below depicts the average rating by sample segment.

Table 3-1
Factors Affecting Purchase Decisions by Segment

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=23	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
1. If your monthly energy bill would be less than it would be with the standard equipment?	2.8	3.1	3.3	3.2	2.9	3.1	3.4	3.3	3.1
2. If it increased the level of comfort in this home	3.0	3.1	3.2	3.1	2.9	3.0	3.2	2.9	3.0
3. If you felt you were helping protect the environment	3.0	3.1	3.4	3.2	2.8	2.9	2.9	2.9	2.9
4. If it increased the value of this home more than standard equipment	2.8	2.7	2.7	3.2	2.7	3.1	3.0	3.0	3.0
5. If you received a rebate for the energy efficient equipment	3.4	3.0	3.4	3.3	3.0	3.1	3.6	3.2	3.1
6. If your salesperson recommended it	2.7	2.2	1.9	2.1	2.2	2.0	1.9	2.4	2.1

On average, respondents indicated that all of the factors stated would positively influence their decision to purchase energy efficient equipment over standard equipment. As shown in Figure 3-1 below, the factors that had the biggest effect were saving money on their monthly energy bill and rebates. It is obvious from this that concern for cost, at point of purchase and in long term savings, is the primary factor in deciding whether to purchase energy efficient equipment. The reason that affected their purchase decision the least was whether it was recommended by the salesperson, which only made them "somewhat more likely to purchase." Overall, multi-family program participants seemed least affected by point of sales influences, scoring at an average of 1.9.

Figure 3-1
Factors Affecting Purchase Decision



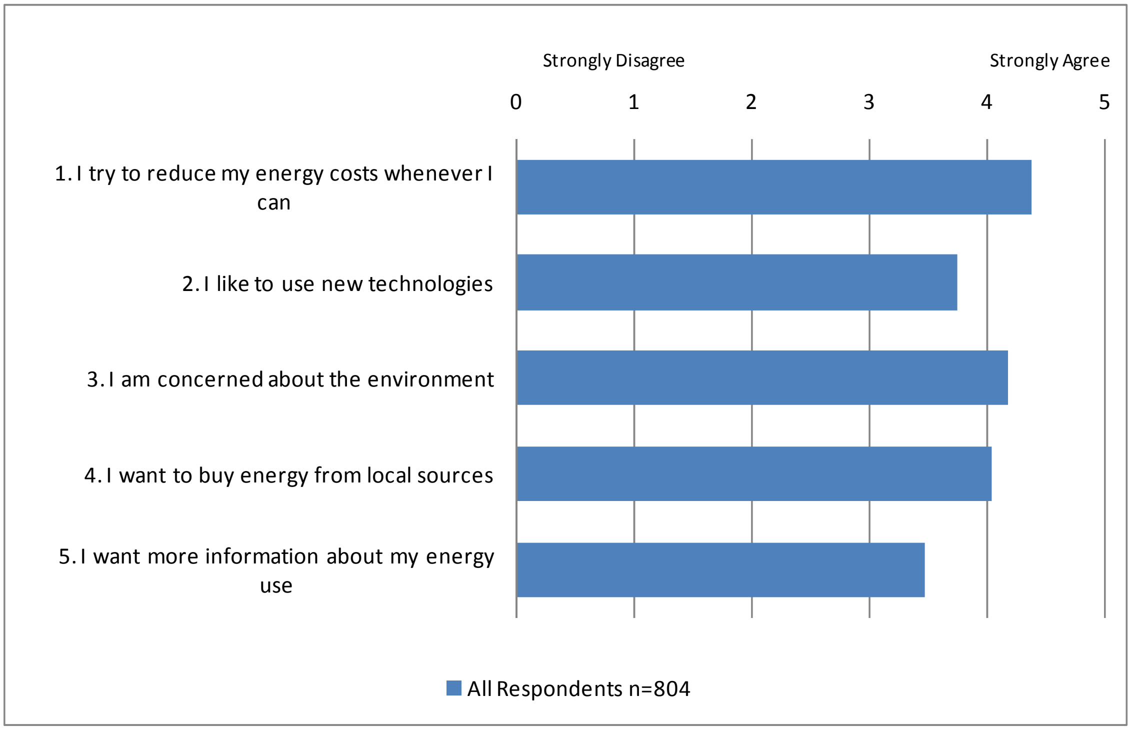
Respondents were also asked to describe barriers that might prevent them from purchasing energy efficient equipment or making energy efficient home improvements, and their responses were allocated to set categories. Table 3-2 below shows the distribution of their responses. Again, respondents overwhelmingly indicated price as a main concern. Approximately 60% of respondents named “costs too much to purchase” a reason they would not choose to make energy efficient upgrades. The next most named reason was “equipment doesn’t currently need to be replaced,” indicating that they would not go out of their way to make the upgrade. Other reasons included being a renter and not having the ability to upgrade their equipment, the equipment not having the features they want, and simply a lack of interest in saving energy.

Table 3-2
Reasons Respondents Chose not to Purchase

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=23	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
1. Costs too much to purchase	43.3%	61.3%	60.0%	65.2%	54.7%	59.9%	70.0%	60.0%	58.6%
2. Too expensive to maintain	6.7%	3.2%	5.0%	4.3%	5.0%	6.8%	20.0%	8.3%	6.6%
3. Too much of a hassle		3.2%			2.8%	3.2%		1.7%	2.6%
4. Don't care about energy efficiency					2.8%	0.9%			1.1%
5. Other features are more important (eg, brand, color)					1.7%	0.2%	5.0%		0.6%
6. Lack in performance quality	10.0%			4.3%	2.8%	2.7%		1.7%	2.7%
7. Minimal energy savings		3.2%	5.0%	4.3%	3.4%	2.5%			2.5%
8. Associated rebate not worth the time needed to fill out paperwork						0.5%	5.0%		0.4%
9. Negative prior experience with an energy efficient product	3.3%					0.7%			0.5%
10. Unaware of the benefits to purchasing energy efficient products					2.2%	1.8%	5.0%	3.3%	1.9%
11. Equipment doesn't currently need to be replaced	13.3%	6.5%	10.0%	13.0%	11.2%	12.9%	15.0%	20.0%	12.8%
12. Other	26.7%	19.4%	15.0%	8.7%	26.8%	17.5%	10.0%	15.0%	19.3%
97. Don't Know	10.0%	19.4%	20.0%	8.7%	4.5%	8.8%	5.0%	8.3%	8.5%
98. Refused						0.5%			0.2%

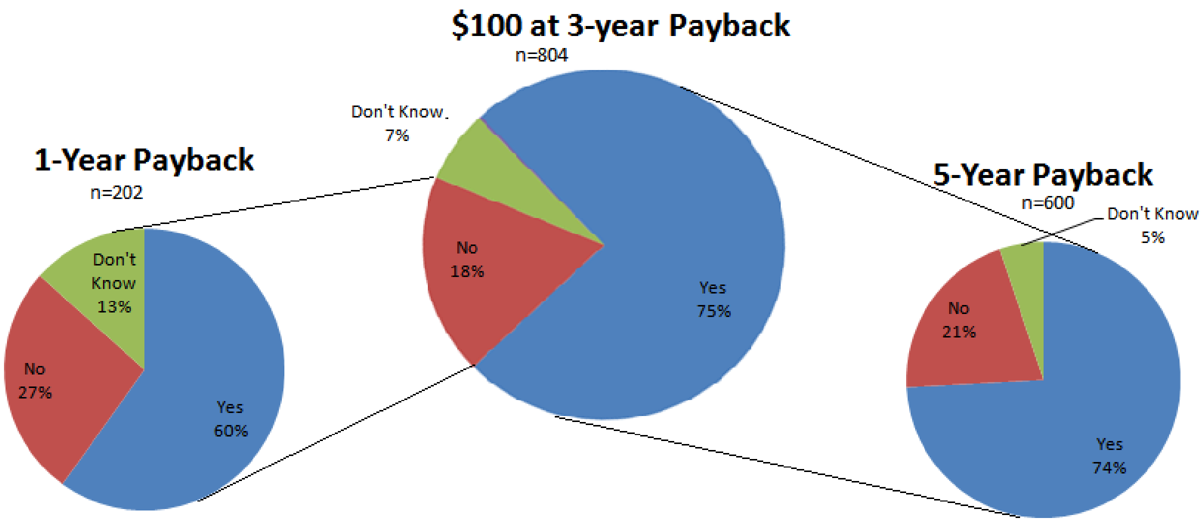
Respondents were asked to rate, on a scale of 1 to 5 where 1 is "strongly disagree" and 5 is "strongly agree," how much they agree with the statements on their energy efficiency attitudes below. The figure below shows their ratings. On average, respondents most strongly agreed with the statement "I try to reduce my energy costs whenever I can." They also indicated concern for the environment and a desire to purchase energy from local sources. They were less concerned with new technologies and information about their energy use.

Figure 3-2
Respondents' Energy Efficiency Attitudes



Respondents were asked a series of questions to gauge their willingness to invest in energy efficient equipment over different payback periods. They were first asked if they would be willing to pay $100 extra for energy efficient equipment and building materials compared to standard equipment and materials for their home considering they would recoup the cost of the equipment through energy savings in three years. The respondents who said they would were then asked if they would make the same investment if it took five years to recoup the costs. The respondents who originally said no were asked if they would do it considering a payback period of just one year. Figure 3-3 below shows the breakdown of responses.

Figure 3-3
Willingness to Invest in Energy Efficient Equipment



To the first question of whether or not they would invest $100 more at a payback period of 3 years, most of the customers responded yes. Table 3-3 below shows the responses by segment.

Table 3-3
Willingness to Invest $100 at 3-year Payback

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=20	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
1. Yes	57%	65%	65%	78%	65%	80%	80%	77%	75%
2. No	33%	23%	20%	9%	27%	15%	20%	12%	19%
97. Don't Know	10%	13%	15%	13%	7%	5%	0%	10%	7%
98. Refused	0%	0%	0%	0%	1%	0%	0%	2%	0%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Of the respondents who indicated that they would not make the $100 additional investment, overall approximately 60% said that they would make the same investment if it had a shorter payback period of one year.

Table 3-4
Willingness to Invest $100 at 1-year Payback

	LI-NP-M n=13	LI-NP-S n=11	LI-PP-M n=7	LI-PP-S n=5	NLI-NP-M n=61	NLI-NP-S n=88	NLI-PP-M n=4	NLI-PP-S n=13	All Respondents n=202
1. Yes	46%	36%	57%	40%	57%	68%	50%	62%	60%
2. No	46%	27%	29%	20%	30%	22%	50%	23%	27%
97. Don't Know	8%	36%	14%	40%	13%	10%	0%	15%	13%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

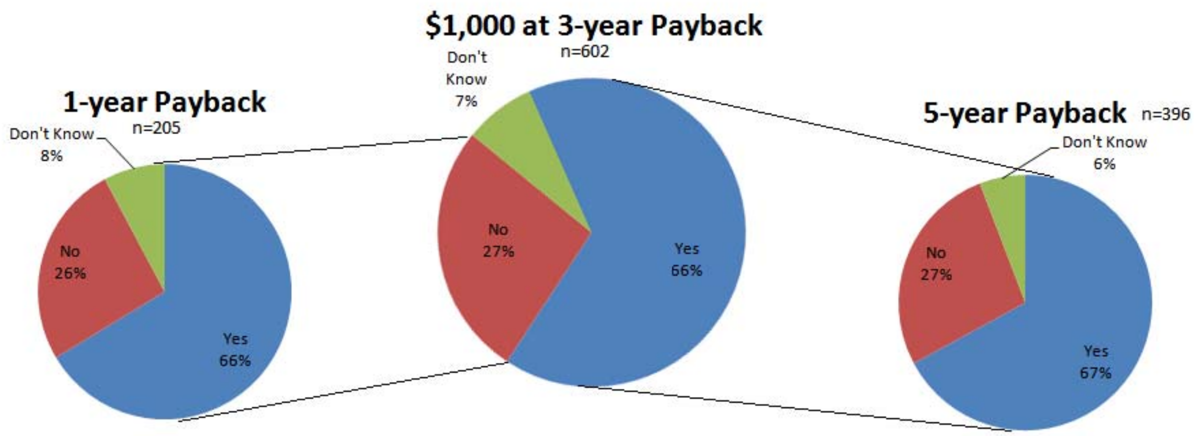
Respondents who indicated that they would make the investment at a payback period of three years were also asked if they would make the same investment at a payback period of five years. Of the original respondents who said they would, 74% of that group indicated that they would make the same investment if the time to recoup the cost was two years longer.

Table 3-5
Willingness to Invest $100 at 5-year Payback

	LI-NP-M n=17	LI-NP-S n=20	LI-PP-M n=13	LI-PP-S n=18	NLI-NP-M n=117	NLI-NP-S n=353	NLI-PP-M n=16	NLI-PP-S n=46	All Respondents n=600
1. Yes	82%	70%	77%	67%	76%	74%	75%	72%	74%
2. No	18%	15%	15%	33%	21%	21%	19%	17%	21%
97. Don't Know	0%	15%	8%	0%	3%	5%	6%	11%	5%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

All customers who said they would make the original energy efficiency investment were then asked if they were willing to pay $1,000 extra for energy efficient equipment with the cost recouped in three years. Customers who indicated that they would were then asked if they would make the same decision at a payback period of five years, and customers who said no were asked if they would at a payback period of one year. Figure 3-4 shows the breakdown of the responses.

Figure 3-4
Willingness to Invest $1,000



Approximately two-thirds of the respondents indicated that they would make the additional investment of $1,000. Table 3-6 below shows the breakdown of responses by segment. The segment least likely to agree was Low-Income/Non-Participant/Multi-Family.

Table 3-6
Willingness to Invest $1,000 at 3-year Payback

	LI-NP-M n=17	LI-NP-S n=20	LI-PP-M n=13	LI-PP-S n=18	NLI-NP-M n=118	NLI-NP-S n=353	NLI-PP-M n=16	NLI-PP-S n=47	All Respondents n=602
1. Yes	59%	55%	54%	72%	64%	68%	63%	64%	66%
2. No	41%	35%	38%	22%	31%	24%	31%	26%	27%
97. Don't Know	0%	10%	8%	6%	5%	8%	6%	11%	7%
98. Refused	0%	0%	0%	0%	1%	0%	0%	0%	0%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Of the respondents who said they would make that investment, approximately 67% of them further indicated that they would make the same investment even in a longer payback period of five years.

Table 3-7
Willingness to Invest $1,000 at 5-year Payback

	LI-NP-M n=10	LI-NP-S n=11	LI-PP-M n=7	LI-PP-S n=13	NLI-NP-M n=75	NLI-NP-S n=240	NLI-PP-M n=10	NLI-PP-S n=30	All Respondents n=396
1. Yes	70%	64%	86%	69%	71%	67%	70%	53%	67%
2. No	30%	18%	14%	31%	23%	28%	30%	30%	27%
97. Don't Know	0%	18%	0%	0%	7%	5%	0%	17%	6%
98. Refused	0%	0%	0%	0%	0%	0%	0%	0%	0%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Respondents who said that they would not make the $1,000 investment were asked if they would consider investing at a payback period of one year. 66% of those who initially responded "no" indicated that they would make the investment if the payback period was shortened. 26% responded that they would still not make that investment.

Table 3-8
Willingness to Invest $1,000 at 1-year Payback

	LI-NP-M n=7	LI-NP-S n=9	LI-PP-M n=6	LI-PP-S n=5	NLI-NP-M n=42	NLI-NP-S n=113	NLI-PP-M n=6	NLI-PP-S n=17	All Respondents n=205
1. Yes	57%	56%	33%	40%	62%	72%	100%	59%	66%
2. No	43%	44%	67%	40%	31%	19%	0%	29%	26%
97. Don't Know	0%	0%	0%	20%	7%	9%	0%	12%	8%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Interviewers asked respondents to rate how important, on a scale of 1 to 5 where 1 means "very unimportant" and 5 means "very important," certain factors were to them when purchasing a new appliance for their home. Energy efficiency and initial cost were the most important factors, and color was the least important. Respondents were also asked to name factors that were important to them. Approximately 12% of respondents suggested that the efficacy and reliability of a product was important when purchasing a product, followed by warranty and size/ergonomics/aesthetics.

Table 3-9

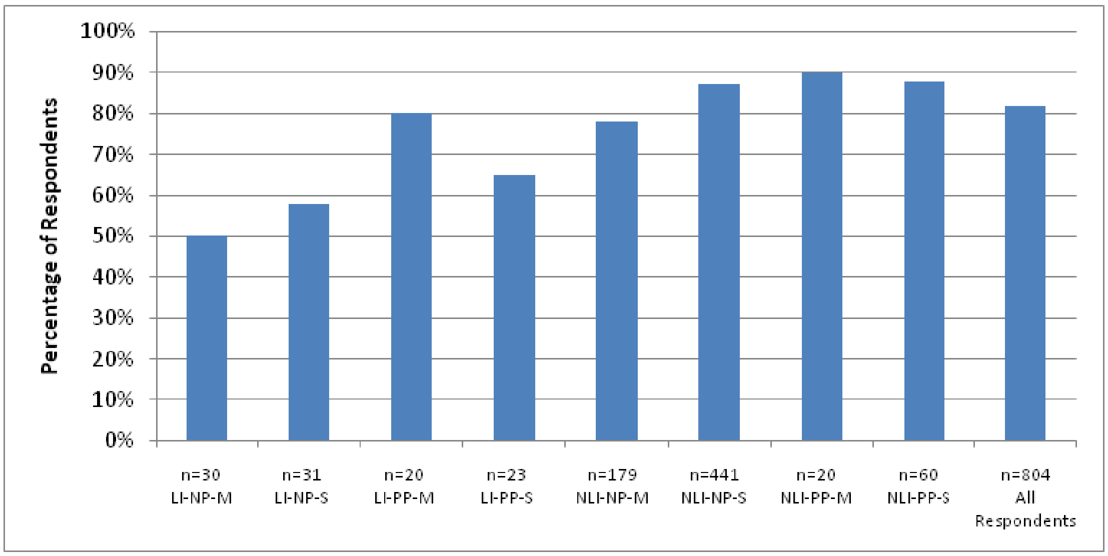
Important Factors When Purchasing Appliances

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=23	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
1. Energy Efficiency	4.6	4.1	4.6	4.7	4.0	4.3	4.5	4.5	4.3
2. Initial Cost	4.3	4.7	4.6	4.8	4.2	4.2	4.1	4.2	4.3
3. Brand	3.9	2.9	3.5	3.9	3.1	3.0	3.1	3.2	3.1
4. Color	3.6	2.3	2.1	2.9	2.7	2.8	2.5	2.8	2.8
5. Product Features	4.1	3.4	3.7	4.1	3.8	3.7	3.6	3.9	3.8
	Percentage of respondents that listed these factors in addition								
Efficacy, Reliability, Reviews	3.3%	9.7%	0.0%	0.0%	11.7%	14.5%	10.0%	5.0%	11.7%
Environmental Impact	0.0%	0.0%	0.0%	0.0%	0.6%	0.5%	0.0%	0.0%	0.4%
Warranty, Maintenance	10.0%	6.5%	10.0%	13.0%	3.9%	7.7%	10.0%	5.0%	7.0%
Size, Ergonomics, Aesthetics	0.0%	0.0%	5.0%	8.7%	7.8%	7.5%	20.0%	15.0%	7.8%
Other	0.0%	9.7%	10.0%	4.3%	2.2%	5.0%	0.0%	3.3%	4.2%

4. Energy Star Awareness

Respondents were asked about their awareness of the Energy Star Program. Most of the respondents in every segment were familiar with the Energy Star label. Awareness was lowest in the Low-Income/Non-Participant/Multi-Family segment.

Figure 4-1
Energy Star Awareness



Interviewers asked respondents to explain what the Energy Star label meant to them, and their responses were sorted into categories as shown in Table 4-1 below. Respondents overwhelmingly associated Energy Star with saving energy, and 23% of respondents also said that they believed Energy Star products cost less money or helped save them money.

Table 4-1
Energy Star Connotations

	LI-NP-M n=12	LI-NP-S n=13	LI-PP-M n=9	LI-PP-S n=13	NLI-NP-M n=87	NLI-NP-S n=295	NLI-PP-M n=16	NLI-PP-S n=40	All Respondents n=485
1. Less Pollution	7%	22%	6%	13%	4%	6%	6%	2%	6%
2. Cost less money/Saves money	47%	50%	31%	27%	19%	21%	28%	25%	23%
3. Uses less energy/saves energy	80%	61%	56%	60%	74%	73%	72%	74%	72%
4. High quality	0%	6%	6%	13%	7%	8%	11%	11%	8%
5. Product is tested; meets standards	0%	11%	13%	7%	14%	17%	22%	11%	15%
6. Government endorsed	0%	11%	0%	0%	1%	6%	0%	2%	4%
7. Safer	0%	6%	6%	0%	4%	1%	0%	0%	1%
8. More comfort	0%	0%	0%	0%	0%	0%	6%	0%	0%
9. Costs more	0%	0%	6%	0%	0%	2%	0%	6%	2%
10. Other	0%	0%	13%	0%	10%	9%	6%	21%	9%
11. Don't know	7%	6%	6%	7%	6%	3%	6%	2%	4%
98. Refused to answer	0%	0%	0%	0%	0%	0%	0%	0%	0%

Respondents were asked whether or not they look for the Energy Star label when making purchasing decisions. Approximately 74% indicated that they do consider Energy Star. The Low-Income/Program Participant/Multi-family segment was least likely to look for Energy Star when making purchasing decisions.

Table 4-2
Energy Star When Purchasing

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=23	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
Yes	80.0%	72.2%	56.3%	86.7%	62.1%	77.0%	88.9%	75.5%	73.7%
No	20.0%	27.8%	43.8%	13.3%	32.9%	20.1%	11.1%	20.8%	23.3%
Don't Know	0.0%	0.0%	0.0%	0.0%	4.3%	2.9%	0.0%	3.8%	2.9%
Refused	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.2%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The approximately 23% of respondents who indicated that they did not consider the Energy Star label to be a factor were then asked to name reasons why not. Table 4-3 shows the percentage of respondents who named the following reasons. The most-named factors included not needing to replace their current equipment and the equipment costing too much to purchase.

Table 4-3
Barriers to Purchasing Energy Star

	LI-NP-M n=3	LI-NP-S n=5	LI-PP-M n=7	LI-PP-S n=2	NLI-NP-M n=46	NLI-NP-S n=77	NLI-PP-M n=2	NLI-PP-S n=11	All Respondents n=153
1. Costs too much to purchase	66.7%	20.0%	57.1%		13.0%	11.7%			14.4%
2. Too Expensive to maintain						2.6%			1.3%
3. Too much of a hassle					2.2%	3.9%			2.6%
4. Don't care about energy efficiency					2.2%	9.1%		9.1%	5.9%
5. Other features are more important					10.9%	13.0%		45.5%	13.1%
6. Lack of performance quality					4.3%				1.3%
7. Minimal energy savings					2.2%				0.7%
8.Associated rebate not worth the time needed to fill out the paperwork									0.0%
9. Negative prior experience with an ES product					2.2%	1.3%			1.3%
U. Unaware of the benefits to purchasing ES products					6.5%	6.5%		9.1%	5.9%
E. Equipment doesn't currently need to be replaced	33.3%	60.0%	28.6%	50.0%	15.2%	15.6%	50.0%		17.6%
O. Other		20.0%	28.6%	50.0%	39.1%	44.2%		27.3%	38.6%
D. Don't know		20.0%	14.3%		6.5%		50.0%	9.1%	4.6%

Figure 4-2 and Table 4-4 below show what Energy Star appliances respondents reported that they owned. The most commonly owned Energy Star appliance was the refrigerator, followed by clothes washer and dishwasher. Other appliances not on the list that respondents named included clothes dryer, and stove/oven.

Figure 4-2
Percentage of Respondents with Energy Star Appliances

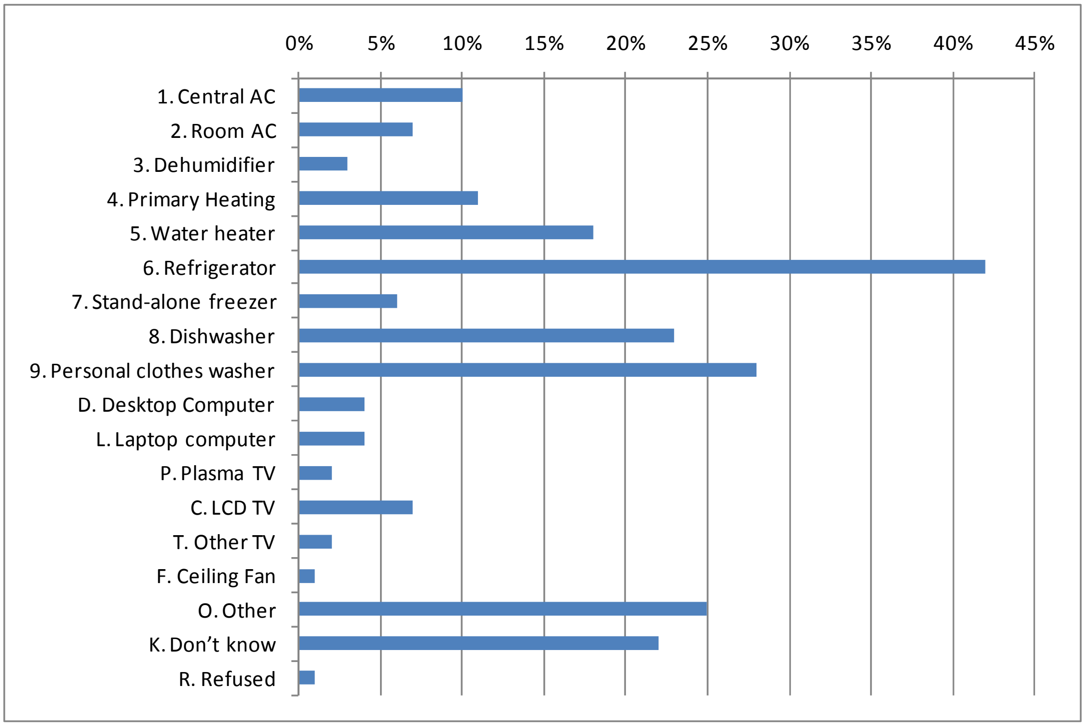


Table 4-4
Energy Star Appliances by Segment

	LI-NP-M n=15	LI-NP-S n=18	LI-PP-M n=16	LI-PP-S n=15	NLI-NP-M n=140	NLI-NP-S n=383	NLI-PP-M n=18	NLI-PP-S n=53	All Respondents n=658
1. Central AC	7%	17%	6%		5%	11%	28%	13%	10%
2. Room AC	13%	6%	25%	13%	10%	5%	11%	6%	7%
3. Dehumidifier				7%	1%	4%	6%	4%	3%
4. Primary Heating		11%	13%	20%	1%	15%		13%	11%
5. Water heater	7%	22%	13%	7%	9%	21%	17%	25%	18%
6. Refrigerator	27%	39%	44%	60%	27%	47%	50%	43%	42%
7. Stand-alone freezer		11%	13%	13%	1%	7%		4%	6%
8. Dishwasher	13%	17%		13%	14%	26%	33%	34%	23%
9. Personal clothes washer	20%	33%	25%	33%	14%	31%	33%	36%	28%
D. Desktop Computer		6%		20%	1%	4%	6%	2%	4%
L. Laptop computer				7%	7%	3%	6%	6%	4%
P. Plasma TV			6%	7%	1%	3%			2%
C. LCD TV	7%	6%			13%	5%		11%	7%
T. Other TV					3%	2%	6%	2%	2%
F. Ceiling Fan				7%	1%	1%			1%
O. Other	40%	11%	25%	20%	26%	24%	22%	34%	25%
K. Don't know	27%	11%	31%	20%	32%	20%	17%	11%	22%
R. Refused					3%				1%

Respondents were asked if they had heard of an "Energy Star-qualified" new home or "Energy Star certified" label for new homes. The majority of respondents had not heard of the label.

Figure 4-3
Energy Star Home Awareness

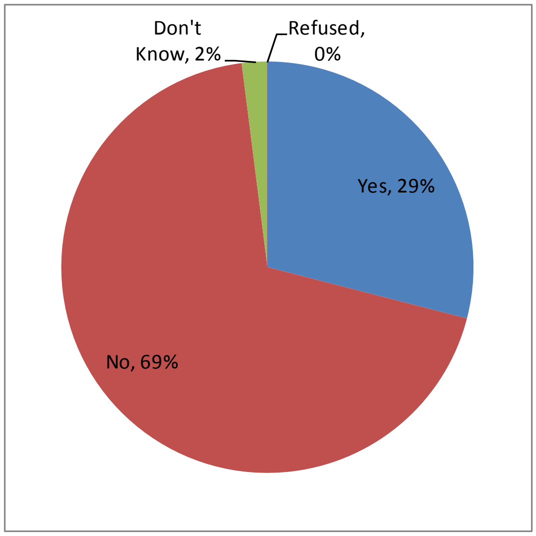


Table 4-5
Energy Star Homes Awareness

	LI-NP-M n=15	LI-NP-S n=18	LI-PP-M n=16	LI-PP-S n=15	NLI-NP-M n=140	NLI-NP-S n=383	NLI-PP-M n=18	NLI-PP-S n=53	All Respondents n=658
Yes	27%	39%	6%	13%	29%	30%	33%	32%	29%
No	73%	50%	88%	80%	71%	69%	61%	62%	69%
Don't Know	0%	6%	6%	7%	1%	1%	6%	6%	2%
Refused	0%	6%	0%	0%	0%	0%	0%	0%	0%

A small pool of respondents (n=10) that were aware of the Energy Star label and also had homes built after 2000 were asked whether their homes were Energy Star certified. Only one respondent, in the Not Low-Income/Non-Participant/Single Family segment, said "yes."

5. Program Awareness and Interest

Respondents were asked a series of questions about their experience with an interest in energy efficiency information and programs. The first question was about the sources of energy efficiency information. Responses were categorized as shown in Table 5-1 below, and multiple responses were accepted. Utility mailers, followed by internet/social media, and newspapers/magazines were the most mentioned sources of energy efficiency information. The low income segments indicated that they received more energy information from utility mailers than did not low income segments. Likewise, not low income segments reported higher rates for receiving information from internet and social media than did low-income segments.

Table 5-1
Sources of Energy Awareness

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=23	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
1. Utility mailer	60.0%	32.3%	45.0%	56.5%	28.5%	31.7%	35.0%	36.7%	33.6%
2. Xcel Energy website	6.7%	12.9%	0.0%	8.7%	6.7%	10.2%	5.0%	11.7%	9.1%
3. Internet/social media	6.7%	6.5%	5.0%	8.7%	24.0%	25.6%	30.0%	20.0%	22.5%
4. Newspapers/ magazines	6.7%	22.6%	15.0%	17.4%	21.8%	32.7%	30.0%	31.7%	27.9%
5. TV/radio	16.7%	16.1%	25.0%	47.8%	25.7%	18.6%	20.0%	20.0%	21.1%
6. Friends/family	3.3%	6.5%	0.0%	8.7%	2.8%	1.6%	20.0%	1.7%	2.7%
7. Energy auditor	0.0%	6.5%	0.0%	8.7%	2.2%	0.7%	5.0%	0.0%	1.5%
8. Utility rep	6.7%	6.5%	10.0%	8.7%	3.4%	5.4%	5.0%	8.3%	5.5%
9. EE product vendor/home supply store	3.3%	12.9%	5.0%	4.3%	7.3%	10.0%	10.0%	10.0%	9.0%
c. Community/local government	6.7%	6.5%	20.0%	8.7%	3.4%	2.9%	10.0%	3.3%	4.1%
O. Other	6.7%	9.7%	15.0%	4.3%	6.1%	14.5%	5.0%	10.0%	11.3%
N. None	10.0%	3.2%	0.0%	0.0%	15.6%	5.9%	0.0%	3.3%	7.5%
D. Don't know	3.3%	6.5%	5.0%	4.3%	3.4%	3.9%	5.0%	5.0%	4.0%
R. Refused	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.1%

Respondents were also asked if they trusted the sources they used and to rate the degree of trust they had in those sources on scale of one to three, where 1 is sometimes, 2 is most of the time, and 3 is always. Table 5-2 shows the results of this line of questioning.

Table 5-2
Trust in Sources of Energy Efficiency Information

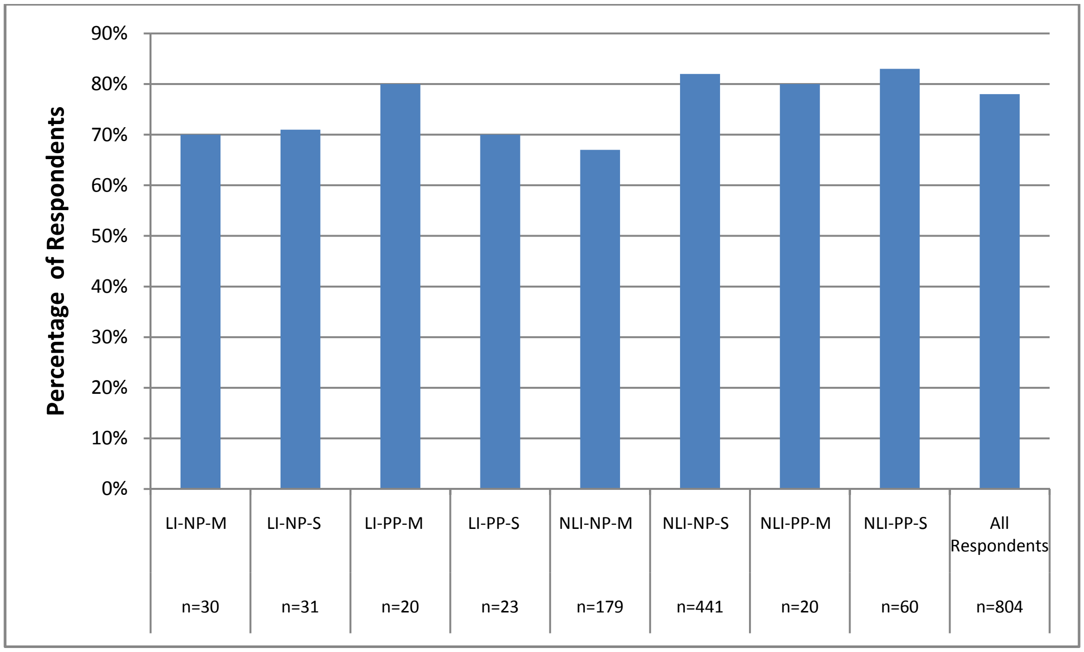
	Yes	No	DK	n	If yes, level of trust 1-3
1. Utility mailer	93.3%	5.6%	1.1%	270	2.2
2. Xcel Energy website	80.8%	5.5%	13.7%	73	2.3
3. Internet/social media	86.7%	8.8%	4.4%	181	1.8
4. Newspapers/magazines	87.1%	8.9%	4.0%	224	1.8
5. TV/radio	76.5%	18.2%	5.3%	170	1.8
6. Friends/family	95.5%	4.5%	0.0%	22	2.1
7. Energy auditor	75.0%	8.3%	16.7%	12	2.3
8. Utility rep	86.4%	6.8%	6.8%	44	2.1
9. EE product vendor/home supply store	84.7%	9.7%	5.6%	72	2.1
10. Community/local government	84.8%	12.1%	3.0%	33	2.1
11. Other	93.4%	5.5%	1.1%	91	2.1

It is reasonable to expect that people will trust the sources of information they use, and overall respondents confirmed this expectation. The most trusted source was "friends and family" with 95.5% of those mentioning this source (n=22) saying they trusted it. The utility mailer was a close second, with 93.3% of a much larger population (n=270) saying they trusted this source. Overall, since the level of trust clustered around "most of the time" with the utility mailer having the highest average level of trust among sources represented by a substantial portion of all respondents.

6. Xcel Energy Program Awareness and Participation

Respondents were questioned about their awareness of and participation in Xcel's energy efficiency programs. First they were asked if they were aware that Xcel Energy had energy efficiency programs that provided incentives and rebates for the purchase of energy efficient equipment.

Figure 6-1
Xcel Program Awareness



Of the 78% of the total pool that were aware of the Xcel Energy programs, 34% (212 or over one-quarter of the entire pool) said that they were influenced to pursue energy efficiency opportunities by this information. Many respondents reported that they changed out their air conditioning units, furnaces, or other large appliances. Many others said they made small changes such as light bulbs or general awareness of electricity usage.

Table 6-1
Influence of Programs

	LI-NP-M n=21	LI-NP-S n=22	LI-PP-M n=16	LI-PP-S n=16	NLI-NP-M n=120	NLI-NP-S n=363	NLI-PP-M n=16	NLI-PP-S n=50	All Respondents n=624
Yes	33%	36%	63%	56%	26%	32%	38%	50%	34%
No	62%	59%	38%	44%	70%	64%	56%	50%	62%
Don't Know	5%	5%	0%	0%	4%	4%	6%	0%	4%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Of those respondents who had heard of the programs, approximately only 30% (187 or 23% of the sample) had participated in one of the programs with Xcel before.

Table 6-2
Program Participation

	LI-NP-M n=21	LI-NP-S n=22	LI-PP-M n=16	LI-PP-S n=16	NLI-NP-M n=120	NLI-NP-S n=363	NLI-PP-M n=16	NLI-PP-S n=50	All Respondents n=624
Yes	29%	27%	38%	63%	8%	34%	56%	40%	30%
No	71%	64%	56%	31%	89%	62%	44%	54%	66%
Don't Know	0%	9%	6%	6%	3%	4%	0%	6%	4%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

The 409 respondents who had never participated in a program before were given a list of reasons for not participating. They were asked to indicate which of these reasons were true for them; results are shown in the figure below.

Figure 6-2
Reasons Why Respondents Chose Not to Participate (n=435)

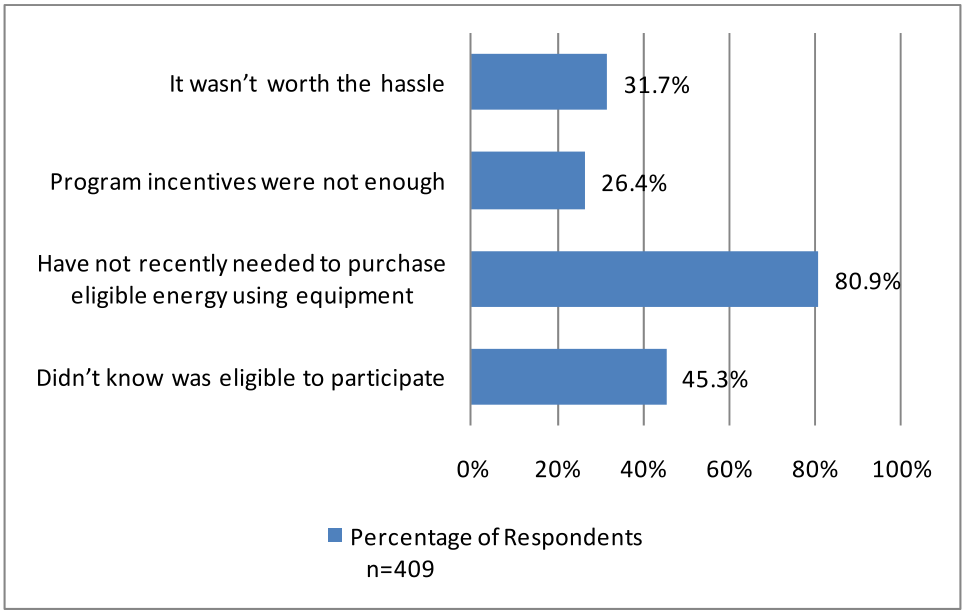


Table 6-3 below shows the percentage of respondents who participated in renewable energy or energy efficiency programs through Xcel Energy. They were also asked if, given their experiences, they would participate in those programs again. The majority of respondents indicated that they would participate again.

Table 6-3
Xcel Program Participation

	Respondents n=189	Would you participate in this program again?		
		Yes	No	DK
1. Whole House improvement/home performance	11	91%	9%	0%
2. Home efficiency audit	25	76%	16%	8%
3. Renewable energy/WindSource or solar rewards	9	89%	0%	11%
4. Income Qualified Weatherization	12	92%	0%	8%
5. New Home Construction	2	50%	0%	50%
6. Cooling rebate	39	90%	10%	0%
7. Heating rebate	35	100%	0%	0%
8. Home energy Squad	16	75%	19%	6%
9. Saver Switch	71	96%	3%	1%

The programs that customers said they would not participate in again included: Whole House Improvement/Home Performance, Home Efficiency Audit, cooling rebate, Home Energy Squad, and Saver Switch. Respondents were asked for their reasons why they would not participate again. Only one customer said he would not participate in the Whole House Improvement/Home Performance program again, citing old age and current house performance as factors. Four customers said they would not participate in the Home Efficiency Audit program again, either because the incentives were not enough, they had made all the suggested improvements, or they had made no changes since the previous audit. Of the customers who indicated they would not repeat the cooling rebate, one said that they incentives were not enough. Respondents also indicated that the Home Energy Squad program was “too much of a hassle” and they were “dissatisfied” with the Saver Switch Program.

Respondents were also asked about programs that they did not participate in. For each program, respondents were asked if they thought their homes could benefit from the program. If yes, then they were also asked if they were interested in participating. Interestingly, on average only about half of the respondents who thought their homes could benefit were also actually interested in participating. When asked why they would not participate, top reasons included the cost being prohibitively high, not owning their own homes, and simply not being interested.

Table 6-4
Xcel Program Interest (n=722)

	Respondents who think their home could benefit from the program		Respondents who think their home could benefit and are also interested in the program	
	n	%	n	%
1. Whole House improvement/home performance	269	37%	129	48%
2. Home efficiency audit	367	51%	197	54%
3. Renewable energy/WindSource or solar rewards	210	29%	109	52%
4. Income Qualified Weatherization	250	35%	128	51%
5. New Home Construction	133	18%	44	33%
6. Cooling rebate	271	38%	155	57%
7. Heating rebate	246	34%	130	53%
8. Home energy Squad	227	31%	127	56%
9. Saver Switch	175	24%	102	58%

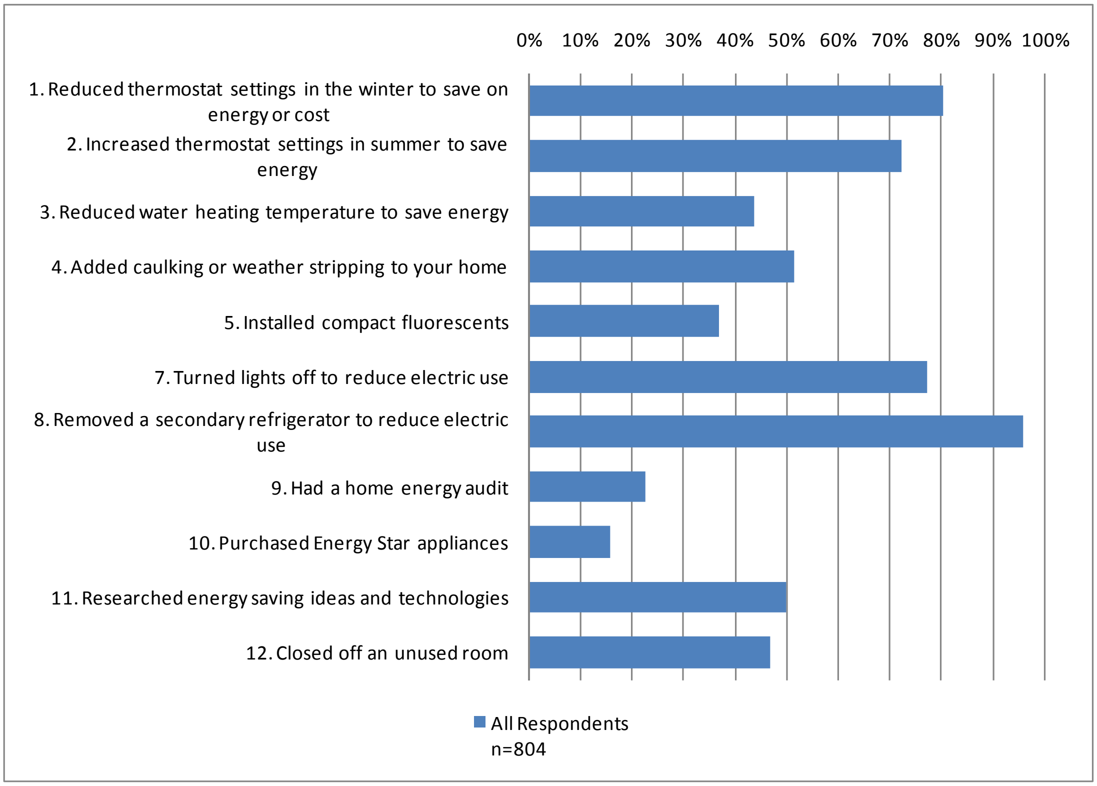
7. Energy Efficiency and Conservation Activities

Respondents were asked about their energy conservation activities during the past year. Table 7-1 shows distribution of reported activities.

Table 7-1
Energy Conservation Measures Taken

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=23	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
1. Reduced thermostat settings in the winter to save on energy or cost	58.6%	76.7%	80.0%	91.3%	73.8%	81.9%	89.5%	93.0%	80.3%
2. Increased thermostat settings in summer to save energy	66.7%	73.1%	76.5%	70.0%	65.2%	73.9%	66.7%	84.7%	72.3%
3. Reduced water heating temperature to save energy	40.9%	55.2%	76.5%	60.9%	26.5%	43.5%	45.0%	61.7%	43.6%
4. Added caulking or weather stripping to your home	46.4%	67.7%	76.5%	71.4%	26.3%	57.3%	55.0%	55.9%	51.6%
5. Installed compact fluorescents	33.3%	44.8%	50.0%	54.5%	17.6%	40.6%	36.8%	45.8%	36.8%
7. Turned lights off to reduce electric use	63.3%	83.9%	75.0%	87.0%	65.1%	80.6%	90.0%	83.1%	77.2%
8. Removed a secondary refrigerator to reduce electric use	90.0%	96.8%	100.0%	100.0%	95.5%	96.6%	100%	90.0%	95.9%
9. Had a home energy audit	22.7%	33.3%	53.8%	31.3%	12.4%	25.4%	35.7%	10.2%	22.6%
A. Purchased Energy Star appliances	6.9%	35.5%	58.8%	70.0%	3.0%	11.2%	60.0%	35.0%	15.8%
B. Researched energy saving ideas and technologies	32.0%	48.3%	62.5%	52.4%	27.3%	56.8%	64.7%	63.6%	49.8%
C. Closed off an unused room	43.3%	43.3%	30.0%	52.2%	37.0%	51.1%	50.0%	50.0%	46.8%
D. Other	48.1%	71.0%	57.9%	72.7%	36.5%	51.9%	38.9%	50.0%	49.5%

Figure 7-1
Energy Conservation Measures



The most common measure taken to reduce energy use was removing a secondary refrigerator and reducing thermostat settings in the winter. Unsurprisingly, conservation activities such as turning off lights were more commonly taken than activities to increase energy efficiency, such as changing out light bulbs for CFLs and purchasing Energy Star appliances. Additionally, steps taken to reduce energy use for building heating and cooling were more popular than other measures such as lighting and water heating. The percentage of people who said they installed CFLs was lower than the percentage of people who had recently added caulking or weather-stripping to their home.

Approximately half of respondents also indicated that they took “other” measures to reduce energy use. Responses in this category were primarily related to building shell efficiency. These included:

- Adding more insulation to the attic

- Installing a new roof
- Replacing doors and windows
- Putting plastic over windows

Respondents were asked if they would be interested in a free energy conservation program where their energy usage would be compared to similar homes in their neighborhood and informed that research has shown that residents enrolled in this type of program across the nation tended to reduce their overall energy consumption. Table 7-2 shows the percentage of respondents who said they were interested in such a program. Non-participant multi-family segments were the least interested in participating, and the Low Income/Program Participant/Single Family segment was the most interested. On average, less than half of the respondents indicated interest in this program.

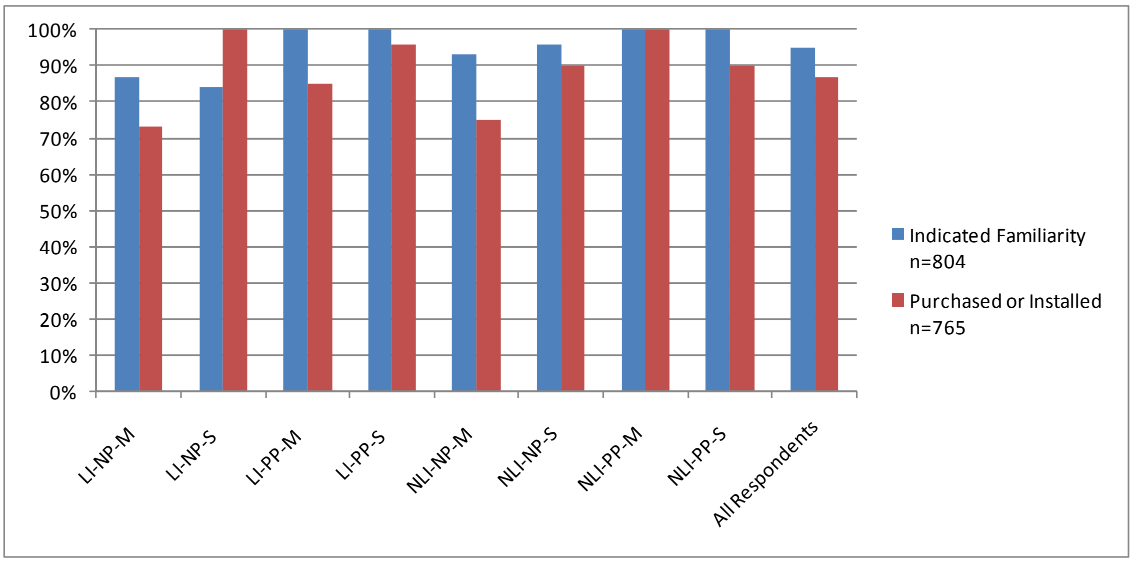
Table 7-2
Interest in Energy Conservation Program

	LI-NP-M n=30	LI-NP-S n=31	LI-PP-M n=20	LI-PP-S n=23	NLI-NP-M n=179	NLI-NP-S n=441	NLI-PP-M n=20	NLI-PP-S n=60	All Respondents n=804
Yes	37%	45%	45%	57%	28%	43%	40%	38%	40%
No	60%	45%	50%	43%	69%	54%	55%	58%	57%
Don't Know	3%	10%	5%	0%	2%	2%	5%	3%	3%
Refused	0%	0%	0%	0%	1%	0%	0%	0%	0%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

8. Residential Lighting and Awareness

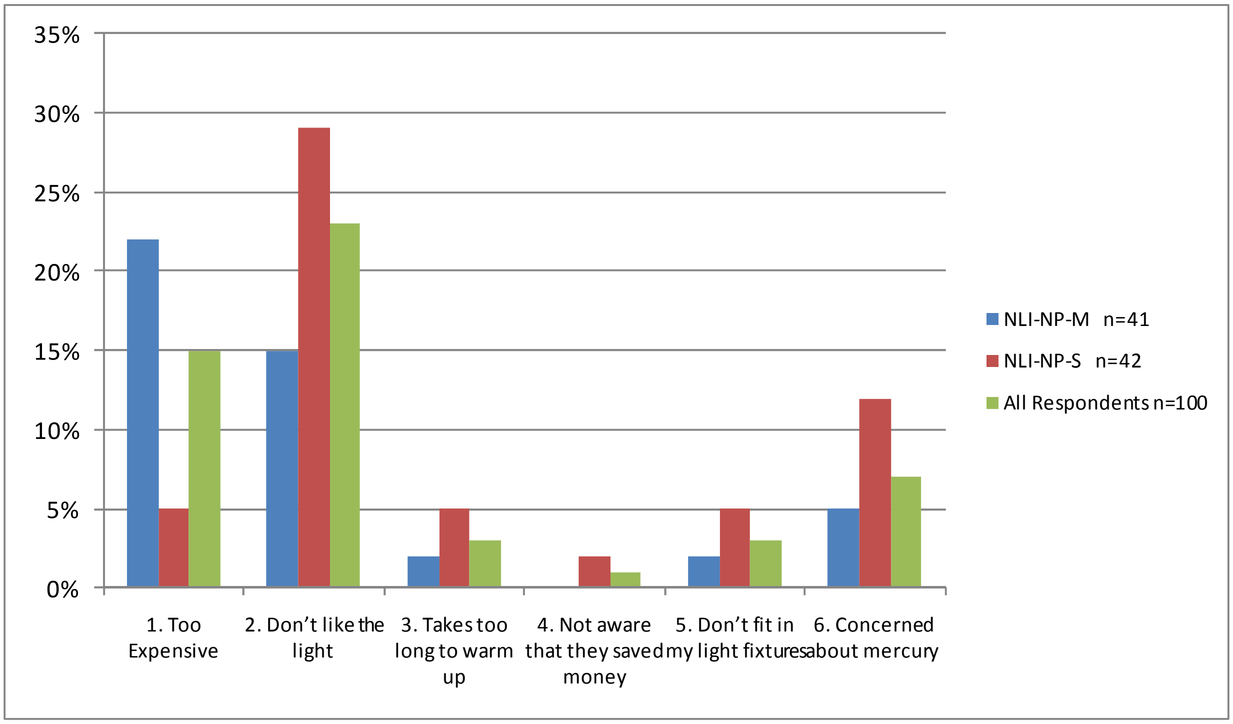
Respondents were asked a series of questions about their home's lighting and their familiarity with efficient lighting technologies, in particular CFL and LED lighting. Figure 8-1 shows the percentage of respondents who indicated that they were familiar with compact fluorescent light bulbs, and the percentage of those who had also purchased or installed CFLs in their home. The majority, if not all of the respondents in some segments, indicated that they were familiar with CFL lighting. Of the respondents who said they were familiar with compact fluorescent lighting, most had purchased CFLs or installed them in their homes. Approximately 13% said that they had never purchased CFLs before nor did they have them in their home.

Figure 8-1



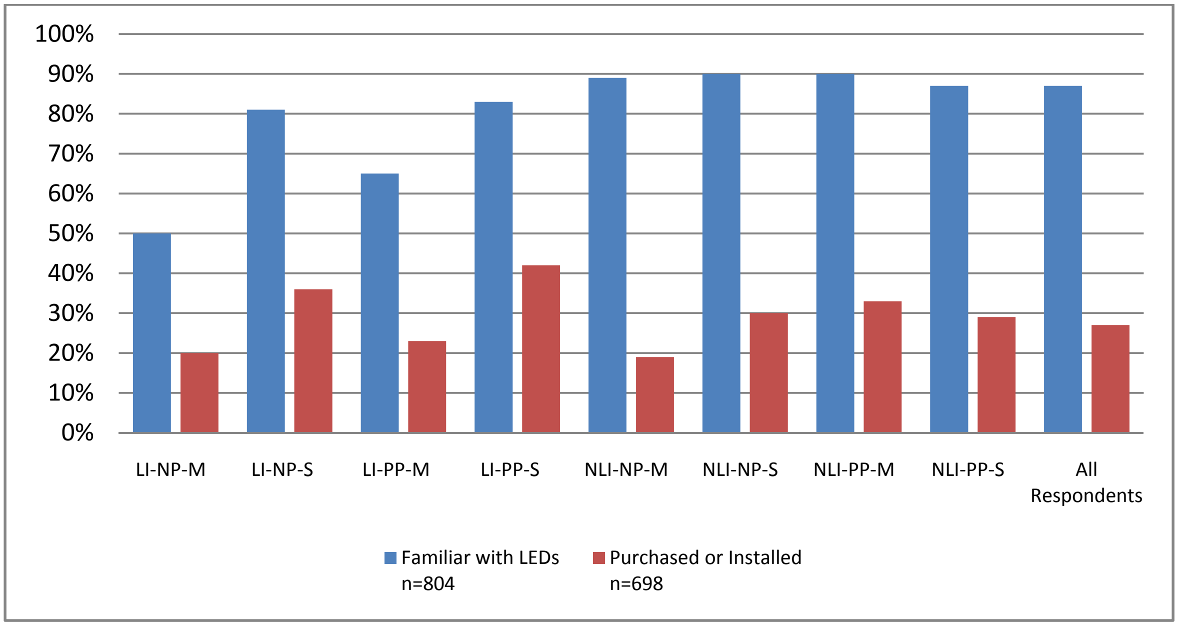
Reasons respondents listed for not purchasing or installing CFL lights in their homes included the bulbs being too expensive and not liking the light. The figure below shows the percentage of respondents listing the following among the reasons for not purchasing or installing CFLs. The not-low income, non-participant single- and multi-family segments had the most substantial number of responses and are compared in the figure below alongside the total group of respondents. Not liking the light was the primary reason respondents indicated that they did not install CFLs. The second most common reason for not purchasing was the cost of CFLs. Respondents who gave "other" reasons primarily said that they are waiting for current light bulbs to burn out.

Figure 8-2
Reasons for Not Installing CFLs



Respondents were also asked about their familiarity with LED lighting. Figure 8-3 below shows the percentage of respondents who were familiar with LED lighting, as well as the percentage of those respondents who had also purchased or installed LEDs, not including LED battery operated equipment such as flashlights. Familiarity with LEDs was high amongst respondents, although at a lower rate than CFL lighting. Significantly fewer customers had purchased LED lights in comparison to CFLs.

Figure 8-3
Familiarity and Installation of LEDs



Respondents who had purchased or installed LEDs were asked to list reasons for purchasing or installing LED lighting. The following table shows the percentage of respondents who listed the following reasons for installing LED lighting. Over half of the respondents named energy efficiency was a reason. Long lasting and providing cost savings were two other popular reasons. Very few people indicated low maintenance and cutting edge technology as priorities.

Figure 8-4
Reasons for Installing LEDs

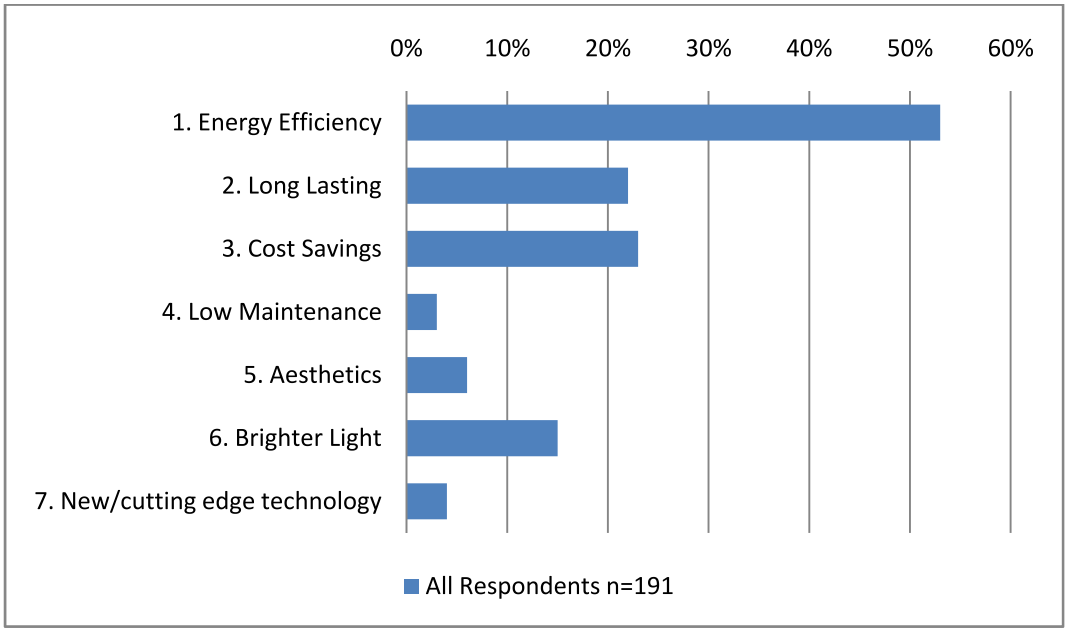


Table 8-1
Reasons for Purchasing and Installing LEDs

	LI-NP-M n=3	LI-NP-S n=9	LI-PP-M n=3	LI-PP-S n=8	NLI-NP-M n=30	NLI-NP-S n=117	NLI-PP-M n=6	NLI-PP-S n=15	All Respondents n=191
1. Energy Efficiency	33%	78%	67%	25%	50%	54%	67%	47%	53%
2. Long Lasting	67%	22%	0%	13%	20%	24%	17%	13%	22%
3. Cost Savings	0%	44%	0%	50%	30%	18%	33%	27%	23%
4. Low Maintenance	0%	0%	0%	0%	10%	2%	0%	7%	3%
5. Aesthetics	0%	0%	0%	0%	17%	4%	17%	0%	6%
6. Brighter Light	33%	0%	33%	13%	20%	14%	0%	20%	15%
7. New/cutting edge technology	0%	0%	0%	0%	0%	4%	0%	13%	4%
8. Other	0%	0%	33%	25%	7%	21%	17%	33%	18%
9. Don't know	0%	0%	0%	0%	3%	3%	0%	0%	3%

9. Summary

Overall, customers of Xcel Energy were familiar with energy efficiency and the programs that Xcel offers. The following summarizes a few points:

- **Respondents are interested in low-cost/no-cost conservation measures.** When surveyed, a majority of customers said that they had enacted many behavioral energy conservation measures, such as turning off lights and adjusting the thermostat in the winter and summer to save energy.
- **Respondents are interested in HVAC and building shell energy efficiency measures.** Customers are primarily concerned with energy efficiency improvements that will lower energy usage for heating and cooling. This will come in HVAC and building shell improvements, such as adding insulation and weather-stripping.
- **CFL adoption is good, and LED awareness is still growing.** Most of the customers surveyed had heard of and installed CFLs in their homes, yet only a small fraction were familiar with LED lighting.
- **Recouping costs is a high priority.** In making purchasing decisions, customers consistently named prohibitive costs as a reason for not making the energy efficient choice. Likewise, they consistently named saving energy as one of their priorities for making these decisions.
- **Customers have been satisfied with Xcel's Energy Efficiency Programs.** Overall, respondents said that they were satisfied with the programs they participated in and said they would participate again.

10. Appendix A – Survey Instrument

Xcel Energy Residential Awareness-Adoption Survey

Hello. This is _____ calling from **[CATI Vendor]** on behalf of Xcel Energy and KEMA, an energy consulting company. KEMA has been retained by Xcel Energy to conduct research to assess customer awareness, interest and experience with energy efficient products and programs. Your input to the study is important and we would appreciate your participation. I want to assure you that this is not a sales call and the information you provide will be kept strictly confidential.

May I please speak to one of the heads of your household?
[REPEAT INTRO AS NEEDED, CONTINUE OR ARRANGE FOR CALLBACK]

[IF REQUESTED]
For further questions about this survey, you can contact **[Jan Nelson]** at Xcel Energy at the following phone number: **[612-330-2868]**

You can also submit your questions to the following email address**:**
Jan.Nelson@XcelEnergy.com

SCREENING QUESTIONS

SC1: I'd like to confirm if your home address is:
[SHOULD MATCH NAME OF ADDRESS FROM CATI LIST]

1. ☐ Confirmed address	
2. ☐ Address not confirmed	**Thank & Terminate Survey**
97. ☐ Don't know	**Thank & Terminate Survey**
98. ☐ Refused to answer	**Thank & Terminate Survey**

SC2: Is this a residence or a business?

1. ☐ Residence	
2. ☐ Both residence and business	
3. ☐ Business only	**Thank & Terminate Survey**
97. ☐ Don't know	**Thank & Terminate Survey**
98. ☐ Refused to answer	**Thank & Terminate Survey**

SC3: Do you currently receive a bill from Xcel Energy for your:
[READ LIST. RECORD ONLY ONE RESPONSE]

1. ☐ Electricity only	
2. ☐ Natural gas only	
3. ☐ Both electricity and natural gas	
97. ☐ Don't know	**Ask for bill payer and repeat intro**
98. ☐ Refused to answer	**Thank & Terminate Survey**
99. ☐ Not a customer/no bills from Xcel Energy	**Thank & Terminate Survey**

HOUSING CHARACTERISTICS

I'd like to ask some questions about the type of house or building you live in.

HC1. Which of the following best describes your home? Is it a ….

[READ LIST. RECORD ONLY ONE RESPONSE]

1. ☐ 1-story house
2. ☐ 2-story house
3. ☐ Split-level house
4. ☐ Mobile home
5. ☐ Duplex, triplex, or quadplex
6. ☐ Apartment w/more than 4 apartments
7. ☐ Condominium
8. ☐ Townhome
9. ☐ Other (Please describe:____)
97. ☐ Don't know
98. ☐ Refused to answer

HC2. Do you own or rent your home?

1. ☐ Own
2. ☐ Rent
3. ☐ Other (Please describe: _______________)
97. ☐ Don't know
98. ☐ Refused to answer

HC3. Approximately what year was this home or building constructed?

1. ☐ 2010 to 2011
2. ☐ 2006 to 2009
3. ☐ 2001 to 2005
4. ☐ 1996- 2000
5. ☐ 1991 to 1995
6. ☐ 1986 to 1990
7. ☐ 1981 to 1985
8. ☐ 1976 to 1980
9. ☐ 1960 - 1975
10. ☐ Before 1960
11. ☐ **[If unsure, but can make educated guess of nearest decade]** Provide response:__________
97. ☐ Don't know
98. ☐ Refused to answer

HC4. What is the approximate square footage of the living space of your home?
Do not include unheated garage, attic, or basement space.
[Prompt by reading response options if necessary]

1. ☐ 0 to 500 square feet
2. ☐ Over 500 to 1,000 square feet
3. ☐ Over 1,000 to 1,500 square feet
4. ☐ Over 1,500 to 2,000 square feet
5. ☐ Over 2,000 to 2,500 square feet
6. ☐ Over 2,500 to 3,000 square feet
7. ☐ Over 3,000 to 3,500 square feet
8. ☐ Over 3,500 to 4,000 square feet
9. ☐ Over 4,000 square feet
97. ☐ Don't know
98. ☐ Refused to answer

HC4a. [If HC4 = 97 or 98 then ask] Currently, how many rooms are there in your home, not counting bathrooms, halls, or garages?
[An estimate is fine]

1. ☐ Record # of rooms: _________________
97. ☐ Don't know
98. ☐ Refused to answer

ENERGY EFFICIENCY ATTITUDES

Now I have some questions about your attitudes towards purchasing energy efficient equipment for your home. I am referring to new equipment specifically designed to be more energy efficient than other *new* models.

EEA1. Use the following scale to indicate how the following factors would affect your choice of energy efficient equipment versus standard equipment, where…

1 means "No effect on purchase decision";
2 means "Somewhat more likely to purchase";
3 means "Much more likely to purchase"; and
4 means "Definitely would purchase"

How would your decision to purchase energy efficient equipment *instead of standard equipment* change…	**1. ENTER 1-4**	**97. Don't know**	**98. Refused to answer**
1. If your monthly energy bill would be less than it would be with the standard equipment?	☐	☐	☐
2. If it increased the level of comfort in this home	☐	☐	☐
3. If you felt you were helping protect the environment?			
4. If it increased the value of this home more than standard equipment?	☐	☐	☐
5. If you received a rebate for the energy efficient equipment?	☐	☐	☐
6. If your sales person recommended it?	☐	☐	☐

EEA2. In general, what do you see as the primary reason(s) you might not purchase energy efficient equipment or make energy efficiency home improvements?

[DO NOT READ; RECORD ALL PHRASES MENTIONED]

1. ☐ Costs too much to purchase
2. ☐ Too expensive to maintain
3. ☐ Too much of a hassle
4. ☐ Don't care about energy efficiency
5. ☐ Other features are more important (e.g., brand, color)
6. ☐ Lack in performance quality
7. ☐ Minimal energy savings
8. ☐ Associated rebate not worth the time needed to fill out paperwork
9. ☐ Negative prior experience with an energy efficient product
10. ☐ Unaware of the benefits to purchasing energy efficient products
11. ☐ Equipment doesn't currently need to be replaced
12. ☐ Other (Specify:_________________________)
97. ☐ Don't know
98. ☐ Refused to answer

EEA3. I am going to read 5 short statements. Please rate how much you agree with the statement using a scale of 1 to 5, where 1 means "strongly disagree" and 5 means "strongly agree."

Statement	**1. ENTER 1-5**	**97. Don't know**	**98. Refused to answer**
1. I try to reduce my energy costs whenever I can	☐	☐	☐
2. I like to use new technologies	☐	☐	☐
3. I am concerned about the environment	☐	☐	☐
4. I want to buy energy from local sources	☐	☐	☐
5. I want more information about my energy use	☐	☐	☐

EEA4a. Would you be willing to pay $100 extra for energy efficient equipment and building materials compared to standard equipment and materials for your home if you would recoup the cost of the equipment through energy savings in THREE years?

1. ☐ Yes	
2. ☐ No	**SKIP TO EEA4c**
97. ☐ Don't know	**SKIP TO EEA4c**
98. ☐ Refused to answer	**SKIP TO EEA4d**

EEA4b. [If EEA4a = 1] ask: Would you be willing to make the same investment if you would recoup the cost in FIVE years?

1. ☐ Yes	**SKIP TO EEA4d**
2. ☐ No	**SKIP TO EEA4d**
97. ☐ Don't know	**SKIP TO EEA4d**
98. ☐ Refused to answer	**SKIP TO EEA4d**

EEA4c. [If EEA4a = 2 or 97] ask: Would you be willing to make the same investment if you would recoup the cost in ONE year?

1. ☐ Yes	**SKIP TO EEA5**
2. ☐ No	**SKIP TO EEA5**

EEA4d. [If EEA4a = 1 OR 98? (to be confirmed by Jonathan)] Would you be willing to pay $1,000 extra for energy efficient equipment and building materials compared to standard equipment and materials for your home if you would recoup the cost of the equipment through energy savings in THREE years?

1. ☐ Yes	
2. ☐ No	**SKIP TO EEA4f**
97. ☐ Don't know	**SKIP TO EEA4f**
98. ☐ Refused to answer	**SKIP TO EEA5**

EEA4e. [If EEA4d = 1] ask: Would you be willing to make the same investment if you would recoup the cost in FIVE years?

1. ☐ Yes	**SKIP TO EEA5**
2. ☐ No	**SKIP TO EEA5**
97. ☐ Don't know	**SKIP TO EEA5**
98. ☐ Refused to answer	**SKIP TO EEA5**

EEA4f. [If EEA4d = 2 or 97] ask: Would you be willing to make the same investment if you would recoup the cost in ONE year?

1. ☐ Yes	
2. ☐ No	
97. ☐ Don't know	
98. ☐ Refused to answer	

EEA5. Please tell me how important each factor is to you when purchasing an appliance for your home? Rate each item on a 1 to 5 scale where 1 means very unimportant and 5 means very important.

Appliance Factor	1. ENTER 1-5	97. Don't know	98. Refused to answer
1. ☐ Energy efficiency			
2. ☐ Initial cost			
3. ☐ Brand			
4. ☐ Color			
5. ☐ Product features			
6. ☐ Is there anything else that is important to you when purchasing an appliance for your home? If yes, please specify:_________________________) [Additional prompt]: How important is this to you on a scale of 1-5?			
97. ☐ Don't know			
98. ☐ Refused to answer			

ENERGY STAR AWARENESS

ES1. Have you ever heard of or seen the Energy Star label?

1. ☐ Yes	
2. ☐ No	**SKIP TO PA1**
97. ☐ Don't know	**SKIP TO PA1**
98. ☐ Refused to answer	**SKIP TO PA1**

ES2. What does the Energy Star label mean to you?
[DO NOT READ. ACCEPT MULTIPLE RESPONSES]

1. ☐ Less pollution
2. ☐ Cost less money/saves money
3. ☐ Uses less energy/saves energy
4. ☐ High quality
5. ☐ Product is tested; meets standards
6. ☐ Government endorsed
7. ☐ Safer
8. ☐ More comfort
9. ☐ Costs more
10. ☐ Other (Specify:____________)
97. ☐ Don't know
98. ☐ Refused to answer

ES3. Do you look for the Energy Star label when making purchasing decisions to help select products that use less energy?

1. ☐ Yes	**SKIP TO ES4**
2. ☐ No	
97. ☐ Don't know	**SKIP TO ES4**
98. ☐ Refused to answer	**SKIP TO ES4**

ES3a. Why do you say that? (Accept multiple responses)

1. ☐ Costs too much to purchase
2. ☐ Too expensive to maintain
3. ☐ Too much of a hassle
4. ☐ Don't care about energy efficiency
5. ☐ Other features are more important (e.g., brand, color)
6. ☐ Lack in performance quality
7. ☐ Minimal energy savings
8. ☐ Associated rebate not worth the time needed to fill out paperwork
9. ☐ Negative prior experience with an Energy Star product
10. ☐ Unaware of the benefits to purchasing Energy Star products
11. ☐ Equipment doesn't currently need to be replaced
12. ☐ Other (Specify:___________________________)
97. ☐ Don't know
98. ☐ Refused to answer

ES4. What appliances do you own that have the Energy Star Label? 9-8: Should we add a none option here? Otherwise, we suggest leaving as is since the study is in progress.
[DO NOT READ. ACCEPT MULTIPLE RESPONSES]

List of Energy Star Appliances
1. ☐ Central Air Conditioner (**Do not include room air conditioners or fans)**
2. ☐ Room Air Conditioner
3. ☐ Dehumidifier
4. ☐ Primary Heating System
5. ☐ Water Heater
6. ☐ Refrigerator
7. ☐ Stand-alone Freezer
8. ☐ Dishwasher
9. ☐ Clothes Washer used for the private use of this home
10. ☐ Desktop Computer
11. ☐ Laptop Computer
12. ☐ Plasma Television
13. ☐ LCD Television
14. ☐ Other Types of Televisions
15. ☐ Ceiling Fans
16. ☐ Other (Please describe:___________________________)

ES5. Have you heard of an "ENERGY STAR-qualified" new home or "ENERGY STAR certified" label for new homes?

1. ☐ Yes	
2. ☐ No	**SKIP TO PA1**
97. ☐ Don't know	**SKIP TO PA1**
98. ☐ Refused to answer	**SKIP TO PA1**

ES5a. [Ask if HC3 = 1, 2, or 3; Else skip to PA1] Is your home an Energy Star qualified or Energy Star certified home?

1. ☐ Yes
2. ☐ No
97. ☐ Don't know
98. ☐ Refused to answer

PROGRAM AWARENESS & INTEREST

Next I would like to ask about your experience and interest regarding energy efficiency information and programs.

PA1. From what source(s) do you receive energy efficiency information?
[Circle all that apply; prompt if respondent has no answer]

1. ☐ Utility mailer	
2. ☐ Xcel Energy website	
3. ☐ Internet/online/social media	
4. ☐ Newspapers/ Magazines	
5. ☐ TV/Radio	
6. ☐ Friends/family	
7. ☐ Energy auditor	
8. ☐ Utility representative	
9. ☐ Energy efficiency product vendor/home supply store	
10. ☐ Community/Local Government	
11. ☐ Other (Describe:_______________)	
12. ☐ None	**SKIP TO PA2**
97. ☐ Don't know	**SKIP TO PA2**
98. ☐ Refused to answer	**SKIP TO PA2**

PA1a. Do you trust the energy efficiency information you receive from: [PA1_1 thru 10]

Source	a. Trust source?	b. [If a=yes] Do you trust this source all the time, most of the time or sometimes?
1. ☐ **[Ask if PA1_1=Yes]** Utility mailer	Y N DK R	All Most Sometimes DK R
2. ☐ **[Ask if PA1_2=Yes]** Xcel Energy website	Y N DK R	All Most Sometimes DK R
3. ☐ **[Ask if PA1_3=Yes]** Internet/online/social media	Y N DK R	All Most Sometimes DK R
4. ☐ **[Ask if PA1_4=Yes]** Newspapers/Magazines	Y N DK R	All Most Sometimes DK R
5. ☐ **[Ask if PA1_5=Yes]** TV/Radio	Y N DK R	All Most Sometimes DK R
6. ☐ **[Ask if PA1_6=Yes]** Friends/family	Y N DK R	All Most Sometimes DK R
7. ☐ **[Ask if PA1_7=Yes]** Energy auditor	Y N DK R	All Most Sometimes DK R
8. ☐ **[Ask if PA1_8=Yes]** Utility representative	Y N DK R	All Most Sometimes DK R
9. ☐ **[Ask if PA1_9=Yes]** Energy efficiency product vendor/home supply store	Y N DK R	All Most Sometimes DK R

10. ☐ [Ask if PA1_10=Yes] Community / Local Government	Y N DK R	All Most Sometimes DK R
11. ☐ [Ask if PA1_10=Yes] Other	Y N DK R	All Most Sometimes DK R

PA2. Are you aware that Xcel Energy has energy efficiency programs or products that provide information to customers about energy efficiency offer incentives or rebates for the purchase of some energy efficiency equipment?

1. ☐ Yes	
2. ☐ No	SKIP TO PA7
97. ☐ Don't know	SKIP TO PA7
98. ☐ Refused to answer	SKIP TO PA7

PA3. Did information from Xcel Energy or about an Xcel Energy program influence your household to purchase any energy efficient products?

1. ☐ Yes (Specify) ________________
2. ☐ No
97. ☐ Don't know
98. ☐ Refused to answer

PA4. While living in your current home, have you participated in any Xcel Energy renewable energy or energy efficiency program or purchased any energy efficiency product promoted by Xcel Energy?

1. ☐ Yes	SKIP TO PA6
2. ☐ No	
97. ☐ Don't know	
98. ☐ Refused to answer	

PA5. I'm going to read a list of reasons for not participating in an energy efficiency program. Please indicate for each reason whether or not it was true for you.

[Note to surveyor: If respondent indicates "Not Applicable," record as False]

Reason	1. True	2. False	97. Don't know	98, Refuse to answer
1. ☐ Didn't know was eligible to participate				
2. ☐ Have not recently needed to purchase eligible energy using equipment.				

3. ☐ Program incentives were not enough				
4. ☐ It wasn't worth the hassle				

PA6. – [Ask if PA4=1] Please tell me which Xcel Energy renewable energy or energy efficiency program or programs you participated in? If you don't remember the name, please tell me what it did for you? ***Record response and prompt until no:*** **Was there anything else? (PA7 list copied into this question for the survey)**

Program Name / Description	a) Would you participate in this program again should you have the opportunity?	b) [If a)=No] Why do you say that?
1)	1 – Yes 2 - No 97 - DK 98 – Refused	1- Incentives were not enough 2 – Too much of a hassle 3- Dissatisfied with outcome 4 – Other – [Record 97- DK 98-Refused
2)	1 – Yes 2 - No 97 - DK 98 - Refused	1- Incentives were not enough 2 – Too much of a hassle 3- Dissatisfied with outcome 4 – Other – [Record 97- DK 98-Refused
3) [If respondent mentions 3 or more programs, SKIP to PA8]	1 – Yes 2 - No 97 - DK 98 - Refused	1- Incentives were not enough 2 – Too much of a hassle 3- Dissatisfied with outcome 4 – Other – [Record 97- DK 98-Refused
4)	1 – Yes 2 - No 97 - DK 98 - Refused	1- Incentives were not enough 2 – Too much of a hassle 3- Dissatisfied with outcome 4 – Other – [Record 97- DK 98-Refused
5)	1 – Yes 2 - No 97 - DK 98 - Refused	1- Incentives were not enough 2 – Too much of a hassle 3- Dissatisfied with outcome 4 – Other – [Record 97- DK 98-Refused

PA7. [If less than three programs mentioned in PA6] – I am now going to read the names and a brief description of the programs Xcel Energy Minnesota offers its customers that you did not

participate in, and ask you a few questions about each. If you realize you have participated in the program after I describe it, please let me know.

Program Name [READ ONLY PROGRAMS WHERE PA6≠Yes]	Program Description	a. [Did respondent volunteer that they participated?]	b. Do you think your home could benefit from what this program offers?	c. Are you interested in participating in this program?	d. Why not?
1. Whole house improvement/Home Performance	The Insulation Rebate Program offers Xcel Energy residential natural gas or electric customers (heat pump heated homes do not qualify) rebates for installing insulation or air sealing in their existing single-family home or one-to-four unit property.	1 – Yes [If Yes, skip to next program, otherwise, proceed] 2-No 97-DK 98-Refused	1- Yes 2 - No-skip to d. 97 –DK 98 - Refuse	1- Yes-go to next program 2-No 97-DK 98-Rrefuse	Record Response 97 – DK 98 - R
2. Home efficiency Audit	The Home Energy Audit program offers Xcel Energy residential customers in-home audits as well as the free online Home Analysis tool. The purpose of this program is to improve energy savings by influencing homeowners' and renters' behaviors through conservation education.	1 – Yes [If Yes, skip to next program, otherwise, proceed] 2-No 97-DK 98-Refused	1- Yes 2 - No-skip to d. 97 –DK 98 - Refuse	1- Yes-go to next program 2-No 97-DK 98-Refuse	Record Response 97 – DK 98 - R
3. Renewable	Solar*Rewards is a	1 – Yes	1- Yes	1- Yes-go to	Record

energy/WindSource or Solar Rewards	web-driven, highly automated, and contract-based solar installation program that provides financial incentives for customer-sited solar energy generating units. Windsource is a voluntary renewable energy program offered by Xcel Energy to its electric customers in Minnesota. Customers have the option of purchasing a specific number of 100 kilowatt-hour (kWh) blocks of Windsource or have 100% of their energy provided by Windsource. The Windsource rate is in addition to base electrical rates and is currently set at $3.53 per 100 kWh block, less a credit for fuel costs. The net Windsource premium after the fuel cost credit averages around $1.00 per block.	[If Yes, skip to next program, otherwise, proceed] 2-No 97-DK 98-Refused	2 - No-skip to d. 97 –DK 98 - Refuse	next program 2-No 97-DK 98-Refuse	Response 97 – DK 98 - R

4. Income Qualified Weatherization	The Single Family Weatherization program provides qualified electric and natural gas customers of Xcel Energy with weatherization services as well as funding for emergency equipment replacement services to reduce their monthly energy bills. Emergency equipment replacements include gas furnaces, boilers and water heaters.	1 – Yes [If Yes, skip to next program, otherwise, proceed] 2-No 97-DK 98-Refused	1- Yes 2 - No-skip to d. 97 –DK 98 - Refuse	1- Yes-go to next program 2-No 97-DK 98-Refuse	Record Response 97 – DK 98 - R
5. New Home Construction	The ENERGY STAR Homes Program provides customers' homebuilders with incentives in the form of free training consultation and diagnostics testing to help construct homes to ENERGY STAR standards.	1 – Yes [If Yes, skip to next program, otherwise, proceed] 2-No 97-DK 98-Refused	1- Yes 2 - No-skip to d. 97 –DK 98 - Refuse	1- Yes-go to next program 2-No 97-DK 98-Refuse	1-Record Response 97 – DK 98 - R
6. Cooling Rebate	The cooling program provides a cash rebate to Xcel Energy electric customers who purchase qualifying air conditioning equipment and have it installed using industry-standard guidelines.	1 – Yes [If Yes, skip to next program, otherwise, proceed] 2-No 97-DK 98-Refused	1- Yes 2 - No-skip to d. 97 –DK 98 - Refuse	1- Yes-go to next program 2-No 97-DK 98-Refuse	1-Record Response 97 – DK 98 - R

7. Heating Rebate	The Heating System Rebate program provides a cash rebate to Xcel Energy's natural gas customers who purchase high-efficiency space heating or water heating equipment for residential use in their service area.	1 – Yes [If Yes, skip to next program, otherwise, proceed] 2-No 97-DK 98-Refused	1- Yes 2 - No-skip to d. 97 –DK 98 - Refuse	1- Yes-go to next program 2-No 97-DK 98-Refuse	1-Record Response 97 – DK 98 - R
8. Home Energy Squad	The Residential Quick Fix Efficiency Service ("QF Service") is a service that will install a range of energy efficiency measures in a home within a short period of time (less than 1 day), starting with CFL bulbs, programmable thermostats, and weather stripping, etc. in the Basic Package for a nominal fee (about $50).	1 – Yes [If Yes, skip to next program, otherwise, proceed] 2-No 97-DK 98-Refused	1- Yes 2 - No-skip to d. 97 –DK 98 - Refuse	1- Yes-go to next program 2-No 97-DK 98-Refuse	1-Record Response 97 – DK 98 - R
9. Saver Switch	The Saver's Switch program gives participating customers discounts on their bills in exchange for allowing Xcel Energy to control central air conditioners and water heaters during times of peak demand.	1 – Yes [If Yes, skip to next program, otherwise, proceed] 2-No 97-DK 98-Refused	1- Yes 2 - No-skip to d. 97 –DK 98 - Refuse	1- Yes-go to next question 2-No 97-DK 98-Refuse	1- Record Response 97 – DK 98 - R

PA8 Would you be interested in a free energy conservation program where your energy usage is compared to similar homes in your neighborhood? The names of the neighbors you are compared to are not listed on the report. Research shows that residents enrolled in this type of program in Minnesota and across the nation tend to reduce their energy consumption.

1. ☐ Yes
2. ☐ No
97. ☐ Don't know
98. ☐ Refused to answer

ENERGY EFFICIENCY/CONSERVATION ACTIVITIES

EEC1. Have you done any of the following activities in the past year or so?

Activity	1. Yes	2. No	3. NA	97. Don't know	98. Refused to answer
1. Reduced thermostat settings in the winter to save on energy or cost	☐	☐	☐	☐	☐
2. Increased thermostat settings in the summer to save on energy or cost	☐	☐	☐	☐	☐
3. Reduced water heating temperature to save energy	☐	☐	☐	☐	☐
4. Added caulking or weather stripping to your home	☐	☐	☐	☐	☐
5. Installed more energy efficient windows	☐	☐	☐	☐	☐
6. Installed compact fluorescent light bulbs	☐	☐	☐	☐	☐
7. Turned lights off to reduce electric use	☐	☐	☐	☐	☐
8. Removed a secondary refrigerator to reduce electric use	☐	☐	☐	☐	☐
9. Had a home energy audit	☐	☐	☐	☐	☐
10. Purchased Energy Star appliances	☐	☐	☐	☐	☐
11. Researched energy saving ideas and technologies	☐	☐	☐	☐	☐
12. Closed off an unused room	☐	☐	☐	☐	☐
13. Other, record response.					

LIGHTING

Now I am going to ask about your home's lighting.

Light1. Are you familiar with compact fluorescent light bulbs, sometimes referred to as a C-F-L bulb?

[If Necessary: Compact fluorescent light bulbs are similar in size to standard incandescent bulbs but are often made out of thin tubes of glass that are either straight, spiraled or bent into loops]

1. ☐ Yes	
2. ☐ No	**SKIP TO Light4**
97. ☐ Don't know	**SKIP TO Light4**
98. ☐ Refused to answer	**SKIP TO Light4**

Light2. Have you ever purchased compact fluorescent light bulbs or do you have any in your home?

1. ☐ Yes	**SKIP TO Light4**
2. ☐ No	
97. ☐ Don't know	
98. ☐ Refused to answer	

Light3. Why haven't you purchase or installed any compact fluorescent light bulbs in your home?

[DO NOT READ; ACCEPT MULTIPLE RESPONSES]

1. ☐ Too expensive
2. ☐ Don't like the light
3. ☐ Takes too long to warm up
4. ☐ Not aware they saved energy
5. ☐ Don't fit in my light fixtures
6. ☐ Concerned about mercury in the home
7. ☐ Other (Specify:______________)
97. ☐ Don't know
98. ☐ Refused to answer

Light4. Have you ever heard of L-E-D lights?

[If needed: LED stands for Light Emitting Diode]

1. ☐ Yes	
2. ☐ No	**Skip to DEM1**
97. ☐ Don't know	**Skip to DEM1**
98. ☐ Refused to answer	**Skip to DEM1**

Light5. Have you ever purchased or do you have LED lighting in your home? Please note this does not include LED battery operated equipment such as flashlights.

1. ☐ Yes	
2. ☐ No	**Skip to DEM1**
97. ☐ Don't know	**Skip to DEM1**
98. ☐ Refused to answer	**Skip to DEM1**

Light5a. What were your reasons for purchasing or installing LED lighting?

[DO NOT READ; ACCEPT MULTIPLE RESPONSES]

1. ☐ Energy efficiency
2. ☐ Long lasting
3. ☐ Cost savings
4. ☐ Low maintenance
5. ☐ Aesthetics
6. ☐ Brighter light
7. ☐ New/Cutting edge technology
8. ☐ Other (Please specify)
97. ☐ Don't know
98. ☐ Refused to answer

DEMOGRAPHICS

Please provide answers to the following questions. Your responses will be confidential and no data will be used on an individual basis. The information is used to allow us to compare energy usage between various groups.

DEM1. Including yourself, how many people currently live in your home year-round?

1	[RECORD NUMBER]
97	Don’t know
98	Refused

DEM 2. Which of the following best describes your age?

1	Less than 18 years old
2	18 to 24
3	25 to 34
4	35 to 44
5	45 to 54
6	55 to 64
7	65 or older?
97	Don’t know
98	Refused

DEM3. What was the highest level of education completed by any head of household in your home?

[READ LIST. RECORD ONLY ONE RESPONSE]

1. ☐ Grade school
2. ☐ Some high school
3. ☐ High school graduate (or GED)
4. ☐ Some college, trade or technical school
5. ☐ 4 year college graduate
6. ☐ Graduate studies or advanced degree
97. ☐ Don't know
98. ☐ Refused to answer

DEM5. Gender

[Can record from voice of respondent]

1. ☐ Male
2. ☐ Female
97. ☐ Don't know
98. ☐ Refused to answer

Thank you very much for your time and feedback!

M. Appendix M: Market Actor Research Report

2011 Minnesota Market Potential Assessment

Market Actor Research Report

Xcel Energy Services, Inc
Contract Number: 322733
Prepared by KEMA Inc
Burlington, MA
November 16, 2011

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1. Executive Summary

1.1 Overview of Approach

Xcel Energy Minnesota (Xcel Energy) engaged KEMA Inc. to conduct an energy efficiency potential study for its service territory. Inputs for this analysis were derived from primary and secondary research and Xcel Energy data sources. This report presents the findings of one component of the primary research, a market actor survey. The objectives of the market actor survey were to help characterize the current market characteristics and to inform Xcel Energy's future program designs.

Market actors, or trade allies, are local businesses that provide energy technology design, specification and installation services in the Xcel Energy service territory. Their daily business is based on direct contact with the populations Xcel Energy programs seek to reach. KEMA conducted 41 interviews with participating and non-participating trade allies in six market segments (architects, engineers, non-residential builders, HVAC contractors, lighting contractors and motor distributors). Participant and non-participant populations for each trade ally category were drawn from Xcel Energy data sources. Participating market actors are defined as those who took part in an Xcel Energy program in the past three years. Non-participating trade allies are those who have not been involved in an Xcel Energy program during this time.

Table 1-1 reports the number of completed surveys for each major actor segment, including a breakdown of completed surveys by participating vs. non-participating interviews.

Table 1-1: Completed Surveys by Participating and Non-Participating Market Actors

Market Actor Segment	# of Participant Surveys Completed	# of Non-Participant Surveys Completed
Architects	2	1
Engineers	4	1
Non-Residential Builders	4	2
HVAC contractors	8	2
Lighting Contractors	8	2
Motor Distributors	5	2
Totals	**31**	**10**

Table 1-2 below summarizes topics by category addressed in the market actor surveys:

Table 1-2: Topics Addressed by Market Actor Surveys

Category	Topics
Business Relationships	• Who trade allies are partnering • Market actor concerns about design/installation practices
Energy Efficiency Practices	• Client awareness and interest in energy efficiency systems • Influence of energy efficiency on business
Impact of Building Codes	• Awareness and influence of building codes
Sales Trends	• Equipment vendors currently selling/promoting • Changes over past three years • Trends anticipated next five years
Program Participation	• Awareness of incentive programs • Participation in utility or government-sponsored energy efficiency programs

1.2 Summary Findings

1.2.1 Business Relationships

Market Actor Partnerships

Many of the non-residential builders and lighting contractors surveyed report working with architects and engineers to obtain design specifications for their projects. The majority of architects, engineers and builders worked with businesses outside their firm when constructing facilities.

Concerns about Design and Installation Practices

Several architects and engineers indicate that builders and lighting contractors focus on upfront cost at the expense of energy efficiency, installing the cheapest equipment that will make them the most money.

→ "Sometimes initial cost is not a good return on investment…pick cheap, noisy systems."

→ "They are just there for upfront cost. Don't care about energy savings."

On the other hand, builders note that architects and engineers need to be more aware of cost effectiveness in their designs.

→ "Make sure they are not over-designing systems. It affects energy cost."

→ "Make sure they are providing cost effective solutions."

→ "They do not have a background in operation of the facility. Operational cost is a major concern."

1.2.2 Energy Efficiency Practices

Client Awareness and Interest in Energy Efficient Systems

Most trade allies report their customers are aware and interested in energy efficient equipment.

- All architects and engineers note client interest in energy efficiency features, with five of the eight interviewed indicating a high level of customer interest.
- The majority of non-residential builders surveyed signal that demand for energy-efficient measures is "very high" in Minnesota for commercial and industrial building construction and sales.

- Eight of the ten HVAC contractors interviewed note clients are interested in energy efficient equipment to lower fuel costs.
- Seven of the ten lighting contractors interviewed indicate at least half their customers are aware of energy efficient lighting options available to them before providing recommendations. All contractors report that clients are accepting their recommendations after providing suggestions about lighting systems to implement.
- Five of the seven motor distributors indicate over half their customers are aware of the benefits of energy efficient motors.

Many trade allies surveyed (including nine of the ten HVAC contractors) report negative client perceptions regarding the upfront cost of purchasing energy efficient compared to standard equipment. A few respondents state specific circumstances when clients are put off by the cost of energy efficient equipment:

→ "LEED becoming very expensive process."

→ "Is it going to be extremely expensive…such as photovoltaic and wind energy and VFDs for fans and pumps?"

→ “Builders who will be renting space want the cheapest option.”

Lighting contactors and motor distributors provided ratings on a scale of 1 to 5, where 1 is “very unimportant” and 5 is “very important” regarding characteristics they perceive non-residential customers consider when selecting equipment. Table 1-3 presents a summary of their observations. Not only is “initial cost of equipment” the highest rated characteristic by lighting contractors and motor distributors, it is also the only characteristic that did not receive a rating lower than 4 from any single lighting contractor or motor distributor providing feedback.

Table 1-3: Perceived Importance of Equipment Characteristics for Non-Residential Customers

Equipment Characteristic	Rating Scale of 1 to 5 (Average)	
	Lighting Contractors N=9	Motor Distributors N=7
Initial cost of equipment	4.44	4.43
Total life cycle cost	4.11	3.00
Ease of maintenance	4.11	3.57
Cost of operation	4.00	2.57
Quality of light	4.00	NA
Maintenance of lighting level	3.56	NA
Life of equipment	NA	3.71
Quiet operation	NA	2.57

Influence of Energy Efficiency on Business

Architects, engineers and HVAC contractors note that energy efficiency has an impact on the work they perform. Architects and engineers were asked to rate on a scale of 1 to 5, where 1 is “least important” and 5 is “most important,” the importance of energy efficiency in their HVAC, lighting and building shell specifications and designs. No architect or engineer provided a rating lower than 3 for any of these systems and the average rating for these technologies was 4.5. Nine of the ten HVAC contractors surveyed indicate that sales of energy efficient HVAC installations, relative to installations of standard HVAC technologies have increased for both commercial and industrial applications over the past three years.

Even though architects and engineers place significant importance on energy efficiency for the systems they specify and install, five of the eight architects and engineers interviewed indicate that satisfying owner demands is a higher priority. A participating engineer summed up this viewpoint as follows.

→ "Energy efficiency is one concern, but comes secondary to meeting the needs of the owner. Important, but not the main focus."

Half the HVAC contractors surveyed report having rebate and/or code requirements determine energy efficiency standards for the systems they install.

1.2.3 Impact of Building Codes

In general, market actors report being aware of building codes that apply to the work they perform (e.g., building design, lighting installation). No trade ally surveyed indicates being unfamiliar with building codes relevant to the work they conduct.

In addition to being aware of building codes, many trade allies indicate that building codes influence the work they perform. Some architects and engineers note their firms exceed what is required by standard building codes.

- → "[Building codes] establish a minimum level of compliance, but as far as energy efficiency goes project goals are exceeding code requirements."
- → "[Building codes] tend to be behind our standard practice."
- → "[Building codes] used as a baseline - Usually exceed code."

Non-residential builders and lighting contractors were asked to rate the influence of these codes on their selection of building materials and equipment using a scale of 1 to 5, where 1 indicates the codes had "no influence on your selection" and 5 indicates that the codes "completely determined the type of building materials and equipment." None of the sixteen trade allies asked this question gave a rating less than 3, which indicates building codes have significance in the selection of building equipment for builders (average rating = 4.33) and lighting contractors (average rating = 3.57).

1.2.4 Sales Trends

1.2.4.1 Equipment Vendors Currently Promoting/Selling

Almost all market actors surveyed report promoting energy efficiency equipment in most or all sales situations. Only two trade allies, both motor distributors, report not recommending energy efficient technologies. In particular, these two motor distributors do not inform their customers about NEMA premium efficiency motors.

HVAC and lighting contractors were asked for the reasons their business promotes energy efficient products. Table 1-4 shows these trade allies are endorsing energy efficiency for a number of reasons, with the major motivations being able to convey an environmentally conscious image, build customer relationships and provide customer cost savings (i.e., lower energy bill).

Table 1-4: Reasons HVAC and Lighting Contractors Promote Energy Efficient Equipment

Reason for Promoting Energy Efficient Equipment	# of Responses		
	HVAC Contractors N=10	Lighting Contractors N=10	Total N=20
Convey environmentally conscious public image (e.g., "Green" business)	4	5	9
Build customer relationships	8	0	8
Provide cost savings to customers	3	5	8
Energy efficient equipment offers more profit compared to standard products	2	3	5
Energy efficient equipment is better quality compared to standard products	1	3	4
Make use of incentives offered	0	3	3
Compliance with government codes	0	1	1

The biggest challenge cited by trade allies (including seven of the eight architects and engineers surveyed) to promoting energy efficient products is cost. Other barriers to advancing energy efficient equipment noted by market actors include design constraints (e.g., having other technologies specified), additional time to implement energy efficient systems, dealing with the rebate process (e.g., paperwork) and the challenge of staying current on efficiency best practices.

A number of trade allies suggest the following to overcome barriers to promoting energy efficiency: offer higher rebates; provide tools to justify payback of increased investment in energy efficient equipment compared to standard systems; and provide customer education to encourage more efficient building practices.

Impact of Xcel Energy Programs on Sales of Energy Efficient Equipment

Lighting contactors were asked to provide ratings on a scale of 1 to 5, where 1 is "not at all important" and 5 is "very important" regarding how important Xcel Energy programs are in their firm's decisions about how heavily to promote energy-efficient lighting equipment. Seven of the eight participating lighting contractors surveyed note Xcel Energy programs are "very important" in their firm's decisions about how heavily to promote energy-efficient lighting equipment (average rating = 4.63).

Lighting contactors were also asked to provide ratings on a scale of 1 to 5, where 1 is “not at all influential” and 5 is “very influential” about how much influence Xcel Energy programs have on the market share of energy-efficient lighting technologies in their market area. Seven of the eight participating lighting contractors surveyed note Xcel Energy programs are “very influential” on the market share of energy-efficient lighting technologies in their market area (average rating = 4.75), signifying Xcel Energy programs are having a noticeable impact on the types of lighting being purchased by commercial and industrial customers.

Architects and engineers were asked to provide ratings on a scale of 1 to 5, where 1 is “no influence” and 5 is “a great deal of influence” about the effectiveness of different approaches as a means of increasing the efficiency level of measures and building shells installed in new buildings in the Xcel Energy service territory. Table 1-5 shows that architects and engineers perceive “changes in government codes and regulations,” “incentives to lower the incremental first cost of high efficiency equipment,” “cash incentives to energy users,” “technology improvements” and “professional training events or certification programs” to be influential in increasing the efficiency level of measures and building shells. On the other hand, architects and engineers surveyed do not think “marketing or stocking agreements with dealers and distributors” or “marketing or stocking agreements with manufacturers” will be very influential.

Table 1-5: **Architect and Engineer Ratings of Effectiveness of Different Approaches to Increase Efficiency Purchases**

Approach to Increasing Installations of Energy Efficient Measures	Rating Scale of 1 to 5 (Average)			
	HVAC	Lighting	Shell	Overall
Changes in government codes and regulations	4.00	4.38	4.67	4.29
Incentives to lower the incremental first cost of high efficiency equipment	3.83	4.00	2.50	3.88
Cash incentives to energy users	3.67	3.75	4.00	3.75
Technology improvements	3.67	3.88	2.67	3.59
Professional training events or certification programs	3.17	3.00	3.00	3.06
Marketing or stocking agreements with dealers and distributors	2.67	2.63	2.50	2.63
Marketing or stocking agreements with manufacturers	2.67	2.63	2.50	2.63

1.2.4.2 Changes over Past Three Years

Most trade allies report an increase in sales of energy efficient equipment over the past three years.

- Five of the six builders report demand for energy-saving measures and features has increased.
- Nine of the ten HVAC contractors indicate energy efficient installations, relative to installations of standard technologies has increased for commercial and industrial applications.
- Of the ten lighting contractors surveyed, seven report an increase in customers specifying more energy efficient high bay lighting, six are recommending more energy efficient linear fluorescent lighting and six are specifying more lighting controls.
- Five of the seven motor distributors note the share of NEMA premium motors sold increased.

Market actors indicate numerous reasons for the increase in sales of energy efficient equipment over the past three years. Table 1-6 shows that increased customer interest in energy efficiency is the main factor noted by trade allies for the expansion in energy efficiency sales.

Table 1-6: Reason for Increase in Sales of Energy Efficient Equipment over Past Three Years

Reason for Increase in Sales	# of responses
Increased customer interest in energy efficiency	16
Rebates attracting customers	9
Improvement in energy efficient products/technologies	7
Cost pressure (e.g., desire for lower energy bill)	6
Cost in energy efficiency technologies coming down	4
More stringent government building codes/regulations	4
Desire for energy savings	3

Even though the majority of the ten HVAC contractors surveyed report sales of energy efficient equipment has increased over the past three years, half the contractors note overall annual sales have decreased during this time (from 10 to 30%). Drivers of energy efficient HVAC equipment sales noted by contractors include cost reduction goals (indicated 5 times), increased interest in energy efficiency (indicated 5 times) and rebates for higher efficiency technologies (indicated 4 times).

1.2.4.3 Trends Anticipated Next Five Years

All market actors were asked about trends they anticipate in energy efficiency practices in the commercial and industrial building markets over the next five years. Almost every trade ally surveyed responded to this question (n=38) and many provided more than one perceived development related to energy efficiency taking place. Table 1-7 shows the most prevalent trends anticipated by market actors focus on businesses becoming more interested of energy efficiency, continued advancements in technology (e.g., lighting controls becoming more sophisticated) and customers dealing with cost pressures due to expected increases in price of energy.

Table 1-7: **Trends in Energy Efficiency Practices Anticipated by Market Actors in the Commercial and Industrial Building Markets over the Next Five Years**

Anticipated Trend	# of responses
Increased demand for energy efficiency	15
Increases in advancements of energy efficient technologies	13
Cost pressure (e.g., desire for lower energy bill)	11
Increase in use of LED lighting	5
Increase in energy efficiency standards	3
Increase in retro-commissioning	3
Cost of energy efficient products will decrease	2

1.2.5 Program Participation

Awareness and Interest in Energy Efficiency Programs

Most market actors surveyed are aware of incentives to consider more energy-efficient alternatives in building design and equipment choices. Architects, engineers and non-residential builders were asked to indicate the energy efficiency programs they have participated. Many of these trade allies report making use of Xcel Energy programs (e.g., Energy Design Assistance Program, Data Center Efficiency Program, Stimulus Energy Grant Program and prescriptive rebates). In addition to Xcel Energy programs, the majority of builders are involved with the National Green Building Program, LEED for New Construction Program, LEED for Existing Buildings Program and Energy Star for Buildings Program.

Besides not taking part in any Xcel Energy efficiency programs over the past three years, many non-participating businesses surveyed also report not taking part in any utility or government-sponsored energy efficiency programs for commercial and industrial construction. Several non-participating businesses indicate their reason for not taking part in any utility or government-sponsored programs is because they are not aware of energy efficiency incentive offerings. A non-participating HVAC contractor summed up this viewpoint as follows.

→ “No [incentive programs] here – would like to see them.”

Market Actor Feedback Regarding Xcel Energy Programs

Program Strengths

The majority of trade allies had positive feedback about Xcel Energy programs, with most comments expressing general satisfaction (e.g., “Xcel Energy has it covered”). A couple builders note the programs encourage the purchase of energy efficient equipment by making the payback more appealing.

- → "Helped to close gap between first cost and payback so payback got shorter. Made doing energy efficiency more attractive.”
- → "Show energy loss and payback…make convincing story for owner to make an intelligent choice."

Recommendations for Program Improvement

Market actors were encouraged to offer suggestions to improve the effectiveness of Xcel Energy programs. The suggestions offered by the trade allies who responded were reviewed and placed into categories as summarized in Table 1-8. Responses regarding program improvements focus on the need for a revamped rebate process.

Table 1-8: Trade Ally Suggestions for Program Improvement

Suggestion for Program Improvement	# of responses
Improve the rebate system	**7**
Speed the rebate process up. Make it faster from requisition to check.	2
Keep market actors in the loop on rebate program timelines.	1
Have a hard time with custom rebates through engineering department (Would install a lot more systems if could get easier pass-through).	1
Help established companies to clear paperwork process. Allow partners to pre-qualify.	1
Provide online calculator to determine return on investment.	1
Develop online rebate tracking system so don't have to call to check on rebates.	1
Provide better marketing	**4**
Increase customer awareness of rebate programs.	3
Show benefits to customers beyond cost savings.	1
Enhance financial offerings	**3**
Provide higher rebates.	1
Offer tax breaks.	1
Make sure to continue rebates.	1
Offer training to market actors	**2**
Offer programs that keep trade allies up to speed on current equipment and trends.	1
Provide training on how to sell high-efficiency equipment (e.g., Help with businesses turning away once payback exceeds 5 years).	1
Provide incentives to market actors	**2**
Offer salesman incentive - nothing currently in it for trade allies even though they often do all the paperwork.	2

2. Introduction

2.1 Market Actor Survey Element of Xcel Energy's Minnesota Potential Study

This report is part of the larger energy efficiency potential study being conducted by KEMA Inc. for Xcel Energy for its Minnesota service territory. The overriding purpose of both the market actor and on-site survey elements also conducted by KEMA is to develop an understanding of energy-efficiency related market characteristics in Xcel Energy's service territory in Minnesota. A secondary purpose is to provide information to support Xcel Energy's future program design efforts.

The scope of the market actor surveys and this related report was to characterize the market penetration rates of high-efficiency measures and related trade ally practices. Surveys were conducted by professional consulting staff.

This report provides high-level summaries of the results obtained from each of the market actor surveys. Survey instruments are included in Appendices A through E.

2.2 Overview of Approach

Forty-one surveys were conducted for this phase of the project by KEMA professional staff. These consisted of interviews with 31 participating and 10 non-participating market actors in the following market segments:

- Architects.
- Engineers.
- Non-Residential Builders.
- HVAC Contractors.
- Lighting Contractors.
- Motor distributors.

Key market actors operating within Xcel Energy's service territory in Minnesota were targeted for interviews using in-depth surveys. In-depth survey instruments were devised to obtain data on topics including market shares of specific sector technologies, design practices, and general market trends. Additionally, the in-depth survey instruments were designed to capture anecdotal data. The in-depth survey instruments included open-ended questions regarding observed and expected market trends, specific design practices, and the importance of local building codes in design decisions.

The intention of the survey research is to collect and assess qualitative data; as such the number of completed interviews (41) is not a representative sample. Xcel Energy provided KEMA with participant and non-participant sample quotas for each market actor segment. The evaluation team interviewed 31 market actors who participated in an Xcel Energy program over the past three years and 10 market actors who did not participate in an Xcel Energy program during this time. The evaluation team selected a sample of businesses from a tracking list provided by Xcel Energy that contained 117 participating firms and 155 non-participating firms. As an incentive for the time and feedback requested of market actors to complete the survey, businesses were included in a drawing for the chance to win $1,000. KEMA conducted these telephone interviews between May 6 and June 8, 2011.

Table 2-1 summarizes the sampling strategy for participating and non-participating market actors.

Table 2-1: **Xcel Energy Participant and Non-Participant Sampling Strategy**

Market Actor	# of Population Participant Businesses	# of Participant Surveys Completed	# of Population Non-Participant Businesses	# of Non-Participant Surveys Completed
Architects	4	2	14	1
Engineers	8	4	7	1
Non-Residential Builders	11	4	97	2
HVAC contractors	30	8	2	2
Lighting Contractors	47	8	26	2
Motor Distributors	17	5	9	2
Totals	**117**	**31**	**155**	**10**

2.3 Market-Specific Approaches

Architects

The initial sampling plan for architects was to collect data from one participating and one non-participating firm. In conducting the non-participating survey, it was found the architect firm identified by the Xcel Energy tracking data as a non-participant had participated in an Xcel Energy program in the past three years. Therefore, a modified sampling plan for architects was pursued in which surveys were conducted with two participating and one non-participating firm. The architect survey was designed to gain a better understanding of practices used by architects regarding the specification and design of energy saving features in the commercial and industrial building markets. Results from the architect surveys are presented in Section 3.1 of this report.

Engineers

Surveys were conducted with five businesses (four participating and one non-participating firm). Similar to architect survey, the objective of the engineer survey instrument was to gain a better understanding of practices used by engineers regarding the specification and design of energy saving features in the commercial and industrial building markets. Results from the engineer surveys are presented in Section 3.2 of this report.

Non-Residential Builders

Data for non-residential builders was collected from six businesses (four participating and two non-participating firms). The non-residential survey instrument was designed to gain a better understanding of practices used by builders regarding energy efficiency systems for new commercial and industrial buildings and major existing facility additions. Results from non-residential builder surveys are presented in Section 3.3 of this report.

HVAC Contractors

Findings from Section 3.4 are based on in-depth interviews conducted with ten HVAC contractor businesses (eight participating and two non-participating firms). The HVAC contractor survey instrument was designed to gain a better understanding of high efficiency systems sold in Xcel Energy's service territory and the factors that influence the sale of energy efficient equipment.

Lighting Contractors

Data for lighting contractors was collected from ten businesses (eight participating and two non-participating firms). The lighting contractor survey instrument was designed to gain a better understanding of the energy characteristics and customer energy efficiency attitudes within the commercial and industrial lighting sector. Findings from the lighting surveys are provided in Section 3.5 of this report.

Motor Distributors

Surveys were conducted with seven businesses (five participating and two non-participating distributors). The objective of the motor distributor survey instrument was to determine market penetration of premium efficiency electric motors, as well as other motor practices. Results from motor distributor surveys are presented in Section 3.6 of this report.

3. Findings by Market Actor

3.1 Architects

3.1.1 Study Approach

Surveys were conducted with three architect businesses (two participating and one non-participating firm). The architect survey was designed to gain a better understanding of practices used by architects regarding the specification and design of energy saving features in the commercial and industrial building markets.

3.1.2 Summary of Key Findings

3.1.2.1 Business Relationships

Who Architects Are Partnering

Both participating architects surveyed work with builders and developers outside their firm when constructing facilities. The non-participating architect surveyed indicates not working with builders and developers when constructing facilities.

Architect Concerns about Builder and Developer Installation Practices

Participating architects express concerns about builder and developer installation practices. Architects note a lack of willingness by builders and developers to purchase more expensive energy efficient systems, instead using cheap equipment that is not a good long-term investment. Architects indicate this impacts building performance for the following systems:

<u>HVAC split systems</u>

- Equipment installed does poor job of providing comfort (e.g., air quality), noise control, and efficiency.

<u>Lighting systems</u>

- Need for better quality lighting.
- Need to do better at implementing efficient lighting.

Building shell and weatherization

- Systems installed meet state energy codes, but not much more than that.

3.1.2.2 Energy Efficiency Practices

Client Awareness and Interest in Energy Efficiency Systems

Architects report there is a noticeable level of awareness and interest from clients in energy efficiency features or options. Comments from architects regarding customer awareness and interest in energy efficiency include:

→ "It is increasing. All clients are aware – it is just a matter of how much they want to buy into energy efficiency."

→ "I think it is fairly high with our client base right now."

→ "In general, clients like to save energy - some more than others."

All architects surveyed note that cost concerns have been expressed by clients when attempting to implement energy efficient technologies and designs. One architect comments that energy efficiency "depends on the payback - if the payback is 50 years, the client is not willing to go that route." Other than cost issues, one architect mentions a client stating that "some of the LEED requirements make a building less efficient."

Influence of Energy Efficiency on Business

Architects note the following energy efficiency design considerations are deemed important to their firm:

- Cost.
- Sustainability.
- Satisfying occupier requirements.
- Complexity of the system.
- Geothermal HVAC systems.
- Lighting (e.g., efficient luminaires, LEDs).

Architects convey the following in indicating energy efficiency considerations play an important role in their decision-making processes:

→ “Required by code and often required by owner.”

→ "It is a point of discussion with our client - For some projects it is very important and for others it is of no perceived importance."

→ "An important initial part - If budget allows, [energy efficiency] becomes part of the project."

Table 3-1 presents factors considered by architects when specifying and designing HVAC equipment, lighting systems and building shells.

Table 3-1: Factors Considered by Architects When Specifying and Designing Energy Systems

System	Specification and Design Factors Considered
HVAC	• State law. • City requirements. • Building owner desires. • Energy Star. • LEED/National Green Building Standards. • Rebates. • Location of equipment.
Lighting	• State law. • City requirements. • Building owner desires. • LEED/National Green Building Standards. • Color requirements. • Rebates. • Location of fixtures. • Efficiency factors. • ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) codes.
Building Shell and Weatherization	• State law. • City requirements. • LEED/National Green Building Standards. • Visual appearance. • Cost. • Longevity. • Code compliance.

Table 3-2 presents feedback from architects on what they consider to be effective and ineffective as a means of increasing the efficiency level of HVAC equipment, lighting measures and building shells installed in new buildings in the Xcel Energy service territory.

Table 3-2: Architect Perception of Influence on Ways to Increase the Efficiency Level of Measures and Building Shells Installed in New Buildings

System	Suggestion to Increase Efficiency Level	Perceived Effectiveness Increasing Efficiency Level
HVAC	• Changes in government codes and regulations	Influential
	• Professional training events/certification programs • Technology improvements • Marketing or stocking agreements with dealers and distributors • Marketing or stocking agreements with manufacturers	Not influential
Lighting	• Changes in government codes and regulations	Influential
	• Professional training events/certification programs • Marketing or stocking agreements with dealers and distributors • Marketing or stocking agreements with manufacturers	Not influential
Building Shell	• Changes in government codes and regulations	Influential
	• Professional training events/certification programs • Technology improvements • Marketing or stocking agreements with dealers and distributors • Marketing or stocking agreements with manufacturers	Not influential

3.1.2.3 Impact of Building Codes

All architects surveyed comment that local building codes influence their energy efficiency decisions

→ "Absolutely – Do not get building permit unless it is met."

→ "Yes - If they do not allow something, we will not use it."

→ "Yes, definitely."

3.1.2.4 Sales Trends

3.1.2.4.1 Equipment Vendors Currently Promoting/Selling

All architects surveyed indicate suggesting energy efficient measures or designs in projects "always" or "most of the time." Energy efficient measures or designs recommended include increased roof and wall insulation, thermal windows and lighting.

All architects surveyed report that cost is an obstacle to specifying and promoting energy efficient processes and equipment. Clients' not being knowledgeable about energy efficiency is also cited as a barrier. Table 3-3 presents recommendations provided by architects regarding how utilities can help them in overcoming these barriers:

Table 3-3: **Architect Suggestions to Overcome Barriers Specifying and Promoting Energy Efficient Systems**

Suggestions to Overcome Barriers Promoting Energy Efficient Systems
• Provide rebates to encourage more efficient building practices. (indicated 2 times) • Offer education programs to clients. (indicated 2 times) • Provide more detailed information on rebates. • Have utilities work with manufacturers in research and development to produce energy efficient, cost effective equipment.

3.1.2.4.2 Changes over Past Three Years

All architects surveyed note an increased emphasis on energy efficiency in design and specification practices over the past three years. Reasons provided by architects for the changes include:

→ "We are seeing more interest in energy efficiency. Some clients have asked for LEED certified projects."

→ "There is more emphasis on energy efficiency in drawings and specs."

→ "Owners are requiring sustainability considerations."

3.1.2.4.3 Trends Anticipated Next Five Years

Architects note anticipating the following trends in energy efficiency practices in the commercial and industrial building markets over the next five years:

- → "More and more energy efficient design will be done."
- → "See a trend continuing for energy savings and improvement."
- → “Facing the 2030 carbon challenge.” (The goal of the 2030 Challenge for Products is to reduce the embodied carbon of building products 50% by the year 2030.)

3.1.2.5 Program participation

Awareness of Incentive Programs

All architects surveyed are aware of incentive programs to consider more energy-efficient alternatives in building design and equipment choices. Architects note being aware of the following incentive programs:

- Xcel Energy Design Assistance Program.
- Tax incentives.
- Local power company rebates.
- LEED, Green Globe and Energy Star certifications.
- LED fixtures.

Participation in Energy Efficiency Programs

The two participating architect firms surveyed report taking part in utility or government-sponsored energy efficiency programs for commercial and industrial construction over the past three years. Programs cited include Xcel Energy – e.g., Energy Design Assistance Program (indicated 2 times) and LEED. The non-participating firm surveyed did not engage in any energy efficiency programs for commercial and industrial construction during this time.

3.2 Engineers

3.2.1 Study Approach

Surveys were conducted with five businesses (four participating and one non-participating firm). Similar to the architect survey, the objective of the engineer survey instrument was to gain a better understanding of practices used by engineers regarding the specification and design of energy saving features in the commercial and industrial building markets.

3.2.2 Summary of Key Findings

3.2.2.1 Business Relationships

Who Engineers Are Partnering

All four participating engineers surveyed work with builders and developers outside their firm when constructing a facility. Similar to the architect firms surveyed, these builders and developers are outside of their firm. Both non-participating engineers surveyed do not work with builders and developers when constructing a facility.

Engineer Concerns about Builder and Developer Installation Practices

Participating engineers express the following concerns about builder and developer installation practices:

→ "Depends on quality of builder - As-built and as-installed documentation not always incorporated. Communication - sometimes builders will not keep us in the loop."

→ "Want to make sure they are using appropriate materials for the end user."

→ "They are just there for the upfront cost - Don't care about energy savings. They put in the cheapest systems to make them the most money."

Engineers indicate the above concerns regarding builder and developer installation practices impacts building performance for the following systems:

<u>HVAC split systems</u>

- Decreases energy efficiency. (indicated 2 times)
- Affects performance, maintenance, sizing and cost.

Lighting systems

- Cheaper systems cut out controls so efficiency goes out the window.
- Affects performance, maintenance, sizing and maintenance.

Building shell and weatherization

- Affects cost.

3.2.2.2 Energy Efficiency Practices

Client Awareness and Interest in Energy Efficiency Systems

All engineers report their clients are aware and interested in energy efficiency features or options. Comments from engineers regarding customer awareness/interest in energy efficiency include:

→ "Clients are interested in energy efficiency." (indicated 4 times)

→ "It comes down to the bottom line - Is there a payback? Clients are interested in measures that have an attractive payback in under five years."

Engineers indicate receiving negative client reactions for the following energy efficient technologies and designs:

- Controls on air economizers (some clients don't believe in this technology).
- Photovoltaic, wind energy and variable speed drives for fans and pumps (concerns about cost).
- LEED certification (becoming very expensive process and clients are turned off by the paperwork).
- Displacement ventilation and under floor systems.
- Geothermal systems.

Influence of Energy Efficiency on Business

Engineers report the following energy efficiency design considerations are taken into account by their firm:

- Occupant satisfaction. (indicated 2 times)
- Control systems to achieve maximum energy efficiency. (indicated 2 times)
- HVAC design – e.g., high efficiency boilers, energy wheels, capturing unused heat (heat recovery), radiant flooring, demand-controlled ventilation, high efficiency chillers, geothermal. (indicated 2 times)
- Lighting design - e.g., daylight harvesting. (indicated 2 times)
- LEED certification requirements.
- System reliability.
- Upfront cost.

Engineers signify energy efficiency considerations weigh heavily into their decision-making processes:

→ "Energy efficiency is key - We do energy modeling on all of our large projects for mechanical systems and lighting."

→ ""Energy efficiency is a high priority. Give owner payback [information] and let them decide if they can afford it or not."

→ “We look at initial versus life cycle cost - Try to project how much it will cost over time and how much it will cost to maintain."

→ "Starts in pre-design phases - incorporates energy modeling and encompasses all aspects of building, but limited by what owner wants to spend."

Table 3-4 presents factors considered by engineers when specifying and designing HVAC equipment and lighting systems.

Table 3-4: **Factors Considered by Architects When Specifying and Designing Energy Systems**

System	Specification and Design Factors Considered
HVAC	• Owner requirements (e.g., level of comfort desired). • Upfront cost. • System reliability, operability, maintainability and efficiency. • Variable speed drives efficiency of equipment • Rebates. • Energy Star. • LEED/ National Green Building Standards. • ASHRAE codes.
Lighting	• Efficiency. (indicated 2 times) • Energy codes. (indicated 2 times) • Cost. (indicated 2 times) • Payback. • Ease of use. • System maintainability. • Aesthetics. • Controls. • Tasks being performed in lighted area. • ASHRAE codes. • Energy Star. • LEED/ National Green Building Standards.
Building Shell and Weatherization	• State law. • City requirements. • LEED/National Green Building Standards. • Visual appearance. • Cost. • Longevity. • Code compliance.

Table 3-5 presents feedback from engineers on what they consider to be effective and ineffective as a means of increasing the efficiency level of HVAC equipment, lighting measures and building shells installed in new buildings in the Xcel Energy service territory.

Table 3-5: Engineer Perception of Influence on Ways to Increase the Efficiency Level of Measures and Building Shells Installed in New Buildings

System	Suggestion to Increase Efficiency Level	Perceived Effectiveness Increasing Efficiency Level
HVAC	• Technology improvements • Incentives to lower the incremental first cost of high efficiency equipment	Influential
	• Marketing or stocking agreements with dealers and distributors • Marketing or stocking agreements with manufacturers	Not influential
Lighting	• Technology improvements • Incentives to lower the incremental first cost of high efficiency equipment • Changes in government codes and regulations	Influential
	• Professional training events/certification programs • Marketing or stocking agreements with dealers and distributors • Marketing or stocking agreements with manufacturers	Not influential
Building Shell	• Technology improvements • Incentives to lower the incremental first cost of high efficiency equipment • Changes in government codes and regulations	Influential
	• Marketing or stocking agreements with dealers and distributors • Marketing or stocking agreements with manufacturers	Not influential

3.2.2.3 Impact of Building Codes

Several engineers comment on exceeding the energy efficiency standards of local building codes:

→ "[Building codes] establish a minimum level of compliance, but as far as energy efficiency goes, project goals are exceeding code requirements."

→ "[Building codes] tend to be behind our standard practice. The 2030 Challenge is impacting our designs on state-owned projects."

→ ""[Building codes used] only as a baseline. Usually exceed code."

3.2.2.4 Sales Trends

3.2.2.4.1 Equipment Vendors Currently Promoting/Selling

All five engineers surveyed suggest energy efficient measures and designs in projects "always" (indicated 4 times) or "most of the time." Engineers are recommending the following measures or designs in their projects:

- Occupancy/temperature/lighting reset schedules. (indicated 8 times)
- Renewable energy (e.g., solar thermal for domestic hot water use, geothermal heat pumps). (indicated 2 times)
- Improved efficiency of mechanical and electrical systems (e.g., commissioning). (indicated 2 times)
- LED fixtures.
- Controls for air economizers.
- Displacement ventilation.
- Energy recovery wheels.
- High efficiency equipment.
- Integrated design along with energy modeling.

Engineers indicate the following obstacles to specifying and promoting energy efficient processes and equipment:

- Higher upfront cost compared to standard efficiency equipment. (indicated 4 times)
- Time required design/implement the system. (indicated 2 times)
- Staying current with latest products on the market.

Table 3-6 presents recommendations provided by engineers regarding how utilities can help them in overcoming these barriers:

Table 3-6: Engineer Suggestions to Overcome Barriers Specifying and Promoting Energy Efficient Systems

Suggestions to Overcome Barriers Promoting Energy Efficient Systems
• Provide rebates to encourage more efficient building practices. (indicated 4 times)
• Provide personnel/consultant to work on-site on a temporary basis. (indicated 2 times)
• Provide customer education – e.g., Have Xcel Energy account reps to visit design firms and consultants. (indicated 2 times)
• Advertise – Spread the word more about rebates for new construction and renovations.
• Make rebate information more user-friendly.
• Fund engineering studies.

3.2.2.4.2 Changes over Past Three Years

All engineers surveyed working for a firm that provides design and specification services report that practices have changed over the past three years. Engineers note the following changes in energy efficient practices:

→ "Looking at requirements for LEED and new technologies (e.g., solar)."

→ “A lot of thought goes into design with a push on energy efficiency - Definitely an emphasis on LEED and B3."

→ "One area where we have improved is renewable systems.”

→ “We are implementing new lighting controls."

3.2.2.4.3 Trends Anticipated Next Five Years

Engineers note anticipating the following trends in energy efficiency practices in the commercial and industrial building markets over the next five years:

→ "More energy efficient technology will evolve continually. Energy efficiency standards are likely to stay ahead of codes and together get progressively stricter. More clients upgrading what they have - ensuring equipment is meeting their needs and energy efficient."

→ "Continuation of current trend - As energy costs rise, people will look at life cycle cost of operating a facility."

→ "Lighting controls are going to get more sophisticated (e.g., controllable ballasts). Retro commissioning increasing in importance and scope. Renewable energy systems are increasing."

→ "Trend is going to be more efficiency, lower lighting levels and ways to save more money."

→ "I think an increase in integrated design and measurement and verification when high efficiency equipment is installed. Commissioning and re-commissioning of buildings is one of the things we will also see an increase."

3.2.2.5 Program Participation

Awareness of Incentive Programs

All engineers surveyed are aware of incentive programs to consider more energy-efficient alternatives in building design and equipment choices. Engineers note being aware of the following incentive programs:

- Xcel Energy rebates for efficient motors and variable speed drives. (indicated 2 times)
- Prescriptive equipment rebates. (indicated 2 times)
- Energy Design Assistance Program.
- Data center programs.
- Lighting.
- HVAC energy efficiency.
- Duct heat recovery.

Participation in Energy Efficiency Programs

Participating engineering firms report having engaged in the following utility or government-sponsored energy efficiency programs for commercial and industrial construction over the past three years:

- Xcel Energy Design Assist Program (indicated 2 times)
- Prescriptive rebate programs.
- Data center program.
- Energy modeling program.
- ENERGY STAR for Buildings program.
- Pilot program for LEED.

The non-participating engineering firm surveyed reports not having taken part in any energy efficiency programs for commercial and industrial construction during this time. The reason cited by the non-participating firm for not engaging in any utility or government-sponsored programs is that the energy efficiency programs have not applied to them.

3.3 Non-Residential Builders

3.3.1 Study Approach

Data for non-residential builders was collected from six businesses (four participating and two non-participating firms). The non-residential survey instrument was designed to gain a better understanding of practices used by builders regarding energy efficiency systems for new commercial and industrial buildings and major existing facility additions.

3.3.2 Summary of Key Findings

3.3.2.1 Business Relationships

Who Non-Residential Builders Are Partnering

All participating and non-participating builders work with architects and engineers when developing projects. Two of the builders report working with architects/engineers both inside and outside their firm and four builders note just working with architects/engineers inside their firm.

Builders use the same personnel to size heating and cooling equipment for both commercial and industrial buildings built in Minnesota. These include engineers (indicated 3 times), architects (indicated 2 times), mechanical contractors (indicated 2 times) and internal design groups.

Non-Residential Builder Concerns about Architect and Engineer Designs

A couple of the participating builders express concerns about architects' and engineers' designs of energy systems like HVAC, lighting and building shell measures.

→ "Make sure [architect and engineer] designs are most efficient at the time and trouble-free."

→ "[Architects and engineers] do not have a background in the operation of a facility. Operational cost is a major concern."

Non-residential builders indicate the above concerns regarding architects' and engineers' designs impacts building performance for the following systems:

HVAC split systems

- Have to make sure architects/engineers are not over-designing systems (impacts energy consumption, cost and sizing).
- Have to make sure architects/engineers are using most efficient and cost effective designs.
- Leads to higher costs and energy consumption if maintenance is not kept up.

Lighting systems

- Need to be efficient and cost effective. (indicated 2 times)
- Need to be aware of aesthetic issues.
- Need for more controls.

Building shell and weatherization

- Make sure design allows for adequate detailing (e.g., ratio of glass to wall affects HVAC).
- Make sure architect/engineer design avoids problems with condensation mold.

3.3.2.2 Energy Efficiency Practices

Influence of Energy Efficiency on Business

Most non-residential builders surveyed report demand for energy-efficient measures and features in commercial and industrial building construction and sales in Minnesota is very high.

Many builders surveyed note the cost of energy will have the most influence on energy efficiency in the commercial and industrial new construction market over the next three years.

3.3.2.3 Impact of Building Codes

All non-residential builders surveyed report being aware of building codes that apply to the type of construction their firm conducts. All builders also note Minnesota building codes have influenced the selection of building materials and equipment over the past three years. Half the builders surveyed indicate the influence of these codes "completely determined the type of building materials and equipment selected."

3.3.2.4 Sales Trends

3.3.2.4.1 Equipment Vendors Currently Promoting/Selling

All builders surveyed report promoting energy efficiency systems to buyers or owners of the commercial and industrial facilities their business builds in Minnesota.

Non-residential builders report installing gas forced boilers with an annual fuel utilization efficiency (AFUE) rating category equal to 90 or greater more frequently than with an AFUE designation less than 90 for both commercial and industrial buildings. Builders indicate being fairly evenly split in installing gas forced air furnaces in commercial and industrial buildings with the following AFUE rating categories:

- AFUE = 80 or lower
- AFUE over 80 to 90
- AFUE over 90

Builders are installing DX packaged systems more often than chillers and heat pumps for commercial and industrial buildings. Other types of energy efficient HVAC and building shell strategies being installed by non-residential builders for commercial and industrial buildings include:

- Renewable systems (i.e., geothermal and solar). (indicated 3 times)
- Evaporative cooled roof tops.
- Shaves (window awnings) on outside of building.
- Variable speed drives.
- Controls (e.g., energy management systems).
- Air exchangers.

3.3.2.4.2 Changes over Past Three Years

Almost every non-residential builder surveyed reports that demand for energy-saving measures and features has increased over the last three years for both commercial and industrial buildings. Builders provide the following reasons for the increase in energy efficiency:

- Technology increases leading to better and more efficient products. (indicated 3 times)
- More financing opportunities for building owners (e.g., government incentives). (indicated 2 times)
- Rising energy costs.
- Changes in building codes.
- Clients becoming more energy conscious and pushing for more energy efficiency.

3.3.2.4.3 Trends Anticipated Next Five Years

Most non-residential builders expect the overall energy efficiency of new facilities their firm constructs to increase over the next few years. No builder anticipates a decrease in energy efficiency. Builders anticipate the following trends in energy efficiency practices in new construction and renovations over the next five years:

- Energy systems continuing to become more efficient. (indicated 5 times)
- More LEED certified or “green” buildings being developed.

3.3.2.5 Program Participation

Participation in Energy Efficiency Programs

All four participating non-residential builders and one of the two non-participating builders surveyed report having taken part in a utility or government-sponsored energy efficiency program for commercial and industrial construction over the past three years. Builders note participating in the following utility or government-sponsored energy efficiency programs:

- Energy Star National Program. (indicated 5 times)
- LEED for New Construction. (indicated 5 times)
- LEED for Existing Buildings. (indicated 4 times)
- National Green Building Standard. (indicated 3 times)
- Minnesota B3 Benchmarking Program.
- Xcel Energy Design Assistance Program.
- Xcel Energy Stimulus Energy Grant Program.
- Xcel Energy Recommissioning Program.
- Federal Loans Program.
- Program that offered an insulation tax credit.

Positive feedback about the programs revolves around payback. One builder indicates the programs “helped to close the gap between first cost and payback so payback got shorter which makes doing energy efficiency more attractive.” Another builder notes the programs "show energy loss and paybacks which makes a convincing story for owners to make an intelligent choice." One participating builder had negative feedback about the federal programs being very time consuming to pursue. The builder comments that “the amount of effort required means the common person cannot do it – the proposal cost is more than the money you get.”

3.4 HVAC Contractors

3.4.1 Study Approach

In-depth interviews were conducted with ten HVAC contractor businesses (eight participating and two non-participating firms). The HVAC contractor survey instrument was designed to gain a better understanding of high efficiency systems sold in Xcel Energy's service territory and the factors that influence the sale of energy efficient equipment.

3.4.2 Summary of Key Findings

3.4.2.1 Energy Efficiency Practices

Client Awareness and Interest in Energy Efficiency Systems

Eight HVAC contractors surveyed report that commercial and industrial customers present cost concerns when purchasing energy efficient HVAC products. One contractor states that "builders who will be renting space want the cheapest option." Some contractors indicate they attempt to justify the higher upfront cost of energy efficient equipment with clients to persuade them to install higher efficiency systems.

HVAC contractors note the following benefits commercial and industrial customers see in purchasing energy efficiency HVAC products:

- Reduced fuel bills. (indicated 6 times)
- Reduced energy usage – more efficiency. (indicated 3 times)
- Decreased operating costs – better quality units (e.g., less maintenance, longer equipment lifetime). (indicated 2 times)
- Return on investment over lifetime of equipment use.
- Commercial and industrial businesses able to promote being "green" to their customers.
- Energy efficient units are quieter.

Influence of Energy Efficiency on Business

Table 3-7 presents criteria HVAC contractors use to characterize equipment as energy efficient for commercial and industrial applications. Contractors frequently indicate having the efficiency amount required to obtain a rebate dictate what is considered energy efficient for HVAC equipment.

Table 3-7: **Criteria Applied To HVAC Equipment to Designate as Energy Efficient for Commercial and Industrial Applications**

HVAC Equipment	Criteria to Designate as Energy Efficient
Chillers (Built up systems)	• Whatever qualifies for rebate (indicated 4 times) • Integrated part load value (IPVL) >12 • 93% efficient • Water - .5 kw/ton air • As efficient as possible - depends on application, chiller type • Minimum of 13 EER and 16 SEER rating
Packaged systems (Unitary equipment)	• Whatever qualifies for rebate (indicated 4 times) • 80% efficient (indicated 2 times) • Minimum 12.2 SEER rating • Whatever meets code • Rooftops - depends on size (smaller – 15 to 17 SEER, larger - 11, really big – 10)
Rooftop split systems	• Whatever qualifies for rebate (indicated 2 times) • Whatever meets code • 12+ EER rating • Minimum of 13 SEER rating • 95% efficient • Usually specified by engineer
Packaged Terminal Air Conditioners (PTAC)	• Whatever qualifies for rebate (indicated 2 times) • Whatever meets code • 80% efficient
Air source heat pumps	• Whatever qualifies for rebate (indicated 2 times) • What Carrier carries • 15 SEER rating • 13 EER rating
Ground source heat pumps	• Whatever qualifies for rebate (indicated 2 times) • Whatever qualifies for federal tax credits • Depends on ground temperature
Ductless mini-split systems	• Whatever qualifies for rebate (indicated 2 times) • SEER rating ranging from 15 to 20

Table 3-8 presents AFUE levels HVAC contractors consider to be energy efficient for natural gas equipment used in commercial and industrial applications.

Table 3-8: AFUE Levels Considered To be Energy Efficient for HVAC Natural Gas Equipment Used in Commercial and Industrial Applications

HVAC Natural Gas Equipment Type	AFUE Level
Natural gas furnaces	Ranges from 80% to 95% (n=4)
Gas boilers	Ranges from 82% to 98% (n=6)
Gas boilers/Indirect Water Heating Systems	Ranges from 90% to 95% (n=5)
Gas steam boilers	Ranges from 85% to 89% (n=1)

3.4.2.2 Sales Trends

3.4.2.2.1 Equipment Vendors Currently Promoting/Selling

All HVAC contractors surveyed report promoting energy efficient products because it enables them to build relationships with customers by providing high quality equipment that reduces energy and maintenance costs. Eight of the ten HVAC contractors surveyed report recommending energy efficient types of equipment in commercial and industrial applications "always" (indicated 5 times) or "most of the time." Reasons cited by contractors for not promoting energy efficiency include:

- Client budget restrictions. (indicated 3 times)
- Design constraints (e.g., other equipment has been specified by architect/engineer).
- If the building space will not be frequently used.

HVAC contractors note the following business advantages to promoting energy efficient technologies in commercial and industrial applications:

- Differentiates business from other contractors who are not aware of benefits and programs. (indicated 5 times)
- Gives more options to customers (e.g., lower operating costs). (indicated 3 times)
- Sales are more profitable for energy efficient equipment compared to standard equipment. (indicated 2 times)
- Provides good public image for business.

Several HVAC contractors indicate the higher cost of energy efficient equipment is a turn-off to some clients. The contractors note that when they present the payback features of energy efficient equipment they are sometimes able to persuade their customers to spend more upfront for the technology.

Table 3-9 presents suggestions from contractors for program services that would be effective in helping promote high efficiency HVAC equipment to customers.

Table 3-9: **Contractor Suggestions for Program Services to Promote Energy Efficient HVAC Equipment**

Program Services to Promote Energy Efficient HVAC Equipment
• Offering higher customer rebates covering upgrade costs. (indicated 3 times) • Training on how to sell high-efficiency equipment to customers (e.g., helping sell to clients who are turned off by payback that extends over five years). (indicated 3 times) • Providing programs that keep contractors up to speed on current equipment, trends and rebate programs. • Making customers aware of rebate programs. • Offering tax breaks.

3.4.2.2.2 Changes over Past Three Years

HVAC contractors were asked about differences in annual sales in 2010 compared to the previous three years. Contractors report mixed responses - with five reporting a decline in sales (ranging from down 10% to 30%) and four indicating an increase in sales (ranging from up 5% to 15%).

Most contractors report the percentage of gas furnaces installed with AFUE ratings of 90% and above over the past three years has increased (ranging from 15% to 80%). Reasons for the increase in the installations of gas furnaces installed with AFUE ratings of 90% and above include:

- Rebates. (indicated 2 times)
- Businesses more conscious of energy costs. (indicated 2 times)
- Code requirements.
- Engineers specifying better equipment.

Nine out of the ten contractors surveyed report energy efficient HVAC installations have increased relative to installations of standard HVAC technologies for commercial and industrial applications over the past three years (ranging from 10% to 50%). No contractor indicates a decrease in installations. Reasons provided for the increase in energy efficient HVAC installations include:

- Businesses are more aware of energy/operating costs. (indicated 4 times)
- Xcel Energy rebates entice owners to justify higher efficiency. (indicated 3 times)
- Customers are asking for more efficient equipment. (indicated 3 times)
- Able to show return on investment of high efficiency equipment over lifetime of use.
- More buildings going for LEED certification.
- HVAC contractors promoting high efficiency equipment.

3.4.2.2.3 Trends Anticipated Next Five Years

HVAC contractors anticipate the following trends in high efficiency products over the next five years:

- Move toward higher efficiency products. (indicated 4 times)
- Increase in energy recovery on generators, boilers and chillers.
- Minimum efficiency standards will increase.
- Businesses will continue to want rebates and quick paybacks.
- Will see more ice-making done at night to save money by using electricity during off peak times and to use the ice during the daytime as a cooling source for the building.

3.4.2.3 Program Participation

Participation in Energy Efficiency Programs

HVAC contractors were asked what energy efficiency programs they would like to see offered by Xcel Energy for commercial and industrial equipment. Suggestions offered by contractors include energy recovery programs, salesman incentives and rebate programs (e.g., rebates for pressurization units – "proven efficient, 20% more than other systems"). While many contractors state that Xcel Energy is doing a good job with incentive programs, a couple contractors provide the following feedback on improving current programs:

→ "Having a hard time with custom rebates - If we could get easier pass-through, would install a lot more systems."

→ "Need to streamline current programs."

3.5 Lighting Contractors

3.5.1 Study Approach

Data for lighting contractors was collected from ten businesses (eight participating and two non-participating firms). The lighting contractor survey instrument was designed to gain a better understanding of the energy characteristics and customer energy efficiency attitudes within the commercial and industrial lighting sector.

3.5.2 Summary of Key Findings

3.5.2.1 Business Relationships

Who Lighting Contractors Are Partnering

New Construction Projects

Lighting contractors note that architects (indicated 7 times) and electrical engineers (indicated 5 times) have the most influence in specification and placement of lighting equipment sold for new construction projects. Others indicated by contractors as having significant influence include lighting/electrical distributors, lighting/electrical contractors, facility managers, designers and end users.

Renovation Projects

Lighting contractors report that electrical engineers (indicated 4 times), architects (indicated 3 times) and lighting/electrical distributors (indicated 3 times) have the most influence in specification and placement of lighting equipment sold for renovation projects. Others indicated by contractors as having significant influence include lighting/electrical contractors, owners, facility managers, chief financial officers and end users.

3.5.2.2 Energy Efficiency Practices

Client Awareness and Interest in Energy Efficiency Systems

Contractors report much variance in the percent of customers knowledgeable about energy efficiency lighting options available to them before receiving recommendations from a lighting expert - with responses ranging from 20% to 100%. Almost all contractors surveyed report customers make use of their advice about energy efficient lighting. In cases where customers do not follow recommendations, contractors note the following reasons:

- Cost of energy efficient lighting is too high. (indicated three times)
- Customer doesn't like change - wants to stay with current lighting system.
- Hard to convince customer that improved technology is going to be beneficial for them due to bad past experience.

Influence of energy efficiency on business

Seven of the eight participating lighting contractors surveyed report that Xcel Energy programs are very important in their firm's decisions about how heavily to promote energy-efficient lighting equipment. Most participating contractors indicate that Xcel Energy programs are very influential on the market share of energy-efficient lighting technologies in their market area.

Lighting contractors were asked what program services would be most effective in helping their company promote high efficiency lighting equipment to customers. Participating and non-participating contractors present the following suggestions:

- Provide customer rebates/incentives for equipment – e.g., offer a standard LED incentive. (indicated 6 times)
- Provide customers with information – e.g., include fliers in billing invoice. (indicated 3 times)
- Create an online calculator to use to come up with return on investment.

3.5.2.3 Impact of Building Codes

All ten lighting contractors surveyed report being aware of Minnesota building codes for lighting.

All contractors surveyed are also aware of the upcoming lighting standards affecting incandescent bulbs and T12 lamps. Nine contractors note this lighting standard influenced their selection of lighting equipment over the past three years, with five indicating the influence of these codes "completely determining the type of building materials and equipment selected."

3.5.2.4 Sales Trends

3.5.2.4.1 Equipment Vendors Currently Promoting/Selling

All lighting contractors surveyed report recommending energy efficient lighting to customers. Lighting contractors provide the following reasons their business promotes energy efficient lighting equipment:

- Cost savings. (indicated 6 times)
- Energy reduction. (indicated 4 times)
- Better for the environment. (indicated 4 times)
- Customers benefit from better quality of lighting. (indicated 4 times)
- Increased revenue/margin from sales of energy efficient equipment compared to standard equipment. (indicated 3 times)
- Make use of incentives/rebates.
- Compliance with government standards.

Table 3-10 presents circumstances in which contractors are more likely to promote energy efficient lighting equipment to customers:

Table 3-10: Situations Contractors More Likely to Recommend Efficient Lighting Equipment to Customers

Circumstances Contractors More Likely to Promote Energy Efficient Lighting
• When there are program incentives available. (indicated 3 times) • When customers understand payback, so upfront cost is not an issue. • When dealing with new construction or remodeling versus replacement projects.

Contractors were asked about the perceived importance of a number of lighting characteristics that customers consider when selecting equipment. “Initial cost of equipment” was found to be the most endorsed factor, with nine contractors rating this characteristic as significant. Many contractors also regard “total life cycle costs,” “ease of maintenance” and “cost of operation” as important. On the other hand, "maintenance of lighting level" was considered to be unimportant to customers when selecting equipment.

Table 3-11 shows the minimum percentage of lighting equipment cost that lighting contractors indicate should be covered by a rebate to get non-residential customers to install higher efficiency lighting products.

Table 3-11: **Perceived Minimum Percentage of Lighting Equipment Cost Covered by Rebate to Persuade Businesses to Install Higher Efficiency Lighting Products**

Lighting Type	% of Lighting Cost Covered by Rebate to Persuade Businesses to Install Higher Efficiency Lighting Products
Low-watt T8 lamps (25 or 28 watt)	Ranges from 10% to 75% (n=7)
T-5 lamps & ballasts	Ranges from 50% to 70% (n=5)
Hard-wired CFL fixtures	Ranges from 50% to 60% (n=4)
LED exit signs	Ranges from 15% to 75% (n=6)
LED ENERGY STAR qualified lamps	Ranges from 50% to 75% (n=7)
LED ENERGY STAR qualified luminaires	Ranges from 50% to 70% (n=7)
Fluorescent fixtures as replacements for HID fixtures	Ranges from 50% to 75% (n=6)
Replace older HID fixtures such as mercury vapor with more modern HID fixtures such as pulse start metal halide	Ranges from 30% to 60% (n=6)
Occupancy controls – ceiling mount	Ranges from 40% to 75% (n=7)

3.5.2.4.2 Changes over Past Three Years

High Bay Lighting Installation

Most contractors surveyed report the type of high bay lighting they have been specifying has changed over the past three years. Many lighting contractors are currently predominantly recommending fluorescents for high bay applications compared to other types of lighting such as pulse-start metal halide and high intensity discharge (HID). Factors causing changes in the type of lighting specified for high bay applications include:

- Advances in technology (i.e., longer bulb life, improved lumen maintenance). (indicated 5 times)
- Xcel Energy rebates. (indicated 4 times)
- Energy consumption savings. (indicated 2 times)
- Price of fixtures decreasing. (indicated 2 times)

Fluorescent Lighting Installation

The majority of lighting contractors report the type of linear fluorescents they have been specifying has changed over the past three years. Many contractors are presently primarily recommending high-performance T8s or Super T8s for linear fluorescent lighting applications compared to other types of lighting such as standard T8s, low-watt T8s, T5s and T12s. Factors causing changes in the types of lighting specified for linear fluorescents include:

- Manufacturing better products/technologies. (indicated 4 times)
- Rebates from Xcel Energy (e.g., Super T8s). (indicated 3 times)
- Xcel Energy Conservation Program.
- Lower cost of linear fluorescents.
- Rules and regulations that have gone into effect.

Lighting Control Installation

The majority of contractors indicate their frequency of specifying lighting controls has increased over the past three years. Most lighting contractors surveyed are currently often installing occupancy/motion sensors and on/off switches as lighting control devices. Less regularly, some contractors also report installing photo sensors, time clocks, building/energy management systems and daylight controls. Factors causing the increase in lighting controls include:

- More businesses looking into lighting controls. (indicated 3 times)
- Xcel Energy rebates. (indicated 2 times)
- Improvements in technology. (indicated 2 times)
- Cost of product has come down, making for a more attractive payback. (indicated 2 times)
- Businesses trying to conserve energy. (indicated 2 times)
- Increased energy rates.
- Cost savings.

3.5.2.4.3 Trends Anticipated Next Five Years

Lighting contractors anticipate the following trends in high efficiency lighting products over the next five years:

- Increase in LED technology. (indicated 5 times)
- More businesses looking into high efficiency lighting products (regardless of rebates). (indicated 2 times)
- Decrease in T8s.
- Increase in induction lighting.
- Longer lasting lighting technologies.
- Lower cost for high efficiency lighting products.
- Market for high efficiency lighting will be stronger in existing building retrofits than new construction.

3.5.2.5 Program Participation

Awareness of Incentive Programs

All eight participating lighting contractors and one of the two non-participating lighting contractors surveyed are aware of Xcel Energy incentive programs for businesses to install energy efficient lighting.

Participation in Energy Efficiency Programs

Even though four participating contractors report Xcel Energy programs work well and are in no need of improvements, four participating contractors indicate they would like to revamp the rebate process to make it quicker and easier to receive rebates and offer the following suggestions:

→ "Streamline the rebate incentive process so it is not so cumbersome. Calculations for custom rebates are labor intensive and we have to wait for the rebate check."

→ "Two week processing on rebate checks would be good - sometimes have to wait six weeks."

→ "Speed the process up to make it faster from requisition to check."

→ "Help established companies to clear paperwork process by not having to send a cut sheet every time. Allow partners to pre-qualify. Have online rebate tracking system so do not have to call to check on rebates."

3.6 Motor Distributors

3.6.1 Study Approach

Surveys were conducted with seven businesses (five participating and two non-participating distributors). The objective of the motor distributor survey instrument was to determine market penetration of premium efficiency electric motors, as well as other motor practices.

3.6.2 Summary of Key Findings

3.6.2.1 Business Relationships

Who Motor Distributors Are Partnering

All seven motor distributors surveyed report selling motors directly to facility owners and managers. Five distributors report selling motors to electrical and mechanical contractors, four report selling motors to original equipment manufacturers (OEMs) and three indicate selling motors to motor dealers.

All distributors surveyed report selling non-integrated units. Six distributors sell non-integrated units to electrical contractors, five sell to OEMs and four sell to facility owners and managers. Only one distributor surveyed indicates selling integrated motor units, with 100% of those sales going to facility owners and managers.

3.6.2.2 Energy Efficiency Practices

Client Awareness and Interest in Energy Efficiency Systems

Most distributors surveyed report the majority of their non-residential customers are aware of the energy benefits of premium motors and/or variable speed drives (VSDs). The primary reason distributors note customers do not purchase energy efficient motors/ VSDs is due to the equipment being too costly (indicated 4 times).

Influence of Energy Efficiency on Business

All seven motor distributors surveyed are aware of NEMA premium motor efficiency standards. Four of the five distributors that stock motors custom order NEMA premium efficiency motors 25% of the time or less. Of the six distributors who indicate responding to bid requests, five report including bids for NEMA premium efficiency motors in “all sales situations” or “most sales situations.”

3.6.2.3 Sales Trends

3.6.2.3.1 Equipment Vendors Currently Promoting/Selling

Table 3-12 shows the number of distributors who sell different categories of motors (designated by amount of horsepower) and provides information about the number of distributors selling 70% or more of motors sold designated as NEMA premium for each horsepower category.

Table 3-12: **Sample Characteristics of Motor Distributors**

Motor Category	# of Distributors Selling Motors	# of Distributors Selling 70%+ Motors Designated as NEMA Premium
1 - 100 HP	7	5
Over 100 to 200 HP	6	6
Over 200 to 300 HP	4	3
Over 300 to 400 HP	2	1
Over 400 HP	1	0

Motor distributors were asked about the perceived importance of a number of characteristics about motors/VSDs that customers consider when choosing equipment. Characteristics considered important are “initial cost of the equipment” (indicated by all distributors surveyed) and “ease of maintenance” (indicated 5 times). On the other hand, many distributors consider “quiet operation” for motors/VSDs to be unimportant to customers.

The majority of motor distributors surveyed inform customers of the availability of NEMA premium efficiency motors in “most” or “all” sales situations. Table 3-13 presents suggestions from motor distributors to increase sales of premium/ high-efficiency motors:

Table 3-13: **Motor Distributor Recommendations to Increase Sales of Premium/High Efficiency Motors**

Suggestions to Increase Sales of Premium/High Efficiency Motors
• Provide cash incentives to customers to purchase NEMA premium efficiency motors and VSDs. (indicated 5 times)
• Offer cash incentives to replace existing motors with premium/ high-efficiency motors. (indicated 2 times)
• Bundle premium/high efficiency motors with packaged OEMs.
• Provide training to dealers on the benefits and techniques of selling NEMA premium efficiency motors and VSDs.
• Offer customer education on the benefits of premium/high-efficiency motors.
• Have premium/high-efficiency motors cost the same as standard motors.
• Make it the law to purchase premium/high-efficiency motors.

3.6.2.3.2 Changes over Past Three Years

Six of the seven most motor distributors surveyed report the number of integral three-phase motors sold has increased over the past three years. Five distributors indicate the share of NEMA premium motors they sold increased over the past three years. Factors contributing to the increased sales of NEMA premium motors include:

- Programs/promotion by Xcel Energy. (indicated 2 times)
- Government regulation. (indicated 2 times)
- Greater awareness of NEMA premium motors among customers.
- Higher energy costs.
- Agriculture sector using more high efficiency motors.

All motor distributors surveyed report wholesale prices of both standard efficiency motors and wholesale prices of NEMA Premium motors have increased over the past three years. Most motor distributors indicate the wholesale price difference between NEMA premium and standard motors of the same size and design has stayed about the same.

3.6.2.3.3 Trends Anticipated Next Five Years

Six of the seven motor distributors surveyed provided their perspective on anticipated trends in high efficiency motors and variable speed drives over the next five years. While four distributors expect there will be an increase in high efficiency motors and variable speed drives during this time, two do not foresee growth for high efficiency motors and VSDs. Reasons cited for the lack of expansion of high efficiency motors and VSDs include:

- → "Cost will continue to go up, but not much change in the product."
- → "Sales of VSDs and premium motors will go down. We are having a big issue with the shaft current and not sure if it is the brand/manufacturer or something else."

A. Appendix A: Architects & Engineers Survey

Xcel Energy Market Actor Survey
Architects & Engineers

Contact Name: [from sample] ____
Company: [from sample] ____
City or Town: [from sample] ____
Address: [from sample] ____
City, State, Zip [from sample]____
Telephone: [from sample] ____
Fax Number: [from sample]____

INTRODUCTION
Hello, my name is ______________ with KEMA, an energy consulting company. I am calling on behalf of the Xcel Energy. Xcel Energy has asked us to help them better understand current practices used by architects and engineers regarding the use of energy-saving features in the commercial and industrial building markets. Could I speak to someone knowledgeable in your firm about building design and construction practices at your company?
This survey is extremely important to better understand the energy characteristics and customer energy efficiency attitudes within the commercial and industrial construction market. Your input is very valuable and all information you provide will be confidential. Your responses will only be provided to Xcel Energy after they have been aggregated with those of other architect and engineer firms. The conversation will take about 15 minutes. As an incentive for your time and feedback, your company will be included in a drawing for the chance to win $1,000.

Is now a good time?

1 Yes
2 No **(See if can reschedule appointment)**
97 Don't know **(See if can reschedule appointment)**
98 Refused **(Thank and Terminate Survey)**

[IF REQUESTED]
For further questions about this survey, you can contact Jan Nelson at Xcel Energy at the following email address: **Jan.Nelson@xcelenergy.com**

FC. FIRM CHARACTERIZATION

FC1. How would you describe your position?

1. Architect
2. Engineer (e.g., Mechanical)
3. General Contractor
4. Mechanical/Electrical Contractor
5. Other (Please describe)
97. Don't know
98. Refused to answer

FC2. How many full-time employees work for your company?
[Note: An estimate is fine]

1 Record Response: ______________________
997 Don't know
998 Refused

The next few questions deal with the TYPES of construction projects that your firm has worked on in Minnesota over the past three years.

FC3. What percentage of your projects in the Xcel Energy Service Territory involves commercial or industrial buildings what percentage involves other types of buildings?

[NOTE THAT SHOULD TOTAL 100%]

[An Estimate is Fine]
DK=997 R=998

a. Commercial Construction: ____________%
b. Industrial Construction: ____________%
c. OTHER TYPES (e.g., Residential) ____________%
[If Other] Please describe:________________________________

[If FC3_a+ FC3_b is not >50% terminate survey]

FC4. What percentage of these projects are new construction and what percentage are renovations? Renovations are major changes to existing construction, including additions.

[NOTE THAT SHOULD TOTAL 100%]

[An Estimate is Fine]
DK=997 R=998

[Skip if FC3_1+ FC3_2=0] a. New Construction C&I: ____________%
[Skip if FC3_1+ FC3_2=0] b. Renovation/Retrofit C&I: ____________%

c. OTHER TYPES (e.g., Residential) _____________%

[If Other] Please describe:_____________________________________

FC5. Over the past three years, what percentage of your commercial and industrial projects were design-built, speculative, built-to-suit, or design-bid?

[EXPLAIN IF NECESSARY]

Design-Build: The owner contracts with a single firm to both design and build the facility the contractor completes some or all of the design for the building or of a particular building system

Speculative: Building/development that is designed and built for sale on the open real estate market

Built-to-Suit: Entails a developer constructing a building according to the prearranged specifications of a client/owner/future occupier of the space

Design-Bid: Presented the developer with a succession of discrete steps: a design for the structure, a bid for construction of the structure, then the actual construction of the building

[NOTE THAT SHOULD TOTAL 100%]

[An Estimate is Fine]
DK=997 R=998

a. Design-Build: _____________%

b. Speculative: _____________%

c. Built-to-Suit: _____________%

d. Design-Bid: _____________%

FC6. What types of commercial or industrial buildings do you specialize in?

(CIRCLE ALL MENTIONS)

1 Office buildings
2 Healthcare
3 Primary/Secondary Education
4 Retail
5 Hotel/Motel
6 Restaurants
7 Industrial
8 Residential Multi-Family
9 (Other:________________)

97 DK

98 Refused

CBD. Coordination with Builders and Developers

CBD1. Do you typically work with builders and developers when constructing a facility?

1 Yes
2 No **[Skip to DM1]**
97 Don't know **[Skip to DM1]**
98 Refused **[Skip to DM1]**

CBD2. Are these individuals outside of your firm?

1 Yes
2 No
3 Both in and out of firm
97 Don't know
98 Refused

CBD3. What concerns, if any, do you have about builder and developer installation practices of installation of energy systems like HVAC systems, lighting, and building shell measures like insulation and windows?

1 Record Response: ______________________
2 No concerns
97 Don't know
98 Refused

CBD4. [If CBD3 implies concerns] How does this effect building performance for the following:

[DK=97; R=98]

CBD4a. HVAC Split Systems
[RECORD RESPONSE]: ____

CBD4b. Lighting systems
[RECORD RESPONSE]: ____

CBD4c. Building Shell and Weatherization
[RECORD RESPONSE]: ____

DM. DECISION-MAKING

DM1. What energy efficiency design considerations are considered most important for your firm?

[PROBE: Cost, comfort, rentability]

1 Record Response: _________________________
97 Don't know
98 Refused

DM2. Is there someone in your organization responsible for continually reviewing new energy efficiency products and technologies?

1 Yes
2 No
97 Don't know
98 Refused

DM2a. [Ask if DM2=Yes] Who does this?

1 Record Response: _________________________
97 Don't know
98 Refused

DM3. How have your design/specifying practices changed over the past 3 years?

1 Record Response: _________________________
97 Don't know
98 Refused

DM4. How do energy efficiency considerations fit into your decision-making processes?

1 Record Response: _________________________
97 Don't know
98 Refused

DM5. Do the local building codes have any influence on these decisions?

1 Record Response: ______________________
97 Don't know
98 Refused

DM6. Are you aware of incentives to consider more energy-efficient alternatives in building design and equipment choices?
[If yes] What are they? Do such incentives influence your decisions?

1 Record Response: ______________________
97 Don't know
98 Refused

DM7. Has your firm experienced any negative perceptions regarding the implementation of energy efficient technologies and designs in your projects?
[If yes] What are they?

1 Record Response: ______________________
97 Don't know
98 Refused

DM8. How often do you suggest energy efficient measures or designs in your projects?

1 Always
2 Most of the time
3 Sometimes
4 Rarely
5 Never
97 Don't know
98 Refused

DM8a. **[Ask if DM8=1, 2, 3 or 4]** Which measures or designs do you recommend in your projects?

1 Record Response: ______________________
97 Don't know
98 Refused

DM9. In general, what is the level of awareness or interest from clients in energy efficiency features or options?

1 Record Response: ________________________
97 Don't know
98 Refused

DM10. What percentage of your customers would you say specifically request energy efficiency measures for: **[997=DK; 998=Refused]**

Measure	%
a. Equipment Lighting	________________%
b. Daylighting	________________%
c. Windows	________________%
d. Ceiling Insulation	________________%
e. Wall Insulation	________________%
f. Floor Insulation	________________%
g. Air Conditioning Systems	________________%
h. Heating Systems	________________%
i. Do your customers request energy efficiency measures for anything else not mentioned? **[If yes]** Please describe: ________________________________	________________%

DM11. Do your clients have any negative reactions or biases against specific energy efficient technologies or design?

1 Record Response: ________________________
97 Don't know
98 Refused

SPECIFIC MEASURES

A. HVAC Systems

HVAC1. What factors do you consider when specifying HVAC systems?

1	Record Response: ______________________
97	Don't know
98	Refused

HVAC2. On a scale of 1-5, where 1 is least important and 5 is most important, in general, how important is energy efficiency in HVAC specifications and designs?

1 2 3 4 5 DK R

HVAC3. What energy efficiency performance standards does your firm generally use?
[CHECK ALL THAT ARE MENTIONED]
[Prompt if needed]

____ 1. Current building practice standards
____ 2. Federal law
____ 3. State law
____ 4. City requirements
____ 5. Regulatory agency requirements
____ 6. General knowledge for building construction/renovation
____ 7. Building owner desires
____ 8. Energy Star
____ 9. LEED/ National Green Building Standards
____ 10. No particular entity/nobody
____ 11. Other: SPECIFY____

B. Lighting Systems

Light1. What factors do you consider when choosing lighting systems?

1	Record Response: ______________________
97	Don't know
98	Refused

Light2. On a scale of 1-5, where 1 is least important and 5 is most important, in general how important is energy efficiency in lighting designs?

1 2 3 4 5 DK R

Light3. What energy efficiency performance standards did you use?
CHECK ALL THAT ARE MENTIONED
[Prompt if needed]

____ 1. Current building practice standards
____ 2. Federal law
____ 3. State law
____ 4. City requirements
____ 5. Regulatory agency requirements
____ 6. General knowledge for building construction/renovation
____ 7. Building owner desires
____ 8. Energy Star
____ 9. LEED/ National Green Building Standards
____ 10. No particular entity/nobody
____ 11. Other: SPECIFY____

C. Building Shell and Weatherization

BSW1. What factors do you consider when designing a building shell?

1	Record Response: ______________________
97	Don't know
98	Refused

BSW2. On a scale of 1-5, where 5 is most important and 1 is least important, in general, how important is energy efficiency in building shell designs?

1 2 3 4 5 DK R

BSW3. What energy efficiency performance standards did you use?

CHECK ALL THAT ARE MENTIONED
[Prompt if needed]

____ 1. Current building practice standards
____ 2. Federal law
____ 3. State law
____ 4. City requirements
____ 5. Regulatory agency requirements
____ 6. General knowledge for building construction/renovation
____ 7. Building owner desires
____ 8. Energy Star
____ 9. LEED/ National Green Building Standards
____ 10. No particular entity/nobody
____ 11. Other: SPECIFY____

Bar. Barriers and Obstacles for Implementing Energy Efficiency

Bar1. What obstacles do you see to design engineers' and architects' willingness or ability to specify and promote energy efficient processes and equipment?

1 Record Response: ________________________
97 Don't know
98 Refused

Bar2. What do you feel utilities could do to assist you in overcoming those barriers?

RECORD EXACT RESPONSE, DO NOT PROMPT, THEN CODE

1 Record Response: ________________________
97 Don't know
98 Refused

Researcher, please code using following:

___1. Nothing
___2. Site specific analysis or assistance by experts and recommendations for efficiency improvements
___3. Training on specific building design elements to make construction more energy efficient
___4. Provide rebates to encourage more efficient building practices
___5. Provide personnel/consultant to work on-site on a temporary basis
___6. Offer shared savings/performance contracting programs
___7. Provide approved contractor lists to building design teams
___8. Provide consulting advice as requested

___9. Help resolve specific technical problems, **SPECIFY**___________________________
___10. Offer training and certification programs to assist in learning how to construct and maintain systems in a way that is energy-efficient
___11. Develop a standardized high efficiency new construction building practices agreement for contractors endorsed by contractor groups and utilities
___12. Other; **SPECIFY**___________________________

Bar3. How effective is each of the following as a means of increasing the efficiency level of measures and building shells installed in new buildings in the Xcel Energy Service Territory**?**

Please rate each of the following using a scale of 1 to 5, where 1="no influence" and 5="a great deal of influence" (97 = Don't Know; 98=Refused to answer)

	HVAC	Lighting	Shell
1. Changes in government codes & regulations			
2. Professional training events or certification programs			
3. Cash incentives to energy users			
4. Technology improvements			
5. Marketing or stocking agreements with dealers & distributors			
6. Marketing or stocking agreements with manufacturers			
7. Incentives to lower the incremental first cost of high efficiency equipment			

PPA. Program Participation and Attitudes

PPA1. Has your firm participated in any utility or government-sponsored energy efficiency programs for commercial and industrial construction over the past three years?

1 Yes
2 No
97 Don't know
98 Refused

PPA2a. **[Ask If PPA1=Yes]** Which utility or government-sponsored energy efficiency programs have you participated?

1 Record Response: ______________________
97 Don't know
98 Refused

PPA2b. **[Ask If PPA1=Yes]** What did you like and/or dislike about the program(s)?

1 Record Response: ______________________
97 Don't know
98 Refused

PPA2c. **[Ask If PPA1=No]** Why hasn't your firm participated in any utility or government-sponsored programs?

1 Record Response: ______________________
97 Don't know
98 Refused

FE. Future Expectations

FE1. What trends do you anticipate in the energy efficiency practices of architects and engineers in the commercial and industrial building markets over the next five years?
[PROMPT IF NECESSARY: These could be trends related to sales volume, products, availability, price, types of retailers carrying particular products, regional differences, etc.]

1	Record Response: ______________________
97	Don't know
98	Refused

CC. Closing Comments

CC1. Do you have any other input regarding energy efficiency in design and construction practices in Minnesota?

1	Record Response: ______________________
97	Don't know
98	Refused

Those are all the questions I have for you today. Thank you for your time.

B. Appendix B: Non-Residential Builders Survey

Xcel Energy Market Actor Survey
Non-Residential Builders

Contact Name: [from sample] ____
Company: [from sample] ____
City or Town: [from sample] ____
Address: [from sample] ____
City, State, Zip [from sample]_______________________________________
Telephone: [from sample] ____
Fax Number: [from sample]____

INTRO. Hello, my name is _______________ with KEMA, an energy consulting company. I am calling on behalf of the Xcel Energy. Xcel Energy has asked us to help them better understand the current practices used by builders regarding the use of energy-saving features for new commercial and industrial buildings and major existing facility additions. Could I speak to someone at your company that is knowledgeable about design and construction decisions that affect energy use in the new buildings and additions you construct?

This survey is extremely important to better understand the energy characteristics and customer energy efficiency attitudes within the new commercial and industrial construction market. Your input is very valuable and all information you provide will be confidential. Your responses will only be provided to Xcel Energy after they have been aggregated with those of other builders. The conversation will take about 15 minutes. As an incentive for your time and feedback, your company will be included in a drawing for the chance to win $1,000.

Is now a good time?

1	Yes
2	No **(See if can reschedule appointment)**
97	Don’t know **(See if can reschedule appointment)**
98	Refused **(Thank and Terminate Survey)**

[IF REQUESTED]

For further questions about this survey, you can contact Jan Nelson at Xcel Energy at the following email address: **Jan.Nelson@xcelenergy.com**

FM. FIRM CHARACTERIZATION

FC1. What is your position at your firm?

1 President/CEO
2 Sales Manager
3 General Manager
4 Construction Manager
5 Design Manager / Architect
6 Other (Specify:____)
97 Don't know
98 Refused

FC2. Which of the following types of facilities does your firm build?
[READ, SELECT ALL THAT APPLY]

1. Office Buildings
2. Healthcare Facilities
3. Primary/Secondary Education
4. Retail
5. Hotel/Motel
6. Restaurants
7. Industrial
8. Other (Please describe:____)
97. Don't know
98. Refused to answer

The next few questions deal with the types of buildings and major additions that your firm built in Minnesota, over the past three years.

FC3. About how many of the following did your firm build in Minnesota over the past three years?

FC3a. New commercial facilities

1 Number of new commercial facilities: ___________________
97 Don't know
98 Refused

FC3b. New industrial facilities

1 Number of new industrial facilities: ___________________
97 Don't know
98 Refused

FC3c. Major building additions

1 Number of major building additions: ________________

97 Don't know

98 Refused

[End survey if FC3a + FC3b + FC3c is less than 15]

FC4. Over the past three years, what percentage of your commercial and industrial projects were design-built, speculative, built-to-suit or design-bid?

[EXPLAIN IF NECESSARY]

Design-Build: The owner contracts with a single firm to both design and build the facility the contractor completes some or all of the design for the building or of a particular building system

Speculative: Building/development that is designed and built for sale on the open real estate market

Built-to-Suit: Entails a developer constructing a building according to the prearranged specifications of a client/owner/future occupier of the space

Design-Bid: Presented the developer with a succession of discrete steps: a design for the structure, a bid for construction of the structure, then the actual construction of the building

[NOTE THAT FC4_a through FC4_d SHOULD TOTAL 100%]

[An Estimate is Fine]

DK=997 R=998

a. Design-Build: _____________%

b. Speculative: _____________%

c. Built-to-Suit: _____________%

d. Design-Bid: _____________%

AE. Experience Working with Architects and Engineers

AE1. **Do you work with architects and engineers when developing projects?**

1. Yes
2. No **[Skip to CP1]**

97. Don't know **[Skip to CP1]**

98. Refuse to answer **[Skip to CP1]**

AE2. **Are these individuals outside your firm?**

3 Yes
4 No
5 Both in and out of firm
97 Don't know
98 Refused

AE3. What concerns, if any, do you have about architects' and engineers' designs of energy systems like HVAC systems, lighting and building shell measures like insulation and windows?

1 Record Response: ______________________
2 No concerns
97 Don't know
98 Refused

AE4. **[If AE3 implies they have concerns]** How does this effect building performance for the following:

[DK=97; R=98]

AE4a. HVAC Split Systems

[RECORD RESPONSE]: ____

AE4b. Lighting systems

[RECORD RESPONSE]: ____

AE4c. Building Shell and Weatherization

[RECORD RESPONSE]: ____

CP. CONSTRUCTION PRACTICES

Now I have some questions about the energy-related characteristics of materials you installed in the new buildings and major additions your firm built over the past three years. Also, we're focusing here on construction occurring only in Minnesota.

CP1. What percent of these buildings and major additions have ceiling insulation in the following R-Value categories…

[READ LIST; Should not add up more than 100%]

	a. Commercial **Enter %** **997. DK** **998. R**	**b. Industrial** **Enter %** **997. DK** **998. R**
1 Percent less than R-19		
2 Percent Between R-19 and R-38		
3. Percent Greater than R-38		

CP2. What percent of these buildings and major additions have above-grade exterior wall insulation in the following R-Value categories …

[READ LIST; Should not add up more than 100%]

	a. Commercial Enter % 997. DK 998. R	b. Industrial Enter % 997. DK 998. R
1 Percent less than R-15		
2 Percent Between R-15 and R-19		
3. Percent Greater than R-19		

Now I'd like to ask you a few questions about the type of windows your firm typically installs in buildings and major additions in Minnesota.

CP3. What percent of the buildings your firm built over the past three years in Minnesota had the following types of windows ……

[READ LIST; SHOULD ADD TO 100%]

	a. Commercial Enter % 997. DK 998. R	b. Industrial Enter % 997. DK 998. R
1 Percent Single pane windows		
2 Percent Double pane windows		
3. Percent Triple pane windows		

CP4. What percent of the multi-paned windows were filled with Argon or Krypton Gas?

	a. Commercial Enter % 997. DK 998. R	b. Industrial Enter % 997. DK 998. R
1 Percent Argon or Krypton gas filled		

CP5. Now, please consider the low emissive or "Low E" rating of these windows. What percent of the buildings and major additions fell into each of the following 'low E' rating categories?

[READ LIST]

	a. Commercial **Enter %** **997. DK** **998. R**	**b. Industrial** **Enter %** **997. DK** **998. R**
1 Percent Non Low-E (Standard Glass)		
2 Percent Low-E		
3. Percent Double Low E or Low E-Squared		

HVAC. HVAC EQUIPMENT AND SIZING PRACTICES

Now I'd like to ask you about HVAC equipment and sizing. When answering these questions please consider the buildings built by your firm over the past three years only in Minnesota.

HVAC1. What percentage of these buildings and major additions were centrally heated with gas, electricity, propane, oil, or other systems?

	a. Commercial **Enter %** **997. DK** **998. R**	**b. Industrial** **Enter %** **997. DK** **998. R**
1 Percent of buildings with central **Gas** heating		
2. Percent of buildings with central **Electric** heating		
3. Percent of buildings with central **Propane** heating		
4. Percent of buildings with central **Oil** heating		
5. Percent of buildings with central **Other** heating		

ASK IF HVAC1_1 has **GAS HEAT GREATER THAN ZERO PERCENT**

HVAC2. Next, I'd like to ask about the typical efficiency of gas forced air furnaces. What percentage of the buildings built with gas furnaces fell into the following AFUE rating categories… ?

	a. Commercial **Enter %** **997. DK** **998. R**	**b. Industrial** **Enter %** **997. DK** **998. R**
1 Percent of buildings with AFUE = 80 or lower		
2. Percent of buildings with AFUE over 80 to 90		
3. Percent of buildings with AFUE over 90		

ASK IF HVAC1_1 has **GAS HEAT GREATER THAN ZERO PERCENT**

HVAC3. Next, I'd like to ask about the typical efficiency of gas boilers. What percentage of the buildings built with gas forced boilers fell into the following AFUE rating categories… ?

	a. Commercial	**b. Industrial**

	Enter % 997. DK 998. R	Enter % 997. DK 998. R
1 Percent of buildings with AFUE less than 90		
2. Percent of buildings with AFUE equal to 90 or greater		

	a. Commercial **997. DK** **998. R**	**b. Industrial** **997. DK** **998. R**
1. Percent with DX systems	**Enter %:________**	**Enter %:________**
2. Average DX system efficiency rating	**Enter Rating:_____**	**Enter Rating:_____**
3. Percent with Chillers	**Enter %:________**	**Enter %:________**
4. Average Chiller efficiency rating	**Enter Rating:_____**	**Enter Rating:_____**
5. Percent with Heat Pumps	**Enter %:________**	**Enter %:________**
6. Average Heat Pump efficiency rating	**Enter Rating:_____**	**Enter Rating:_____**
99. No central cooling system installed	**Enter %:________**	**Enter %:________**

HVAC4. Considering this same group of buildings, what percent were built with DX packaged systems, chillers and heat pumps, and what is the average efficiency rating?

HVAC5. Who normally sizes your heating and cooling equipment in the buildings your firm has built in Minnesota over the last three years?

[DO NOT READ. Circle SINGLE RESPONSE]

	a. Commercial 1. Builder 2.Heating and Air Conditioning Contractor 3. Consultant 4. Other (Specify:__________) 97. DK 98. R	b. Industrial 1. Builder 2.Heating and Air Conditioning Contractor 3. Consultant 4. Other (Specify:__________) 97. DK 98. R
1. Who normally sizes your heating and cooling equipment for the building your firm built in Minnesota over the last year?		

HVAC6. Beyond the energy efficiency features we've already discussed, what other types of energy efficient HVAC or building shell strategies do you typically install?

	a. Commercial 1. Record response: 97. DK 98. R	b. Industrial 1. Record response: 97. DK 98. R
1. What other types of energy efficient HVAC or building shell strategies do you typically install?		

MEE. MARKET FOR ENERGY EFFICIENCY IN NEW Commercial and Industrial CONSTRUCTION

MEE1. Based on your experience in building construction and sales in Minnesota, how much demand would you say there is for energy-efficient measures and features? Would you say demand is …

	a. Commercial **1. Very High** **2. Moderate** **3. Low** **4. No demand** **97. DK** **98. Refused**	**b. Industrial** **1. Very High** **2. Moderate** **3. Low** **4. No demand** **97. DK** **98. Refused**
1. How much demand would you say there is for energy-efficient features?		

MEE2. Would you say demand for energy-saving measures and features has increased, decreased, or stayed the same over the last three years?

	a. Commercial **1. Increased** **2. Decreased** **3. Stayed the same** **97. DK** **98. Refused**	**b. Industrial** **1. Increased** **2. Decreased** **3. Stayed the same** **97. DK** **98. Refused**
1. Would you say demand for energy-saving features has increased, decreased, or stayed the same over the last 3 years?		

MEE3. How regularly does your firm promote energy efficient measures or features to buyers or owners of the facilities you build in Minnesota? Would you say…

	a. Commercial **1. Often** **2. Sometimes** **3. Rarely** **4. Never** **97. DK** **98. Refused**	**b. Industrial** **1. Often** **2. Sometimes** **3. Rarely** **4. Never** **97. DK** **98. Refused**
1. How regularly do you promote energy efficiency to buyers of the facilities you build in Minnesota?		

MEE4. What will have the most influence on how builders address energy efficiency in the commercial and industrial new construction market over the next three years?

	a. Commercial **1. Record response:** **97. DK** **98. R**	**b. Industrial** **1. Record response:** **97. DK** **98. R**
1. What will have the most influence on how builders address energy efficiency in the commercial and industrial new construction market over the next 3 years?		

MEE5. Over the next three years do you expect the overall energy efficiency of new facilities your firm constructs to increase, decrease, or stay the same?

	a. Commercial **1. Increased** **2. Decreased** **3. Stayed the same** **97. DK** **98. Refused**	**b. Industrial** **1. Increased** **2. Decreased** **3. Stayed the same** **97. DK** **98. Refused**
1. Over the next three years do you expect the overall energy efficiency of your firm's new facilities to increase, decrease, or stay the same?		

ASK IF MEE5 = 1 or 2

MEE5a. Why do you think that is ?

	a. Commercial **1. Record response:** **97. DK** **98. Refused**	**b. Industrial** **1. Record response:** **97. DK** **98. Refused**
1. Why do you think that is ?		

EE. C&I ENERGY EFFICIENCY AND BUILDING RATING PROGRAMS

[This section refers to All Construction]

EE1. Are you aware of the building codes that apply to the type of construction that your firm does?

1 Yes
2 No **[Skip to EE2]**
97 Don't know **[Skip to EE2]**
98 Refused **[Skip to EE2]**

EE1a. For the projects you completed in the past three years, did the Minnesota building codes influence your selection of building materials and equipment?

1 Yes
2 No **[Skip to EE2]**
97 Don't know **[Skip to EE2]**
98 Refused **[Skip to EE2]**

EE1b. Please rate the influence of these codes on your selection of building materials and equipment using a scale of 1 to 5, where 1 indicates that the codes had "no influence on your selection" and 5 indicates that the codes "completely determined the type of building materials and equipment"?

1 Enter # (1 thru 5): ______________________
97 Don't know
98 Refused

EE2. Has your firm participated in any utility or government-sponsored energy efficiency programs for commercial and industrial construction over the past three years?

3 Yes
4 No
97 Don't know
98 Refused

EE2a. **[Ask If EE2=Yes]** Which utility or government-sponsored energy efficiency programs have you participated?

1 Record Response: ______________________
97 Don't know
98 Refused

EE2b. **[Ask If EE2=Yes]** What did you like and/or dislike about the program(s)?

1 Record Response: ______________________
97 Don't know
98 Refused

EE2c. **[Ask If EE2=No]** Why hasn't your firm participated in any utility or government-sponsored programs?

1 Record Response: _______________________
97 Don't know
98 Refused

EE3. **[ASK IF EE2 = 1 (YES)]** Has your firm participated in the following energy efficiency or rating programs for new buildings over the past three years?

PROGRAM **[Read list]**	RESPONSE 1 Yes 2 No 97 97 98 98
1. National Green Building Standard	
2. Energy Star (national program)	
3. LEED for New Construction	
4. LEED for Existing Buildings	
5. Minnesota B3 Benchmarking program **[If needed; Program to identify the energy performance of existing public buildings and determine those that are most in need of energy conservation improvements]**	
6. Other (specify): __________________________	

EE3a. **[ASK IF EE3_1, EE3_2, EE3_3, or EE3_4 = Yes]** What percentage of the buildings or additions that your firm built in Minnesota over the past three years were inspected and rated by one of these building rating programs?

1 Record Percentage: _______________________
997 Don't know
998 Refused

FE. Future Expectations

FE1. What trends do you anticipate in the energy efficiency practices of non-residential builders regarding new construction and renovations over the next five years?
[PROMPT IF NECESSARY: These could be trends related to sales volume, products, availability, price, types of retailers carrying particular products, regional differences, etc.]

1 Record Response: ______________________
97 Don't know
98 Refused

CC. Closing Comments

CC1. Do you have any other input regarding energy efficiency in new commercial and industrial building construction in Minnesota?

1 Record Response: ______________________
97 Don't know
98 Refused

Those are all the questions I have for you today. Thank you for your time.

C. Appendix C: HVAC Contractors Survey

XCEL ENERGY MARKET ACTOR SURVEY
HVAC CONTRACTORS

Contact Name: [from sample] ____
Company: [from sample] ____
City or Town: [from sample] ____
Address: [from sample] ____
City, State, Zip [from sample]____
Telephone: [from sample] ____
Fax Number: [from sample]____

LEAd-IN:

Hello, my name is _______ calling from KEMA on behalf of Xcel Energy. We are talking to HVAC contractors in Minnesota who sell or install products in commercial and/or industrial settings. I need to talk to a person at your firm who is familiar with your sales and installation of HVAC products. Who would that be?

Name: ______________________________

Title: ______________________________

Phone: ______________________________

[WHEN CORRECT PERSON]

We are talking to HVAC contractors in Minnesota to better understand the percentage of high efficiency systems sold and the factors that influence the sale of energy efficient equipment. Your input is very valuable and all the information you provide will be confidential. Your responses will only be provided to Xcel Energy after they have been aggregated with those of other contractors. The conversation will take about 15 minutes. As an incentive for your time and feedback, your company will be included in a drawing for the chance to win $1,000.

I'd like to confirm that your company performs HVAC contracting services?

If no - thank and terminate. Code as "does not qualify".

Is now a good time? **[IF YES, CONTINUE. IF NO:]** What would be a good time to talk?

RECORD APPOINTMENT DAY/DATE/TIME ______________________________

[IF REQUESTED]

For further questions about this survey, you can contact Jan Nelson at Xcel Energy at the following email address: **Jan.Nelson@xcelenergy.com**

SC. SCREENING

SC1. What is your job title?

1. HVAC Contractor
2. Other (Please describe: ___________________)

97. DK

98. Refused

SC2. How would you break down your business in Minnesota among the commercial and industrial sectors? Please provide your response in terms of the percentage of your business that is dedicated to each sector.

[NOTE THAT SC1a through SC1d SHOULD TOTAL 100%]

SC2a. Small Commercial Buildings (i.e., buildings < 10,000 sq. ft.)	____%
SC2b. Larger Commercial Buildings	____ %
SC2c. Industrial Buildings	____ %
SC2d. Other (e.g. Residential Homes)	____ %
[If Other] Please describe:_______________________________	
[DON'T KNOW]…………………………………………………………	997
[REFUSED]……………………………………………………………	998

[If SC2a+SC2b+SC2c is not >50% terminate survey]

SC3. What type of work do you perform from this location?

[READ LIST; ACCEPT MULTIPLE RESPONSES]

1. Heating and cooling equipment service
2. Heating and cooling equipment installation
3. Heating and cooling equipment distribution
4. Plumbing service
5. Plumbing installation
6. General construction/contracting services
7. Sheet metal/duct work fabrication
8. Electrical contracting

97. [DON'T KNOW]

98. [REFUSED]

GEN. GENERAL COMPANY INFORMATION

Next, I'd like to ask some general information about your company.

GEN1. How many full-time employees does your company employ at this location?

[An estimate is fine]

Enter #: ______ DK=997 R=998

GEN2. How were your annual sales different in the calendar year 2010 than from the past three years? Would you say annual sales were…?

1. Less in the three years preceding 2010
2. Greater in the three years preceding 2010
3. About the same in the 3 years preceding 2010

97. Don't know

98. Refused

GEN3a. About what percentage of your business revenues comes from the installation of natural gas fuelled space heating equipment at this location?

Enter %: _____ DK=997 R=998

GEN3b. About what percentage of your business revenues comes from the installation of space cooling equipment during at this location?

Enter %: _____ DK=997 R=998

GEN3c. About what percentage of your revenues from the installation of commercial and industrial HVAC equipment comes from new construction projects, as opposed to replacements and retrofits at this location?

Enter %: ______ DK=997 R=998

GEN4. Which of the following types of equipment did your company sell to or install for commercial and industrial customers in Minnesota over the past three years?

[READ LIST; Accept multiple answers]

1. Air-cooled chillers (Built up systems)
2. Water-cooled chillers (Built up systems)
3. Packaged systems (Unitary equipment) <11 Tons
4. Packaged systems (Unitary equipment) 11-20 Tons

5. Packaged systems (Unitary equipment) >20 Tons
6. Rooftop split systems
7. Packaged terminal air conditioners (PTAC units)
8. Air Source Heat Pumps
9. Ground Source Heat Pumps

EEC. ENERGY EFFICIENCY CRITERIA

EEC1. What criteria do you typically apply to the following types of HVAC equipment to designate them as energy-efficient for commercial and industrial applications?

[Probe for EER, COP, or kW per ton rating]

[DK=97; R=98]

EEC1a. Chillers (Built up systems)

[RECORD RESPONSE]: ____________________________

EEC1b. Packaged systems (Unitary equipment)

[RECORD RESPONSE]: ____________________________

EEC1c. Rooftop split systems

[RECORD RESPONSE]: ____________________________

EEC1d. Packaged Terminal Air Conditioners (PTAC)

[RECORD RESPONSE]: ____________________________

EEC1e. Air source heat pumps

[RECORD RESPONSE]: ___________________________

EEC1f. Ground source heat pumps

[RECORD RESPONSE]: ___________________________

EEC1g. Ductless mini-split systems

[RECORD RESPONSE]: ___________________________

C. Commercial and Industrial Heating

C1. What types of the following heating equipment or products does your company install from this location?

[READ LIST; RECORD ALL THAT APPLY]

1. Gas Furnaces
2. Gas Boilers
3. Gas Boiler/Indirect Water Heating Systems
4. Gas Steam Boilers
5. Radiant Heaters5
6. Condensing Unit Heater
7. Boiler Resets
8. Programmable Thermostats
9. Duct Sealing
10. Refrigeration heat recovery
97. [DON'T KNOW]
98. [REFUSED]

C2. For the following natural gas equipment types, what Annual Fuel Utilization Efficiency (AFUE) level do you consider to be energy-efficient for C&I applications?

Equipment Type	AFUE Rating
a. Natural Gas furnaces	Enter #: _____ DK=997 R=998
b. Gas Boilers	Enter #: _____ DK=997 R=998
c. Gas Boiler/Indirect Water Heating Systems Water Heating Systems	Enter #: _____ DK=997 R=998
d. Gas Steam Boilers	Enter #: _____ DK=997 R=998

C3. In the past three years, has the percentage of gas furnaces you installed with AFUE ratings of 90% above…

1. Increased
2. Decreased
3. Stayed about the same
97. Don't know
98. Refused

C4. [Ask if C3=1 or 2] What do you think has caused this change?

[Do not read, accept multiples]

1. Cost of Gas
2. Lower cost of equipment/new tech
3. Rebates/Deals from Manufacturer
4. Concern/Awareness of Saving Energy
5. Concern for Environment
6. New technologies give better performance
7. Better/More Advertising
8. Changes in building codes, other legal changes
9. Efficient equipment is too expensive
10. Lack of customer energy efficiency awareness
11. Other (Specify:_____________)
97. Don't know
98. Refused

EECI. ROLE OF Efficient equipment –

COMMERCIAL/INDUSTRIAL

REECI1. What are the reasons your company promotes energy efficient products?

[DO NOT READ LIST; RECORD ALL THAT APPLY]

1. Competitors are doing it
2. Increased revenue or margin
3. Customer satisfaction/retention
4. Efficient equipment is more durable
5. Better for the environment
6. Helps home become Energy Star Certified
7. Make use of incentives
8. Other (Specify: ___________________)
9. No reasons to promote energy efficiency products

97. Don't know
98. Refused

REECI2. Over the last three years, have energy efficient HVAC installations, relative to installations of standard HVAC technologies, for commercial and industrial applications increased, decreased, or stayed about the same?

1. Increased
2. Decreased
3. Stayed about the same
97. Don't know
98. Refused

REECI3. **[If REECI2=1 or 2]** What do you think has caused this change?

[Do not read, accept multiples]

1. Cost of Electricity/Gas
2. Lower cost of equipment/new tech
3. Rebates/Deals from Manufacturer
4. Concern/Awareness of Saving Energy
5. Concern for Environment
6. New technologies give better performance
7. Better/More Advertising
8. Changes in building codes, other legal changes
9. Efficient equipment is too expensive
10. Lack of customer energy efficiency awareness
11. Other (Specify:_____________)
97. Don't know
98. Refused

REECI4. How often do you recommend energy efficient types of equipment in commercial and industrial applications? Would you say it is …?

1. Always **[SKIP to REECI 5]**
2. Most of the time
3. Sometimes
4. Rarely
5. Never
97. Don't know **[SKIP to REECI5]**
98. Refused **[SKIP to REECI5]**

[ASK IF REECI4 = 2, 3, 4, or 5]

REECI4a. Under what circumstances would you **NOT** recommend energy efficiency types of equipment in commercial and industrial applications?

1 Record Response: _______________________
97 Don't know
98 Refused

REECI5. What kinds of objections to purchasing energy efficient HVAC products do you hear most frequently from commercial and industrial customers?

Cost too much 1
Economics are not sufficiently advantageous 2
Not as reliable as standard efficiency 3
Not aware of premium efficiency 4
Too much of a hassle…………………………………………………..5
Not interested in efficiency……………………………………………6
Other 1(Specify: ______________________________________).......... 7
No objections 9
Don't know 97
Refused 98

REECI6. What benefits do commercial and industrial customers see in purchasing energy efficiency HVAC products?

Lower energy costs 1
Better performance, longer life 2
Other 1(Specify: ______________________________________).......... 3
No benefits 5
Don't know 97
Refused 98

REECI7. What business advantages do you perceive in promoting energy efficient HVAC technologies in commercial and industrial applications?

1 Record Response: _______________________
2 No advantages
97 Don't know
98 Refused

REECI8. What business disadvantages do you perceive in promoting energy efficient HVAC technologies in commercial and industrial applications?

1 Record Response: ______________________
2 No disadvantages
97 Don't know
98 Refused

PPO. PROGRAM OFFERINGS

PPO1. What other incentive programs would you like to see offered by Xcel Energy for commercial and industrial HVAC equipment?

1 Record Response: ______________________
97 Don't know
98 Refused

PPO2. What program services do you think would be effective in helping your company promote high efficiency HVAC equipment to customers?
[READ LIST. RECORD ALL THAT APPLY]

1. Sales training for your staff
2. Technical training for your staff
3. Training for contractors
4. Financing
5. Information for customers
6. Accurate estimates of savings
7. Education for building owners
8. Education for architects/engineers
9. Utility Programs
10. Payback tools/analysis
11. Third Party verification of savings
12. Other ____________

97 [Don't know]

98 [Refused]

FE. Future Expectations

FE1. What trends do you anticipate in high efficiency HVAC products over the next five years? **[PROMPT IF NECESSARY: These could be trends related to sales volume, products, availability, price, types of retailers carrying particular products, regional differences, etc.]**

1 Record Response: ______________________
97 Don't know
98 Refused

Those are all the questions I have for you today. Thank you for your time.

D. Appendix D: Lighting Contractors Survey

XCEL ENERGY MARKET ACTOR SURVEY
LIGHTING CONTRACTORS

Contact Name: [from sample] ______________________________
Company: [from sample] ______________________________
City or Town: [from sample] ______________________________
Address: [from sample] ______________________________
City, State, Zip [from sample] ______________________________
Telephone: [from sample] ______________________________
Fax Number: [from sample] ______________________________

INTRO. Hello, my name is _______________ with KEMA, an energy consulting company. I am calling on behalf of Xcel Energy. Xcel Energy has asked us to help them better understand the commercial and industrial market for high-efficiency lighting in Minnesota. Could I speak to someone at your company that is knowledgeable about your lighting sales and installation?

[WHEN CORRECT PERSON]

This survey is extremely important to better understand the energy characteristics and customer energy efficiency attitudes within the commercial and industrial building market. Your input is very valuable and all information you provide will be confidential. Your responses will only be provided to Xcel Energy after they have been aggregated with those of other contractors. The conversation will take about 15 minutes. As an incentive for your time and feedback, your company will be included in a drawing for the chance to win $1,000.

Is now a good time?

1	Yes
2	No **(See if can reschedule appointment)**
97	Don't know **(See if can reschedule appointment)**
98	Refused **(Thank and Terminate Survey)**

[IF REQUESTED]

For further questions about this survey, you can contact Jan Nelson at Xcel Energy at the following email address: **Jan.Nelson@xcelenergy.com**

SC. SCREENING

SC1. Is commercial and industrial lighting a significant part of your business?

Yes 1
No 2
Don't Know 97
Refused 98

IF YES, THEN GO TO C1; ELSE IF NO or DK, THEN ASK SC2.

SC2. Does your company do more than $50,000 per year in business involving commercial and industrial lighting work?

Yes 1
No 2
Don't Know 97
Refused 98

IF SC2 = YES, THEN PROCEED. OTHERWISE THANK AND END SURVEY

CI. COMPANY INFORMATION

First I would like to get some background information about your company.

C1. What is your title or position with your firm?

Proprietor/CEO 1
Sales Manager 2
General Manager 3
Project Manager 4
Lighting Estimator 5
Other (Please describe:______________) 6
Don't know 97
Refused 98

C2. Which of the following best describes your firm?
[READ LIST. ACCEPT ONLY ONE.]

Electrical contractor 1
Lighting contractor 2
Other (Please describe:______________) …………………3
Don't know 97
Refused 98

C3. I'm going to read you a list of lighting services. Please tell me which ones your company offers?…

[Read list; ACCEPT MULTIPLE RESPONSES]

The sale and distribution of residential lighting equipment.................. 1
The sale and distribution of nonresidential lighting equipment............ 2
The design and specification of residential lighting 3
The design and specification of nonresidential lighting 4
The installation of residential lighting equipment................................ 5
The installation of nonresidential lighting equipment........................... 6
Contracted maintenance services for lighting………………… 7
Any other lighting services (Please describe:______________)……………. 8
Don't know.. 97
Refused 98

IF C3=2, 4 OR 6 PROCEED, OTHERWISE THANK AND END SURVEY

C4. How many locations does your firm have in Xcel Energy's service territory in Minnesota?
Enter #: _____ DK=97 R=98

C5. About how many full-time employees does your company employ at this location?
Enter #: _____ DK=997 R=998

C6. Roughly how many nonresidential lighting installation projects did your firm work on in the last 12 months in Minnesota?

[An estimate is fine]

Enter #: _____ DK=997 R=998

C7. Approximately, what share of your company's annual revenue is related to commercial and industrial lighting work in Minnesota?

ENTER PERCENTAGE: _____% DK=997 R=998

C8. Approximately what percentage of your company's non-residential lighting projects occurs in the following areas?

a. New construction ____%
b. Major renovation and remodeling projects equipment _____%
c. Other _____%

SHOULD SUM TO 100%

RECORD DK=997 R=998

C9. Approximately what percentages of your commercial and industrial lighting projects are done on ....

C9a. Office Settings _____%
C9b. Retail Settings _____%
C9c. Other commercial settings _____%
C9d. Industrial Settings _____%

SHOULD SUM TO 100%
RECORD DK=997 R=998

LS. LIGHTING SPECIFICATIONS AND STOCKING PRACTICES

Now I have a few questions about your lighting specification practices.

LS1. **[ASK ONLY IF C8_1>0]** For the lighting equipment you sell for NEW CONSTRUCTION projects, who would you say has significant influence in specification and placement of lighting equipment?

DO NOT READ. ACCEPT MULTIPLES. PROMPT IF NEEDED

Developer	1
Owner/Tenant	2
Architect	3
Electrical Engineer	4
Lighting Designer	5
General Contractor	6
Lighting/Electr Contractor	7
Lighting/Electr Distributor	8
Manufacturers	9
Other (Specify: ______________________________)	10
Don't know	97
Refused	98

LS2. **[ASK ONLY IF C8_2>0]** For the lighting equipment you sell for RENOVATION and REMODELING projects, who would you say has significant influence in specification and placement of lighting equipment?

DO NOT READ. ACCEPT MULTIPLES. PROMPT IF NEEDED.

Developer	1
Owner/Tenant	2
Architect	3
Electrical Engineer	4
Lighting Designer	5
General Contractor	6
Lighting/Electr Contractor	7
Lighting/Electr Distributor	8
Manufacturers	9
Other (Specify: ________________________________)	10
Don't know	97
Refused	98

HB. HIGH BAY LIGHTING INSTALLATION PRACTICES

HB1. Does your firm specify lighting for high-bay applications in Minnesota?

[IF NECESSARY, DEFINE HIGH BAY APPLICATIONS AS CEILING HEIGHT OF 15 FT OR MORE.]

3 Yes
4 No **[Skip to FL1]**
97 Don't know **[Skip to FL 1]**
98 Refused **[Skip to FL 1]**

HB2. When you are specifying lighting for high-bay applications in Minnesota, about what percentage of the time are you specifying the following technologies:

a. High-bay fluorescents	___%
b. Pulse-start metal halides	___%

c. Probe metal halides	___%
d. Other HID including high-pressure sodium and mercury vapor	____%
e. Other high bay lighting such as induction and LED (Please describe: _____________________________)	____%

SHOULD SUM TO 100%
DK=997 REF=998

HB3. Have these percentages changed from what you were specifying for high-bay applications three years ago?

1 Yes
2 No **[Skip to FL1]**
97 Don't know **[Skip to FL 1]**
98 Refused **[Skip to FL 1]**

HB4. What factors caused these changes in the types of lighting you were specifying for high bay applications?

1 Record Response: ______________________
97 Don't know
98 Refused

FL. FLUORESCENT LIGHTING INSTALLATION

FL1. Does your firm specify lighting for linear fluorescent lighting applications in Minnesota?

1 Yes
2 No **[Skip to LC1]**
97 Don't know **[Skip to LC1]**
98 Refused **[Skip to LC1]**

FL2. When you are specifying linear fluorescent lighting for applications in Minnesota, about what percent of the time are you specifying the following technologies:

a. High-performance T8s or Super T8s	___%
b. Standard T8s (32 watts)	___%
c. Low-watt T8s (25 or 28 watts)	___%
d. T5s	____%
e. T12s	____%
f. LEDs	____%
g. Other (Describe:________________________________)	____%

[SHOULD SUM TO 100%]
DK=997 REF=998

FL3. Have these percentages changed from what you were specifying for linear fluorescents three years ago?

1 Yes
2 No **[Skip to LC1]**
97 Don't know **[Skip to LC1]**
98 Refused **[Skip to LC1]**

FL4. What factors caused these differences in the types of lighting you were specifying for linear fluorescents?

1 Record Response: ______________________
97 Don't know
98 Refused

LC. LIGHTING CONTROLS

LC1. What percent of the projects your firm completed in the past three years included the following types of lighting controls…

Type of Lighting Control	**Enter %** **DK=997** **REF=998**
A. Simple on/off switches	%
B. Occupancy or motion sensors	%
C. Photo sensors	%
D. Time clocks	%
E. Building or energy management systems	%
F. Daylight controls	%
G. Other (Specify:_________) **if >0%**	%
H. None	%

LC2. Have these percentages changed from what you were specifying for lighting controls three years ago?

1 Yes
2 No **[Skip to CS1]**
97 Don't know **[Skip to CS1]**
98 Refused **[Skip to CS1]**

LC3. What factors caused these differences in the frequency with which you were specifying lighting controls?

1 Record Response: ______________________
97 Don't know
98 Refused

CS. CODES AND STANDARDS

CS1. Are you aware of Minnesota's building codes for lighting?

1 Yes
2 No **[Skip to CS4]**
97 Don't know **[Skip to CS4]**
98 Refused **[Skip to CS4]**

CS2. For the projects you completed in the past three years, did the Minnesota building codes influence your selection of lighting equipment?

1 Yes
2 No **[Skip to CS4]**
97 Don't know **[Skip to CS4]**
98 Refused **[Skip to CS4]**

CS3. Please rate the influence of these codes on your selection of lighting equipment using a scale of 1 to 5, where 1 indicates that the codes had "no influence on your selection" and 5 indicates that the codes "completely determined the type of lighting equipment you installed"?

1 Record Response: ______________________
97 Don't know
98 Refused

CS4. Are you aware of the upcoming lighting standards affecting incandescent bulbs and T12 lamps?

1 Yes
2 No **[Skip to AA1]**
97 Don't know **[Skip to AA1]**
98 Refused **[Skip to AA1]**

CS5. For the projects you completed in the past three years, did this lighting standard influence your selection of lighting equipment?

1 Yes
2 No **[Skip to AA1]**
97 Don't know **[Skip to AA1]**
98 Refused **[Skip to AA1]**

CS6. Please rate the influence of this standard on your selection of lighting equipment using a scale of 1 to 5, where 1 indicates that the codes had "no influence on your selection" and 5 indicates that the codes "completely determined the type of lighting equipment you installed"?

1 Record Response: ______________________

97 Don't know
98 Refused

AA. ATTITUDES AND AWARENESS

AA1. I'm going to name a number of characteristics about lighting equipment that customers might consider when selecting equipment. For each one, please rate how important it is for your nonresidential customers.
Please use a scale from 1 to 5 where 1 is very unimportant to 5 is very important.
DK=97 REF=98

a. Initial cost of the equipment…………………………………………_____

b. Costs of operation .... _____

c. Total life cycle costs .... _____

d. Quality of light... _____

e. Maintenance of lighting level .... _____

f. Ease of maintenance.. _____

AA2. How often have you recommended energy efficient lighting to your customers over the past three years?

6 Always
7 Most of the time
8 Sometimes
9 Rarely
10 Never
97 Don't know
98 Refused

AA3. **[If AA2 = 1, 2, 3, or 4]** Roughly what percent of your customers are aware of the options for energy-efficient lighting available to them before you provide recommendations about the lighting system?

[Enter percent] [0-100] ....……………………………____%
[Don't Know] 997
[Refused] 998

AA4. **[If AA2 = 1, 2, 3, or 4]** For customers who you recommend energy efficient lighting, do they generally accept your recommendations?

1	Yes
2	No
97	Don't know
98	Refused

AA5. **[IF AA4= No, DK or R]** What do you think is the main reason why customers do not follow recommendations in regard to installing energy efficiency lighting?

DO NOT READ. CODE AS FOLLOWS:

Cost is too high	1
Appearance of equipment	2
Quality of light	3
Difficulty in maintenance	4
Lack of information about performance	5
Difficulty of installation	6
Requires rewiring, remodeling, or other ancillary work	7
Other (Specify) ______________________________	8
Don't know	97
Refused	98

AA6. Are there certain kinds of projects or circumstances in which you are more likely to promote energy efficient lighting equipment to a customer?

1	Yes
2	No
97	Don't know
98	Refused

AA7. [**IF AA6 = YES, ASK AA7. ELSE SKIP TO AA8]** What types of projects are you most likely to recommend or promote energy-efficient lighting products?

DO NOT READ. ACCEPT MULTPLES. PROMPT IF NEEDED.

New construction or remodeling versus replacement	1

Owner occupied versus leased space	2
Larger buildings	3
Aesthetics not a priority	4
Public versus private sector	5
Program incentives available	6
Other (Specify)	7
Don't know	97
Refused	98

AA8. What do you think is the most important reason to promote energy efficient lighting equipment?

DO NOT READ. ACCEPT ONE RESPONSE ONLY.

Competitors are doing it	1
Increased revenue or margin	2
Customer satisfaction/retention	3
Efficient equipment is more durable	4
Better for the environment	5
Helps building become Energy Star Certified	6
Makes use of incentives	7
Other (Specify)	8
Don't know	97
Refused	98

AA8a. Are there other reasons?

DO NOT READ. ACCEPT MULTIPLE RESPONSES.

Competitors are doing it	1
Increased revenue or margin	2
Customer satisfaction/retention	3
Efficient equipment is more durable	4
Better for the environment	5
Helps building become Energy Star Certified	6
Makes use of incentives	7
Other (Specify)	8
Don't know	97
Refused	98

PP. PROGRAM PARTICIPATION

PP1. Are you aware of any Xcel Energy incentive programs for businesses to install energy efficient lighting?

Yes 1
No.. [GO TO PP7] 2
Don't Know.. [GO TO PP7] 97
Refused... [GO TO PP7] 98

PP2. Have you participated in lighting installation projects that received incentives from Xcel Energy?

Yes .... [GO TO PP4]1
No.. [GO TO PP3] 2
[Don't Know] .... [GO TO PP7] 97
[Refused] .... [GO TO PP7] 98

PP3. Why don't you participate in Xcel Energy programs that promote high efficiency lighting? **[DO NOT READ. ACCEPT MULTIPLES]**

[Didn't meet program requirements for contractor eligibility] 1
[My customers aren't interested in energy efficient lighting]........................ 2
[No / limited opportunities to install energy efficient lighting].................... 3
[Customers not willing to pay extra cost of energy efficient lighting] 4
[Other (RECORD VERBATIM)] .... ______________ 5
[Don't Know] 97
[Refused] 98

PP4. Do you have any suggestions for how Xcel Energy could improve their lighting programs to enable contractors such as yourself to participate in it in the future? What are your suggestions?

1 Record Response: ______________________
97 Don't know
98 Refused

PP5. On a scale of 1 to 5, where 1 is not at all important and 5 is very important, how important are the Xcel Energy programs in **<u>your firm's</u>** decisions about how heavily to promote energy-efficient lighting equipment?

[Enter number] [1-5] .... ______
[Don't Know] 97
[Refused] 98

PP6. On a scale of 1 to 5, where 1 is not at all influential and 5 is very influential, how much influence do you think Xcel Energy programs have on the **market share** of energy-efficient lighting technologies in your market area? That is, how much did the program influence your customers?

[Enter number] [1-5] .... ______
[Don't Know] 97
[Refused] 98

PP7. What is the minimum rebate dollar amount that you think a program would need to offer to get your non-residential customers to install higher efficiency lighting products in the following categories?

LIGHTING TYPE	**a.** **Enter $ Amount of Rebate** **DK=997** **R=998**	**b.** **[Skip if a = DK or R]** **About what % of the lighting equipment cost would be covered by that level of rebate?** **DK=997** **R=998**
1. Low-watt T8 lamps (25 or 28 watt)		
2. T-5 lamps & ballasts		
3. Hard-wired CFL Fixtures		
4. LED exit signs		
5. LED ENERGY STAR qualified lamps		
6. LED ENERGY STAR qualified luminaires		
7. Fluorescent fixtures as		

replacements for HID fixtures		
8. Replace older HID fixtures such as mercury vapor with more modern HID fixtures such as pulse start metal halide		
9. Occupancy controls – ceiling mount		

PP8. What specific program services do you think would be most effective in helping your company promote high efficiency lighting equipment to customers?

[DO NOT READ LIST. RECORD ALL THAT APPLY]

1. Sales training for your staff
2. Technical training for your staff
3. Training for contractors
4. Customer incentives (rebates) for equipment
5. Customer incentives for maintenance
6. Customer incentives for commissioning
7. Contractor incentives (rebates) for equipment
8. Contractor incentive for maintenance practices
9. Contractor incentives for commissioning
10. Distributor incentives (rebates) for equipment
11. Manufacturer incentives (rebates) for equipment
12. Financing
13. Information for customers
14. Accurate estimates of savings
15. Case studies
16. Education for building owners
17. Education for architects/engineers
18. Utility Programs
19. Calculation tools
20. Payback tools/analysis
21. Commissioning
22. Third Party verification of savings
23. Other ____________

FE. Future Expectations

FE1. What trends do you anticipate in high efficiency lighting products over the next five years? **[PROMPT IF NECESSARY: These could be trends related to sales volume, products, availability, price, types of retailers carrying particular products, regional differences, etc.]**

1 Record Response: ____________________

97 Don't know
98 Refused

Those are all the questions I have for you today. Thank you for your time.

E. Appendix E: Motor Distributors Survey

XCEL ENERGY MARKET ACTOR SURVEY

MOTOR/VARIABLE SPEED DRIVES VENDORS

Contact Name: [from sample] ____
Company: [from sample] ____
City or Town: [from sample] ____
Address: [from sample] ____
City, State, Zip [from sample] ____
Telephone: [from sample] ____
Fax Number: [from sample] ____

LEAD-IN:

Hi, my name is _______ calling from KEMA on behalf of Xcel Energy. We are talking to motor and variable speed drive distributors who sell electric motors to businesses and industry. I need to speak to a person at your firm who is familiar with your sales of motors and variable speed drive. Who would that be?

Name: ________________________________

Title: ________________________________

Phone: ________________________________

[WHEN CORRECT PERSON]

We are talking to motor distributors in Minnesota to better understand the percentage of high efficiency motors sold and factors that influence the sale of energy efficient equipment. Xcel Energy will use this information to develop energy efficiency programs for both distributors and end users. Your input is very valuable, and all information you provide will be confidential. Your responses will only be provided to Xcel Energy after they have been aggregated with those of other motor and variable speed drive distributors. The conversation will take about 15 minutes. As an incentive for your time and feedback, your company will be included in a drawing for the chance to win $1,000.

I'd like to confirm that your company sells motors and/or variable speed drives ?

If no – thank and terminate. Code as "does not qualify".

Is now a good time? **[IF YES, CONTINUE. IF NO:]** What would be a good time to talk?

RECORD APPOINTMENT DAY/DATE/TIME ___________________________________

[IF REQUESTED]

For further questions about this survey, you can contact Jan Nelson at Xcel Energy at the following email address: **Jan.Nelson@xcelenergy.com**

SC. SCREENING /FIRMOGRAPHICS

SC1. First, what is your job title?

Sales Manager 1
President/CEO.. 2
General Manager.. 3
Outside Sales Representative 4
Inside Sales Representative.. 5
Other(Specify)____________________ 6
[Don't Know] 97
[Refused] 98

SC2. Which of the following activities does your company pursue at this location?
[READ LIST. ACCEPT MULTIPLES]

Electric motor sales to end users 1
Electric motor installations... 2
Motor rewind and repair... 3
Sales of variable speed drives... 4
Sales of other kinds of electrical or mechanical equipment 5
Motor inventory services for facility owners... 6
Electric motor sales to motor dealers 7
[Don't Know] 97
[Refused] 98

SC3. Approximately what percentage of the motors that you sell do you have in stock at the time you sell them?

0 percent.. 1
1 – 50 percent.. 2
51 – 75 percent.. 3
76 – 99 percent.. 4
100 percent.. 5
[Don't Know] 97
[Refused] 98

SC4a. About what percentage of your Minnesota sales revenues came from sales of new electric motors?
[PROBE FOR APPROXIMATE]

ENTER PERCENT .... ____
[Don't Know] 997
[Refused] 998

SC4b. **[Ask if SC2=3]** About what percentage of your Minnesota sales revenues came from rewinding motors?
[PROBE FOR APPROXIMATE]

ENTER PERCENT .... ____
[Don't Know] 997
[Refused] 998

SC5. Approximately what percentage of these motors were...

sc5a. General purpose AC induction motors
ENTER PERCENT .... ____
[Don't Know] 997
[Refused] 998

sc5b. Definite or special purpose AC induction motors
ENTER PERCENT .... ____
[Don't Know] 997
[Refused] 998

sc5c. DC or other types of motors
ENTER PERCENT .... ____
[Don't Know] 997
[Refused] 998

SC6. Approximately what percentage of the motors you sell went to customers in Minnesota?
ENTER PERCENT .... ____
[Don't Know] 997
[Refused] 998

SC7. What percentage of these motors did you sell to the following markets?

Sc7a. Direct to facility owners and managers.. ____
[Don't Know] 997
[Refused] 998

Sc7b. To electrical and mechanical contractors .... ____
[Don't Know] 997
[Refused] 998

Sc7c. To Original Equipment Manufacturers .... ____
[Don't Know] 997
[Refused] 998

Sc7d. **[ASK ONLY IF SC2 = 5]** To motor dealers .... ____
[Don't Know] 997
[Refused] 998

SC8. Are you aware of the NEMA Premium motor efficiency standards?

Yes.. 1
No 2
[Don't Know] 97
[Refused] 98

IF SC8=1 THEN READ "NEMA PREMIUM MOTORS" WHENEVER IT APPEARS IN THE BELOW QUESTIONS; OTHERWISE READ "PREMIUM MOTORS" WHENEVER "NEMA PREMIUM MOTORS" APPEARS. ALL OCCURANCES OF NEMA PREMIUM MOTOTS HAVE BEEN HIGHLIGHTED IN YELLOW

SC9. Excluding sales to OEMs, what percentage of the **integral horsepower three-phase AC motors** you sell fall into the following horsepower categories?

[If needed: OEM stands for Original Equipment Manufacturer]

[Use the below DK and REF codes for SC9a-SC9f]
[Don't Know] 997
[Refused] 998

Question Number	HP Category	% in HP Category
SC9a	1 - 100 HP	
SC9b	Over 100 to 200 HP	
SC9c	Over 200 to 300HP	
SC9d	Over 300 to 400 HP	
SC9e	Over 400 to 500 HP	
SC9f	Over 500 HP	

SC10. **[ASK FOR EACH HORSEPOWER CATEGORY >0%in SC8].** What percentage of motors you sell in the [___ HP CATEGORY] are designated NEMA premium? **By premium, we mean motors from 1 to 200 horsepower that exceed current federal energy efficiency standards.**

[Use the below DK and REF codes for SC10a-Sc10f]
[Don't Know] 997
[Refused] 998

Question Number	HP Category	% NEMA Premium
Sc10a	1 - 100 HP	
Sc10b	Over 100 to 200 HP	
Sc10c	Over 200 to 300HP	
Sc10d	Over 300 to 400 HP	
Sc10e	Over 400 to 500 HP	
Sc10f	Over 500 HP	

TR. Trends in Motor Sales and Prices

TR1. Over the past three years, did the number of integral three-phase motors you sold increase, decrease or stay about the same?

Increased 1
Decreased 2
Stayed about the same.. 3
[Don't Know] 97
[Refused] 98

TR2. Over the past three years, did the share of NEMA premium motors you sold increase, decrease or stay about the same?

Increased 1
Decreased 2
Stayed about the same.. 3
[Don't Know] 97
[Refused] 98

[IF PERCENTAGE OF NEMA PREMIUM MOTORS INCREASED OR DECREASED ASK TR3, ELSE SKIP TO TR4.]

TR3. In your opinion, what are the most important factors contributing to that change?
DO NOT READ. ACCEPT MULTIPLE RESPONSES

Higher energy costs.. 1
Lower price difference between EPACT and premium motors 2
Greater awareness among customers 3
Greater availability of premium models 4
Fuller product line for premium efficiency.. 5
Promotion by manufacturers 6
Programs/promotion by Xcel Energy.. 7
Utility company programs 8
Downturn in the economy……………………………………………………..9
Other (Describe)____10
[Don't Know] 97
[Refused] 98

TR4. Have the wholesale prices of **standard efficiency motors** increased, decreased, or stayed about the same over the past three years?

Increased 1

Decreased 2
Stayed about the same.. 3
[Don't Know] 97
[Refused] 98

TR5. How about the wholesale prices of NEMA Premium motors?

Increased 1
Decreased 2
Stayed about the same.. 3
[Don't Know] 97
[Refused] 98

TR6. Has the wholesale price difference between NEMA Premium and standard motors of the same size and design increased, decreased, or stayed about the same over the past year?

Increased 1
Decreased 2
Stayed about the same.. 3
[Don't Know] 97
[Refused] 98

TR7. Generally, at what percentage of list price do you sell **standard efficiency motors** when sold individually?

ENTER PERCENTAGE... _____
[Don't Know] 997
[Refused] 998

TR8. How about when sold in volume?

ENTER PERCENTAGE... _____
[Don't Know] 997
[Refused] 998

TR9. At what percentage of list price do you sell NEMA premium motors when sold individually?

ENTER PERCENTAGE... _____
[Don't Know] 997
[Refused] 998

TR10. How about when sold in volume?

ENTER PERCENTAGE.. _____
[Don’t Know] 997
[Refused] 998

ST. Stocking

Now I'd like to ask you a few questions about your stocking practices for **general purpose 3-phase motors**.

ST1. Compared to 12 months ago, has the number of the integral horsepower three-phase motors in stock increased, decreased, or stayed about the same?

Increased 1
Decreased 2
Stayed about the same 3
[Don't Know] 97
[Refused] 98

ST2. Compared to 12 months ago, has the share of NEMA premium efficiency motors in your stock increased, decreased, or stayed about the same?

Increased 1
Decreased 2
Stayed about the same 3
[Don't Know] 97
[Refused] 98

ST3. Over the past 12 months, what percentage of your sales of standard efficiency 3-phase motors had to be custom ordered, as opposed to delivered from your own stock?

ENTER PERCENTAGE .... ________
[Don't Know] 997
[Refused] 998

ST4. What percentage of NEMA premium efficiency motors needed to be custom ordered?

ENTER PERCENTAGE .... ________
[Don't Know] 997
[Refused] 998

PO. Promotion of Premium Motors

PO1. How often does your sales staff inform customers of the availability of NEMA premium efficiency motors? Would you say it is...

In all sales situations 1
In most sales situations 2
In some sales situations 3
Never 4
[Don't Know] 97
[Refused] 98

PO2. Does your staff have tools such as MotorMaster or other references to support calculations of operating cost or life-cycle cost?

Yes... 1
No 2
[Don't Know] 97
[Refused] 98

PO3. Does your firm respond to bid requests?

Yes... 1
No 2
[Don't Know] 98
[Refused] 99

PO3a. **[If PO3=1]** When you submit bids for a quantity of motors, how often do you include bids for NEMA premium efficiency motors? Would you say it is in…

In all sales situations 1
In most sales situations 2
In some sales situations 3
Never 4
Only if customer requests it 5
[Don't Know] 97
[Refused] 98

IV. Sales of Integrated VSDs

IV1. Does your company sell motors with integrated variable speed drives?

Yes 1
No 2
[Don't Know] 97
[Refused] 98

IF IV1 = YES, ASK IV1a. ELSE SKIP TO VS1

IV1a. Approximately what percentage of the total number of VSDs you sell are integrated units (as opposed to units sold separately from the motor)?

ENTER PERCENT .... ____
[Don't Know] 997
[Refused] 998

IV2. Approximately what percentage of integrated units are sold to …

IV2a Electrical contractors.. __________
[Don't Know] 997
[Refused] 998

IV2b Facility owners .... __________
[Don't Know] 997
[Refused] 998

IV2c OEMs .... __________
[Don't Know] 997
[Refused] 998

IV2d Other kinds of contractors.. __________
[Don't Know] 997
[Refused] 998

IV3. What is the typical range of horsepower ratings for units with integrated VSDs?

IV3a ....ENTER LOWER HP MENTIONED ______________________
[Don't Know] 997
[Refused] 998

IV3b ....ENTER HIGHER HP MENTIONED ______________________
[Don't Know] 997
[Refused] 998

IV4. Approximately what percentage of total motor sales in this horsepower range do integrated units account for?

ENTER PERCENT .... ___________________
[Don't Know 997
[Refused] 998

IV5. Over the past three years, has this percentage increased, decreased or stayed about the same?

Increased 1
Decreased 2
Stayed about the same 3
[Don't Know] 97
[Refused] 98

IF IV5 = 1 OR 2, ASK IV5a. ELSE SKIP TO VS1

IV5a. What factors do you think contribute to this change in sales volume?

DO NOT READ. ACCEPT MULTIPLE RESPONSES

Reduced cost of units 1
Increased cost of units 2
Improved performance of units 3
Changes in manufacturing processes 4
Changes in OEM equipment 5
Effects of Xcel Energy programs 6
Effects of other energy efficiency programs 7
Other (specify) 8
[Don't Know] 97
[Refused] 98

VS. Sales of Non-Integrated VSDs

VS1. Does your company sell variable speed drives that are not integrated into motors?

Yes 1
No 2
[Don't Know] 97
[Refused] 98

IF VS1 = YES, ASK VS2. ELSE SKIP TO RW1

VS2. Approximately what percentage of non-integrated units are sold to …

VS2a Electrical contractors .... ____________
[Don't Know] 997
[Refused] 998

VS2b Facility owners .... ____________
[Don't Know] 997
[Refused] 998

VS2c OEM .... ____________
[Don't Know] 997
[Refused] 998

VS2d Other kinds of contractors .... ____________
[Don't Know] 997
[Refused] 998

VS3. What is the typical range of horsepower ratings for the non-integrated VSDs you sell?

VS3a ....ENTER LOWER HP MENTIONED ____________________________
[Don't Know] 997
[Refused] 998

VS3b ....ENTER HIGHER HP MENTIONED ____________________________
[Don't Know] 997
[Refused] 998

VS4. Approximately what percentage of total motor sales in this horsepower range do non-integrated units account for?

ENTER PERCENT .... ________________
[Don't Know 997
[Refused] 998

VS5. Over the past three years, has this percentage increased, decreased or stayed about the same?

Increased 1
Decreased 2
Stayed about the same 3
[Don't Know] 97
[Refused] 98

IF VS5 = 1 OR 2, ASK VS5a. ELSE SKIP TO RW1.

VS5a. What factors do you think contribute to this change in sales volume?
DO NOT READ. ACCEPT MULTIPLES

Reduced cost of units 1
Increased cost of units 2
Improved performance of units 3
Changes in manufacturing processes 4
Changes in OEM equipment 5
Effects of Xcel Energy programs 6
Effects of other energy efficiency programs 7
Other (specify) 8
[Don't Know] 97
[Refused] 98

RW. Rewind and Repair Business

IF SC2 =3 ASK RW1. ELSE SKIP TO PC1

RW1. When customers bring in motors for rewinding, do you ever suggest the purchase of a new motor instead?

Yes.. 1
No, never 2
[Don't Know] 97
[Refused] 98

IF RW1 = YES, ASK RW2; ELSE SKIP TO RW4.

RW2. Under what circumstances do you recommend purchasing a new motor versus rewinding?
[DO NOT READ. ACCEPT MULTIPLES.]

Motor falls below certain horsepower (Specify) ____________________ 1
Motor has been rewound before 2
Other repairs required 3
Motor is of a common design, base, mounting.. 4
Motor is used a certain number of hours per year.................................. 5
Other _________________________ 6
[Don't Know] 97
[Refused] 98

RW3. In approximately what percentage of cases do you recommend replacement instead of rewinding?

ENTER PERCENT. .... _________
[Don't Know] 997
[Refused] 998

RW4. Currently, what is the typical breakpoint horsepower level at which customers begin choosing repairs or rewinds over replacement?

ENTER BREAKPOINT HORSEPOWER... _____
[Don't Know] 997
[Refused] 998

RW5. Has this horsepower level gone up, down, or stayed about the same over the past three years?

Up 1
Down... 2
About the same 3
[Don't Know] 97
[Refused] 98

PC. Perceptions of Customer Demand

Now I'd like to ask you about your views on trends in customer demand for energy-efficient motors and related services.

PC1. What percentage of your customers have policies concerning the efficiency of the motors they buy?

ENTER PERCENT .... _____
[Don't Know] 997
[Refused] 998

PC2. Have you provided information or technical support to customers for developing motor purchase policies?

Yes.. 1
No 2
[Don't Know] 97
[Refused] 98

PC3. **[If PC1>0]** What percentage of customers with motor purchase policies specify NEMA premium efficiency motors for the applicable types and horsepower categories?

ENTER PERCENT .... _____
[Don't Know] 997
[Refused] 998

PC4. What percentage of your customers apply life-cycle costing principles to the purchase of electric motors?

ENTER PERCENT .... _____
[Don't Know] 997
[Refused] 998

B. Customer Motivations and Barriers

B1. I'm going to name a number of characteristics about motors/VSDs that customers might consider when choosing equipment. For each one I name, please rate how important this feature is for your nonresidential customers. Please use a scale from 1 to 5 where 1 is very unimportant and 5 is very important.

CODE 1 - 5, DON'T KNOW = 97 REFUSED = 98

B1a. Initial cost of the equipment... _____
B1b. Costs of operation... _____
B1c Total life cycle costs.. _____
B1d Quiet operation .... _____
B1e Life of equipment/system .... ______
B1f Ease of maintenance.. _____

B2. What kinds of objections to purchasing energy efficient motors/ VSD do you hear most frequently from your nonresidential customers?

Cost too much 1
Economics are not sufficiently advantageous.. 2
Not as reliable as standard efficiency 3
Not aware of premium efficiency.. 4
No Objections……………………………………………………………….5
Other (Specify: ________________________________) 6

[Don't Know] 97
[Refused] 98

B3. What percentage of your nonresidential customers are aware of the energy benefits of premium motors and/or VSDs?

[Can prompt by reading response options]

1-5% …………………………………………………………………….1
6-10% 2
11-25% 3
26-50%. 4
Over 50% ………………. 5
None 6

[Don't Know] 97
[Refused] 98

B4. What would be the single most effective way to increase the use of premium/ high-efficiency motors? **[READ ALL; PICK ONLY ONE]**

Increase customer education on their benefits 1
Provide a rebate on new purchases.. 2
Bundle them in/with packaged OEM systems 3
Provide a cash incentive to replace existing motors 4
Other (Specify: ______________________________________)..................5

[Don't Know] 97
[Refused] 98

PR. Response to Program

PR1. In terms of dollars per horsepower, what do you think is the minimum incentive needed to significantly increase the share of NEMA premium efficiency motors among those you sell?

ENTER DOLLAR AMOUNT .... ____
[Don't Know] 97
[Refused] 98

PR2. I am going to briefly describe a number of program approaches to promote NEMA premium efficiency motors and appropriate application of variable speed drives. After each description, please rate how effective you think the approach will be. Use a scale of 1 to 5, where 1 is 'very ineffective' and 5 is 'very effective'.

CODE 1 - 5, DON'T KNOW = 97 REFUSED = 98

PR2a Provide cash incentives to customers to purchase NEMA premium efficiency motors and VSDs.. ______
PR2b Provide cash incentives to dealers for sales of NEMA premium efficiency motors and VSDs` .... ______
PR2c Provide training to customers on the benefits and techniques of motor fleet management and purchase... ______
PR2d Provide training to dealers on the benefits and techniques of selling NEMA premium efficiency motors and VSDs.................................... ______
PR2e Provide analysis tools for comparing the net financial benefits of investments in energy efficiency measure versus other those from other kinds of investments.. ______

FE. Future Expectations

FE1. What trends do you anticipate in high efficiency motors and variable speed drives over the next five years?
[PROMPT IF NECESSARY: These could be trends related to sales volume, products, availability, price, types of retailers carrying particular products, regional differences, etc.]

1 Record Response: ______________________
97 Don't know
98 Refused

THANK YOU FOR YOUR TIME AND COOPERATION.

N. Appendix I: Benchmarking of Demand Response Potentials Report

Benchmarking of Demand Response Potentials – Final Report:

Adaptation of *FERC's NADR Model to Xcel Energy's Minnesota Service Territory*

Prepared for Xcel Energy

April 20, 2012

Experience you can trust.

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1. Executive Summary

KEMA developed estimates of demand response (DR) potential for the Xcel Energy's Minnesota service territory through 2021 using the Federal Energy Regulatory Commission's (FERC) National Assessment of Demand Response[1] (NADR) model with specific inputs for Xcel Energy's service territory. We present most of our results for 2020 to be consistent with the other components of the DSM potential analysis that this research is a component of. For the analysis, KEMA benchmarked three alternative DR program scenarios against DR savings as forecast by Xcel Energy from its current program efforts. The alternative scenarios, consistent with the FERC analysis, were developed by using the NADR model with specific inputs for Xcel Energy's service territory for customer characteristics and loads combined with NADR-model assumptions regarding customer response to the various DR initiatives. The values for the Xcel Energy system peak without DR were derived by adding Xcel Energy's known and projected DR savings to the appropriate system peak. Where possible, the inputs for the model were developed using information provided by Xcel Energy staff and from recent KEMA research for Xcel Energy.

This report includes the following components:

1. An overview of the model and input definitions;
2. A listing of the inputs used to assess the potential in Xcel Energy's territory; and
3. A summary of the results generated by the model under four different scenarios.

The model estimates impacts for four customer segments (residential and small, medium, and large nonresidential) and five DR program mechanisms (direct load control, interruptible rates, dynamic pricing with enabling technologies, dynamic pricing without enabling technologies, and other DR programs such as demand bidding and other aggregator offerings). It develops these estimates for four scenarios, business as usual (BAU), expanded business as usual (EBAU), achievable participation (AP), and full participation (FP) which are defined in the body of this report (see Section 3 – Model Overview).

Table 1 and Figure 1 below present a summary of the model outputs. The direct load control impacts are similar for all four scenarios, indicating that Xcel Energy's current BAU programs

[1] *A National Assessment of Demand Response Potential*, Staff Report, Federal Energy Regulatory Commission, prepared by The Brattle Group, Freeman, Sullivan & Co., and Global Energy Partners, LLC, June 2009.

are achieving a high level of impact for this delivery mechanism. Impacts for the interruptible rates delivery mechanism increase for the EBAU, AP, and FP scenarios above those shown in the BAU scenario. The EBAU scenario shows an expansion of potential for “Other” DR programs that mainly address the large commercial and industrial (C&I) customer segment. This “Other” category is influenced by regions that have Independent System Operator/Regional Transmission Organization (ISO/RTO) programs, which increases the standard upon which the EBAU scenario is based.

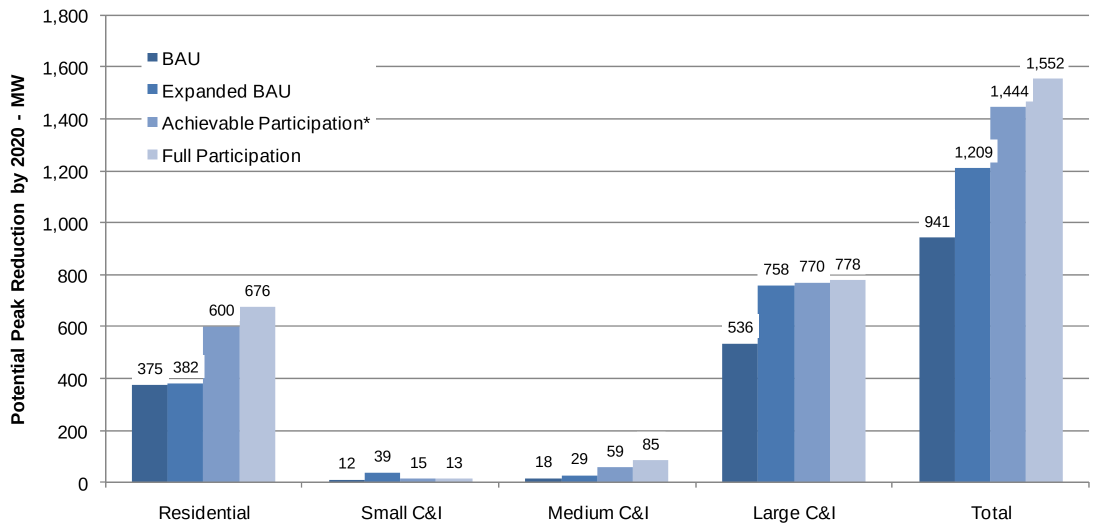
The AP and FP scenarios show increases over the BAU and EBAU scenarios that are mainly through the dynamic pricing mechanisms. These pricing potentials are modeled to be incremental to the direct load control and interruptible tariff potentials, as the latter two programs are assumed, in the FERC study, to continue through all scenarios as unchanged potential. However, we have some concern that potentials for the pricing mechanisms may overstate the incremental potential in the AP and FP scenarios. These pricing mechanisms target similar end uses as the direct load control and interruptible tariffs mechanisms (mainly HVAC for the direct load control and multiple end uses for large C&I interruptible tariffs), and these latter two mechanisms are already achieving high levels of participation and savings. We also note the assumption that direct load control and interruptible tariff potentials may not remain unchanged in the AP and FP scenarios, as assumed in the NADR analysis, but that some of these potentials may shift to the pricing programs if dynamic pricing is pursued by Xcel Energy. Potentials from Other DR programs decreases in the AP and FP scenarios as customers are assumed to move out of these programs into the pricing programs. The main sources of savings across all scenarios are the residential and large C&I segments.

Table 1 – Summary of Cumulative Demand Response Potential by Mechanism (2020), MW

DR Mechanism (MW)	BAU	EBAU	Achievable Participation*	Full Participation
Pricing with Technology	0	0	13	37
Pricing without Technology	0	11	304	422
Automated/Direct Load Control	438	465	440	438
Interruptible/Curtailable Tariffs	503	643	643	643
Other DR Programs	0	90	44	12
Total	941	1,209	1,444	1,552

Estimates developed using FERC NADR model, modified to reflect the Xcel Energy service territory customers and loads and the XCEL ENERGY business as usual program impacts. * Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.

Figure 1 – Summary of Cumulative Demand Response Potential by Sector (2020)



* Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.

There are significant barriers to achieving the DR potentials developed in this study, including but not limited to:

- Constraints on the number of AMI installations which are required for critical peak pricing, with the understanding that there are many other factors with more significant costs and benefits that influence the decision to install AMI, beyond DR; AMI is currently not widely deployed in Xcel Energy's Minnesota service territory, and installing an AMI system presents significant barriers in terms of total costs, timing of deployment and cost recovery;
- Regulatory barriers that include reluctance to adopt dramatically different pricing structures and reluctance to fund investments in AMI installations or in customer-side enabling technologies;
- Technology barriers such as the limitations on cost-effective enabling technologies; and,
- Customer barriers including: lack of awareness regarding DR, risk aversion to new technologies and pricing strategies, and perceived lack of ability to respond to DR events.

This analysis for Xcel Energy developed a theoretical estimate of the peak savings that might be achieved if all the assumptions, forecast inputs, and model design logic prove accurate over time. KEMA strongly recommends that the reviewers of this analysis keep the following caveats firmly in mind:

1. This analysis does not address the need for demand response programs in Xcel Energy's service territory. This can only be determined by a comprehensive review of forecasts regarding future load and economic conditions, demand response resources, existing and projected generation, transmission, and distribution capacities, and other attributes outside the scope of this study.
2. This analysis does not incorporate a full assessment of the costs and benefits of any course of action or scenario. The cost-effectiveness of direct load control technologies and enabling technologies for pricing programs was determined based on NADR model inputs for the state of Colorado and a high-level cost-effectiveness analysis[2]. Once the technologies were determined to be cost-effective, the NADR analysis just focused on the demand savings available from DR programs and did not quantify overall benefits and costs associated with those savings.
3. The analysis does not take into account directly-measured Xcel Energy customer acceptance of programs and enabling technologies, but rather uses the acceptance level and price elasticity assumptions developed for the NADR model.

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[2] A simple Total Resource Cost (TRC) Test was used to compare the lifetime benefits of the control technologies to the associated costs on a per customer basis. The analysis was not performed at the program level, and therefore the effects of incentives and participation rates are not included in the analysis. For dynamic pricing, it is assumed that AMI is already installed, and AMI costs are not included in the cost-effectiveness determination.

The NADR cost-effectiveness analysis looked at a 10-year time horizon. An avoided capacity cost of $75 per kW (based on the cost of a gas-fired combustion turbine generator) was used to develop benefits. This cost was escalated at a 3% inflation rate and discounted to present value using a 5% discount rate. Equipment costs, as noted in the following table, were utilized with an additional 15% adder to account for program costs. These costs were developed in the NADR study and are based on vendor estimates and utility program cost data for programs with similar demand response options. This study does not assess how these enabling technology and load control costs compare to Xcel Energy's costs.

Customer Type	Dynamic Pricing		Direct Load Control	
	Equipment	Unit Cost	Equipment	Unit Cost
Residential	PCT	$200	Switch	$200
Small C&I	PCT	$350	Switch	$350
Medium C&I	PCT	$1,050	Auto-DR	$1,050
Large C&I	Auto-DR	$13,500	N/A	N/A

PCT: programmable Communicating Thermostats
Auto-DR: automated demand response technologies for large customers

4. The model does not account for the demand response savings acquired by energy efficiency measures and programs that are not incorporated in the baseline conditions. With the adoption of emerging technologies, and ongoing utility and regulatory support of energy efficiency programs, it is likely that the load susceptible to peak reduction through demand response mechanisms is less than the model projects. For this reason, the results of the model runs are likely to overstate the savings that may be achieved from demand response mechanisms.
5. The model estimates are based on national benchmarked data and are not based on economic analysis using Xcel Energy's rates, industrial structure or costs to customers. These are significant factors that would need to be addressed when moving beyond this study to estimate economic or market potential.
6. Regulatory mechanisms are not in place to address the likely revenue losses associated with expanded demand response programs.

The primary uses of this benchmarking study include:

- Understanding the amount of DR potential that might be available, in addition to forecasted business-as-usual impacts, under varying program assumptions (some of which require a significant investment in AMI);
- Understanding how current Xcel Energy DR programs compare against high participation programs in the U.S. by comparing business-as-usual potentials against the estimates of the expanded business-as-usual scenario, which assumes participation rates equal to the 75th percentile of ranked participation rates of existing programs in the country; and
- Understanding which program mechanisms and customer segments provide the most significant sources of DR potential, if DR program expansion is ever required to meet system needs.

2. Introduction

KEMA developed an estimate of demand response (DR) potential for the Xcel Energy Minnesota service territory through 2021 using the Federal Energy Regulatory Commission's (FERC) National Assessment of Demand Response (NADR) model with specific inputs for Xcel Energy's service territory. For this analysis KEMA compared demand response savings as forecast by Xcel Energy from its current program efforts to three reference scenarios and to peak load absent DR through 2021. The reference scenarios were developed by using the Federal Energy Regulatory Commission's (FERC) National Assessment of Demand Response (NADR) model with specific inputs for Xcel Energy's service territory. The values for the system peak without DR were derived by adding Xcel Energy's known and projected DR savings to the appropriate system peak. Where possible, the inputs for the model were developed using information provided by Xcel Energy staff, and from recent KEMA research for Xcel Energy.

This report includes the following components:

1. An overview of the model and input definitions;
2. A listing of the inputs used to assess the potential in Xcel Energy's territory; and
3. A summary of the results generated by the model under four different scenarios.

3. Model Overview

FERC's NADR model is an Excel spreadsheet tool with default state-specific data that enables users to estimate and better understand demand response (DR) resources and potential under various scenarios. Model inputs can also be adjusted for aggregation at the utility or municipal level by the user.

While the model as distributed by FERC is populated with state-specific data, utility-specific data can be used for service territory scenario analysis. This section describes the customer classes, DR programs, and scenarios incorporated in the model.

Table 2 below identifies customer segments as defined in the NADR model.

Table 2 – Customer Segment Definition*

Customer Segment	Description
Residential	All residential customers
Small C&I	Commercial and Industrial customers with summer peak demand < 20 kW
Medium C&I	Commercial and Industrial customers with summer peak demand between 20 kW and 200 kW
Large C&I	Commercial and Industrial customers with summer peak demand > 200 kW

*Xcel Energy does not readily segment its commercial and industrial customers according to the NADR model definitions, so assumptions were made and analysis conducted in order to categorize Xcel Energy's customer information for inclusion in the NADR model.

The NADR model assesses savings from four basic types of DR programs:

1. Dynamic pricing with and without enabling technology[3];
2. Direct Load Control (DLC);
3. Interruptible tariffs; and,

[3] "Enabling technology" refers to devices that are capable of reducing consumption during peak demand or higher cost time periods. Examples of these devices include programmable communicating thermostats for air conditioning applications, typically used for residential applications, and automated demand response systems that respond to a signal to coordinate load reductions in multiple end-uses at commercial facilities.

4. Other DR programs likely administered by independent system operators (ISO) and regional transmission organizations (RTO (e.g., capacity/ demand bidding).

The NADR model estimates demand savings under four different participation scenarios, defined[4] as follows:

1. Business-as-usual (BAU): BAU assumes current programs and tariffs are held constant;
2. Expanded BAU (EBAU): EBAU assumes that: 1) the currently available mix of demand response programs is implemented in the study area with "best practices" participation levels[5]; 2) partial deployment of advanced metering infrastructure; and 3) the availability of dynamic pricing to customers, with a small number of customers (5 percent) choosing dynamic pricing. Note, areas with participation rates higher than the 75th percentile are assumed to remain at existing levels, rather than revert to the 75th percentile.
3. Achievable Participation (AP): AP assumes advanced metering infrastructure (AMI) is universally deployed, and dynamic pricing is the opt-out default tariff; and,
4. Full Participation (FP): FP assumes that dynamic pricing and the acceptance of enabling technology is mandatory. This scenario quantifies the maximum cost-effective DR potential, absent any regulatory and market barriers.

The BAU scenario has been calibrated to Xcel Energy's known and forecast program accomplishments and system peaks. The other three scenarios are generated by the model based on Xcel Energy specific inputs (e.g. customer populations and system load forecasts) and inputs derived incorporated in the NADR model by its creators, such as price elasticities. Each of these three scenarios is a theoretical and speculative estimate of the demand response savings that might be acquired under a very constrained, and artificial, set of conditions. As such, the scenarios are best used as reference points, not as goals.

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[4] Note that the scenario names are the same names utilized in the *National Assessment of Demand Response Potential* report.

[5] For purposes of this Assessment, "best practices" refers only to high rates of participation in demand response programs, not to a specific demand response goal nor the endorsement of a particular program design or implementation. The best practice participation rate is equal to the 75th percentile of ranked participation rates of existing programs of the same type and customer class. (ibid., page xi) In order to develop participation rates, program customer counts by program type and customer class were collected by state and divided by total state customer counts (by customer class). The 75th percentile participation was determined for each program type and customer class by looking at the participation rate for the 13th highest state (which defines the 75th percentile).

We note that the NADR model results should be qualified. As stated on page 18 of the 2009 NADR report:

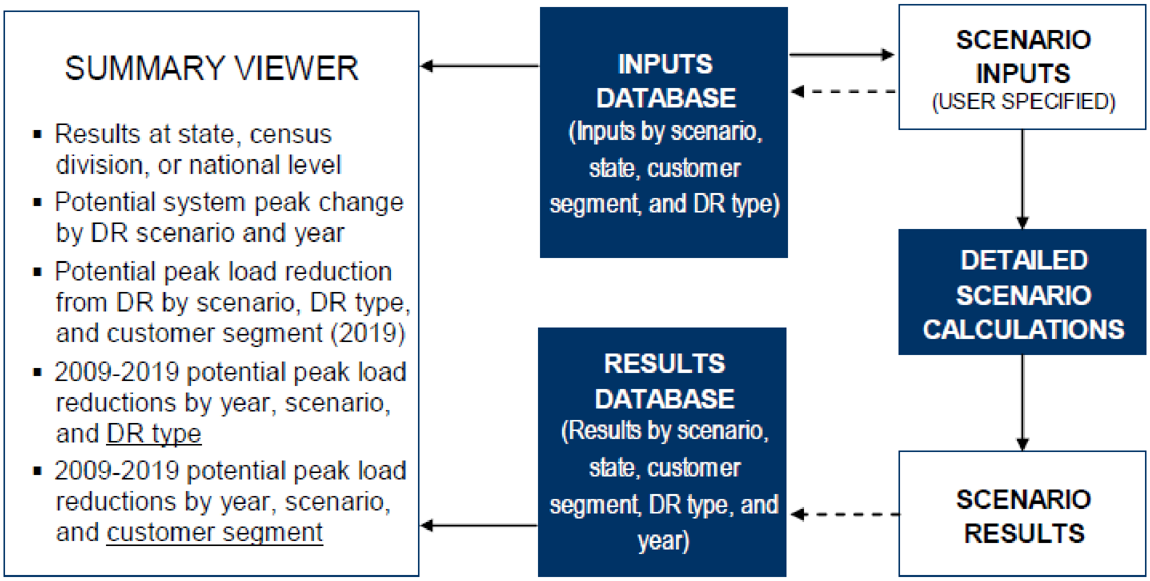
> "It is important to note that the results of the four scenarios are in fact estimates of potential, rather than projections of what is likely to occur. The numbers reported in this study should be interpreted as the amount of demand response that could potentially be achieved under a variety of assumptions about the types of programs pursued, market acceptance of the programs, and the overall cost-effectiveness of the programs. This report does not advocate what programs/measures should be adopted/implemented by regulators; it only sets forth estimates should certain things occur.
>
> As such, the estimates of potential in this report should not be interpreted as targets, goals, or requirements for individual states or utilities. However, by quantifying potential opportunities that exist in each state, these estimates can serve as a reference for understanding the various pathways for pursuing increased levels of demand response.
>
> As with any model-based analysis in economics, the estimates in this Assessment are subject to a number of uncertainties, most of them arising from limitations in the data that are used to estimate the model parameters. Demand response studies performed with accurate utility data have had error ranges of up to ten percent of the estimated response per participating customer. In this analysis, the use of largely publicly-available, secondary data sources makes it likely that the error range for any particular estimate in each of the scenarios studied is larger, perhaps as high as twenty percent."

3.1 How the NADR Model Works

The model architecture is shown in the figure below and is provided in the model guide.[6] Each box in the figure below is equal to one worksheet in the Excel workbook (model).

[6] Source: The Brattle Group, Freeman, Sullivan & Co. and Global Energy Partners, LLC. *National Demand Response Potential Model Guide*, online 06/09.

Figure 2 – Model Architecture



To develop DR potential estimates, users adjust scenario inputs through an interface that appears in the Scenario Inputs sheet of the model. Once fields are updated the user then clicks on a “button” or macro assigned graphic to run the model. After the model is run, results can be found in the Scenario Results sheet and are summarized in the Summary Viewer. The Summary Viewer is considered the end product of the model (incorporating more permanent state (or utility) data entered/ adjusted in the Inputs Database sheet and more temporary scenario inputs entered/ adjusted in the Scenario Inputs sheet).

The final inputs and results are stored in the Inputs Database sheet and Results Database sheet, respectively. A database format enables users to conduct analysis in database and statistical analysis software. For example, a comparison of inputs or outputs can be made in Excel by creating a pivot table and chart from either database.

3.2 Summary of Inputs

The NADR model imports default data which can be changed on a temporary or a more permanent basis. These inputs are identified below and appear as defined in the model guide.[7]

[7] Ibid.

3.2.1 Temporary Changes

Temporary changes refer to parameter changes that define the type of scenario to be run by the model and are useful for sensitivity or comparative analyses once the model is populated.

Parameters include:

1) State (or utility territory)
2) Type of Potential (scenarios):
    - Business As Usual (BAU)
    - Expanded BAU
    - Achievable Participation (AP), and
    - Full Participation (FP)
3) New Peak to Old Peak Price Ratio for all four customer types listed in Table 2.
4) Year the data is from.

3.2.2 Permanent Changes

For the purposes of this model, permanent changes are changes to the underlying data entered by the user, e.g. the Xcel Energy-specific data added to the model for this analysis. These changes appear are reflected on the scenario worksheets (BAU, EBAU, AP, and FP) and stored in the Inputs Database worksheet. To assure closest calibration of the model to Xcel Energy actual conditions, KEMA and Xcel Energy staff used 2011 data and set the beginning of the analysis horizon at 2011 as well. This approach allows the comparison of the model outputs to Xcel Energy actual accomplishments and does not require scaling or forecasting.

3.2.3 Definition of Inputs

Customer Population Inputs

Starting Customer Population – Number of accounts in each customer segment.

Annual Growth Rate – Annual growth rate in the number of accounts.

Annual Consumption Growth (Per Customer) – Growth in annual consumption per customer; this input is different than the growth in consumption for the customer segment as a whole in that it excludes growth associated with increases in the number of accounts.

Annual Critical Peak Load Growth (Per Customer) – Annual growth in critical peak load per customer; this input is different than the peak load growth for the customer segment as a whole in that it excludes growth associated with increases in the number of accounts.

Yearly System Peak and AMI Deployment Inputs

System Peak Forecast (MW) – This is the forecast summer system peak for each year.

Advanced Metering Infrastructure (AMI) Deployment – AMI deployment for each year for each customer segment. This is the share of accounts, by customer segment and year, expected to have meters capable of supporting dynamic pricing.

Average Participant Critical Day Load and Load Reductions Inputs

Critical Peak Avg. Hourly Load (kW) – This is an estimate of the average demand, by customer segment, for the 2-6pm period during the 15 highest system load days as described in Appendix D of FERC's National Assessment of Demand Response Potential.[8]

Customers on Dynamic Pricing without Enabling Technology (Percent Reduction) – This is the percent load reduction from customers on dynamic pricing *without* enabling technology.

Customers on Dynamic Pricing with Enabling Technology (Percent Reduction) – This is the percent load reduction from customers on dynamic pricing *with* enabling technology. Residential customers without air conditioning are not eligible for the default enabling technology.

Automated or Direct Load Control DR (kW Reduction) – This is the load reduction per participant in this type of program (kW/participant). If the available information is on a per device basis, multiply by the average number of AC units for the customer segment.

Interruptible Tariffs (Percent Reduction) – This is the load reduction per participant (kW/participant).

Other DR (Percent Reduction) – This is the expected percent load reduction per participant (kW/participant).

[8] FERC, prepared by The Brattle Group, Freeman, Sullivan & Co. and Global Energy Partners, LLC. *A National Assessment of Demand Response Potential*, online 2009.

Program Participation Inputs

Dynamic Pricing:

Max Percent Enrolled or Notified – Maximum percent of customers who enroll in dynamic pricing. The participation rate varies based on whether opt-in, as in the Achievable potential scenario, or op-out is assumed.

Rates Become Effective at (Percent AMI Penetration) – Determines whether a specific AMI deployment threshold needs to be met prior to offering dynamic pricing to customers.

Customers with Load Suitable for Enabling Technology (Percent) – For Residential, Small C&I and Medium C&I, this is central air conditioning (CAC) saturation. For Large C&I this is the share of customers with system configurations and load suitable for automated demand response systems.

Offered Technology (Percent of Eligible) – Percent of eligible customers where the enabling technology is cost-effective. This affects the share of customers that are offered enabling technology (at no cost to the customer) in conjunction with dynamic pricing.

Accept Technology (Percent) – Used for Achievable – This affects the share of customers that are expected to accept enabling technology if offered to them at no cost. Default estimates are based on enabling technology acceptance observed in pricing pilots.

Automated or Direct Load Control DR (Air conditioning related):

Current Market Penetration (Percent of Eligible Customers) – Current participation rate by customer segment where eligibility is defined as possessing load suitable for enabling technology..

Max Market Penetration (Percent of Eligible Customers) – Program saturation potential among eligible customers by customer segment.

Years Required to Achieve Max Penetration – This determines how quickly the program moves from current participation to max penetration.

Interruptible Tariffs:

Current Penetration (Percent of Customers in Segment) – The current share of customers in the segment that are participating in interruptible tariffs programs.

Current Penetration (Percent of MW in Segment) – The load of current participants as a percent of the total segment load.

Max Penetration (Percent of Customers in Segment) – The participation defined as the maximum share of customers in the segment that would participate.

Max Penetration (Percent of MW in Segment) – The maximum participation defined as the participant load as a percent of the total segment load.

Other DR Programs:

Current Penetration (Percent of Customers in Segment) – The current share in the segment that are participating in other programs.

Current Penetration (Percent of MW in Segment) – The current participants as a percent of the total segment load.

Max Penetration (Percent of Customers in Segment) – Estimate of the participation potential defined as the maximum share of customers in the segment that would participate.

Max Penetration (Percent of MW in Segment) – Estimate of the maximum participation defined as the share of load as a percent of the total load segment load.

4. Xcel Energy Minnesota Inputs

This section documents the model input adjustments that were made so that the DR potential estimates better reflect Xcel Energy's Minnesota service territory and not just default state values. Issues (if any) are also identified in this section.

4.1 Customer Population Inputs

The numbers in the below table were used for each scenario run and were derived using Xcel Energy provided data.

Table 3 – Customer Population Inputs

		Commercial & Industrial		
CUSTOMER POPULATION INPUTS	Residential	Small	Medium	Large
Starting Customer Population	1,101,721	109,478	16,830	3,118
Population Growth Rate	0.93%	0.93%	0.93%	0.93%
Annual Consumption Growth (per customer)	0.01%	-0.35%	-0.35%	-0.35%
Annual Critical Peak Load Growth (per customer)	-0.14%	-0.14%	-0.14%	-0.14%

4.2 Yearly System Peak and AMI Deployments Inputs

System peak values for 2011 through 2021 were developed through an iterative process based on existing Xcel Energy load forecasts. The table below shows both the actual, or BAU peaks and the calculated peaks in the absence of any demand response savings.

Table 4 – System Peak w/ and w/o Base DR

SYSTEM PEAKS (MW)		
YEAR	No DR	Actual (BAU)
2011	7,181	6,325
2012	7,276	6,403
2013	7,360	6,477
2014	7,452	6,558
2015	7,527	6,622
2016	7,596	6,683
2017	7,627	6,707
2018	7,663	6,735
2019	7,696	6,761
2020	7,739	6,797
2021	7,786	6,837

Actual peak demand forecast based on Xcel Energy March 2011 forecast.

Model inputs for the AMI metering penetration for the BAU scenario are based on Xcel Energy's projections. For the other scenarios, we utilized the NADR model defaults, but delayed these default penetrations by two years to provide a somewhat more realistic AMI deployment schedule for the Xcel Energy service territory. AMI penetrations are shown in the following tables by scenario for each sector.

Table 5 – AMI Penetration Inputs - Residential

YEAR	SECTOR - RESIDENTIAL			
	BAU	EBAU	AP	FP
2011	0%	0%	0%	0%
2012	0%	1%	1%	1%
2013	0%	1%	1%	1%
2014	0%	9%	13%	13%
2015	0%	18%	25%	25%
2016	0%	27%	40%	40%
2017	0%	36%	55%	55%
2018	0%	38%	62%	62%
2019	0%	41%	75%	75%
2020	0%	44%	87%	87%
2021	0%	46%	100%	100%

Table 6 – AMI Penetration Inputs – Small C&I

YEAR	SECTOR - SMALL C&I			
	BAU	EBAU	AP	FP
2011	0%	0%	0%	0%
2012	0%	1%	1%	1%
2013	0%	1%	1%	1%
2014	0%	9%	13%	13%
2015	0%	18%	25%	25%
2016	0%	27%	40%	40%
2017	0%	36%	55%	55%
2018	0%	38%	62%	62%
2019	0%	41%	75%	75%
2020	0%	44%	87%	87%
2021	0%	46%	100%	100%

Table 7 – AMI Penetration Inputs – Medium C&I

YEAR	SECTOR - MEDIUM C&I			
	BAU	EBAU	AP	FP
2011	0%	0%	0%	0%
2012	0%	1%	1%	1%
2013	0%	1%	1%	1%
2014	0%	9%	13%	13%
2015	0%	18%	25%	25%
2016	0%	27%	40%	40%
2017	0%	36%	55%	55%
2018	0%	38%	62%	62%
2019	0%	41%	75%	75%
2020	0%	44%	87%	87%
2021	0%	46%	100%	100%

Table 8 – AMI Penetration Inputs – Large C&I

YEAR	SECTOR - LARGE C&I			
	BAU	EBAU	AP	FP
2011	0%	0%	0%	0%
2012	0%	1%	1%	1%
2013	0%	1%	1%	1%
2014	0%	9%	13%	13%
2015	0%	18%	25%	25%
2016	0%	27%	40%	40%
2017	0%	36%	55%	55%
2018	0%	38%	62%	62%
2019	0%	41%	75%	75%
2020	0%	44%	87%	87%
2021	0%	46%	100%	100%

4.3 Average Participant Critical Day Load and Load Reduction Inputs

The critical peak average hourly load (kW) for C&I customers was calculated using billing data provided by Xcel Energy (2.06 kW for Small C&I, 31.08 for Medium C&I, and 1621.95 for Large C&I). BAU, Expanded BAU, Achievable Participation and Full Participation data inputs for average participant critical day load and load reduction can be seen in the tables below.

Table 9 – Average Critical Peaks and Load Reductions

AVERAGE PARTICIPANT CRITICAL DAY LOAD AND LOAD REDUCTIONS	Residential w/o Central AC	Residential w/ Central AC	Commercial & Industrial		
			Small	Medium	Large
Critical peak avg. hourly load (kW)	0.92	1.96	2.06	31.08	621.95
Customers on dynamic pricing without enabling tech (% reduction)					
BAU	8.5%	19.3%	0.7%	8.7%	7.5%
EBAU	8.5%	19.3%	0.7%	8.7%	7.5%
Achievable	8.5%	19.3%	0.7%	8.7%	7.5%
Full Participation	8.5%	19.3%	0.7%	8.7%	7.5%
Customers on dynamic pricing with enabling tech (% reduction)					
BAU	DNA	33.8%	14.9%	13.9%	13.9%
EBAU	DNA	33.8%	14.9%	13.9%	13.9%
Achievable	DNA	33.8%	14.9%	13.9%	13.9%
Full Participation	DNA	33.8%	14.9%	13.9%	13.9%
Automated or Direct Load Control DR (kW reduction)					
BAU	DNA	0.84	1.02	2.67	9.27
EBAU	DNA	1.01	2.03	6.08	30.40
Achievable	DNA	1.01	2.03	6.08	30.40
Full Participation	DNA	1.01	2.03	6.08	30.40
Interruptible Tariffs - (% reduction)					
BAU	0.0%	0.0%	0.0%	0.0%	69.24%
EBAU	0.0%	0.0%	0.0%	100.0%	100.0%
Achievable	0.0%	0.0%	0.0%	100.0%	100.0%
Full Participation	0.0%	0.0%	0.0%	100.0%	100.0%
Other DR (% reduction)					
BAU	0.0%	0.0%	0.0%	0.0%	0.0%
EBAU	0.0%	0.0%	0.0%	100.0%	20.3%
Achievable	0.0%	0.0%	0.0%	100.0%	20.3%
Full Participation	0.0%	0.0%	0.0%	100.0%	20.3%

Notes: DNA = Does not apply.

4.4 Program Participation Inputs

The tables below show the program participation inputs for each of the demand response mechanisms by scenario (BAU, Expanded BAU, Achievable Potential and Full Potential). As mentioned above, where possible, data from Xcel Energy provided documents were used.

Table 10 – Dynamic Pricing Inputs

Program Participation Input - Dynamic Pricing	Residential	Commercial & Industrial		
		Small	Medium	Large
Max Percent Enrolled or Notified				
BAU	0.0%	0.0%	0.0%	0.0%
EBAU	5.0%	5.0%	5.0%	5.0%
Achievable	75.0%	75.0%	60.0%	60.0%
Full Participation	100.0%	100.0%	100.0%	100.0%
Rates become effective at (% AMI penetration)				
BAU	0.0%	0.0%	0.0%	0.0%
EBAU	0.0%	0.0%	0.0%	0.0%
Achievable	0.0%	0.0%	0.0%	0.0%
Full Participation	0.0%	0.0%	0.0%	0.0%
Customers with load suitable for enabling technology (%)				
BAU	59.3%	54.7%	54.7%	40.0%
EBAU	59.3%	54.7%	54.7%	40.0%
Achievable	59.3%	54.7%	54.7%	40.0%
Full Participation	59.3%	54.7%	54.7%	40.0%
Offered technology (% of eligible)				
BAU	0.0%	0.0%	0.0%	0.0%
EBAU	0.0%	0.0%	0.0%	0.0%
Achievable	0.0%	0.0%	95.0%	0.0%
Full Participation	0.0%	0.0%	100.0%	0.0%
Accept technology (%) - used for achievable				
BAU	60.0%	60.0%	60.0%	60.0%
EBAU	0.0%	0.0%	0.0%	0.0%
Achievable	60.0%	60.0%	60.0%	60.0%
Full Participation	100.0%	100.0%	100.0%	100.0%

Table 11 – Automated or Direct Load Control Inputs

Program Participation Input - Automated or DLC	Residential	Commercial & Industrial		
		Small	Medium	Large
Current Market Penetration (% of eligible customers)				
BAU	55.4%	17.3%	32.0%	54.3%
EBAU	33.7%	0.0%	0.0%	0.0%
Achievable	33.7%	29.9%	0.0%	0.0%
Full Participation	33.7%	0.0%	0.0%	0.0%
Max Market Penetration (% of eligible customers)				
BAU	63.2%	21.6%	40.1%	68.0%
EBAU	33.7%	29.9%	7.2%	0.0%
Achievable	33.7%	29.9%	7.2%	0.0%
Full Participation	33.7%	29.9%	7.2%	0.0%
Years required to achieve max penetration				
BAU	10	5	5	5
EBAU	5	5	5	5
Achievable	5	5	5	5
Full Participation	5	5	5	5

Table 12 – Interruptible Tariffs Inputs

Program Participation Input - Interruptible Tarriffs	Residential	Commercial & Industrial		
		Small	Medium	Large
Current Penetration (% of customers in segment)				
BAU	0.0%	0.0%	5.7%	23.5%
EBAU	0.0%	0.0%	1.3%	26.8%
Achievable	0.0%	0.0%	1.3%	26.8%
Full Participation	0.0%	0.0%	1.3%	26.8%
Current Penetration (% of MW in segment)				
BAU	0.0%	0.0%	0.0%	26.0%
EBAU	0.0%	0.0%	0.9%	30.1%
Achievable	0.0%	0.0%	0.9%	30.1%
Full Participation	0.0%	0.0%	0.9%	30.1%
Max Penetration (% of customers in segment)				
BAU	0.0%	0.0%	5.7%	23.5%
EBAU	0.0%	0.0%	1.3%	26.8%
Achievable	0.0%	0.0%	1.3%	26.8%
Full Participation	0.0%	0.0%	1.3%	26.8%
Max Penetration (% of MW in segment)				
BAU	0.0%	0.0%	0.0%	26.0%
EBAU	0.0%	0.0%	1.7%	30.1%
Achievable	0.0%	0.0%	1.7%	30.1%
Full Participation	0.0%	0.0%	1.7%	30.1%
Years required to achieve max penetration				
BAU	1	1	1	1
EBAU	5	5	5	5
Achievable	5	5	5	5
Full Participation	5	5	5	5

Table 13 – Other DR Program Inputs

Program Participation Input - Other DR Programs	Residential	Commercial & Industrial		
		Small	Medium	Large
Current Penetration (% of customers in segment)				
BAU	0.0%	0.0%	0.0%	0.0%
EBAU	0.0%	0.0%	0.0%	1.9%
Achievable	0.0%	0.0%	0.0%	1.9%
Full Participation	0.0%	0.0%	0.0%	1.9%
Current Penetration (% of MW in segment)				
BAU	0.0%	0.0%	0.0%	0.0%
EBAU	0.0%	0.0%	0.0%	29.2%
Achievable	0.0%	0.0%	0.0%	29.2%
Full Participation	0.0%	0.0%	0.0%	29.2%
Max Penetration (% of customers in segment)				
BAU	0.0%	0.0%	0.0%	0.0%
EBAU	0.0%	0.0%	0.1%	18.9%
Achievable	0.0%	0.0%	0.1%	18.9%
Full Participation	0.0%	0.0%	0.1%	18.9%
Max Penetration (% of MW in segment)				
BAU	0.0%	0.0%	0.0%	0.0%
EBAU	0.0%	0.0%	0.0%	29.2%
Achievable	0.0%	0.0%	0.0%	29.2%
Full Participation	0.0%	0.0%	0.0%	29.2%
Years required to achieve max penetration				
BAU	5	5	5	5
EBAU	5	5	5	5
Achievable	5	5	5	5
Full Participation	5	5	5	5

5. Xcel Energy Minnesota Outputs

5.1 Reduction Overview

The NADR model was run with the data inputs described in the previous sections for the years 2011 through 2021. The Table 14 below shows a summary of demand reduction by scenario in both megawatts and percentage of peak demand reduced. Figure 3 graphically displays the impact of the savings on peak demand over time.

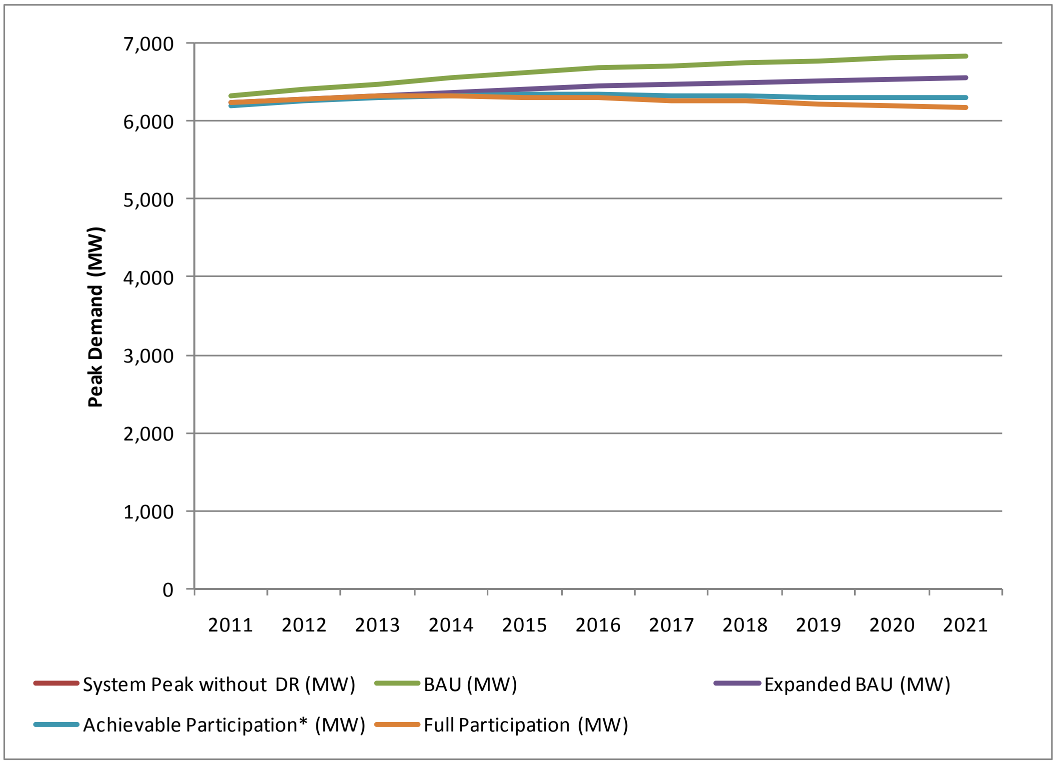
Under the BAU scenario, the model predicts a reduction of 12.2% in peak demand by the year 2021. The Expanded BAU scenario predicts that peak demand savings will be 15.7% when participation in Xcel Energy's service territory is modeled at 75th percentile penetration rates. Under the Achievable Participation and Full Participation scenarios the model predicts peak demand reduction of 19.2% and 20.9% for the year 2021, respectively.

Table 14 – Summary Results by Year and Scenario - MW

Year	System Peak without DR (MW)	BAU (MW)	% Reduction	Expanded BAU (MW)	% Reduction	Achievable Participation* (MW)	% Reduction	Full Participation (MW)	% Reduction
2011	7,181	6,325	11.9%	6,227	13.3%	6,199	13.7%	6,226	13.3%
2012	7,276	6,403	12.0%	6,284	13.6%	6,255	14.0%	6,281	13.7%
2013	7,360	6,477	12.0%	6,327	14.0%	6,299	14.4%	6,323	14.1%
2014	7,452	6,558	12.0%	6,366	14.6%	6,320	15.2%	6,315	15.3%
2015	7,527	6,622	12.0%	6,402	15.0%	6,334	15.9%	6,308	16.2%
2016	7,596	6,683	12.0%	6,448	15.1%	6,345	16.5%	6,300	17.1%
2017	7,627	6,707	12.1%	6,462	15.3%	6,320	17.1%	6,259	17.9%
2018	7,663	6,735	12.1%	6,483	15.4%	6,320	17.5%	6,249	18.4%
2019	7,696	6,761	12.1%	6,502	15.5%	6,303	18.1%	6,215	19.2%
2020	7,739	6,797	12.2%	6,530	15.6%	6,295	18.7%	6,187	20.1%
2021	7,786	6,837	12.2%	6,562	15.7%	6,288	19.2%	6,161	20.9%

BAU peak demand forecast based on Xcel Energy's March 2011 forecast release. * Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.

Figure 3 – Summary Results Graph – MW



BAU peak demand forecast based on Xcel Energy March 2011 forecast release. * Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.

5.2 Reduction by Mechanism

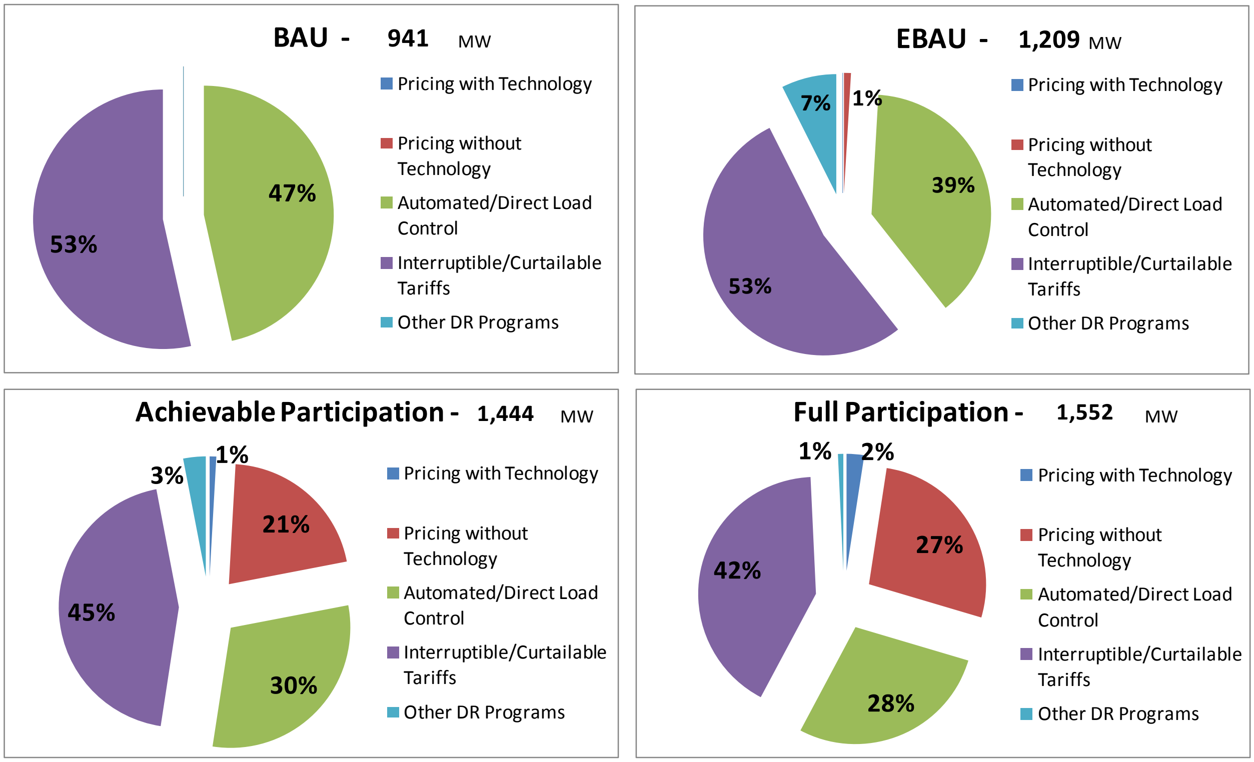
As shown in Table 15 and Figure 4 the direct load control and interruptible tariffs mechanisms provide a steady source of potentials in all scenarios throughout the study period. “Other” DR potential is zero in the BAU scenario, increases steadily in the EBAU scenario, and first increases and then declines in the AP and FP scenarios as potential savings are assumed to move toward the pricing mechanisms in the latter years. Potentials for critical peak pricing for both the AP and FP scenarios increase steadily throughout the forecast period as AMI deployment is assumed to begin penetrating the service territory. The pricing scenarios account for about 24 percent of the DR potentials in the AP scenario, growing to about 33 percent of the potentials in the FP scenario. These scenarios assume that AMI is fully deployed and price elasticities utilized in the NADR model are reflective of future customer response. Pricing with enabling technologies only accounts for a small share of overall critical peak pricing potentials because, under the NADR study assumption, enabling technologies were only cost effective for the medium C&I customer segment.

Table 15 – Reductions by Mechanism by Year (MW)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
BAU											
Pricing With Enabling Technology	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pricing Without Enabling Technology	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Automated or Direct Control DR	353.0	369.0	380.0	391.0	402.0	410.0	417.0	424.0	431.0	438.0	445.0
Interruptible Tariffs	503.4	503.4	503.4	503.4	503.4	503.4	503.4	503.4	503.4	503.4	503.4
Other DR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	856.4	872.4	883.4	894.4	905.4	913.4	920.4	927.4	934.4	941.4	948.4
Expanded BAU											
Pricing With Enabling Technology	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pricing Without Enabling Technology	0.1	0.2	0.2	2.2	4.3	6.6	8.9	9.6	10.3	11.1	11.9
Automated or Direct Control DR	353.0	369.0	381.5	405.1	424.6	435.2	442.8	450.1	457.4	464.7	472.0
Interruptible Tariffs	592.2	597.7	603.2	608.8	614.4	620.1	625.9	631.7	637.5	643.4	649.4
Other DR	8.6	24.7	48.7	70.2	82.1	86.3	87.4	88.2	88.9	89.6	90.4
TOTAL	953.8	991.5	1,033.6	1,086.3	1,125.4	1,148.2	1,164.9	1,179.6	1,194.2	1,208.9	1,223.6
Achievable Participation											
Pricing With Enabling Technology	0.0	0.1	0.1	1.8	3.5	5.6	7.8	8.9	10.8	12.8	14.7
Pricing Without Enabling Technology	1.1	2.2	3.4	43.4	84.2	134.3	185.4	212.9	258.3	304.4	351.4
Automated or Direct Control DR	380.1	395.8	406.3	413.5	420.8	424.7	427.7	432.7	436.2	439.7	445.0
Interruptible Tariffs	592.2	597.7	603.2	608.8	614.4	620.1	625.9	631.7	637.5	643.4	649.4
Other DR	8.5	24.6	48.4	64.9	70.2	66.4	59.8	56.3	50.0	43.6	37.0
TOTAL	982.0	1,020.4	1,061.4	1,132.4	1,193.2	1,251.2	1,306.6	1,342.6	1,392.9	1,443.9	1,497.6
Full Participation Potential											
Pricing With Enabling Technology	0.1	0.3	0.4	5.3	10.3	16.5	22.8	26.1	31.7	37.4	43.1
Pricing Without Enabling Technology	1.5	3.1	4.7	60.2	116.6	186.1	256.9	295.1	357.9	421.8	487.0
Automated or Direct Control DR	353.0	369.0	381.4	401.9	416.1	420.7	422.4	426.7	431.0	438.0	445.0
Interruptible Tariffs	592.2	597.7	603.2	608.8	614.4	620.1	625.9	631.7	637.5	643.4	649.4
Other DR	8.5	24.5	48.2	61.2	61.8	52.4	40.3	33.9	22.8	11.5	0.0
TOTAL	955.4	994.6	1,037.8	1,137.3	1,219.4	1,295.8	1,368.3	1,413.5	1,480.9	1,552.2	1,624.5

Large savings potential for pricing mechanisms in the Achievable and Full Participation scenarios are dependent on extensive AMI deployment and price elasticities contained in the NADR model. * Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.

Figure 4 – Cumulative Reduction by Mechanism - 2020



* Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.

5.3 Reduction by Customer Segment

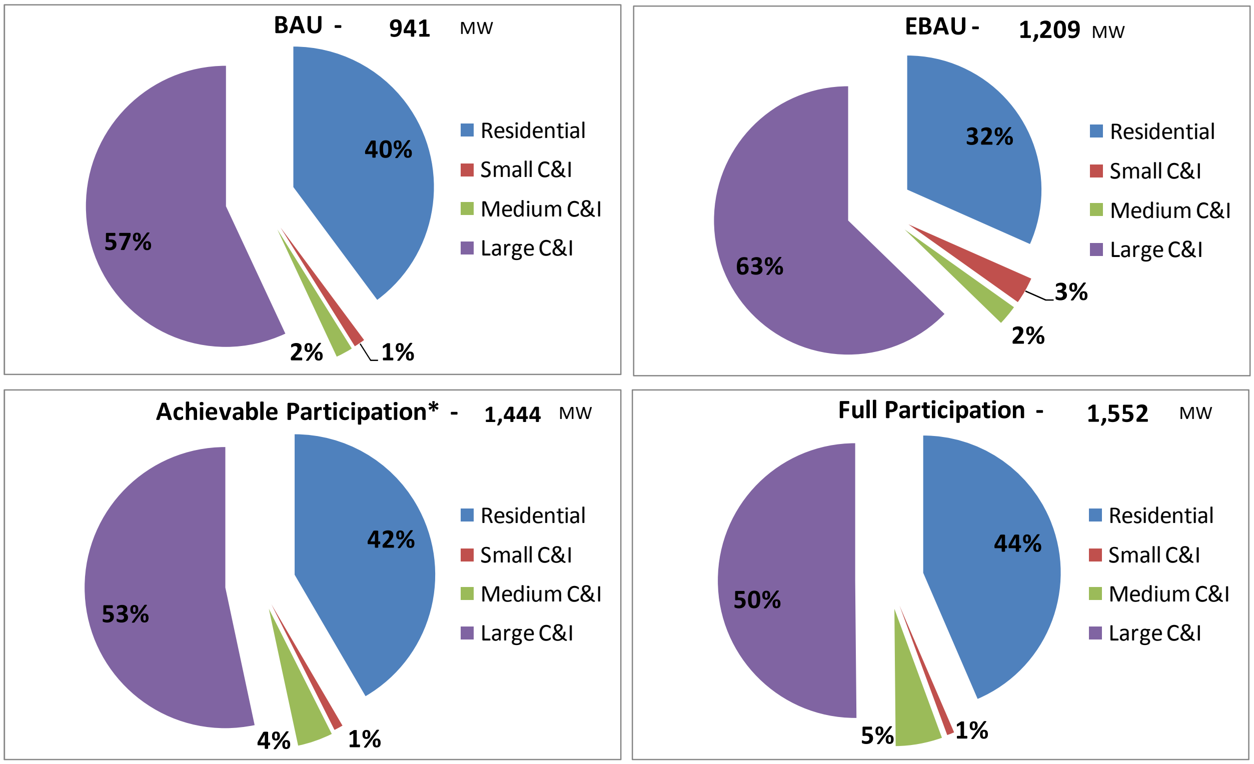
As Table 16 and Figure 6 show, the residential and large C&I customer segments account for the majority of savings. The residential share declines between the BAU and EBAU scenarios, under the assumption that impact under interruptible tariffs increase and "Other" programs targeted at the large C&I segment come into play. DR potentials increase significantly for both the residential and large C&I segments in the AP and FP scenarios, and the share between residential and large C&I remains fairly constant for both scenarios.

Table 16 – Reduction by Customer Segment by Year (MW)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
BAU											
Residential	305.0	318.0	325.0	332.0	340.0	347.0	354.0	361.0	368.0	375.0	382.0
Small C&I (20 kW or less)	9.1	9.7	10.4	11.2	11.7	11.9	11.9	11.9	11.9	11.9	11.9
Medium C&I (20 to 200 kW)	13.9	14.8	15.9	17.1	17.9	18.2	18.2	18.2	18.2	18.2	18.2
Large C&I (200 kW and up)	528.4	530.0	532.1	534.2	535.7	536.2	536.2	536.2	536.2	536.2	536.2
TOTAL	856.4	872.4	883.4	894.4	905.4	913.4	920.4	927.4	934.4	941.4	948.4
Expanded BAU											
Residential	305.1	318.1	325.2	333.5	342.9	351.4	360.0	367.5	375.0	382.5	390.0
Small C&I (20 kW or less)	9.1	9.7	11.9	25.3	34.4	37.2	37.7	38.0	38.3	38.6	39.0
Medium C&I (20 to 200 kW)	23.0	24.0	25.3	26.7	27.9	28.5	28.8	29.0	29.1	29.3	29.5
Large C&I (200 kW and up)	616.6	639.7	671.2	700.8	720.2	731.1	738.4	745.1	751.7	758.4	765.2
TOTAL	953.8	991.5	1,033.6	1,086.3	1,125.4	1,148.2	1,164.9	1,179.6	1,194.2	1,208.9	1,223.6
Achievable Participation											
Residential	305.8	319.7	327.5	364.2	402.3	446.5	491.3	518.7	559.3	600.4	642.2
Small C&I (20 kW or less)	36.2	36.5	36.7	33.8	30.8	27.1	23.3	21.4	18.0	14.6	13.2
Medium C&I (20 to 200 kW)	23.1	24.2	25.6	30.8	35.9	41.3	46.5	49.3	53.9	58.6	63.4
Large C&I (200 kW and up)	616.8	640.0	671.6	703.6	724.1	736.4	745.5	753.2	761.7	770.2	778.8
TOTAL	982.0	1,020.4	1,061.4	1,132.4	1,193.2	1,251.2	1,306.6	1,342.6	1,392.9	1,443.9	1,497.6
Full Participation Potential											
Residential	306.1	320.2	328.4	374.9	423.1	479.6	537.1	571.2	623.0	675.6	729.0
Small C&I (20 kW or less)	9.1	9.7	11.8	22.2	26.3	23.2	18.2	15.6	13.1	13.3	13.6
Medium C&I (20 to 200 kW)	23.2	24.4	25.9	34.6	43.2	52.9	62.5	67.7	76.2	84.9	93.7
Large C&I (200 kW and up)	616.9	640.3	671.8	705.6	726.8	740.1	750.5	758.9	768.6	778.3	788.2
TOTAL	955.4	994.6	1,037.8	1,137.3	1,219.4	1,295.8	1,368.3	1,413.5	1,480.9	1,552.2	1,624.5

* Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.

Figure 5 – Cumulative Reduction by Customer Segment - 2020



* Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.

5.4 Cumulative Reductions by Segment and Mechanism

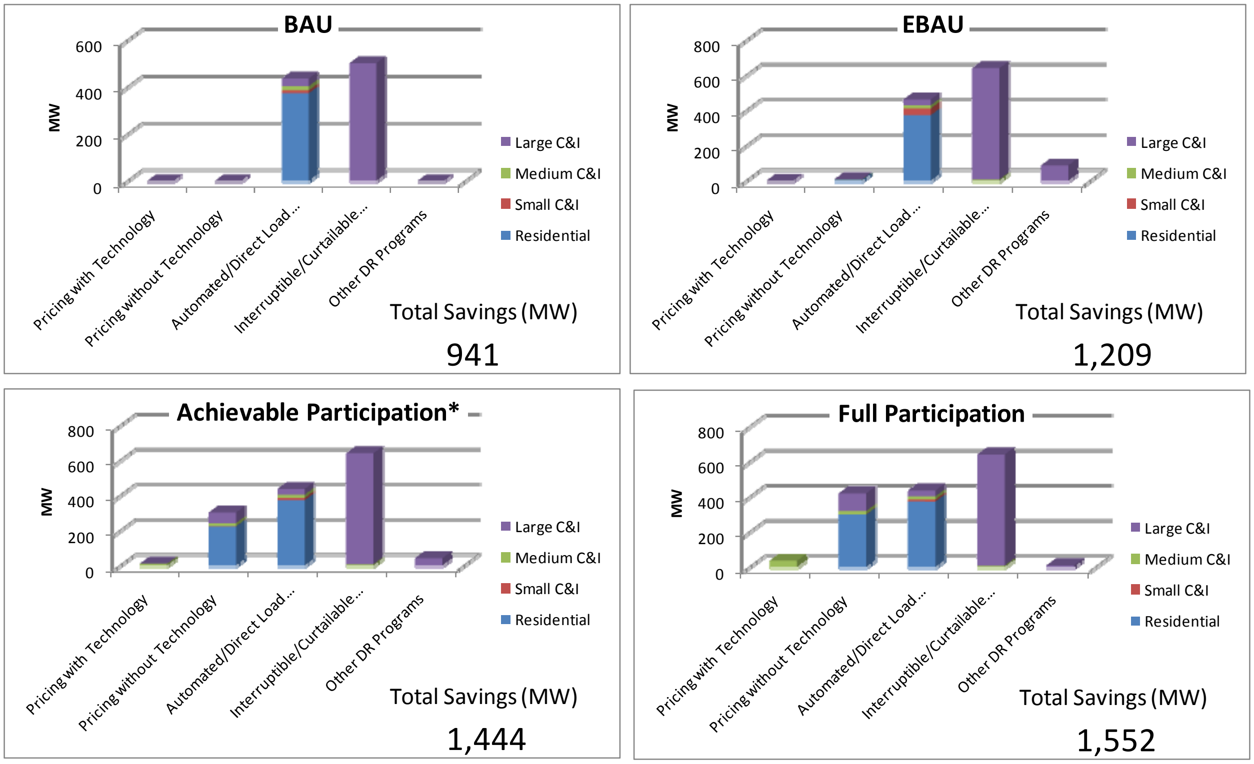
Table 17 below presents the cumulative results to 2020, by scenario, mechanism, and segment. Figure 6 shows a graphical depiction of the same data.

Table 17 – Cumulative Reductions by Scenario, Mechanism and Sector (2020), MW

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
BAU											
Pricing With Enabling Technology	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pricing Without Enabling Technology	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Automated or Direct Control DR	353.0	369.0	380.0	391.0	402.0	410.0	417.0	424.0	431.0	438.0	445.0
Interruptible Tariffs	503.4	503.4	503.4	503.4	503.4	503.4	503.4	503.4	503.4	503.4	503.4
Other DR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	856.4	872.4	883.4	894.4	905.4	913.4	920.4	927.4	934.4	941.4	948.4
Expanded BAU											
Pricing With Enabling Technology	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pricing Without Enabling Technology	0.1	0.2	0.2	2.2	4.3	6.6	8.9	9.6	10.3	11.1	11.9
Automated or Direct Control DR	353.0	369.0	381.5	405.1	424.6	435.2	442.8	450.1	457.4	464.7	472.0
Interruptible Tariffs	592.2	597.7	603.2	608.8	614.4	620.1	625.9	631.7	637.5	643.4	649.4
Other DR	8.6	24.7	48.7	70.2	82.1	86.3	87.4	88.2	88.9	89.6	90.4
TOTAL	953.8	991.5	1,033.6	1,086.3	1,125.4	1,148.2	1,164.9	1,179.6	1,194.2	1,208.9	1,223.6
Achievable Participation											
Pricing With Enabling Technology	0.0	0.1	0.1	1.8	3.5	5.6	7.8	8.9	10.8	12.8	14.7
Pricing Without Enabling Technology	1.1	2.2	3.4	43.4	84.2	134.3	185.4	212.9	258.3	304.4	351.4
Automated or Direct Control DR	380.1	395.8	406.3	413.5	420.8	424.7	427.7	432.7	436.2	439.7	445.0
Interruptible Tariffs	592.2	597.7	603.2	608.8	614.4	620.1	625.9	631.7	637.5	643.4	649.4
Other DR	8.5	24.6	48.4	64.9	70.2	66.4	59.8	56.3	50.0	43.6	37.0
TOTAL	982.0	1,020.4	1,061.4	1,132.4	1,193.2	1,251.2	1,306.6	1,342.6	1,392.9	1,443.9	1,497.6
Full Participation Potential											
Pricing With Enabling Technology	0.1	0.3	0.4	5.3	10.3	16.5	22.8	26.1	31.7	37.4	43.1
Pricing Without Enabling Technology	1.5	3.1	4.7	60.2	116.6	186.1	256.9	295.1	357.9	421.8	487.0
Automated or Direct Control DR	353.0	369.0	381.4	401.9	416.1	420.7	422.4	426.7	431.0	438.0	445.0
Interruptible Tariffs	592.2	597.7	603.2	608.8	614.4	620.1	625.9	631.7	637.5	643.4	649.4
Other DR	8.5	24.5	48.2	61.2	61.8	52.4	40.3	33.9	22.8	11.5	0.0
TOTAL	955.4	994.6	1,037.8	1,137.3	1,219.4	1,295.8	1,368.3	1,413.5	1,480.9	1,552.2	1,624.5

Large savings potential for pricing mechanisms in the Achievable and Full Participation scenarios are dependent on extensive AMI deployment and price elasticities contained in the NADR model. * Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.

Figure 6 – Cumulative Results by Mechanism and Segment – 2020



* Achievable Participation is the name given to a specific scenario in the FERC NADR study; these potentials are only achievable under the specific assumptions that define this scenario.