



## Focus on Energy Calendar Year 2013 Baseline Market Study

May 14, 2014

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## Table of Contents

Executive Summary.....	iii
Overview and Objectives.....	iii
Summary of Findings.....	iv
Overview of Study Methods.....	1
Data Sources.....	1
Methods.....	1
Panel Study.....	1
Nonresidential Site Visits.....	2
Residential Audits.....	3
Baseline Efficiency Distributions.....	4
Showerhead.....	5
Aerator.....	6
Clothes Washer.....	7
Refrigerator.....	8
Dishwasher.....	9
Residential Furnaces.....	10
Residential Water Heater.....	11
Commercial Water Heaters.....	15
Commercial Boilers.....	16
Commercial Air Compressor.....	17
Electronically Commutated Motors.....	18
Attic Insulation.....	19
Exterior Wall Insulation.....	20
Light Bulbs.....	21
Light Fixtures.....	23
Nonresidential Occupancy Sensors.....	24
Panel Study Survey Analysis.....	25
Appendix A. Other Research Questions and Future Research.....	35
Research Questions the Evaluation Team Did Not Pursue.....	35
Priorities for Future Research.....	35

Appendix B. Nonresidential Site Visits.....	36
Site Visit Data .....	36
Appendix C. Panel Survey Verbatim Responses .....	41
Verbatim Responses by Question and Code.....	41
Appendix D. Data Sources and Number of Observations .....	53
Appendix E. Measures by Efficiency Level .....	55

## Executive Summary

### Overview and Objectives

In CY 2013, The Public Service Commission of Wisconsin (PSC) contracted the Evaluation Team<sup>1</sup> to conduct a baseline market study to identify the penetration of efficient technologies across the state. The Evaluation Team used the following approaches to collect data on the sale and use of key energy-using technologies such as light bulbs, furnaces, and home appliances and determine the proportion of installed technologies that met Focus on Energy's standards for energy efficiency.

- Conducted an online survey (panel study) of vendors to collect data on their recent sales of efficient and non-efficient technologies;
- Performed site visits to determine the efficiency levels of technologies currently installed at nonresidential customer sites;
- Reviewed data collected during home audits, which included audits performed for through the Home Performance with ENERGY STAR® Program and a Residential Lighting and Appliance study,<sup>2</sup> to estimate the efficiency levels of technologies currently used by residential customers; and
- Reviewed Focus on Energy's program database (SPECTRUM) to ensure the measure definitions used for the panel study and nonresidential site visits matched current program practice.

Additionally, the Evaluation Team collected qualitative responses on program experience and thoughts about the market to provide insight on program effectiveness.

Together, these data sources provide insight into how Wisconsin utility customers are already using energy-efficient technologies and the potential for future energy-efficient upgrades and installations. By allowing the Evaluation Team to compare the efficiency levels of program measures to those of the technologies used by nonparticipants, the Evaluation Team is able to use findings from this report to calculate Net to Gross (NTG) ratios for certain measures. With additional study, the Evaluation Team could also be able to compare market demand for efficient products over time and quantify market effects, with net savings analysis, to determine how the market has changed due to Focus on Energy programs.

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<sup>1</sup> The Evaluation Team is Cadmus, Nexant, Inc., TecMarket Works, and St. Norbert College Strategic Research Institute.

<sup>2</sup> More information on the Residential Lighting and Appliance Program and the Lighting Audit study is available in Volume II of Focus on Energy's CY 2013 Evaluation Report.

**Summary of Findings**

The majority of residential measure sales reported in the panel study were energy efficient, including 89% of showerheads, 99% of clothes washers, 90% of refrigerators, 99% of dishwashers, 100% of furnaces, 100% of attic insulation, and 77% of wall insulation. Table 1 shows the percentage of efficient observations for each measured and the efficiency thresholds used.

**Table 1. Residential Panel Study Efficiency Thresholds**

Measure	Efficiency Set by Programs	Percentage of Efficient Observations	
		Residential	Nonresidential
Showerhead	≤1.6 gpm	89%	66%
Aerator	≤1.5 gpm	-	40%
Clothes Washer	CEE Tier 1 or Higher	99%	-
Refrigerator	ENERGY STAR Certified	90%	-
Dishwasher	ENERGY STAR Certified	99%	-
Residential Furnace	AFUE ≥ 0.90	100%	-
Natural Gas Water Heater	Energy Factor ≥ 0.67	25%	-
Electric Water Heater	Energy Factor ≥ 0.93	18%	-
Compressor and Condenser Fan Motor	Usage of an Electrically Commutated Motor (ECM)	-	6%
Attic Insulation Projects	Achieved R-Value Over 0.50	100%	-
Wall Insulation Projects	Achieved R-Value Over 0.20	77%	-

Residential audit data showed that natural gas water heaters installed through the Home Performance with ENERGY STAR Program were more efficient than gas water heaters reported in the panel study sales data. Ninety-eight percent of equipment installed through the Home Performance with ENERGY STAR Program had an efficiency rating of 0.67 or higher, while only 25% of equipment reported as sales had an efficiency rating of 0.67 or higher.

During the home audits, over half of all light bulbs observed in single-family and multifamily homes were incandescent bulbs. However, according to panel study data, less than 1% of respondents reported sale of incandescent bulbs. Further, panel respondents reported no sales or installations of T12 bulbs or fixtures. One should note that the panel sample is not a census; therefore, it is likely that incandescent bulbs and T12s were sold in the state of Wisconsin during the data collection period.

Among commercial measures reported in the panel study, only 9% of commercial boilers and 6% of compressor and condenser fan motors were energy-efficient models. For ECM retrofits, only 28% of consumers used a Focus on Energy rebate to purchase equipment and 82% purchased the equipment to replace a burned out motor.

During the site visits, only 18% of all commercial air compressors observed were energy-efficient models.

Among commercial water heaters observed during site visits, the most common types installed were electric storage water heaters and natural gas storage water heaters.

If such data collection efforts are to continue in the future, the Evaluation Team will be able to compare market demand for efficient products over time. With this information, the Evaluation Team can begin to determine the market effects that are occurring in Wisconsin. The Evaluation Team can then combine information on market effects with net savings analysis to determine how the market has changed due to Focus on Energy programs.

## Overview of Study Methods

### Data Sources

As described, the Evaluation Team used data from four sources: (1) a panel study including sales from retailers in Wisconsin, (2) nonresidential on-site surveys, (3) a review of residential home audits, and (4) a review of the ongoing Residential Lighting and Appliance study. Table 2 lists the total number of observations or sales from each data source. This section describes each of these data collection methods in further detail.

**Table 2. Data Contribution by Source**

Data Source	Number Sold/Observed
Panel Observations	125,859
Site Visit Observations	140,102
Home Audit Data	15,391
Lighting Audit Study	5,604

### Methods

#### Panel Study

Focus on Energy contacted 1,094 retailers in Wisconsin for the panel study, using contact information from a third-party sample of 650 businesses and information on 444 additional businesses gathered through the Manta® search engine. The study targeted retailers with Standard Industrial Classifications (SIC) codes, which indicated the vendor sold products of interest to the study, but the Evaluation Team found that SIC codes were not always accurate. To compensate for this data limitation, the Evaluation Team created an introductory phone screening survey to ask businesses which products they sold and how much demand they saw for their products.

If the screening survey verified that a retailer sold applicable measures, the Evaluation Team encouraged the business owners to participate in the panel study. The Team completed two separate studies—the first was a general sales survey and the second focused on motors only. Motor efficiency information required a higher level of detail than the general sales survey, so the Evaluation Team handled it separately.

For all measures included in the study, the survey asked respondents to provide data on the quantity of units sold; the make, model, efficiency level information; and the price. The survey also asked customers to quantify their sales separately for residential and nonresidential sales, whether customers used Focus on Energy incentives or other rebates, and the age of the unit being replaced. The survey design allowed the respondent to report on a high volume of sales in a single form. If the respondent sold 200 items of a single unique make and model combination, the sales entry would only require one form (which records the quantity sold) instead of completing 200 separate forms for each individual sale. By reducing

the length of survey forms, the Evaluation Team was able to collect a high number of responses from a relatively hard to reach population (business owners).

After requesting sales data, the survey asked respondents nine open-ended questions about the demand for their products or services, efficiency, and their interactions with rebate programs in general (not limited to interactions with Focus on Energy programs). Appendix C. Panel Survey Verbatim Responses details the analysis of the open-ended questions. The motor-focused survey did not ask respondents these additional open-ended questions due to a shorter period of data collection.

A total of 78 respondents completed the survey, reporting on 125,591 unit sales. The general sales survey included 64 respondents, while the motor-focused survey included 14.

### **Nonresidential Site Visits**

The goal of the nonresidential on-site surveys was to describe the types of equipment installed in various Wisconsin businesses. In total, the Evaluation Team collected on-site survey information from 173 randomly selected businesses. The commercial measures included in this report are water heaters, boilers, air compressors, and lighting.<sup>3</sup> While the sample was not large enough on its own to provide specific information about each segment within the state, the Evaluation Team augmented these data with the data collected during the panel study.

The Evaluation Team used field engineers trained to collect data on the energy-using characteristics of participating business facilities across Wisconsin. This following section describes the methodologies for recruiting participants and collecting data at the participants' facilities.

### **Recruitment**

Like the panel study, the Evaluation Team purchased a sample from a third-party vendor. From this sample, 228 companies expressed interest in participating in the study when first contacted. Potential participants scheduled an on-site survey after receiving a previsit call from the Evaluation Team.

During the previsit call, the Evaluation Team gathered basic data on the company's facilities (number of structures, building size, age, occupants, etc.) and information on the major end uses of equipment. The Evaluation Team attempted to contact companies a maximum of three times before excluding a facility from the study.

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<sup>3</sup> Appendix C contains data the Evaluation Team collected on additional measures during the site visits and used in net-to-gross analyses.

### *On-Site Surveys*

Engineers experienced with identifying and describing building systems conducted on-site surveys. These engineers verified installed measures and gathered data on each measure's end use, fuel type, and efficiency level.

To ensure consistent categorization of complex buildings and systems, the Evaluation Team used a systemic process and trained the engineers to categorize and record system types and parameters in the survey forms. Another engineer then performed a desk review of the 173 completed surveys for consistency.

The on-site surveys typically lasted between one to two hours, depending on the building size and complexity of the building systems.

### *Data Validation and Review*

To confirm the field observations were valid, the engineer performing desk reviews verified all locations to ensure the field engineers consistently categorized buildings into the appropriate segments/end use categories for later analysis.

### *Residential Audits*

As a part of the Home Performance with ENERGY STAR Program, contractors conduct residential on-site audits for those participating in the program. During the home audit, the contractor identifies how much energy the participant's home uses and provides recommendations to improve the home's energy efficiency. The contractor also records the following types of home characteristics: heating and cooling methods, presence of faucet aerators, showerhead water usage, types of light bulbs installed, and insulation.

During the audit, contractors replace certain measures in the home, such as inefficient showerheads. For measures not replaced, the contractor does not record information about the pre-existing measure. When evaluating the Program Administrator's data, the Evaluation Team assumed that if a contractor did not replace a measure, it was already an efficient model.

The Program Implementer compiled data from the home audits into a program database and shared those data with the Evaluation Team for the purpose of this baseline study.

The Evaluation Team is researching ways to coordinate with Focus on Energy Program Implementers to capture additional data points to build upon this initial baseline study in a cost-effective way; thus, increasing the confidence and validity of the study conclusions.

## Baseline Efficiency Distributions

This section describes the Evaluation Team’s findings from the panel study, nonresidential on-site surveys, residential audits, and the estimated or actual market size for a given measure. When available, the Evaluation Team used Association of Home Appliance Manufacturer (AHAM) data to give the exact number of products sold in CY 2013. AHAM data were only available for clothes washers, refrigerators, and dishwashers. For all other measures, the Evaluation Team used the following equation to estimate the number of sales based on data from the Residential Energy Consumption Survey (RECS):<sup>4</sup>

### Equation 1: Estimating Annual Sales

$$\text{Annual Sales} = \frac{\text{Total Households} \times \text{Average Measures per Household}}{\text{Measure EUL}}$$

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<sup>4</sup> RECS is a survey administered by the Energy Information Administration, which collects data about housing energy characteristics.

**Showerhead**

An estimated total of 314,333 showerheads were sold in Wisconsin during CY 2013 (see Table 3). Contractors for the Home Performance with ENERGY STAR Program installed showerheads rated at 1.6 gallons per minute (gpm) or less. For the panel study, the Evaluation Team considered a showerhead efficient if it was as efficient as the showerheads installed through the program (1.6 gpm or less). The sample from the panel study included 11 respondents who reported collective sales of 506 showerheads. For residential sales, 89% of the sales included efficient showerheads, and for nonresidential sales, 66% of the sales included efficient showerheads (see Table 4). According to Program Implementer data, Home Performance with ENERGY STAR Program audit contractors replaced a non-efficient showerhead with an efficient model 75% of the time, while the remaining 25% of showerheads were already efficient (see Table 5).

**Table 3. Residential Showerhead Sales**

Sales of Showerheads	Estimated Number Sold/Installed
Estimated Sales in Wisconsin <sup>1</sup>	314,333

<sup>1</sup>The Evaluation Team estimated sales using RECS data and annual sales calculated using Equation 1.

**Table 4. Panel Study Showerhead Sales**

Showerhead Type	Residential		Nonresidential	
	Frequency	Percentage	Frequency	Percentage
Efficient	48	89%	300	66%
Non-Efficient	6	11%	144	34%
<b>Total</b>	<b>54</b>	<b>100%</b>	<b>444</b>	<b>100%</b>

**Table 5. Home Audit Efficient Showerhead Installations**

Showerhead Type	Number Observed	Percentage Efficient
Efficient	261	25%
Non-Efficient	789	75%
<b>Total</b>	<b>1,050</b>	<b>100%</b>

## Aerator

An estimated total of 599,916 aerators were sold in Wisconsin during CY 2013 (see Table 6). Contractors for the Home Performance with ENERGY STAR Program installed aerators rated at 1.5 gpm or less. For the panel study, the Evaluation Team considered an aerator efficient only if it was as efficient as the aerators installed through the program (1.5 gpm or less). In the panel study, 10 respondents reported collective sales or installations of 1,947 aerators. As shown in Table 7, respondents only reported that 29 aerators were for residential use, all of which were non-efficient (rated at 2.2 gpm). For nonresidential use, respondents reported that 40% of aerators were rated at 1.5 gpm. During the Home Performance with ENERGY STAR Program home audits, 63% of aerators observed were non-efficient (see Table 8).

**Table 6. Residential Aerator Sales**

Aerator Sales	Estimated Number Sold/Installed
Estimated Sales in Wisconsin <sup>1</sup>	599,916

<sup>1</sup>The Evaluation Team estimated sales using RECS data and annual sales calculated in Equation 1.

**Table 7. Panel Study Aerator Sales**

Aerator Type	Residential		Nonresidential	
	Frequency	Percentage	Frequency	Percentage
Efficient	-	-	758	40%
Non-Efficient	29	100%	1,160	60%
<b>Total</b>	<b>29</b>	<b>100%</b>	<b>1,918</b>	<b>100%</b>

**Table 8. Home Audit Aerator Observations**

Aerator Type	Number Observed	Percentage Efficient
Efficient	800	37%
Non-Efficient	1,354	63%
<b>Total</b>	<b>2,154</b>	<b>100%</b>

## Clothes Washer

Based on AHAM sales data, 135,042 clothes washer sales occurred in Wisconsin in CY 2013 (see Table 9). In the panel study, 13 respondents reported collective sales of 1,450 clothes washers. Overall, the respondents sold efficient clothes washers 99% of the time (see Table 10). Since the Evaluation Team did not include clothes washers in any on-site investigations, Table 10 only lists data reported during the panel study. The Consortium for Energy Efficiency (CEE) tiers also describe a clothes washer's efficiency, and a higher CEE tier level means the product runs more efficiently. As shown in Table 11, 48% of panel sales included CEE tier 1 washers and 49% included CEE tier 3 washers.

**Table 9. Residential Clothes Washer Sales**

Clothes Washer Sales	Estimated Number Sold/Installed
Sales in Wisconsin <sup>1</sup>	135,042

<sup>1</sup>Sales based on AHAM 2013 data.

**Table 10. Panel Study Clothes Washer Sales**

Clothes Washer Type	Residential	
	Frequency	Percentage
Efficient	1,434	99%
Non-Efficient	16	1%
<b>Total</b>	<b>1,450</b>	<b>100%</b>

**Table 11. Clothes Washers by CEE Tiers**

Clothes Washer CEE Tier	Quantity Sold	Percentage
0	16	1%
1	696	48%
2	33	2%
3	705	49%
<b>Total</b>	<b>1,450</b>	<b>100%</b>

**Refrigerator**

Based on AHAM CY sales data, 157,437 refrigerator sales occurred in Wisconsin in CY 2013 (see Table 12). The Evaluation Team organized the refrigerator data into AHAM’s categories. As shown in Table 13, the majority of respondents in the panel study reported sales of top-mounted freezers (37%) and bottom-mounted freezers (57%). There is a difference between the distribution of reported sales in the panel study and AHAM data; this is due to the low number of respondents reporting on refrigerator sales in the panel study (n=10). As shown in Table 14, respondents reported 90% of their collective refrigerators sales included efficient models.

**Table 12. Wisconsin Residential Refrigerator Sales**

Refrigerator Type	Estimated Number Sold/Installed	Percentage
Top-Mounted Freezer or Refrigerator Only	80,508	51%
Side-by-Side	21,252	14%
Bottom-Mounted Freezer	55,677	35%
<b>Total</b>	<b>157,437</b>	<b>100%</b>

**Table 13. Panel Study Refrigerator Sales**

Refrigerator Type	Frequency	Percentage
Top-Mounted Freezer or Refrigerator Only	191	37%
Side-by-side	32	6%
Bottom-Mounted Freezer	291	57%
<b>Total</b>	<b>514</b>	<b>100%</b>

**Table 14. Panel Study Refrigerator Sales Distribution**

Refrigerator Sales	Number Sold/Installed	Number Efficient
Total Refrigerator Sales Reported in Panel Study	514	90%

## Dishwasher

Based on AHAM data, 91,413 dishwasher sales occurred in Wisconsin in CY 2013 (see Table 15). As shown in

Table 16, eight respondents from the panel study reported collective sales of 565 dishwashers; most of these dishwashers (99%) were ENERGY STAR products.

Table 16 only lists information from the panel study because the nonresidential site visits and residential audits did not include dishwashers.

**Table 15. Residential Dishwasher Sales**

Dishwasher Sales	Estimated Number Sold/Installed
Sales in Wisconsin <sup>1</sup>	91,413

<sup>1</sup>Sales based on AHAM 2013 data.

**Table 16. Panel Study Dishwasher Sales**

Dishwasher Type	Frequency	Percent
Efficient	561	99%
Non-Efficient	4	1%
<b>Total</b>	<b>565</b>	<b>100%</b>

## Residential Furnaces

An estimated total of 110,353 residential furnaces were sold in Wisconsin during CY 2013 (see Table 17). To qualify for a rebate through the Enhanced Rewards Program or the Residential Rewards Program, a furnace's annual fuel utilization efficiency (AFUE) rating must be 90% or greater.<sup>5</sup> As shown in Table 18, six panel study respondents collectively reported sales of 626 furnaces in CY 2013, and all of the respondents reported their furnace sales were for efficient models (AFUE  $\geq$  0.90). In the Home Performance with ENERGY STAR Program audits, contractors observed that 86% of homes had a furnace (see Table 19), and 74% of these furnaces were efficient models (see Table 20). For a more detailed listing of all of the observed furnaces and their efficiency levels, see Appendix E. Measures by Efficiency Level.

**Table 17. Residential Furnace Sales**

Furnace Sales	Estimated Number Sold/Installed
Sales in Wisconsin <sup>1</sup>	110,353

<sup>1</sup>The Evaluation Team estimated sales using RECS data and annual sales calculated in Equation 1.

**Table 18. Panel Study Residential Furnace Sales**

Furnace Type	Frequency	Percent
Efficient	626	100%
Non-Efficient	-	-
<b>Total</b>	<b>626</b>	<b>100%</b>

**Table 19. Homes With Furnaces**

Item	Number of Homes	Percentage of Homes with a Furnace
Furnaces	2,900	86%

**Table 20. Efficient Residential Furnace Installations**

Residential Furnaces	Number Installed	Percentage Efficient
Efficient	1,846	74%
Non-Efficient	648	26%
<b>Total</b>	<b>2,494</b>	<b>100%</b>

<sup>5</sup> Minimum efficiency is based on the fuel type (gas or propane) and other factors (modulating, multistage, presence of ECM). Minimum efficiencies for the Residential Rewards and Enhanced Rewards Programs are between 90% and 95% AFUE.

**Residential Water Heater**

The estimated number of water heaters sold in Wisconsin in CY 2013 was 155,276 (see Table 21). For residential gas and electric water heaters, Table 22 and Table 23 compare expected national sales, panel sales, and program installations.

The expected sales distribution data comes from a Department of Energy (DOE) report,<sup>6</sup> which used shipping information of water heaters across the United States from the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) directories (see Table 22). The Evaluation Team categorized the energy factors (EF) in the same fashion as the DOE 2010 report. In the panel study, almost half (43%) of new natural gas storage water heater sales had an energy factor of 0.59 or less (see Table 22). Fifty percent of the panel sales of electric water heaters had an EF of 0.92 (see Table 23). The panel study did not include any sales of tankless water heaters.

Figure 1 shows the national, and panel distributions by energy factor for natural gas water heaters, while Figure 2 shows the same comparison for electric water heaters. Electric water heaters with an EF greater than 1 are hybrid water and space heaters. The national expected distribution is only 1% for such devices (EF 2.2 or higher), but 18% of panel sales were in this category. In future studies, investigators should focus on electric water heater sales to validate this distribution, as the panel study only included 22 electric water heater sales. Appendix F. Water Heaters Additional Information shows comparisons between the EF of water heaters from the expected national distribution, panel distribution, and items installed through Focus on Energy programs.

**Table 21. Residential Water Heater Sales**

Furnace Sales	Estimated Number Sold/Installed
Sales in Wisconsin <sup>1</sup>	155,276

<sup>1</sup>The Evaluation Team estimated sales using RECS data and annual sales calculated in Equation 1.

<sup>6</sup> “Code of Federal Regulations,” Energy Conservation Program: Energy Conservation Standards for Residential Water Heaters, Direct Heating Equipment, and Pool Heaters; Final Rule, title 10 sec. 430.

Table 22. Natural Gas Water Heater Sales Distributions

Energy Factor	Expected National Distribution	Panel Distribution <sup>1</sup>
≤0.59	64%	43%
0.60 to 0.62	23%	4%
0.63	2%	21%
0.64	5%	7%
0.65 to 0.66	0%	0%
0.67 to 0.76	5%	24%
≥0.77	1%	1%
Total	100%	100%

<sup>1</sup>Percentage based on sales of 76 water heaters reported during the panel study.

Figure 1. Distributions of Natural Gas Water Heaters by Energy Factor

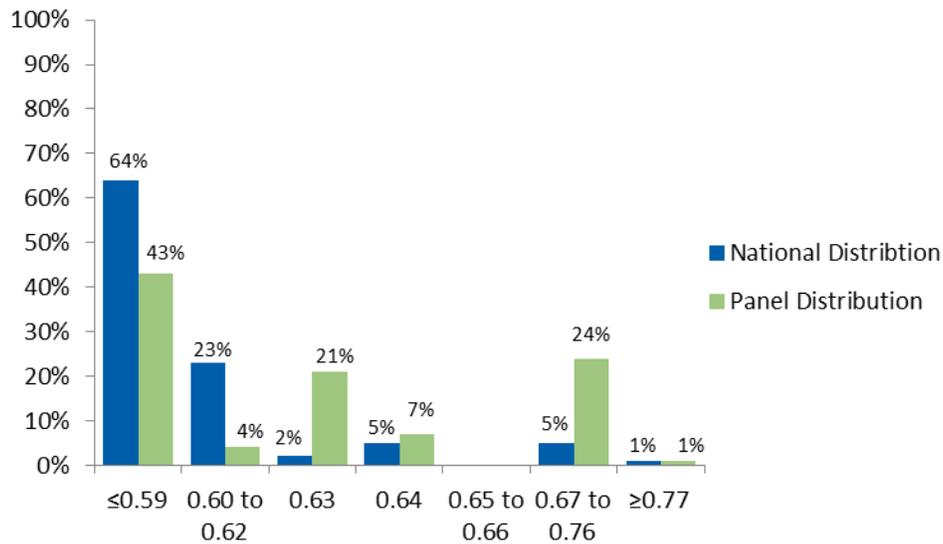


Figure 1 reflects data shown in Table 22.

**Table 23. Electric Water Heater Sales Distributions**

Energy Factor	Expected National Distribution	Panel Distribution <sup>1</sup>
≤0.90	30%	27%
0.91	17%	5%
0.92	11%	50%
0.93	26%	0%
0.94	8%	0%
0.95 to less than 1.9	4%	0%
2.0 to 2.1	4%	0%
≥2.2	1%	18%
Total	100%	100%

<sup>1</sup>Percentage based on sales of 22 water heaters sales reported during the panel study.

**Figure 2. Distributions of Electric Water Heaters by Energy Factor**

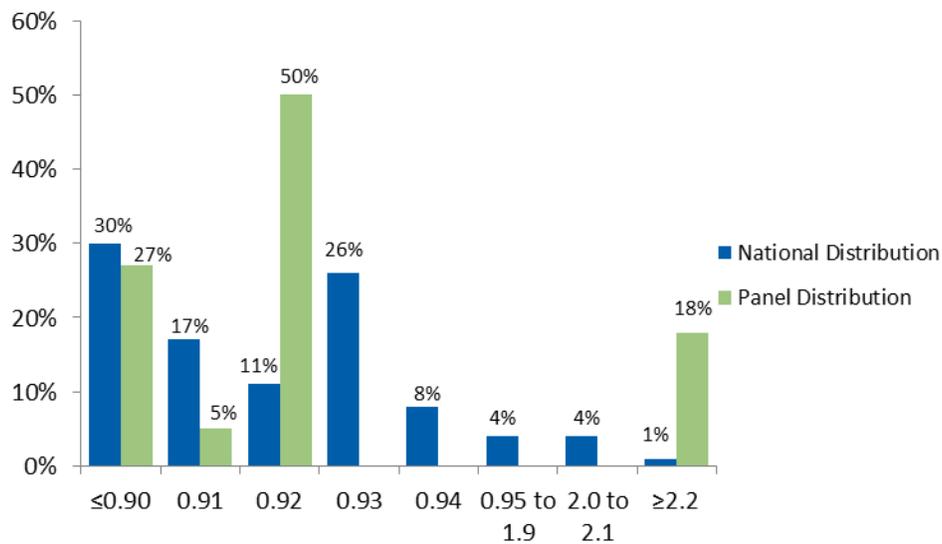


Figure 2 reflects data from Table 23.

## *Water Heater Temperature Turn-Down*

As part of the Home Performance with ENERGY STAR Program, contractors lowered water heater temperatures to 120 °F in participating homes. The EPA does not recommend a temperature lower than 120 °F as lower temperatures are prone to biological growth and potential health hazards. Based upon data gathered during home audits -prior to participation in the temperature turn-down, the customers' average temperature for both gas and electric storage water heaters was 130 °F (see Table 24).

**Table 24. Water Heater Temperature Turn-Down**

Water Heater Type	Average Temperature	Number of Observations
Gas Storage Water Heater	130 °F	2,738
Electric Storage Water Heater	130 °F	492

## Commercial Water Heaters

The Evaluation Team conducted site visits and gathered data on water heaters used for commercial and industrial purposes. Field engineers only identified the makes and models of the water heaters for 20 of the units, but recorded the approximate date of installation of the all 177<sup>7</sup> installed water heaters. A storage water heater refers to a water heater that maintains the temperature of water in a tank, while a tankless water heater does not store any water. High usage water heaters for industrial purposes use a different measure of efficiency than energy factor—thermal efficiency. Thermal efficiency is the ratio of heat transferred to the desired medium (water) as compared to the heat content of the input fuel such as natural gas, oil, or propane.

Of the 20 units observed with make and model information, 43% of the water heaters were similar in size to a water heater used for residential purposes (see Table 25). The remaining 57% were high-usage, larger systems with an average thermal efficiency of 0.88 (see Table 26). A precise market estimation of commercial water heater sales is not possible with the current information, but market estimations will be possible with future investigations in conjunction with the present data.

**Table 25. Standard Water Heater Efficiency From Site Visits**

Water Heater Type	Average Energy Factor	Number Installed
Storage Water Heater, High Usage, Natural Gas	0.60	1
Storage Water Heater, High Usage, Electric	0.92	7
Storage Water Heater, High Usage, Electric Heat Pump	2.45	1

**Table 26. Industrial Water Heater Efficiency From Site Visits**

Water Heater Type	Average Thermal Efficiency	Number Installed
Storage Water Heater, High Usage, Natural Gas	0.88	12

<sup>7</sup>Additionally, the average age of observed water heaters was 9 years old (see Appendix F. Water Heaters Additional Information).

## Commercial Boilers

Of the 172 nonresidential sites visited by the Evaluation Team, 44 locations had at least one boiler (Table 27). Of the sites with boilers installed, 9.1% of these boilers were efficient models (see Table 28). For the baseline study, the Evaluation Team considered commercial boilers efficient if they had an AFUE  $\geq$  90%.

**Table 27. Distribution of Boiler Type**

Boiler Type	Percentage of Locations With Boilers
Boiler Plant Retrofit (1,000 – 5,000 MBH)	9.3%
Boiler Replacement, Hot Water (300-999 MBH)	2.9%
Boiler Replacement, Hot Water (175-299 MBH)	5.2%
Boiler Replacement, Hot Water (<175 MBH)	2.9%
No Boiler at location	79.7%
<b>All Boiler Measures</b>	<b>20.3%</b>

**Table 28. Efficient Boiler Installations**

Boiler Type	Number Installed	Percentage Efficient
Boiler Plant Retrofit (1,000 – 5,000 MBH)	22	13.6%
Boiler Replacement, Hot Water (300-999 MBH)	5	-
Boiler Replacement, Hot Water (175-299 MBH)	5	-
Boiler Replacement, Hot Water (<175 MBH)	13	7.7%
<b>All Boiler Measures</b>	<b>45</b>	<b>8.9%</b>

## Commercial Air Compressor

Field engineers visited 121 sites using at least one air compressor (see Table 29), noting 148 air compressors in total (see Table 30). Engineers considered an air compressor system efficient if a variable-speed drive (VSD) was present. Only 27 air compressors were equipped with a VSD, and 77% of air compressors with a VSD had more than 25 horsepower (hp). Table 30 shows that most of the observed air compressors equipped with VSDs (75%) were used for drive tools, and Table 31 shows the horsepower of the installed units.

**Table 29. Sites With Air Compressors**

Air Compressor Observations	Sites with Air Compressors	Total Sites Visited
Site visits	121	172

**Table 30. Air Compressors by End Use**

End Use	Number Observed with a VSD	Total Number Observed
Cleaning	0	21
Drive Tools	20	99
HVAC Pneumatic	2	16
Other	2	5
Uncategorized	3	7
<b>Total</b>	<b>27</b>	<b>148</b>

**Table 31. Air Compressors by Horsepower**

End Use	Number Installed	Number Observed With a VSD	Percentage Observed With a VSD
Less than 1.5 hp	8	1	13%
1.5 hp to 5 hp	29	2	7%
5.1 hp to 10 hp	10	0	0%
10.1 hp to 25 hp	38	3	8%
25.1 hp to 50 hp	34	8	24%
50.1 hp to 100 hp	11	3	27%
More than 100 hp	18	10	56%
<b>Total</b>	<b>148</b>	<b>27</b>	<b>18%</b>

## Electronically Commutated Motors

Respondents in the panel study also reported on electronically commutated motors (ECM) retrofit sales and fan-motor installations for commercial refrigeration.

## Compressor and Condenser Fan Motors

A number of Focus on Energy programs include rebates for eligible compressor and condenser ECM motors. As shown in Table 32, panel respondents reported 94% of their installed motors were non-efficient (permanent-split capacitor or shaded pole motors). The installed motors were for commercial end uses such as walk-in coolers and other commercial refrigeration units.

**Table 32. Panel Study Compressor and Condenser Fan Motor Sales**

Motor Type	Frequency	Percentage
ECM	11	6%
Non-ECM	184	94%
<b>Total</b>	<b>195</b>	<b>100%</b>

## ECM Retrofits

A total of nine panel study respondents reported the collective installation of 1,508 ECMs in CY 2013, and respondents reported that only 28% of those sales used a Focus on Energy rebate (see Table 33). Only 1,077 items have listed replacement times. Most respondents (82%) reported they replaced burned out motors (see Table 34).

**Table 33. Panel Study ECM Participation**

Program Participation	Frequency	Percentage
Program Participant	420	28%
Nonparticipant	1,088	72%
<b>Total</b>	<b>1,508</b>	<b>100%</b>

**Table 34. Motor Replacement Timing**

Replacement Timing	Frequency	Percentage
Early Replacement	192	18%
Replaced on Failure	885	82%
<b>Total</b>	<b>1,077</b>	<b>100%</b>

## Attic Insulation

The estimated number of attic insulation projects in Wisconsin was 92,000 according to RECS data (see Table 35). The Evaluation Team’s threshold for attic insulation efficiency was an installed R-value of 50 or higher. In the panel study, five respondents reported a total of 187 installation projects, all installing insulation with R-values of 50 or higher (see Table 36). During a review of residential audits, the Evaluation Team identified 98% of homes had insulation installed with an R-value 50 or higher (see Table 37).

**Table 35. Residential Attic Insulation Projects**

Attic Insulation Projects	Estimated Number of Projects
Estimated Sales in Wisconsin <sup>1</sup>	92,000

<sup>1</sup>The Evaluation Team estimated sales using RECS data and annual sales calculated in Equation 1.

**Table 36. Panel Study Attic Insulation Installations Projects**

Efficiency	Frequency	Percentage
Efficient (R-Value $\geq$ 50)	187	100%
Non-Efficient (R-Value $\leq$ 49)	-	-
<b>Total</b>	<b>187</b>	<b>100%</b>

**Table 37. Home Audit Attic Insulation Projects**

Efficiency	Frequency	Percentage
Efficient (R-Value $\geq$ 50)	2,359	98%
Non-Efficient (R-Value $\leq$ 49)	36	2%
<b>Total</b>	<b>2,395</b>	<b>100%</b>

## Exterior Wall Insulation

The estimated number of exterior wall insulation projects in Wisconsin was 92,000 according to RECS data (see Table 38). The Evaluation Team’s threshold for exterior wall insulation efficiency was an installed R-value of 19 or higher. In the panel study, two respondents reported 172 insulation projects. Most of these insulation projects had R-values of 21 or higher (75%), with the remaining 25% had R-values of 13 (see Table 39). For home audits, the Evaluation Team categorized efficiency into two tiers based on climate zones. The first climate zone required an R-value above 15, and the second climate zone required an R-value above 19. Most observed homes (85%) had exterior wall insulation that had an R-value less than 15 (see Table 40), which is lower than either climate zone requirement.

**Table 38. Residential Exterior Wall Insulation Projects**

Exterior Wall Insulation Projects	Estimated Number of Projects
Estimated Sales in Wisconsin <sup>1</sup>	92,000

<sup>1</sup>The Evaluation Team estimated sales using RECS data and annual sales calculated in Equation 1.

**Table 39. Panel Study Wall Insulation Installations Projects**

Efficiency	Frequency	Percentage
Efficient (R-Value ≥ 20)	119	75%
Non-Efficient (R-Value ≤ 19)	40	25%
<b>Total</b>	<b>172</b>	<b>100%</b>

**Table 40. Home Audit Exterior Wall Insulation Installations**

R-value	Frequency	Percentage
R-Value Over 19	15	1%
R-Value Between 15 and 19	234	14%
R-Value Less Than 15	1,445	85%
<b>Total</b>	<b>1,694</b>	<b>100%</b>

### Light Bulbs

Thirty-three panel survey respondents reported a total of 545 residential sales and 113,196 nonresidential sales of light bulbs (see Table 41). Only five of the respondents sold bulbs for residential end uses, representing less than 0.5% of bulbs sold. Of the residential bulb sales, 61% were LED products. The nonresidential sales were mostly T8 bulbs (65%) CFLs (17%) or LED products (15%). During the home audits completed as part of the Residential Lighting and Appliance evaluation, the Evaluation Team found that incandescent continue to constitute the majority of installed bulbs in residences— 56% of all sockets in single family units and 52% of all sockets in multifamily units. Additionally, 100% of all single family homes, and 97% of multifamily homes, had at least one incandescent bulb in use. While panel study respondents reported that LEDs accounted for the majority of their light bulb sales (61%), home auditors found LEDs installed in only 2% of single-family homes (see Table 42).

One should note that the majority of residential bulb sales occur through national retailers and big box stores (Walmart, Home Depot, Lowe’s, etc.); however, those retailers declined to participate in this panel study. Current sales data capture the nonresidential market with higher precision than the residential market<sup>8</sup>.

**Table 41. Panel Study Light Bulb Sales**

Bulb Type	Residential		Nonresidential	
	Frequency	Percentage	Frequency	Percentage
CFL	212	39%	19,729	17%
LED	333	61%	17,451	15%
T5	-	-	732	1%
T8	-	-	74,099	65%
Induction	-	-	776	0.1%
Incandescent	-	-	100	0.1%
Metal Halide	-	-	20	0.02%
<b>Total</b>	<b>545</b>	<b>100%</b>	<b>113,196</b>	<b>100%</b>

<sup>8</sup> The overall distribution of residential sales across bulb types (CFL, LED and incandescent) has low precision due to the small number of sales other than CFL and LEDs. However, the Evaluation Team believes the distribution of wattages sold for residential use within each of these bulb-type categories is representative of the population.

Table 42. Home Audit Bulb Observations

Bulb Type	Single Family		Multifamily	
	Frequency	Percentage	Frequency	Percentage
CFL	1,159	33%	731	35%
LED	56	2%	29	1%
Incandescent	1,974	56%	1,081	52%
Halogen	16	1%	59	3%
Linear Fluorescent <sup>1</sup>	322	9%	176	8%
Halide	1	0.03%	0	0%
<b>Total</b>	<b>3,528</b>	<b>100%</b>	<b>2,076</b>	<b>100%</b>

<sup>1</sup>Home audit contractors did not specify if the bulb was a T5, T8, or T12.

**Light Fixtures**

Light fixtures include products like wall units for LED bulbs, multisolet lamp fixtures, high-bay lighting, or strip lighting. Respondents from the panel study reported sales and installation of fixtures for nonresidential end uses only. For both site visits and the panel study, T8 fixtures were the most common fixture type sold or installed—84% of sales reported in the panel study (see Table 43) and 82% of fixtures observed during the site visits (see Table 44). Panel Study survey respondents did not report T12 fixtures, but the Evaluation Team observed T12 fixtures in 9% of existing installations during the nonresidential site visits.

**Table 43. Panel Study Nonresidential Lighting Fixture Sales**

Bulb Type for Fixture	Frequency	Percentage
T8	13,513	84%
LED	2,403	15%
CFL	94	1%
Induction	82	1%
T5	53	0.3%
<b>Total</b>	<b>16,145</b>	<b>100%</b>

**Table 44. Nonresidential Site Visits Light Fixtures**

Bulb Type for Fixture	Frequency	Percentage
T8	115,184	82%
T12	12,448	9%
Induction	4,302	3%
T5	3,477	2%
Incandescent	2,053	1%
CFL	1,495	1%
LED	754	1%
<b>Total</b>	<b>139,713</b>	<b>100%</b>

**Nonresidential Occupancy Sensors**

The Evaluation Team observed 563 occupancy sensors during the nonresidential site visits and only noted occupancy sensors in 7% of all lighting fixtures (see Table 45). Of the 4,385 occupancy sensor sales reported in the panel study, respondents reported that 3,491 of these sales (80%) included Focus on Energy rebates (see Table 46). On average, the total wattage of fixtures connected to occupancy sensors observed in the baseline study was 284 watts.

**Table 45. Site Visit Occupancy Sensor Saturation**

Source	Number of Occupancy Sensors	Percentage of Fixtures with Occupancy Sensors
Site Visits	563	6.7%

**Table 46. Panel Study Occupancy Sensor Rebate**

Source	Number of Occupancy Sensors	Percentage of Using Focus on Energy Rebate
Panel Study	4,385	80%

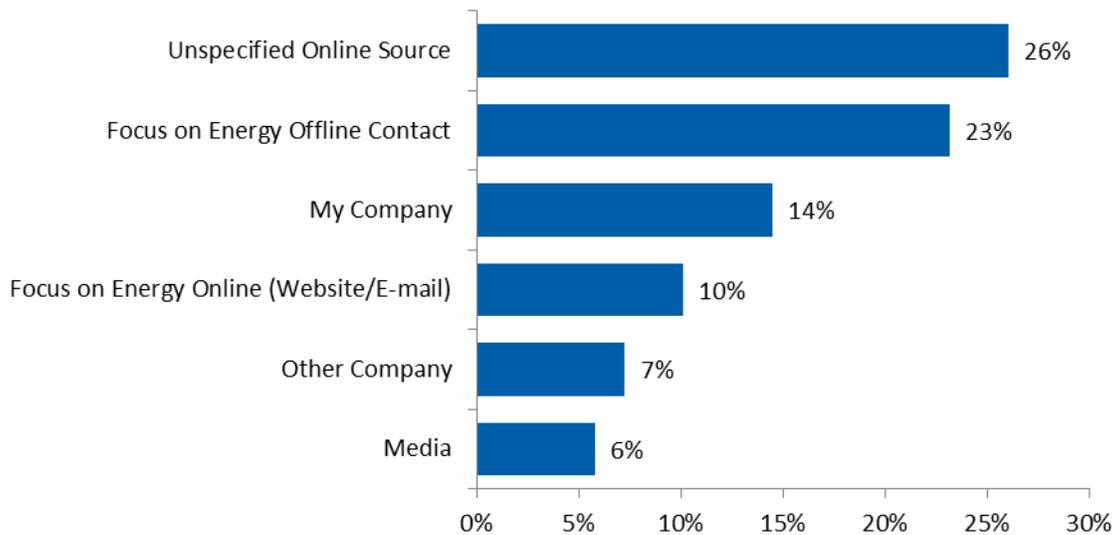
## Panel Study Survey Analysis

In addition to questions about equipment sales, the Evaluation Team investigated panel survey respondents' interactions with incentive and rebate programs by asking respondents to answer open-ended questions. A total of 69 respondents completed this section. While the general sales panel study only include 64 respondents, five additional respondents skipped the sales data sections and only completed the open-ended questions. The following figures show the most common response categories but omit responses such as "don't know." Additionally, figures will not include items coded as "other," but excerpts of these responses appear in Appendix C. Panel Survey Verbatim Responses. The second panel study, which focused on motors only, did not include any open-ended questions.

Generally, panel survey respondents reported that they were satisfied with their interactions with Focus on Energy and tended to find the programs easy to understand. Respondents complained about the complexity of the forms and requested that Focus on Energy expand the rebate offerings to include more products. Also, respondents cited that customers' lack of knowledge about the return on investment from upgrading equipment was the most common misunderstanding about efficiency.

Figure 3 shows how business owners and their customers learned about new rebate programs. Over half (66%) of the participants who attributed their awareness of new programs to an unspecified online source stated “e-mail” as their response. The participants did not identify if the e-mails were from Focus on Energy or from another source. Additionally, respondents identified Focus on Energy contact—phone calls, mail, flyers, and face-to-face contact—as the next most frequent source of information about new programs.

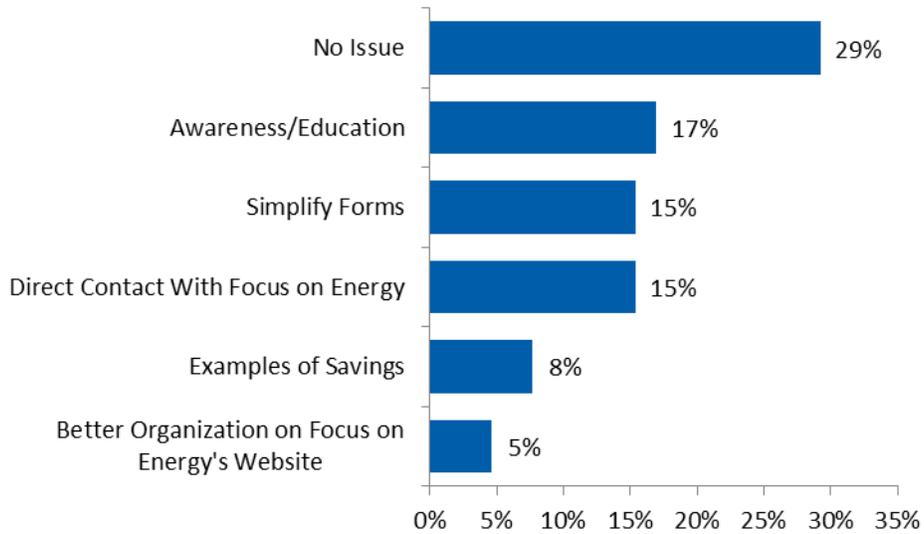
**Figure 3. How Respondents and Their Customers Learn About New Program Offerings**



Source: Focus on Energy CY 2013 Panel Study Survey: Q57. “What is the most common way for you, or your customers, to learn about new rebate and incentive offerings?” (n=69).

As shown in Figure 4, almost one-third (29%) of respondents reported no issues with their customers understanding various rebate programs (not limited to programs offered by Focus on Energy). Other respondents noted that improving awareness and general education about the available programs would make the programs easier to understand (17%). Next, respondents identified that simplifying rebate forms would lead to better program understanding (15%).

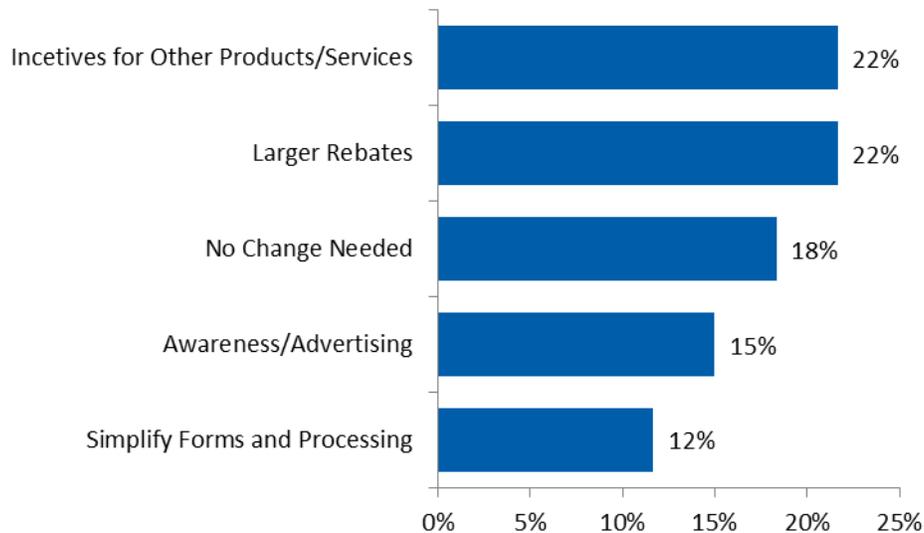
**Figure 4. How to Make Programs Easier to Understand**



Source: Focus on Energy CY 2013 Panel Study Survey: Q59. “How can these rebate and incentive offerings become easier for the customer to understand?” (n=65).

Respondents frequently noted that expanding rebates to other products (22%) or increasing the rebate levels (22%) would promote growth and efficiency (see Figure 5). Several respondents expressed concerns about changes to programs in CY 2013, which decreased rebates. For example, three respondents specifically commented on changes to rebates offered through the Small Business Program’s gold package (reducing the number of rebated bulbs from 80 to 30).

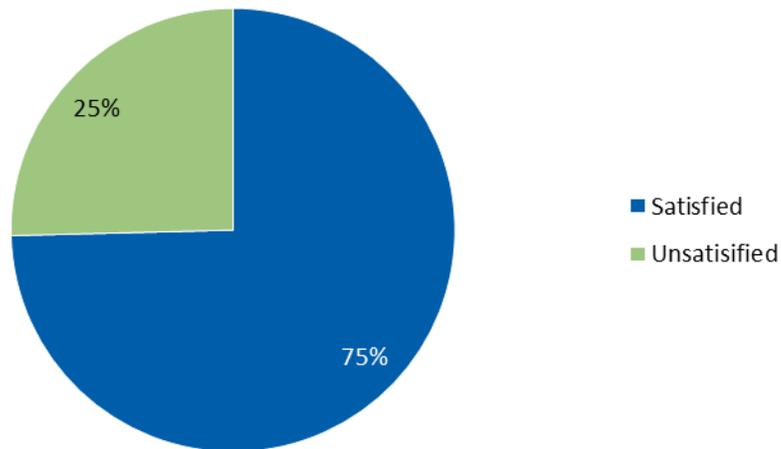
**Figure 5. Suggested Rebate Changes to Promote Growth and Efficiency**



Source: Focus on Energy CY 2013 Panel Study Survey: Q61. “Are there any changes that could be made to current energy-efficiency rebate offerings that could promote both growth and efficiency?” (n=60).

Figure 6 shows respondents' satisfaction with the rebate application process. For coding purposes, the Evaluation Team labeled all scores between 1 and 5 as "unsatisfied" and scores between 6 and 10 as "satisfied." The majority of respondents (75%) reported a satisfaction level of 6 or higher. Respondents answered a follow-up question about the source of their dissatisfaction if they rated their satisfaction as a 5 or less.

**Figure 6. Satisfaction With Rebate Application Process**



Source: Focus on Energy CY 2013 Panel Study Survey: Q63. "How satisfied are you with the current rebate application process?" The Evaluation Team used a rating scale of 1 to 10, with 1 being extremely unsatisfied and 10 being extremely satisfied. (n=63).

Table 47 shows the raw satisfaction scores.

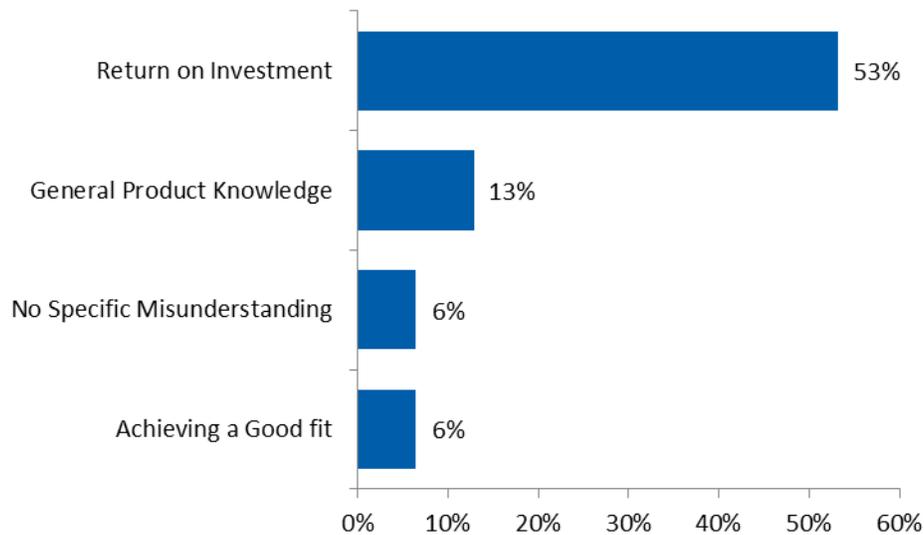
**Table 47. Raw Satisfaction Value for Rebate Application Process**

Satisfaction with Current Rebate Application Process	Frequency	Percentage
1	3	5%
2	1	2%
3	5	8%
4	1	2%
5	6	10%
6	7	11%
7	7	11%
8	21	33%
9	5	8%
10	7	11%
<b>Total</b>	<b>63</b>	<b>100%</b>

Of those who were unsatisfied (n=16), two respondents were mostly unaware of how the program worked or what it offered. Other respondents cited specific problems with Focus on Energy interactions (n=2), while some respondents wanted new programs or incentives for products not currently offered through Focus on Energy(n=4). Many of the issues were specific to the business itself, and no major theme emerged.

Respondents stated that a major misunderstanding their customers had about efficiency was “return on investment” (53%), and these respondents noted that many customers did not realize how much energy their current equipment was using (see Figure 7). In addition, some respondents coded under “return on investment” reported that customers focused more on the purchase price than the payout over time. Owners also reported that some customers had a general misunderstanding of how the product worked, which led to a fundamental misunderstanding about efficiency (13%).

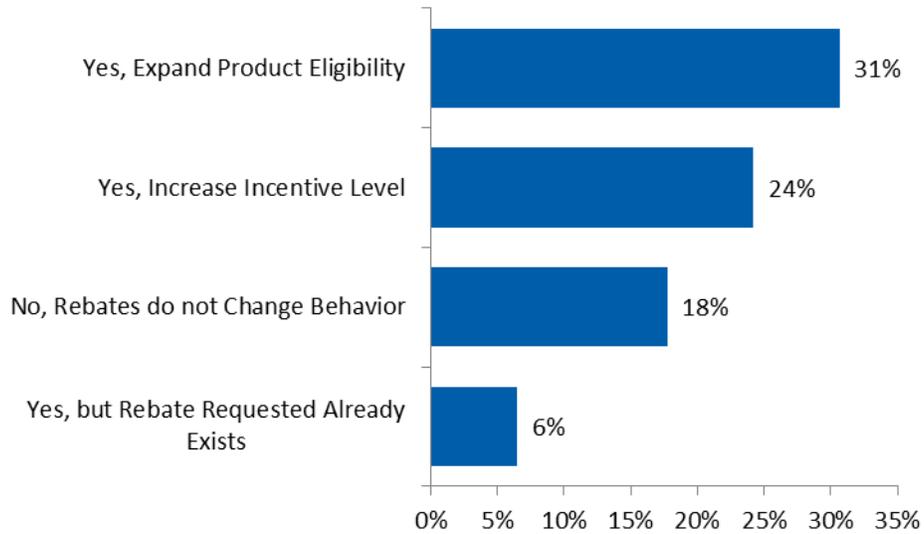
**Figure 7. Customer Misunderstandings About Efficiency**



Source: Focus on Energy CY 2013 Panel Study Survey: Q67. “What is the biggest misunderstanding your customers have about energy efficiency or energy usage?” (n=62).

As shown in Figure 8, most respondents reported that expanding product eligibility (31%) or increasing the incentive level for current products (24%) would lead customers to purchase more efficient measures. A few respondents said rebates have not been a motivating factor for their customers (18%). In other cases (6%) a respondent requested the creation of a new incentive for one of their products, however an incentive already existed.

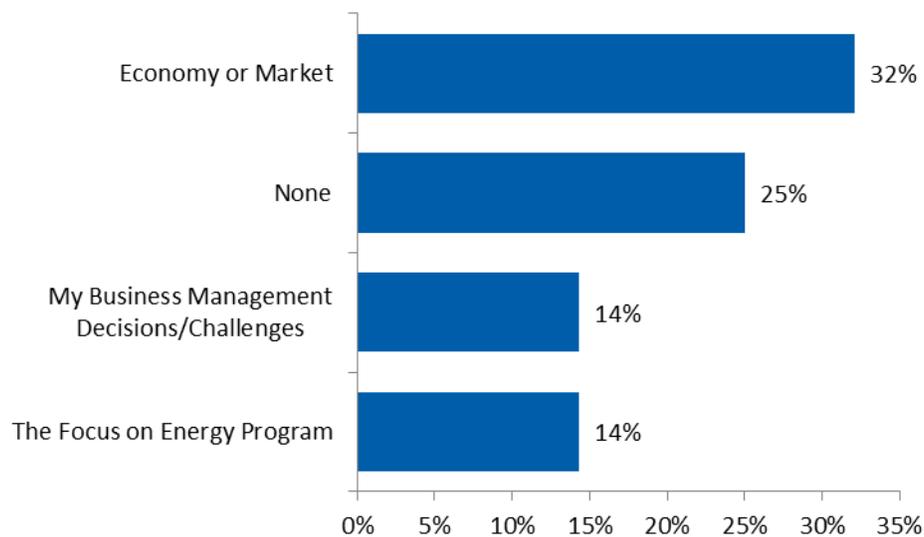
**Figure 8. Do Rebates Affect Whether Customers Buy Efficient Products**



Source: Focus on Energy CY 2013 Panel Study Survey: Q69. “Are there products that are highly efficient but consumers are not buying because no rebate is offered for these high efficient measures?” (n=62).

Most respondents attributed changes in business growth to economic factors and market effects such as competition, general market uncertainty, and the rate of new construction (see Figure 9). A small portion of respondents said their business management influenced growth (14%). For business management, respondents cited activities such as hiring new employees, budgeting concerns, treating their customers well, etc. For those who mentioned Focus on Energy specifically (14%), the statements were mixed. Some respondents noted they encountered issues when Focus on Energy rebates changed, while others noted an increase in demand for their product or services which they attributed directly to Focus on Energy.

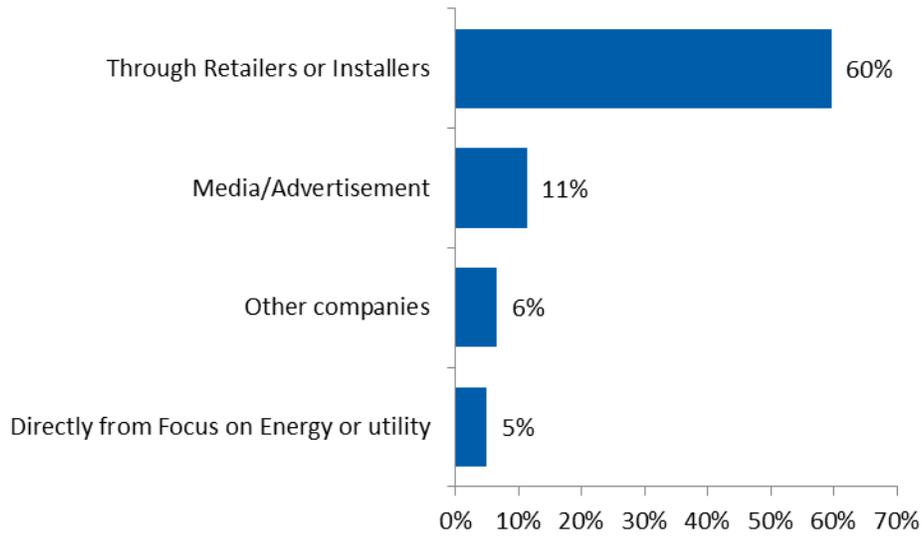
**Figure 9. Factors Affecting Company Growth**



Source: Focus on Energy CY 2013 Panel Study Survey: Q71. “Are there any other factors that alter your company's growth?” (n=56).

A majority of respondents (60%) noted that their company staff would inform customers of rebate programs. Other respondents reported that their customers had heard of programs through advertisements, typically a television advertisement.

**Figure 10. How Customers Learn About Rebates**



Source: Focus on Energy CY 2013 Panel Study Survey: Q77. “Of customers who have utilized a rebate program, what was the most common way they reported hearing about a rebate program?” (n=62).

## Appendix A. Other Research Questions and Future Research

### *Research Questions the Evaluation Team Did Not Pursue*

The Evaluation Team's updated memo to the PSC on the need for an energy-efficiency baseline study proposed that the baseline study would address market penetration, program net-to-gross (NTG) ratios, and market effects. After the first year of data gathering, the Evaluation Team will be able to use its findings to report on market penetration and calculate NTG ratios for certain measures. However, being able to effectively report on market effects will require a few more years of data gathering in order to accurately identify the sources of changes in the market.

### *Priorities for Future Research*

During the first year of this study, the Evaluation Team focused on refining methodologies to ensure valid results. For future investigations using similar methods, the Evaluation Team can focus more resources on recruitment and increasing the sample size of each portion of the baseline investigation. The Evaluation Team will continue to gather additional data on the same measures, and the scope will broaden to include other measures (such as VSD for more end uses and commercial HVAC systems)

If such data collection efforts are to continue in the future, the Evaluation Team will be able to compare market demand for efficient products over time. With this information, the Evaluation Team can begin to determine the market effects that are occurring in Wisconsin. The Evaluation Team can then combine information on market effects with net savings analysis to determine how the market has changed due to Focus on Energy programs.

**Appendix B. Nonresidential Site Visits**

**Site Visit Data**

Table 48 through Table 58 list summaries of the data collected on-site during the nonresidential site visits. Many of the measures observed during the site visits were unfortunately missing make and model information, which made it impractical to compare these results to the panel study, residential home audits, and a review of SPECTRUM data.

For Table 49 through Table 58, the “all nonresidential” category represents the combined average of both commercial and industrial categories.

**Table 48. Saturation by Measure**

End Use	Saturation	Fuel Share				n-Values
		Electric	Natural Gas	Fuel Oil	Other	
Lighting	100%	100%	0.0%	0.0%	0.0%	172
Space Heating	100%	6.3%	84.9%	0.7%	8.1%	116
Space Cooling	58.7%	100%	0.0%	0.0%	0.0%	177
Plug Load	100%	100%	0.0%	0.0%	0.0%	172
Refrigeration	30.2%	100%	0.0%	0.0%	0.0%	52
Cooking	16.3%	57.3%	42.7%	0.0%	0.0%	28
Water Heating	93.6%	55.9%	42.6%	0.5%	1.0%	161

**Table 49. Building Information**

End Use	Commercial	Industrial	All Nonresidential
Average Age	51.6	39.7	46.6
Average Occupants	156.5	56.2	114.5
Average Occupants (Nonbusiness)	16.7	5.4	12.0
Average Number of Floors	1.7	1.1	1.4

**Table 50. Saturation of Cooling Equipment in Buildings**

End Use	Commercial	Industrial	All Nonresidential
Packaged DX Unit	38.5%	54.8%	45.2%
Window/Wall Air Conditioning Unit	0.0%	0.0%	0.0%
Evaporative Cooling	0.0%	0.0%	0.0%
DX Split System	0.0%	0.0%	0.0%
Heat Pump (Cooling)	0.0%	0.0%	0.0%
Packaged Central Plant	21.2%	5.5%	14.7%
None	40.4%	39.7%	40.1%
n-Values	104	73	177

**Table 51. Saturation of Heating Equipment in Buildings**

End Use	Commercial	Industrial	All Nonresidential
Unit Heat	0%	0%	0%
Packaged Single-Zone	53.6%	83.0%	65.5%
Furnace	0%	0%	0%
Central Plant (Packaged Multizone/Boiler)	46.4%	17.0%	34.5%
Heat Pump (Heating)	0%	0%	0%
n-Values	69	47	116

**Table 52. Lighting System Technology Saturation**

Type	Commercial	Industrial	All Nonresidential
Incandescent	0%	0%	0%
Metal Halide	1.3%	2.1%	1.6%
High Pressure Sodium	0%	0.8%	0.3%
Mercury Vapor	0%	0%	0%
Neon (Cold Cathode)	0%	0%	0%
LED	0.5%	0.1%	0.3%
CFL	0.1%	0.1%	0.1%
Linear Fluorescent Total	98%	96.9%	97.6%
Other	0.1%	0.1%	0.1%
n-Values	75,995	59,079	135,074

**Table 53. Saturation of Refrigeration Equipment Type**

Type	Commercial	Industrial	All Nonresidential
Solid Door Refrigerator/Freezer	24.5%	33.3%	25.0%
Glass Door Refrigerator/Freezer	10.2%	0%	9.6%
Open Medium Temperature Display Case	2%	0%	1.9%
Open Low Temperature Display Case	0%	0%	0%
Display Case with Doors	2%	0%	1.9%
Walk-in Refrigerator	34.7%	33.3%	34.6%
Walk-in Freezer	26.5%	33.3%	26.9%
n-Values	49	3	52

**Table 54. Saturation of Equipment Type for Buildings With Water Heating**

Type	Commercial	Industrial	All Nonresidential
Heat Pump	0%	1.5%	0.6%
Heat Recovery	0%	0%	0%
Instantaneous (Tankless)	5.2%	7.7%	6.2%
Self-Contained	75%	78.5%	76.4%
Storage Tank (Central Boiler)	17.7%	12.3%	15.5%
Other	2.1%	0%	1.2%
n-Values	96	65	161

**Table 55. Saturation of Electric Cooking Equipment in Buildings With Installed Cooking Equipment**

Type	Commercial	Industrial	All Nonresidential
Convection Oven	69.2%	50%	64.3%
Conventional Oven	38.5%	50%	35.7%
Range	65.4%	50%	60.7%
Fryer	38.5%	0%	35.7%
Hot Food (warming oven)	50%	50%	46%
Steam Cooker	34.6%	50%	32%
Griddle	38.5%	50%	36%
Pizza Oven	7.7%	0%	7%
Warming Table	46.2%	0%	43%
Heat Lamp	34.6%	0%	32%
Soup Pot	26.9%	0%	25%
Continuous Toaster	7.7%	50%	7%
Microwave	84.6%	50%	79%
n-Values	26	2	28

**Table 56. Average Number of Plug Load Equipment per Premise**

Type	Commercial	Industrial	All Nonresidential
Air Purifiers	2.3	1.5	2.1
All-in-One (printer, copier, scanner, fax)	3.6	2.4	3.1
Beverage Machines	3.4	2.3	2.9
Coffee Makers	4.2	2.3	3.4
Fax Machines	1.4	1.3	1.4
Laptops	48.9	11.1	32.8
Microwave	10.3	3.3	7.3
Paper Shredder	2.0	1.9	1.9
Computers	48.4	20.9	37.3
Photocopiers	2.3	1.3	1.9
Printers	8.9	3.3	6.6
Residential Style Refrigerators	9.7	1.8	6.2
Scanners	1.9	1.1	1.6
Secondary Monitors	56.1	8.2	32.9
Security Cameras	8.9	7.4	8.5
Servers	3.1	1.5	2.5
Snack Machine	4.1	2.6	3.5
Space Heaters	2.0	4.3	3.2
TVs	6.9	1.1	5.0
Water Coolers	2.8	1.8	2.4
Other	2.2	1.7	1.9
n-values	842	614	1,456

**Table 57. Motor Service Type Distribution**

Type	Commercial	Industrial	All Nonresidential
Pump	87.3%	66.2%	77.5%
Fan/Blower	1.8%	5.4%	3.5%
Material Handling/Conveyor	4.2%	4.1%	4.1%
Machine Tool	2.6%	15.9%	8.8%
Grinding/Milling	1.0%	6.8%	3.7%
Escalator	0%	0%	0%
Passenger Elevator	1.1%	0%	0.6%
Freight Elevator	0%	0%	0%
Separation	0%	0%	0%
Other	1.9%	1.7%	1.8%

**Table 58. Motor Control Distribution**

Type	Commercial	Industrial	All Nonresidential
Throttled	6.5%	18.2%	15%
Mechanical VSD	9.7%	6.7%	7.5%
Electronic VSD	29%	18.2%	21.1%
Constant Speed	54.8%	57%	56.4%
Two Speed	0%	0%	0%

## Appendix C. Panel Survey Verbatim Responses

### Verbatim Responses by Question and Code

The questions and answers in this section are examples of verbatim responses from the panel study. The Evaluation Team organized the responses by question, and by category within that question, and then coded the responses based on the first statement made. For example, if a respondent said he or she heard about Focus on Energy through both its website and a radio ad, the Evaluation Team placed the response in the “Focus on Energy Website” category. Lower case “n” means the population of respondents. The Evaluation Team also fixed any spelling errors and filled in missing words in brackets if needed for clarity.

The Evaluation Team redacted any personal identifying information from this section and, where necessary, replaced in brackets. For example, if an owner stated his or her store’s name, the comment is replaced by [my store]. A copy of the full unedited remarks is available upon request, but note that this report does not include any personal identifying statements.

### *Q57. What is the most common way for you, or you customers, to learn about new rebate and incentive offerings? (n=69)*

#### **Focus on Energy Offline Contact (n=16)**

- “The best thing we have ever had is our Focus on Energy agent [who] used to stop in once a month and gave us the rebate forms. When [the forms] were displayed that is when they were used the most. We used to have someone come by once a month and they would update our products with an ENERGY STAR photo. But this has slowly died over the years. Haven't seen a rep in two years. But most customers come in knowing about rebates. We normally don't present the rebates at the product. When the forms were there, 50% to 60% took advantage and that was good for us too. Now [we] only get less than 10% of sales using a rebate. [Our supplier’s website] is pretty good at telling us what Focus on Energy rebates are available. We take every customer over to our computer—but have to go searching for it. To get the form, have to go searching through the website. It was much easier when we had forms to hand to the customer at the store.”
- “I talk to the Focus on Energy rep maybe about once a year. He stays pretty quiet. There isn't a lot of communication and I'm not told about upcoming offers. They used to put on a luncheon and they would go over everything with the contractors. They would tell us about new rebates and how to navigate the website. That was really helpful but the last time that happened was about two years ago. I think it would be helpful to do this again. It's hard to find the rebate forms on line; you have to click through so many pages. Last time I just called the rep to get the rebate form and he e-mailed it to me. I don't really know too much about what is available in terms of rebates. There are probably other rebates out there that I don't know about.”
- “Through the Small Business Program and my contacts at [my local utility].”

## Focus on Energy Online (n=7)

- “I check the website for current rebates.”
- “E-mail from Focus on Energy.”

## Unspecified Online Source (n=18)

- “E-mails works well, but would be great if it was short and precise.”
- “Online.”

## Media/Advertisement (n=4)

- “TV, radio, newspaper.”
- “Advertisement.”

## My Company (n=10)

- “I do all of the rebates and keep everything current for our company. I locate all rebates online and post them to our intrasite for everyone to see.”
- “E-mail for us; our [customers] learn through our technician or office staff.”

## Other Company (n=5)

- “E-mail from [my supplier], or ‘green’ websites.”
- “[My suppliers] sends me posters and rebate forms.”

## Other (n=9)

- “Focus on Energy does [a lot] of marketing but does not reach everyone; consumers need to reach out and work to find out information. All the [answers] are right in front of you and Focus on Energy is willing to help share their product.”
- “[My company] has been involved in this program since 2006. We know and update the Food Service Incentive part on an ongoing basis. We share information with sales staff and customers. We mention the incentives and energy savings when quoting equipment.”
- “[There] is no Focus [representative]. There used to be one that came around in the past through ENERGY STAR but it wasn't Focus. Maybe it was through the electric company. Just a few people have asked me about the Focus program where they remove an old refrigerator. Just a small percent of customers are aware of this.”

*Q59. How can these rebate and incentive offerings become easier for the customer to understand? (n=65)*

**No issue (n=19)**

- “We have had very good luck with our customers understanding the program.”
- “Already easy enough.”

**Direct contact with Focus on Energy (n=10)**

- “Most factory reps of HVAC equipment are unaware of rebate programs. More contact with Focus on Energy is needed.”
- “Just keep having a presence in the market place. Continue to do trade shows, and maybe advertise in related publications. Continue to support those Trade Ally's that support Focus on Energy. It's difficult for [the] end user to understand unless they invest the time, or are [working] with a dealer that knows the program.”
- “I would like to have a rep that would call or come out on a regular basis. The phone would be the easiest. It would be nice to know about the programs and have some signage in our store too.”

**Simplify forms (n=10)**

- “The forms are intimidating. If you could simplify the forms down into a more functional process, I believe it would be easier, and people would be more apt to use them. Could they be broken down into simpler categories?”
- “Easy to read forms [and with] clearer terms and conditions.”
- “Simplify and standardize the offerings. Have the rebate applications sorted by section per CSI division of work,<sup>9</sup> so that lighting, HVAC, and plumbing are separate sections with a shared cover with the client's general information. No need to print or submit volumes of blank pages.”

**Better organization of the Focus on Energy Website (n=3)**

- “You should group all the applications in one area and have subfolders for each rebate category.”

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<sup>9</sup> The Evaluation Team assumes the respondent is referring to the Construction Specification Institution. <http://www.csinet.org/>.

**Awareness/education (n=13)**

- “Education of the trade allies is important considering trade allies are the ones who are really pushing the Focus on Energy product. Most of the offerings are pretty clear, the trade allies just need to understand how to make it work for the end user.”
- “Publish rebates in local newspapers.”
- “Online webinars.”

**Other (n=10)**

- “Not have so many restrictions. Offer rebates for saving energy not only if you use a certain product.”
- “Examples always help, [have] easier ways to redeem incentives, have incentives go directly to installers to show consumers immediate savings.”

**Q61. Are there any changes that could be made to current energy efficiency rebate offerings that could promote both growth and efficiency? (n=60)**

**Incentives for other products or services (n=13)**

- “I think if there was a rebate for an extra \$100 on front loaders—that just the independent dealers would get—that would really stimulate the economy from higher ticket prices.”
- “In the past, I could sell an air conditioner simply by the rating it was labeled with. This made it very easy to sell the air conditioner with a rebate. Now all air conditioner's ratings are only applicable when sold with a corresponding furnace. This pretty much ended my getting rebates because I usually sell one or the other, and not both a furnace and an air conditioner, plus the economy has limited the amount of business I do. Even people who would consider buying the applicable pair (furnace and air) in order to get the rebate [could be] asked if they could buy one now and the other later; but as I read the incentive requirements, they need [to purchase] both at once. Also, navigating the site to find an AHRI number is a chore to say the least; sometimes it's more like a nightmare.”

**Simplify forms and processing (n=7)**

- “It would be nice if the incentives were out in three to four weeks. Some do not want to wait six to eight weeks.”
- “Less paperwork, hassle. Easier qualified product lists.”

**Larger rebates (n=13)**

- “A higher dollar value on rebates.”
- “Instant rebates at the small dealer level, not just the big box for residential, as well as incentive programs for large ticket residential items.”

**No change needed (n=11)**

- “I think it is pretty straightforward”
- “I believe the current system is working fine.”

**Awareness/Advertising (n=9)**

- “If you spend more on ads to get the word out more. Increasing the rebate will of course help to stimulate sales.”

**Other (n=7)**

- “Every Focus on Energy program should operate the same; even with different incentive values, the applications through the final submittal should all be the same.”
- “Get Focus personal who know what they are talking about and provide clear information.”

**Don't Know (n=3)**

- “I have never seen any energy rebate offers.”

*Q65. You noted your satisfaction with the rebate application process was five or less - why? What could be changed or improved? (Only asked of those who rated satisfaction five or lower on Q63) (n=16)*

**No categories were made for this section due to the small size and the variance in answers.**

- “I do not know much about the process. I have only applied twice myself. It is hit or miss because I do not know all the offerings.”
- “I used to do 150 Focus rebates per year. Now less than 10. I have complained and no one listens. I give up.”
- “More [communication] with stores.”
- “Bring back the steam trap incentive from 2009 and 2010. It's good for the end user, the [trade] ally's, and the program. The current incentive isn't very good.”
- “[More incentives] are needed for HVAC...”
- “I currently have no info on what rebates are available for the products we promote and sell.”
- “We [appreciate] the rebate but would like to have the forms in our hands. That would be much easier and lead to more using the rebates.”
- “Still a lot of paperwork and time investment required for something that could be simpler.”
- “Get rid of the DLC list.<sup>10</sup> Less fine print.”
- “[The] time to receive rebate is very long after rebate form is submitted.”
- “Forms are confusing, busy, etc.”
- “The Business Incentive Program and small business programs are easy to understand. The other programs are too complicated. You don't know who to talk to and if you do they don't seem to have the info you need.”
- “Focus is a pain to deal with. Nothing gets done in a [timely] manner.”
- “It's difficult to navigate the website to find the forms and the forms require more information than what can be found with the product; some consumers become intimidated by the form.”
- “Some of the instructions are unclear and there are also [products] that do not qualify that should.”
- “When I have [used] the rebate process in the past, where the customer receives the incentive money at the end of the project, there always seems to be a problem. Once [a problem occurs] it is hard to find [someone] to take responsibility and help iron out the problems. I would love it

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<sup>10</sup> The Evaluation Team assumes the respondent is referring to the DesignLight Consortium.  
<http://www.designlights.org/>.

if each application had a reference number you could track to let your customer know what process the incentive is in or that it even exists.”

**Q67. What is the biggest misunderstanding your customers have about energy efficiency or energy usage? (n=62)**

**Return on investment (n=33)**

- “That the cost of an electric motor is nothing compared to cost of running it, or starting it.”
- “My customers are aware, but they have difficulty calculating savings. The term ‘watt hours’ does not mean much to them.”
- “[Not] understanding first cost versus the payback over a period of time.”
- “Many customers can't see the forest from the trees. They are concerned about the upfront cost of purchasing equipment. Some just don't want to believe that spending more upfront will bring a payback over time that makes the dollar difference not even a factor. Even after showing some people the cost [benefits] and payback, they just won't part with upfront dollars.”

**Achieving a good fit (n=4)**

- “Most of my customers are confused by the amount of light they feel that they need. In my experiences, I see people overloading their store fronts, showrooms, [etc.,] with too much light! The majority seem to feel that LED means everything is going to be brighter. The key is finding the perfect amount of lumens to satisfy the desired result while using less energy.”
- “Not sure. Perhaps some think bigger is better when it comes to air conditioners. But I tell them theoretically, if sized exactly right, it would not shut off on the hottest day, and an oversized unit would cool you down fast but cycle on and off more, which is harder on the unit, uses more energy, and does less [dehumidification].”

**General product knowledge (n=8)**

- “[Customers] believe because things are more energy efficient that the products do not last as long now.”
- “[Customers believe] that the biggest cost in lighting is not the equipment, but the electricity.”

**No specific misunderstanding (n=4)**

- “Is it too good to be true? This is an area where the Focus on Energy team has been very valuable in confirming documentation.”
- “We do not have many misunderstandings.”

**Q71. Are there products that are highly efficient but consumers are not buying because no rebate is offered for these high efficient measures? (n=62)**

**Yes, expand product eligibility (n=19)**

- “Variable frequency drives in some applications.”
- “The high end products could use a boost with rebates!”

**Yes, increase incentive level (n=15).**

- “A better rebate for LED retrofit kits for 2x4 fluorescent will bring the return on investment down to entice smaller businesses.”
- “Renewable energy solutions (geothermal, solar thermal, solar photovoltaic) are lacking the proper incentives to encourage consumers to opt into them. Rebates should also increase.”

**Yes, but rebate requested already exists (n=4)**

- “Standard T8s.”
- “LEDs.”

**No, rebates don’t change behavior (n=11)**

- “[No]. [Even] with a rebate the price doesn't offset the additional cost of [buying] more efficient.”
- “Not that I know of.”

**Other (n=13)**

- “There are many products that are efficient but fall under the custom incentive grants. More incentives are needed to make system assessments and to use that data to make systems more efficient.”
- “99% of customers are interested in price. Not energy efficiency.”

**Don’t know (n=2)**

- “Not sure.”

**Q73: Are there any other factors that alter your company's growth? (n=56)****Economy or market (n=18)**

- “The economy, credit markets, project funding, competition, missed opportunities, etc.”
- “Big box junk clouding the efficiency of the quality product market place.”
- “Economy and competition.”
- “The economy is brutal right now.”

**The Focus on Energy Program (n=8)**

- “The changing of the program is difficult.”
- “Focus is an important but small part of my business.”
- “Could use a better partnership with Focus.”

**None (n=14)**

- “None that I can think of

**My business management decisions/challenges (n=8)**

- “Cost of being in business is high (health insurance, taxes, etc.) prevents me from investing or hiring as much as I'd like.”
- “I think credibility in standing behind in our products are key. We have very good repeat customer sales [at] (different locations, etc.).”

**Other (n=8)**

- “The uncertainty of the year to year deadlines.”
- “Development of new products.”
- “Misleading information from manufacturers.”

**Don't know (n=1)**

- “N/A.”

**Q75. What sort of energy-efficiency programs could improve your company's growth the most? (n=60)**

**Larger rebates (n=15)**

- “Provide greater incentives for LED fixtures and lamps.”
- “More incentives.”

**Specifically a product I offer (n=24)**

- “Electric motor rebates for 3-phase and single-phase motors. Variable frequency drive rebates for [non-pump] and fan applications.”
- “I feel one area we are missing the boat is the residential market for lighting upgrades. Any lighting rebates geared towards the residential market would help increase our growth.”
- “Steam trap/steam system assessments.”

**Awareness/marketing (n=5)**

- “Probably direct mailings with case studies and [explanations] of the programs offered.”
- “Combination of education and simple rebates.”

**None (n=6)**

- “The programs that are out there are working well for our company, and the updated information coming is nice to understand.”
- “I love the Small Business Program; it makes my clients believe that I am helping them, not selling to them.”

**Other (n=10)**

- “[If] I received pay for promoting Focus on Energy programs.”
- “More programs like Small Business Program for other customers.”

**Don't know (n=1)**

- “I'm not sure.”

*Q77. Of customers who have utilized a rebate program, what was the most common way they reported hearing about a rebate program?*

**Directly from Focus on Energy or Utility (n=3)**

- “Visits from a Focus rep.”

**My company (n=37)**

- “[From] me when we talk about replacing equipment.”
- “[Usually] first hear about it from our sales staff.”

**Other companies (n=4)**

- “Program ally.”
- “Through the installing contractor. Many of our customers (contractors) do residential installations also. They are more aware of rebate programs.”

**Media/advertisement (n=7)**

- “Most of the time, [it’s] from a store display or advertisement.”
- “Advertising or field professionals.”

**No customers used a rebate (n=3)**

- “I have never had anyone use a rebate program.”

**Other (n=8)**

- “Most are familiar with Focus, but depend on [my company] to provide actual current incentive values.”

**Don’t know (n=3)**

- “I do not know.”

**Appendix D. Data Sources and Number of Observations**

Table 59. shows the number of sales, models, for each measure as well as the number of respondents reporting on each measure. Table 60. shows the number of observations of measure in the Nonresidential site visits, and Table 61. shows the number of data points used from the implementer database.

**Table 59. CY 2013 Panel Study Sales and Installations of Residential Measures**

Measure	Units Sold in CY 2013	Number of Models	Number of Respondents
Showerhead	531	15	12
Aerator	1,947	14	12
Clothes Washer	1,450	72	13
Refrigerator	514	116	10
Dishwasher	565	61	11
Furnace	626	52	11
Water Heater	122	25	10
ECM Retrofit <sup>1</sup>	1,508	19	9
Compressor and Condenser Fan Motor	195	28	8
Attic Insulation Projects <sup>2</sup>	103	N/A	5
Wall Insulation Proects <sup>2</sup>	172	N/A	2
Occupancy Sensors	4,385	77	22
Lighting (Bulb/Fixture)	113,741	352	33
<b>Totals</b>	<b>125,859</b>	<b>833</b>	<b>78<sup>3</sup></b>

<sup>1</sup>ECM retrofits for walk-in coolers, walk-in freezers, and reach-in coolers.

<sup>2</sup>The Evaluation Team collected data for insulation but did not list the specific makes and models.

<sup>3</sup>Most respondents reported sales in more than one category, thus, the total number of respondents appears to exceed 78.

**Table 60. Nonresidential Site Visit Measures**

Measure	Number of Observations
Water Heater	173
Boiler	44
Air Compressor	172
Nonresidential Lighting	139,713
Occupancy Sensor	563
<b>Total</b>	<b>140,102</b>

**Table 61. Home Audit Observations**

Measure	Number of Observations
Showerhead	1,050
Aerator	2,154
Furnace	2,494
Attic Insulation Projects	2,395
Exterior Wall Insulation Projects	1,694
Light Bulbs	5,604
<b>Total</b>	<b>15,391</b>

**Appendix E. Measures by Efficiency Level**

The following tables show measures by their efficiency level. These tables list more granular detail of the efficiency levels reviewed in this study, showing the quantities of measures sold at each efficiency level within the residential and nonresidential segments. Not all measures had additional efficiency information (such as refrigerators and dishwashers) and were only categorized as ENERGY STAR certified or non-ENERGY STAR certified.

**Table 62. Showerhead Sales by GPM**

Showerhead GPM	Residential		Nonresidential	
	Quantity Sold	Percentage	Quantity Sold	Percentage
1.5	12	68%	300	22%
2	36	27%	120	67%
2.5	6	5%	24	11%
<b>Total</b>	<b>54</b>	<b>100%</b>	<b>444</b>	<b>100%</b>

**Table 63. Aerator Sales by GPM**

Aerator GPM	Residential		Nonresidential	
	Quantity Sold	Percentage	Quantity Sold	Percentage
0.5	-	-	40	2%
1.5	-	-	718	37%
2.2	29	100%	1,160	60%
<b>Total</b>	<b>29</b>	<b>100%</b>	<b>1,918</b>	<b>100%</b>

**Table 64. Clothes Washers by CEE Tiers**

Clothes Washer CEE Tier	Quantity Sold	Percentage
0	16	1%
1	696	48%
2	33	2%
3	705	49%
<b>Total</b>	<b>1,450</b>	<b>100%</b>

**Table 65. Furnaces by Efficiency**

Furnaces by AFUE	Quantity Sold	Percentage
0.92	70	11%
0.95	113	21%
0.96	303	47%
0.97	140	22%
<b>Total</b>	<b>626</b>	<b>100%</b>

**Table 66. Attic Insulation Projects by R-Value**

Insulation by R-value	Quantity Sold	Percentage
50	187	75%

**Table 67. Exterior Wall Insulation Projects by R-Value**

Insulation by R-value	Quantity Sold	Percentage
13	40	60%
21	95	15%
38	24	25%
<b>Total</b>	<b>159</b>	<b>100%</b>

**Table 68. Gas Water Heaters Sales by Energy Factor**

Water Heater by Energy Factor	Quantity Sold	Percentage
0.58	19	25%
0.59	14	18%
0.61	1	1%
0.62	2	3%
0.63	16	21%
0.64	5	7%
0.70	8	11%
0.76	10	13%
0.96	1	1%
<b>Total</b>	<b>76</b>	<b>100%</b>

**Table 69. Electric Water Heaters Sales by Energy Factors**

Water Heater by Energy Factor	Quantity Sold	Percentage
0.90	6	27%
0.91	1	5%
0.92	11	50%
2.40	4	18%
<b>Total</b>	<b>22</b>	<b>100%</b>

**Table 70. Gas Hybrid Space Heating Water Heaters Sales by Energy Factors**

Water Heater by Energy Factor	Quantity Sold	Percentage
0.96	4	100%

**Table 71. Electric Hybrid Space Heating Water Heaters Sales by Energy Factors**

Water Heater by Energy Factor	Quantity Sold	Percentage
2.33	4	100%

**Table 72. Lighting Control Sales by Type**

Lighting Control Type	Quantity Sold	Percentage
Occupancy Sensor	4,389	100%
Daylight Sensor	125	3%
Timer	272	6%
<b>Total</b>	<b>4,786</b>	<b>100%</b>

**Appendix F. Water Heaters Additional Information**

Both residential and commercial water heaters have additional information that was not included in the baseline report. The purpose of the additional information is to give additional insight that was unique to these measures. For residential water heaters, Table 73 and Table 74 provide a comparison of the expected national distribution, the panel sales observations, and installations that occurred through Focus on Energy programs. Additionally, the distributions comparisons are shown in Figure 11 (natural gas water heaters) and Figure 12 (electric water heaters). Table 75 shows commercial water heater units by age. Since many units are replaced on failure, age information can give insights to replacement needs in the future.

**Table 73. Residential Gas Water Heater Distributions by EF**

Energy Factor	Expected National Distribution	Panel Distribution <sup>1</sup>	Program Distribution <sup>2</sup>
≤0.59	64%	43%	0.4%
0.60 to 0.62	23%	4%	0.2%
0.63	2%	21%	0.1%
0.64	5%	7%	0.4%
0.65 to 0.66	0%	0%	0.6%
0.67 to 0.76	5%	24%	98.0%
≥0.77	1%	1%	0.4%
Total	100%	100%	100%

<sup>1</sup>Percentage based on sales of 76 water heaters reported during the panel study.

<sup>2</sup>Percentage based on 857 water heaters rebates recorded in SPECTRUM.

Figure 11. Residential Gas Water Heater Distributions by EF

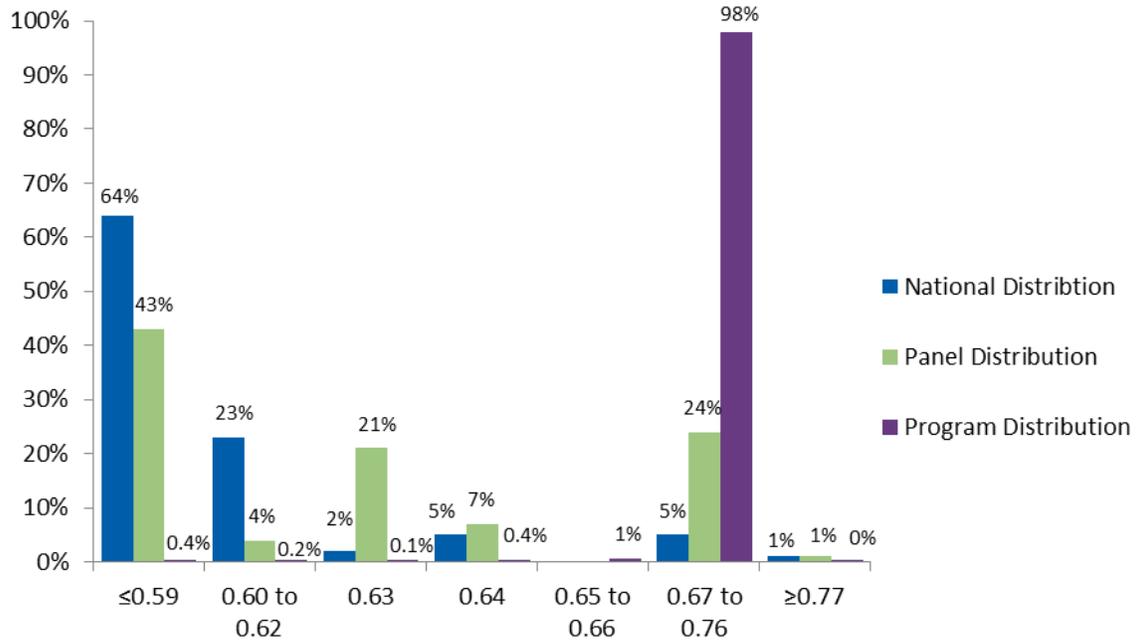


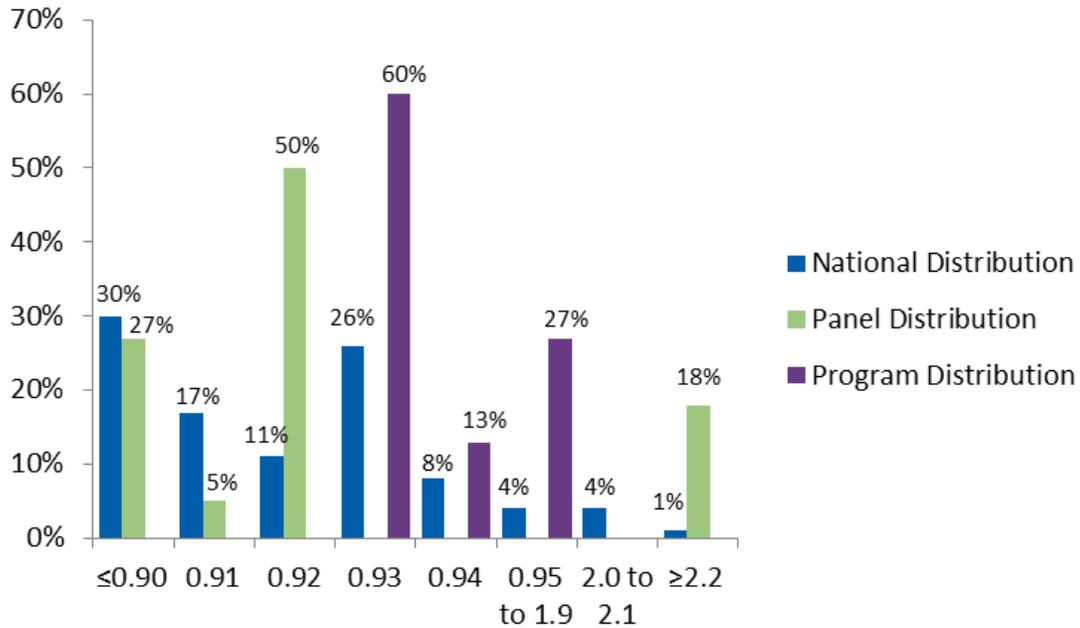
Table 74. Residential Electric Water Heater Distributions by EF

Energy Factor	Expected National Distribution	Panel Distribution <sup>1</sup>	Program Distribution <sup>2</sup>
≤0.90	30%	27%	0%
0.91	17%	5%	0%
0.92	11%	50%	0%
0.93	26%	0%	60%
0.94	8%	0%	13%
0.95 to less than 1.9	4%	0%	27%
2.0 to 2.1	4%	0%	0%
≥2.2	1%	18%	0%
Total	100%	100%	100%

<sup>1</sup>Percentage based on sales of 22 water heaters sales reported during the panel study.

<sup>2</sup>Percentage based on 15 water heaters rebates recorded in SPECTRUM.

**Figure 12. Residential Electric Water Heater Distributions by EF**



**Table 75. Average Age of Water Heater by Type**

Water Heater Type	Average Age	Number Installed
Storage Water Heater, High Usage, Electric	14	88
Tankless Water Heater, High Usage, Electric	1	7
Storage Water Heater, High Usage, Electric Heat Pump	11	1
Storage Water Heater, High Usage, Natural Gas	3	67
Tankless Water Heater, High Usage, Natural Gas	15	4
Storage Water Heater, High Usage, Oil	13	1
Storage Water Heater, High Usage, Propane	9	2
Storage Water Heater, High Usage, Other	16	7
<b>All Water Heaters Measures</b>	<b>9</b>	<b>177</b>