State of Wisconsin Public Service Commission of Wisconsin

Focus on Energy Evaluation

Business Programs: Incremental Cost Study

Final Report: October 28, 2009

Evaluation Contractor: PA Consulting Group Inc.

Prepared by: Miriam L. Goldberg, KEMA
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The power is within you.

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1. EXECUTIVE SUMMARY

1.1 BACKGROUND AND STUDY GOALS

Focus on Energy program tracking and evaluation place substantial emphasis on the energy and demand savings achieved. At the same time, program planning and benefit cost analysis also require solid estimates of the incremental costs associated with implementing the savings measures. While the difference in energy use with versus without the measure is tracked by the program, the incremental cost is not.

The purpose of this study was to provide incremental cost estimates for Focus Business Programs. This information will be used in the upcoming benefit cost analysis as well as for use in future program design. The work was led by KEMA, Inc. as the evaluator of the Business Program, with assistance from WECC, as program implementer, on study design and data collection.

Over time, WECC had collected some cost data for CFLs, boiler service, ventilation, and HVLS fans. The sources of these data are not cited in the spreadsheets provided. In addition, costs for some projects were captured in the WATTS and WISEERTS databases. Some of these cost data have high variability with standard deviations three or four times the mean cost. Given the high variability in cost data and the lack of specific sources for data, WECC wanted to find incremental costs that were more defensible. In addition, the need for better incremental cost estimates was demonstrated during the FY08 program planning process. Through this study, we hoped to improve upon this existing base of cost information.

We surveyed market players on pricing for various measures, and analyzed the costs of past custom engineering projects. The market players included distributors, supply houses, and contractors. We also research secondary sources to find pricing data to supplement the survey data. In addition, we looked for areas of strength and weakness within the Focus on Energy program from the perspective of market players.

The primary goal of this study was to estimate incremental costs for deemed measures. The secondary goal was to estimate incremental costs for custom measures to the extent practical. Deemed measures are defined as measures with prescriptive incentives and deemed savings. Custom measures are defined as measures with custom incentives and custom savings calculations. The program also includes hybrid measure types. Hybrid measures are defined as measures with prescriptive incentives and custom savings calculations. We provide estimation approaches for hybrid measures based on the custom and prescriptive findings.

1.2 INCREMENTAL COSTS FOR DEEMED MEASURES.

The primary goal of this study was to estimate incremental costs for currently deemed measures. It was not practical to address every individual measure. We successfully estimated incremental costs for currently deemed measures accounting for the large majority of deemed savings.

To obtain Wisconsin specific incremental cost data, we surveyed market players in the state. We attempted to collect pricing data for measures in the following technology categories:

lighting, HVAC, boilers, motors and drives, vending machines and controls, food service equipment, refrigeration equipment, and agricultural ventilation fans.

The survey responses provided adequate data for analysis for most lighting measures. The survey also provided adequate data for analysis for steam traps for pressures less than 50 psig.[1]

The survey responses provided inadequate data for analysis in the remaining categories. We gathered additional pricing data from secondary sources for HVAC, boilers, vending machines and controls, food service equipment and some lighting equipment.

From the available survey and secondary data, we estimated incremental pricing, simple paybacks (based on avoided cost of generation), and incremental cost per unit savings. The simple paybacks and incremental cost per unit savings results can be used to estimate incremental costs for similar measures currently lacking incremental costs. Table 1-1 shows a summary of which incremental costs (IC) we estimated through this study and the associated percent of deemed savings magnitude, by technology category.

Table 1-1. Summary of Deemed Measure Categories with Incremental Costs Estimated

Technology Category	Percent of Deemed Savings			IC Estimate
	kW	kWh	therm	
Ag Fans	1.5%	1.4%	0.0%	None
Boilers & Burners (Total of Included Measures)	0.0%	0.0%	96.8%	**Some**
Boilers	0.0%	0.0%	4.2%	None
Steam Traps	0.0%	0.0%	50.1%	**All < 125 psig**
Tune up	0.0%	0.0%	42.6%	None
Food Service	0.2%	0.3%	1.7%	**Some**
HVAC (Total of Included Measures)	3.3%	0.9%	1.3%	**Some**
Furnace	0.0%	0.0%	0.2%	**Most**
PTAC	0.1%	0.0%	0.0%	**All**
PTHP	0.1%	0.4%	0.0%	**All**
RTU	2.9%	0.4%	1.0%	None
Split System	0.2%	0.0%	0.0%	None
Lighting	94.3%	95.8%	0.0%	**Most**
Motors	0.4%	0.6%	0.0%	None
Refrigeration	0.0%	0.5%	0.0%	None
Vending, Plug Loads	0.1%	0.3%	0.0%	**Some**
Total	**99.9%**	**99.8%**	**99.8%**	
Total with Incremental Costs Estimated	**94.8%**	**96.9%**	**52.0%**	

Note: In this study, we did not try to estimate incremental costs for all possible measures. Measures not included in the study are associated with 0.1 to 0.2 percent of deemed savings.

As illustrated in the table, we estimated incremental costs at the technology code level for measures associated with over 94 percent of deemed kW and kWh savings and over 50

[1] To estimate incremental costs for all steam traps under 125 psig, we supplemented the survey data with data from Grainger.

percent of deemed therm savings. Tables providing these incremental costs are included in the main report. Conversely, we were unable to estimate incremental costs for three of the technology categories (ag fans, motors, and refrigeration) and for several other subcategories.

Budget and other considerations limited the scope of this project. Additionally, some cost data were unavailable for some deemed measures (e.g., LED Reach-In Refrigerator Case Lighting). We calculated ratios of mean incremental cost to unit of savings[2] (i.e., kW and kWh) based on measures for which we had estimated incremental costs. These ratios can be used as a check against the program's existing incremental costs for measures that were not verified through this study. A low ratio can indicate low incremental cost or high savings. Table 1-2 shows ratios for lighting end use, some specific subcategories of lighting end use and CFL end use. Table 1-3 shows ratios for non-lighting end uses

Table 1-2. Lighting Incremental Cost per Unit Savings Ratios

	Agriculture		Commercial		Industrial		Schools & Government	
End use	**Mean IC per kW ($/kW)**	**Mean IC per kWh ($/kWh)**	**Mean IC per kW ($/kW)**	**Mean IC per kWh ($/kWh)**	**Mean IC per kW ($/kW)**	**Mean IC per kWh ($/kWh)**	**Mean IC per kW ($/kW)**	**Mean IC per kWh ($/kWh)**
3 - All Lighting*	906.88	0.19	1191.39	0.29	975.01	0.19	1130.74	0.23
3.1 - Linear Fluorescents	1266.95	0.26	1340.02	0.33	1183.29	0.23	816.28	0.18
3.2- High Intensity Discharge replacing Incandescents	581.00	0.12	2221.14	0.54	581.00	0.11		
3.3- Occupancy Sensors		0.15		0.10		0.08		0.11
3.4- High Bay Lighting	1024.21	0.21	1151.46	0.28	961.97	0.19	1332.78	0.29
7 - CFL	12.66	0.00	35.38	0.01	45.55	0.01	47.76	0.01

*Based on all lighting technologies reported in this study

Lighting incremental cost per unit savings ratios are shown by sector. Each sector has its own operating characteristics with operating hours and load coincident with peak specific to the sector. Even though the incremental costs are consistent across sectors, savings ratios vary by sector due to the different operating hours and load coincident with peak.

[2] Savings used for these calculations are from the 18MCP program database.

Table 1-3. Non-lighting Natural Replacement Incremental Cost per Unit Savings Ratios

End Use	Mean IC per kW ($/kW)	Mean IC per kWh ($/kWh)	Mean IC per therm ($/therm)
2 - HVAC*	551	0.12	0.96
2.1 - Furnaces	NA	0.38	1.24
2.2 - Steam Trap Repair	NA	NA	0.47
2.3 - PTAC	494	0.57	NA
2.4 - PTHP	672	0.03	NA
5 - Other			
5.1 - Food Service	2556	0.33	2.73

*All HVAC technologies reported in this study

1.3 INCREMENTAL COSTS FOR CUSTOM MEASURES

In this portion of the study, we tried to estimate the incremental costs for 15 custom measures that were installed with assistance from the Program. These 15 projects were selected based on the magnitude of their overall savings and included the six largest custom projects for kW, kWh, and therm savings. With available information, we estimated the incremental costs and simple paybacks for 11 of these projects.

The typical custom project reviewed had a three to four year payback prior to incentives. Since the sample size was small, we did not calculate simple paybacks by end use for the custom measures. Table 1-4 provides illustrative examples, not definitive values, of custom measure simple paybacks and incremental costs.

Table 1-4. Illustrative Custom Project Simple Paybacks and Incremental Costs

End Use	Project Description	Simple Payback (years)	Incremental Cost (Equipment & Install)	Incremental Equipment Cost	Incremental Installation Cost	Units	Notes
2-HVAC	Municipality – Chiller System	3.62	$142.00	Insufficient Data	Insufficient Data	per ton of cooling	
	Paper manufacturer – Custom Boiler	5.14	$16.41	$6.59	$9.82	per lb of steam capacity	
	Food processing company – Flue gas heat recovery on boilers	4.88	$4.23	$2.82	$1.41	per therm of heat recovery	
	Paper manufacturer – Steam trap service buy-down	0.24	$1,001.00	$481.00	$520.00	per trap	Equipment cost is substantially higher than Trade Ally survey but consistent with Grainger pricing for some traps.
3-Lighting	Municipality – LED traffic lights	21.45	$3.62	$6.49	$(2.87)	per unit	Includes life cycle costs
	Health care – Reconfigure Lighting	1.92	$63.00	Insufficient Data	Insufficient Data	per light fixture	

End Use	Project Description	Simple Payback (years)	Incremental Cost (Equipment & Install)	Incremental Equipment Cost	Incremental Installation Cost	Units	Notes
4-Mnfg Process	Mill – Custom Compressed Air	2.14	$1,220.00	$782.00	$437.00	per compressor hp	
	Sealant manufacturer – Compressed air leak detection	0.02	$16.26	Insufficient Data	Insufficient Data	per leak	Survey cost only, repair cost unknown.
	Glass manufacturer – VFD on fan/blower	-	Insufficient Data	$8,143.00	Insufficient Data	per VFD	Equipment cost is consistent with Trade Ally survey results for 101 to 200hp VFDs. Installation by in-house labor
	Pipeline company – VFD on pump	-	Insufficient Data	$298,355.00	Insufficient Data	per VFD	VFD size exceeds online survey categories so no comparison is possible. Installation by in-house labor
	Tool and die company – VFD on fan/blower	-	Insufficient Data	$1,000.00	Insufficient Data	per VFD	Equipment cost is consistent with Trade Ally survey results for 1 to 20hp VFDs. Installation by in-house labor
	Plumbing fixtures manufacturer – Regenerative Thermal Oxidizer	4.77	$4.03	$3.67	$0.35	per therm saved	System cost
	Steel manufacturer – Recuperative Burners	NA	Insufficient Data	Insufficient Data	Insufficient Data		
	Food processing company – Process heat recovery	2.31	$2.01	$1.54	$0.47	per therm of heat recovery	
5-Other	School district – Demand Limiting Controls	0.61	$24,623.00	Insufficient Data	Insufficient Data	Total	Control System cost.

1.4 CONCLUSIONS AND RECOMMENDATIONS

This study produced incremental costs per unit saved for individual deemed technologies accounting for nearly all deemed electric savings and about half the deemed therm savings. Estimates for deemed measures using the results of this study are expected to be more accurate than estimates used in the previous benefit-cost analysis. In most cases, these estimates will also be more accurate for planning purposes than the costs in the Program's ad hoc cost database.

The study did not produce specific incremental cost values for custom and hybrid measures. Our review determined that incremental costs per unit saved can be higher or lower for these measures compared to deemed measures, depending on the custom factors. As a result, we recommend continuing to estimate incremental cost factors for these measures based on aggregate incremental costs of sampled custom and hybrid measures. This is the method that was used for the last benefit cost analysis.

Thus, the study identifies three methods to estimate incremental costs for future benefit-cost studies and for program planning:

1. Apply incremental costs per unit saved by individual technology code. This study provides results at this level for selected lighting, HVAC, and other deemed technologies.

2. Apply incremental costs per unit saved by end-use category. This study provides results at this level for the lighting equipment and HVAC service end-uses.
3. Calculate simple payback for each end use category as the ratio of average incremental cost to average first-year avoided cost, based on a sample of projects. The resulting ratios may not be accurate for individual projects or technologies, but should be meaningful in aggregate. This is the procedure that was used in the previous benefit-cost analysis. A similar procedure is being used as part of the current benefit-cost analysis.

Recommendations:

- Use the incremental cost by technology code from this study (method one) for deemed measures for lighting and HVAC service measures with the technology codes covered here.
- If the incremental cost for a deemed lighting or HVAC service measure is unavailable at a technology code level, use the incremental cost by end use if available from this study (method two).
- For all other deemed measures, and for custom and hybrid measures, use the sample-based simple payback by end use (method three).

These recommendations identify three different approaches for estimating incremental costs. Method one can be used to analyze individual measures. Methods two and three can be applied to aggregated measures for analysis of the Program. Available incremental costs and recommended aggregate estimation methods are summarized in Table 1-5. The recommended aggregated estimation method applies to program wide analysis such as a benefit cost study. Specific measures can be analyzed at the tech code level when data is available.

Table 1-5. Incremental Cost Estimation Method Summary by End Use

End Use	Available Incremental Costs: Tech Code (Method 1)	Available Incremental Costs: End Use (Method 2)	Available Incremental Costs: Simple Payback (Method 3)	Recommended Aggregated Estimation Method
Building Shell	NA	NA	Available	Method 3
HVAC Equipment	Some furnace, some PTAC, and some PTHP measures	NA	Available	Method 3
HVAC Service	Some steam trap measures	Available	Available	Method 2
Lighting	Most measures	Available	Available	Method 2
Manufacturing Process Equipment	NA	NA	Available	Method 3
Manufacturing Process Service	NA	NA	Available	Method 3
Other	Some vending machine control and some food service equipment measures	NA	Available	Method 3
CFL	Most measures	Available	Available	Method 2
Motors	NA	NA	Available	Method 3

1.5 MARKET PLAYER PROGRAM SATISFACTION

In the final portion of the study, we tried to determine if market players are satisfied with the Program and what are the Program strengths and weakness. In general, we found that the survey respondents were generally satisfied with the Program. As is typically found in such surveys, suppliers would like to see improvements in communication and the generation of leads. Generation of leads is generally impractical and not part of the program design.

2. INTRODUCTION

2.1 BACKGROUND AND OBJECTIVES

2.1.1 History

During planning for the benefit cost analysis, both KEMA and WECC identified incremental cost as important information. KEMA identified incremental costs as a key uncertainty in the benefit cost analysis that could be addressed through further study. WECC identified a need for more defensible incremental costs for program planning. WECC collected pricing and incremental cost data from a variety of sources prior to beginning this study. Some of these data are means of historical project costs tracked in the WATTS or WISEERTS databases (see Appendix B). These sources do not provide reliable incremental costs for most measures. As a result, KEMA proposed to conduct an incremental cost study in conjunction with WECC.

2.1.2 Previous incremental cost estimation method

When incremental cost estimates were used for previous benefit cost analysis,[3] we estimated them based on the simple payback period by end use. KEMA estimated the simple paybacks through the following method. First, we collected incremental cost data for a sample of projects through follow-up surveys. The sample for this data collection was taken from the engineering review sample for impact estimation. We then calculated the avoided cost of generation savings for these sampled projects by applying avoided cost per kWh, kW, or therms to the gross savings. Finally, we calculated the simple payback as the ratio of mean incremental cost to mean first-year avoided cost savings, separately for each end use. This ratio can be thought of as the simple payback period. The same end use payback periods were used for each sector, since the available data were not sufficient to generate separate estimates by sector and end use combined.

The result of this analysis is a set of payback periods representing the ratio of incremental cost to first-year avoided cost for each end use. Any particular project may have a payback higher or lower than this value. However, these ratios are expected to be meaningful in aggregate.

2.1.3 Goals

The detailed evaluation plan specified that the incremental cost study would focus on "prescriptive measures that account for the majority of prescriptive savings and secondarily for large custom measures in the engineering sample."[4] In keeping with this, the primary objective of the incremental cost study was to identify and develop parameters that would allow incremental costs to be estimated for prescriptive measures at the WISeerts technology code level. It was not practical to address every individual measure, but we addressed

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[3] Miriam L. Goldberg, Chris Clark, Sander Cohan, KEMA Inc. *Focus on Energy Statewide Evaluation, Interim Benefit-Cost Analysis: FY07 Evaluation Report*, Final: February 26, 2007.

[4] Focus Evaluation Team. *Contract Period One, Detailed Evaluation Plans.* Page 2-16. June 15, 2007.

measures representing nearly all of the deemed savings. The secondary objective was to attempt to develop general formulas to estimate incremental costs for custom projects based on the savings for these projects. KEMA would then use these data as inputs to our benefit cost analysis, and WECC would use them as inputs to their planning process.

2.2 METHOD

The incremental cost is the difference between the high efficiency cost and baseline alternative cost (i.e., standard efficiency cost). Our approach sought to collect data on the cost of energy efficient measures and the cost of standard (i.e., less efficient) measures and then calculate an incremental cost for each measure. Where applicable, we differentiated between labor and equipment costs. This distinction is important in determining the economic impacts of the program. In addition, labor and equipment costs may scale differently.

The data collected for this project came from three sources: an online/telephone survey of trade allies active in the Focus on Energy program, a review of targeted custom projects from the engineering sample, and secondary research.

2.3 OVERVIEW OF REPORT

The remainder of this report describes the methodology and results of the incremental cost study. Section 3 covers the research methodology employed and the data collection activities undertaken in greater detail. Section 4 presents the results of the incremental cost analysis and KEMA's recommended estimates for the incremental costs of various measures. Survey instruments can be found in the appendices.

3. APPROACH

3.1 OVERVIEW

This section begins by defining some key terms used in incremental cost analysis. It then discusses each of the three data sources—trade ally survey, engineering sample, and secondary research—in detail. Each subsection includes an evaluation of the quality and coverage of the data collected.

3.2 DEFINING TERMS

Incremental cost is defined as the difference between the cost of an energy efficiency measure and the cost of its standard efficiency, or baseline, alternative. The full cost is defined as the cost of an energy efficiency measure. These two costs provide clarity to the costs surrounding different types of projects including the following categories:

- **Natural replacement (or replace on burnout)** projects are defined as those projects when a technology is replaced at the end of its useful life or for new installations.
- **Early replacement (or retrofit)** projects are defined as those projects when a technology is replaced before the end of its useful life.[5]

The best way to collect incremental cost data varies based on the existence of a predetermined alternative to the energy efficient measure and the variability in type and size of the measure. With this in mind, the following Focus Business Programs measure categories were used to determine our data collection methods:

- **Deemed** measures are defined as measures where a specific value or algorithm for energy savings has been recommended by KEMA and approved by the PSC. Although not a part of the definition all deemed measures also have prescribed incentive levels.
- **Custom** measures are those that lack both deemed savings and prescribed incentives. These measures are typically large, complex projects where both savings and appropriate incentive levels are calculated on a project-by-project basis.
- **Hybrid** measures are measures that have a prescribed incentive level but lack deemed savings. The energy savings from hybrid measures are calculated on a project-by-project basis, much like custom measures. These calculations may be based on standard calculation algorithms that are not currently deemed. For clarity, hybrid projects can be thought of as prescriptive measures without deemed savings, but the term hybrid is commonly used among stakeholders at Focus and the PSC.

[5] With the exception of binary projects (such as VFDs), the current net-to-gross method for benefit-cost uses the incremental cost and savings for natural replacement for all projects. For binary projects, the net-to-gross method uses the full cost and full savings. For flexibility and transparency, we provide both the incremental cost and the full cost of the efficient technology. This will allow these data to be applied to alternative benefit cost methods (such as the proposed LCNS method).

The complexity of capturing these cost data varies substantially depending on the type of measure in question. Determining the incremental cost of the **deemed measures** is the most straightforward case because each measure has a predefined standard efficiency alternative; the key is obtaining accurate data on the market price of each energy efficient measure and its alternative. We determined that the best way to capture cost data for most deemed measures was through a survey of WECC's trade ally network. Gaps could then be addressed through secondary research (e.g., mining Grainger catalogs, other equipment databases, and US Department of Energy life cycle cost calculators).

Custom measures presented a more challenging case, due to greater variability of type, size, and costs of the efficiency measures and the difficulty of identifying appropriate alternative measures for comparison. To address this challenge, we first identified a short list of custom measures from the 18MCP Business Programs Impact Evaluation engineering sample. We identified this list by examining the distribution of savings across all custom projects and focusing on projects that account for a large fraction of these savings. For each of these projects, KEMA engineers and analysts reviewed the project documentation provided by the program for the impact evaluation[6]. KEMA staff also attempted to capture additional cost information as needed via secondary research and interviews with end users and/or vendors. We then used these data, in conjunction with expert judgment, to estimate an incremental cost for the sample of custom measures. Due to the complexity and diversity of custom projects, we did not attempt systematic compilation of custom project incremental costs in this study. We attempted to calculate the incremental costs for the projects with the largest savings. Based on these incremental costs, we tried to develop a factor that could be applied to all custom projects.

Measures classified as **hybrid** vary considerably in the complexity of cost calculations. Some, like variable frequency drives (VFDs), have consistent costs that can be obtained from trade ally surveys. Others, including many agricultural measures, have costs that vary considerably by project or location making them more similar to custom projects. In this study, we attempted to collect cost data for VFDs through the trade ally survey, supplemented with secondary research.

Each element of the resulting three-pronged data collection approach (trade ally survey, review of projects from the engineering sample, and secondary research) is described in more detail below.

3.3 TRADE ALLY SURVEY

To obtain market estimates of the cost of deemed measures and their base case alternatives, KEMA conducted a survey of contractors and distributors who had participated in the Focus on Energy Program in recent years (trade allies). Although KEMA took the lead in this survey, it was a joint effort of KEMA and WECC. KEMA's role was to draft the survey, revise it based on WECC and PSC feedback, field the survey, and analyze the data. WECC's role was to facilitate the data collection by a) providing sample lists (from the WATTS and WISeerts databases) and b) leverage their relationships with the trade allies to encourage them to complete the survey. We expected this encouragement to be necessary because of the

[6] The program paperwork generally includes a total cost for custom projects and sometimes provides additional details on the costs (e.g., equipment costs per unit, labor costs, and feasibility study fees).

length of the survey, daily commitments of the trade ally respondents, and the sensitivity of the price data we were requesting. WECC staff was responsive throughout the survey process.

3.3.1 Sample selection

The sample frame consisted of business premises that were listed in the WATTS database as either the contractor or distributor for various Focus on Energy projects. These lists were provided by WECC. Based on these files, KEMA created three "priority" tiers to guide data collection. These tiers were not intended as stratification variables with specific targets, but rather as guides to help the recruiters and interviewers focus their efforts productively. Priority 1 trade allies were responsible for at least 20 percent of all program installations[7] within a given technology category. Priority 2 allies were responsible for between five percent and 20 percent of the installations in their technology category, and Priority 3 allies were responsible for less than five percent.

The final sample frame consisted of 157 trade ally establishments. Table 3-1 summarizes how these establishments broke out by technology category and priority level.

Table 3-1. Trade Ally Sample Frame

	Priority Level			
Technology Category	**1**	**2**	**3**	**Total**
Ag Fans	1	4	7	**12**
Boilers & Burners	2	2	8	**12**
Food Service	1	3	8	**12**
HVAC		2	33	**35**
Lighting		7	48	**55**
Motors	1	6	14	**21**
Refrigeration	1	1	5	**7**
Vending, Plug Loads	2		1	**3**
Total	**8**	**25**	**124**	**157**

The final sample frame of 157 trade allies was reviewed by WECC staff who provided updated contact information and email addresses where available. After the original sample frame was established, WECC staff suggested the inclusion of 24 additional trade allies. Staff felt these trade allies would be responsive and would complete the survey. After removing five trade allies who had been included in the original prioritized sample frame, KEMA added 19 trade allies to the sample frame. These 19 were not assigned a priority level. Measures within the technology categories included in the study account for nearly all of the savings associated deemed measures (see Table 3-2).

[7] The sample files provided by WECC did not include savings values, merely the type and number of measures installed. Thus, we used percent of installations as a proxy for each trade ally's impact on the market.

Table 3-2. Percent Deemed Savings Associated with Measures Included

Technology Category	Percent of Deemed Savings kW	kWh	Therm
Ag Fans	1.5%	1.4%	0.0%
Boilers & Burners	0.0%	0.0%	96.8%
Food Service	0.2%	0.3%	1.7%
HVAC	3.3%	0.9%	1.3%
Lighting	94.3%	95.8%	0.0%
Motors	0.4%	0.6%	0.0%
Refrigeration	0.0%	0.5%	0.0%
Vending, Plug Loads	0.1%	0.3%	0.0%
Total	**99.9%**	**99.8%**	**99.8%**

Note: In this study, we did not try to estimate incremental costs for all possible measures. Measures not included are associated with only 0.1 to 0.2 percent of deemed savings.

3.3.2 Survey design

This section describes the logic behind how we structured the survey instrument. The survey itself can be found in Appendix C. The survey included in the appendix includes average response ranges.

The primary goals of the survey were to capture equipment and installation costs for high efficiency equipment (i.e., measures) and their standard efficiency alternatives. We also sought to assess how much of an impact each respondent had on the market for any given technology based on their sales volume.

The final list of deemed measures and base case technologies included in the trade ally survey can be found in the Appendix. This list began with the efforts of the Incremental Cost Working Group (ICWG) and was refined through discussions between KEMA and WECC. We began the survey by asking respondents to indicate which types of measures (technology categories) they sold to Wisconsin businesses. The categories of interest were:

- Lighting products (e.g., lamps, ballasts, or fixtures)
- HVAC equipment (e.g., furnaces, boilers, AC split systems, packaged or rooftop air-conditioners, energy recovery ventilators)
- Motors or drives
- Vending machines or vending machine controls
- Food service equipment (e.g., fryers, steamers, ovens, griddles, hot food holding cabinets, refrigerators, freezers, dishwashers, or pre-rinse sprayers)
- Refrigeration equipment for grocery stores
- Ventilation fans for agricultural applications.

For each category they indicated, we then asked them to identify the specific equipment they sold and answer pricing questions for this equipment.

Because of the wide range of measures included in the survey, it was not possible to ask all of the price questions in the same way. For **motors, vending machines, food service equipment, and most lighting technologies,** we asked for the retail price of both equipment and installation for specific sizes and efficiencies (e.g., 25W ceramic metal-halide lamps; NEMA premium efficiency motors between 51 and 100 hp; or 4 pan, ENERGY STAR® rated, electric steamers). For **compact fluorescent and incandescent lamps**, we only asked for equipment prices on the grounds that these units are typically installed by the customer.

For **HVAC equipment,** we took a slightly different approach. We asked respondents to identify up to three of their best-selling high efficiency and standard efficiency models across technology categories that mapped to the types of HVAC equipment covered by Focus on Energy rebates:

- Furnaces
- Boilers
- Air-conditioning split systems less than 65 MBh
- Packaged terminal air-conditioning (PTAC) units
- Rooftop air-conditioning units broken out by four size categories
  - Less than 65 MBh
  - 65 to 134 MBh
  - 135 to 239 MBh
  - 240 to 759 MBh
- Packaged terminal heat pump (PTHP) units.

For each specific model a respondent identified as a best seller in one of these categories, we asked them to provide capacity, efficiency, retail equipment cost, retail installation cost, and the percent of their sales volume it accounted for. We followed the same approach for **agricultural fans**.

For **grocery store refrigeration** units, which are typically made to order according to customers' specifications, we took a third approach. Rather than ask for pricing of complete refrigerator or freezer units, we asked for the equipment and installation cost for various high efficiency and standard efficiency components.

To put their responses in context, we asked respondents to tell us how many full time employees they had at their location, what percentage of their sales at this location were to business customers in Wisconsin, and what percentage of their sales to Wisconsin businesses were accounted for by each of the measures for which they provided pricing data. Using number of employees as a proxy for total sales, these data would allow us to use ratio estimation to weight individual survey responses when calculating mean values.

We also included **a battery of pricing questions that were not tied to a specific technology or measure**. These questions asked respondents to characterize their overall pricing strategy and to indicate whether a variety of factors (e.g., a doubling of the capacity of a product; a doubling of the number of competitors in their area; or an increase from standard to high efficiency) would yield a large increase in price, a moderate increase, no change, a moderate decrease, or a large decrease in price. The intent of these data was to allow us to model retail prices as a function of price drivers, and hence in theory be able to estimate the incremental cost of any given measure whether we had specifically asked about it or not.

The final survey instrument (after being reviewed by WECC and the PSC) was converted into an online survey using an online survey hosting site called QuestionPro (www.questionpro.com). Email invitations to complete the survey were handled through the QuestionPro portal.

The primary reason for choosing an online survey approach was the length and complexity of the survey. The kind of response grids necessary for asking price, efficiency, size, and percent of sales questions for numerous measures are much easier for respondents to understand and fill out when presented visually rather than by phone. In addition, on-line surveys allow respondents to fill out the survey at a convenient time. This may improve the response rate.

3.3.3 Primary data collection

Although KEMA led the data collection effort, it was a joint effort of KEMA and WECC. WECC's involvement was based on the expectation that leveraging the relationships between WECC staff and the trade allies would substantially increase our response rate.

The first step in data collection was to mail an **advance letter** to all 157 trade ally business establishments in the sample frame. This letter went out from WECC on Focus letterhead and was signed by the appropriate Market Channels Field Representative for each trade ally. The letter was timed to arrive roughly 24 hours before the online survey went live. It explained the purpose of the study, offered respondents a high-level summary of the study's results in exchange for filling out the survey, and gave a contact at WECC whom they could call if they had concerns about the study. It also provided a static URL that respondents could use to access the online survey if for any reason they did not receive a personalized email invitation/link in the next few days. We will provide a PDF of the survey with average responses included in Appendix C to all respondents.

At the same time the letter was mailed, WECC staff began making **pre-survey phone calls** to respondents KEMA had identified as high priority. The purpose of these calls was to both encourage survey participation and update contact information (including email addresses).

The online survey went live on September 4, 2008. On that day, KEMA sent **email invitations** to all of the trade allies in the sample frame for which we had been able to obtain email addresses from WECC. These emails again explained the purpose of the study, offered an executive summary of the findings in exchange for participation, and provided a Focus (WECC) contact to allay any concerns about the survey's legitimacy. It also included a link to the online survey, which allowed us to track which respondents had begun and or completed the survey.

On September 10, 2008, KEMA provided WECC with a list of trade allies who had not yet logged into the survey instrument. WECC staff began making **reminder calls** to these trades to insure that they had received the email invitation and urge them to complete the survey. WECC provided KEMA with a status report on these calls on September 16.

On September 16, 2008, KEMA staff began making **Phase I follow up calls** to trade allies who had begun the online survey but had not completed it. At that point, this was the majority of respondents who had begun the survey. These calls attempted to diagnose why respondents were dropping out of the survey, address technical problems or questions of how to interpret survey questions that had arisen, and encourage respondents to complete the surveys they had begun. The most common response to these calls was that the respondent had started the survey, gotten interrupted or busy, and planned to come back to it.

By October 6, 2008, it was apparent that the online survey, even with telephone follow ups, was not yielding an acceptable response rate. Accordingly KEMA began **Phase II**, which consisted of calling every trade ally who had either not begun or not completed the online survey and attempting to **complete the survey with them over the phone**. During Phase II, every remaining sample point was called at least six times over the course of three weeks. The days of the week and times of day that each respondent was called were varied to maximize the chances of reaching them. Phase II concluded on October 28, 2008, at which point the surveys that had been collected by telephone were data entered and combined with the data from the online survey instrument.

3.3.4 Results of data collection

The final survey dataset contained 100 completed surveys. Of these, there were:

- 13 completed surveys for which we could not identify either the company or the individual who completed the survey
- 10 completed surveys by respondents not included in the original prioritized sample frame
- 77 completes clearly linkable to the original prioritized sample frame.

The 13 unidentifiable completes are the result of respondents logging into the online survey using the static URL that we included in the pre-survey letter. The Question Pro survey tool did not provide any way of identifying who these respondents were. Since these respondents could not be identified, we could not assign appropriate weights. Therefore, we excluded these responses from our analysis. Before concluding that it was impossible to identify the respondent we exhausted several avenues including tapping the knowledge of other KEMA and WECC staff and triangulating on likely companies or locations based on the respondent’s IP address.

The ten cases were clearly identified by trade ally name and address, but were not among the firms pulled from the WATTS database for the original prioritized sample frame. Rather, these respondents came from the 19 trade allies that were added to the original sample frame.

Finally, 77 cases were clearly linkable to the original prioritized sample frame. Table 3-3 shows the distribution of these responses by technology category and priority level.

Table 3-3. Original Sample Frame Trade Ally Survey Response Rates

Technology Category	Priority Level 1	2	3	Total
Ag Fans	100%	0%	57%	**42%**
Boilers & Burners	50%	50%	63%	**58%**
Food Service	100%	67%	50%	**58%**
HVAC		50%	52%	**51%**
Lighting		43%	50%	**49%**
Motors	0%	33%	50%	**43%**
Refrigeration	0%	0%	40%	**29%**
Vending, Plug Loads	100%		0%	**67%**
Total	**63%**	**36%**	**51%**	**49%**

The trade ally survey did not supply all of the cost data needed for deemed measures. The table in Appendix A shows how many price data points are available for each measure. In general, the survey data appears robust for lighting and good for motors, food service, and boilers. Further analysis shows that only lighting data are sufficient for estimating incremental costs. The data for agricultural fans, HVAC, refrigeration, and vending machines are much thinner and entirely absent in several cases. Respondents often supplied equipment pricing but not installation pricing. In these cases, we researched secondary sources to try to find labor costs to supplement the survey findings.

3.4 ENGINEERING SAMPLE

3.4.1 Sample selection

In determining which custom projects to focus on from the 18MCP Impact Evaluation sample (aka “the engineering sample”) we began by sorting the projects by total savings according to three different metrics—electricity saved (kWh), demand reduction (kW), and gas saved (therms). As shown in Table 3-4, looking at the six largest projects by each of the three savings metrics yielded a total of 15 projects (some projects were in the top six on more than one metric). We chose to focus our data collection efforts from the engineering sample on these 15 measures.[8]

[8] Note that these included a mixture of custom and hybrid measures (e.g., VFD installation).

Table 3-4. Largest Custom Projects by Savings Metric

Custom Project	Six Largest Projects by		
	kW	kWh	Therms
Glass manufacturer – VFD on fan/blower		X	
Municipality – LED traffic lights	X	X	
Mill – Custom Compressed Air	X	X	
Pipeline company – VFD on pump		X	
Health care – Reconfigure Lighting	X	X	
Sealant manufacturer – Compressed air leak detection		X	
School district – Demand Limiting Controls	X		
Municipality – Chiller System	X		
Tool and die company – VFD on fan/blower	X		
Paper manufacturer – Custom Boiler			X
Plumbing fixtures manufacturer – Regenerative Thermal Oxidizer			X
Paper manufacturer – Steam trap service buy-down			X
Steel manufacturer – Recuperative Burners			X
Food processing company – Flue gas heat recovery on boilers			X
Food processing company – Process heat recovery			X

These projects comprise 4.4 percent kW, 6.4 percent kWh, and 11.9 percent of custom project savings (see Table 3-5).

Table 3-5. Percent Custom Savings Associated with Included Custom Projects

Custom Project	Percent Custom Savings		
	kW	kWh	therm
Glass manufacturer – VFD on fan/blower	0.0%	1.9%	0.0%
Municipality – LED traffic lights	0.1%	0.1%	0.0%
Mill – Custom Compressed Air	0.9%	1.5%	0.0%
Pipeline company – VFD on pump	0.7%	1.4%	0.0%
Health care – Reconfigure Lighting	1.0%	0.7%	0.0%
Sealant manufacturer – Compressed air leak detection	0.5%	0.8%	0.0%
School district – Demand Limiting Controls	1.3%	0.0%	0.0%
Municipality – Chiller System	0.2%	0.0%	0.0%
Tool and die company – VFD on fan/blower	0.1%	0.1%	0.0%
Paper manufacturer – Custom Boiler	-0.1%	-0.2%	2.7%
Plumbing fixtures manufacturer – Regenerative Thermal Oxidizer	0.0%	-0.1%	2.3%
Paper manufacturer – Steam trap service buy-down	0.0%	0.0%	2.5%
Steel manufacturer – Recuperative Burners	NA	NA	NA
Food processing company – Flue gas heat recovery on boilers	0.0%	0.0%	1.8%
Food processing company – Process heat recovery	0.0%	0.0%	2.5%
Total	**4.4%**	**6.4%**	**11.9%**

3.4.2 Data collection approach

For the impact evaluation of custom projects, KEMA supplemented the project documentation provided by WECC (which included grant application forms, feasibility studies, invoices, and other materials) with phone and on-site surveys. As part of these surveys, we included a sequence of questions designed to get at the incremental costs of larger custom projects. Measures installed were assigned to groups of similar measures. Respondents were then asked to provide the total cost of the improvements made in each measure group (cost before financial assistance). The interviewer encouraged respondents to provide their best estimate to the nearest $100. The interviewer also recorded what the respondent based their estimate on and provided their own estimate of the quality of the cost data the respondent was able to supply. Next, the respondent was asked to estimate how much of the total cost for each measure group was equipment (as opposed to labor) costs.

For measures that were installed to replace failed or broken equipment (i.e., natural replacements) the respondents were also asked to estimate whether the energy efficiency improvements that were part of these replacements increased, decreased, or did not affect the total cost of the replacements. If they said the improvements increased or decreased the cost of the project, they were asked to estimate how large the increase/decrease was (to the nearest $100). Finally they were asked the same series of questions (did the improvements increase/decrease cost and by how much) for the total equipment costs and for the total labor costs.

In some cases, we were unable to obtain certain aspects of cost data. In some cases, respondents were either unable or unwilling to provide specific cost information and the paperwork did not include the required information. In other cases, respondents provided cost information that was inconsistent with the invoices that were included in the paperwork. KEMA engineers evaluated these cases in conjunction with secondary research to determine cost estimates for each measure. These cases often arise because customers do not think of project costs in terms the energy efficiency portion of the project. Instead, they think in terms of the cost of an overall project that included an energy efficiency piece. For example, an industrial facility may replace a boiler with a higher efficiency boiler at the same time as they replace process equipment. In this case, the customer may include the cost of the process equipment in the project cost during a phone survey.

3.4.3 Results

We completed custom surveys for 14 of the 15 sampled projects. The information obtained through these surveys varied from specific cost breakdowns to general overall costs. These costs provide a useable basis to determine incremental costs for the custom projects. However, available information will limit the findings for some projects to total installed incremental cost or equipment incremental cost.

3.5 SECONDARY RESEARCH

From the outset, KEMA anticipated the need for secondary research to fill in data gaps that would remain after the primary data collection. We found several sources that provided additional incremental cost data. No single source provided a comprehensive list of incremental costs data applicable to measures within the Focus on Energy program. We focused on sources that would provide recently updated pricing information, ideally since 2007. In addition, we focused on sources that provided both a high efficiency (also indicated as efficient measure or EM) and ‘base case’ (also indicated as BC) version of a particular technology. If two secondary sources provided information on a measure then the most recently updated price was used in the analysis. If prices for similar pieces of equipment were significantly different, the cost for the measure most closely resembling the Focus on Energy measure description was used. When Focus on Energy measure descriptions could not aid in choosing an appropriate source, we attempted to find a third source to substantiate the cost shown in the other two sources. The following describes the sources we used, the data available from the source, and what data was obtained from the source.

Grainger Industrial Supply. The Grainger catalog provides actual selling prices for a wide variety of commercial and industrial products. Grainger provides pricing for many of the measures included in this analysis. However, the Grainger catalog often does not explicitly state the efficiency of equipment. This limited the usefulness of the catalog. The Grainger catalog provided support for steam trap pricing.

RSMeans. RSMeans is a tool based on trade survey data that allows users to produce construction estimates. RSMeans CostWorks contains information on labor and product pricing and can adjust these costs to approximate local pricing. RSMeans covers a broad range of products and presents information for many measures included in this analysis. However, as with the Grainger catalog, RSMeans often did not explicitly state the efficiency of equipment. This limited the usefulness of this tool. RSMeans CostWorks construction estimator provided estimates of labor and installation costs for metal halide and fluorescent lighting fixtures. These estimates are specific to multiple metropolitan areas in Wisconsin. RSMeans is missing a number of technologies of interest to this study and could not provide additional data for any other technologies.

The Database for Energy Efficient Resources (DEER). DEER is a resource produced for the California Public Utilities Commission. DEER contains pricing data on a number of energy efficiency measures that have been collected through surveys and other research. Nearly every measure eligible for Focus on Energy incentives is contained in DEER. The usefulness of this source was limited as many DEER source materials were older than 2007. DEER provided cost data for vending machines and controls.

The Food Service Warehouse. We obtained most of the food service technology cost information from this large distributor of both standard and high efficiency food service equipment. The Food Service Warehouse provided cost for high and standard efficiency cooking appliances (fryers, ovens, griddles, and steamers), refrigeration equipment, ice machines and pre-rinse sprayers. The food service warehouse is a national distributor of these technologies and prices shown represent the cost of equipment in Wisconsin.

US Department of Energy life cycle cost (DOELCC). DOELCC analyses provided information on gas furnaces, package terminal air conditioners (PTACs), and package terminal heat pumps (PTHPs). While these sources provide high efficiency and base case unit and installation pricing data, we cannot determine the data sources used to populate the DOELCCs. Since the pricing data are consistent with professional market experience and in the absence of other data, we used these data to develop incremental cost estimates for furnaces, PTACs and PTHPs.

United States Environmental Protection Agency’s (US EPA) ENERGY STAR. ENERGY STAR savings estimation tools have been published for some technologies. These savings estimators provide unit costs as part of the tool’s assumptions. ENERGY STAR estimators provided us with cost information on commercial dishwashers. Prices were derived from 2007 national industry research; based on professional market experience, we believe that these are reliable cost estimates for Wisconsin. The ENERGY STAR site provided cost data for commercial dishwashing machines.

Table 3-6 provides a summary about the sources and what information was provided by each source for use in this report.

Table 3-6. Secondary Source Summary

Secondary Resource	Resource location	Information Provided	Data Description	Comments
Grainger Industrial Supply	www.grainger.com	Unit costs steam trap repair kit between 50 and 125 PSI	Retail prices	Retail prices are based on required markups and supplier pricing. Grainger does not supply efficiency information in its product descriptions, limiting usefulness in this report.
RSMeans - Costworks	www.meanscostworks.com	Labor costs for HID and fluorescent lighting fixtures	Estimate provides cost per fixture, hourly labor rate and approximate time required to perform the installation.	RSMeans gathers information from trade ally surveys and contractor submitted project detail. RSMeans often does not explicitly state the efficiency of equipment.
Database for Energy Efficient Resources (DEER)	www.energy.ca.gov/deer	Vending machines and controls	Retails prices of vending machines and controls	DEER takes its data from a variety of sources including primary survey data ranging from 2002-2005 and refereed academic journals from a similar timeframe.
Food Service Warehouse	www.foodservicewarehouse.com	Unit costs for all kitchen equipment with reported incremental costs	Retail prices	Retail prices are based on required markups and supplier pricing.
USDOE LCC tables	www1.eere.energy.gov/buildings/appliance_standards/	Unit and installation costs for gas furnaces, PTACs and PTHPs	Base unit price with derived models based on regression coefficients	Sources for costs are unavailable.
ENERGY STAR Informational Products	www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/CalculatorCommercialDishwasher.xls	Unit costs for commercial dishwashers	Costs and consumptions derived from industry data	2007 industry data used to determine prices and consumption levels for a variety of dishwashers.

3.5.1 Analysis

Analysis of the Trade Ally Survey data indicated we had robust data for most lighting technologies. We had insufficient data to estimate incremental costs for Ag Fans, HVAC equipment, refrigeration equipment, vending machines, motors, food service equipment, boilers and a few lighting technologies. As a result, we obtained additional data from secondary sources to fill in the data for these technologies.

Some data were unavailable from either the secondary sources or the Trade Ally Survey. We could obtain additional data from existing cost data in WATTS and WISeerts, but we did not use these data in our analysis. We are unsure of the source or quality of the data obtained from the WATTS and WISeerts databases. Means for various measures had high standard deviations (as high as two to three times the mean). Other means were obviously inaccurate (e.g., WISeerts indicates the cost of NEMA premium efficiency 1.0 hp motor is $1). In the absence of additional information, these issues suggest the data is unreliable.

Table 3-7 indicates the main source of cost information regarding technology categories. It is, however, not rare to have accessed a different source for measure specific information. For example, while primary sources provided the majority of information for the lighting section, we used RSMeans to provide information on labor costs in some cases. Appendix A includes a table with more detail.

Table 3-7. Main Data Sources

	Main Source of Data	
Technology Category	**Trade Ally Survey**	**Secondary Sources**
Ag Fans		
Boilers & Burners		X
Food Service		X
HVAC		X
Lighting	X	
Motors		
Refrigeration		
Vending, Plug Loads		X

4. FINDINGS

4.1 OVERVIEW

We used data from the primary data collection and secondary research to estimate the incremental costs for the various deemed technologies. In general, we had good data from respondents for lighting pricing and used this to directly estimate the incremental costs. For other technologies where we had poor or insufficient data from survey respondents and were able to find secondary sources, we used the secondary sources to estimate the incremental costs. These technologies included some HVAC, food service, vending, and refrigeration measures. Market factors will affect pricing and we provide an overview of these effects.

In addition to the deemed technologies, we calculated incremental costs for custom engineered projects. The results from this portion of the study provide some support for the deemed project results as well as insights into differences between custom and deemed project costs. Some custom projects are amalgamations of deemed measures applied in specific ways as part of a larger project. Other custom projects are too large, unique or complex and are not comparable to deemed measures.

Finally, the data collected provides insights into market player satisfaction with the Program. We summarized the participant satisfaction based on survey data. These results show where participants are satisfied with the program and where participants would like to see changes.

4.1.1 General analysis methods

Our first step in the analysis was to determine weighted average costs for each technology based on survey responses. We compiled these findings and summarized them on the Trade Ally survey form (see Appendix C). We will provide this average survey to respondents in exchange for filling out the survey. We calculated the weights based on approximate market share in Wisconsin. Since actual market share data was not available, we approximated it based on the respondents' company size, percent sales in Wisconsin, and percent sales in the specific end use.

We calculated explicit incremental costs for all measures that have available data. In addition, we developed regression cost models for standard and high efficiency furnaces based on data obtained from US DOE Life Cycle Cost (DOE LCC) calculator. Labor and unit costs were estimated using two variable regression models. In these models, cost was estimated as a function of both unit capacity (BTUh) and AFUE. Given the generally linear form of the Trade Ally Survey data no data transformations were performed. We built a linear pricing model for both high and standard efficiency. The total cost for the piece of equipment is the sum of the estimated equipment and estimated labor costs. The form of the model is:

$$\begin{aligned} Cost &= m_{EquipCap} \times Capacity + m_{EquipEff} \times Efficiency + b_{Equip} \\ &+ m_{LaborCap} \times Capacity + m_{LaborEff} \times Efficiency + b_{Labor} \end{aligned} \qquad \textbf{eqn 1}$$

Where: Capacity = BTUh, Efficiency = AFUE (%), $m_{EquipCap}$ = regression factor for equipment capacity, $m_{EquipEff}$ = regression factor for equipment efficiency, b_{Equip} = regression factor for equipment, $m_{LaborCap}$ = regression factor for labor based on equipment capacity, $m_{LaborEff}$ = regression factor for labor based on equipment efficiency, b_{Labor} = regression factor for labor.

We produced other incremental cost estimates using simpler methods. The difference between estimated standard efficiency total (including both unit and labor) costs and the estimated high efficiency total cost for a given technology yields the incremental cost. The high efficiency technology and associated labor costs alone give the full costs.[9] Exceptions to these general strategies are detailed in the technology specific sections to follow.

4.1.2 Reporting

For the deemed measures, we report results from the study and indicate if the results were calculated with data from the Trade Ally Survey or from a secondary source. The Trade Ally Survey results represent specific Wisconsin based information for these measures. Secondary research results are reasonable but are not specific to markets in Wisconsin. When we were unable to estimate incremental costs from either the Trade Ally Survey or secondary sources, we recommend continuing to use the method previously applied to estimate incremental cost. This method will be described in the recommendations.

We also report the results for deemed measures based on the natural replacement incremental cost and the full cost. These results provide more flexibility and transparency to the incremental costs. The natural replacement incremental cost is the cost of the high efficiency technology minus the cost of the standard efficiency technology. The full cost is only the cost of the high efficiency technology.

We do not report separate natural replacement incremental costs and full costs for lighting measures. Incentives for many measures (such as occupancy sensors) are only available for retrofit situations. Incentives for some measures (such as new construction) are only applicable to natural replacement situations. Finally, some measures (such as CFLs replacing incandescent lamps) are treated as natural replacements due to the relatively short life of the replaced technology. The incremental costs that are reported will be what are used for benefit cost and other similar studies.

Based on natural replacement incremental costs and avoided cost of generation for deemed savings, we calculated simple paybacks for each measure for which we estimated incremental cost. These results offer one source to determine the need for incentives for various technologies. We also calculated weighted average incremental cost per unit savings ratios for each end use for which we found incremental costs. We used the 18MCP tracked savings by measure for the weights. The simple paybacks and ratios are reported within their respective technology sections. The median and weighted average simple paybacks for deemed measures are 1.2 years and 1.8 years respectively.

Other market factors (such as increased competition) impact the pricing of the technologies. We compiled the survey results for the impact of various market factors on price by technology. To summarize the survey results, we calculated weighted average responses[10]

[9] With the exception of binary projects (such as VFDs), the current net-to-gross method for benefit-cost uses the incremental cost and savings for natural replacement for all projects. For binary projects, the net-to-gross method uses the full cost and full savings.

[10] The weights are based on number of employees, percent total sales in Wisconsin, and percent of sales for the specific technology.

for each market factor. Since the responses to these questions varied by technology, the information obtained through these questions provides insights into some of the pricing drivers for each technology. This information can inform decisions and provides support to widely held beliefs about pricing. We were unable to find a reliable correlation between the responses to the market factor questions and the incremental costs. A correlation would allow the average responses to be converted to a percent change in pricing and directly applied to incremental cost models.

For custom projects, we report the incremental cost, simple payback and incremental cost per unit savings ratios. Most of the custom projects sampled for this study cannot be broken down for easy comparison to deemed measures, but the simple paybacks and ratios allow some cross comparison.

4.1.3 Program administrator's compilation of cost data

Prior to beginning this study, WECC collected pricing and incremental cost data from a variety of sources. The sources of these data are not well documented. Some data are from historic projects tracked in the WATTS or WISEERTS databases but do not include clarifications or explanations describing the basis of the cost. We do not have enough information to formally assess the validity of these existing costs but we found several measures where the standard deviation is two to three times the average cost. We also found measures where the costs are obviously inaccurate (e.g., WISeerts indicates the cost of NEMA premium efficiency 1.0 hp motor is $1). In the absence of other data, these issues suggest unreliable existing cost data. These data could be evaluated on the basis of incremental cost per unit saved ratios as a preliminary test of validity. We have compiled the data from WATTS and WISEERTS and have included it in Appendix B.

The cost data collected by WECC could be valuable if it were well documented. We recommend that WECC continue to collect and document cost data when it is available. These efforts will allow the incremental costs to be more easily updated in the future.

4.2 LIGHTING

Since lighting represents 94 percent of kW and 96 percent of kWh savings for prescriptive projects, the trade ally sample was large. With a 49 percent response rate, we obtained data from 27 lighting trade allies. The cost data for lighting measures were fairly robust and we were able to calculated incremental costs for most lighting measures.

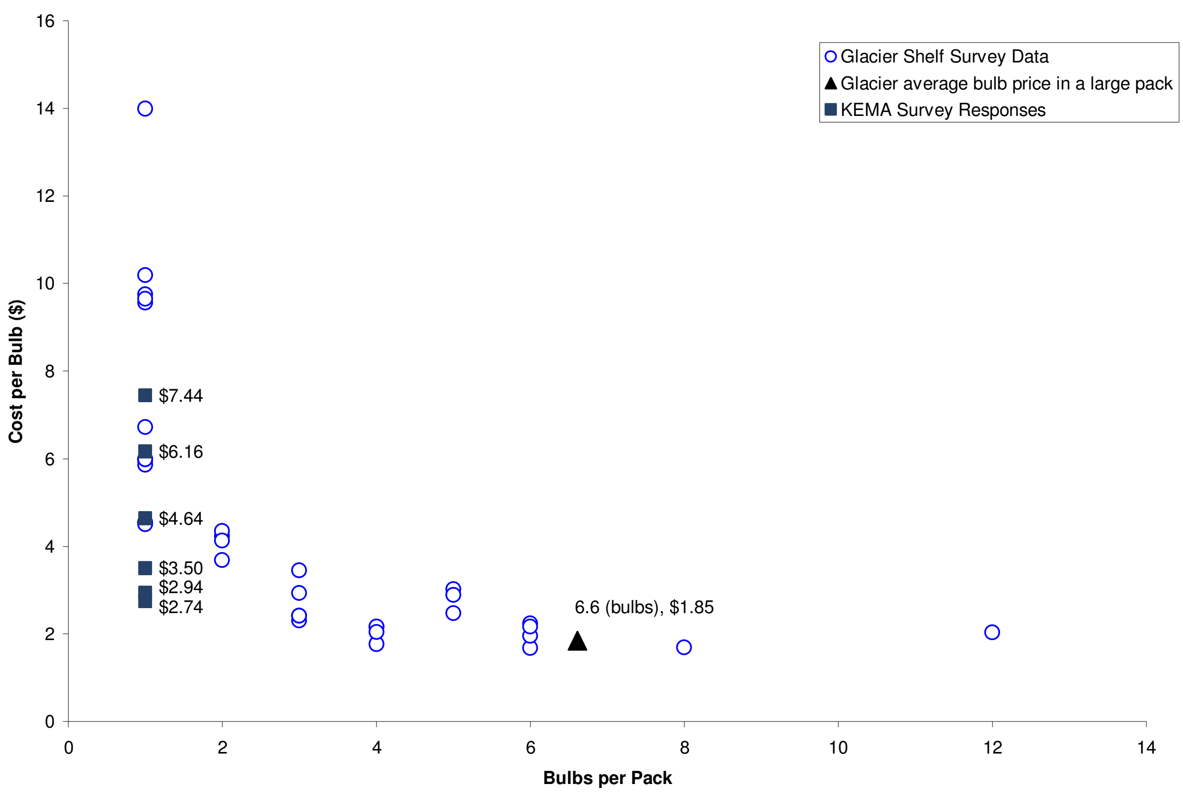
In the following sections, we discuss the methods used for analysis and the incremental costs that we calculated. We also present ratios that can be used as a check against the program's existing incremental costs for measures that were not found through this study (due to lack of cost data for some deemed measures or limitation of scope). Finally, we present average responses to questions about the impact on pricing of various market factors (e.g., impact of pricing if number of installations doubled).

4.2.1 Analysis methods

Although primary material cost data collected for lighting was fairly robust, the analysis varied depending on the measure. The incremental cost for a lighting measure can be as simple the difference in cost of a standard efficiency product and a high efficiency product. One such example is relamping a fixture from standard T8 to low wattage T8. In other cases such as replacing incandescent lamps with CFLs, the difference in lamp life must be considered. A CFL can last three times as long as a comparable incandescent. Therefore, the incremental cost is the difference between one CFL and three incandescent lamps. Finally, in some cases fixtures must be changed in order for the customer to upgrade to a higher efficiency option. For these situations, fixture cost is incorporated into the incremental cost estimate.

In addition, we checked results from the survey against other data sources. Due to the wealth of information available for CFLs, we are capable of addressing some of the shortfalls of the Trade Ally Survey more effectively than for other technologies. The Trade Ally Survey did not capture sufficient information to allow CFL weighting based on sales per wattage. Information from WECC's CFL database provided the number of rebates per CFL wattage. We developed wattage level weighting for CFL data from the Trade Ally Survey using this proxy for sales. The pricing from the survey seemed high for small CFLs (i.e., <30 watts). We checked the average survey CFL results against retail pricing documented by Glacier Consulting[11] and found the Trade Ally Survey responses were similar to prices for lamps sold individually or in packs of two. The Glacier study found a substantial decrease in price per lamp when purchased in multipacks with price per lamp leveling off at six lamps per pack (see Figure 4-1).

Figure 4-1. Small CFL Bulb Cost by Package Quantity



[11] Rick Winch and Tom Talerico, Glacier Consulting Group, LLC. *Second Annual Comprehensive CFL Market Effects Study – Final Report*. September 30, 2008.

Due to the relationship identified in the Glacier study, we adjusted the CFL costs to be consistent with the purchase of a larger quantity of lamps. The Glacier study showed that the average CFL was sold in a multipack of 6.61 lamps, with each bulb costing approximately $1.85. This price per bulb in a pack was substantially lower than the price for a single bulb. This difference indicated a price reduction for bulk purchases. The pricing data from the Trade Ally Survey was consistent with that of a single bulb purchase. Since most businesses are likely to purchase in quantity, we assumed the price reduction due to bulk purchases would be consistent with that seen in the retail setting. As a result, we updated our estimate of CFL cost to non-residential customers by applying a 43 percent high volume purchase adjustment factor for the Trade Ally Survey's CFL price. The adjustment factor is based on a ratio of Trade Ally Survey weighted average CFL cost and the Glacier study's average CFL price. This adjustment factor reduces the prices provided by the trade allies to more accurately represent CFL costs when bought at higher volumes.

4.2.2 Lighting incremental costs

We estimated incremental costs for over 90 percent of the lighting measures addressed in our primary data gathering efforts. In cases where we could not calculate incremental cost based on either primary or secondary data, we indicate that the previous estimation method should be used to obtain incremental cost data (see Table 4-1).

Table 4-1. Lighting Incremental Costs

WISeerts Tech Code	Category Description	Measure Description	Simple Payback (years)				Incremental Cost (Equipment & Install)
			Ag	Comm	Ind	Schl/ Gov't	
2.0300.165	Fluorescent, Compact (CFL)	CFL <= 30 Watts, replacing incandescent	0.04	0.04	0.03	0.05	$0.58
2.0301.165	Fluorescent, Compact (CFL)	CFL High Wattage 31-115 Watts, replacing incandescent	0.18	0.19	0.17	0.22	$7.25
2.0307.165	Fluorescent, Compact (CFL)	CFL reflector flood lamps replacing incandescent reflector flood lamps	0.04	0.04	0.03	0.05	$0.63
2.0310.165	Fluorescent, Compact (CFL)	CFL Direct Install, replacing incandescent, WPS Hometown Checkup	0.04	0.04	0.03	0.05	$0.58
2.0505.085	Controls	Occupancy Sensors - Wall Mount <= 200 Watts	3.73	3.97	3.23	4.51	$41.67
2.0506.085	Controls	Occupancy Sensors - Wall Mount >= 201 Watts	1.60	1.70	1.38	1.94	$41.67 †
2.0507.085	Controls	Occupancy Sensors - Ceiling Mount <= 500 Watts	2.52	2.67	2.17	3.05	$65.63
2.0508.085	Controls	Occupancy Sensors - Ceiling Mount 501-1000 Watts	1.17	1.25	1.01	1.42	$65.63 †
2.0509.085	Controls	Occupancy Sensors - Ceiling Mount >= 1001 Watts	0.73	0.78	0.63	0.89	$65.63 †
2.0515.085	Controls	High / low control for 320W PSMH, per fixture controlled	13.11	13.92	11.32	23.08	$273.64
2.0810.170	Fluorescent, Linear	T8 4L-4-4ft High Performance Replacing T12 2L-8 ft	17.65	18.31	16.12	21.83	$136.11 *
2.0811.170	Fluorescent, Linear	T8 4L-4ft High Performance Replacing T12HO/VHO 2L-8 ft	4.11	4.26	3.74	5.07	$136.11 *
2.0822.170	Fluorescent, Linear	T8 2L-4 ft Low Watt with CEE Ballast - 25 Watts	7.92	8.19	7.22	9.78	$55.80
2.0824.170	Fluorescent, Linear	T8 4L-4 ft Low Watt with CEE Ballast - 25 Watts	4.86	5.02	4.42	5.98	$70.47
2.0832.170	Fluorescent, Linear	T8 2L-4 ft Low Watt with CEE Ballast - 28 Watts	9.14	9.46	8.32	11.29	$48.29 †

WISeerts Tech Code	Category Description	Measure Description	Simple Payback (years)				Incremental Cost (Equipment & Install)
			Ag	Comm	Ind	Schl/ Gov't	
2.0834.170	Fluorescent, Linear	T8 4L-4 ft Low Watt with CEE Ballast - 28 Watts	6.76	7.02	6.18	8.36	$74.08 †
2.0851.170	Fluorescent, Linear	T8 Low Watt Relamp - 25 Watts	0.47	0.49	0.43	0.57	$1.21
2.0852.170	Fluorescent, Linear	T8 Low Watt Relamp - 28 Watts	0.67	0.71	0.62	0.84	$1.32
2.0853.170	Fluorescent, Linear	T8 Low Watt Relamp - 30 Watts	0.66	0.70	0.60	0.82	$0.93
2.0856.170	Fluorescent, Linear	T8 Low Watt Relamp 8 ft - 54 Watts	0.54	0.58	0.50	0.67	$0.81
2.0860.170	Fluorescent, Linear	T8 1L-4 ft Hi Lumen Lamp with Low BF	17.98	18.83	16.30	21.97	$42.61
2.0870.170	Fluorescent, Linear	T8 2L-4 ft Hi Lumen Lamp with Low BF	23.02	23.74	20.96	28.36	$93.75
2.0880.170	Fluorescent, Linear	T8 3L-4 ft Hi Lumen Lamp with Low BF	14.61	15.17	13.34	17.97	$111.71
2.0895.170	Fluorescent, Linear	T8 1L-4 ft Hi Lumen Lamp with Low BF (New Construction)	4.64	4.68	4.20	5.60	$42.61
2.0896.170	Fluorescent, Linear	T8 2L-4 ft Hi Lumen Lamp with Low BF (New Construction)	2.82	2.92	2.57	3.45	$49.02
2.0897.170	Fluorescent, Linear	T8 3L-4 ft Hi Lumen Lamp with Low BF (New Construction)	2.58	2.66	2.34	3.18	$63.24
2.0900.170	Fluorescent, Linear	T5 2L - F28T5 Fixture, Recessed Indirect 2x4, replacing 3LT8 or 4LT12	19.90	20.68	18.16	24.52	$176.64
2.2110.220	High Intensity Discharge (HID)	Metal Halide (MH) Ceramic 20-100 Watts - Replaces Incandescent	7.45	7.73	6.79	9.18	$287.74
2.2115.220	High Intensity Discharge (HID)	Metal Halide (MH) Ceramic 25 Watts - Replaces 75-90 Watts Incandescent	16.79	17.39	15.31	20.70	$285.78
2.2150.220	High Intensity Discharge (HID)	Metal Halide (MH), Pulse Start, 320W replacing 400W HID	1.77	1.83	1.61	2.18	$49.15
2.2155.220	High Intensity Discharge (HID)	Metal Halide (MH), Pulse Start - 750W replacing 1000W MH	0.48	0.50	0.44	0.59	$40.64
2.2170.220	High Intensity Discharge (HID)	Metal Halide (MH), Electronic Ballast Pulse Start - 250W replacing 400W HID	0.44	0.45	0.40	0.54	$23.46
2.2171.220	High Intensity Discharge (HID)	Metal Halide (MH), Electronic Ballast Pulse Start - 320W replacing 400W HID	1.49	1.54	1.36	1.83	$50.19
2.3100.260	Light Emitting Diode (LED)	LED Reach-In Refrigerated Case Lighting replaces T12 or T8	0.00	0.00	0.00	0.00	**
2.5180.170	Fluorescent, Linear	T8 6 lamp or T5HO 4 lamp Replacing 400-999 W HID	2.90	3.01	2.65	3.58	$202.32
2.5182.170	Fluorescent, Linear	T8 8 lamp or T5HO 6 lamp Replacing 400-999 W HID	5.22	5.41	4.75	6.43	$246.43
2.5185.170	Fluorescent, Linear	T8/T5HO <= 500 Watts Replacing >=1000 W HID	1.34	1.39	1.22	1.65	$246.43
2.5186.170	Fluorescent, Linear	T8 or T5HO <= 800W, Replacing >=1000 W HID	2.21	3.85	3.10	4.43	$492.86

* indicates that values was derived from secondary research

** indicates pricing data is unavailable through this study

† indicates that costs specific to this technology are not available, cost derived from a similar technology

This research resulted in two important findings. The first is that small CFLs have a simple payback of less than one month and other lamp replacement measures have simple paybacks of less than six months. The second it that fluorescent high bays are less expensive than metal halide high bays. The incremental cost shown in Table 4-1 represents a retrofit cost (i.e., full cost of the new fixtures). The incremental cost based on natural replacement (i.e., cost of fluorescent high bay minus cost of HID high bay) is negative.

Budget and other considerations limited the scope of this project. Additionally, some data were unavailable (e.g., LED Reach-In Refrigerator Case Lighting). As a result, we calculated ratios of mean incremental cost to unit of savings (i.e., kW and kWh) based on measures for which we had estimated incremental costs. These ratios can be used as a check against existing incremental costs for measures that were not verified through this study. A low ratio can indicate low incremental cost or high savings. Table 4-2 shows ratios for lighting end use, some specific subcategories of lighting end use and CFL end use.

Table 4-2. Lighting Mean IC per Unit Savings Ratios

	Agriculture		Commercial		Industrial		Schools & Government	
End use	**Mean IC per kW ($/kW)**	**Mean IC per kWh ($/kWh)**	**Mean IC per kW ($/kW)**	**Mean IC per kWh ($/kWh)**	**Mean IC per kW ($/kW)**	**Mean IC per kWh ($/kWh)**	**Mean IC per kW ($/kW)**	**Mean IC per kWh ($/kWh)**
3 - All Lighting*	906.88	0.19	1191.39	0.29	975.01	0.19	1130.74	0.23
3.1 - Linear Fluorescents	1266.95	0.26	1340.02	0.33	1183.29	0.23	816.28	0.18
3.2- High Intensity Discharge replacing Incandescents	581.00	0.12	2221.14	0.54	581.00	0.11	**	**
3.3- Occupancy Sensors	**	0.15	**	0.10	**	0.08	**	0.11
3.4- High Bay Lighting	1024.21	0.21	1151.46	0.28	961.97	0.19	1332.78	0.29
7 - CFL	12.66	0.00	35.38	0.01	45.55	0.01	47.76	0.01

*Based on all lighting technologies reported in this study

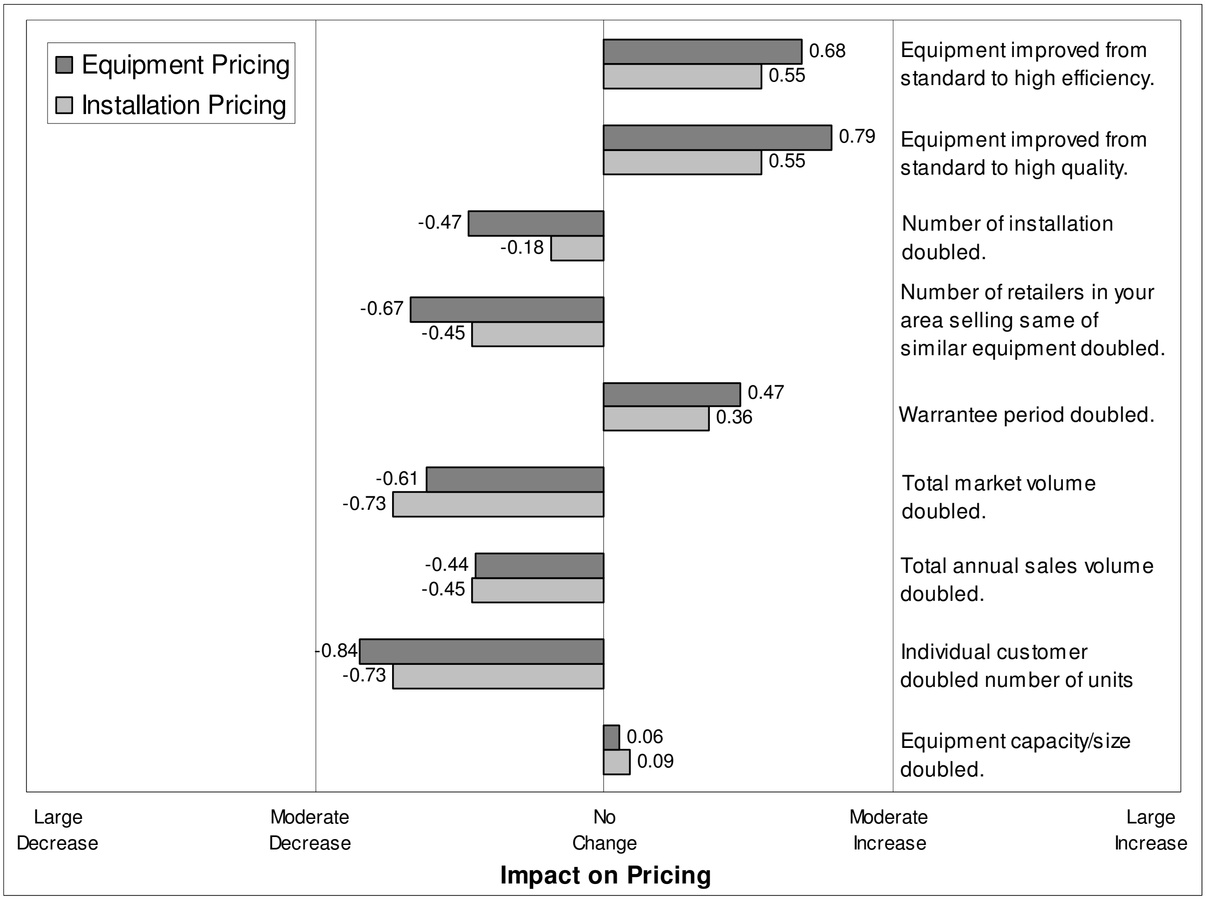
**Result not calculated - No associated savings are available for weighting.

Lighting incremental cost per unit savings ratios are shown by sector. Each sector has its own operating characteristics with operating hours and load coincident with peak specific to the sector. Even though the incremental costs are consistent across sectors, savings ratios vary by sector due to the different operating hours and load coincident with peak.

4.2.3 Factors affecting lighting equipment pricing

Through the study, we obtained data on the impact that market factors (such as increased competition) may have on lighting equipment and installation pricing. We compiled the average responses to the market factors' impact on lighting equipment pricing in Figure 4-2.

Figure 4-2. Average Responses to Lighting Equipment Pricing Impact Questions



Note: Results based on 19 responses. Responses were equated to a five-point scale with -2 corresponding to a large decrease and +2 corresponding to a large increase.

Figure 4-2 shows that some changes in the lighting market or in lighting equipment will cause price changes. Some of the market or equipment changes will cause increases while other changes will cause decreases.

Factors that increase pricing:

- Changing the product from standard to high efficiency has about the same impact on pricing as changing from standard to high quality. The pricing increase makes sense since higher efficiency equipment is often also higher quality.
- Doubling the warrantee period will increase the price but not as much as changing to high efficiency or high quality. This pricing increase also makes sense. A product with higher efficiency *will* save the business money over time. However, an increased warrantee *may* save the business money in the future. As a result, the increased warrantee will not be as valuable to the business,
- Increasing product efficiency, quality, or warrantee will have a slightly larger impact on equipment price than labor price. This makes sense as well. Products with higher efficiency, quality, or warrantee may require greater skill or care during installation

resulting in higher labor pricing. However, it is not likely that the additional time will be too large.

- Increasing equipment capacity or size will only slightly increase price. This makes sense and can be illustrated with a metal halide high bay fixture. A 175 W metal halide high bay fixture will have essentially the same construction and components as a 400 W metal halide high bay fixture. The 400 W lamp and ballast may be more expensive than the 175 W versions, but the rest of the fixture components will be the same price.

Factors that decrease pricing:

- Increasing sales volume for any reason will tend to lower price. This price decrease makes sense since businesses selling and installing equipment have both fixed and adjustable costs. Larger sales volumes will result in lower fixed costs per unit sold. Desired profits can be obtained at a lower selling price. This situation is illustrated in the Glacier CFL study we used to estimate the effect of bulk pricing for CFL lamps.

- Increasing competition will lower price. This price decrease follows basic economic theory—increasing supply will decrease price.

4.3 HVAC

Although 18 HVAC trade allies responded to the survey, pricing data collected through the Trade Ally survey was inadequate for analysis for any HVAC technology. The respondents provided very little pricing data. We are unsure of the reason. HVAC equipment covers a wide range of measures including furnaces, packaged terminal air conditioners (PTACs), package terminal heat pumps (PTHPs), and rooftop units and it is possible some of the trade allies may specialize in equipment for certain measures. We obtained pricing data on furnaces, PTACs, and PTHPs from secondary sources (DOE Life cycle cost calculators) and have based the analysis on these data.

4.3.1 HVAC costs analysis methods

The pricing data we obtained from the DOE LCC models has already been aggregated as average costs for the equipment in question. We do not have statistical information on the results. The PTACs and PTHPs values presented in this report are directly from the DOE LCC model[12]. To provide flexibility for readers of this document to calculate incremental costs for furnaces of various sizes and efficiencies, we performed a regression analysis on the DOE LCC furnace data. We have not verified the DOE LCC cost data with other sources, but they are consistent with professional market experience.

[12] http://www1.eere.energy.gov/buildings/appliance_standards/commercial/docs/ptac_lcc_fr.xls (accessed 5/12/09).

Furnace results included in the DOE LCC have a wide range of sizes and efficiencies. To simplify the analysis, we classified all furnaces with efficiencies less than 90 percent as standard efficiency and all furnaces greater than or equal to 90 percent as high efficiency. Based on these classifications, we used the available secondary source data to develop regression cost models. The cost models are:

$$Cost_{St\,Eff\,Furnace\,Equipment} = 0.00502 \times BTUh + 116.86054 \times \%AFUE - 8378.11 \quad \text{eqn. 2}$$

$$Cost_{St\,Eff\,Furnace\,Labor} = 17.70751 \times \%AFUE - 579.16206 \quad \text{eqn. 3}$$

$$Cost_{Hi\,Eff\,Furnace\,Equipment} = 0.00601 \times BTUh + 194.06976 \times \%AFUE - 16500 \quad \text{eqn. 4}$$

$$Cost_{Hi\,Eff\,Furnace\,Labor} = 2600.5972 \quad \text{eqn. 5}$$

Capacity is not included in the models describing labor cost due to a lack on influence on model behavior. Indeed AFUE has such a minor role in the behavior of the high efficiency furnace simulation as to fix labor cost at approximately $2,600 across our range of capacity and efficiency. We plotted the total cost model (as defined by eqn. 1) along with secondary source data, and Trade Ally Survey data. This figure allows readers to assess the relationship between survey data and estimated incremental costs. Figure 4-3 shows the resulting curves.

Figure 4-3. Furnace Capacity vs Cost Model

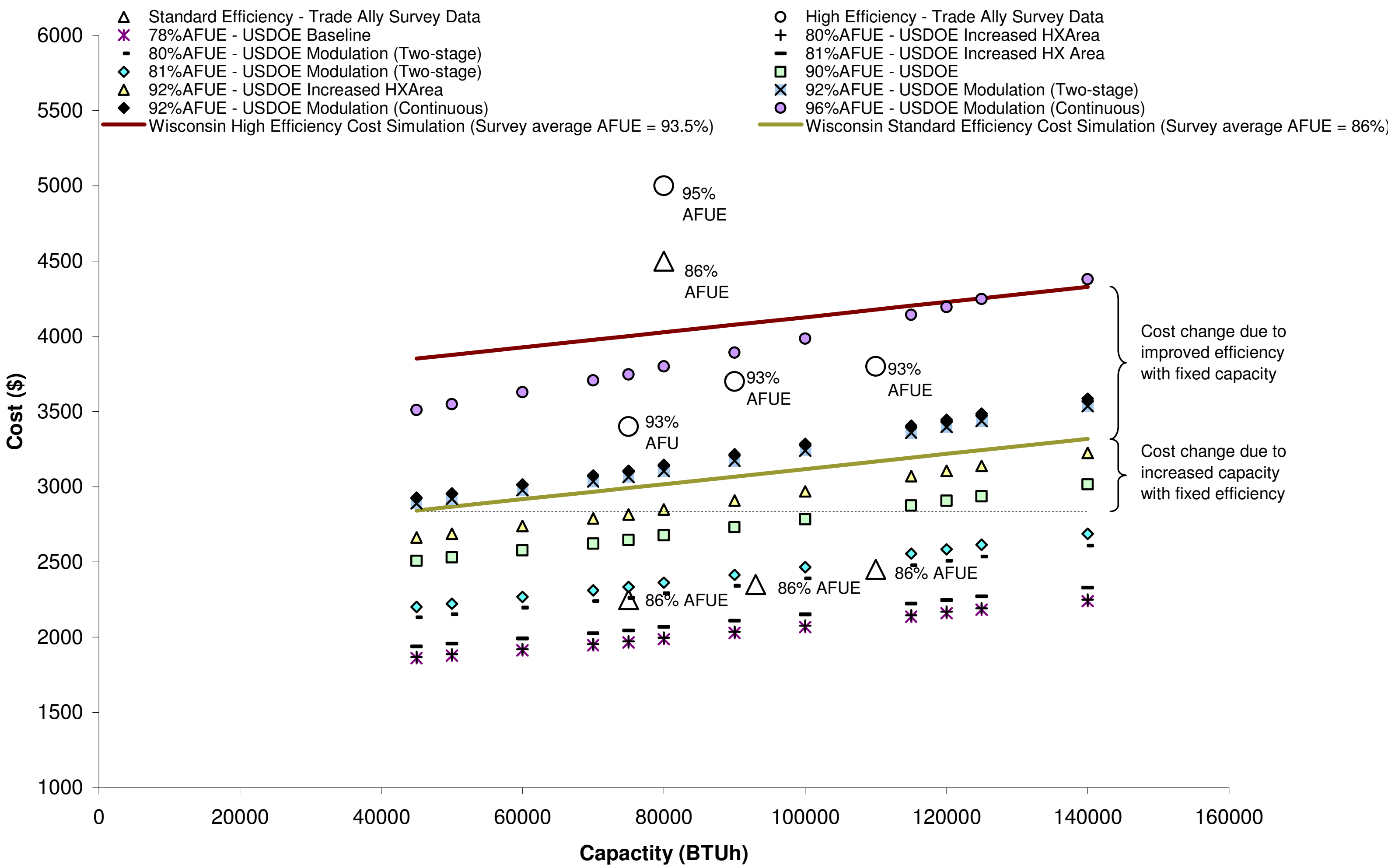


Figure 4-3 includes data from the trade ally survey, a USDOE lifecycle cost table and simulated Wisconsin furnace costs. DOE data shows that as capacity increases cost increases. The fact that these lines are nearly parallel shows that this price increase occurs at the same rate across efficiency levels. The simulated Wisconsin furnace cost lines combine the DOE data to produce a cost estimate for a generalized high efficiency and standard efficiency furnace. The Wisconsin simulations used the average AFUE rating provided by trade ally survey responses. The mean AFUE for our high efficiency furnaces is 93.5 percent, while the mean AFUE for standard furnaces was 86 percent. To validate our simulated cost lines we also show data points provided by trade ally survey respondents. Prices differ between the survey responses and the DOE data. Although we found that absolute prices in Wisconsin tend to be lower than what our model predicts, the incremental cost tends to be similar. Based on the similarity in behavior we suggest that our natural replacement incremental costs estimates for each furnace size range are reasonable for Wisconsin.

Figure 4-3 also illustrates that, within the bounds of this analysis, furnace cost is more strongly dependant on efficiency than on capacity. This is likely because furnace components change little as capacity increases within the bounds of this analysis. Increasing efficiency involves additional mechanisms and more advanced technologies resulting in higher unit cost.

4.3.2 HVAC incremental costs

We summarize the natural replacement incremental costs, full costs, and simple payback in Table 4-3. These results include furnaces, PTACs, and PTHPs. We were unable to obtain useable data for cost analysis of roof top units and split systems.

Table 4-3. HVAC Equipment Costs and Paybacks – Furnaces, PTACs, and PTHPs

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs)				Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs)				Full Cost for Efficient Measure
				Ag	Comm	Ind	Schl/ Gov't		Ag	Comm	Ind	Schl/ Gov't	
4.1697.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 54.675 - 60.749 MBh	1.31	1.29	1.47	1.42	$275 *	15.11	14.94	16.94	16.36	$3,181 *
4.1698.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 60.750 - 67.499 MBh	1.24	1.23	1.39	1.35	$291 *	13.81	13.64	15.48	14.94	$3,228 *
4.1699.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 67.5 - 74.9 MBh	1.18	1.17	1.33	1.28	$307 *	12.63	12.48	14.15	13.67	$3,280 *
4.1701.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 75.0 - 82.5 MBh	1.13	1.12	1.27	1.23	$325 *	11.62	11.48	13.02	12.58	$3,336 *
4.1702.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 82.5 - 90.75 MBh	1.09	1.08	1.22	1.18	$344 *	10.75	10.62	12.05	11.63	$3,394 *

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs)				Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs)				Full Cost for Efficient Measure
				Ag	Comm	Ind	Schl/ Gov't		Ag	Comm	Ind	Schl/ Gov't	
4.1703.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 90.76 - 99.82 MBh	1.05	1.04	1.18	1.14	$365 *	9.95	9.84	11.16	10.77	$3,458 *
4.1704.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 99.83 - 109.8 MBh	1.01	1.00	1.14	1.10	$387 *	9.23	9.13	10.35	9.99	$3,529 *
4.1705.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 109.9 - 120.7 MBh	0.98	0.97	1.10	1.06	$412 *	8.58	8.48	9.62	9.28	$3,606 *
4.1706.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 120.8 - 132.9 MBh	0.95	0.94	1.06	1.03	$439 *	7.98	7.89	8.95	8.64	$3,692 *
4.1707.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 133.0 - 146.1 MBh	0.92	0.91	1.03	1.00	$469 *	7.44	7.35	8.34	8.05	$3,786 *
4.1708.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 146.2 - 160.8 MBh	0.90	0.89	1.01	0.97	$502 *	6.95	6.87	7.79	7.52	$3,889 *
4.5000.085	HVAC	Controls	Guest Room Energy Management Controls - Electric heat PTAC systems only	-	-	-	-	Use Previous Method**	-	-	-	-	Use Previous Method **
4.3805.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTAC, <8000 Btuh, ≥12.1 EER, Retrofit Application	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
4.3806.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTAC, <8000 Btuh, ≥12.1 EER, New Construction	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
4.3810.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTAC, 8000 - 9999 Btuh, ≥11.5 EER, Retrofit Application	3.07	3.01	3.03	2.99	$54 *	43.48	42.54	42.86	42.29	$768 *
4.3811.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTAC, 8000 - 9999 Btuh, ≥11.5 EER, New Construction	5.89	5.76	5.80	5.73	$54 *	83.34	81.54	82.15	81.05	$768 *
4.3815.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTAC, 10000-12999 Btuh, ≥10.9 EER, Retrofit Application	2.40	2.35	2.36	2.33	$84 *	19.81	19.39	19.53	19.27	$693 *
4.3816.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTAC, 10000-12999 Btuh, ≥10.9 EER, New Construction	6.95	6.80	6.85	6.76	$84 *	57.39	56.15	56.57	55.81	$693 *
4.3820.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTAC, ≥13000 Btuh, ≥9.8 EER, Retrofit Application	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
4.3821.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTAC, ≥13000 Btuh, ≥9.8 EER, New Construction	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs)				Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs)				Full Cost for Efficient Measure
				Ag	Comm	Ind	Schl/ Gov't		Ag	Comm	Ind	Schl/ Gov't	
4.3822.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTHP, <8000 Btuh, ≥12.1 EER, Retrofit Application	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
4.3823.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTHP, <8000 Btuh, ≥12.1 EER, New Construction	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
4.3824.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTHP, 8000 - 9999 Btuh, ≥11.5 EER, Retrofit Application	0.53	0.50	0.51	0.49	$61 *	5.55	5.16	5.29	5.05	$629 *
4.3825.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTHP, 8000 - 9999 Btuh, ≥11.5 EER, New Construction	0.60	0.55	0.57	0.54	$61 *	6.22	5.74	5.90	5.62	$629 *
4.3826.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTHP, 10000-12999 Btuh, ≥10.9 EER, Retrofit Application	0.65	0.60	0.62	0.59	$105 *	4.77	4.44	4.55	4.36	$771 *
4.3827.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTHP, 10000-12999 Btuh, ≥10.9 EER, New Construction	0.76	0.70	0.72	0.69	$105 *	5.59	5.17	5.30	5.06	$771 *
4.3830.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTHP, ≥13000 Btuh, ≥9.8 EER, Retrofit Application	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
4.3831.295	HVAC	Packaged Terminal Unit (PTAC, PTHP)	PTHP, ≥13000 Btuh, ≥9.8 EER, New Construction	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **

* Pricing data obtained from secondary sources.
** Pricing data unavailable through this study.

We were unable to estimate natural replacement incremental costs for some measures. As a result, we calculated ratios of mean incremental cost to unit of savings (i.e., kW, kWh, and therm) based on measures for which we estimated incremental costs. These ratios can be used as a check against existing incremental costs for measures that were not verified through this study. A low ratio can indicate low incremental cost or high savings. Table 4-4 shows ratios for HVAC end use and some specific subcategories of HVAC end use (note: steam trap repairs are included in this table as a subcategory of HVAC end use but are discussed in the next section).

Table 4-4. HVAC Mean IC per Unit Savings Ratios

End Use	Mean IC per kW ($/kW)	Mean IC per kWh ($/kWh)	Mean IC per Therm ($/therm)
2 - HVAC*	551	0.12	0.96
2.1 - Furnaces	NA	0.38	1.24
2.2 - Steam Trap Repair	NA	NA	0.47
2.3 - PTAC	494	0.57	NA
2.4 - PTHP	672	0.03	NA

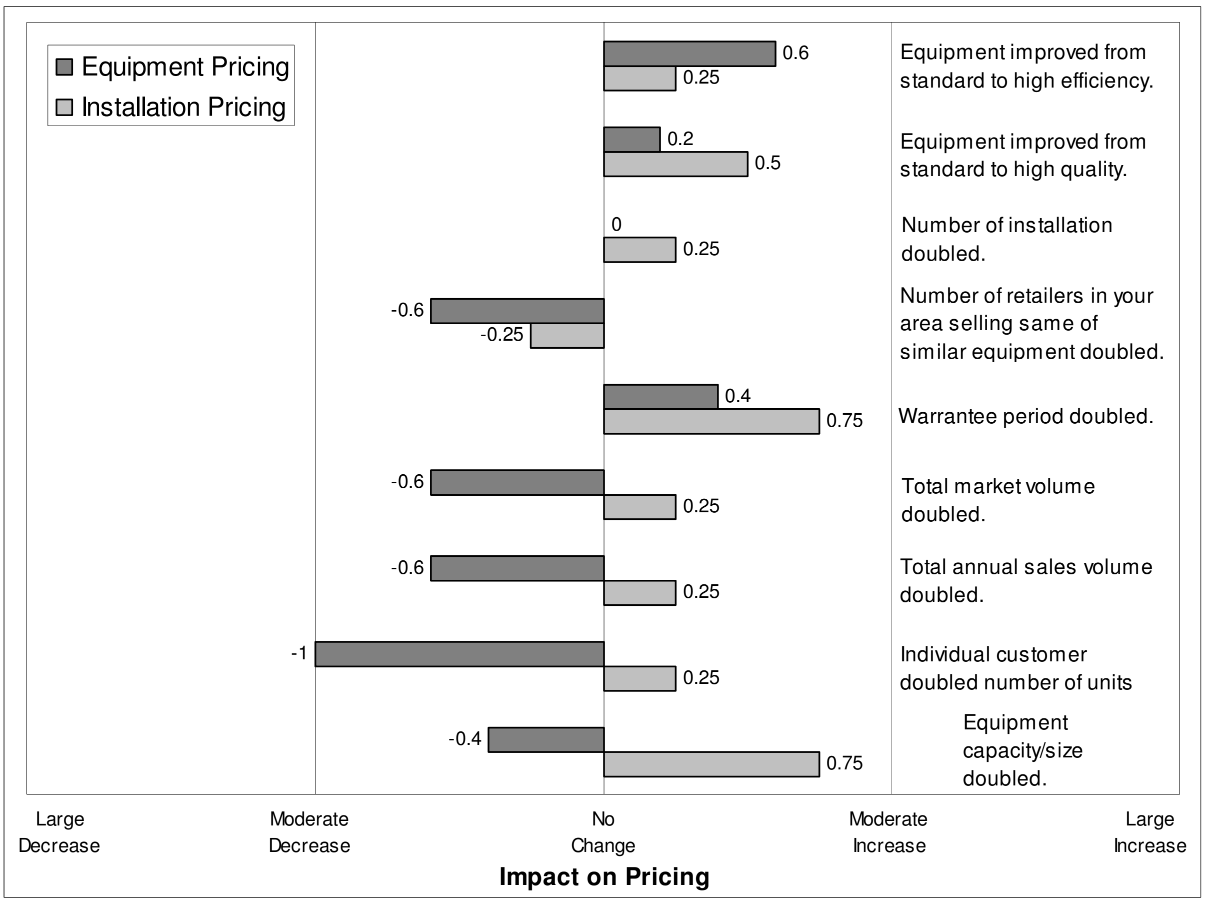
*All HVAC technologies reported in this study

One item of note in Table 4-4 is the incremental cost per kW for a PTAC and a PTHP is somewhat similar while the incremental cost per kWh for a PTAC is dramatically different from that for a PTHP. This may seem counter-intuitive but actually makes sense. The kW savings for both technologies are driven by operation in cooling mode. Similar sized PTAC and PTHPs will have somewhat similar kW savings for the efficient version. Conversely, the kWh savings for a PTAC will occur primarily only during the cooling season while the kWh savings for a PTHP will generally occur in both the heating and cooling season. As a result, a PTHP will have greater annual savings and therefore a lower incremental cost per kWh saved.

4.3.3 Factors affecting HVAC pricing

Through the study, we obtained data on the impact that market factors (such as increased competition) may have on HVAC equipment and installation pricing. We compiled the average responses to the market factors' impact on lighting equipment pricing in Figure 4-4.

Figure 4-4. Average Responses to HVAC Equipment Pricing Impact Questions



Note: Results based on five responses. Responses were equated to a five-point scale with -2 corresponding to a large decrease and +2 corresponding to a large increase.

Figure 4-4 shows that some changes in the HVAC market or in HVAC equipment will cause price changes. The changes indicated by the responses do not necessarily make sense. We expect volume discounts to reduce pricing for both equipment and labor on a per unit basis. The increases shown for labor associated with increasing volume suggest respondents answered the labor questions per job not per unit installed. Since there seems to be problems with the interpretation of the questions by respondents, we cannot draw any additional insights from the data.

4.4 BOILERS

Although we collected some pricing data for boilers from seven respondents through the trade ally survey, these data were inadequate for analysis. Boilers are available in a wide range of sizes and efficiencies and a regression model for boiler pricing should include a coefficient for both. We only obtained nine boiler data points through the trade ally survey. This quantity is inadequate to perform a two variable linear regression. We were also unable to find secondary sources of pricing for the boiler capacities larger than 300 MBh. As a result, we are not able to produce cost estimates for boilers. We recommend the continued use of existing cost estimates until additional pricing data can be obtained from future impact evaluations or market research.

We were able to collect some pricing data for steam trap repairs, and we obtained additional data from the Grainger Industrial Products Catalog and RSMeans. We based the analysis on these data. In the following sections, we discuss the methods used for analysis and the natural replacement incremental costs that we calculated. We also present incremental cost per therm ratio for steam traps. This ratio has limited applicability but is included to provide a more complete picture for the study as a whole. Finally, we present average responses to questions about the impact on pricing of various market factors (e.g., impact of pricing if number of installations doubled).

4.4.1 Analysis methods

We obtained pricing for steam trap repair kits from the Trade Ally Survey, Grainger catalog, and RSMeans. The Trade Ally Survey provided adequate equipment and installation pricing data for steam traps for pressures less than 50 psig. Grainger provided steam trap equipment pricing data and RSMeans provided installation pricing data for steam traps between 50 psig and 125 psig.

Each source of data required separate analysis. The price for steam trap equipment less than 50 psig and associated installation is a mean of trade ally responses. For steam traps rated more the 50 psig and less than 125 psig, steam traps repair kits in Grainger provided pricing based on pressure and orifice size. We estimated the price for a given pressure by finding the mean price of traps with different orifice sizes. Finally, the installation cost for the 50 to 125 psig traps is as reported in RSMeans.

4.4.2 Boiler equipment incremental costs

The natural replacement incremental costs, full costs, and simple paybacks for steam traps with pressure ratings of less than 125 psig (pounds per square inch gauge) are shown in Table 4-5.

Table 4-5. Boiler Equipment Costs and Paybacks

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs)				Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs)				Full Cost for Efficient Measure
				Ag	Comm	Ind	Schl/ Gov't		Ag	Comm	Ind	Schl/ Gov't	
1.1412.390	Boilers & Burners	Steam Trap	Repair leaking steam trap, <50 psig steam (Industrial Only)	1.08	1.08	1.25	1.21	$214	1.08	1.08	1.25	1.21	$214
1.1414.390	Boilers & Burners	Steam Trap	Repair leaking steam trap, 50-125 psig steam (Industrial Only)	0.46	0.46	0.54	0.52	$353 *	0.46	0.46	0.54	0.52	$353 *
1.1416.390	Boilers & Burners	Steam Trap	Repair leaking steam trap, 126-225 psig steam (Industrial Only)	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
1.1418.390	Boilers & Burners	Steam Trap	Repair leaking steam trap, >225 psig steam (Industrial Only)	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **

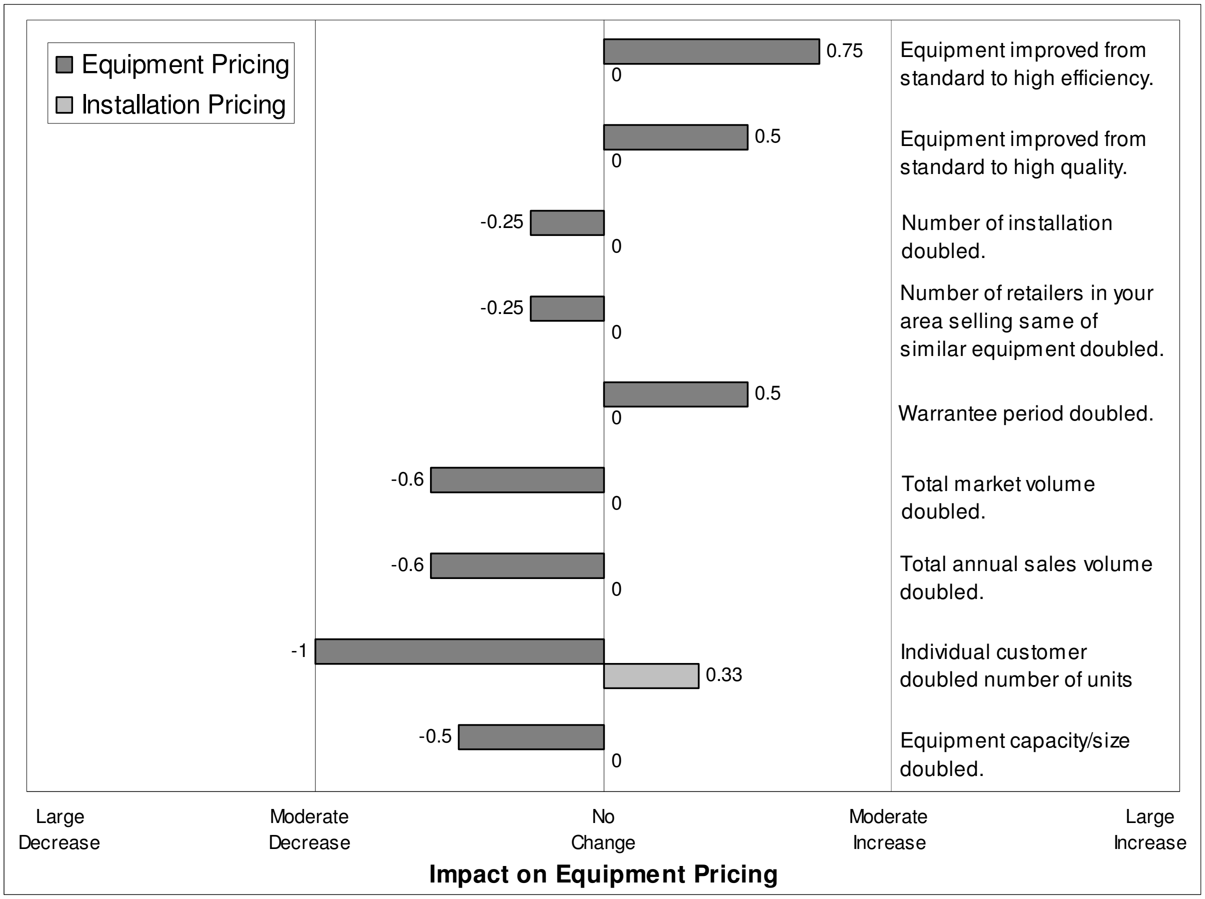
* Pricing data obtained from secondary sources.
** Pricing data unavailable through this study.

The ratio of incremental cost per therm saved for steam traps is 0.59. This ratio is lower than other IC per therm saved ratios presented in this study and indicates a relatively cost effective energy savings measure.

4.4.3 Factors affecting boiler equipment pricing

Through the study, we also obtained data on the impact that market factors (such as increased competition) may have on boiler equipment and installation pricing. We compiled the average responses to the market factors' impact on boiler equipment pricing in Figure 4-5.

Figure 4-5. Average Responses to Boiler Equipment Pricing Impact Questions



Note: Results based on five responses. Responses were equated to a five-point scale with -2 corresponding to a large decrease and +2 corresponding to a large increase.

Figure 4-5 shows that some changes in the boiler market or in boiler equipment will cause price changes. Some of the market or equipment changes will cause increases while other changes will cause decreases. The respondents provided little data on installation pricing. As a result, we focused on equipment pricing impacts.

Factors that increase pricing:

- Changing the product from standard to high efficiency has a slightly greater impact on pricing than changing from standard to high quality or doubling warrantee. This makes sense since higher efficiency equipment is often also higher quality. In addition, since failure of a single boiler can seriously limit operations, businesses are likely to be interested in longer warrantees.

Factors that decrease pricing:

- Increasing sales volume for any reason will tend to lower price. This price decrease makes sense since businesses selling and installing equipment have both fixed and adjustable costs. Larger sales volumes will result in lower fixed costs per unit sold. Desired profits can be obtained at a lower selling price.

- Increasing competition will lower the price. This price decrease follows basic economic theory—increasing supply will decrease price.

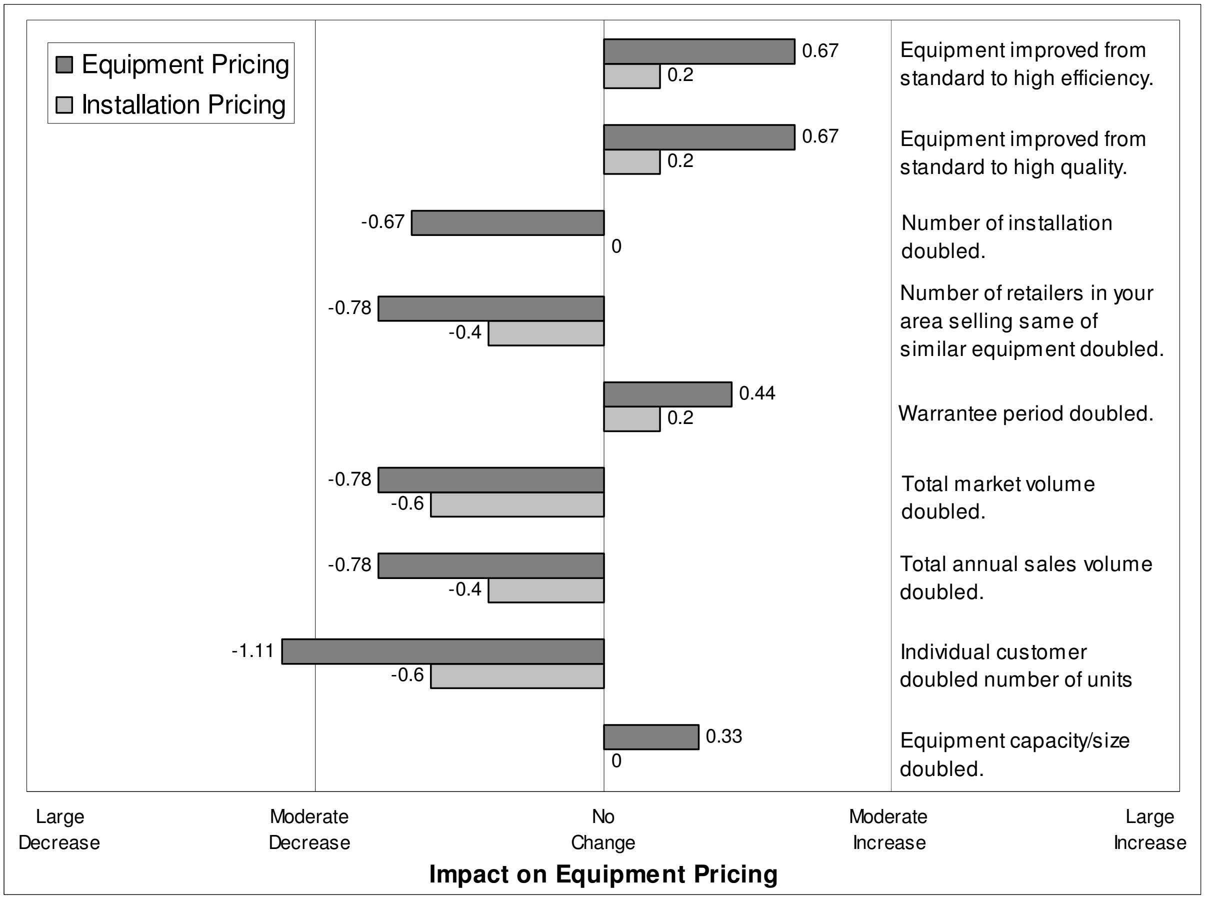
One finding is questionable. According to the respondents, doubling the equipment size will decrease the price. This response does not make sense and is likely an interpretation problem.

4.5 MOTORS AND DRIVES

Pricing data for motors and drives were thin. While nine respondents from the motor trade ally sample completed the survey, the respondents provided few pricing data points for each motor horsepower. Additionally, respondents provided minimal pricing data for variable frequency drives (VFDs). None of these data was adequate for incremental cost analysis. We were also unable to obtain useable data on motor pricing or VFDs through secondary sources (i.e., Grainger and DOE LCC). As a result, we are unable to report any incremental cost estimates for motors or VFDs.

Although incremental cost estimates are currently unavailable, we obtained data on the impact that market factors may have on motor and drive equipment and installation pricing. We compiled the average responses to the market factors' impact on boiler equipment pricing in Figure 4-6.

Figure 4-6. Average Responses to Motor Pricing Impact Questions



Note: Results based on nine responses. Responses were equated to a five-point scale with -2 corresponding to a large decrease and +2 corresponding to a large increase.

Figure 4-6 shows that some changes in the motor market or in motor equipment will cause price changes. Some of the market or equipment changes will cause increases while other changes will cause decreases.

Factors that increase pricing:

- Changing the product from standard to high efficiency has about the same impact on pricing than changing from standard to high quality. The pricing increase makes sense since higher efficiency equipment is often also higher quality.
- Doubling the warrantee period will increase the price but not as much as changing to high efficiency or high quality. This pricing increase also makes sense. A product with higher efficiency *will* save the business money over time. However, an increased warrantee *may* save the business money in the future. As a result, the increased warrantee will not be as valuable to the business,
- Increasing the product efficiency, quality, or warrantee will have a substantially larger impact on equipment price than labor price. This makes sense as well. Products with higher efficiency, quality, or warrantee may require greater skill or care during installation resulting in higher labor pricing. However, it is not likely that the additional time will be too large.

- Increasing the equipment capacity or size will slightly increase price. This makes sense since a larger motor will require more materials but will have a similar assembly time at the manufacturer. The price for a larger motor will be higher reflecting the increase in material cost.

Factors that decrease pricing:

- Increasing sales volume for any reason will tend to lower price. This price decrease makes sense since businesses selling and installing equipment have both fixed and adjustable costs. Larger sales volumes will result in lower fixed costs per unit sold. Desired profits can be obtained at a lower selling price.
- Increasing competition will lower price. This price decrease follows basic economic theory—increasing supply will decrease price.

4.6 VENDING MACHINES AND CONTROLS

Limited data were available regarding vending machines and controls. The original sample frame only included three trade allies for this technology category. Of these, only two completed the survey. These respondents provided equipment pricing for a single cold beverage vending machine control (VMC) unit and a single snack VMC. No respondents provided data on the unit cost or installation price for vending machines of any type.

DEER provided information for cold beverage VMCs and some limited cost information on ENERGY STAR rated machines. No information regarding standard unit pricing was available in DEER. In the absence of this information, we cannot estimate the incremental cost for replace on burnout (natural replacement). However, we estimated incremental cost for early replacement by averaging the available cost information. We also estimated the incremental cost for VMCs. VMCs are a standalone efficiency measure and their full cost is the incremental cost for installing the technology. We provided the results of our analysis for each of the deemed savings measures for vending machines and controls in Table 4-6.

Table 4-6. Vending Incremental Costs

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs)				Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs)				Full Cost for Efficient Measure
				Ag	Comm	Ind	Schl/ Gov't		Ag	Comm	Ind	Schl/ Gov't	
17.0500.465	Plug Loads	Vending Machine	Vending Machine, ENERGY STAR, Cold Beverage, Not Software Activated	-	-	-	-		1.62	1.62	1.62	1.62	$199 *
17.0501.465	Plug Loads	Vending Machine	Vending Machine, ENERGY STAR, Cold Beverage, Software Activated	-	-	-	-		-	-	-	-	Use Previous Method **
17.0520.085	Plug Loads	Controls	Snack Machine - Install VendingMiser Controller	4.80	4.76	4.85	4.85	$73	4.80	4.76	4.85	4.85	$73 *

The ratio of incremental cost per kWh saved for snack machine VendingMiser Controller is 0.11. This ratio is lower than all of the lighting IC per kWh ratios except occupancy sensors. This indicates this measure is more cost effective for electrical energy savings than most lighting measures.

4.7 FOOD SERVICE EQUIPMENT

Data collection from the Trade Ally Survey provided mixed results for food service equipment pricing data. Seven respondents provided solid pricing information on fryers, hot food storage equipment, and ovens. The respondents also provided pricing data for most of the remaining food service equipment listed in the survey; however, pricing data from the survey were very sparse for dishwashers, steamers, griddles and dishwashers. These data were inadequate for analysis. In addition, labor pricing data are sparse since some respondents only sell the units and do not perform installations.

Food Service Warehouse, an online kitchen equipment distributor, provided additional pricing information for some measures. These sources lacked depth and provided only a few data points for each measure. We obtained adequate data from secondary sources to estimate incremental unit costs for griddles, ovens, dishwashers, steamers, refrigerators, and freezers. In cases where neither primary nor secondary data were satisfactory, we do not report an incremental cost for the measure.

4.7.1 Analysis methods

The analysis of food service pricing data posed a couple of challenges. The first challenge was that adequate labor pricing data were not available. Primary sources provided too few points to produce reliable estimates and secondary sources did not provide any. We assume that food service equipment cost is the primary driver of the total cost since installation can be simply connecting a plug and leveling the unit. Since incremental labor cost is likely to be negligible, we ignored labor cost in the results. The second challenge was that in some cases we only had data for the high efficiency option. In these cases, we only calculated the retrofit incremental cost.

We estimated the prices for the standard and high efficiency options as the mean price of the available data. When adequate survey data were available, we estimated the mean prices from these data as a weighted average. Otherwise, we estimated the mean prices from available secondary data. We did not mix survey data with secondary data for this analysis since we were unable to estimate weights associated with secondary sources. The replace on burnout (natural replacement) incremental cost for each measure is the difference between the high efficiency mean and the standard efficiency mean. The retrofit incremental cost for each measure is the high efficiency mean.

4.7.2 Food service equipment incremental costs

We provided the results of our analysis for each of the deemed measures for fryers, steamers, hot holding cabinets, ovens, griddles, and ice machines in Table 4-7.

Table 4-7. Food Service Equipment Costs and Paybacks – Miscellaneous

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Full Cost for Efficient Measure
14.1100.180	Food Service	Fryer	Fryer, Electric, ENERGY STAR	12.45	12.39	12.54	12.54	$861	25.33	25.21	25.53	25.52	$1,752
14.1200.180	Food Service	Fryer	Fryer, Gas, ENERGY STAR	3.39	3.39	3.91	3.79	$1,351	5.94	5.94	6.85	6.63	$2,363
14.1301.180	Food Service	Fryer	Fryer, Large Vat, Electric, High Efficiency	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.1302.180	Food Service	Fryer	Fryer, Large Vat, Gas, High Efficiency	3.45	3.45	3.98	3.85	$2,000	6.90	6.90	7.96	7.71	$4,000
14.2103.395	Food Service	Steamer	Steamer, Electric, 3 pan - ENERGY STAR	-	-	-	-	Use Previous Method **	4.90	4.88	4.94	4.94	$4,000
14.2104.395	Food Service	Steamer	Steamer, Electric, 4 pan - ENERGY STAR	-	-	-	-	Use Previous Method **	5.26	5.23	5.30	5.30	$4,588 *
14.2105.395	Food Service	Steamer	Steamer, Electric, 5 pan - ENERGY STAR	-	-	-	-	Use Previous Method **	6.43	6.40	6.48	6.48	$6,000
14.2106.395	Food Service	Steamer	Steamer, Electric, 6 pan - ENERGY STAR	-	-	-	-	Use Previous Method **	10.07	10.02	10.15	10.15	$10,000
14.2107.395	Food Service	Steamer	Steamer, Gas, 5 pan - ENERGY STAR	(0.10)	(0.10)	(0.11)	(0.11)	-$182*	2.96	2.96	3.41	3.31	$5,652 *
14.2206.395	Food Service	Steamer	Steamer, Gas, 6 pan - ENERGY STAR	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.3000.225	Food Service	Hot Holding Cabinet	Hot Food Holding Cabinet - ENERGY STAR	5.55	5.52	5.60	5.60	$1,600	12.49	12.42	12.60	12.60	$3,600
14.3101.290	Food Service	Oven	Oven, Convection, Electric, High Efficiency	4.76	4.73	4.80	4.80	$600	26.40	26.23	26.65	26.65	$3,329
14.3102.290	Food Service	Oven	Oven, Convection, Gas, High Efficiency	1.85	1.85	2.13	2.06	$600	10.26	10.26	11.83	11.46	$3,329
14.3501.210	Food Service	Griddle	Griddle, Electric, High Efficiency	29.10	28.97	29.31	29.31	$3,600 *	37.67	37.50	37.94	37.94	$4,660 *
14.3502.210	Food Service	Griddle	Griddle, Gas, High Efficiency	26.68	26.68	30.77	29.80	$2,359 *	58.35	58.35	67.30	65.18	$5,160 *

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Full Cost for Efficient Measure
14.5100.235	Food Service	Ice Machine	Ice Machines, < 500 lbs, High Efficiency	-	-	-	-	Use Previous Method **	22.56	22.46	22.71	22.71	$2,122 *
14.5200.235	Food Service	Ice Machine	Ice Machines, 500-1000 lbs, High Efficiency	-	-	-	-	Use Previous Method **	18.05	17.97	18.17	18.17	$2,507 *
14.5300.235	Food Service	Ice Machine	Ice Machines, > 1000 lbs, High Efficiency	-	-	-	-	Use Previous Method **	10.90	10.85	10.98	10.97	$4,136 *

* Pricing data obtained from secondary sources.
** Pricing data unavailable through this study.

The Food Service Warehouse provided information on commercial refrigerators and freezers in addition to the technologies above. The analysis for refrigerators and freezers is limited to retrofit situations since we only have average cost for high efficiency equipment. In addition, the installation costs for refrigerators are negligible and are not included. We provided the results of our analysis for each of the deemed savings measures for refrigeration equipment costs and paybacks in Table 4-8.

Table 4-8. Food Service Equipment Costs and Paybacks – Refrigerator and Freezer

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Full Cost for Efficient Measure
14.4110.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, < 20 cu ft, ENERGY STAR	-	-	-	-		130.06	129.31	131.25	131.22	$2,865 *
14.4120.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, 20-48 cu ft, ENERGY STAR	-	-	-	-		103.41	102.81	104.35	104.33	$3,274 *
14.4130.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, > 48 cu ft, ENERGY STAR	-	-	-	-		100.50	99.91	101.41	101.40	$4,976 *
14.4135.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, Commercial, CEE Tier 2 efficiency, < 20 cu ft	-	-	-	-		66.89	66.50	67.50	67.49	$3,347 *
14.4136.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, Commercial, CEE Tier 2 efficiency, 20-48 cu ft	-	-	-	-		35.04	34.84	35.36	35.35	$2,633 *
14.4137.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, Commercial, CEE Tier 2 efficiency, >48 cu ft	-	-	-	-		51.06	50.76	51.52	51.51	$6,201 *
14.4210.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, < 20 cu ft, ENERGY STAR	-	-	-	-		150.06	149.19	151.43	151.40	$2,844 *
14.4220.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, 20-48 cu ft, ENERGY STAR	-	-	-	-		182.71	181.65	184.37	184.34	$3,310 *
14.4230.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, > 48 cu ft, ENERGY STAR	-	-	-	-		488.43	485.59	492.90	492.82	$8,141

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Full Cost for Efficient Measure
14.4235.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, Commercial, CEE Tier 2 efficiency, <20 cu ft	-	-	-	-		58.60	58.26	59.13	59.12	$3,445 *
14.4236.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, Commercial, CEE Tier 2 efficiency, 20-48 cu ft	-	-	-	-		37.45	37.23	37.79	37.78	$3,912 *
14.4237.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, Commercial, CEE Tier 2 efficiency, >48 cu ft	-	-	-	-		38.66	38.43	39.01	39.01	$7,282 *

* Pricing data obtained from secondary sources.

The available pricing data for dishwashers provided some results that seem reasonable and others that did not. For example, the secondary data indicates that ENERGY STAR dishwashers are less expensive than standard dishwashers are. We do not believe this is a valid result and have presented it here for discussion. Table 4-9 shows the results of our analysis for each of the deemed savings measures for dishwasher equipment costs and paybacks.

Table 4-9.Food Service Equipment Costs and Paybacks – Dishwashers

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Full Cost for Efficient Measure
14.5400.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Electric Heat, Electric Booster, Door Type	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5401.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Electric Heat, Electric Booster, Multi Tank Conveyor	2.08	2.06	2.09	2.09	$4,000 *	12.45	12.38	12.57	12.56	$24,000 *
14.5402.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Electric Heat, Electric Booster, Single Tank Conveyor	2.86	2.84	2.88	2.88	$3,000 *	14.28	14.19	14.41	14.40	$15,000 *
14.5403.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Electric Heat, Electric Booster, Under Counter	(0.97)	(0.96)	(0.98)	(0.98)	$(408) *	9.24	9.19	9.33	9.32	$3,895
14.5404.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Electric Booster, Door Type	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5405.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Electric Booster, Multi Tank Conveyor	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs) Ag	Comm	Ind	Schl/ Gov't	Full Cost for Efficient Measure
14.5406.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Electric Booster, Single Tank Conveyor	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5407.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Electric Booster, Under Counter	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5408.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Gas Booster, Door Type	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5409.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Gas Booster, Multi Tank Conveyor	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5410.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Gas Booster, Single Tank Conveyor	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5411.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Gas Booster, Under Counter	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5413.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Electric Heat, Door Type	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5414.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Electric Heat, Multi Tank Conveyor	4.06	4.03	4.09	4.09	$4,000 *	22.32	22.19	22.52	22.52	$22,000 *
14.5416.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Electric Heat, Single Tank Conveyor	4.67	4.64	4.71	4.71	3,000 *	21.80	21.67	22.00	21.99	$14,000 *
14.5417.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Electric Heat, Under Counter	-	-	-	-	Use Previous Method **	51.15	50.86	51.62	51.61	$3,500
14.5419.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Gas Heat, Door Type	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5420.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Gas Heat, Multi Tank Conveyor	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **

WISeerts Tech Code	Group Desc.	Category Description	Measure Description	Natural Replacement Incremental Cost Simple Payback (yrs)				Natural Replacement Incremental Cost	Full Cost Simple Payback (yrs)				Full Cost for Efficient Measure
				Ag	Comm	Ind	Schl/ Gov't		Ag	Comm	Ind	Schl/ Gov't	
14.5422.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Gas Heat, Single Tank Conveyor	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **
14.5423.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Gas Heat, Under Counter	-	-	-	-	Use Previous Method **	-	-	-	-	Use Previous Method **

* Pricing data obtained from secondary sources.
** Pricing data unavailable through this study.

As with other technologies, data were unavailable or not found for some measures. As a result, we calculated ratios of mean incremental cost to unit of savings (i.e., kW, kWh, and therms) based on measures for which we had estimated incremental costs. These ratios can be used as a check against existing incremental costs for measures that were not verified through this study. A low ratio can indicate low incremental cost or high savings. Table 4-10 shows ratios for food service equipment. In other sections of this report, we have calculated this ratio for the end use. In this case, Food Service is actually a subcategory of “Other” end use. We are reporting results specific to Food Service equipment for greater flexibility.

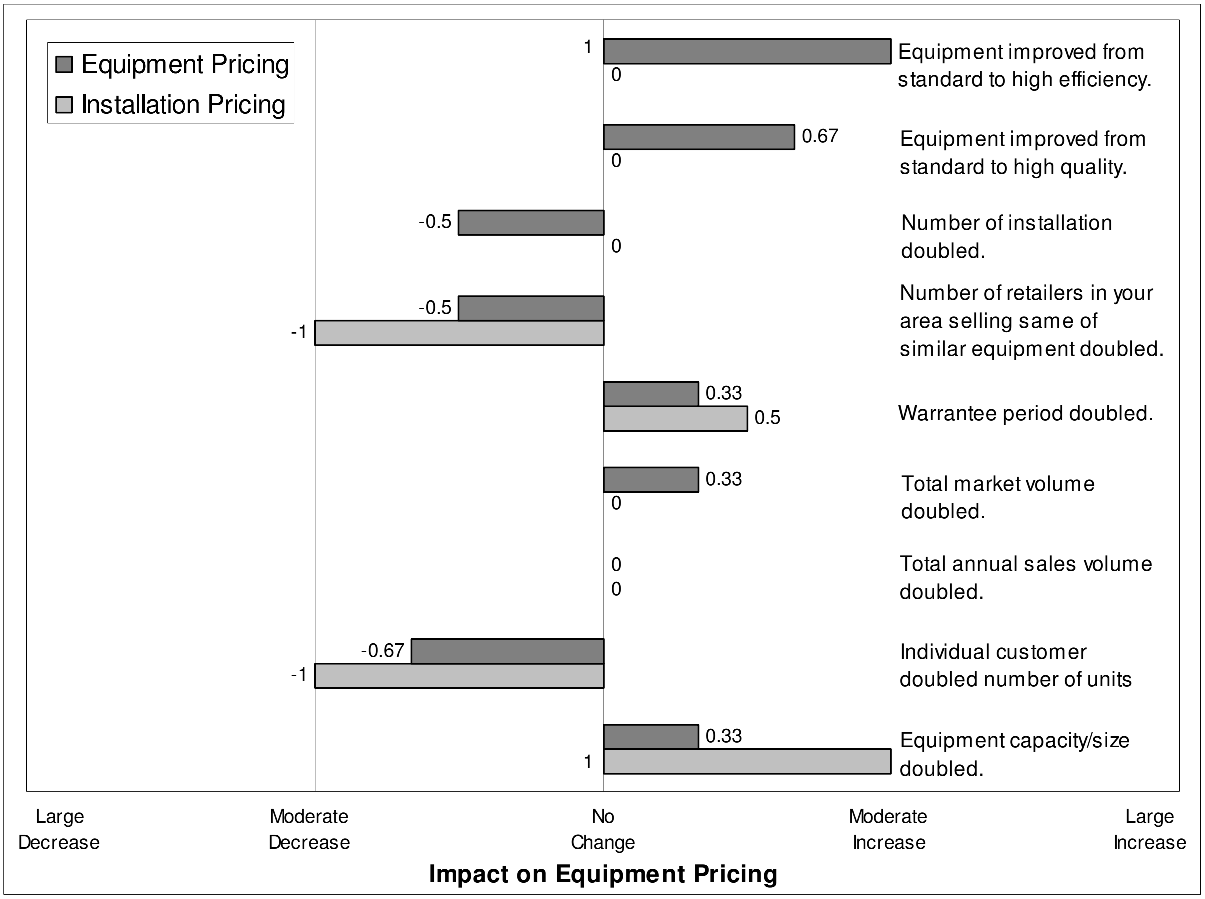
Table 4-10. Food Service IC per Unit Savings Ratios

End Use	Mean IC per kW ($/kW)	Mean IC per kWh ($/kWh)	Mean IC per Therm ($/therm)
5.1 - Food Service	2556	0.33	2.73

4.7.3 Factors affecting food service equipment pricing

We obtained data on the impact that market factors (such as increased competition) may have on food service equipment and installation pricing. We compiled the average responses to the market factors’ impact on food service equipment pricing in Figure 4-7.

Figure 4-7. Average Responses to Food Service Equipment Pricing Impact Questions



Note: Results based on four responses. Responses were equated to a five-point scale with -2 corresponding to a large decrease and +2 corresponding to a large increase.

Figure 4-7 shows that some changes in the food service market or in food service equipment will cause price changes. Some of the market or equipment changes will cause increases while other changes will cause decreases.

Factors that increase pricing:

- Changing the product from standard to high efficiency has a slightly larger impact on pricing than changing from standard to high quality. This pricing increase makes sense since higher efficiency equipment is often also higher quality.
- Doubling the warrantee period will increase the price, but not as much as changing to high efficiency or high quality. This pricing increase also makes sense. A product with higher efficiency *will* save the business money over time. However, an increased warrantee *may* save the business money in the future. As a result, the increased warrantee will not be as valuable to the business.
- Increasing the product efficiency, quality, or warrantee will have a substantially larger impact on equipment price than labor price. This makes sense as well. Products with higher efficiency, quality, or warrantee may require greater skill or care during installation resulting in higher labor pricing. However, it is not likely that the additional time will be too large.

- Increasing the equipment capacity or size will slightly increase price. This makes sense since a larger motor will require more materials but will have a similar assembly time at the manufacturer. The price for a larger motor will be higher reflecting the increase in material cost.
- Doubling market volume will tend to increase the price. This finding is counter to findings for other technologies. It is possible that increased demand associated with doubled market volume could drive a short-term price increase. At the same time, this finding could indicate an interpretation problem.

Factors that decrease pricing:

- Increasing sales volume will tend to lower price. This price decrease makes sense since businesses selling and installing equipment have both fixed and adjustable costs. Larger sales volumes will result in lower the fixed costs per unit sold. Desired profits can be obtained at a lower selling price. One finding does not follow this tendency. According to the respondents, doubling the market volume will tend to increase the price. This is discussed above.
- Increasing competition will lower the price. This price decrease follows basic economic theory—increasing supply will decrease price.

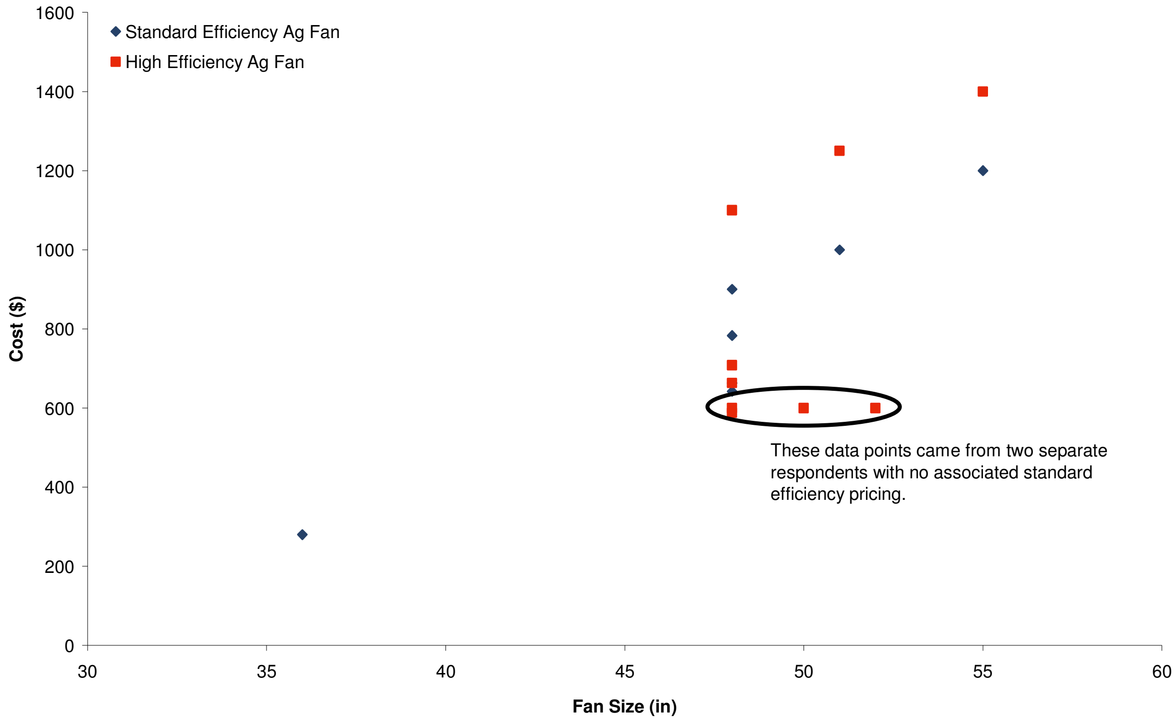
4.8 REFRIGERATION EQUIPMENT

Good data regarding grocery refrigeration equipment were unavailable. Only two of the refrigeration trade allies in the sample responded to the survey. These respondents provided little data on refrigeration equipment pricing. We are also unable to obtain data from secondary sources. As a result, we are unable to estimate any incremental costs.

4.9 AGRICULTURAL VENTILATION FANS

Although the original sample included 12 trade allies and 42 percent responded to the survey, we are unable to estimate natural replacement incremental costs for agricultural ventilation fans. The pricing data provided by respondents did not show a clear incremental cost between standard efficiency ventilation fans and high efficiency ventilation fans (see Figure 4-8).

Figure 4-8. Agricultural Ventilation Fan Pricing Data



Based on the pricing data we received and comments made by respondents during the phone surveys, we believe there is confusion about the definition of high efficiency ventilation fans. Focus on Energy defines high efficiency ventilation fans as those with a minimum ventilating efficiency ratio of 20 CFM per watt at 0.05 inch static pressure. However, not all ventilation fans provide this metric in their specifications.

Since the pricing data provided through the Trade Ally survey could not be used to calculate incremental costs, we researched secondary sources. The secondary sources did not provide pricing associated with a ventilation efficiency ratio and we were unable to obtain additional pricing data from secondary sources. As a result, we are unable to estimate an incremental cost.

4.10 CUSTOM ENGINEERING PROJECTS

The investigation of incremental cost for custom engineering projects provided good cost data for many custom engineering measures. Some incremental costs calculated in this part of the study can be compared directly to results of the Trade Ally survey. Other incremental costs provide a basis for understanding costs associated with custom engineering projects. However, this sample was too small and too diverse to provide general factors for application to future projects.

These calculated incremental costs are based primarily on invoices, other record documents, or information provided by respondents during the impact evaluation phone survey. Since most of these projects were retrofits or replacements, the incremental cost is the entire cost of the project. The only exception to this is LED traffic lights. These are a special case since the expected life of an LED traffic signal (100,000 hours) far exceeds the life of an incandescent traffic signal (16,000 hours). To keep the basis the same, we annualized the cost of the lamps and labor and calculated the incremental cost on an annual basis.[13]

The costs of VFDs for two of the custom projects can be compared to VFD costs estimated through Trade Ally survey (see Table 4-11). The VFD incremental cost for the tool and die company is consistent with the Trade Ally survey estimated incremental cost. The VFD incremental cost for the glass manufacturer is slightly higher than the Trade Ally survey estimated cost. This VFD rating for the custom project is at the high end or the survey range. With this in mind, the incremental cost is consistent with expected. Unfortunately, VFDs for the custom projects were installed in-house and no installation cost data are available.

[13] We assumed the lamps operate 4,380 hours per year (red is on half the time, green is on half the time, amber is negligible), lamp changes take 15 minutes and labor is $50 per hour.

Table 4-11. Incremental Costs of Largest Custom Projects by Savings Metric

End Use	Project Description	Simple Payback (years)	Incremental Cost (Equipment & Install)	Incremental Equipment Cost	Incremental Installation Cost	Units	Notes
2-HVAC	Municipality – Chiller System	3.62	$142.00	Insufficient Data	Insufficient Data	per ton of cooling	
	Paper manufacturer – Custom Boiler	5.14	$16.41	$6.59	$9.82	per lb of steam capacity	
	Food processing company – Flue gas heat recovery on boilers	4.88	$4.23	$2.82	$1.41	per therm of heat recovery	
	Paper manufacturer – Steam trap service buy-down	0.24	$1,001.00	$481.00	$520.00	per trap	Equipment cost is substantially higher than Trade Ally survey but consistent with Grainger pricing for some traps.
3-Lighting	Municipality – LED traffic lights	21.45	$3.62	$6.49	$(2.87)	per unit	Includes life cycle costs
	Health care – Reconfigure Lighting	1.92	$63.00	Insufficient Data	Insufficient Data	per light fixture	
4-Mnfg Process	Mill – Custom Compressed Air	2.14	$1,220.00	$782.00	$437.00	per compressor hp	
	Sealant manufacturer – Compressed air leak detection	0.02	$16.26	Insufficient Data	Insufficient Data	per leak	Survey cost only, repair cost unknown.
	Glass manufacturer – VFD on fan/blower	-	Insufficient Data	$8,143.00	Insufficient Data	per VFD	Equipment cost is consistent with Trade Ally survey results for 101 to 200hp VFDs. Installation by in-house labor
	Pipeline company – VFD on pump	-	Insufficient Data	$298,355.00	Insufficient Data	per VFD	VFD size exceeds online survey categories so no comparison is possible. Installation by in-house labor
	Tool and die company – VFD on fan/blower	-	Insufficient Data	$1,000.00	Insufficient Data	per VFD	Equipment cost is consistent with Trade Ally survey results for 1 to 20hp VFDs. Installation by in-house labor
	Plumbing fixtures manufacturer – Regenerative Thermal Oxidizer	4.77	$4.03	$3.67	$0.35	per therm saved	System cost
	Steel manufacturer – Recuperative Burners	NA	Insufficient Data	Insufficient Data	Insufficient Data		
	Food processing company – Process heat recovery	2.31	$2.01	$1.54	$0.47	per therm of heat recovery	
5-Other	School district – Demand Limiting Controls	0.61	$24,623.00	Insufficient Data	Insufficient Data	Total	Control System cost.

Most of the remainder of the incremental costs shown in Table 4-11 is for complex or non-typical systems. The particulars of some of these systems make their incremental costs almost negligible. For others, the complexity and level of customization makes their incremental costs quite high compared to prescriptive measures with similar savings.

The results are based on few measures within each end use and represent illustrative examples, not definitive values for application to future projects. The range is from less than one month to more than twenty years. However, the typical custom project reviewed had a three to four year payback prior to incentives. The median and weighted average simple paybacks for this sample of custom measures are 2.3 years and 3.0 years respectively. In contrast, the median and weighted average simple paybacks for deemed measures are 1.2 years and 1.8 years respectively.

The finding associated with LED traffic lights does not seem correct. Based on the project reviewed for this study, LED traffic lights have a simple payback of more than 21 years. This finding seems strange since LED traffic lights have been widely adopted due, in part, to their cost effectiveness. The incremental cost found through this analysis was based on the difference in equipment cost as well as labor to change lamps. The standard incandescent lamp (with a 16,000-hour life) would need to be changed six times over the life of a single LED lamp (with a 100,000-hour life). Although labor savings was included in the incremental cost estimate, we were unable to include additional maintenance and other savings (such as increased liability) associated with LED traffic lights. The costs and savings associated with this measure need additional research.

4.10.1 Recommendation for future research

In an effort to improve the applicability of ratios to the general custom project population, further research could be done on future projects. This study focused on the projects from the impact evaluation with the largest savings. As a result, this approach provided incremental costs for 4.4 percent of the custom program kW savings, 6.4 percent of the custom program kWh savings, and 11.9 percent of the custom program therm savings.

Sampling strategies for this study were limited because impact evaluations were completed at a customer level. This approach limited better sampling for purposes of incremental cost research. However, future impact evaluations will be completed at a measure level. This will allow future research efforts to consider custom projects by end use and sample these accordingly. This improved sampling approach could yield results that could be more easily generalized to the entire custom population.

4.11 FOCUS ON ENERGY SATISFACTION RATINGS

As part of the Incremental Cost Study, we surveyed respondents about their satisfaction with the Focus on Energy Program. In these questions, we were looking for strengths of the Programs interaction as well as any areas that may require improvement. We also asked respondents why the Program may not be asked to be involved in a project and how the Program could improve.

The respondents to the survey have a wide variety of experience with Focus on Energy. Of those who have completed eligible projects in the last year, the largest group completed energy efficient lighting projects (42 percent of respondents). Refer to Table 4-12 for additional information.

Table 4-12. Percentage of Respondents Participating in Technologies

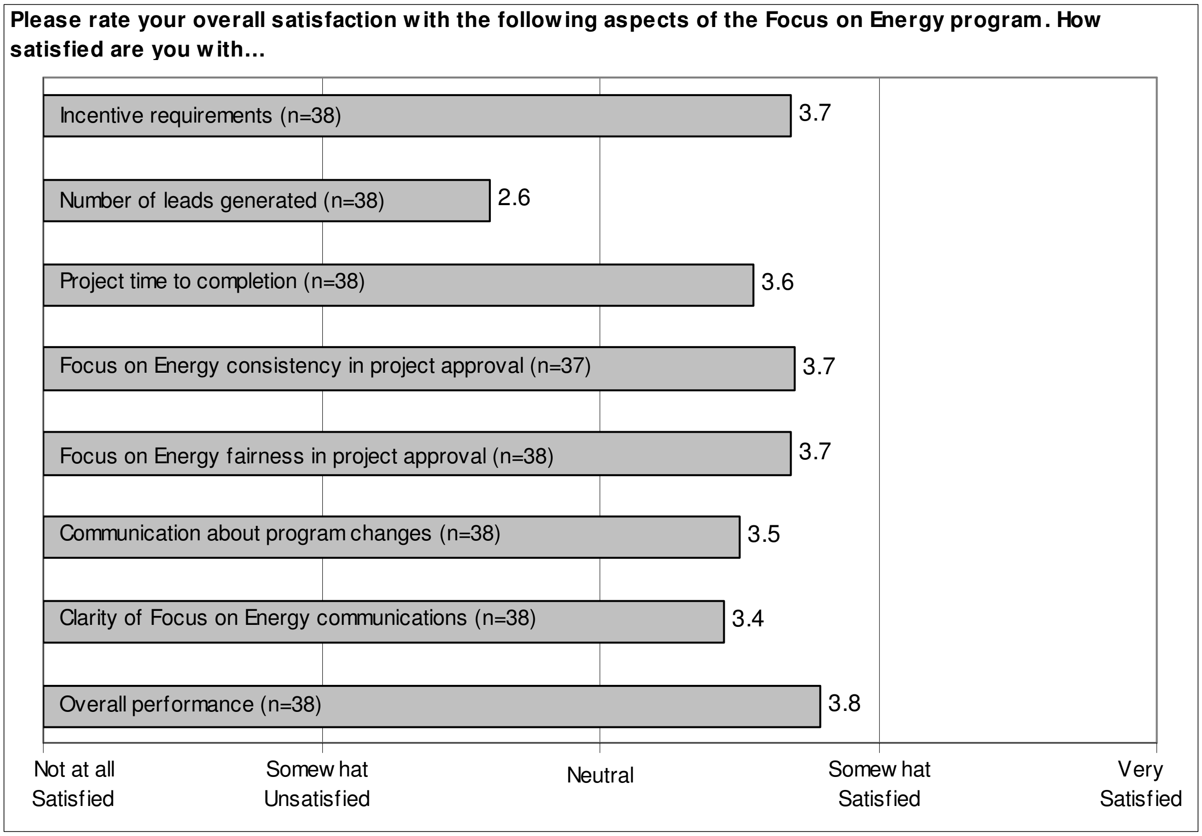
Technology	Percent of Respondents
EE Lighting	42%
Motors	20%
HVAC	11%
Ag Fans	11%
Boilers	11%
Food Service	9%
Refrigeration	7%
Vending	4%
Total	116%

Note: 45 respondents answered these questions.

We asked the trade allies how satisfied they were with their energy advisors as well as with various aspects of the Focus on Energy program. On average the respondents were generally more satisfied with their energy advisors (Figure 4-10) than they were with program processes such as incentive requirements, project approvals, and program communications (Figure 4-9). Respondents were least satisfied with the program's ability to generate customer leads for them. This issue is discussed in more detail below.

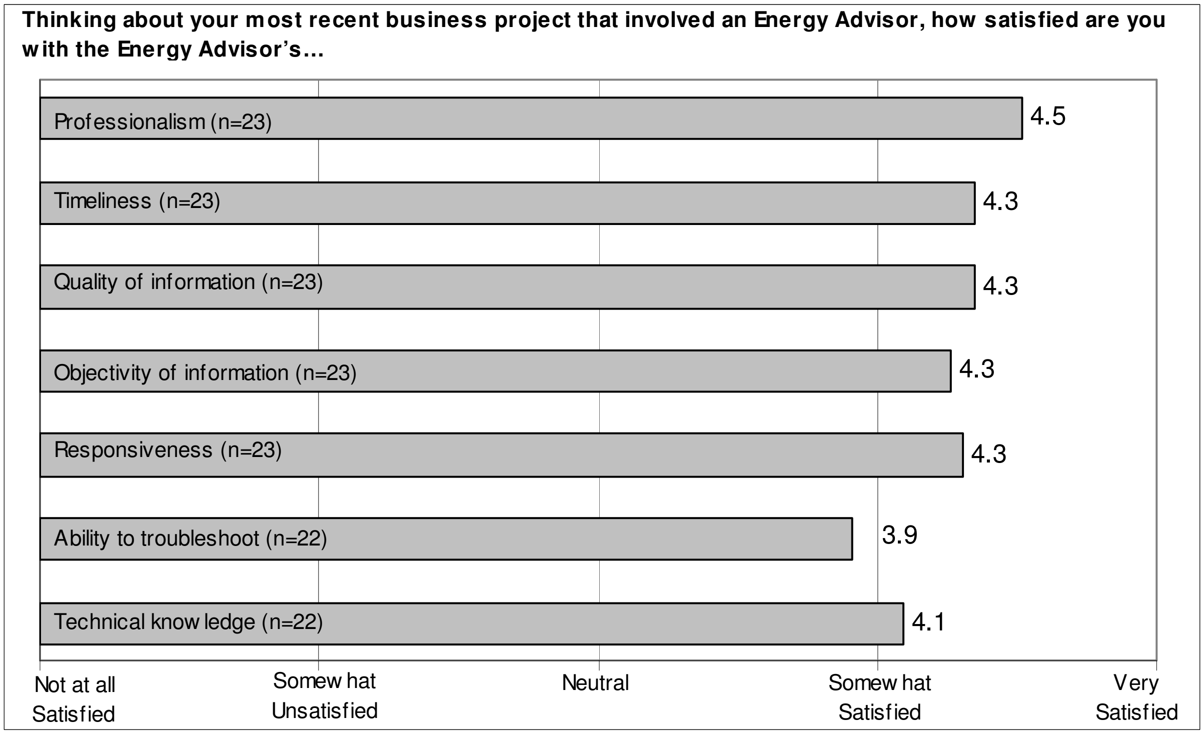
It is natural that respondents would be more satisfied with the energy advisers with whom they have likely developed personal relationships than with the more impersonal program processes that may delay project approval or the receipt of program incentives. However even taking this into consideration, it is our assessment that the average satisfaction ratings in Figure 4-9 show some needs for program improvements. Based on our experience conducting dozens of such trade ally surveys, we view average satisfaction ratings below 4 on a 5-point Likert scale as causes for concern. Yet it is difficult for us to comment on whether these trade ally concerns are justified without conducting a process evaluation of the current Focus BP project implementation practices.

Figure 4-9. Focus on Energy Program Satisfaction



Note: The responses to the satisfaction questions were analyzed on a 5-point scale with 1 being "Not at all Satisfied" and 5 being "Very Satisfied".

Figure 4-10. Energy Advisor Ratings



Note: The responses to the ratings questions were analyzed on a 5-point scale with 1 being "Not at all Satisfied" and 5 being "Very Satisfied".

The issue of generating customer or project leads is a more complicated one. This is not a new issue. In 2002 when evaluators first asked Focus on Energy BP trade allies why they joined the program, obtaining more customer leads was one of the primary motivations.[14]

In theory, a project lead provided by a Focus on Energy adviser to a trade ally would have a lower risk of free ridership than a project lead provided by a trade ally to a Focus energy adviser.[15] This is because we would assume that for most Focus-generated leads the Focus energy advisers would have helped to identify the energy-efficiency opportunities. Conversely, with trade-ally leads there is a greater risk of free ridership. This is because in most such cases both the energy efficiency project and the contractor who will install the equipment have already been determined. While it is still possible for the Focus BP program to influence such trade ally-generated projects—either through recommending energy

[14] Other drivers for trade ally participation included obtaining financial incentives for their customers, keeping abreast of new industry trends, and finding out what their competitors were doing in the area of energy efficiency.

[15] We are assuming that, for a variety of good reasons, the energy adviser would not provide the project lead directly to a specific trade ally but instead would provide the end user a list of possible vendors. But we do not know this for sure.

efficient enhancements to the project or through the financial incentives—the scope of potential influence is inherently more limited.[16]

Yet from a practical standpoint, it will be always difficult for the Focus BP program to generate a high volume of customer leads. First, some of the BP sector programs are not designed to do this. “For some end user segments, the vendors will remain a primary conduit for end users to reach Business Programs. With the development of the Channel strategies, the Trade Ally role is expected to increase,” we reported in our 2006 *Delivery Review* report. The Commercial and Agricultural sectors are the ones that rely more on trade allies than energy advisers to generate projects.

Second, even for the BP sectors such as Industrial and Institutional that make greater use of energy advisers to generate project leads, program attribution concerns will necessarily constrain the number of these project leaders. This is because Focus energy advisers are trained to pre-qualify leads and screen out projects that have a high potential to be free riders. In summary, the ways that certain Focus BP sector programs are implemented, and the procedures that these sector programs use to minimize free ridership, means that fewer energy-adviser-generated project leads are generated than trade allies would like.

While it is possible to increase the volume of Focus-generated project leads, it would be very difficult and could decrease Focus BP program cost effectiveness and increase free ridership. As discussed in the *Delivery Review* report, there are very good reasons why the BP Commercial and Agricultural sectors rely primarily on trade allies to generate project leads. For example, Commercial is the largest Focus BP sector in terms of the number of potential participants. While this sector has had some success using energy advisers to target certain Commercial subsectors, the large size of this sector and the wide dispersion of its energy savings potential forces it to rely heavily on trade allies to generate project leads. In the case of the Agricultural sector, there have always been strong relationships between farmers and the vendors that supply them with their equipment. For this reason, it has made good sense for the BP Agricultural sector program to use trade allies as its primary channel for communicating with farmers. To recommend that the Focus BP Commercial and Agricultural sectors switch to a more energy-adviser-reliant program delivery model just to increase the volume of Focus-generated leads would be imprudent.

To increase the volume of Focus-generated project leads, the Industrial and Institutional sector programs could increase their number of energy advisers and/or loosen their screening processes for pre-qualifying projects. Increasing the number of energy advisers might pay off if the increased net savings from the greater program attribution of the energy-adviser-generated projects (see discussion above) offset the costs of hiring the new energy advisers. However, we would recommend against the BP program loosening its screening processes for pre-qualifying projects just to increase the flow of Focus-generated projects to trade allies. The recent impact analysis results indicate that the BP program cannot afford to take any actions that would risk reducing program attribution levels.

[16] These issues are discussed in more depth in *Focus on Energy Public Benefits Evaluation: Business Programs: Delivery Review*, Final: April 4, 2006, Evaluation Contractor: PA Government Services Inc., Prepared by Chris Dyson, Miriam Goldberg, Valy Goepfrich, KEMA Inc. This report analyzed how program delivery strategies might be impacting program attribution.

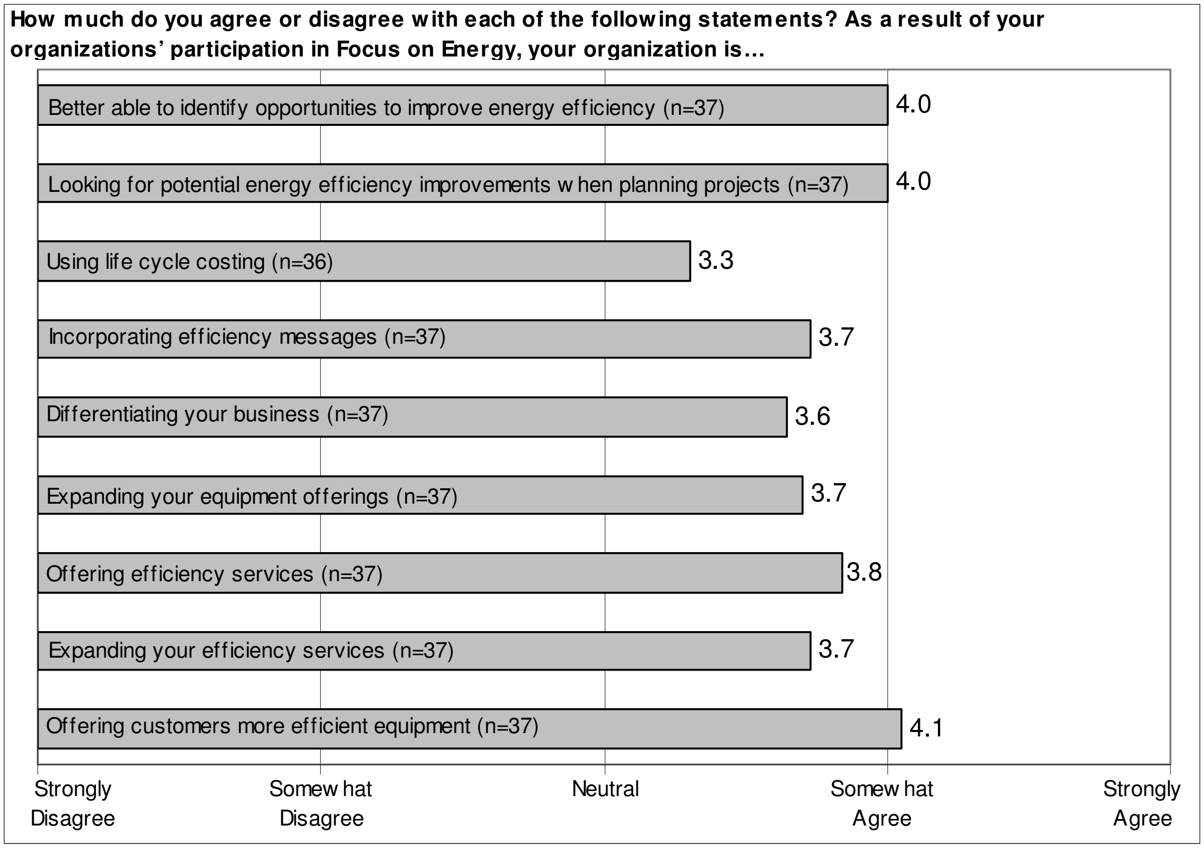
Finally, it is a legitimate question whether the best use of the Focus BP energy advisers' time is to help some of the responding trade allies generate project leads. Such energy advisers are most effective when they:

- Use the prestige and perceived objectivity of Focus on Energy to validate new and unfamiliar energy-efficiency technologies to skeptical customers; or
- Provide support and guidance for larger, more sophisticated custom projects.

Yet the trade allies that we surveyed for the incremental cost study are largely participating through the prescriptive part of the Focus BP program. Most of these prescriptive technologies have been in the market for a number of years and while they may still be unfamiliar to some end users, they do not qualify as the kind of technologies that would require energy adviser assistance. In the final assessment, our best advice would be for the Focus BP program to try to educate trade allies on how the sector programs are designed and the constraints of program attribution and thereby manage their expectations on the volume of project leads that they could expect through the program.

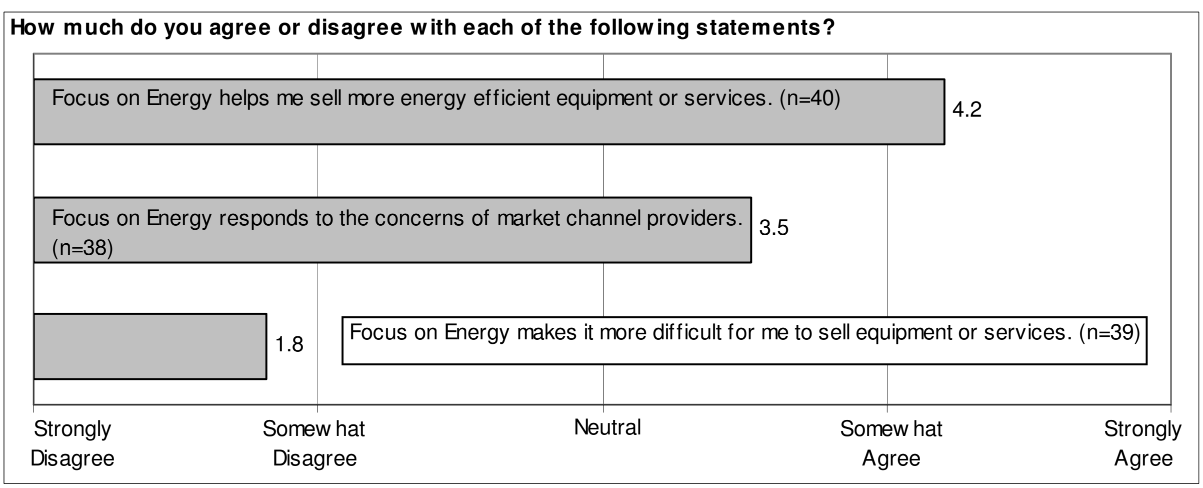
In addition to these program satisfaction questions, we also asked the trade allies how much they agree with a series of statements concerning possible effects that the Focus BP program might be having on their business practices. Figure 4-11 shows that the trade allies gave the program the most credit for helping them offer more efficient equipment to their customers and helping them identify energy efficiency opportunities. They gave the program the least credit for helping them use lifecycle costing or differentiating their businesses. Figure 4-12 shows that the trade allies generally agreed that Focus helped them sell energy-efficient products and service and disagreed with a statement that Focus made it more difficult for them to sell these products and services.

Figure 4-11. Focus on Energy Effects on Trade Ally Business Practices



Note: The responses to the effects questions were analyzed on a 5-point scale with 1 being "Not at all Satisfied" and 5 being "Very Satisfied".

Figure 4-12. General Focus on Energy Questions



Note: The responses to these questions were analyzed on a 5-point scale with 1 being "Not at all Satisfied" and 5 being "Very Satisfied".

A few respondents offered reasons why they do not seek Focus on Energy participation in projects. Primary concerns were project delays, extra time required due to program involvement and concerns about competition with Focus or other providers. On the other hand, some respondents stated that their projects are often straightforward, prescriptive projects that do not require any help from Focus.

A few respondents also offered suggestions to improve the program. These responses range from no changes needed to substantial improvement is required. The following summarizes the suggestions:

- Continue the program as is. Some respondents stated the program was working well and did not need any changes.
- Clarify what the Program will and will not do. One respondent stated the program is “wishy-washy” and would like better clarity.
- Improve the incentives and ease of the process.
- Improve communication about program changes
- Improve project and rebate turnaround. One respondent suggested the program allow a licensed engineer to provide preliminary custom project incentive estimates.
- Improve availability of promotional material.
- Improve the website. One respondent stated the website is difficult to use. As a result, they call for answers rather than trying to find the answer on the site.
- Focus on proven energy efficient technology. One respondent stated the program is too focused on new technology.
- Provide incentives for maintaining efficient refrigeration systems.

5. CONCLUSIONS AND RECOMMENDATIONS

Incremental cost data provides useful information for program managers and other stakeholders but useable data is difficult to obtain. Some data are unavailable and some are highly variable. Even with these difficulties, we estimated incremental costs associated with 94.8 percent of deemed kW, 96.9 percent of deemed kWh, and 52.0 percent of deemed therm savings (see Table 5-1). We also found incremental costs associated with 4.4 percent of the custom kW, 6.4 percent of the custom kWh, and 11.9 percent of the custom therm savings.

Table 5-1. Percent Deemed Savings with Associated Incremental Costs

Technology Category	Percent of Deemed Savings		
	kW	kWh	Therm
Boilers & Burners	0.0%	0.0%	50.1%
Food Service	0.2%	0.3%	1.7%
HVAC	0.2%	0.5%	0.2%
Lighting	94.3%	95.8%	0.0%
Vending, Plug Loads	0.1%	0.3%	0.0%
Total	**94.8%**	**96.9%**	**52.0%**

Incremental costs estimates in technology categories lighting and boilers and burners will be directly used in program benefit cost analysis. These savings represent a substantial portion of total program savings and will improve the accuracy of the benefit cost analysis.

When data was available, we calculated simple paybacks based on avoided cost of deemed savings. These simple paybacks show a wide range from less than one month (e.g., CFLs) to more than the expected life of the equipment (e.g., retrofit ENERGY STAR freezer greater than 48 cubic feet). These results offer one source to determine the need for incentives for various technologies. In addition, we calculated end use ratios of incremental cost per unit saved. These ratios offer a method of estimating incremental costs based on unit savings within an end use. The reader should apply these ratios carefully since the ratios may be dramatically different for different measures within an end use. This is especially true for the end use "Other" since it includes many different technologies.

Even when this study showed a positive incremental cost, there is a potential for actual negative incremental costs (e.g., fluorescent highbays replacing high-pressure sodium highbays). We recommend evaluating these situations and changing program rules as needed.

The incremental costs and paybacks calculated in this study provide an idea of the true costs. However, market factors can play a role in pricing decisions suppliers make. The likelihood of changes in prevailing market factors should be evaluated when considering the results of this study. The responses to market factor questions can offer a guide to this evaluation.

In addition to the deemed measures, we summarized the incremental costs for custom engineering projects. These incremental costs cannot be generalized due to the complexity of each project. However, we have calculated two metrics (e.g., simple payback and IC per unit saved) to allow some comparison and generalization of custom projects. These metrics should be further developed through further research using a systematic sampling by end use so they may be applied reliably to general custom projects.

Overall market players seem satisfied with the program. The primary potential improvements are better communications in all forms (verbal, written, and web based) and increasing leads for suppliers and installers. However, increasing leads is not necessarily practical.

The findings from this study do not provide comprehensive incremental costs for all measures. However, we did find incremental costs that represent a substantial portion of program savings. These incremental costs are well documented. Previously, we could obtain incremental costs for these measures from a WECC database or from survey questions. These sources did not necessarily provide reliable incremental cost data. The WECC database was undocumented and ad hoc. The survey questions provided questionable incremental costs because:

- Our interviewers often had the sense that respondents did not know how to answer and were giving off the cuff responses.
- Many energy efficiency measures are undertaken as part of larger projects. In these cases, respondents generally did not get isolated cost estimates for the project with and without the energy efficiency increment, and they could not isolate the "measure" cost, either full or incremental.
- We were unable to get both equipment and labor costs because these were not separated in bids. It is important to have the separate values because benefit-cost analysis needs them.

Even with these limitations, the survey data for custom projects is the best available. It was clear from our assessment our prescriptive-oriented work did not address custom.

5.1 APPLICATION OF THE FINDINGS

This study produced incremental costs per unit saved for individual deemed technologies accounting for nearly all deemed electric savings and about half the deemed therm savings. Estimates for deemed measures using the results of this study are expected to be more accurate than estimates used in the previous benefit-cost analysis. In most cases, these estimates will also be more accurate for planning purposes than the costs in the program's ad hoc cost database.

The study did not produce specific incremental cost values for custom and hybrid measures. Our review determined that incremental costs per unit saved can be higher or lower for these measures compared to deemed measures, depending on the custom factors. As a result, we recommend continuing to estimate incremental cost factors for these measures based on aggregate incremental costs of sampled custom and hybrid measures. This is the method that was used for the last benefit cost analysis.

Thus, the study identifies three methods to estimate incremental costs for future benefit-cost studies and for program planning:

1. Apply incremental costs per unit saved by individual technology code. This study provides results at this level for selected lighting, HVAC, and other deemed technologies.

2. Apply incremental costs per unit saved by end-use category. This study provides results at this level for the lighting equipment and HVAC service end-uses.
3. Calculate simple payback for each end use category as the ratio of average incremental cost to average first-year avoided cost, based on a sample of projects. The resulting ratios may not be accurate for individual projects or technologies, but should be meaningful in aggregate. This is the procedure that was used in the previous benefit-cost analysis. A similar procedure is being used as part of the current benefit-cost analysis.

Recommendations:

- Use the incremental cost by technology code from this study (method one) for deemed measures for lighting and HVAC service measures with the technology codes covered here.
- If the incremental cost for a deemed lighting or HVAC service measure is unavailable at a technology code level, use the incremental cost by end use if available from this study (method two).
- For all other deemed measures, and for custom and hybrid measures, use the sample-based simple payback by end use (method three).

These recommendations identify three different approaches for estimating incremental costs. Method one can be used to analyze individual measures. Methods two and three can be applied to aggregated measures for analysis of the Program. Available incremental costs and recommended aggregate estimation methods are summarized in Table 5-2. The recommended aggregated estimation method applies to program wide analysis such as a benefit cost study. Specific measures can be analyzed at the tech code level when data is available.

Table 5-2. Incremental Cost Estimation Method Summary by End Use

	Available Incremental Costs			
End Use	**Tech Code (method 1)**	**End Use (method 2)**	**Simple Payback (method 3)**	**Recommended Aggregated Estimation Method**
Building Shell	NA	NA	Available	Method 3
HVAC Equipment	Some furnace, some PTAC, and some PTHP measures	NA	Available	Method 3
HVAC Service	Some steam trap measures	Available	Available	Method 2
Lighting	Most measures	Available	Available	Method 2
Manufacturing Process Equipment	NA	NA	Available	Method 3
Manufacturing Process Service	NA	NA	Available	Method 3
Other	Some vending machine control and some food service equipment measures	NA	Available	Method 3
CFL	Most measures	Available	Available	Method 2
Motors	NA	NA	Available	Method 3

5.2 FUTURE WORK

The primary focus of this study was to find incremental costs for deemed measures. While we were successful for some technology categories, we were unable to estimate incremental costs for several measures and technology categories. In addition, while we were able to estimate incremental costs for 11 of 15 custom projects, the estimates cannot be generalized to the custom population. Future studies can provide additional data that can support the findings from this study. These include a custom project study with a more systematic sampling approach, targeted pricing data collection for boiler projects, and a study to determine what impact the retail channel has on pricing through other channels.

The future work described above does not address all technology categories and measures for which we were unavailable to estimate incremental cost. The categories include agricultural fans, food service, HVAC, motors, refrigeration, and vending plug loads. It is important to understand the incremental costs of these categories but based on historical data, the savings associated with these are a very small portion of the program savings. If future advancements cause these categories to have more prevalent savings, the incremental costs should be addressed at that time. To make this easier, we recommend that the Program continue to collect project cost data. In addition, we recommend that WECC continue to compile pricing data. These data with appropriate documentation could be used in future research.

APPENDIX A: COLLECTED DATA SUMMARY

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
CFLs						
5W CFL lamps	M	12	0	0	0	
7W-11W CFL lamps	M	15	0	0	0	
13W-17W CFL lamps	M	16	0	0	0	
18W-21W CFL	M	15	0	0	0	
18-21W CFL reflector flood lamps	M	12	0	0	0	
23W-27W CFL	M	14	0	0	0	
28W-34W CFL	M	13	0	0	0	
40W-45W CFL	M	14	0	0	0	
65W CFL lamps	M	12	0	0	0	
Incandescent Lamps						
25W Incandescent	BC	11	0	0	0	
40W Incandescent	BC	12	0	0	0	
60W incandescent	BC	12	0	0	0	
75W Incandescent	BC	12	0	0	0	
75W incandescent flood (PAR)	BC	10	0	0	0	
100W Incandescent	BC	13	0	0	0	
110W-120W Incandescent	BC	7	0	0	0	
150W Incandescent	BC	10	0	0	0	
200-250W Incandescent	BC	9	0	0	0	
T8 Lamps						
8 foot, 59W wattage T8 lamps	BC	10	6	0	0	
8 foot, 54W T8 lamps	BC	7	5	0	0	
4 foot, 25W T8 lamps	BC	7	3	0	0	
4 foot, 28W T8 lamps	BC	10	7	0	0	

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
4 foot, 30W T8 lamps	BC	7	4	0	0	
4 foot, 32W T8 lamps (700 series)	BC	13	7	0	0	
4 foot, 32W high lumen T8 lamps	BC	13	6	0	0	
T8 Ballasts and Fixtures						
6 lamp, 4 foot T8 standard ballast high bay fixtures	BC	13	9	0	0	
8 lamp, 4 foot T8 standard ballast high bay fixtures	BC	7	6	0	0	
1 lamp, 4 foot 32W T8 fixtures with standard lamp & ballast	BC	8	4	0	0	
2 lamp, 4 foot 32W T8 fixtures with standard lamp & ballast	BC	9	5	0	0	
4 lamp, 4 foot 32W T8 fixtures with standard lamps & ballast	BC	9	5	0	0	
4 lamp, 4 foot fixtures with high performance T8 lamps & ballast	BC	10	6	0	0	
2 lamp, 4 foot fixture with 25W T8 lamps & CEE ballast	BC	5	2	0	2	RSMeans labor estimates for 4' fluorescent fixtures
2 lamp, 4 foot fixture with 28W T8 lamps & CEE ballast	BC	7	4	0	0	
4 lamp, 4 foot fixture with 25W T8 lamps & CEE ballast	BC	5	2	0	0	
4 lamp, 8 foot fixture with 28W T8 lamps & CEE ballast	BC	7	5	0	0	

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
1 lamp, 4 foot fixture with high lumen T8 low ballast factor (BF)	BC	8	4	0	0	
2 lamp, 4 foot fixture with high lumen T8 low ballast factor (BF)	BC	9	4	0	0	
3 lamp, 4 foot fixture with high lumen T8 low ballast factor (BF)	BC	8	5	0	0	
T5 Ballasts and Fixtures						
4 lamp T5HO High bay fixtures	M	14	8	0	0	
2 lamp, 4 foot T5 recessed indirect 2x4 fixture	M	8	5	0	0	
2 lamp, 4 foot T5HO recessed 2x4 fixture	M	7	5	0	0	
Standard Metal Halide						
175W metal halide fixture	BC	4	1	0	0	
250W standard metal halide fixture with core & coil ballast	BC	4	1	0	0	
400W probe start metal halide fixture with core & coil ballast	BC	4	2	0	0	
1,000W standard metal halide fixture with core & coil ballast	BC	3	1	0	0	
Ceramic Metal Halide						
25W ceramic MH lamp & fixture	M	2	1	0	0	
39W ceramic MH lamp & fixture	M	3	1	0	0	

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
70W ceramic MH lamp & fixture	M	3	1	0	0	
Pulse-start Metal Halide Fixtures and Controls						
Pulse-start MH 320W fixture	M	6	3	0	1	RSMeans labor estimate for pulse-start MH fixture
Pulse-start MH 750W fixture	M	3	1	0	0	
Pulse-start MH 250W electronic ballast fixture	M	3	1	0	0	
Pulse-start MH 320W electronic ballast fixture	M	4	2	0	0	
High/low control for pulse-start MH	M	3	1	0	0	
HID Lamps						
25W CMH lamps	BC	2	1	0	0	
39W CMH lamps	BC	4	1	0	0	
70W CMH lamps	BC	4	1	0	0	
175W HID lamps	BC	7	3	0	1	RSMeans labor estimate for HID lamp and fixture replacement
250W HID lamps	BC	6	2	0	1	RSMeans labor estimate for HID lamp and fixture replacement
250W PSMH lamps	BC	6	2	0	1	RSMeans labor estimate for lamp replacement
320W PSMH lamps	BC	8	3	0	0	
400W HID lamps	BC	9	4	0	0	
720W PSMH lamps	BC	4	1	0	0	
1,000W HID lamps	BC	5	2	0	0	
Occupancy Sensors						
Wall mounted	M	10	6	0	1	RSMeans labor estimate for sensor install
Ceiling mounted	M	10	6	0	1	RSMeans labor estimate for sensor install

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
Furnaces						
60 MBh, AFUE 96.7	M	1	1	60	60	DOELCC Standard efficiency furnaces range from 90 to 96% capacities range from 50000 – 140000.
75 MBh, AFUE 85	BC	1	1	60	60	DOELCC Standard efficiency furnaces range from 78 to 82% capacities range from 50000 – 140000.
75 MBh, AFUE 93	M	1	1	0	0	
80 MBh, AFUE 92	BC	1	1	0	0	
80 MBh, AFUE 95	M	1	1	0	0	
90 MBh, AFUE 93	M	1	1	0	0	
93 MBh, AFUE 85	BC	1	1	0	0	
110 MBh, AFUE 85	BC	1	1	0	0	
110 MBh, AFUE 93	M	1	1	0	0	
Boilers						
100 MBh, AFUE 80	BC	1	1	0	0	
100 MBh, AFUE 86	BC	1	1	0	0	
100 MBh, AFUE 94	M	1	1	0	0	
150 MBh, AFUE 94	M	1	1	0	0	
175 MBh, AFUE 95	M	1	1	0	0	
300 MBh, AFUE 96	M	1	1	0	0	
500 MBh, AFUE 82	BC	1	1	0	0	
500 MBh, AFUE 95	M	1	1	0	0	

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
1000 MBh, AFUE 92	BC	1	1	0	0	
1000 MBh, AFUE 95	M	1	1	0	0	
1200 MBh, AFUE 92	M	1	1	0	0	
2000 MBh, AFUE 88	BC	1	1	0	0	
4000 MBh, AFUE 80	BC	1	1	0	0	
Split System AC, MBh < 65						
EER 12	BC	1	1	0	0	
EER 13	BC	2	2	0	0	
EER 14	M	1	1	0	0	
EER 14.5	M	1	1	0	0	
EER 15	M	1	1	0	0	
PTACs						
9000 MBh, EER 10	BC	1	1	1	1	DOELCC contained aggregated (average) value
9000 MBh, EER 12	M	1	1	1	1	DOELCC contained aggregated (average) value
Packaged Terminal Heat Pumps						
36 MBh, EER 11, COP 3.5	BC	1	1	1	1	DOELCC contained aggregated (average) value
36 MBh, EER 14.5, COP 4.5	M	1	1	1	1	DOELCC contained aggregated (average) value
Rooftop AC, MBh < 65						
EER 10	BC	1	1	0	0	
EER 11	BC	1	1	0	0	
EER 12	M	2	2	0	0	
EER 13	M	1	1	0	0	
Rooftop AC, 65 to 134 MBh						
EER 9.5	BC	1	1	0	0	
EER 11.5	M	1	1	0	0	
EER 12	M	1	1	0	0	
Rooftop AC, 135 to 239 MBh						
EER 9.5	BC	1	1	0	0	

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
EER 11.5	M	1	1	0	0	
Rooftop AC, 240 to 759 MBh						
EER 15	M	1	1	0	0	
EER < 10.5	BC	0	0	0	0	
Services						
Boiler tune-up	M	4	4	0	0	
Steam trap repair -- < 25 psig	M	4	4	0	0	
Steam trap repair -- 25 to 50 psig	M	2	2	0	3	RSMeans labor value for various orifice sizes
Steam trap repair -- 51 to 125 psig	M	2	2	13	3	Grainger unit costs for various orifice sizes. RSMeans labor value for various orifice sizes
Steam trap repair -- 126 to 225 psig	M	0	0	0	0	
Steam trap repair -- > 226 psig	M	0	0	0	0	
Motors						
NEMA, 1 – 20 hp	M	1	1	0	0	
NEMA, 21 – 50 hp	M	2	2	0	0	
NEMA, 51 – 100 hp	M	0	0	0	0	
NEMA, 101 – 200 hp	M	0	0	0	0	
NEMA, greater than 200 hp	M	0	0	0	0	
Standard, 1 – 20 hp	BC	2	0	0	0	
Standard, 21 – 50 hp	BC	2	0	0	0	
Standard, 51 – 100 hp	BC	1	0	0	0	
Standard, 101 – 200 hp	BC	0	0	0	0	
Standard, greater than 200 hp	BC	0	0	0	0	

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
Drives						
VFD, 1 – 20 hp	M	2	0	0	0	
VFD, 21 – 50 hp	M	3	1	0	0	
VFD, 51 – 100 hp	M	2	0	0	0	
VFD, 101 – 200 hp	M	1	0	0	0	
VFD, greater than 200 hp	M	1	0	0	0	
Vending Machines, Cold Beverage						
ENERGY STAR rated cold beverage vending machines with software	M	0	0	2	0	DEER provided cost values for two types of cold beverage vending (indoors vs. outdoors)
ENERGY STAR rated cold beverage vending machines **without** software	M	0	0	0	0	
Standard efficiency (i.e., <u>not</u> ENERGY STAR) cold beverage vending machines	BC	0	0	0	0	
Vending Machine Controls						
Vending machine controls for cold beverage vending machines	M	0	0			
Vending machine controls for snack vending machines	M	0	0	2	0	DEER provided cost values for two vending machine controllers
Food Service - Fryers						
ENERGY STAR rated electric fryers	M	1	0	0	0	

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
ENERGY STAR rated natural gas fryers	M	2	0	0	0	
Standard efficiency (i.e., not ENERGY STAR) electric fryers	BC	2	0	0	0	
Standard efficiency (i.e., not ENERGY STAR) natural gas fryers	BC	2	0	0	0	
High efficiency* large vat electric fryers	M	0	0	0	0	
High efficiency** large vat natural gas fryers	M	1	0	0	0	
Standard efficiency large vat electric fryers	BC	0	0	0	0	
Standard efficiency large vat natural gas fryers	BC	0	0	0	0	
Food Service – Convection Ovens						
High efficiency[1] electric convection ovens	M	2	0	1	0	The Food Service Warehouse provides retail pricing for products
High efficiency[2] natural gas convection ovens	M	2	0	3	0	The Food Service Warehouse provides retail pricing for products
Standard efficiency electric convection ovens	BC	0	0	1	0	The Food Service Warehouse provides retail pricing for products
Standard efficiency natural gas convection ovens	BC	0	0	3	0	The Food Service Warehouse provides retail pricing for products

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
Food Service – Combination Ovens						
High efficiency[3] electric combination ovens	M	1	0	3	0	The Food Service Warehouse provides retail pricing for products
High efficiency[4] natural gas combination ovens	M	1	0	1	0	The Food Service Warehouse provides retail pricing for products
Standard efficiency electric combination ovens	BC	1	0	2	0	The Food Service Warehouse provides retail pricing for products
Standard efficiency natural gas combination ovens	BC	1	0	1	0	The Food Service Warehouse provides retail pricing for products
Food Service – Griddles						
High efficiency[5] electric griddles	M	0	0	3	0	The Food Service Warehouse provides retail pricing for products
High efficiency[6] natural gas griddles	M	0	0	3	0	The Food Service Warehouse provides retail pricing for products
Standard efficiency electric griddles	BC	2	0	3	0	The Food Service Warehouse provides retail pricing for products
Standard efficiency natural gas griddles	BC	2	0	3	0	The Food Service Warehouse provides retail pricing for products
Food Service – Steamers						
3 pan electric steamers – ENERGY STAR	M	0	0	2	0	The Food Service Warehouse provides retail pricing for products

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
4 pan electric steamers – ENERGY STAR	M	0	0	1	0	The Food Service Warehouse provides retail pricing for products
5 pan electric steamers – ENERGY STAR	M	0	0	1	0	The Food Service Warehouse provides retail pricing for products
5 pan *natural gas* steamers – ENERGY STAR	M	0	0	0	0	
6 pan electric steamers – ENERGY STAR	M	0	0	1	0	The Food Service Warehouse provides retail pricing for products
6 pan *natural gas* steamers – ENERGY STAR	M	0	0	1	0	The Food Service Warehouse provides retail pricing for products
3 pan electric steamers – standard	BC	0	0	1	0	The Food Service Warehouse provides retail pricing for products
4 pan electric steamers – standard	BC	0	0	1	0	The Food Service Warehouse provides retail pricing for products
5 pan electric steamers – standard	BC	0	0	0	0	
5 pan *natural gas* steamers – standard	BC	0	0	0	0	
6 pan electric steamers – standard	BC	0	0	3	0	The Food Service Warehouse provides retail pricing for products
6 pan *natural gas* steamers – standard	BC	0	0	2	0	The Food Service Warehouse provides retail pricing for products

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
Food Service – Hot food holding cabinets						
ENERGY STAR rated hot food holding cabinets	M	0	0	2	0	The Food Service Warehouse provides retail pricing for products
Standard efficiency (i.e., not ENERGY STAR) hot food holding cabinets	BC	1	1	1	0	The Food Service Warehouse provides retail pricing for products
Food Service – Refrigerators						
CEE Tier 1 – 22 to 23 cubic ft.	M	2	0	2	0	The Food Service Warehouse provides retail pricing for products
CEE Tier 1 – 49 to 54 cubic ft.	M	3	0	3	0	The Food Service Warehouse provides retail pricing for products
CEE Tier 1 – 82 cubic ft.	M	1	0	3	0	The Food Service Warehouse provides retail pricing for products
CEE Tier 2 – 22 to 23 cubic ft.	M	0	0	2	0	The Food Service Warehouse provides retail pricing for products.
CEE Tier 2 – 49 to 54 cubic ft.	M	0	0	2	0	The Food Service Warehouse provides retail pricing for products.
CEE Tier 2 – 82 cubic ft.	M	0	0	3	0	The Food Service Warehouse provides retail pricing for products.
Standard Efficiency – 22 to 23 cubic ft.	BC	0	0	3	0	The Food Service Warehouse provides retail pricing for products

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
Standard Efficiency – 49 to 54 cubic ft.	BC	0	0	2	0	The Food Service Warehouse provides retail pricing for products
Standard Efficiency – 82 cubic ft.	BC	0	0	3	0	The Food Service Warehouse provides retail pricing for products
Food Service – Freezers						
CEE Tier 1 – 22 to 23 cubic ft.	M	3	0	3	0	The Food Service Warehouse provides retail pricing for products
CEE Tier 1 – 49 to 54 cubic ft.	M	2	0	2	0	The Food Service Warehouse provides retail pricing for products
CEE Tier 1– 82 cubic ft.	M	1	0	2	0	The Food Service Warehouse provides retail pricing for products
CEE Tier 2 – any size	M	0	0	7	0	The Food Service Warehouse provides retail pricing for products. Distribution of data points by size as in Tier 1.
Standard Efficiency – 22 to 23 cubic ft.	BC	0	0	3	0	The Food Service Warehouse provides retail pricing for products
CEE Tier 1 – 49 to 54 cubic ft.	BC	0	0	2	0	The Food Service Warehouse provides retail pricing for products
CEE Tier 1 – 82 cubic ft.	BC	0	0	3	0	The Food Service Warehouse provides retail pricing for products

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
Food Service – Ice Machines						
ENERGY STAR – <500 cubic ft.	M	2	0	3	0	The Food Service Warehouse provides retail pricing for products
ENERGY STAR – 500-1000 cubic ft.	M	1	0	2	0	The Food Service Warehouse provides retail pricing for products
ENERGY STAR – 1000+ cubic ft.	M	0	0	2	0	The Food Service Warehouse provides retail pricing for products
Standard – <500 cubic ft.	BC	2	0	2	0	The Food Service Warehouse provides retail pricing for products
Standard – 500-1000 cubic ft.	BC	1	0	2	0	The Food Service Warehouse provides retail pricing for products
Standard – 1000+ cubic ft.	BC	0	0	2	0	The Food Service Warehouse provides retail pricing for products
Food Service – Under Counter Dishwashers						
ENERGY STAR – high temp electric	M	2	0	3	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
ENERGY STAR – low temp electric	M	1	0	0	0	
ENERGY STAR – high temp gas	M	0	0	0	0	
ENERGY STAR – low temp gas	M	0	0	0	0	
Standard Efficiency – high temp gas	M	0	0	0	0	

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
Standard Efficiency – low temp gas	M	0	0	0	0	
Standard Efficiency – high temp electric	M	0	0	2	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
Standard Efficiency – low temp electric	M	0	0	0	0	
Food Service – Single Tank Dishwashers						
ENERGY STAR – high temp electric	M	2	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
ENERGY STAR – low temp electric	M	1	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
ENERGY STAR – high temp gas	M	0	0	0	0	
ENERGY STAR – low temp gas	M	0	0	0	0	
Standard Efficiency – high temp gas	BC	0	0	0	0	
Standard Efficiency – low temp gas	BC	0	0	0	0	
Standard Efficiency – high temp electric	BC	0	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
Standard Efficiency – low temp electric	BC	0	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
Food Service – Single Tank Conveyer Dishwashers						

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
ENERGY STAR – high temp electric	M	0	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
ENERGY STAR – low temp electric	M	0	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
Standard Efficiency – high temp electric	BC	1	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
Standard Efficiency – low temp electric	BC	0	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
Food Service – Multi Tank Conveyer Dishwasher						
ENERGY STAR – high temp electric	M	1	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
ENERGY STAR – low temp electric	M	0	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
Standard Efficiency – high temp electric	BC	0	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.
Standard Efficiency – low temp electric	BC	0	0	1	0	The ENERGY STAR savings estimator gives retail pricing for a variety of dishwasher types.

Technology	Measure or Base Case?	Primary Data (Sample Size)		Secondary Data		
		Equipment	Installation	Equipment	Installation	Source Description
Food Service – Sprayers						
Low flow pre-rinse sprayer	M	1	0	2	0	The ENERGY STAR savings estimator gives retail pricing for a variety of kitchen technologies.
Standard flow sprayer	BC	1	0	0	0	.
Grocery Store Refrigerators						
Shaded pole motor	BC	0	0	0	0	
PSC motor	M	0	0	0	0	
ECM	M	0	0	0	0	
Standard freezer door	BC	0	0	0	0	
Low energy freezer door	M	0	0	0	0	
No energy freezer door	M	0	0	0	0	
Low energy refrigerator door	BC	0	0	0	0	
No energy refrigerator door	M	0	0	0	0	
Anti-sweat heater controls	M	1	1	0	0	
LED display case lighting	M	0	0	0	0	
Agricultural Fans						
High efficiency	M	9	3	1	0	Grainger does not supply the proper metric to determine with confidence whether a fan is high or standard efficiency
Standard efficiency	M	10	10	18	0	Grainger does not supply the proper metric to determine with confidence whether a fan is high or standard efficiency

APPENDIX B: SUMMARY OF EXISTING COST DATA

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
1.0100.085	Hot water reset on boiler system	$1800	$4286 ($-1351.06 - $9923.06)
1.0200.085	Outdoor air cutout on boiler system	$8110	
1.0300.245	Insulate boiler plumbing	$42394.1 ($16108.13 - $68680.08)	
1.0600.460	Variable speed drive for process boiler hot water distribution pump	$1171	
1.0701.085	Linkageless Boiler Control - custom	$17698.43 ($7904.35 - $27492.51)	$14318 ($5879.39 - $22756.61)
1.0900.045	Boiler (existing) - replace burner	$32856 ($9623.3 - $56088.7)	$168236
1.1000.145	Flue gas heat recovery system on boilers	$218150.75 ($-149087.65 - $585389.15)	$189591.67 ($-83513.37 - $462696.7)
1.1100.330	Steam to Hot Water Conversion	$49000 ($47585.79 - $50414.21)	$658493.33 ($-62405.67 - $1379392.33)
1.1300.430	Boiler Tune-up - Service Buy Down	$548.75 ($-1151.62 - $2249.13)	$847.81 ($-220.04 - $1915.65)
1.1400.390	Steam Traps - service buy down	$190.36 ($161.43 - $219.3)	$4927.72 ($-10543.92 - $20399.36)
1.1800.085	Hot Water Setback - Reduce boiler set point temperature when system is idle	$1800	$9218
1.2807.040	High Efficiency Modulating Hot Water Boiler (effic> = 90.0%) 132.9 - 146.1 MBh	$12352	
1.2808.040	High Efficiency Modulating Hot Water Boiler (effic> = 90.0%) 146.2 - 160.7 MBh	$9689.18 ($6832.21 - $12546.15)	
1.2812.040	High Efficiency Modulating Hot Water Boiler (effic> = 90.0%) 214.0 - 235.3 MBh	$12850	
1.3800.085	Hot water reset on boiler system	$45916.67	
1.9800.040	Custom Boiler Replacement	$130833.43 ($16573.59 - $245093.27)	$130311.65 ($-123837.92 - $384461.22)
1.9900.280	Custom boiler/burner measure not otherwise specified	$40457.23 ($2261.17 - $78653.28)	$42685 ($10462.68 - $74907.32)
2.0100.110	Delamp Lighting Reduction	$58500 ($-6381.29 - $123381.29)	
2.0200.260	LED Exit Lighting - for specially targeted early replacement only	$26.6	$43.36 ($17.26 - $69.47)
2.0300.165	CFL <= 30 Watts, replacing incandescent	$7.48 ($-13.86 - $28.82)	$20.7

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
2.0301.165	CFL High Wattage 31-115 Watts, replacing incandescent	$38.04 ($-75.9 - $151.97)	
2.0304.165	CFL High Wattage ≥200 Watts, replacing metal halide	$40	
2.0305.060	CFL Cold Cathode Screw-In, replacing incandescent	$14.1 ($12.09 - $16.1)	
2.0307.165	CFL reflector flood lamps replacing incandescent reflector flood lamps	$30.61 ($-114.04 - $175.27)	
2.0400.165	CFL Fixture, replacing incandescent fixture	$1829.75 ($-481.92 - $4141.42)	$50
2.0401.165	CFL High Wattage, >=100 Watts, replacing high bay HID or incandescent	$3316.67 ($2928.29 - $3705.04)	
2.0410.175	T8 Circular fixture, <=36W, hard wired - Ag Only		$40.07 ($26.02 - $54.11)
2.0505.085	Occupancy Sensors - Wall Mount <= 200 Watts	$87.54 ($-71.31 - $246.39)	$65 ($43.79 - $86.21)
2.0506.085	Occupancy Sensors - Wall Mount >= 201 Watts	$255.48 ($-45.34 - $556.29)	$52.36
2.0507.085	Occupancy Sensors - Ceiling Mount <= 500 Watts	$213.2 ($-130.56 - $556.96)	$170
2.0508.085	Occupancy Sensors - Ceiling Mount 501-1000 Watts	$134.81 ($-82.3 - $351.92)	$135 ($85.5 - $184.5)
2.0509.085	Occupancy Sensors - Ceiling Mount >= 1001 Watts	$85.78 ($68.69 - $102.87)	
2.0600.085	Daylighting Controls, Automatic	$13000	
2.0810.170	T8 4L-4-4ft High Performance Replacing T12 2L-8 ft	$761.05 ($-2789.35 - $4311.45)	
2.0811.170	T8 4L-4ft High Performance Replacing T12HO/VHO 2L-8 ft	$264.69 ($-280.96 - $810.33)	
2.0822.170	T8 2L-4 ft Low Watt with CEE Ballast - 25 Watts	$59.46 ($3.58 - $115.34)	
2.0823.170	T8 3L-4 ft Low Watt with CEE Ballast - 25 Watts	$23.76	
2.0824.170	T8 4L-4 ft Low Watt with CEE Ballast - 25 Watts	$29.02 ($28.99 - $29.04)	
2.0831.170	T8 1L-4 ft Low Watt with CEE Ballast - 28 Watts	$314.03 ($-173.74 - $801.8)	
2.0832.170	T8 2L-4 ft Low Watt with CEE Ballast - 28 Watts	$19.77 ($7.9 - $31.65)	

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
2.0833.170	T8 3L-4 ft Low Watt with CEE Ballast - 28 Watts	$68.74 ($-4.25 - $141.72)	
2.0834.170	T8 4L-4 ft Low Watt with CEE Ballast - 28 Watts	$28.61 ($6.5 - $50.72)	
2.0842.170	T8 2L-4 ft Low Watt with CEE Ballast - 30 Watts	$30.17 ($10.42 - $49.92)	
2.0843.170	T8 3L-4 ft Low Watt with CEE Ballast - 30 Watts	$28.35	
2.0844.170	T8 4L-4 ft Low Watt with CEE Ballast - 30 Watts	$42.03	
2.0851.170	T8 Low Watt Relamp - 25 Watts	$12.41 ($-7.05 - $31.86)	
2.0852.170	T8 Low Watt Relamp - 28 Watts	$3.71 ($2.84 - $4.57)	
2.0853.170	T8 Low Watt Relamp - 30 Watts	$2.22	
2.0860.170	T8 1L-4 ft Hi Lumen Lamp with Low BF		$20
2.0870.170	T8 2L-4 ft Hi Lumen Lamp with Low BF	$108.37 ($-189.91 - $406.64)	$27.41 ($16.45 - $38.37)
2.0880.170	T8 3L-4 ft Hi Lumen Lamp with Low BF	$1805.38 ($-4332.23 - $7942.99)	$35.83 ($25.73 - $45.94)
2.0890.170	T8 4L-4 ft Hi Lumen Lamp with Low BF	$106.95 ($-234.15 - $448.05)	
2.0891.170	T8 High Performance Fixture with Low Wattage Lamps	$4277.25 ($2579.87 - $5974.63)	$1047.5 ($-271.25 - $2366.25)
2.0896.170	T8 2L-4 ft Hi Lumen Lamp with Low BF (New Construction)	$982.25 ($-628.1 - $2592.59)	
2.0897.170	T8 3L-4 ft Hi Lumen Lamp with Low BF (New Construction)	$209.96 ($60.37 - $359.56)	
2.0898.170	T8 4L-4 ft Hi Lumen Lamp with Low BF (New Construction)	$614.96 ($30.02 - $1199.89)	
2.0910.170	T5 2L - F28T5 Fixture - Replaces Standard T8 or T12	$3479.6	
2.1000.260	LED traffic lights replacing incandescent	$9941.94 ($-999.65 - $20883.53)	$219182 ($-47846.98 - $486210.98)
2.1010.170	T8 2L-4 ft fixture - AG ONLY	$122.36 ($44.49 - $200.22)	$107.42 ($60.51 - $154.33)
2.1015.170	T8 3L-4 ft fixture - AG ONLY	$195.06 ($65.97 - $324.14)	$214.17 ($95.05 - $333.28)
2.1021.170	T8 8 ft fixture - AG ONLY	$188.32 ($115.56 - $261.08)	$188.02 ($93.47 - $282.57)
2.1040.220	High Pressure Sodium Fixture - AG ONLY	$101.16 ($83.09 - $119.23)	$155.42 ($66.02 - $244.82)
2.1050.220	MH Pulse Start - AG ONLY	$239.47 ($156.29 -	$346.41 ($182.4 -

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
		$322.64)	$510.43)
2.1060.170	T8 fixture, 6-lamp - AG ONLY	$3793.49 ($-3477.72 - $11064.69)	$181.18 ($92.73 - $269.64)
2.1800.170	T8 lamps, electronic ballasts, replacing metal halide or high pressure sodium	$34883.28 ($-6949.47 - $76716.04)	
2.1900.170	T8 or T5 - Replaces HID	$22749.44 ($-15145.09 - $60643.98)	$11333.79 ($3600.42 - $19067.16)
2.2110.220	Ceramic Metal Halide (CMH) Fixture, 20-100 Watts - Replaces Incandescent Fixture	$51.79 ($-21.37 - $124.95)	
2.2115.220	Ceramic Metal Halide (CMH) Integral Ballast Lamp, <= 25 Watts - Replaces 75-90 Watt Incandescent Lamp	$0.04	
2.2150.220	Metal Halide (MH), Pulse Start, 320W replacing 400W HID	$216.19 ($149.63 - $282.75)	
2.2170.220	Metal Halide (MH), Electronic Ballast Pulse Start - 250W replacing 400W HID	$1378.49	
2.2600.330	Reconfigure lighting layout to use light more effectively	$18326.34 ($952.2 - $35700.48)	$97814.21 ($-31935.35 - $227563.77)
2.3100.260	LED Reach-In Refrigerated Case Lighting replaces T12 or T8	$767.24 ($-216.22 - $1750.71)	
2.5170.170	T8 4 lamp or T5HO 2 lamp Replacing 250-399 W HID	$382.13 ($-378.48 - $1142.73)	
2.5180.170	T8 6 lamp or T5HO 4 lamp Replacing 400-999 W HID	$158.69 ($51.86 - $265.53)	$208.48
2.5182.170	T8 8 lamp or T5HO 6 lamp Replacing 400-999 W HID	$258.37 ($-186.86 - $703.59)	
2.5185.170	T8/T5HO <= 500 Watts Replacing >=1000 W HID	$381.76 ($-100.27 - $863.78)	
2.5191.085	Add occupancy sensors or multi-level switching to a retrofit project where high bay fluorescent replaces HID	$81.88 ($1.22 - $162.53)	
2.9900.280	Custom lighting measure not otherwise specified	$26527.05 ($-6459.14 - $59513.24)	
3.0300.145	Refrigeration Waste Heat Recovery	$3200	$5250 ($4189.34 - $6310.66)
3.0400.430	Repair Refrigerator Doors - seals, threshold, closing mechanisms	$235	

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
3.0800.460	Variable speed drive on refrigeration fan	$8568.5 ($3875.43 - $13261.57)	
3.1100.405	Cooler Curtain, plastic strip curtain or slats on walk-in cooler door	$5150 ($3113.46 - $7186.54)	
3.1200.085	Cooler Door Anti-Sweat Heater Controls (Prescriptive)	$249.03 ($-81.22 - $579.28)	$2000
3.1300.085	Floating Head Pressure Controls	$44815.5	
3.1600.330	Parallel Rack Systems in place of individual compressors per case	$35200	
3.1700.145	Heat Recovery - Desuperheater / Capture heat off compressors to pre-heat domestic hot water	$44815.5	
3.1800.145	Heat Recovery - Capture heat off compressors to pre-heat supply air for space heating	$5000	$4650
3.2000.145	Mechanical Sub-Cooling - Installation of additional subcooled compressor, expansion valve and heat exchanger	$44815.5	
3.2400.280	Cooler Night Covers - Cover the glass cooler doors during non-operating hours	$3000	$4879
3.9900.280	Custom refrigeration measure not otherwise specified	$47916.65 ($-52213.56 - $148046.86)	$35672.06 ($-1748 - $73092.12)
4.0300.150	Destratification fans in high ceiling areas	$12132.5 ($3459.84 - $20805.16)	
4.0400.240	Infrared heating units, high or low Intensity - New Construction	$2621.26 ($2533.72 - $2708.81)	
4.0410.240	Infrared heating units - high or low intensity - Existing Building	$2197.37 ($762.57 - $3632.17)	
4.0510.085	Large Space Air Management - control outside air based on occupancy in applicable areas	$8616.67 ($4972.38 - $12260.95)	$4487.17 ($-831.94 - $9806.28)
4.0550.145	Energy recovery ventilator - wheel heat exchanger	$40358.67 ($6605.16 - $74112.18)	
4.0600.145	Exhaust Air Heat Recovery System	$39766.88 ($7093.12 - $72440.63)	$88087.33 ($25423.49 - $150751.17)

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
4.1000.390	Steam Traps - service buy down	$255.92 ($-20.14 - $531.98)	
4.1100.460	Variable speed drive on HVAC ventilation fan	$66426.75 ($-130198.86 - $263052.37)	$5591.52 ($-1303.5 - $12486.54)
4.1120.460	Variable speed drive on the pump or fan motor of HVAC system (Custom)	$67402.5 ($-48013.63 - $182818.63)	
4.1300.085	Energy Management System - more efficiently control HVAC system	$24950.27 ($-17780.94 - $67681.48)	$72610.14 ($-171561.77 - $316782.06)
4.1301.085	Demand Limiting Controls - reduce building peak electrical demand	$1814.12	$15156.5 ($1768.85 - $28544.15)
4.1400.370	Building Scheduling - Adjust occupied/unoccupied schedule	$5000	$4172.25 ($320.21 - $8024.29)
4.1500.115	Direct Fired Heating Systems	$65000	
4.1697.190	Furnaces (90% AFUE or Greater & ECM Motor), 54.675 - 60.749 MBh	$4383 ($2520.46 - $6245.54)	
4.1699.190	Furnaces (90% AFUE or Greater & ECM Motor), 67.5 - 74.9 MBh	$5178.86 ($2566.5 - $7791.22)	
4.1701.190	Furnaces (90% AFUE or Greater & ECM Motor), 75.0 - 82.5 MBh	$6780.5 ($79.79 - $13481.21)	
4.1702.190	Furnaces (90% AFUE or Greater & ECM Motor), 82.5 - 90.75 MBh	$5599.95 ($2384.66 - $8815.24)	
4.1704.190	Furnaces (90% AFUE or Greater & ECM Motor), 99.83 - 109.8 MBh	$8792.87 ($2297.26 - $15288.49)	
4.1705.190	Furnaces (90% AFUE or Greater & ECM Motor), 109.9 - 120.7 MBh	$3289	
4.1706.190	Furnaces (90% AFUE or Greater & ECM Motor), 120.8 - 132.9 MBh	$2445.91	
4.1800.050	Chiller System - replace existing chiller system with new high efficiency unit	$170189.5 ($-18764.28 - $359143.28)	$50777.86 ($-12614.75 - $114170.47)
4.1810.430	Chiller System Tune Up, Air Cooled - service buydown, System ≤500 tons	$903.64 ($604.74 - $1202.53)	$1450.11 ($-892.15 - $3792.37)
4.1812.430	Chiller System Tune Up, Water Cooled - service buydown, System ≤500 tons	$1703.99 ($-114.82 - $3522.79)	$2142.44 ($1344.73 - $2940.16)

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
4.1813.430	Chiller System Tune Up, Water Cooled - service buydown, System >500 Tons	$5982.67 ($6.75 - $11958.6)	$1497.95 ($188.6 - $2807.29)
4.1820.085	Chiller Optimization Controls	$13000	$13550
4.1900.195	Geothermal Installation (Custom)	$893166.17 ($-21184.95 - $1807517.29)	$13285
4.2000.445	Unit Heaters - Steady state efficiency 83% or greater	$38500	
4.2110.455	Replace Constant Volume HVAC with VAV	$90406.67 ($63112.05 - $117701.28)	$240000 ($169289.32 - $310710.68)
4.3300.085	Ventilation Controls Installed	$186354.87 ($-121831.17 - $494540.91)	$8370 ($-187.41 - $16927.41)
4.3530.365	A/C Split System < 65 MBh SEER 14	$5047.66 ($1060.93 - $9034.38)	
4.3540.365	A/C Split System < 65 MBh SEER 15	$6507.8 ($2867.65 - $10147.95)	
4.3550.365	A/C Split System < 65 MBh SEER 16 or greater	$2749.89 ($1142.09 - $4357.69)	
4.3570.365	Rooftop A/C, <65 MBh, EER = 11.3, expires 01June08	$10610.19 ($1006.62 - $20213.77)	
4.3571.365	Rooftop A/C, <65 MBh, EER = 11.4, expires 01June08	$3684	
4.3600.365	Rooftop A/C, ≥65 and <135 MBh, EER = 11.0, expires 01June08	$11354.57 ($1031.7 - $21677.45)	
4.3602.365	Rooftop A/C, ≥65 and <135 MBh, EER = 11.2, expires 01June08	$17550	
4.3603.365	Rooftop A/C, ≥65 and <135 MBh, EER = 11.3, expires 01June08	$10887.74 ($-261.56 - $22037.04)	
4.3800.295	PTAC, SEER >= 13.0 or EER >= 11.3	$506.62 ($355.8 - $657.43)	
4.4100.050	High Efficiency Chillers - Retrofit, air cooled all sizes	$82599.65 ($10079.73 - $155119.57)	
4.4200.050	High Efficiency Chillers - Retrofit, water cooled < 150 tons	$31370	
4.4800.050	High Efficiency Chillers - New Construction, water cooled ≥ 300 tons	$120187.5	
4.6000.155	Air filtration for exhaust air system	$748045 ($-227698.72 - $1723788.72)	$81774 ($16174.29 - $147373.71)
4.9900.280	Custom HVAC measure not otherwise specified	$49699.94 ($7959.1 - $91440.78)	$100305.47 ($-14070.06 - $214681)

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
5.0100.320	Process Heating Improvement or Upgrade	$88333.33 ($7870.09 - $168796.58)	$91690
5.0110.190	Install Stack Melting Furnace	$203700	
5.0300.145	Process Heat Recovery	$164911.33 ($-3717.44 - $333540.11)	$194413.33 ($-31563.91 - $420390.57)
5.9900.280	Custom process measure not otherwise specified	$143181.53 ($-49836.25 - $336199.31)	$54000
6.0200.185	Hot Water Heater - Replace Electric with Natural Gas	$5177.07 ($4154.69 - $6199.45)	$2818.33 ($1185.39 - $4451.28)
6.0300.475	Hot Water Heater Installation or Upgrade	$19677.94 ($142.19 - $39213.7)	$20133.75 ($-4932.57 - $45200.07)
6.0400.330	Water temperature reduction on water heater	$1000	
6.0800.085	Circulation pump timeclock on domestic hot water system	$100	
6.2070.475	Water Heater - Power-vented natural gas with EF .80 or greater	$2448.88 ($1856.18 - $3041.57)	
6.9900.280	Custom hot water measure not otherwise specified	$55845 ($16356.62 - $95333.38)	$10333.33 ($4825.76 - $15840.9)
7.0300.245	Attic Insulation - add additional insulation	$8921.67 ($1746.57 - $16096.76)	
7.0400.245	Roof Insulation - Insulate roof when re-roofing	$104593 ($-12596.11 - $221782.11)	$121673.84 ($-73650.76 - $316998.44)
7.0500.245	Insulation (Wall)	$15783.5 ($-3567.89 - $35134.89)	
7.0600.245	Ceiling Insulation	$5400	$44000
7.1000.130	Door Replacement - Replace all doors with energy-efficient insulated doors with double pane insulated glass	$4446.67 ($2941.75 - $5951.58)	
7.1100.500	Window Replacement - high efficiency units	$358727.4 ($-391296.14 - $1108750.94)	$15911.87 ($4510.28 - $27313.45)
7.1600.020	Overhead Door Seals	$560	
7.9900.280	Custom building envelope measure not otherwise specified	$3508.81 ($1584.14 - $5433.48)	$26984 ($-10728.95 - $64696.95)
8.0100.055	Laundry Equipment - Replace with new high efficiency units	$11217.46 ($5460.57 - $16974.36)	$12122.09 ($2670.09 - $21574.09)
9.0300.070	Air Compressor Upgrade - higher efficiency model	$105882.87 ($-7900.69 - $219666.43)	$11925
9.0400.430	Compressed Air Leak Repair	$1000	$2413.47 ($-292.58 - $5119.51)

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
9.0801.070	Air compressor equipped with variable speed drive, new equipment	$35125.34 ($-8466.45 - $78717.13)	$35391.42 ($-18474.4 - $89257.24)
9.1200.070	Variable Speed Compressor - Upgrade to new equipment	$294091	$20170.33 ($7231.23 - $33109.42)
9.1250.070	Variable Displacement Compressor	$21248 ($16583.92 - $25912.08)	
9.1400.145	Compressed Air Heat Recovery	$108013.67 ($-34236.2 - $250263.54)	$41500 ($-10188.97 - $93188.97)
9.9900.280	Custom compressed air measure not otherwise specified	$97893.2 ($-9173.46 - $204959.86)	$216750 ($-70547.49 - $504047.49)
10.0100.215	Plate heat exchanger on milk pipeline	$3174.83 ($2354.55 - $3995.11)	$3659.29 ($2526.84 - $4791.74)
10.0110.215	Plate Heat Exchanger / Well Water Pre-Cooler	$3966.53 ($1805.48 - $6127.58)	$2700
10.0120.215	Plate heat exchanger on milk pipeline and VFD on milk vacuum pump	$13243.5 ($3780.29 - $22706.71)	$10150.76 ($970.8 - $19330.73)
10.0170.300	On-farm energy efficient milk pasteurization system – electric boiler	$18500	$28502
10.0175.300	On-farm pasteurization system – fuel switching from electric to gas	$33065	
10.0200.460	VFD on Dairy Vacuum Pump (Ag only)(Hybrid)	$6197.08 ($4166.04 - $8228.12)	$6749.86 ($4790.04 - $8709.67)
10.0210.460	VFD on Dairy Vacuum Pump (Ag only)(Custom)	$6547.09 ($3271.34 - $9822.85)	$7924.36 ($3485.36 - $12363.35)
10.0500.070	Scroll Compressors for Dairy Refrigeration (Ag Only)(Hybrid)	$3149.75 ($1669.48 - $4630.03)	$2792.83 ($1209.47 - $4376.18)
10.0510.070	Scroll Compressors for Dairy Refrigeration (Ag Only)(Custom)	$10298.34 ($1879.08 - $18717.6)	$3282.09 ($2121.96 - $4442.21)
10.0600.460	VFD on Dairy Milk Jar	$3161.8 ($1836.71 - $4486.89)	$2951.11 ($2031.55 - $3870.68)
10.0800.145	Heat Recovery Tank, no heating element	$2926.01 ($2168.59 - $3683.44)	$3360.67
10.1200.145	Heat Recovery, custom, not otherwise specified	$4317.43 ($1116.02 - $7518.83)	$2776.46 ($2327.03 - $3225.9)
10.4100.200	Grain Dryer - energy efficient	$101961.38 ($-11261.68 - $215184.43)	$93444.79 ($-9553.94 - $196443.51)
10.5000.250	Irrigation Pressure Reduction	$10079.63 ($1782.08 - $18377.19)	$19662.23 ($8567.64 - $30756.82)
10.5100.265	Energy Efficient Livestock Waterer (Ag Only) (Prescriptive)	$710.33 ($357.29 - $1063.37)	$630.89 ($406.11 - $855.67)

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
10.8000.205	Thermal blanket for use on greenhouse	$37272.13 ($23955.85 - $50588.4)	
10.8310.205	Greenhouse Glazing - Improve	$8893	
10.8400.205	Reduce air infiltration in greenhouse	$1000	
10.8710.205	Greenhouse IR Rated Poly-film	$757.08 ($328.26 - $1185.9)	$4797.02 ($-3251 - $12845.04)
10.8720.205	Greenhouse Power Vented Unit Heaters	$3021.36 ($340.39 - $5702.33)	$1783.44 ($808.43 - $2758.44)
10.8730.205	Greenhouse Climate Controls	$5085	
11.0300.460	Variable speed drive on pump motor	$92812.55 ($-68793.42 - $254418.51)	
11.4000.005	Custom Aeration Measure	$99366.67 ($79572.64 - $119160.69)	$41400
11.9900.280	Custom waste water treatment measure not otherwise specified	$100500	
12.1000.045	Recuperative Burners Installed	$57700	$309154.67
12.4001.045	Radiant tube inserts installed in exhaust of radiant tube burners - per insert (Hybrid)	$418.02	
12.6000.190	High frequency melting furnace replaces line-frequency furnace	$198970	$336000
14.0003.280	Food Service Bonus, multiple equipment, 3 types	$300	
14.1301.180	Fryer, Large Vat, Electric, High Efficiency	$3992.2	
14.1302.180	Fryer, Large Vat, Gas, High Efficiency	$4324.36 ($3213.87 - $5434.86)	
14.2103.395	Steamer, Electric, 3 pan - ENERGY STAR	$4358.6	
14.2106.395	Steamer, Electric, 6 pan - ENERGY STAR	$6009.94	
14.3000.225	Hot Food Holding Cabinet - ENERGY STAR	$3550.93 ($1737.12 - $5364.74)	
14.3102.290	Oven, Convection, Gas, High Efficiency - per cavity	$3208.31 ($3059.89 - $3356.72)	
14.3112.290	Oven, Rack Type, Gas, Single Compartment, High Efficiency	$19500	
14.3122.290	Oven, Rack Type, Gas, Double Compartment, High Efficiency	$21425.15	

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
14.3132.290	Oven, Combination Type, Gas, High Efficiency	$17398.76 ($16659.49 - $18138.03)	
14.4110.340	Refrigerator, < 20 cu ft, ENERGY STAR	$2348 ($1454.22 - $3241.78)	
14.4120.340	Refrigerator, 20-48 cu ft, ENERGY STAR	$2527.95 ($2047.05 - $3008.85)	
14.4130.340	Refrigerator, > 48 cu ft, ENERGY STAR	$3543	
14.4210.340	Freezer, < 20 cu ft, ENERGY STAR	$2980	
14.4220.340	Freezer, 20-48 cu ft, ENERGY STAR	$2626.28 ($2144.28 - $3108.27)	
14.4230.340	Freezer, > 48 cu ft, ENERGY STAR	$5036.99 ($3616.77 - $6457.2)	$3213.64
14.5100.235	Ice Machines, < 500 lbs, High Efficiency	$2489.01 ($1763.01 - $3215.01)	
14.5200.235	Ice Machines, 500-1000 lbs, High Efficiency	$2187.96 ($153.64 - $4222.28)	
61.0111.270	Motor NEMA premium efficiency 1.0 hp	$1	
61.0113.270	Motor NEMA premium efficiency 2.0 hp	$462.31	
61.0114.270	Motor NEMA premium efficiency 3.0 hp	$393.57 ($205.67 - $581.46)	
61.0115.270	Motor NEMA premium efficiency 5.0 hp	$478.32 ($174.66 - $781.98)	$42.5 ($31.89 - $53.11)
61.0116.270	Motor NEMA premium efficiency 7.5 hp	$831.35 ($630.38 - $1032.32)	$80 ($9.29 - $150.71)
61.0117.270	Motor NEMA premium efficiency 10 hp	$739.27 ($609.89 - $868.66)	
61.0118.270	Motor NEMA premium efficiency 15 hp	$1501.9 ($899.56 - $2104.24)	$90
61.0119.270	Motor NEMA premium efficiency 20 hp	$1596.07 ($1057.55 - $2134.6)	$125 ($117.93 - $132.07)
61.0120.270	Motor NEMA premium efficiency 25 hp	$1665.73 ($1552.7 - $1778.75)	$127.5 ($123.96 - $131.04)
61.0121.270	Motor NEMA premium efficiency 30 hp	$2153.14 ($1262.32 - $3043.97)	
61.0122.270	Motor NEMA premium efficiency 40 hp	$2303.44 ($1771.29 - $2835.59)	
61.0123.270	Motor NEMA premium efficiency 50 hp	$18993.76 ($-5364.63 - $43352.14)	
61.0125.270	Motor NEMA premium efficiency 75 hp	$3756.78	
61.1000.280	Distributor SPIFF, motors <=30 hp	$47.47 ($-162.32 - $257.26)	

WISEERTS Tech Code	Measure Description	WISeerts Cost Estimate	WATTS Cost Estimate
61.9900.280	Motor, measures not otherwise specified	$52330.37 ($-50501.63 - $155162.38)	$3200 ($2853.59 - $3546.41)

APPENDIX C: SURVEY WITH AVERAGE RESPONSES

Disclaimer: The results presented in this average response version of the survey are the 80 percent confidence interval (presented as x – y) and the number of responses for each question (presented as n=z). This interval indicates an 80 percent chance that the average actual price is within the range. We did not include average responses with fewer than four responses (n<4) or the results of any secondary research. Due to statistical analysis, some of the intervals have ranges that do not seem to make sense (e.g., percentages that are less than zero or more than 100 percent). We advise viewers of this document to use any information included herein with caution.

FOCUS ON ENERGY INCREMENTAL COST STUDY

TRADE ALLY SURVEY

Background Questions

Welcome to the Focus on Energy market survey. The following questions ask about your company's sales and installations of various energy efficient technologies in Wisconsin. Please answer the questions as completely as you can. If you do not know the answer to a particular question, please provide your best estimate.

Many of these questions will focus on pricing. We recognize that pricing is a sensitive topic and want you to understand why we need this information and what we will do with it. The purpose of the survey is to estimate the incremental cost of various efficiency measures compared with their less efficient alternatives. By understanding the incremental cost of measures the Focus on Energy team is able to more effectively evaluate the program's impact on the market.

Your survey responses will be combined with those of similar firms to guide program planning and evaluation efforts. All information you provide will be confidential and not linked to your company in anyway. No one outside of the project team will have access to your individual, non-aggregated responses. If you complete the survey, you will receive a copy of the final results which will include the average prices that firms like yours are charging for various high efficiency products.

If you have questions about how to complete the survey, please contact Shawn McNulty at 608-259-9152, x60227. Thanks for your assistance with this important research.

To begin, please tell us a little bit about yourself and your company.

Q1. What is your name? ______________________________

Q2. What is your title? ______________________________

Q3. How many years have you been with this firm? ______ years

Q4. How many full-time employees at your location? (33.85 – 50.26) FTEs, n=76

Q5. Which of the following product types does your company sell to (or install for) commercial or industrial customers in Wisconsin? *For purposes of this survey, when asked about commercial and industrial customers include schools, governments and agricultural businesses in all your responses.* **(Check all that apply)**

a. Lighting products (e.g., lamps, ballasts, or fixtures)
b. HVAC equipment (e.g., furnaces, boilers, AC split systems, packaged or rooftop air-conditioners, energy recovery ventilators)
c. Motors or drives
d. Vending machines or vending machine controls
e. Food service equipment (e.g., fryers, steamers, ovens, griddles, hot food holding cabinets, refrigerators, freezers, dishwashers, or pre-rinse sprayers)
f. Refrigeration equipment for grocery stores
g. Ventilation fans for agricultural applications
h. None of the above

Q6. Which of the following services does your company provide to commercial or industrial customers in Wisconsin? **(Check all that apply)**

a. Boiler tune-ups - A boiler tune-up includes reducing excess air, cleaning boiler tubes and recalibrating boiler controls.
b. Steam trap repair
c. None of the above

If Q5 = h and Q6 = c, go to C1.

Q7. What percent of your company's sales at this location are sales to commercial or industrial customers in Wisconsin?

_____ %

Q8. What percent of your company's sales to commercial or industrial customers in Wisconsin fall into each of the following categories?

a. Lighting products
b. HVAC equipment
c. Motors or drives
d. Vending machines or vending machine controls
e. Food service equipment
f. Refrigeration equipment for grocery stores
g. Ventilation fans for agricultural applications
h. Boiler tune-ups
i. Steam trap repairs
j. Other

Lighting Questions (asked only if Q5 = a)

L1. Which of the following lighting products does your company sell to (or install for) commercial or industrial customers in Wisconsin? **(Check all that apply)**

a. Compact fluorescent lamps (CFLs)
b. Incandescent lamps
c. T5, T8, or T12 lamps, ballasts, or fixtures
d. Metal halide fixtures (standard, ceramic, or pulse-start)
e. Hi/lo controls for pulse-start metal halide
f. High-intensity discharge (HID) lamps
g. LED retrofit kits
h. Occupancy sensors
i. None of the above

If L1 = i, proceed to next applicable category or go to C1.

<u>CFL Questions</u> (asked only if L1 = a)

CFL1. For each of the following **compact fluorescent lamp** products please indicate the average price per lamp that your Wisconsin commercial/industrial customers paid in the past 12 months. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check "N/A."

High Efficiency CFL	Incandescent Equivalent (Assume Type A or G unless noted otherwise)	Avg. Retail Price of High Efficiency CFL (per lamp)	N/A
a. 5W CFL lamps	25W Incandescent	($2.11 - $3.38), n=12	
b. 7W-11W CFL lamps	40W Incandescent	($2.32 - $3.56), n=15	
c. 13W-17W CFL lamps	60W incandescent	($2.61 - $4.39), n=16	
d. 18W-21W CFL	75W Incandescent	($2.93 - $6.35), n=15	
e. 18-21W CFL reflector flood lamps	75W incandescent flood (PAR)	($4.1 - $14.13), n=12	
f. 23W-27W CFL	100W Incandescent	($3.94 - $8.38), n=14	
g. 28W-34W CFL	110W-120W Incandescent	($4.83 - $10.05), n=13	
h. 40W-45W CFL	150W Incandescent	($6.01 - $11.07), n=14	
i. 65W CFL lamps	200-250W Incandescent	($10.87 - $29.56), n=12	

Incandescent Questions (ask only if L1 = b)

INC1. For each of the following **incandescent lamp** products please indicate the average price per lamp that your Wisconsin commercial/industrial customers paid in the past 12 months. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check "N/A."

	Avg. Retail Price (per lamp)	**N/A**
a. 25W Incandescent	($0.47 - $1.17), n=11	
b. 40W Incandescent	($0.42 - $0.52), n=12	
c. 60W incandescent	($0.41 - $0.48), n=12	
d. 75W Incandescent	($0.45 - $0.51), n=12	
e. 75W incandescent flood (PAR)	($1.42 - $4.75), n=10	
f. 100W Incandescent	($0.46 - $0.53), n=13	
g.110W-120W Incandescent	($0.8 - $1.77), n=7	
h.150W Incandescent	($0.82 - $1.15), n=10	
i. 200-250W Incandescent	($1.07 - $3.23), n=9	

INC2. What percent of your total sales of incandescent and CFL products is accounted for by CFLs?

(23.44 - 34.94)%, n=30

Fluorescent Questions (ask only if L1 = c)

FL1. For each of the following **fluorescent lighting** products please indicate the average price that your Wisconsin commercial/industrial customers paid in the past 12 months. List the price per unit (lamp, ballast, or fixture) and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check "N/A."

		Avg. Retail Price		
	Additional Description	**Equipment (per unit)**	**Installation (Labor) (per unit)**	**N/A**
T8 Lamps				
a. 8 foot, 59W wattage T8 lamps	Standard F96T8 lamp	($5.1 - $6.34), n=10	($4.64 - $6.94), n=6	
b. 8 foot, 54W T8 lamps	F96T8 reduced wattage (54W) lamp	($5.95 - $7.07), n=7	($4.46 - $6.74), n=5	
c. 4 foot, 25W T8 lamps	4' T8 reduced wattage lamp	($2.47 - $3.17), n=7		
d. 4 foot, 28W T8 lamps	4' T8 reduced wattage lamp	($2.33 - $4.16), n=10	($4.64 - $7.5), n=7	
e. 4 foot, 30W T8 lamps	4' T8 reduced wattage lamp	($2.05 - $2.98), n=7	($4.53 - $6.99), n=4	
f. 4 foot, 32W T8 lamps (700 series)	Standard F32T8 lamp	($1.51 - $1.97), n=13	($4.18 - $6.12), n=7	
g. 4 foot, 32W high lumen T8 lamps	F32T8 (3100 initial lumen & 24,000 hour rated life)	($2.44 - $3.11), n=13	($4.6 - $7.5), n=6	

		Avg. Retail Price		
	Additional Description	**Equipment (per unit)**	**Installation (Labor) (per unit)**	**N/A**
T8 Ballasts and Fixtures				
h. 6 lamp, 4 foot T8 standard ballast high bay fixtures		($156.31 - $177.68), n=13	($29.44 - $52.45), n=9	
i. 8 lamp, 4 foot T8 standard ballast high bay fixtures		($184.22 - $228.9), n=7	($27.9 - $51.84), n=6	
j. 1 lamp, 4 foot 32W T8 fixtures with standard lamp & ballast	Commodity grade lamp (700 series), generic electronic ballast	($32.26 - $40.29), n=8	($38.03 - $51), n=4	
k. 2 lamp, 4 foot 32W T8 fixtures with standard lamp & ballast	Commodity grade lamp (700 series) w/generic electronic ballast	($37.73 - $49.68), n=9	($38.27 - $50.78), n=5	
l. 4 lamp, 4 foot 32W T8 fixtures with standard lamps & ballast	Commodity grade lamp (700 series) w/generic electronic ballast	($52.93 - $64.41), n=9	($43.24 - $51.04), n=5	
m. 4 lamp, 4 foot fixtures with high performance T8 lamps & ballast	3100 initial lumen 32W T8 lamp paired with .78 BF or lower ballast or CEE/NEMA premium.	($53.47 - $81.02), n=10	($48.72 - $61.79), n=6	
n. 2 lamp, 4 foot fixture with 25W T8 lamps & CEE ballast	25W reduced wattage 4' T8 lamp paired with .78 BF or lower ballast or CEE/NEMA premium.	($52.25 - $62.48), n=5		
o. 2 lamp, 4 foot fixture with 28W T8 lamps & CEE ballast	28W reduced wattage 4' T8 lamp paired with .78 BF or lower ballast or CEE/NEMA premium. .	($46.3 - $53.04), n=7	($46.87 - $56.59), n=4	
p. 4 lamp, 4 foot fixture with 25W T8 lamps & CEE ballast	25W reduced wattage 4' T8 lamp paired with .78 BF or lower ballast or CEE/NEMA premium. .	($67.3 - $76.78), n=5		

	Additional Description	Avg. Retail Price Equipment (per unit)	Installation (Labor) (per unit)	N/A
q. 4 lamp, 8 foot fixture with 28W T8 lamps & CEE ballast	28W reduced wattage 4' T8 lamp paired with .78 BF or lower ballast or CEE/NEMA premium. .	($64.43 - $86.11), n=7	($48.59 - $62.34), n=5	
r. 1 lamp, 4 foot fixture with high lumen T8 low ballast factor (BF)	3100 initial lumen 32W T8 lamp paired with .78 BF or lower ballast or CEE/NEMA premium. .	($34.44 - $40.93), n=8	($44.61 - $52.4), n=4	
s. 2 lamp, 4 foot fixture with high lumen T8 low ballast factor (BF)	3100 initial lumen 32W T8 lamp paired with .78 BF or lower ballast or CEE/NEMA premium. .	($44.56 - $48.79), n=9	($44.88 - $53.2), n=4	
t. 3 lamp, 4 foot fixture with high lumen T8 low ballast factor (BF)	3100 initial lumen 32W T8 lamp paired with .78 BF or lower ballast or CEE/NEMA premium. .	($58.48 - $71.26), n=8	($49.41 - $58.37), n=5	
T5 Ballasts and Fixtures				
u. 4 lamp T5HO High bay fixtures	Replacement for HID high bay	($137.03 - $174.05), n=14	($29.53 - $53.18), n=8	
v. 2 lamp, 4 foot T5 recessed indirect 2x4 fixture	Replacement for 2x4 parabolic troffer	($86.26 - $129.07), n=8	($43.91 - $94.04), n=5	
w. 2 lamp, 4 foot T5HO recessed 2x4 fixture	High lumen output replacement for 2x4 parabolic troffer	($75.12 - $116.74), n=7	($44.28 - $92.02), n=5	

FL2. What percent of your company's total T8 lamp sales fall into each of the following categories?

a. Reduced wattage T8 lamps 25.62 %, n=16

b. High lumen T8 lamps 63.09 %, n=18

c. All other T8 lamps 37.68 %, n=21

FL3. What percent of your company's total sales of high bay lighting products are high bay fluorescents?

(76.2 – 87.1)%, n=22

Metal Halide Questions (ask only if L1 = d or e)

MH1. For each of the following **metal halide lighting** products please indicate the average price that your Wisconsin commercial/industrial customers paid in the past 12 months. List the price per unit (lamp, ballast, fixture, or control) and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check "N/A."

		Avg. Retail Price		
	Additional Description	**Equipment (per unit)**	**Installation (Labor)**	**N/A**
Standard Metal Halide				
a. 175W metal halide fixture		($146.74 - $168.85), n=4		
b. 250W standard metal halide fixture with core & coil ballast		($185.84 - $203.93), n=4		
c. 400W probe start metal halide fixture with core & coil ballast		($189.93 - $231.24), n=4		
d. 1,000W standard metal halide fixture with core & coil ballast				
Ceramic Metal Halide				
e. 25W ceramic MH lamp & fixture	Complete new fixture with CMH lamp			
f. 39W ceramic MH lamp & fixture	Complete new fixture with CMH lamp			
g. 70W ceramic MH lamp & fixture	Complete new fixture with CMH lamp			

		Avg. Retail Price		
	Additional Description	**Equipment (per unit)**	**Installation (Labor)**	**N/A**
Pulse-start Metal Halide Fixtures and Controls				
h. Pulse-start MH 320W fixture	Complete new fixture containing pulse start ballast and lamp	($229.67 - $276.39), n=6		
i. Pulse-start MH 750W fixture	Complete new fixture containing pulse start ballast and lamp			
j. Pulse-start MH 250W electronic ballast fixture	Complete new fixture containing pulse start ballast and lamp			
k. Pulse-start MH 320W electronic ballast fixture		($270.02 - $288.76), n=4		
l. High/low control for pulse-start MH	Occupancy based high /low control			

MH2. What percent of your company's total sales of high bay lighting products are pulse-start metal halides?

(15.36 - 71.99)%, n=20

<u>High Intensity Discharge (HID) Questions</u> (ask only if L1 = f)

HID1. For each of the following **HID lighting** products please indicate the average price that your Wisconsin commercial/industrial customers paid in the past 12 months. List the price per lamp and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check “N/A.”

	Avg. Retail Price		
HID lamps	**Equipment**	**Installation (Labor) (per lamp)**	**N/A**
a. 25W CMH lamps			
b. 39W CMH lamps	(\$25.2 - \$80.82), n=4		
c. 70W CMH lamps	(\$30.22 - \$47.2), n=4		
d. 175W HID lamps	(\$23.59 - \$34.63), n=7		
e. 250W HID lamps	(\$26.49 - \$39.88), n=6		
f. 250W PSMH lamps	(\$34.06 - \$43.44), n=6		
g. 320W PSMH lamps	(\$33.9 - \$44.99), n=8		
h. 400W HID lamps	(\$27.4 - \$46.62), n=9	(\$14.25 - \$20.74), n=4	
i. 720W PSMH lamps	(\$53.8 - \$63.49), n=4		
j. 1,000W HID lamps	(\$48.43 - \$66.98), n=5		

<u>Occupancy Sensor Questions</u> (ask only if L1 = g or h)

OS1. For each of the following lighting products please indicate the average price that your Wisconsin commercial/industrial customers paid in the past 12 months. List the price per unit and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check "N/A."

	Avg. Retail Price		
	Equipment (per unit)	**Installation (Labor)**	**N/A**
a. Occupancy sensors, wall mounted	(\$37.62 - \$45.73), n=10	(\$29.99 - \$40.26), n=6	
b. Occupancy sensors, ceiling mounted	(\$59.67 - \$71.59), n=10	(\$48.13 - \$80.28), n=6	

HVAC Questions (asked only if Q5 = b)

HVAC1. Which of the following heating and cooling products does your company sell to (or install for) commercial or industrial customers in Wisconsin? **(Check all that apply)**

a. High efficiency furnaces (ECM fan motor and AFUE >= 90%)
b. Standard efficiency furnaces
c. High efficiency modulating boilers (AFUE >= 90%)
d. Standard efficiency boilers
e. Air-conditioning split systems < 65 MBh (5.4 ton)
f. Packaged terminal air-conditioning (PTAC) units
g. Rooftop AC units < 65 MBh (5.4 ton)
h. Rooftop AC units 65 to 134 MBh (5.4 to 11.2 ton)
i. Rooftop AC units 135 to 239 MBh (11.2 to 19.9 ton)
j. Rooftop AC units 240 to 759 MBh (20 to 63.3 ton)
k. Packaged terminal heat pump (PTHP) units
l. None of the above

If HVAC1 = l, proceed to next applicable section or C1.

<u>Furnace Questions</u> (ask only if HVAC1 = a or b)

HVAC2. Please list below the following information for your company's 3 best selling **high efficiency furnace** models (For purposes of this survey, high efficiency means the furnace has an ECM fan motor and an AFUE rating of at least 90%.) and the **standard efficiency furnace** alternative (For purposes of this survey, standard efficiency means any furnace that does **not** have both an ECM fan motor and an AFUE rating of at least 90%). Provide this information based on sales for the previous 12 months.

1. furnace capacity (MBh)
2. furnace efficiency (AFUE)
3. price for the equipment your commercial/industrial customers in Wisconsin paid
4. price for installation and labor your commercial/industrial customers in Wisconsin paid
5. percent of all furnace units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's 3 best selling **standard efficiency furnace** models and the **high efficiency furnace** alternative.

List the price per unit (furnace) and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Best-Selling Standard and High Efficiency Furnace Models and Alternatives (past 12 months).	**Std Eff Furnace Capacity (MBh)**	**Std Eff Furnace Efficiency (AFUE)**	**Std Eff Equipment Cost to Customer ($/unit)**	**Std Eff Installation/ Labor Cost to Customer ($/unit)**	**Std Eff Percent of All Furnace Units Sold in Past 12 Months (%)**	**Hi Eff Furnace Capacity (MBh)**	**Hi Eff Furnace Efficiency (AFUE)**	**Hi Eff Equipment Cost to Customer ($/unit)**	**Hi Eff Installation/ Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All Furnace Units Sold in Past 12 Months (%)**
#1 Selling High Efficiency model and Standard Efficiency alternative										
#2 Selling High Efficiency model and Standard Efficiency alternative										
#3 Selling High Efficiency model and Standard Efficiency alternative										

Best-Selling Standard and High Efficiency Furnace Models and Alternatives (past 12 months).	**Std Eff Furnace Capacity (MBh)**	**Std Eff Furnace Efficiency (AFUE)**	**Std Eff Equipment Cost to Customer ($/unit)**	**Std Eff Installation/ Labor Cost to Customer ($/unit)**	**Std Eff Percent of All Furnace Units Sold in Past 12 Months (%)**	**Hi Eff Furnace Capacity (MBh)**	**Hi Eff Furnace Efficiency (AFUE)**	**Hi Eff Equipment Cost to Customer ($/unit)**	**Hi Eff Installation/ Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All Furnace Units Sold in Past 12 Months (%)**
#1 Selling Standard Efficiency model and High Efficiency alternative										
#2 Selling Standard Efficiency model and High Efficiency alternative										
#3 Selling Standard Efficiency model and High Efficiency alternative										

<u>Boiler Questions</u> (ask only if HVAC1 = c or d)

HVAC3. Please list below the following information for your company's 3 best selling **high efficiency boiler** models (For purposes of this survey, high efficiency means the boiler has an AFUE rating of at least 90%.) and the **standard efficiency boiler** alternative (For purposes of this survey, standard efficiency means the boiler has an AFUE rating of less than 90%.). Provide this information based on sales for the previous 12 months.

1. boiler capacity (MBh)
2. boiler efficiency (AFUE)
3. price for the equipment your commercial/industrial customers in Wisconsin paid
4. price for installation and labor your commercial/industrial customers in Wisconsin paid
5. percent of all boiler units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's 3 best selling **standard efficiency boiler** models and the **high efficiency boiler** alternative.

List the price per unit (boiler) and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Best-Selling Standard and High Efficiency Boiler Models and Alternatives (past 12 months).	**Std Eff Boiler Capacity (MBh)**	**Std Eff Boiler Efficiency (AFUE)**	**Std Eff Equipment Cost to Customer ($/unit)**	**Std Eff Installation/ Labor Cost to Customer ($/unit)**	**Std Eff Percent of All Boiler Units Sold in Past 12 Months (%)**	**Hi Eff Boiler Capacity (MBh)**	**Hi Eff Boiler Efficiency (AFUE)**	**Hi Eff Equipment Cost to Customer ($/unit)**	**Hi Eff Installation/ Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All Boiler Units Sold in Past 12 Months (%)**
#1 Selling High Efficiency model and Standard Efficiency alternative	(462.98 - 736.13) MBh, n=4	(81.29 - 86.24%), n=4	(6286.31 - 11434.25), n=4	(6510.29 - 9342.4), n=4	(47.79 - 69.68)%, n=4	(382.52 - 586.66) MBh, n=5	(94.94 - 95.62)%, n=5	$(6354.86 - 10289.34), n=5	$(6987.38 - 9239.97), n=5	(44.21 - 98.91)%, n=5
#2 Selling High Efficiency model and Standard Efficiency alternative										
#3 Selling High Efficiency model and Standard Efficiency alternative										
#1 Selling Standard Efficiency model and High Efficiency alternative										
#2 Selling Standard Efficiency model and High Efficiency alternative										
#3 Selling Standard Efficiency model and High Efficiency alternative										

Split System AC Questions (ask only if HVAC1 = e)

HVAC4. Please list below the following information for your company's 3 best selling **high efficiency split system AC models < 65 MBh (5.4 tons)** (For purposes of this survey, high efficiency means the split system AC models < 65 MBh (5.4 tons) have an EER rating of at least 11.6.) and the **standard efficiency split system AC models < 65 MBh (5.4 tons)** alternative (For purposes of this survey, standard efficiency means the split system AC models < 65 MBh (5.4 tons) have an EER rating of less than 11.6.). Provide this information based on sales for the previous 12 months.

1. system efficiency rating (EER)
2. price for the equipment your commercial/industrial customers in Wisconsin paid
3. price for installation and labor your commercial/industrial customers in Wisconsin paid
4. percent of all split system AC models < 65 MBh (5.4 tons) units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's 3 best selling **standard split system AC models < 65 MBh (5.4 tons)** and the **high efficiency split system AC model < 65 MBh (5.4 tons)** alternative.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Please do not report data for any system >= 65 MBh (5.4 tons).

Best-Selling Standard and High Efficiency split system AC models < 65 MBh (5.4 tons) and Alternatives (past 12 months).	**Std Eff Efficiency (EER)**	**Std Eff Equip-ment Cost to Customer ($/unit)**	**Std Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Std Eff Percent of All Units Sold in Past 12 Months (%)**	**Hi Eff Efficiency (EER)**	**Hi Eff Equip-ment Cost to Customer ($/unit)**	**Hi Eff Installa-tion/ Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All Units Sold in Past 12 Months (%)**
#1 Selling High Efficiency model and Standard Efficiency alternative								
#2 Selling High Efficiency model and Standard Efficiency alternative								
#3 Selling High Efficiency model and Standard Efficiency alternative								
#1 Selling Standard Efficiency model and High Efficiency alternative								
#2 Selling Standard Efficiency model and High Efficiency alternative								
#3 Selling Standard Efficiency model and High Efficiency alternative								

<u>Packaged Terminal Air Conditioning Questions</u> (ask only if HVAC1 = f)

HVAC5. Please list below the following information for your company's 3 best selling **high efficiency packaged terminal air-conditioning (PTAC)** models and the **standard efficiency PTAC** alternative. Provide this information based on sales for the previous 12 months.

1. PTAC capacity (MBh)
2. PTAC efficiency (EER)
3. price for the equipment your commercial/industrial customers in Wisconsin paid
4. price for installation and labor your commercial/industrial customers in Wisconsin paid
5. percent of all PTAC units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's 3 best selling **standard efficiency** PTAC models and the **high efficiency** PTAC alternative.

For purposes of this survey high efficiency PTAC means:

- <8,000 BTU/hr; >=12.1 EER
- 8,000–9,999 BTU/hr; >=11.5 EER
- 10,000–12,999 BTU/hr; >=10.9 EER
- >=13,000 BTU/hr; >=9.8 EER

For purposes of this survey standard efficiency PTAC means units that do not meet the above criteria for high efficiency PTAC.

List the price per unit (PTAC) and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Best-Selling Standard and High Efficiency PTAC Models and Alternatives (past 12 months).	**Std Eff PTAC Capacity (MBh)**	**Std Eff PTAC Efficiency (EER)**	**Std Eff Equipment Cost to Customer ($/unit)**	**Std Eff Installation/ Labor Cost to Customer ($/unit)**	**Std Eff Percent of All PTAC Units Sold in Past 12 Months (%)**	**Hi Eff PTAC Capacity (MBh)**	**Hi Eff PTAC Efficiency (EER)**	**Hi Eff Equipment Cost to Customer ($/unit)**	**Hi Eff Installation/ Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All PTAC Units Sold in Past 12 Months (%)**
#1 Selling High Efficiency model and Standard Efficiency alternative										
#2 Selling High Efficiency model and Standard Efficiency alternative										
#3 Selling High Efficiency model and Standard Efficiency alternative										
#1 Selling Standard Efficiency model and High Efficiency alternative										
#2 Selling Standard Efficiency model and High Efficiency alternative										
#3 Selling Standard Efficiency model and High Efficiency alternative										

<u>Packaged Terminal Heat Pump Questions</u> (ask only if HVAC1 = k)

HVAC6. Please list below the following information for your company's 3 best selling **high efficiency packaged terminal heat pump (PTHP)** models and the **standard efficiency PTHP** alternative. Provide this information based on sales for the previous 12 months.

1. PTHP capacity (MBh)
2. PTHP efficiency (EER)
3. PTHP Coefficient of Performance (COP)
4. price for the equipment your commercial/industrial customers in Wisconsin paid
5. price for installation and labor your commercial/industrial customers in Wisconsin paid
6. percent of all PTHP units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's 3 best selling **standard efficiency** PTHP models and the **high efficiency** PTHP alternative.

For purposes of this survey high efficiency PTHP means:

- <8,000 BTU/hr; >=12.1 EER and >=3.4 COP
- 8,000–9,999 BTU/hr; >=11.5 EER and >=3.2 COP
- 10,000–12,999 BTU/hr; >=10.9 EER and >=3.1 COP
- >=13,000 BTU/hr; >=9.8 EER and >=3.1 COP

For purposes of this survey standard efficiency PTHP means units that do not meet the above criteria for high efficiency PTHP.

List the price per unit (PTHP) and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Best-Selling Standard and High Efficiency PTHP Models and Alternatives (past 12 months).	**Std Eff PTHP Capacity (MBh)**	**Std Eff PTHP Efficiency (EER)**	**Std Eff PTHP COP**	**Std Eff Equip-ment Cost to Customer ($/unit)**	**Std Eff Installation/ Labor Cost to Customer ($/unit)**	**Std Eff Percent of All PTHP Units Sold in Past 12 Months (%)**	**Hi Eff PTHP Capacity (MBh)**	**Hi Eff PTHP Efficiency (EER)**	**Std Eff PTHP COP**	**Hi Eff Equip-ment Cost to Customer ($/unit)**	**Hi Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All PTHP Units Sold in Past 12 Months (%)**
#1 Selling High Efficiency model and Standard Efficiency alternative												
#2 Selling High Efficiency model and Standard Efficiency alternative												
#3 Selling High Efficiency model and Standard Efficiency alternative												
#1 Selling Standard Efficiency model and High Efficiency alternative												
#2 Selling Standard Efficiency model and High Efficiency alternative												
#3 Selling Standard Efficiency model and High Efficiency alternative												

Rooftop AC Models < 65 MBh (5.4 tons) Questions (ask only if HVAC1 = g)

HVAC7. Please list below the following information for your company's 3 best selling **high efficiency rooftop AC models < 65 MBh (5.4 tons)** (For purposes of this survey, high efficiency means the rooftop AC models < 65 MBh (5.4 tons) have an EER rating of at least 11.6.) and the **standard efficiency rooftop AC models < 65 MBh (5.4 tons)** alternative (For purposes of this survey, standard efficiency means the rooftop AC models < 65 MBh (5.4 tons) have an EER rating of less than 11.6.). Provide this information based on sales for the previous 12 months.

1. efficiency rating (EER)
2. price for the equipment your commercial/industrial customers in Wisconsin paid
3. price for installation and labor your commercial/industrial customers in Wisconsin paid
4. percent of all rooftop AC models < 65 MBh (5.4 tons) units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's 3 best selling **standard rooftop AC models < 65 MBh (5.4 tons)** and the **high efficiency rooftop AC models < 65 MBh (5.4 tons)** alternative.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Please report data ONLY for units < 65 MBh (5.4 tons).

Best-Selling Standard and High Efficiency rooftop AC models < 65 MBh (5.4 tons) and Alternatives (past 12 months).	**Std Eff Efficiency (EER)**	**Std Eff Equip-ment Cost to Customer ($/unit)**	**Std Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Std Eff Percent of All Units Sold in Past 12 Months (%)**	**Hi Eff Efficiency (EER)**	**Hi Eff Equip-ment Cost to Customer ($/unit)**	**Hi Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All Units Sold in Past 12 Months (%)**
#1 Selling High Efficiency model and Standard Efficiency alternative								
#2 Selling High Efficiency model and Standard Efficiency alternative								
#3 Selling High Efficiency model and Standard Efficiency alternative								
#1 Selling Standard Efficiency model and High Efficiency alternative								
#2 Selling Standard Efficiency model and High Efficiency alternative								
#3 Selling Standard Efficiency model and High Efficiency alternative								

Rooftop AC Models 65 to 134 MBh (5.4 to 11.2 tons) Questions (ask only if HVAC1 = h)

HVAC8. Please list below the following information for your company's 3 best selling **high efficiency rooftop AC models 65 to 134 MBh (5.4 to 11.2 tons)** (For purposes of this survey, high efficiency means the rooftop AC models 65 to 134 MBh (5.4 to 11.2 tons) have an EER rating of at least 11.5.) and the **standard efficiency rooftop AC models 65 to 134 MBh (5.4 to 11.2 tons)** alternative (For purposes of this survey, standard efficiency means the rooftop AC models 65 to 134 MBh (5.4 to 11.2 tons) have an EER rating of less than 11.5.). Provide this information based on sales for the previous 12 months.

1. efficiency rating (EER)
2. price for the equipment your commercial/industrial customers in Wisconsin paid
3. price for installation and labor your commercial/industrial customers in Wisconsin paid
4. percent of all rooftop AC models 65 to 134 MBh (5.4 to 11.2 tons) units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's 3 best selling **standard rooftop AC models 65 to 134 MBh (5.4 to 11.2 tons)** and the **high efficiency rooftop AC models 65 to 134 MBh (5.4 to 11.2 tons)** alternative.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Please report data ONLY for units 65 to 134 MBh (5.4 to 11.2 tons).

Best-Selling Standard and High Efficiency rooftop AC models 65 to 134 MBh (5.4 to 11.2 tons) and Alternatives (past 12 months).	**Std Eff Efficiency (EER)**	**Std Eff Equip-ment Cost to Customer ($/unit)**	**Std Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Std Eff Percent of All Units Sold in Past 12 Months (%)**	**Hi Eff Efficiency (EER)**	**Hi Eff Equip-ment Cost to Customer ($/unit)**	**Hi Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All Units Sold in Past 12 Months (%)**
#1 Selling High Efficiency model and Standard Efficiency alternative								
#2 Selling High Efficiency model and Standard Efficiency alternative								
#3 Selling High Efficiency model and Standard Efficiency alternative								
#1 Selling Standard Efficiency model and High Efficiency alternative								
#2 Selling Standard Efficiency model and High Efficiency alternative								
#3 Selling Standard Efficiency model and High Efficiency alternative								

Rooftop AC Models 135 to 239 MBh (11.2 to 19.9 tons) Questions (ask only if HVAC1 = i)

HVAC9. Please list below the following information for your company's 3 best selling **high efficiency rooftop AC models 135 to 239 MBh (11.2 to 19.9 tons)** (For purposes of this survey, high efficiency means the rooftop AC models 135 to 239 MBh (11.2 to 19.9 tons) have an EER rating of at least 11.5.) and the **standard efficiency rooftop AC models 135 to 239 MBh (11.2 to 19.9 tons)** alternative (For purposes of this survey, standard efficiency means the rooftop AC models 135 to 239 MBh (11.2 to 19.9 tons) have an EER rating of less than 11.5.). Provide this information based on sales for the previous 12 months.

1. system efficiency rating (EER)
2. price for the equipment your commercial/industrial customers in Wisconsin paid
3. price for installation and labor your commercial/industrial customers in Wisconsin paid
4. percent of all rooftop AC models 135 to 239 MBh (11.2 to 19.9 tons) units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's 3 best selling **standard rooftop AC models 135 to 239 MBh (11.2 to 19.9 tons)** and the **high efficiency rooftop AC models 135 to 239 MBh (11.2 to 19.9 tons)** alternative.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Please report data ONLY for units 135 to 239 MBh (11.2 to 19.9 tons).

Best-Selling Standard and High Efficiency rooftop AC models 135 to 239 MBh (11.2 to 19.9 tons) and Alternatives (past 12 months).	**Std Eff Efficiency (EER)**	**Std Eff Equip-ment Cost to Customer ($/unit)**	**Std Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Std Eff Percent of All Units Sold in Past 12 Months (%)**	**Hi Eff Efficiency (EER)**	**Hi Eff Equip-ment Cost to Customer ($/unit)**	**Hi Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All Units Sold in Past 12 Months (%)**
#1 Selling High Efficiency model and Standard Efficiency alternative								
#2 Selling High Efficiency model and Standard Efficiency alternative								
#3 Selling High Efficiency model and Standard Efficiency alternative								
#1 Selling Standard Efficiency model and High Efficiency alternative								
#2 Selling Standard Efficiency model and High Efficiency alternative								
#3 Selling Standard Efficiency model and High Efficiency alternative								

<u>Rooftop AC Models 240 to 759 MBh (19.9 to 63.3 tons) Questions</u> (ask only if HVAC1 = j)

HVAC10. Please list below the following information for your company's 3 best selling **high efficiency rooftop AC models 240 to 759 MBh (19.9 to 63.3 tons)** (For purposes of this survey, high efficiency means the rooftop AC models 240 to 759 MBh (19.9 to 63.3 tons) have an EER rating of at least 10.5.) and the **standard efficiency rooftop AC models 240 to 759 MBh (19.9 to 63.3 tons)** alternative (For purposes of this survey, standard efficiency means the rooftop AC models 240 to 759 MBh (19.9 to 63.3 tons) have an EER rating of less than 10.5.). Provide this information based on sales for the previous 12 months.

1. system efficiency rating (EER)
2. price for the equipment your commercial/industrial customers in Wisconsin paid
3. price for installation and labor your commercial/industrial customers in Wisconsin paid
4. percent of all rooftop AC models 240 to 759 MBh (19.9 to 63.3 tons) units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's 3 best selling **standard rooftop AC models 240 to 759 MBh (19.9 to 63.3 tons)** and the **high efficiency rooftop AC models 240 to 759 MBh (19.9 to 63.3 tons)** alternative.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Please report data ONLY for units 240 to 759 MBh (19.9 to 63.3 tons).

Best-Selling Standard and High Efficiency rooftop AC models 240 to 759 MBh (19.9 to 63.3 tons) and Alternatives (past 12 months).	Std Eff Efficiency (EER)	Std Eff Equip-ment Cost to Customer ($/unit)	Std Eff Installa-tion/Labor Cost to Customer ($/unit)	Std Eff Percent of All Units Sold in Past 12 Months (%)	Hi Eff Efficiency (EER)	Hi Eff Equip-ment Cost to Customer ($/unit)	Hi Eff Installa-tion/Labor Cost to Customer ($/unit)	Hi Eff Percent of All Units Sold in Past 12 Months (%)
#1 Selling High Efficiency model and Standard Efficiency alternative								
#2 Selling High Efficiency model and Standard Efficiency alternative								
#3 Selling High Efficiency model and Standard Efficiency alternative								
#1 Selling Standard Efficiency model and High Efficiency alternative								
#2 Selling Standard Efficiency model and High Efficiency alternative								
#3 Selling Standard Efficiency model and High Efficiency alternative								

Supplemental HVAC Questions.

HVAC11. Are there options or features available on high efficiency HVAC equipment, not available on standard efficiency equipment that would increase the retail price?

a. Yes
b. No [SKIP HVAC12]

HVAC12. If yes, please describe these features and provide an estimate of the increased retail cost for furnaces, boilers, AC split systems, rooftop units, and PTACs.

a. Furnaces:
b. Boilers:
c. AC Split systems
d. Rooftop units:
e. PTACs

Motor Questions (asked only if Q5 = c)

M1. Please indicate whether you have sold or installed each of the following products to commercial or industrial customers in Wisconsin in the past 12 months. **Check yes or no under both the Sold and Installed heading for each product.**

In the past 12 months have you sold/installed the following products for WI business customers?	**Sold**		**Installed**	
a. NEMA premium efficiency motors of 1 hp or greater	Yes ☑	No ☑	Yes ☑	No ☑
b. Standard efficiency motors of 1 hp or greater	Yes ☑	No ☑	Yes ☑	No ☑
c. Stand-alone variable frequency drives (VFDs)	Yes ☑	No ☑	Yes ☑	No ☑

If there are no "Yes" responses to M1, proceed to next applicable section or C1.

M2. Approximately what percentage of the 1 hp plus motors and drives your customers purchase end up being installed by . . . ?
(Enter percents; must sum to 100%)

a. The customer themselves ...._______ %
b. A third party (e.g., contractor)..._______%
c. Your company ...._______%

M3. What would you estimate is the average price that one of your customers would pay if they hired a third-party contractor to install a motor or drive? **(Enter value)**

$(234.5 – 1123.4), n=10

M4. ***(Ask only if R indicated sales/installations of NEMA motors on M1)*** Approximately what percentage of the 1 hp plus motors you sold/installed in the past 12 months were NEMA premium efficiency motors?

(33.5 – 50.5)%, n=15

<u>NEMA Premium Motor Questions</u> ***(ask only if R indicated sales/installations of NEMA motors on M1***)

NM1. Please indicate what percent of your sales and installations of **NEMA premium efficiency** motors to Wisconsin businesses in the past 12 months fell into each of the following **motor hp categories**. ***Percents should sum to 100 in each column***.

	Percent of NEMA motors **sold**	Percent of NEMA motors **installed**
a. 1 – 20 hp	(41.48 - 67.31)%, n= 9	(16.96 - 53.48)%, n= 6
b. 21 – 50 hp	(17.12 - 20.47)%, n= 9	(18.81 - 25.61)%, n= 6
c. 51 – 100 hp	(11.76 - 27.14)%, n= 8	(15.85 - 54.32)%, n= 6
d. 101 – 200 hp	(7.17 - 16.49)%, n= 7	(20 - 20)%, n= 5
e. greater than 200 hp	(8.34 - 16.61)%, n= 7	(20 - 20)%, n= 5
	100%	**100%**

NM2. For each of the following **motor hp ranges** please indicate the average % efficiency for motors sold in each hp category, the average price you charged Wisconsin commercial/industrial customers for NEMA premium efficiency motor sales and/or installations in the past 12 months. List the **price per motor** and report the price for equipment versus installation separately.

In reporting prices, please **do not include**:

- any Focus on Energy or utility incentives (i.e., report prices before incentives were applied)
- the price of extended warranties, optional service plans, or delivery
- the price of VFDs that may have been included with the motor.

Price boxes will be "grayed out" for any size that accounted for 0% of sales or installations in NM1.

		Average Price Charged	
NEMA Premium Motors by HP range	**Average % Efficiency**	**Equipment (per motor)**	**Installation (Labor) (per motor)**
a. 1 – 20 hp	(45.43 - 89)% n= 5	$(445.32 - 1012.92) n= 5	$(180.08 - 947.05) n= 4
b. 21 – 50 hp	(45.89 - 94.66)% n= 4	$(844.05 - 2078.22) n= 4	
c. 51 – 100 hp	(41.36 - 96.25)% n= 4	$(1301.65 - 3789.13) n= 4	
d. 101 – 200 hp	(41.52 - 97.12)% n= 4	$(2169.6 - 6987.58) n= 4	
e. greater than 200 hp			

Standard Efficiency Motor Questions ***(ask only if R indicated sales/installations of standard efficiency motors on M1)***

SM1. Please indicate what percent of your sales and installations of **standard efficiency** motors to Wisconsin businesses in the past 12 months fell into each of the following **motor hp categories**. ***Percents should sum to 100 in each column.***

	Percent of standard efficiency motors **sold**	Percent of standard efficiency motors **installed**
a. 1 – 20 hp	(34.2 - 60.07)%, n= 7	(16.22 - 34.53)%, n= 4
b. 21 – 50 hp	(17.8 - 19.85)%, n= 5	
c. 51 – 100 hp	(12.41 - 17.6)%, n= 5	
d. 101 – 200 hp	(7.82 - 17.65)%, n= 5	
e. greater than 200 hp	(5.36 - 15.22)%, n= 5	
	100%	**100%**

SM2. For each of the following **motor hp ranges** please indicate the average % efficiency for motors sold in each hp category, the average price you charged Wisconsin commercial/industrial customers for standard efficiency motor sales and/or installations in the past 12 months. List the **price per motor** and report the price for equipment versus installation separately.

In reporting prices, please **do not include**:

- any Focus on Energy or utility incentives (i.e., report prices before incentives were applied)
- the price of extended warranties, optional service plans, or delivery
- the price of VFDs that may have been included with the motor.

Price boxes will be "grayed out" for any size that accounted for 0% of sales or installations in SM1.

		Average Price Charged	
Standard Efficiency Motors by HP range	**Average % Efficiency**	**Equipment (per motor)**	**Installation (Labor) (per motor)**
a. 1 – 20 hp			
b. 21 – 50 hp			
c. 51 – 100 hp			
d. 101 – 200 hp			
e. greater than 200 hp			

Variable Frequency Drive (VFD) Questions ***(ask only if R indicated sales/installations of VFDs on M1***)

VFD1. Please indicate what percent of your sales and installations of **stand-alone variable frequency drives (VFDs)** to Wisconsin businesses in the past 12 months fell into each of the following **hp categories**. ***Percents should sum to 100 in each column***.

	Percent of VFDs **sold**	Percent of VFDs **installed**
a. 1 – 20 hp	(35.57 - 64.92)%, n= 6	
b. 21 – 50 hp	(18.73 - 20.38)%, n= 4	
c. 51 – 100 hp	(12.7 - 17.92)%, n= 4	
d. 101 – 200 hp	(4.45 - 15.47)%, n= 4	
e. greater than 200 hp		
	100%	**100%**

VFD2. For each of the following **hp ranges** please indicate the average price you charged Wisconsin commercial/industrial customers for stand-alone VFD sales and/or installations in the past 12 months. List the **price per drive** and report the price for equipment versus installation separately.

In reporting prices, please **do not include**:

- any Focus on Energy or utility incentives (i.e., report prices before incentives were applied)
- the price of extended warranties, optional service plans, or delivery

Price boxes will be "grayed out" for any size that accounted for 0% of sales or installations in VFD1.

	Average Price Charged	
Variable Frequency Drives by HP range	**Equipment (per drive)**	**Installation (Labor) (per drive)**
a. 1 – 20 hp	$(257.77 - 698.97) n= 6	
b. 21 – 50 hp	$(694.82 - 2412.7) n= 4	
c. 51 – 100 hp		
d. 101 – 200 hp		
e. greater than 200 hp		

Vending Machine Questions (asked only if Q5 = d)

VEND1. The table below lists several **vending machine** products within two product categories – cold beverage vending machines and vending machine controls. For each product, please indicate:

1. the percentage of your unit sales within the category in the past 12 months that this product accounted for, and

2. the average retail price that your Wisconsin commercial/industrial customers paid in the past 12 months for this product.

For percent of sales, we are looking for percent of **unit** sales, not percent of revenue.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you did not sell a particular product, check “NA.”

		Avg. Retail Price		
	Percent of Unit Sales within Category	**Equipment (per unit)**	**Installation (Labor) (per unit)**	**N/A**
Category 1 – Cold beverage vending machines				
a. ENERGY STAR rated cold beverage vending machines with software				
b. ENERGY STAR rated cold beverage vending machines **without** software				
c. Standard efficiency (i.e., not ENERGY STAR) cold beverage vending machines				
	100%			
Category 2 – Vending Machine Controls				
d. Vending machine controls for cold beverage vending machines				
e. Vending machine controls for snack vending machines				
	100%			

Food Service Questions (asked only if Q5 = e)

FOOD1. Which of the following food service products does your company sell to (or install for) commercial or industrial customers in Wisconsin? **(Check all that apply)**

a. Fryers
b. Ovens or griddles
c. Steamers or hot food holding cabinets
d. Refrigerators, freezers, or ice machines
e. Dishwashers or pre-rinse sprayers
f. None of the above

If FOOD1 = f, proceed to next applicable section or C1.

<u>Fryer Questions</u> (ask only if FOOD1 = a)

FOOD2. For each of the following **fryer** products please indicate:

1. the percentage of your unit sales of fryers in the past 12 months that this product accounted for, and

2. the average retail price that your Wisconsin commercial/industrial customers paid for this product in the past 12 months.

For percent of sales, we are looking for percent of **unit** sales, not percent of revenue.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check “NA.”

		Avg. Retail Price		
	Percent of Unit Sales of Fryers	**Equipment**	**Installation (Labor)**	**N/A**
a. ENERGY STAR rated electric fryers				
b. ENERGY STAR rated natural gas fryers				
c. Standard efficiency (i.e., not ENERGY STAR) electric fryers	(5.98 - 10.99)%, n=6	$(831.01 - 1032.5), n=5		
d. Standard efficiency (i.e., not ENERGY STAR) natural gas fryers	(66.78 - 86.07)%, n=5	$(929.52 - 1126.49), n=5		
e. High efficiency* large vat electric fryers				
f. High efficiency** large vat natural gas fryers				
g. Standard efficiency large vat electric fryers				
h. Standard efficiency large vat natural gas fryers				
	100%			

* ≥ 80% efficiency as rated by the ASTM Standard Test Method for the Performance of Large Vat Fryers (F2144-05).

** ≥ 50% efficiency as rated by the ASTM Standard Test Method for the Performance of Large Vat Fryers (F2144-05).

Oven or Griddle Questions (ask only if FOOD1 = b)

FOOD3. The table below lists several cooking products within three product categories – convection ovens, combination ovens, and griddles. For each product please indicate:

1. the percentage of your unit sales within the category in the past 12 that this product accounted for, and

2. the average retail price that your Wisconsin commercial/industrial customers paid for this product in the past 12 months.

For percent of sales, we are looking for percent of **unit** sales, not percent of revenue.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check "NA."

		Avg. Retail Price		
	Percent of Unit Sales within Category	**Equipment**	**Installation (Labor)**	**N/A**
Convection Ovens				
a. High efficiency[1] electric convection ovens	(3.96 - 16.44)%, n=4	$(3008.11 - 3650.48), n=4		
b. High efficiency[2] natural gas convection ovens	(32.58 - 62.61)%, n=4	$(3008.11 - 3650.48), n=4		
c. Standard efficiency electric convection ovens				
d. Standard efficiency natural gas convection ovens				
	100%			
Combination Ovens				
e. High efficiency[3] electric combination ovens				
f. High efficiency[4] natural gas combination ovens				
g. Standard efficiency electric combination ovens				
h. Standard efficiency natural gas combination ovens				
	100%			
Griddles				

	Percent of Unit Sales within Category	Avg. Retail Price		N/A
		Equipment	Installation (Labor)	
e. High efficiency[5] electric griddles				
f. High efficiency[6] natural gas griddles				
g. Standard efficiency electric griddles				
h. Standard efficiency natural gas griddles	(24.28 - 62.8)%, n=4			
	100%			

[1]≥70% efficiency as rated by the ASTM Standard Test Method for the Performance of Convection Ovens (F1496)
[2]≥60% efficiency as rated by the ASTM Standard Test Method for the Performance of Combination Ovens (F1639-05).
[3]≥40% efficiency as rated by the ASTM Standard Test Method for the Performance of Convection Ovens (F1496)
[4]≥40% efficiency as rated by the ASTM Standard Test Method for the Performance of Combination Ovens (F1639-05).
[5]≥70% efficiency as rated by the ASTM Standard Test Method for the Performance of Griddles (F1275).
[6]≥38% efficiency as rated by the ASTM Standard Test Method for the Performance of Griddles (F1275).

Steamers or Hot Food Cabinet Questions (ask only if FOOD1 = c)

FOOD4. The table below lists several products within three product categories – ENERGY STAR rated steamers, standard efficiency (i.e., non-ENERGY STAR rated) steamers, and hot food holding cabinets. For each product please indicate:

1. the percentage of your unit sales within the category in the past 12 that this product accounted for, and

2. the average retail price that your Wisconsin commercial/industrial customers paid for this product in the past 12 months.

For percent of sales, we are looking for percent of **unit** sales, not percent of revenue.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check “NA.”

		Avg. Retail Price		
	Percent of Unit Sales within Category	**Equipment**	**Installation (Labor)**	**N/A**
ENERGY STAR rated steamers				
a. 3 pan electric steamers				
b. 4 pan electric steamers				
c. 5 pan electric steamers				
d. 5 pan *natural gas* steamers				
e. 6 pan electric steamers				
f. 6 pan *natural gas* steamers				
	100%			
Standard efficiency (i.e., *not* ENERGY STAR rated) steamers				
g. 3 pan electric steamers				
h. 4 pan electric steamers				
i. 5 pan electric steamers				
j. 5 pan *natural gas* steamers				
k. 6 pan electric steamers				
l. 6 pan *natural gas* steamers				
	100%			
Hot food holding cabinets				
m. ENERGY STAR rated hot food holding cabinets				
n. Standard efficiency (i.e., not ENERGY STAR) hot food holding cabinets				
	100%			

FOOD4a. Overall, what percentage of your unit sales of steamers in the past 12 months were ENERGY STAR rated?

______ %

<u>Refrigerator, Freezer, and Ice Machine Questions</u> (ask only if FOOD1 = d)

FOOD5. Which of the following food service products does your company sell to (or install for) commercial or industrial customers in Wisconsin? **(Check all that apply)**

a. Refrigerators
b. Freezers
c. Ice machines
d. None of the above

If FOOD5 = d, proceed to next applicable section or C1.

(Ask only if FOOD5 = a) **FOOD6**. Please list below the following information for your company's three best selling CEE Tier 1, CEE Tier 2, and standard efficiency commercial refrigerators. Provide this information based on sales for the previous 12 months.

1. size (cubic feet)
2. price for the equipment your commercial/industrial customers in Wisconsin paid
3. price for installation and labor your commercial/industrial customers in Wisconsin paid
4. percent of all commercial refrigerators (standard and high efficiency) sold in the past 12 months

List the price per unit (refrigerator) and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models within a category, leave the extra rows blank.

	Size (cubic feet)	Avg. Retail Price		Percent of All Refrigerators Sold
		Equipment	Installation (Labor)	
CEE Tier 1 Refrigerators (ENERGY STAR rated solid door unit, OR glass door units in 25% of top performance products)				
a. Refrigerator model #1				
b. Refrigerator model #2				
c. Refrigerator model #3				
CEE Tier 2 Refrigerators (Solid door units that are 40% more efficient than ENERGY STAR standards, OR glass door units that are 28% more efficient than CEE Tier 1 units)				
d. Refrigerator model #4				
e. Refrigerator model #5				
f. Refrigerator model #6				
Standard Efficiency Refrigerators				
g. Refrigerator model #7				
h. Refrigerator model #8				
i. Refrigerator model #9				
				100%

(Ask only if FOOD5 = b) **FOOD7.** Please list below the size (in cubic feet) of your **best-selling ENERGY STAR, CEE Tier 2 efficiency, and standard efficiency freezers for food service** as well as the retail price your commercial/industrial customers in Wisconsin paid for each of these models in the past 12 months.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models of freezers in a given efficiency category leave the extra rows blank.

		Avg. Retail Price		
	Size (cubic feet)	**Equipment**	**Installation (Labor)**	**Percent of All Freezers Sold**
CEE Tier 1 Freezers (ENERGY STAR rated)				
a. Freezer model #1				
b. Freezer model #2				
c. Freezer model #3				
CEE Tier 2 Freezers (ENERGY STAR + 30%)				
d. Freezer model #4				
e. Freezer model #5				
f. Freezer model #6				
Standard Efficiency Freezers				
g. Freezer model #7				
h. Freezer model #8				
i. Freezer model #9				
				100%

(Ask only if FOOD5 = c) **FOOD8.** Please list below the following information for your company's three best selling ENERGY STAR rated ice machines and the standard efficiency (non-ENERGY STAR) alternatives. Provide this information based on sales for the previous 12 months.

1. size (cubic feet)
2. price for the equipment your commercial/industrial customers in Wisconsin paid
3. price for installation and labor your commercial/industrial customers in Wisconsin paid
4. percent of all ice machine units (standard and high efficiency) sold in the past 12 months

Also in the table list your company's three best selling **standard efficiency (non-ENERGYSTAR)** ice machines and the **ENERGY STAR** alternative for each.

List the price per unit (ice machine) and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Best-Selling ENERGY STAR and Non-ENERGY STAR ice machine Models and Alternatives (past 12 months).	Std Eff Ice Machine Size (cubic feet)	Std Eff Equip-ment Cost to Customer ($/unit)	Std Eff Installa-tion/Labor Cost to Customer ($/unit)	Std Eff Percent of All Ice Machines Sold in Past 12 Months (%)	Hi Eff Ice Machine Size (cubic feet)	Hi Eff Equip-ment Cost to Customer ($/unit)	Hi Eff Installa-tion/Labor Cost to Customer ($/unit)	Hi Eff Percent of All Ice Machines Sold in Past 12 Months (%)
#1 Selling ENERGY STAR model and Standard Efficiency alternative								
#2 Selling ENERGY STAR model and Standard Efficiency alternative								
#3 Selling ENERGY STAR model and Standard Efficiency alternative								

Best-Selling ENERGY STAR and Non-ENERGY STAR ice machine Models and Alternatives (past 12 months).	Std Eff Ice Machine Size (cubic feet)	Std Eff Equip-ment Cost to Customer ($/unit)	Std Eff Installa-tion/Labor Cost to Customer ($/unit)	Std Eff Percent of All Ice Machines Sold in Past 12 Months (%)	Hi Eff Ice Machine Size (cubic feet)	Hi Eff Equip-ment Cost to Customer ($/unit)	Hi Eff Installa-tion/Labor Cost to Customer ($/unit)	Hi Eff Percent of All Ice Machines Sold in Past 12 Months (%)
#1 Selling Standard Efficiency model and ENERGY STAR alternative								
#2 Selling Standard Efficiency model and ENERGY STAR alternative								
#3 Selling Standard Efficiency model and ENERGY STAR alternative								

Dishwasher and pre-rinse sprayer Questions (ask only if FOOD1 = e)

FOOD9. The table below lists several dishwasher products within five product categories – under counter, stationary single tank, single tank conveyor, and multi tank conveyor dishwashers, and sprayers. For each product please indicate:

1. the percentage of your unit sales within the category in the past 12 that this product accounted for, and

2. the average retail price that your Wisconsin commercial/industrial customers paid for this product in the past 12 months.

For percent of sales, we are looking for percent of **unit** sales, not percent of revenue.

List the price per unit and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not sell a particular product, check "NA."

		Avg. Retail Price		
	Percent of Unit Sales within Category	**Equipment**	**Installation (Labor)**	**N/A**
Category 1 – Under Counter Dishwashers				
a. ENERGY STAR rated high temperature electric dishwasher				
b. ENERGY STAR rated high temperature natural gas dishwasher				
c. ENERGY STAR rated **low** temperature electric dishwasher				
d. ENERGY STAR rated **low** temperature natural gas dishwasher				
e. Standard efficiency (i.e., not ENERGY STAR) high temperature electric dishwasher				
f. Standard efficiency (i.e., not ENERGY STAR) high temperature natural gas dishwasher				
g. Standard efficiency (i.e., not ENERGY STAR) **low** temperature electric dishwasher				

		Avg. Retail Price		
	Percent of Unit Sales within Category	Equipment	Installation (Labor)	N/A
h. Standard efficiency (i.e., not ENERGY STAR) **low** temperature natural gas dishwasher				
	100%			
Category 2 – Stationary Single Tank Dishwashers				
i. ENERGY STAR rated high temperature electric dishwasher				
j. ENERGY STAR rated high temperature natural gas dishwasher				
k. ENERGY STAR rated **low** temperature electric dishwasher				
l. ENERGY STAR rated **low** temperature natural gas dishwasher				
m. Standard efficiency (i.e., not ENERGY STAR) high temperature electric dishwasher				
n. Standard efficiency (i.e., not ENERGY STAR) high temperature natural gas dishwasher				
o. Standard efficiency (i.e., not ENERGY STAR) **low** temperature electric dishwasher				
p. Standard efficiency (i.e., not ENERGY STAR) **low** temperature natural gas dishwasher				
	100%			
Category 3 –Single Tank Conveyor Dishwashers				
q. ENERGY STAR rated high temperature electric dishwasher				
r. ENERGY STAR rated high temperature natural gas dishwasher				
s. ENERGY STAR rated **low** temperature electric dishwasher				
t. ENERGY STAR rated **low** temperature natural gas dishwasher				

		Avg. Retail Price		
	Percent of Unit Sales within Category	**Equipment**	**Installation (Labor)**	**N/A**
u. Standard efficiency (i.e., not ENERGY STAR) high temperature electric dishwasher				
v. Standard efficiency (i.e., not ENERGY STAR) high temperature natural gas dishwasher				
w. Standard efficiency (i.e., not ENERGY STAR) **low** temperature electric dishwasher				
x. Standard efficiency (i.e., not ENERGY STAR) **low** temperature natural gas dishwasher				
	100%			
Category 4 – Multi Tank Conveyor Dishwashers				
y. ENERGY STAR rated high temperature electric dishwasher				
z. ENERGY STAR rated high temperature natural gas dishwasher				
aa. ENERGY STAR rated **low** temperature electric dishwasher				
bb. ENERGY STAR rated **low** temperature natural gas dishwasher				
cc. Standard efficiency (i.e., not ENERGY STAR) high temperature electric dishwasher				
dd. Standard efficiency (i.e., not ENERGY STAR) high temperature natural gas dishwasher				
ee. Standard efficiency (i.e., not ENERGY STAR) **low** temperature electric dishwasher				
ff. Standard efficiency (i.e., not ENERGY STAR) **low** temperature natural gas dishwasher				
	100%			
Category 5 – Sprayers				
gg. Low flow pre-rinse sprayer				
hh. Standard flow sprayer				
	100%			

Grocery Refrigeration Questions (asked only if Q5 = f)

GR1. For each of the following **components of freezer or refrigerator cases** please indicate the average retail price that your Wisconsin commercial/industrial customers paid in the past 12 months. List the price per unit and report the price for equipment versus installation separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans. **Report pricing for standard display cases, not walk-in coolers**.

If you do not sell a particular product, check “NA.”

		Avg. Retail Price		
	Percent of Refrigerator or Freezer Cases Sold with . . .	**Equipment**	**Installation (Labor)**	**N/A**
Motor				
a. Shaded pole				
b. PSC				
c. ECM				
Total	**100%**			
Freezer Door				
d. Standard				
e. Low energy				
f. No energy (include price of anti-fog coating)				
Total	**100%**			
Refrigerator Door				
g. Low energy				
h. No energy				
Total	**100%**			
Miscellaneous				
i. Anti-sweat heater controls				
j. LED display case lighting (step-up or incremental price)				
Total	**100%**			

Agricultural Fan Questions (asked only if Q5 = g)

AF1. Please list below the following information for your company's three best selling high efficiency horizontal barn ventilation fans and the standard efficiency alternatives. Provide this information based on sales for the previous 12 months.

1. diameter (inches)
2. price for the equipment your commercial/industrial customers in Wisconsin paid
3. price for installation and labor your commercial/industrial customers in Wisconsin paid
4. percent of all horizontal barn ventilation fans (standard and high efficiency) sold in the past 12 months

Also in the table list your company's three best selling **standard efficiency** horizontal barn ventilation fans and the **high efficiency** alternative for each.

List the price per unit (fan) and report the price for equipment versus installation separately. Please indicate the price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you sell fewer than three models, leave the extra rows blank.

Best-Selling high efficiency and standard efficiency Models and Alternatives (past 12 months).	**Std Eff Fan Diameter (inches)**	**Std Eff Equip-ment Cost to Customer ($/unit)**	**Std Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Std Eff Percent of All Fans Sold in Past 12 Months (%)**	**Hi Eff Fan Diameter (inches)**	**Hi Eff Equip-ment Cost to Customer ($/unit)**	**Hi Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All Fans Sold in Past 12 Months (%)**
#1 Selling high efficiency model and Standard Efficiency alternative	(47.6 - 50.21)in., n=4	$(628.79 - 827.36), n=4			(47.84 - 49.9)in., n=5	$(568.53 - 798.91), n=5		(88.08 - 96.64)%, n=4
#2 Selling high efficiency model and Standard Efficiency alternative								
#3 Selling high efficiency model and Standard Efficiency alternative								
#1 Selling Standard Efficiency model and high efficiency alternative								

Best-Selling high efficiency and standard efficiency Models and Alternatives (past 12 months).	**Std Eff Fan Diameter (inches)**	**Std Eff Equip-ment Cost to Customer ($/unit)**	**Std Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Std Eff Percent of All Fans Sold in Past 12 Months (%)**	**Hi Eff Fan Diameter (inches)**	**Hi Eff Equip-ment Cost to Customer ($/unit)**	**Hi Eff Installa-tion/Labor Cost to Customer ($/unit)**	**Hi Eff Percent of All Fans Sold in Past 12 Months (%)**
#2 Selling Standard Efficiency model and high efficiency alternative								
#3 Selling Standard Efficiency model and high efficiency alternative								

Service Questions (asked only if Q6 = a or b)

SVC1. Which of the following services does your company provide for commercial or industrial customers in Wisconsin? **(Check all that apply)**

a. Boiler tune- ups - A boiler tune-up includes reducing excess air, cleaning boiler tubes and recalibrating boiler controls.
b. Steam trap repair
c. None of the above

If SVC1 = c, proceed to C1.

(Ask only if SVC1 = a) **SVC2.** Please provide the average retail price your commercial/industrial customers in Wisconsin paid for tune-ups on boilers in the past 12 months.

Report the price for parts versus labor separately. Please indicate the average price to the customer before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not service boilers of a particular size, check "NA."

Tune-ups	Parts - Average Cost to Customer ($)	Labor - Average Cost to Customer ($)	N/A
	_____	_____	

(Ask only if SVC1 = b) **SVC3.** Please list the retail price your commercial/industrial customers in Wisconsin paid for repairs to steam traps in each of the following pressure ranges in the past 12 months.

Report the price for parts versus labor separately. Please indicate the price before any Focus on Energy or utility incentives. Do not include the price of extended warranties or optional service plans.

If you do not service steam traps of a particular pressure, check "NA."

	Avg. Retail Price		
Repairs to steam traps by pressure range:	**Parts**	**Labor**	**N/A**
a. < 25 psig			
b. 25 – 50 psig			
c. 51 – 125 psig			
d. 126 – 225 psig			
e. > 225 psig			

[ALL RESPONDENT ARE ASKED THE Product Pricing Questions.]

Product Pricing Questions

C1. We are interested in the various factors companies like yours take into account when determining product prices for customers. Which of the following pricing strategies describe your approach to setting retail prices? The percent mark up is…**(Check all that apply)**

☑ same for all products	☑ higher for higher-efficiency products
☑ higher for higher quality products	☑ higher for products with additional features
☑ higher for products with additional features	☑ higher for products with longer warrantees
☑ higher for products that sell poorly	☑ higher for products purchased in large volumes
☑ higher for products with limited market competition	☑ Other (please specify): ______________________________

C2. How would each of the following scenarios be likely to affect the retail price of equipment, if nothing else changed in the market?

	Large Decrease	**Moderate Decrease**	**No Effect**	**Moderate Increase**	**Large Increase**	**Not Applicable**
a. Equipment capacity/size doubled.	☐	☐	☑	☐	☐	☐
b. Individual customer doubled number of units purchased.	☐	☑	☑	☐	☐	☐
c. Total annual sales volume doubled.	☐	☑	☑	☐	☐	☐
d. Total market volume doubled.	☐	☑	☑	☐	☐	☐
e. Warrantee period doubled.	☐	☐	☑	☑	☐	☐
f. Number of retailers in your area selling same or similar equipment doubled.	☐	☑	☑	☐	☐	☐
g. Number of installations doubled.	☐	☑	☑	☐	☐	☐
h. Equipment improved from standard to high quality.	☐	☐	☑	☑	☐	☐
i. Equipment improved from standard to high efficiency.	☐	☐	☑	☑	☐	☐

C3. How would each of the following scenarios be likely to affect the installation cost of equipment, if nothing else changed in the market?

	Large Decrease	**Moderate Decrease**	**No Effect**	**Moderate Increase**	**Large Increase**	**Not Applicable**
a. Equipment capacity/size doubled.	☐	☐	☑	☑	☐	☐
b. Individual customer doubled number of units purchased.	☐	☑	☑	☐	☐	☐
c. Total annual sales volume doubled.	☐	☐	☑	☐	☐	☐
d. Total market volume doubled.	☐	☐	☑	☐	☐	☐
e. Warrantee period doubled.	☐	☐	☑	☐	☐	☐
f. Number of retailers in your area selling same or similar equipment doubled.	☐	☑	☑	☐	☐	☐
g. Number of installations doubled.	☐	☐	☑	☐	☐	☐
h. Equipment improved from standard to high quality.	☐	☐	☑	☐	☐	☐
i. Equipment improved from standard to high efficiency.	☐	☐	☑	☐	☐	☐

C4. Please describe in your own words what factors affect retail prices for equipment and installation, and how retail prices are affected.

General responses included:

- *Cost of goods (including raw material prices and wages or dealer/distributor costs)*
- *Transportation costs*
- *Labor costs*
- *Overhead costs*
- *Complexity of project*
- *Project timing*
- *Customer relationship (including support)*
- *Sales volume*
- *Labor costs*
- *Competition*
- *Higher energy costs and higher rebates allow for some increase in retail prices*

[ALL RESPONDENT ARE ASKED THE Product Participation Questions.]

Program Participation Questions

For the next few questions think about the most recent projects you completed at BUSINESSES for which the businesses received Focus on Energy incentives or rewards.

P1. Which category or categories best describe those projects? **(Check all that apply)**

25%	Energy Efficient Lighting	2%	Insulation
2%	Manufacturing Process	1%	Building Shell
5%	HVAC	8%	Motors
1%	Compressed Air	8%	Drives
7%	Refrigeration	6%	Steam/Boiler (no HVAC)
7%	Controls	8%	CFLs
3%	Electrical (non-lighting)	1%	Weatherization
6%	Other (please specify):_______________________________________		
9%	Have not completed any projects eligible for Focus on Energy incentives or rewards (**skip to CLOSING TEXT**)		

P2. Have any of your business projects in the past year involved a Focus on Energy Program Energy Advisor? An Energy Advisor provides a 3rd party review and recommendations for energy efficiency upgrades and obtains the required pre-approval from Focus on Energy for these projects.

☐ Yes (Continue with Question P3)

☐ No (Skip to Question P5)

☐ Not sure/don't know (Skip to Question P5)

P3. Thinking about your most recent business project that involved an Energy Advisor, how satisfied are you with the Energy Advisor's…

	Not at all Satisfied	**Somewhat Unsatisfied**	**Neutral**	**Somewhat Satisfied**	**Very Satisfied**
a. Professionalism	☐	☐	☐	☐	☐
b. Timeliness	☐	☐	☐	☐	☐
c. Quality of information	☐	☐	☐	☐	☐
d. Objectivity of information	☐	☐	☐	☐	☐
e. Responsiveness	☐	☐	☐	☐	☐
f. Ability to troubleshoot	☐	☐	☐	☐	☐
g. Technical knowledge	☐	☐	☐	☐	☐

P4. Overall, how would you rate the Energy Advisor?

Far below expectations	**Somewhat below expectations**	**Met expectations**	**Exceeded expectations**	**Far exceeded expectations**
☐	☐	☐	☐	☐

P5. Please rate your overall satisfaction with the following aspects of the Focus on Energy program. How satisfied are you with…

	Not at all Satisfied	**Somewhat Unsatisfied**	**Neutral**	**Somewhat Satisfied**	**Very Satisfied**
a. Incentive requirements	☐	☐	☐	☐	☐
b. Number of leads generated	☐	☐	☐	☐	☐
c. Project time to completion	☐	☐	☐	☐	☐
d. Focus on Energy consistency in project approval	☐	☐	☐	☐	☐
e. Focus on Energy fairness in project approval	☐	☐	☐	☐	☐
f. Communication about program changes	☐	☐	☐	☐	☐
g. Clarity of Focus on Energy communications	☐	☐	☐	☐	☐
h. Overall performance	☐	☐	☐	☐	☐

P6. How much do you agree or disagree with each of the following statements? As a result of your organizations' participation in Focus on Energy, your organization is…

	Strongly Disagree	**Somewhat Disagree**	**Neutral**	**Somewhat Agree**	**Strongly Agree**
Better able to identify opportunities to improve energy efficiency	☐	☐	☐	☐	☐
Looking for potential energy efficiency improvements when planning projects	☐	☐	☐	☐	☐
Using life cycle costing	☐	☐	☐	☐	☐
Incorporating efficiency messages	☐	☐	☐	☐	☐
Differentiating your business	☐	☐	☐	☐	☐
Expanding your equipment offerings	☐	☐	☐	☐	☐
Offering efficiency services	☐	☐	☐	☐	☐
Expanding your efficiency services	☐	☐	☐	☐	☐
Offering customers more efficient equipment	☐	☐	☐	☐	☐

P7. How much do you agree or disagree with each of the following statements?

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
Focus on Energy helps me sell more energy efficient equipment or services	☐	☐	☐	☐	☐
Focus on Energy responds to the concerns of market channel providers.	☐	☐	☐	☐	☐
Focus on Energy makes it more difficult for me to sell equipment or services.	☐	☐	☐	☐	☐

P8. Are there any projects for which you typically do not invite Focus on Energy to participate even though the projects would be eligible? What types of projects? What are your reasons for not inviting Focus on Energy?

P9. Please share any comments about what works well and what doesn't work well with Focus on Energy programs?

Closing Text

That's all of the questions. Thank you for your cooperation. A summary of the results from these data will be emailed to you in November.

APPENDIX D: INCREMENTAL COST CALCULATION EQUATIONS

Table D-1. BP Lighting Incremental Cost Calculation Equations

WISeerts Tech Code	Group Description	Measure Description	Incremental cost calculation equation
2.0300.165	Fluorescent, Compact (CFL)	CFL <= 30 Watts, replacing incandescent	Weighted average cost of a spiral CFL <=30W - (Lifecycle correction(2.75) * Weighted average cost of an incandescent <= 120W)
2.0301.165	Fluorescent, Compact (CFL)	CFL High Wattage 31-115 Watts, replacing incandescent	Weighted average cost of a spiral CFL l31W-115W - (Lifecycle cost * Weighted average cost of an incandescent 121W - 250W)
2.0307.165	Fluorescent, Compact (CFL)	CFL reflector flood lamps replacing incandescent reflector flood lamps	Weighted average cost of a 18-21W parabolic reflector CFL - (Lifecycle Correction * Weighed average cost of a 75W parabolic reflector incandescent)
2.0310.165	Fluorescent, Compact (CFL)	CFL Direct Install, replacing incandescent, WPS Hometown Checkup	Weighted average cost of a spiral CFL <=30W - (Lifecycle cost * Weighted average cost of an incandescent <= 120W)
2.0505.085	Controls	Occupancy Sensors - Wall Mount <= 200 Watts	Weighted average wall mounted occupancy sensor cost
2.0506.085	Controls	Occupancy Sensors - Wall Mount >= 201 Watts	Weighted average wall mounted occupancy sensor cost
2.0507.085	Controls	Occupancy Sensors - Ceiling Mount <= 500 Watts	Weighted average ceiling mounted occupancy sensor cost
2.0508.085	Controls	Occupancy Sensors - Ceiling Mount 501-1000 Watts	Weighted average ceiling mounted occupancy sensor cost
2.0509.085	Controls	Occupancy Sensors - Ceiling Mount >= 1001 Watts	Weighted average ceiling mounted occupancy sensor cost
2.0515.085	Controls	High / low control for 320W PSMH, per fixture controlled	Weighted average cost for high/low control for 320W PSMH
2.0810.170	Fluorescent, Linear	T8 4L-4-4ft High Performance Replacing T12 2L-8 ft	Weighted average cost of a 4' 4 lamp T8 - Weighted average cost of a 8' 2 lamp T12
2.0811.170	Fluorescent, Linear	T8 4L-4ft High Performance Replacing T12HO/VHO 2L-8 ft	Weighted average cost of a 4' 4 lamp high performance T8 - Weighted average cost of a 8' 2 lamp T12 High Output or Very High Output
2.0822.170	Fluorescent, Linear	T8 2L-4 ft Low Watt with CEE Ballast - 25 Watts	Weighted average cost of a 4' 2 lamp 25W T8 with high efficiency ballast
2.0824.170	Fluorescent, Linear	T8 4L-4 ft Low Watt with CEE Ballast - 25 Watts	Weighted average cost of a 4' 4 lamp 25W T8 with high efficiency ballast

WISeerts Tech Code	Group Description	Measure Description	Incremental cost calculation equation
2.0832.170	Fluorescent, Linear	T8 2L-4 ft Low Watt with CEE Ballast - 28 Watts	Weighted average cost of a 4' 2 lamp 28W T8 with high efficiency ballast
2.0834.170	Fluorescent, Linear	T8 4L-4 ft Low Watt with CEE Ballast - 28 Watts	Weighted average cost of a 4' 4 lamp 28W T8 with high efficiency ballast
2.0851.170	Fluorescent, Linear	T8 Low Watt Relamp - 25 Watts	Weighted average cost of a 25W 4' T8 - Weighted average cost of a 32W 4' T8
2.0852.170	Fluorescent, Linear	T8 Low Watt Relamp - 28 Watts	Weighted average cost of a 28W 4' T8 - Weighted average cost of a 32W 4' T8
2.0853.170	Fluorescent, Linear	T8 Low Watt Relamp - 30 Watts	Weighted average cost of a 30W 4' T8 - Weighted average cost of a 32W 4' T8
2.0856.170	Fluorescent, Linear	T8 Low Watt Relamp 8 ft - 54 Watts	Weighted average cost of a 30W 8' T8 - Weighted average cost of a 32W 8' T8
2.0860.170	Fluorescent, Linear	T8 1L-4 ft Hi Lumen Lamp with Low BF	Weighted average cost of a single 4' T8 high lumen lamp with high efficiency ballast
2.0870.170	Fluorescent, Linear	T8 2L-4 ft Hi Lumen Lamp with Low BF	Weighted average cost of a 4' T8 high lumen 2 lamp with high efficiency ballast
2.0880.170	Fluorescent, Linear	T8 3L-4 ft Hi Lumen Lamp with Low BF	Weighted average cost of a 4' T8 high lumen 3 lamp with high efficiency ballast
2.0895.170	Fluorescent, Linear	T8 1L-4 ft Hi Lumen Lamp with Low BF (New Construction)	Weighted average cost of a single 4' T8 high lumen lamp with high efficiency ballast - Weighted average cost of a single 4' T8 standard 32W lamp with standard ballast
2.0896.170	Fluorescent, Linear	T8 2L-4 ft Hi Lumen Lamp with Low BF (New Construction)	Weighted average cost of a 4' T8 high lumen 2 lamp with high efficiency ballast - Weighted average cost of a 4' T8 standard 32W 2 lamp with standard ballast
2.0897.170	Fluorescent, Linear	T8 3L-4 ft Hi Lumen Lamp with Low BF (New Construction)	Weighted average cost of a 4' T8 high lumen 3 lamp with high efficiency ballast - Weighted average cost of a 4' T8 standard 3 lamp with standard ballast
2.0900.170	Fluorescent, Linear	T5 2L - F28T5 Fixture, Recessed Indirect 2x4, replacing 3LT8 or 4LT12	Weighted average cost of a 4' 2 lamp T5 recessed indirect fixture
2.2110.220	High Intensity Discharge (HID)	Metal Halide (MH) Ceramic 20-100 Watts - Replaces Incandescent	Weighted average cost of ceramic metal halide 25W - (Lifecycle correction (4) * Weighted average cost of incandescent 75-90W)
2.2115.220	High Intensity Discharge (HID)	Metal Halide (MH) Ceramic 25 Watts - Replaces 75-90 Watts Incandescent	Weighted average cost of ceramic metal halide 25-70W - (Lifecycle correction (4) * Weighted average cost of incandescent <150W)

WISeerts Tech Code	Group Description	Measure Description	Incremental cost calculation equation
2.2150.220	High Intensity Discharge (HID)	Metal Halide (MH), Pulse Start, 320W replacing 400W HID	Weighted average cost of 320W Pulse Start - Weighted average cost of 400W Pulse Start
2.2155.220	High Intensity Discharge (HID)	Metal Halide (MH), Pulse Start - 750W replacing 1000W MH	Weighted average cost of 750W Pulse Start - Weighted average cost of 1000W Pulse Start
2.2170.220	High Intensity Discharge (HID)	Metal Halide (MH), Electronic Ballast Pulse Start - 250W replacing 400W HID	Weighted average cost of 320W Pulse Start - Weighted average cost of 400W Pulse Start
2.2171.220	High Intensity Discharge (HID)	Metal Halide (MH), Electronic Ballast Pulse Start - 320W replacing 400W HID	Weighted average cost of 250W Electronic Ballast Pulse Start - Weighted average cost of 400W Pulse Start
2.3100.260	LED	LED Reach-In Refrigerated Case Lighting replaces T12 or T8	Not Calculated
2.5180.170	Fluorescent, Linear	T8 6 lamp or T5HO 4 lamp Replacing 400-999 W HID	Weighted average cost of T8 6 lamp and T5HO 4 lamp
2.5182.170	Fluorescent, Linear	T8 8 lamp or T5HO 6 lamp Replacing 400-999 W HID	Weighted average cost of T8 8 lamp and T5HO 4 lamp
2.5185.170	Fluorescent, Linear	T8/T5HO <= 500 Watts Replacing >=1000 W HID	Weighted average cost of T8 8 lamp and T5HO 4 lamp
2.5186.170	Fluorescent, Linear	T8 or T5HO <= 800W, Replacing >=1000 W HID	2 * Weighted average cost of T8 8 lamp and T5HO 4 lamp

Table D-2. BP Non-lighting Incremental Cost Calculation Equations

WISeerts Tech Code	Group Description	Category Description	Measure Description	Incremental cost calculation equation
1.1412.390	Boilers & Burners	Steam Trap	Repair leaking steam trap, <50 psig steam (Industrial Only)	Weighted average cost of steam trap repair kit <50 psig
1.1414.390	Boilers & Burners	Steam Trap	Repair leaking steam trap, 50-125 psig steam (Industrial Only)	Weighted average cost of steam trap repair kit 50-125 psig
14.1100.180	Food Service	Fryer	Fryer, Electric, ENERGY STAR	Weighted average ENERGY STAR electric fryer - Weighted average standard efficiency technology cost
14.1200.180	Food Service	Fryer	Fryer, Gas, ENERGY STAR	Weighted average ENERGY STAR gas fryer - Weighted average standard efficiency technology cost
14.1301.180	Food Service	Fryer	Fryer, Large Vat, Electric, High Efficiency	Weighted average cost for a high efficiency gas large vat fryer - Weighted average standard efficiency technology cost
14.1302.180	Food Service	Fryer	Fryer, Large Vat, Gas, High Efficiency	Weighted average cost for a high efficiency electric large vat fryer - Weighted average standard efficiency technology cost
14.2103.395	Food Service	Steamer	Steamer, Electric, 3 pan - ENERGY STAR	Weighted average cost for a 3 pan ENERGY STAR electric steamer - Weighted average standard efficiency technology cost
14.2104.395	Food Service	Steamer	Steamer, Electric, 4 pan - ENERGY STAR	Weighted average cost for a 4 pan ENERGY STAR electric steamer - Weighted average standard efficiency technology cost
14.2105.395	Food Service	Steamer	Steamer, Electric, 5 pan - ENERGY STAR	Weighted average cost for a 5 pan ENERGY STAR electric steamer - Weighted average standard efficiency technology cost
14.2106.395	Food Service	Steamer	Steamer, Electric, 6 pan - ENERGY STAR	Weighted average cost for a 6 pan ENERGY STAR electric steamer - Weighted average standard efficiency technology cost
14.2107.395	Food Service	Steamer	Steamer, Gas, 5 pan - ENERGY STAR	Weighted average cost for a 5 pan ENERGY STAR gas steamer - Weighted average standard efficiency technology cost
14.2206.395	Food Service	Steamer	Steamer, Gas, 6 pan - ENERGY STAR	Weighted average cost for a 6 pan ENERGY STAR gas steamer - Weighted average standard efficiency technology cost
14.3000.225	Food Service	Hot Holding Cabinet	Hot Food Holding Cabinet - ENERGY STAR	Weighted average cost for an ENERGY STAR hot food holding cabinet - Weighted average standard efficiency technology cost

WISeerts Tech Code	Group Description	Category Description	Measure Description	Incremental cost calculation equation
14.3101.290	Food Service	Oven	Oven, Convection, Electric, High Efficiency	Weighted average cost for a high efficiency electric convection oven - Weighted average standard efficiency technology cost
14.3102.290	Food Service	Oven	Oven, Convection, Gas, High Efficiency	Weighted average cost for a high efficiency gas convection oven - Weighted average standard efficiency technology cost
14.3131.290	Food Service	Oven	Oven, Combination Type, Electric, High Efficiency	Weighted average cost for a high efficiency electric combination oven - Weighted average standard efficiency technology cost
14.3132.290	Food Service	Oven	Oven, Combination Type, Gas, High Efficiency	Weighted average cost for a high efficiency gas combination oven - Weighted average standard efficiency technology cost
14.3501.210	Food Service	Griddle	Griddle, Electric, High Efficiency	Weighted average cost for a high efficiency electric griddle - Weighted average standard efficiency technology cost
14.3502.210	Food Service	Griddle	Griddle, Gas, High Efficiency	Weighted average cost for a high efficiency gas griddle - Weighted average standard efficiency technology cost
14.4110.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, < 20 cu ft, ENERGY STAR	Weighted average cost for an ENERGY STAR refrigerator <20 cu ft. - Weighted average standard efficiency technology cost
14.4120.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, 20-48 cu ft, ENERGY STAR	Weighted average cost for an ENERGY STAR refrigerator 20-48 cu ft. - Weighted average standard efficiency technology cost
14.4130.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, > 48 cu ft, ENERGY STAR	Weighted average cost for an ENERGY STAR refrigerator >48 cu ft. - Weighted average standard efficiency technology cost
14.4135.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, Commercial, CEE Tier 2 efficiency, < 20 cu ft	Weighted average cost for a CEE tier 2 refrigerator <20 cu ft. - Weighted average standard efficiency technology cost
14.4136.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, Commercial, CEE Tier 2 efficiency, 20-48 cu ft	Weighted average cost for a CEE tier 2 refrigerator 20-48 cu ft. - Weighted average standard efficiency technology cost
14.4137.340	Food Service	Refrigerator / Freezer, Commercial	Refrigerator, Commercial, CEE Tier 2 efficiency, >48 cu ft	Weighted average cost for a CEE tier 2 refrigerator >48 cu ft. - Weighted average standard efficiency technology cost

WISeerts Tech Code	Group Description	Category Description	Measure Description	Incremental cost calculation equation
14.4210.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, < 20 cu ft, ENERGY STAR	Weighted average cost for an ENERGY STAR freezer <20 cu ft. - Weighted average standard efficiency technology cost
14.4220.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, 20-48 cu ft, ENERGY STAR	Weighted average cost for an ENERGY STAR freezer 20-48 cu ft. - Weighted average standard efficiency technology cost
14.4230.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, > 48 cu ft, ENERGY STAR	Weighted average cost for an ENERGY STAR freezer >48 cu ft. - Weighted average standard efficiency technology cost
14.4235.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, Commercial, CEE Tier 2 efficiency, <20 cu ft	Weighted average cost for a CEE tier 2 freezer <20 cu ft. - Weighted average standard efficiency technology cost
14.4236.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, Commercial, CEE Tier 2 efficiency, 20-48 cu ft	Weighted average cost for a CEE tier 2 freezer 20-48 cu ft. - Weighted average standard efficiency technology cost
14.4237.340	Food Service	Refrigerator / Freezer, Commercial	Freezer, Commercial, CEE Tier 2 efficiency, >48 cu ft	Weighted average cost for a CEE tier 2 freezer >48 cu ft. - Weighted average standard efficiency technology cost
14.5401.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Electric Heat, Electric Booster, Multi Tank Conveyor	Weighted average cost for an ENERGY STAR multi tank conveyor electrically heated high temp dishwasher - Weighted average standard efficiency technology cost
14.5402.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Electric Heat, Electric Booster, Single Tank Conveyor	Weighted average cost for an ENERGY STAR single tank conveyor electrically heated high temp dishwasher - Weighted average standard efficiency technology cost
14.5403.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Electric Heat, Electric Booster, Under Counter	Weighted average cost for an ENERGY STAR undercounter conveyor electrically heated high temp dishwasher - Weighted average standard efficiency technology cost
14.5409.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Gas Booster, Multi Tank Conveyor	Weighted average cost for an ENERGY STAR multi tank conveyor gas heated high temp dishwasher - Weighted average standard efficiency technology cost
14.5410.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Gas Booster, Single Tank Conveyor	Weighted average cost for an ENERGY STAR single tank conveyor gas heated high temp dishwasher - Weighted average standard efficiency technology cost
14.5411.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, High Temp, Gas Heat, Gas Booster, Under Counter	Weighted average cost for an ENERGY STAR undercounter conveyor gas heated high temp dishwasher - Weighted average standard efficiency technology cost

WISeerts Tech Code	Group Description	Category Description	Measure Description	Incremental cost calculation equation
14.5414.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Electric Heat, Multi Tank Conveyor	Weighted average cost for an ENERGY STAR multi tank conveyor electrically heated low temp dishwasher - Weighted average standard efficiency technology cost
14.5416.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Electric Heat, Single Tank Conveyor	Weighted average cost for an ENERGY STAR single tank conveyor electrically heated low temp dishwasher - Weighted average standard efficiency technology cost
14.5417.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Electric Heat, Under Counter	Weighted average cost for an ENERGY STAR undercounter conveyor electrically heated low temp dishwasher - Weighted average standard efficiency technology cost
14.5420.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Gas Heat, Multi Tank Conveyor	Weighted average cost for an ENERGY STAR multi tank conveyor gas heated low temp dishwasher - Weighted average standard efficiency technology cost
14.5422.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Gas Heat, Single Tank Conveyor	Weighted average cost for an ENERGY STAR single tank conveyor gas heated low temp dishwasher - Weighted average standard efficiency technology cost
14.5423.120	Food Service	Dishwasher, Commercial	Dishwasher, ENERGY STAR, Low Temp, Gas Heat, Under Counter	Weighted average cost for an ENERGY STAR undercounter conveyor gas heated low temp dishwasher - Weighted average standard efficiency technology cost
17.0500.465	Plug Loads	Vending Machine	Vending Machine, ENERGY STAR, Cold Beverage, Not Software Activated	Weighted average cost for an ENERGY STAR cold beverage vending machine w/o software - Weighted average standard efficiency technology cost
17.0501.465	Plug Loads	Vending Machine	Vending Machine, ENERGY STAR, Cold Beverage, Software Activated	Weighted average cost for an ENERGY STAR cold beverage vending machine with software - Weighted average standard efficiency technology cost
17.0520.085	Plug Loads	Controls	Snack Machine - Install VendingMiser Controller	Weighted average cost for a VendingMiser installed on snack machine
4.1708.190	HVAC	Furnace	Furnace, with ECM fan motor, for space heating (AFUE >= 90%), 146.2 - 160.8 MBh	Cost of a high efficiency furnace as a function of AFUE and capacity - the cost of a standard furnace as a function of AFUE and capacity
6.1001.315	Domestic Hot Water	Pre-Rinse Sprayer	Pre-Rinse Sprayer, Low Flow, Natural Gas, commercial application	Weighted average cost for a low flow pre-rinse sprayer, gas heated water - Weighted average standard efficiency technology cost
6.1002.315	Domestic Hot Water	Pre-Rinse Sprayer	Pre-Rinse Sprayer, Low Flow, Electric, commercial application	Weighted average cost for a low flow pre-rinse sprayer, electrically heated water - Weighted average standard efficiency technology cost