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NEEA Market Progress Evaluation Report #6: Evaluation of NEEA's Industrial Initiative

Prepared by:
The Cadmus Group Inc. / Energy Services
720 SW Washington Street, Suite 400
Portland, OR 97205

Northwest Energy Efficiency Alliance
PHONE
503-688-5400
FAX
503-688-5447
EMAIL
info@neea.org

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Executive Summary

This is the sixth Market Progress Evaluation Report (MPER) on the progress and accomplishments of the Industrial Initiative (the Initiative) of the Northwest Energy Efficiency Alliance (NEEA). The Initiative specifically focuses on Continuous Energy Improvement (CEI), which consists of several components integral to energy management. Cadmus has been the Initiative's independent evaluator since the program's 2004 inception. This MPER focuses on the food processing market and documents the findings from data collected during 2010 through site visits and interviews with industrial end users and market partners.

Market Progress

This report updates three of the Initiative's key market progress indicators:

- Market penetration;
- Market partner support of CEI;
- Trade association support of CEI.

Progress in Market Penetration

One of the Initiative's goals was to engage 13 percent of the large food processor market in CEI practices. Based on surveys of nonparticipating and participating facilities, 36 percent of the target market currently practices CEI. Data indicate an expanding sector, with the industry open to capital and non-capital approaches, including CEI, for improving energy efficiency and controlling energy costs. Data from the survey with participating facilities also indicate that these facilities have successfully integrated CEI into their corporate cultures, supported by evidence of persistence of capital improvement projects and operations and maintenance measures implemented with Initiative involvement. Cadmus also found the majority of the participating facilities practicing CEI attributed their decision to do so to NEEA, the Initiative, and/or the Initiative's implementation team.

Progress in Market Partner Support of CEI

Key aspects of the Initiative's implementation strategy include market partner support of CEI and encouraging partners' promotion of it. The most significant indication of market partners' progress has been recognition of CEI measures as energy-efficiency resources in the Northwest Power and Conservation Council's Sixth Power Plan. As a result, seven utilities interviewed in 2009 were considering developing their own energy management programs. In 2010, two of these utilities reported being in the process of developing such programs. Additionally, Energy Trust of Oregon (ETO) and Bonneville Power Administration (BPA) already had implemented energy management programs, which included CEI elements.

Progress in Trade Association Support of CEI

Northwest Food Processors Association (NWFPA), one of the Initiative's market partners, serves as a trade association for the food processing industry. As a result of the Initiatives' efforts in the food processing sector, in late 2008, the NWFPA established a goal for its members to reduce energy intensity by 25 percent in 10 years. To measure energy intensity reduction, NWFPA collected data from its members to establish baseline energy intensity for the year 2009, from which progress toward the energy intensity reduction goal can be measured. NWFPA also

conducts energy audits and tests implementation of energy management software systems at food processing facilities.

Energy Savings

The Initiative's original goal was to save 20 average MW (aMW) of energy region-wide by the end of 2009. Based on information available to date, Cadmus validated a total of 7.864 aMW of electric and 4,129,854 therms of gas savings from 2006 through 2009 in the food processing and pulp and paper sectors. Food processing measures accounted for nearly 72 percent of validated electric savings and 100 percent of natural gas savings.

As the savings potential from pulp and paper facilities was expected to be large, this sector was projected to make up the majority of the 20 aMW goal. However, total validated electric savings in the pulp and paper market were only 2.217 aMW by the end of 2009. Due to shortfalls in the pulp and paper sector, the Initiative did not achieve its electric savings goal. However, the food processing sector exceeded expectations by providing 5.646 aMW through the Initiative. This gave a total 7.864 aMW electric savings in food processing and pulp and paper combined.

Cadmus also estimated that food processing facilities practicing CEI can save an average of 3.07 percent of their electricity consumption per year, and 2.89 percent of their gas consumption per year.

As of January, 2011, an independent evaluation contractor has started the process of validating the 2010 energy savings. The 2010 validated energy savings will be available by March 2011.

Trade Ally Promotion of CEI

An additional measure of market change is trade ally promotion of CEI. Cadmus identified that at least six companies in the region provide energy management consulting services to industrial facilities. Findings from surveys with five energy management consulting companies in the region indicate that industrial facilities have become more aware of energy management practices and benefits due to: increased promotion and marketing; changes in environmental awareness and attitudes; and economic pressures to reduce their bottom lines. Additionally, more resources are available to the industry for obtaining information about energy management, and resources have improved since 2004. The result has been more facilities recognizing energy as a controllable expense, and a substantial increase in the number of facilities practicing CEI since 2004, when most respondents felt almost no facilities were managing energy.

Overall Accomplishments

The research conducted in 2010 shows the Initiative has succeeded in integrating energy management into food processors' business and manufacturing operations, with energy as a manageable cost for food processors, as evidenced by the following:

- Participating facilities have been pleased with the program, and the Initiative can disengage with these facilities, confident the facilities will continue practicing CEI.
- Nonparticipant and participant surveys revealed that 36 percent of the target market is practicing CEI, an increase from 13 percent in 2004.

- Trade ally and market partner interviews showed that awareness has increased regarding energy as a controllable cost and as an important factor in maintaining a competitive advantage. The availability and quality of software tools and training opportunities has also increased.
- Outside of the Northwest, the California Public Utilities Commission (CPUC) and Investor Owned Utilities (IOUs) have implemented energy management programs for industrial facilities, based on the Initiative's design.

Future Direction of the Initiative

Over the next four years, NEEA can build on this success by engaging a new group of participants. Cadmus found 35 percent of the target market practices energy management; however, only two facilities reported practicing CEI without help from NEEA, BPA, or ETO. Trade allies confirmed that very few if any facilities would begin practicing energy management without technical and financial help. This shows a continuing need to provide assistance to the food processing sector to further promote energy management adoption. Market partners and trade allies agreed NEEA continues to have a large role to play in this market. Despite energy management's economic benefits, many food processors remain reluctant to adopt CEI. This suggests a market gap NEEA and its market partners can help close with incentives, education and marketing.

1. Introduction

The Northwest Energy Efficiency Alliance (NEEA) designs and implements market transformation programs in Idaho, Montana, Oregon, and Washington. In partnership with local utilities and other market partners, NEEA's initiatives encourage market-wide adoption of energy-saving technologies and practices; NEEA's efforts target the residential, commercial, and industrial sectors.

Since early 2005, NEEA has implemented its Industrial Initiative (the Initiative, formerly known as the Industrial Efficiency Alliance or IEA), which focuses on market transformation in the industrial sector. The Initiative targeted the food processing and pulp and paper markets to encourage firms to adopt Continuous Energy Improvement (CEI), which comprises the following six key elements, into their management and operational practices:

- Having dedicated staff, including an energy champion;
- Tracking energy use;
- Setting energy reduction goals;
- Developing and routinely updating an energy management plan;
- The ability to quantify energy savings from energy-efficient equipment upgrades; and
- The ability to quantify energy savings from O&M improvements.

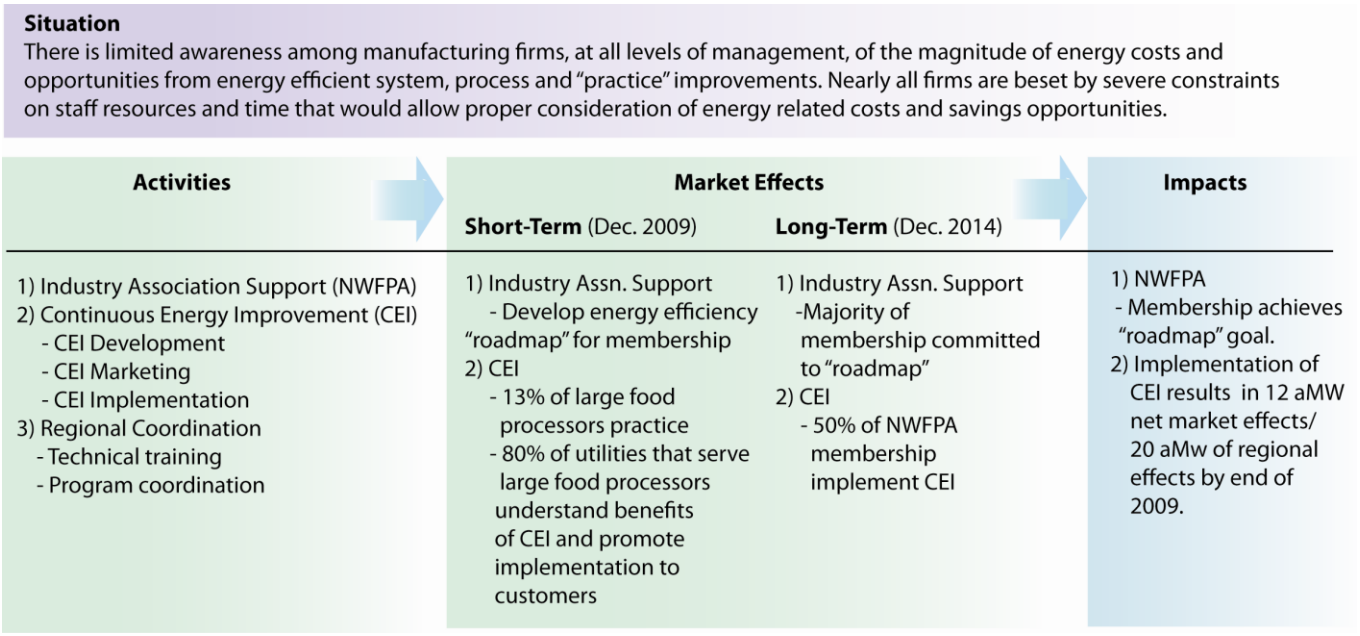
CEI aims to permanently integrate energy management into business systems —from corporate office to shop floor. As a program/product, CEI addresses organizational structures, people, manufacturing systems, and measurements as equally essential aspects of industrial energy management. While CEI leads to specific actions and energy-efficiency measures, the program's/product's emphasis is to position energy as an input into the manufacturing process, so it can be managed for maximum value. The Initiative categorizes facilities based on the following five CEI engagement stages:

- **Stage 1: Aware/Receptive/Interested.** The facility, having heard about the program, has expressed interest.
- **Stage 2: Engaged.** The facility has begun a business practice assessment process to identify specific opportunities.
- **Stage 3: Committed.** The facility has dedicated resources to work with the Initiative and to develop an action plan for energy management.
- **Stage 4: Practicing.** The facility is implementing the action plan and actively practicing energy efficiency.
- **Stage 5: Sustained Practicing.** The facility has implemented and continues to practice all CEI elements. The facility can continue practicing CEI without the Initiative's assistance.

Unlike NEEA's early market transformation efforts, which primarily focused on technology upgrades, this initiative is designed with a "holistic" approach, targeting end users, trade allies, and utilities to promote a whole-system strategy for improving energy efficiency. As such, the Initiative complements local utility incentive programs providing financial incentives for capital

projects. Figure 1.1 shows the Initiative's food processing logic model for 2009, which was also used in 2010. The Initiative is currently developing a new logic model to reflect its future goals.

Figure 1.1. Initiative 2009 Food Processing Logic Model



Since the Initiative's launch, Cadmus has been reporting evaluation findings in the form of five Market Progress Evaluation Reports (MPERs). The MPERs have documented the Initiative's development and maturation, including its many changes, challenges, and strategies used by NEEA to address these challenges. The MPERs have also reported on the Initiative's achievements, particularly energy savings and market transformation effects, as measured by the six Market Progress Indicators (MPIs) described below.

Market Progress Indicators

To monitor progress, NEEA set 5- and 10-year performance targets for the Initiative, as well as 33 key performance indicators (KPIs), at the program's outset. The initial performance indicators included a cumulative electricity savings target of 130 average Megawatts (aMW) by 2015, 35 percent of which (45 aMW) would be achieved in the first five years.

As the program evolved, the Initiative revised both the energy savings targets and various KPIs to more realistically reflect market conditions. The Initiative adjusted the savings target down to 20 aMW based on actual experience in the field and changing macroeconomic conditions. The Initiative also condensed the original 33 KPIs to six Market Progress Indicators (MPIs), which were considered better and more relevant measures of the Initiative's progress:

- MPI 1: The percentage of large food processing firms (as measured in terms of employment shares) and pulp and paper firms (as measured in terms of output capacities) implementing CEI.

- MPI 2: The percentage of industrial firms from non-targeted markets implementing CEI.
- MPI 3: The number of large (multi-facility) food processing or pulp and paper firms adopting CEI in plants or mills without Initiative involvement.
- MPI 4: The number of large food processing or pulp and paper firms adopting CEI in plants or mills outside the Northwest.
- MPI 5: The percentage of Northwest utility representatives promoting CEI as part of their energy-efficiency activities.
- MPI 6: Target markets' trade associations, such as the Northwest Food Processors Association (NWFPA), promoting CEI.

To date, progress measurement activities have focused on the more easily-tracked MPI 1, MPI 5, and MPI 6. This MPER reports progress on MPI 1, MPI 3, MPI 5, and MPI 6.

Progress from 2004–2009

Over the past five years, independent evaluation of the Initiative has indicated the pulp and paper market did not achieve the same success as the food processing market for a number of reasons:

- The pulp and paper industry had already trended toward decreasing energy intensity, perhaps indicating a higher awareness and knowledge of energy-efficiency practices.
- The economic downturn affected the pulp and paper industry, resulting in production curtailments and plant closures.
- Companies with headquarters outside the Northwest owned many regional mills, making it difficult for regional efforts to gain corporate buy-in for CEI.
- The absence of a strong regional association made it difficult to reach out to the region's mills in a consistent, continuous manner.

As such, the Initiative narrowed its focus in 2009 to the food processing industry.

The Initiative made notable progress in the food processing sector regarding MPI 1 (target market firms practicing CEI); MPI 5 (utility promotion of CEI); and MPI 6 (coordination with NWFPA). MPER #5 reported 20 percent of the food processing target market, as measured in terms of total employment, was implementing CEI, exceeding the Initiative's MPI 1 target of 13 percent of large food processors practicing CEI by December 2009.[1] Regarding MPI 5, the 2009 Utility Survey indicated almost all utilities understood CEI, and over half of the utility respondents promoted some version of CEI. Regarding MPI 6, the NWFPA has adopted aggressive energy intensity reduction targets for its members.

Having completed the five-year project, NEEA must now determine how best to build upon the Initiative's success as it develops its strategy for the next five years (2010–2014). Cadmus interviewed market partners, trade allies, and participating and nonparticipating food processing facilities to understand the current market for energy management and to obtain

[1] The market penetration percentage in the food processing market is defined in terms of the total number of employees at plants with 250 or more employees at an Engagement Stage of 3 or higher, relative to the total number of employees in the target market (41,765).

recommendations regarding NEEA's role in the future. This MPER reports on the findings of the surveys and recommendations on moving forward.

Organization of Report

This MPER is organized in 10 chapters:

- Chapter 1 is this introduction.
- Chapter 2 discusses this MPER's evaluation activities.
- Chapter 3 provides an overview of the food processing market.
- Chapter 4 summarizes energy savings achieved from the 2006–2009 projects.
- Chapter 5 discusses the results from past target audience follow-up surveys and compares to the results in 2010.
- Chapter 6 summarizes the results from the nonparticipant surveys and trends in the market since 2005.
- Chapter 7 discusses the results from the market partner interviews.
- Chapter 8 presents the findings from the trade ally interviews.
- Chapter 9 provides recommendations for revising assumptions made in the Initiative's cost-effectiveness (ACE) model.
- Chapter 10 presents conclusions and recommendations derived from research conducted for this MPER.

2. Evaluation Activities

Through six MPERs, Cadmus has documented evaluation of the Initiative's implementation for its first five years. Table 2.1 presents an overview of evaluation activities for each report. Reflecting different implementation stages as well as NEEA's reporting needs, each MPER differs slightly in scope and focus. MPER #6 updates energy savings and assesses the CEI diffusion to food processing facilities in the Northwest.

Table 2.1 Overview of Historical Evaluation Activities

Evaluation Activities	MPER#1 (Jun '06)	MPER#2 (Nov '06)	MPER#3 (Oct '07)	MPER#4 (Jul '08)	MPER#5 (May '09)	MPER#6 (Nov '10)
Review of Strategy and Assumptions	☑		☑	☑	☑	
Market Characterization	☑	☑	☑	☑	☑	☑
Process Evaluation (Staff Interviews)	☑		☑	☑		☑
Process Evaluation (Contractor Interviews)	☑	☑				☑
Market Progress Assessment (Target Audience Follow-Up Survey)		☑	☑	☑		☑
Market Progress Assessment (Market Partner Surveys)		☑		☑	Partial*	☑
Energy Savings Validation & Estimation (From Training)			☑	☑		
Energy Savings Validation & Estimation (From Business Practices Services)			☑	☑	☑	☑
Market Diffusion of CEI						☑

*Only three market partners and two trade allies/vendors were interviewed.

This report's findings and conclusions are based on data and analysis from three principal activities:

1. Document review and site visits in support of savings analysis.
2. Market assessment interviews with market partners, utilities, participating and nonparticipating food processing facilities, and trade allies (energy management consulting companies). Senior Cadmus staff with an understanding of the Initiative completed the interviews.
3. Assessment of the Initiative's projected savings, using a market diffusion model.

Table 2.2, on the following page, summarizes sample sizes and time frames for each data collection activity.

Table 2.2. Summary of Data Sources and Sample Sizes for MPER #6

Data Collection Activity	Number Targeted	Number Completed	Time Frame
Savings Analysis (Site Visits)			
Food Processing	15	8	February 2010
Pulp & Paper	3	1	February 2010
Market Assessment for CEI (Phone Interviews)			
Participating Food Processing Facilities	15	13	June/July 2010
Nonparticipating Food Processing Facilities	30	24	June 2010
Market Partner Surveys			
Regional Energy Policy Groups	1	1	February 2010
Market Partners	8	5	July 2010
Utilities	8	5	July 2010
Trade Ally Survey			
Energy Management Consulting Firms	6	5	July/August 2010

Methodology Updates

Cadmus modified the evaluation methods and focus over the last five years in line with the Initiative evolution in strategy and focus. From 2006 to 2008, Cadmus' engineers derived energy savings estimates for individual energy-efficiency measures after installation. Beginning in 2009, the implementation contractor, Ecos, took responsibility for developing estimates of energy consumption prior to implementation and for savings estimates after work completion at individual facilities. Cadmus' role shifted to working with the implementation contractor and facility staff to standardize savings estimation procedures and to validate final calculations.

As of MPER #5, Cadmus began validating gas savings in addition to electric savings as, on average, 60 percent of the energy used in food processing facilities was natural gas. In February 2010, Cadmus conducted site visits to validate electric and natural gas savings from projects reported as complete in NEEA's Industrial Tracking System (ITS).

Beginning with MPER #5, the focus of market characterization shifted to food processing, as this sector became the Initiative's primary target market. Past MPERs generally focused on summarizing facility characteristics and financial health. For MPER #6, interviews focused on changes in market awareness and CEI adoption within the food processing sector since 2004. The reasons for this focus in MPER #6 were the expectation that market characterization would not have changed significantly since a year ago, and additionally, NEEA was interested in the diffusion of CEI beyond facilities engaged with the Initiative, therefore, the 2010 interviews collected information specifically about market penetration.

MPER #6 also analyzes CEI's diffusion within the Northwest's food processing sector. Developments including the Council adding CEI elements to the Sixth Power Plan, and several market partners implementing programs similar to the Initiative, necessitated a different and more systematic approach to estimating the Initiative's impacts and market potential. To address this, and to compare such *ex ante* data with NEEA's Alliance Cost Effectiveness (ACE) model, Cadmus created a market diffusion model, which predicts the number of facilities likely to practice CEI from 2011 to 2015, and derives estimates of associated energy savings.

3. Market Characterization

MPER #1 reported on the initial industry characteristics, such as energy use, employment, and energy-efficiency opportunities. Building on the initial market characterization, MPERs #2, #3, and #4 presented market updates. In support of the 2008 market characterization update for MPER #5, Cadmus completed primary and secondary research, including interviews with utility representatives, market partners, and trade allies as well as a review of various industry publications, and regional and national newspapers.

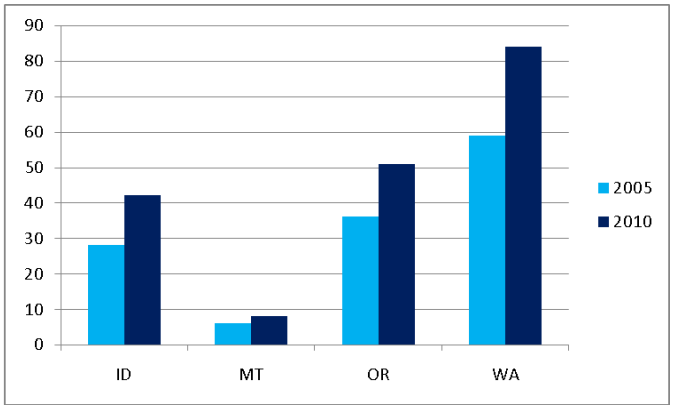
For this market characterization, Cadmus reviewed a population of 183 food processing facilities, which were affiliated with 59 different companies distributed throughout Washington, Oregon, Idaho, and Montana. Companies examined had at least 250 employees at all facilities located in the Northwest. Cadmus compared 2010 Dun & Bradstreet (D&B) data to 2005 data to determine changes in facility characteristics or the market. Cadmus also interviewed utility representatives, market partners, energy management consulting firms, and nonparticipating food processing facilities to determine CEI's diffusion within the food processing sector.

Food Processing Market

Overall, findings for the food processing market largely mirrored those from previous years: the market continues to grow, and facilities are open to improving their energy efficiency. Cadmus examined the data from D&B of 183 facilities across four states, an increase of 42 percent over the 2005 report (thus indicating the increase in the number of facilities within the target market between 2005 and 2010). Figure 3.1 shows changes in the number of food processing facilities with more than 250 employees by state.

Generally, the Northwest food processing sector grew from 2005 to 2010. Mean sales revenue increased during this period by 52.6 percent. Employees per facility, not including staff at corporate headquarters, stayed roughly the same during this period.[2] In 2005, the average employee count was 197; that number increased to 199 in 2010.

Figure 3.1. Number of Food Processing Facilities by State in 2005 and 2010



The 2008 market partner survey findings in MPER #5 suggested energy-efficiency investments were not a top priority for food processors, with only 2 of 11 respondents citing such investments

[2] Dun & Bradstreet Industry Sector Report, www.dnc.com. Accessed May 28, 2010.

as a high priority. In the 2010 nonparticipant survey, Cadmus found that all facilities interviewed had recently made energy-efficient improvements of some sort. As reported in MPER #5, the NWFPA has taken a formal and aggressive role in promoting energy efficiency to its members. Specifically, NWFPA aims to reduce member-wide energy intensity by 25 percent in 10 years and by 50 percent in 20 years. While participation in this initiative is voluntary, NWFPA plans to heavily promote energy reduction goals among members, and to devote considerable resources to assisting its members with energy-efficiency projects. Of 13 participant survey respondents, 12 reported awareness of NWFPA's energy reduction efforts, and five of 21 nonparticipants' surveys mentioned they first learned about energy management practices through the NWFPA.

In light of these developments and the Initiative's active collaboration with NWFPA, Cadmus anticipates the food processing market will be more open to investing in energy-efficiency improvements in future years than it was in 2008.

Pulp and Paper

MPER #5 reported large changes for the pulp and paper industry. Declining demand – especially for newsprint products – combined with higher prices for inputs and the general economic downturn has created a highly competitive environment. Cadmus found Northwest pulp and paper producers faced high rates of plant ownership turnover and layoffs. Most market partners interviewed in late 2008 likewise maintained that pulp and paper producers faced a highly turbulent market, with two interviewed market partners/trade allies considering the market to be in decline. Due to changes in this sector, Cadmus concentrated its MPER #6 research on the food processing sector.

4. Energy Savings Analysis

At the Initiative's beginning in 2004, program staff anticipated reaching a goal of 20 aMW electric savings by the end of the fifth program year. Starting in 2006, Cadmus conducted annual site visits to assess progress toward this goal. In addition to site visits conducted in February and March 2010, Cadmus evaluated facility-wide, or top-down, energy savings for several facilities, based on statistical models provided by NEEA. Top-down energy savings evaluations captured both validated measures and other energy-saving activities that were implemented but could not be quantified. Appendices A and B contain more detail on the energy savings validation methodology and results.

The 2010 savings validation effort consisted of two parts:

1. Review and validation of top-down (or facility-wide) energy savings claims; and
2. Validation of bottom-up (or measure-level) energy savings claims.

Table 4.1 and Table 4.2 detail the number of reports received and the number of top-down savings claims evaluated per the facilities' engagement stage in NEEA's Initiative.

Table 4.1. Distribution of Top-Down Electric Savings Claims, 2006 – 2009

Stage of Engagement	Total Number of Facilities Analyzed	Number of Facilities with 2006 Savings Claim (Electric)	Number of Facilities with 2007 Savings Claim (Electric)	Number of Facilities with 2008 Savings Claim (Electric)	Number of Facilities with 2009 Savings Claim (Electric)
Stage 3 - Committed	1	0	0	0	0
Stage 4 – Practicing*	6	0	3	3	1
Stage 5 – Sustaining*	11	1	2	5	5
Total	18	1	5	8	6

*At the time of site visit selection.

Table 4.2. Distribution of Top-Down Gas Savings Claims, 2006 – 2009

Stage of Engagement	Total Number of Facilities Analyzed	Number of Facilities with 2006 Savings Claim (Gas)	Number of Facilities with 2007 Savings Claim (Gas)	Number of Facilities with 2008 Savings Claim (Gas)	Number of Facilities with 2009 Savings Claim (Gas)
Stage 3 - Committed*	1	0	0	0	0
Stage 4 - Practicing*	6	0	0	0	0
Stage 5 - Sustaining*	11	1	2	6	6
Total	18	1	2	6	6

*At the time of site visit selection.

For the bottom-up analysis, Cadmus developed an inventory of 14 facilities reporting energy savings for measures installed through the Initiative by using a list of measures provided by the implementation contractor (Ecos). The six facilities reporting the highest amount of claimed electric savings were selected for site visits, and savings claims at the three additional facilities were validated by phone (in lieu of a site visit). Together, these nine facilities represented over 95 percent of total claimed energy savings. Table 4.3 presents the number of site visits and phone verifications Cadmus completed.

Table 4.3. Site Visit Disposition by Engagement Stage, 2010*

Stage of Engagement**	Number of Plants with Pending Savings Claim(s)**	Number of Completed Site Visits	Number of Completed Phone Verifications	Number of Facilities Not Selected for Site Visit or Phone Verification
Stage 3 - Committed	2	1	0	1
Stage 4 - Practicing	3	2	0	1
Stage 5 - Sustaining	9	3	3	3
Total	14	6	3	5

*Site visits occurred in early 2010 to validate savings for measures installed from 2006 through 2009.

**At the time of site visit selection, which occurred in January 2010.

Top-Down Savings Estimates

Table 4.4 presents gross and net top-down savings for 18 food processing facilities reaching Stage 3 or higher since 2006. Gross savings numbers capture all savings at the facility, including those arising from capital measures installed through the program. To prevent double-counting, Cadmus calculated net top-down savings by deducting validated bottom-up savings from the gross top-down claim for the same year. In the one case where validated bottom-up savings exceeded the top-down claim, top-down savings were not credited, but validated bottom-up savings were not decreased (see Appendices A and B for a detailed methodology and facility-level gross and net top-down savings).

Table 4.4. Top-Down Savings by Year, 2006–2009

Year	Gross Top-Down Savings (aMW)	Net Top-Down Savings (aMW)	Gross Top-Down Savings (therms)	Net Top-Down Savings (therms)
2006	0.242	0.220	73,666	73,666
2007	0.672	0.461	131,378	131,378
2008	0.913	0.563	967,701	967,701
2009	0.816	0.579	1,879,095	1,879,095
Total	2.643	1.823	3,051,840	3,051,840

Bottom-Up Savings Estimates

Table 4.5 and Table 4.6 present electric and gas savings validated during the 2010 site visits and phone verifications. Cadmus validated savings for projects completed in 2007, 2008, and 2009. Most validated savings occurred in 2009. Operations and maintenance (O&M) improvements accounted for the majority of savings validated during these verifications (see Appendix B for detailed facility-level savings data). Incented capital projects, which are measures for which the facility receives an incentive from other utility or market partner programs, accounted for 0.197 aMW. Unincented capital projects, or capital improvements that did not receive an incentive from any other program, made up the remainder of the savings.

Table 4.5. Electric Savings by Year—Validated by Site Visits and Phone Verification (February/March 2010)

Year	O&M (aMW)	Incented Capital (aMW)	Unincented Capital (aMW)	Total Electric Savings (aMW)
2007	0.075	0.101	0	0.176
2008	0.020	0.011	0	0.031
2009	1.239	0.085	0.038	1.362
Total	1.334	0.197	0.038	1.569

Table 4.6. Gas Savings by Year—Validated by Site Visits and Phone Verification (February/March 2010)

Year	O&M (therms)	Incented Capital (therms)	Unincented Capital (therms)	Total Gas Savings (therms)
2009	0	0	20,600	20,600
Total	0	0	20,600	20,600

Total Savings

Table 4.7 presents total validated electric savings, including net top-down savings. Through the end of 2009, CEI saved the region 7.864 aMW. This does not include pending savings.

Table 4.7. Total Validated Electric Savings (2006–2009)

Year	O&M (aMW)	Incented Capital (aMW)	Unincented Capital (aMW)	Net Top-Down (aMW)	Total Electric Savings (aMW)
2006	0.161	0.489	0	0.220	0.869
2007	0.329	0.227	0.285	0.461	1.303
2008	1.079	1.306	0.617	0.563	3.565
2009	1.324	0.186	0.038	0.579	2.126
Total	2.893	2.208	0.940	1.823	7.864

Table 4.8 presents total validated gas savings to date, including net top-down savings. Cadmus did not track gas savings until 2008. Savings reported for 2006 and 2007 were derived solely from top-down analyses.

Table 4.8. Total Validated Gas Savings (2006–2009)

Year	O&M (therms)	Incented Capital (therms)	Unincented Capital (therms)	Net Top-Down (therms)	Total Gas Savings (therms)
2006	n/a	n/a	n/a	73,666	73,666
2007	n/a	n/a	n/a	131,378	131,378
2008	68,750	0	988,664	967,701	2,025,115
2009	0	0	20,600	1,879,095	1,899,695
Total	68,750	0	1,009,264	3,051,840	4,129,854

Pending Savings

Pending savings refer to completed measures documented and flagged as ready for evaluation in NEEA's Industrial Tracking System (ITS) for facilities reaching Stage 3 or higher. Table 4.9 lists pending savings for facilities in the food processing and pulp and paper sectors as of August 12, 2010.

Table 4.9. Outstanding Pending Savings

Market	Outstanding Pending Electric Savings (kWh)	Outstanding Pending Electric Savings (aMW)	Outstanding Pending Gas Savings (therms)
Food Processing	5,521,724	0.630	227,512
Pulp & Paper	462,000	0.053	64,000
Total	5,983,724	0.683	291,512

Annual Electricity Savings Relative to Consumption

Cadmus validated energy savings and collected annual electricity and natural gas consumption data for 13 food processing facilities engaged with the Initiative. Relative savings for each facility were calculated using the following steps:

1. Dividing validated savings (which include net top-down savings and bottom-up savings) for each facility in each year by the facility's total consumption in that year.
2. Calculating weighted average total annual savings as a percentage of consumption across all facilities for all years.

Table 4.10 shows that over four years, food processing facilities practicing CEI achieved average electric savings of 3 percent of their annual consumption.

Table 4.10. Percent Electric Savings by Year, 2006–2009

Facility	2006	2007	2008	2009	Total
O-009	n/a	7.85%	8.57%	n/a	8.19%
W-028	No data available.				
O-007	n/a	5.73%	6.19%	5.85%	5.92%
O-005	9.89%	10.55%	10.82%	10.71%	10.48%
O-006	n/a	0.88%	0.19%	0.50%	0.52%
I-013	0.00%	0.00%	2.17%	0.00%	0.63%
I-016	n/a	0.00%	10.21%	0.00%	3.45%
I-009	4.72%	0.00%	7.16%	1.00%	3.27%
W-015	n/a	1.38%	1.91%	0.00%	1.13%
W-007	0.70%	0.00%	4.60%	32.50%	9.25%
W-023	No data available.				
I-007	n/a	0.00%	1.65%	0.00%	0.59%
I-012	n/a	0.75%	1.16%	3.70%	1.85%
O-004	n/a	3.19%	6.62%	3.71%	4.49%
O-008	n/a	16.26%	14.95%	26.14%	18.81%
Wtd. Avg	4.35%	1.68%	4.59%	2.57%	3.07%

Annual Gas Savings Relative to Consumption: As shown in Table 4.11, over two years, engaged food processing facilities achieved average gas savings of nearly 3 percent of their annual consumption. Gas savings were not tracked until 2008, so Cadmus calculated gas savings as a percentage of consumption only for 2008 and 2009. Facility data on production units per year were not available, so it was not possible to calculate the percentage change in energy intensity. However, food processing facilities interviewed in 2010 set goals ranging from a 2.5 percent to a 5 percent reduction in energy intensity per year, and 75 percent of respondents felt they were on track to meet their goals. Annual electricity savings as a percentage of consumption, in addition to validated natural gas savings, supported interview findings that facilities have been meeting their energy intensity reduction goals.

Table 4.11. Percentage Gas Savings by Year, 2008–2009

Plant	2008	2009	Total
O-009	0.00%	n/a	0.00%
W-028	No data available		
O-007	14.17%	13.06%	13.59%
O-005	13.23%	12.22%	12.70%
O-006	6.64%	6.10%	6.38%
I-013	3.13%	14.02%	7.11%
I-016	1.14%	0.00%	0.58%
I-009	0.56%	0.59%	0.57%
W-015	4.08%	0.00%	2.11%
W-007	1.71%	0.00%	0.86%
W-023	No data available.		
I-007	6.04%	0.00%	3.38%
I-012	0.45%	0.00%	0.23%
O-004	0.00%	0.00%	0.00%
O-008	0.00%	0.00%	0.00%
Wtd. Avg	**3.24%**	**2.48%**	**2.89%**

Analysis of Savings in Urban and Rural Areas[3]

NEEA requested a breakout of validated energy savings between urban and rural areas. To facilitate this analysis, NEEA provided Cadmus with a list of Rural Urban Continuum Codes (RUCC) by zip code, to which Cadmus matched individual facility zip codes. Table 4.12a shows that a majority of the savings (52 percent) were concentrated in urban areas. Savings in high rural areas represented 45 percent of total validated electric savings, while savings in low rural areas represented only 3 percent of the total. The concentration in urban and high rural areas reflects the concentration of engaged facilities in these areas (Tables 4.12b and 4.12c).

[3] NEEA used the Rural-Urban Continuum Codes (RUCC) developed by the United States Department of Agriculture, which assigns codes ranging from one to nine, based on counties' population size. Further information about the RUCC can be found in www.ers.usda.gov/Briefing/Rurality/RuralUrbCon. NEEA further segments the codes by Urban (codes one to three), High Rural (codes four to six) and Low Rural (codes seven to nine).

Table 4.12a. Total Validated Electric Savings (2006–2009) by Urban/Rural Designation

Year	Urban (aMW)	High Rural (aMW)	Low Rural (aMW)	Total (aMW)
2006	0.389	0.228	0.253	0.869
2007	0.672	0.630	0	1.303
2008	1.418	2.147	0	3.565
2009	1.615	0.512	0	2.126
Total	4.094	3.517	0.253	7.864

Table 4.12b. Number of Facilities with Validated Savings (2006 - 2009) by Urban/Rural Classification

Year	Urban (n)	High Rural (n)	Low Rural (n)	Total (n)
2006	2	1	2	3
2007	7	1	0	8
2008	9	4	0	13
2009	6	2	0	8

Table 4.12c. Annual Consumption (2006 - 2009) by Urban/Rural Classification

Year	Urban (aMW)	High Rural (aMW)	Low Rural (aMW)	Total (aMW)
2006	6.804	3.625	NA	10.429
2007	31.286	10.974	0.000	42.260
2008	32.158	11.142	0.000	43.301
2009	29.591	9.540	0.000	39.131
Total	99.839	35.282	0.000	135.121

5. Target Audience Follow-Up Survey

Cadmus has conducted annual Target Audience Follow-Up (TAFU) interviews with Initiative participants since 2006. The interviews were designed to: (1) collect participants' feedback regarding their involvement in the Initiative; and (2) determine the Initiative's role in participants' decisions to implement CEI at their plants. This survey addresses MPI 1, pertaining to participating firms implementing CEI. The research objectives of the 2010 TAFU differ slightly from those of past TAFUs, with 2010 focusing on determining the persistence of measures and processes implemented in previous years. Therefore, this chapter begins with a summary of past TAFU findings, followed by the findings of the 2010 TAFU.

Past TAFU Findings

In 2006, the Initiative classified 11 industrial plants (including two pulp and paper and nine food processing facilities) as Initiative participants, and Cadmus interviewed eight of these. Cadmus found the most important, overarching issues for industrial end users were staying competitive and reducing operating costs (including energy costs). Regarding energy management, six interviewees indicated they had formal energy management plans, and most interviewees indicated they held formal discussions on energy usage and CEI with staff.

One-half of participants mentioned that they track energy data, and most noted data was only discussed on a monthly or annual basis. Participants also indicated they valued the Initiative, and relied on the face-to-face meetings with Initiative staff to advance energy management within their firm. The 2006 TAFU results also indicated participants were not coordinating with their utilities, and the Initiative was not leveraging utility resources to spread the word about the Initiative.

By May 2009, participation in the food processing market had grown to 21 plants practicing CEI at Stage 3 (Committed) or higher. In interviews with 18 of these participants, Cadmus determined that some issues (such as the industrial end users' interests in staying competitive and reducing costs) had stayed constant since the first TAFU interviews. Industrial end users continue to face a tight market, where capital and time constraints limit a firm's ability to focus on energy efficiency.

However, the 2009 TAFU, which focused on the food processing market, revealed a markedly evolved participant profile. Of the 18 interviewed participants, the majority (15) indicated they had an "energy champion" or person in charge of energy management, an energy action plan, and some type of data tracking plan in place. More than half of the firms were able to quantify energy savings related to their capital and O&M efficiency projects. The Initiative also made progress in improving end user and utility relationships; all but one of the 2009 interviewees rated their relationship with their utility as good or very good, and eight interviewees noted that their relationships improved after engaging with the Initiative. Cadmus' surveys revealed that 15 of the 18 interviewed participants fully grasped the CEI concept and its value. Cadmus also found the majority of the facilities practicing CEI attributed their decision to do so to NEEA, the Initiative, and/or the Initiative's implementation team.

2010 TAFU Findings

The 2010 TAFU research objectives differed slightly from years past. Although the 2010 interviews continued to collect participants' feedback regarding their involvement in the

Initiative and the Initiative's role in their implementation of CEI, Cadmus, with direction from NEEA, designed the 2010 survey with several forward-looking objectives, specifically:

- Persistence of measures and processes implemented in previous program years;
- Projects participating facilities implemented on their own;
- Factors influencing a facility's decision to sustain CEI;
- Facilities' future plans for reducing energy consumption; and
- How NEEA's withdrawal may affect CEI persistence.

Appendix D contains the survey guide, and Appendix E contains the tabulated results.

Cadmus attempted to interview all food processing facilities engaged at Stage 3 (Committed) or higher. Based on engagement stages captured in the ITS database, the 2010 sample frame included 15 food processing facilities. As shown in Table 5.1, Cadmus interviewed 13 out of the 15 facilities. Coordination with the implementation contractor revealed two facilities were unable to complete the interviews due to pressing, time-intensive obligations at the plants. In all cases where interviews were completed, Cadmus interviewed the current energy champion. The interviewed participating facilities represent 9 percent of the target market by number of employees at the company level.

Table 5.1. TAFU Survey Disposition

Stage of Engagement	Engaged Facilities (n)	Interviewed Facilities (n)
Stage 3 – Committed	0	0
Stage 4 – Practicing	1	1
Stage 5 - Sustaining	14	12
Total	15	13

Measure and Savings Persistence and Additional Energy Projects

The persistence of both capital and O&M measures implemented through CEI is an important gauge of the Initiative's success, and an indication of whether CEI will continue as the Initiative disengages with these facilities. To accurately assess measure persistence, Cadmus generated a list of validated measures at each facility, and asked respondents whether each individual measure remained in place. As shown in Table 5.2, of 41 capital improvement projects implemented at the 13 plants where Cadmus interviewed contacts, no respondents identified projects no longer being in place. Out of 50 validated O&M measures, respondents identified only three measures no longer in place: two measures were abandoned to prevent damage to facility floors, and the third was removed because it limited capabilities during production. Five capital improvement measures and three O&M measures had an unknown status.

Table 5.2. Capital and O&M Measure Persistence

Type of Improvements	Validated Measures	Measures Still in Place	Measures No Longer in Place	Measures with Unknown Status
Capital Improvements	41	36	0	5*
O&M Improvements	50	44	3	3*

*Respondents were unfamiliar with these five capital and three O&M measures and did not know whether they remained in place.

In addition to a high rate of measure persistence, all interviewed facilities reported having installed energy-related projects in addition to the validated measures discussed above. These projects included: lighting retrofits, heat recovery projects, and refrigeration upgrades. Four respondents cited upper management as the motivating factor behind installing these measures. Other factors included: reducing the cost of the finished product or saving money on energy costs; gaining a competitive advantage; and environmental, operational, and safety benefits. This is indicative of the influence and adoption of CEI in these facilities.

While 9 of the 13 facilities received technical assistance for these projects, only two cited Initiative staff (including the implementation contractor, Ecos) as the source of assistance. This contrasts sharply with findings from the 2006 TAFU, which revealed facilities relied on face-to-face meetings with Initiative staff to advance energy management within their plants. Facilities credited internal engineering departments (three respondents) and equipment distributors (three respondents) most often as their technical resources. Cascade Energy Engineering provided support to two facilities, and the Association of Energy Engineers provided support to one facility. In addition, 10 facilities received an incentive for installing the additional measures, which suggests high utility involvement.

CEI Persistence

Several findings suggest CEI will persist after the Initiative disengages with the facilities. As shown in Table 5.3, the energy champions at all but two facilities could clearly articulate their energy intensity reduction goals. In addition, 10 of the facilities are participating in the NWFPA goal to reduce energy intensity by 25 percent over the next 10 years (Table 5.4).

Table 5.3. Facilities' Independent Energy Intensity Reduction Goals

Response	Frequency (n=13)
25% in 10 years*	4
5% per year for 5 years	1
5% per year (no duration)	2
3% per year (no duration)	4
No goals	1
Don't know	1

*All goals measured in energy use per unit of product.

Table 5.4. Participation in NWFPA's Energy Intensity Reduction Goal

Response	Frequency (n=13)
Yes	10
Maybe in the future	0
No, was not aware of goal	1
No, was aware of goal but not participating	2

Nine of 11 representatives of facilities with energy-intensity reduction goals felt they were likely or very likely to meet their goals. Table 5.5 presents reasons the facilities provided for meeting or not meeting their goals. Facility representatives expressing confidence about meeting energy reduction goals cited historical success, good management and employee support, and energy being a priority at their plants as reasons for their confidence.

Factors decreasing the likelihood of meeting energy reduction goals included changes in production processes (for example, shifting from freezing to canning, which is more energy-intensive), and the product mix.

Respondents reported several strategies for meeting their goals, which included: implementing O&M improvements (nine respondents), implementing capital projects (eight respondents), increasing employee awareness (six respondents), and tracking and monitoring energy use (one respondent).

Table 5.5. Factors Influencing Facilities' Likelihood of Reaching Goal*

Facility's Likelihood of Meeting Energy Intensity Reduction Goals	Factors Influencing Facilities' Likelihood of Reaching Goal						
	Good management support	Historical success	Energy is a priority	Employee/ team support	Efficiency depends on crops	Production process change	No Response
Not likely (n = 1)	0	0	0	0	0	1	0
Somewhat Likely (n = 1)	0	0	0	0	1	0	0
Likely (n = 3)	0	2	0	0	1	0	1
Very Likely (n = 6)	1	5	1	1	1	0	0
Total (n = 12)	1	7	1	1	3	1	1

*Multiple responses allowed

Results from the 2010 TAFU suggest most participating facilities have successfully integrated CEI into their business practices. Of the 13 plants Cadmus interviewed, 11 claimed successful integration of energy management into their business practices.

As shown in

Table 5.6, evidence cited of successful integration of CEI into business practices were increased employee awareness (six respondents), good management support (four respondents), and good support from plant staff (three respondents). Two respondents stated employee awareness still needed to increase.

Table 5.6. Evidence of Successful CEI Integration into Business Practices*

Success of Integration of CEI into Business Practices	Increased Employee Awareness	Good Management Support	Energy Is Now Considered On a Daily Basis	Energy Efficiency Always Considered for Capital Installations	Good Support from Plant Staff	Energy Has a Place at the Table Now	Realizing Consistent Energy Savings	Still Need to Increase Employee Awareness
Successful (n = 7	3	2	0	1	0	1	1	2
Very successful (n = 4)	2	1	1	0	2	0	0	0
Don't know (n = 2)	1	1	1	0	1	0	0	0
Total (n = 13)	6	4	2	1	3	1	1	2

*Multiple responses allowed. No respondent gave ratings of "not successful" or "somewhat successful."

Eleven facilities stated that energy projects installed through the Initiative provided benefits beyond energy savings. These included (among others): lower maintenance costs (three respondents); safety benefits (three respondents); increased productivity (three respondents); and increased technical knowledge (two respondents).

Twelve of 13 facilities reported using outside resources for assistance with energy projects. As shown in Table 5.7, no facilities reported complete reliance on Initiative staff or the program implementer (Ecos) for assistance with energy management projects, and three respondents reported they were not at all reliant on the Initiative or Ecos. Table 5.8 shows that only four interviewees stated they would approach Ecos first to talk about improving energy efficiency at their facilities, and five respondents stated they would approach their utilities first. Other reported sources of information included: BPA (one respondent); Cascade Energy Engineering (one respondent); and the Association of Energy Engineers (one respondent).

Table 5.7. Facility Reliance on Initiative Staff or Ecos for Assistance with Energy Management Projects*

Response	Frequency (n=13)
1 – Not at all reliant	3
2	3
3	5
4	1
5 – Completely reliant	0
Don't know	1

*Using a 5-point scale with 1 being "not at all reliant" and 5 being "completely reliant"

Table 5.8. Entity Facility Would Approach First to Talk About Improving Energy Efficiency**

Response	Frequency (n=13)
BPA	1
Utility: Idaho Power	3
Utility: Rocky Mountain Power	1
Utility: Portland General Electric / NW Natural	1
Energy consulting company: Cascade Energy Engineering	1
Ecos	4
Other: Association of Energy Engineers	1
No one outside of company staff	1

**Multiple responses allowed.

Cadmus asked facility representatives what would happen to energy management at their companies if Initiative support were no longer available. Table 5.9 shows that 11 facilities stated it would have no effect, and two facilities stated energy management would continue, but at a slower pace.

Table 5.9. What Would Happen to Energy Management at Facility If the Initiative Were to Disappear

Response	Frequency (n=13)
Continue as before	11
Continue, but at a slower pace	2

Table 5.10 shows that five facilities had all the resources they needed in-house for continuing to manage energy successfully, and four would tap into continued support from NWFPA and other external resources. Each of the following resources had one mention for ensuring continued successful management of energy: training; software tools; trade shows; vendors of energy-using equipment; and rebates for installing efficient equipment.

Table 5.10. Resources that Facilities Would Need to Continue Managing Energy Successfully

Response	Frequency (n=13)
Training	1
Capital / Rebates for installing efficient equipment	1
Trade shows / Communication with other facilities	1
Software tools	1
Vendors of energy-using equipment	1
Continued support from NWFPA/current external resources	4
Already have sufficient in-house resources	5

Note: More than one response allowed.

6. Nonparticipating Facilities Survey

This survey addresses MPI 3, which pertains to the number of facilities adopting CEI without Initiative involvement. To create a sample of eligible facilities not participating in NEEA's Continuous Energy Improvement program, Cadmus used information available from Dun & Bradstreet to define a target market of food processing facilities with at least 250 employees throughout all facilities within NEEA's territory (Washington, Oregon, Idaho, and Montana). Facilities engaged with NEEA and deemed to be practicing CEI at a Stage 3 (Committed) or higher level as of April 2010 were removed from this sample. From the remaining population of nonparticipating food processing plants, a sample of facilities was surveyed regarding their energy-efficiency activities and programs. In all, Cadmus completed 21 surveys with nonparticipating facilities, representing 16 different companies, resulting in an 85 percent confidence level with 15 percent precision (Table 6.1). The interviewed nonparticipants represent 31 percent of the target market by number of employees at the company level.

Table 6.1. Nonparticipant Population Size and Sample Disposition

Type of Company	Total Number*	Number Targeted	Number Interviewed
Food processing facilities with at least 200 employees across facilities located in the Northwest	161	30	21
Unique food processing companies	58	N/A	16

*Dun & Bradstreet records from 2010 show 192 food processing facilities in the Northwest from 59 unique companies with at least 250 employees across all Northwest facilities. Fifteen of these facilities are currently (as of April 2010) engaged with the Initiative, and have been removed from the sample. During survey calls, Cadmus found 14 of the remaining facilities were not processing facilities, and two of the facilities had closed. Cadmus also removed these 16 facilities (and one unique company) from the sample. Overall, this reduced the sample size to 161 facilities from 58 unique companies.

Senior Cadmus staff conducted the surveys to understand current perceptions of energy management and to estimate parameters needed for the market diffusion model. The survey goals were to determine:

- Awareness of energy management practices and CEI;
- Implementation of CEI;
- Assistance received in implementing recent energy-efficiency projects; and
- Plans for future energy-efficiency projects.

Appendix D contains the survey guide, and Appendix E contains tabulated results.

Awareness of Energy Management Practices and CEI

Of 21 nonparticipant facilities surveyed, 14 reported their facilities were either "very" or "somewhat" aware of energy management practices, with 17 reporting they first learned of energy-efficient operating practices more than three years ago. Just under half (10 of 21) of respondents reported having heard the term Continuous Energy Improvement or CEI.

Implementation of CEI Elements

Cadmus asked respondents a series of questions to evaluate whether they had implemented any key CEI elements in their facilities. The questions addressed:

- **Having dedicated staff, including an energy champion**. Cadmus asked respondents about management support for dedicated, full-time employee resources for energy management. Six out of 21 facilities reported total management support; another nine facilities claimed they had some support, and five reported little support. Only one respondent claimed management did not support a dedicated, full-time employee for energy management. Despite high levels of management support, only four facilities reported having a designated "energy manager."
- **Tracking energy use**. All 21 facilities surveyed reported tracking their electricity and/or natural gas use. Of those who specified using either electricity and/or natural gas, 63 percent (10 respondents) did so by reviewing billing data, and six facilities used metering equipment. Fifteen facilities reported reviewing energy data monthly or more frequently.
- **Setting energy reduction goals**. Sixty-two percent (13 of 21) of respondents reported their facility set goals for reduction in energy usage or energy intensity.
- **Developing and routinely updating an energy management plan.** Twenty-four percent (5 of 21) of the facilities reported having developed an energy management plan that included both energy reduction goals and time frames; all these facilities reported periodically revisiting and updating their energy management plans.
- **Quantifying energy savings from energy-efficient equipment upgrades.** Eighty-six percent (18 of 21) of respondents have installed energy-efficient equipment upgrades in the last two years. Out of these, 61 percent (11 of 18) reported they quantified the amount of energy savings from their equipment upgrades.

Technical Assistance Received from Outside Organizations

Nineteen respondents reported receiving energy management technical assistance from an outside organization. The most common technical assistance source (for 13 respondents) was the facility's utility. Eight facilities received technical aid from equipment distributors, and six received assistance from the BPA, Cascade Energy Engineering, Strategic Energy Group, or Evergreen Consulting.

Plans for Energy-Efficient Upgrades

Cadmus also asked respondents about their policies for replacing worn-out equipment with high-efficiency upgrades. Five facilities reported having a specific policy in place to do this, and another nine reported they considered purchasing efficient equipment, but did not have a formal policy. Seven facilities reported they had different return on investment (ROI) requirements for energy-efficiency projects, compared to other capital improvements.

Nonparticipant Trends in CEI Awareness and Implementation Since 2004

The survey also sought to track awareness of energy management practices among nonparticipating facilities over time and to estimate the proportions of the market independently practicing CEI aspects without Initiative involvement.

As a measure of awareness, Cadmus used the percentage of facilities self-reporting as "very" or "somewhat" aware of energy management practices[4], as defined by NEEA. To determine how

[4] At the interview's start, respondents were read the following to ensure their understanding of energy management practices aligned with NEEA's definition: "For the purposes of this survey, energy management practices includes

many facilities practiced CEI, Cadmus combined survey responses to ascertain whether facilities had implemented the necessary components to qualify as Committed (Stage 3) in the CEI process, regardless of whether they were familiar with CEI. This analysis indicated six nonparticipating facilities (25 percent) in the sample practiced CEI at a level of Stage 3 or higher. Of these, four reported receiving technical assistance from BPA or its program partners.

Cadmus compared 2010 nonparticipant survey results with findings from past NEEA survey projects and interpolated[5] across years to establish a time series of data showing trends in nonparticipant awareness and CEI practice back to 2005.

Table **6.2** shows yearly estimates of the two measures, first for nonparticipating facilities and then for the market as a whole. Engagement and awareness at the full market level was calculated by weighting the percent of participants and non-participants meeting the criteria according to the size of participant and nonparticipant populations in the overall market.

Table 6.2. Estimates of Energy Management Awareness and Implementation Levels in the Northwest Food Processing Market

Year	Implementation of CEI at Stage 3 (Committed) or Higher			Awareness of Energy Management Practices		
	Non-Participant Sample	Full Market Segment	Date of Surveys	Non-Participant Sample	Full Market Segment	Date of Surveys
2005	13%	13%	Summer 2005	59%	59%	Summer 2005
2006	12%	13%	Interpolation	54%	62%	Spring 2006
2007	11%	12%	Spring 2007	59%	68%	Spring 2007
2008	17%	20%	Interpolation	62%	70%	Interpolation
2009	23%	28%	Interpolation	66%	71%	Interpolation
2010	29%	36%	Summer 2010	69%	72%	Summer 2010

The data indicate a trend toward a greater awareness of energy management practices among facility managers and an increased willingness to take steps toward committing to CEI. Based on nonparticipant survey data, just over one-third of industrial food processors in the Northwest have engaged in energy-efficiency practices equivalent to Stage 3 of NEEA's CEI process, with the majority being facilities not actually participating in the CEI program. This trend can be credited to a combination of factors, including: successful implementation and growth of NEEA's Initiative and the CEI product; continued advocacy by other regional actors (NWFPA and the Council, etc.); and implementation of similar programs from Energy Trust of Oregon (ETO) and Bonneville Power Administration (BPA) – all of which started with NEEA's intervention in the food processing market.

activities such as purchasing efficient equipment, tracking your energy bills, efficient operating and maintenance practices and training your personnel in managing energy or to operate your equipment efficiently."

[5] Interpolation was calculated using this formula:

% year Y = % year X + (% year Z - % year X)*(year Y - year X)/(year Z – year X)

As an example, if there are two years in between, then the first year is multiplied by 1/3 and the second year is multiplied by 2/3:

% year 4 = % year 3 + (% year 6 - % year 3)*(1/3)

% year 5 = % year 3 + (% year 6 - % year 3)*(2/3)

7. Market Partner Survey

In addition to participant surveys, Cadmus conducted annual surveys of utilities and market partners (e.g., utilities, Bonneville Power Administration, Energy Trust of Oregon, Oregon Department of Energy, Washington State University Energy Extension Program, and Northwest Food Processors Association) to gain insights into their awareness of and response to the Initiative's presence and activities in the regional industrial market. In 2010, Cadmus interviewed the Council about regional energy-efficiency policies regarding CEI, and interviewed market partners and utilities about their promotion of CEI. The market partner survey additionally addresses MPI 5 on utility promotion of CEI and MPI 6 on promotion of CEI by trade associations.

Regional Energy-Efficiency Policy

Based on Cadmus' interview with the Northwest Power and Conservation Council, perhaps the Initiative's most far-reaching achievement has been earning recognition of CEI in the Northwest's Sixth Power Plan as an energy-efficiency measure with savings that can be validated. Prompted in part by research conducted under the Initiative, the Council decided in 2008 to investigate savings opportunities in industrial facilities. The resulting assessment found significant savings opportunities from energy optimization measures in addition to equipment upgrades. Consequently, the industrial supply curves for the Sixth Power Plan included savings from optimization activities, such as: demand-side assessment; proper design, sizing, and/or reconfigurations to match supply to demand; system "commissioning"; sustainable O&M; and supporting management practices.[6]

Energy optimization-type measure activities were grouped into three tiers of bundled measures for the Sixth Power Plan. In order of comprehensiveness, these bundles were: Plant Energy Management; Energy Project Management; and Integrated Plant Energy Management. Each tier was inclusive of all measures in the lower tiers. The "Integrated Plant Energy Management" savings level, which encompassed systematic systems management practices, was comparable to the end goal of NEEA's CEI program (Stage 5: Sustaining).

The Council estimated the regional 20-year achievable potential from these measures at 245 aMW, with a levelized cost less than $0.05 per kWh. This constituted about one-third of the projected total energy-efficiency potential in the industrial sector. Given this, BPA and ETO have already implemented their own energy management programs, based on the Initiative. Results from the 2009 utility survey showed at least seven utilities noted they were moving to adopt BPA's program or to develop their own.

[6] "System Optimization Measures Guide." Prepared for Charlie Grist. Strategic Energy Group. March 23, 2009.

Energy Management Programs Outside of the Northwest

Programs similar to the Initiative have also been implemented outside of the Northwest. A CEI program in California based on the Initiative's design began in 2009.[7] Additionally, the U.S. Department of Energy started the Save Energy Now LEADER program, seeking to reduce energy intensity by 25 percent over 10 years.[8]

Market Partner and Utility 2010 Interviews

The 2010 market partner interviews primarily sought to inform NEEA's understanding of CEI's diffusion in the industrial market, to forecast market penetration and energy savings, and to determine utilities' and trade associations' promotions of CEI. Specific goals included:

- Understand the Initiative's impact in the industrial market from the market partners' perspectives.
- Assess relationships between the Initiative's staff and market partners.
- Learn how many market partners offered programs similar to the Initiative. Determine components and goals for these programs, and NEEA's influence in their designs.
- Identify new directions for NEEA in the industrial market, and determine how NEEA can best work with the market partners in the future.

Appendix D contains the interview guide, and Appendix E contains the tabulated results.

Cadmus targeted 16 market partners for interviews, including eight utilities, five energy offices, and three other regional actors.[9] Cadmus successfully interviewed 10 market partners, including five utilities, two energy offices, and three other market partners (see Table 7.1). The utilities interviewed represented 67 percent of food processing facilities (or 30 percent of the food processing sector, by number of employees), and 41 percent of pulp and paper facilities (or 28 percent of the pulp and paper market by production). The five utilities represented a mix of rural and urban areas, with three serving mainly rural areas, two serving mainly urban areas. The key findings, shown below, are derived from the 10 completed interviews.

Table 7.1. Sample Disposition for Market Partner Interviews

Market Partner Type	Number Targeted	Number Declined	Number Interviewed
Utility	8	1	5
Energy Office	5	0	2
Other	3	0	3
Survey Total	**16**	**1**	**10**

[7] More information about the California CEI program can be found on the Pacific Gas and Electric Company (PG&E) website: http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/cei/

[8] More information about the U.S. DOE Save Energy Now LEADER program can be found on their website: http://www1.eere.energy.gov/industry/saveenergynow/index.html

[9] This sample excludes the Northwest Power and Conservation Council, whose representatives were interviewed but were not asked the same questions as the other market partners.

The Initiative's Impact on the Industrial Market

Table 7.2 reports on market partners' perceptions about the industrial sector's level of awareness regarding energy management.

Table 7.2. Percentage of Industrial Customers Aware of the Opportunity to Save Energy Using Energy Management Practices

Response	Frequency (n = 10)	Spontaneous Comments (These were unsolicited comments made by respondents when answering the question asked)
25%	2	• Growing, around 25% • 25% of largest customers
50%	1	Within the larger facilities, approximately 50% are aware of opportunities for energy savings
75%	1	75% are aware, but it is hard for them to quantify savings, costs, or which opportunities are the most valuable
80%	1	
Almost 100%	1	Almost all are aware, but actual implementation varies by size. Larger facilities are much more likely to have an energy manager or someone who knows a little bit, like who to call or where to go for help. There is lots of help and training out there if they look for it. Small plants typically do not have anyone who can spend the time on energy
100%	1	
No numerical response	1	Just their largest customer (represents 10% of utility load)
Don't know	2	Don't know, but most know that how they run their equipment affects their bill. They tend to be pretty knowledgeable about these things. The larger issue is conveying the issue to everyone else

Table 7.3 shows the degree of interest that aware industrial customers have in integrating energy management practices. Though respondents' estimates of awareness levels ranged from 25 percent to 100 percent, in general, market partners reported large facilities being more aware than smaller facilities. They also reported that, though facilities were aware of the potential to save energy, they were not aware of the potential's magnitude. Some respondents thought the larger industrial facilities were more interested in implementing CEI than were small- to medium-sized facilities, and interest generally depended on the facility's culture.

According to one respondent, most facilities conscientiously assess whether implementing CEI would be worth the required energy savings accountability to receive an incentive. Another respondent said that without the incentive, industrial customers expressed much less interest. One respondent said many opportunities still existed for efficient equipment installations producing easily-verified energy savings; thus, energy management remained a secondary priority.

Table 7.3. Degree of Interest that Aware Industrial Customers have in Integrating/Adopting Energy Management Practices (using a 5-point scale with 1 being "not at all interested" and 5 being "very interested")

Response	Frequency (n = 10)	Spontaneous Comments (These were unsolicited comments made by respondents when answering the question asked)
1 to 2 (1 = not at all interested)	1	If no utility incentive, then 1-2.
3	1	• So many customers that have huge opportunities for capital investments, including EE. Energy efficiency equipment is the highest priority of those energy efficiency opportunities because the savings are quantifiable. Energy management (i.e. difficult to quantify) savings are second to that. • Because industrial programs are still fairly new, there is still low-hanging fruit for capital energy efficiency investments that customers are going to take advantage of first.
4	2	• Once industrial customers learn about CEI, they are very interested. However, for most facilities there is a real conscientious assessment about whether participation in a program is worth it. Many facilities do not want to be held to the expected 1,000,000 kwh savings goal in order to receive the incentive. • Large facilities are more interested, but it is not a priority
5 (Very Interested)	1	
No numerical response	2	Very few small facilities are aware of energy management.
No response	3	

Initiative Relationship with Market Partners

Cadmus asked market partners about their relationships with Initiative staff. Five of the seven market partners (representing 30 percent of the food processing market by number of employees) ranked their current relationship with NEEA as good or very good. Only one respondent reported their current relationship with NEEA as very poor due to NEEA's lack of follow-through and lack of communication about alternative ways to address their targeted industrial customers.

Eight of 10 market partner respondents said they were familiar with NEEA's Initiative and CEI, and two said they were somewhat familiar with the Initiative and CEI. Of 10 market partners interviewed by Cadmus, seven (representing 12 percent of the food processing market by number of employees) promote active energy management programs to their customers as part of their energy-efficiency offerings. Four of the five non-utility market partners were currently offering energy management incentives to their customers, and two utility market partners (representing 12 percent of the food processing market by number of employees) planned to implement energy management programs—one of which was to launch sometime in 2011 (the other did not specify a launch date).

Energy Management Program Offerings

Table 7.4 shows four market partners' reasons for offering energy management programs that provide incentives or technical support for measures beyond capital or equipment improvements.

Table 7.4. Reasons for Offering Energy Management Programs by Non-Utility Market Partners

Response	Frequency (n = 4)
CEI has been incorporated into the region's Sixth Power Plan	1
Industrial customers saw benefits from other programs, and expressed interest in having access to a program they could participate in	1
CEI provides a cost-effective means of achieving energy savings goals, and an effective way to achieve low-cost energy savings, with little capital outlay required for participants during a difficult economic period	1
The market partner is strongly committed to providing comprehensive services to industrial customers/sites, and formal planning to achieve comprehensive savings proved the best approach for this	1

Table 7.5 outlines the energy management program offerings of four market partners, including: primary program components; goals; incentives offered; and whether NEEA influenced the program's design.

Programs offered tend to be fairly new, with most beginning during 2009. Two market partners modeled their program designs directly on NEEA's CEI program, while a third designed its program to complement the Initiative. Three market partners reported quantitative, measurable energy savings goals for their programs, and provided incentives. The two market partners with program designs based on CEI regretted their inability to share NEEA's program branding, as doing so likely would have created additional progress toward transformation in the industrial market. In the words of one: *"NEEA wouldn't let us use the term 'CEI' and we were forced to use other names. This was a huge mistake because it doesn't support market transformation."*

Two market partners had quantitative measurement and verification approaches for estimating energy savings for their programs, and three provided incentives directly to customers. Most incentive structures were based on a dollar amount per kWh or annual MW of energy savings, and were often paired with a cap at a percentage of participant project costs. Two respondents reported a measurement and verification approach analyzing changes in energy intensity (kWh consumption per unit output) as a key performance indicator of energy savings.

Table 7.5. Market Partner Energy Management Offerings

Market Partner	Energy Management Offerings and Components	Goals	Incentives Offered	Did NEEA Influence design?
BPA	Offers three programs, which started October 1, 2009: "Energy Project Manager Program": Provides funding for facility energy champions (18-month funding, facility must have savings of 1 million kWh/year to qualify); this program also has a goal-setting program, with incentives for meeting targets. "Track and Tune Program": Provides incentives for O&M measures. "High Performance Energy Management Program": Similarly to CEI, incorporates energy management into all aspects of business, incentives for O&M, capital projects, behavioral measures.	12 aMW goal in 2010, 15 aMW goal in 2011. Has savings targets in Sixth Power Plan, one-third of industrial savings goals are related to energy management.	Pays up to $2 million per aMW saved. Incentive is funding for a salaried Energy Manager position. Track and Tune is the lesser of $0.25/kWh or 70 percent of project costs. Interim progress payments are available.	Yes, the High-Performance Energy Management program was based on CEI.
ETO	Recruitment began January 2009 for "Industrial Energy Improvement." Supports a network of non-competing industrial facilities in sharing and implementing energy-saving strategies. A support role, it provides training, and focuses on network interactions. It also provides direct technical support through contractors between IEI sessions (very similar to CEI). Involves an Energy Information System aspect.	Not quantitative; creates capability to measure, track, and quantify savings through monitoring, targeting, and reporting (MT&R) analysis; creates full pipeline of capital projects, market transformation.	Offers incentives for anything they can analyze. O&M: $0.08/kWh, capped at 50 percent. IEI custom: $0.025/kWh, capped at 50 percent of cost. Direct meter-level savings vary from $0.001 to $0.02/kWh with caps.	Yes, program was based directly on CEI, plus capacity for incentives.
WSU	Conducts training on energy management programs, has incentives for implementation (and works with utilities to provide incentives).	Reduce energy intensity by 25 percent in 10 years.	Has $1 million to give away, at $100k or less per facility. Depends on the amount needed to reduce the facility's payback period to 1-2 years.	No.
NWFPA	"Baseline Project": Establishes baseline energy intensity to measure progress toward the energy intensity reduction goal. "Energy Assessment and Mapping": Conducting energy audits to educate facilities about appropriate energy-saving actions. "Access to Energy Data": Tests and tracks implementation of energy management software systems at food processing facilities.	25 percent reduction in energy intensity in 10 years among its members.	None.	Yes, NEEA is a program partner.

Barriers to Offering an Energy Management Program

For a variety of reasons, the remaining market partners did not actively administer their own energy management programs. As shown in Table 7.6, two respondents (representing 18 percent of the food processing market by number of employees) said their state's Public Service Commission required them to only offer cost-effective incentive programs that passed the total resource cost (TRC) test.

Other reasons mentioned for not offering an energy management program included: market partners having an insufficient number of industrial customers, specifically larger customers (two mentions). One respondent reported they did not offer a program because their customers had very diverse energy usage, staffing, structure, and products, making a program difficult to implement. Another market partner stated they lacked funding and staff to implement this type of program.

Table 7.6. Barriers to Offering an Energy Management Program

Response	Frequency (n = 4)
Insufficient number of industrial customers, who are diverse in their energy usage, staffing, structure, and products	1
Insufficient number of LARGE industrial customers	1
Very few large customers are interested	1
Market partner does not know how to quantify savings to perform the required TRC test	2
Market partner does not have funding and staff do not have time	1

Recommended Future Directions for NEEA

Cadmus asked market partners for input regarding the role NEEA should play moving forward. Specifically, they were asked about energy management software and the ISO 50001 standard.

- **Energy Management Software.** Three out of 10 respondents thought promoting energy-management software would serve as an effective strategy for promoting energy management practices. Another four respondents gave answers of "Mildly/maybe/ possibly effective" to this question and pointed out that one standardized tool would not work for all facilities because of variability among customers.
- **ISO 50001.** Four out of 10 respondents thought promoting the ISO 50001 standard would be an effective use of NEEA's resources, but NEEA should not concentrate on it exclusively. One respondent thought a barrier existed because industrial customers did not want to make binding commitments. To overcome this barrier, NEEA could provide customers with information about obligations and costs to make them comfortable with the standard.
- **Training.** Request for technical training emerged as a consistent theme among market partners. Specifically, three of five applicable respondents said they would be interested in training on how to design energy management programs. One respondent mentioned training for process engineers on how to implement energy management practices. Others recommended NEEA continue technology-specific training. The two respondents who were not interested in a program design workshop would like information on how to measure and verify energy savings from CEI.

MPI 6: Trade Association Promotion of CEI

NWFPA, one of the Initiative's market partners, serves as a trade association in the food processing industry. Indicative of NEEA's success with this key food processing trade association, in late 2008, NWFPA established a goal for its members to reduce energy intensity by 25 percent in 10 years. To measure this reduction, NWFPA has implemented a number of data-collection and education-based programs:

- **Baseline Project**. NWFPA collected billing data from its members to establish 2009 baseline energy intensity, so progress can be measured toward the energy intensity reduction goal.
- **Energy Assessment and Mapping.** NWFPA conducts energy audits to educate facilities about energy-saving actions. NWFPA also seeks to determine which recommendations have been implemented and the reasoning behind the decisions.
- **Access to Energy Data.** NWFPA tests and tracks energy management software systems' implementation at food processing facilities. NWFPA also hopes to include training on software programs in their future budgets.

8. Trade Ally Survey

The trade ally survey for MPER #6 targeted a different group of companies than such surveys conducted in previous years, in which Cadmus had interviewed equipment dealers. Market partner surveys conducted in late 2009 revealed several market partners either offering programs with products similar to CEI, or considering such offerings. Like the Initiative, these programs used an implementation contractor who visited facilities and provided technical guidance and assistance. Therefore, Cadmus targeted regional energy management consulting companies, also defined as trade allies, to collect data on current, past and future demand for energy management consulting, and other inputs required for the development of the market diffusion model. The survey's goals included:

- Understand CEI elements marketed by trade allies and how they promote energy management.
- Understand trends in CEI awareness and market penetration over the last five years, and obtain trade ally adoption projections over the next five years.
- Identify CEI implementation barriers as well as influential factors.
- Identify how NEEA can best work with trade allies in the future.

Appendix D contains the interview guide, and Appendix E contains the tabulated results.

Cadmus interviewed five of the six (83%) regional consulting firms identified as promoting energy management in the industrial sector. These six firms are the only companies doing energy management consulting in the Northwest. Table 8.1 summarizes characteristics of energy management consulting groups within each firm.

Table 8.1. Summary of Interviewed Trade Ally Characteristics

Firm	Years in EM Consulting	Number of Employees Working on EM	Industrial Sectors Targeted													
			Food Products & Beverages	Wood Products	Paper Manufacturing	Computers and Electronic Manufacturing	Primary Metals	Misc. Manufacturing	Agriculture	Petroleum/ Chemicals	Industrial Machinery	Mining Minerals	Irrigation	Water/Wastewater	Cold Storage	States Served
1	5 to 6 years	35	x	x	x	x										OR, WA, ID, MT, Others, Canada
2	13 years	6		x		x	x									OR, Northern CA, TX
3	6 years	5-10	x		x											OR, WA, ID, MT, Others
4	13 years *	3						x								OR, WA, ID, MT
5	> 10 years	14	x	x			x		x	x	x	x	x	x	x	OR, WA, ID, MT, Others

*Less than 1 year in industrial sector

Respondents reported some industries proved more receptive to energy management than others. When asked to list three industries most receptive to energy management, four companies identified food products and beverages, and two companies identified wood products. Paper

manufacturing, computers and electronic manufacturing, primary metals, and petroleum/ chemicals were each mentioned once. Most companies Cadmus interviewed served a limited number of industries, making it difficult for them to identify those less receptive to energy management. Trade allies serving more than three industries identified high-tech industries, water/wastewater, paper manufacturing, and agriculture as the least-receptive industries.

CEI Elements Promoted by Consulting Firms

As shown in Table 8.2, trade allies interviewed promoted a number of CEI elements, including: tracking energy use, quantifying energy savings from measures, and several others.

Table 8.2. Elements of CEI Trade Allies Promote

CEI Element	Frequency (n= 5)
Energy audit	4
Analysis of energy intensity	4
Set energy reduction goals	4
Design energy plan to reach goals	4
Tracking energy use	5
Efficient equipment trainings	3
Efficient O&M practices trainings	3
Quantifying energy savings from measures	5
Visit facility regularly to update strategy and/or goals	4

Awareness and Implementation Trends

According to firms interviewed, industrial facilities' awareness of energy management practices and the number of industrial facilities practicing energy management have increased over the past five years. Facilities have generally become more open to energy efficiency, and awareness has increased regarding energy as a controllable cost and component of maintaining a competitive advantage. Software tools, training opportunities, and monetary incentives have also become more available. Factors driving these changes include: changes in environmental awareness and attitudes; facilities' interests in presenting themselves as "green"; NEEA's Initiative; increased marketing; incentives; increased visibility of energy; and prices of electricity or natural gas.

According to respondents from three firms, facilities expect to reduce their electric bills by 2 percent to 15 percent in the first one to two years following an energy management strategy's implementation. Cost estimates varied for the initial implementation of energy management. Annual dollar estimates ranged from $50,000 to $500,000 for the initial period. One respondent reported costs on a per-kWh basis, stating it cost $0.25 per kWh to implement CEI. After the initial implementation period, typical costs decreased to $20,000 per year (per two respondents), or $0.05 per kWh.

NEEA's Future Role with Trade Allies

Several barriers in the industrial sector slow adoption of energy management practices. While trade allies Cadmus interviewed generally felt NEEA effectively addressed these barriers, they identified several ways NEEA could continue to help facilities overcome potential hurdles:

- Raise facilities' interest and effectively communicate how they can participate.
- Communicate concrete results of implementing energy management strategies and changes necessary to realize these results.
- Continue to educate and gain support from upper management at facilities, as illustrated by the following comment by a trade ally:

  "I think that the effort needs to be to the higher upper management in corporations. Getting upper-level management to commit to energy management is the driving force. It happens much more effectively when you have high-level corporate sponsorship."
- Continue to explore other target markets. In the words of an energy management consultant interviewed:

  "Their focus on food processing and pulp and paper has been significant, but small manufacturing branching is good. They are headed down the right road and should continue to look at other markets."
- Create messaging about utilizing energy management to manage risk.
- Offer localized training on basic energy management concepts and energy tracking principles.
- Continue to offer the Initiative in regions not covered by BPA, ETO, or other utility programs.
- Standardize CEI components across all programs offered in the Northwest, so companies with facilities in different utility territories have the same or similar recommendations and goals, as illustrated by the following quote from an energy management consultant:

  "They should also get everyone together to standardize CEI. A company could have facilities in several territories and the practices at all facilities should all look the same, but may not because BPA may have different recommendations than NEEA or ETO."

Although NEEA's role may shift, high demand clearly exists for the services and support it is poised to provide.

9. Review of ACE Model for Food Processing

NEEA uses the Alliance Cost Effectiveness (ACE) model, a spreadsheet tool, to estimate the cost-effectiveness of its initiatives during the planning phase as well as to forecast future energy savings impacts..The model requires various inputs and assumptions about market growth, penetration rates, and savings rates, among other factors. The accuracy of the model's results depends on the quality and accuracy of these inputs.

Part of Cadmus' ongoing evaluation activities has included a periodic review of assumptions underlying the Food Processing ACE model. Cadmus conducted such a review in August 2010. To aid this review, NEEA provided Cadmus with a PowerPoint presentation detailing current assumptions used in the model. NEEA also provided an electronic copy of the most recent ACE model documenting the source and rationale behind most assumptions.

Because Cadmus last reviewed the ACE model in 2009, and the assumptions have not changed, Cadmus compared assumptions to inputs and results from the market diffusion model.

Comparison of Food Processing Assumptions and Results of NEEA's ACE and Cadmus' Market Diffusion Models

Cadmus developed a market diffusion forecast for energy management practices in Pacific Northwest large food processing facilities[10] to capture both programmatic and non-programmatic market effects and compare findings to the existing Alliance Cost Effectiveness (ACE) model assumptions. The forecast provides Cadmus' best estimate of shares of large food processing facilities that will, between 2011 and 2015, practice energy management at levels equivalent to or higher than the Initiative's Stage 3. To forecast the market's energy savings, the market share forecast was combined with validated estimates of gas and electric savings in food processing facilities engaged with NEEA. Appendix F details the data sources, diffusion model methodology and findings of the Cadmus model.

Table 9.1 compares the ACE and Cadmus diffusion model inputs and outputs. Most assumptions regarding energy management costs, electric savings rates and electricity consumption are similar between the two. The main differences related to the gas savings rate and facility consumption. Using verified consumption and savings data from engaged facilities, Cadmus estimated average annual gas savings of 2 percent to 4 percent between years one and five, and assumed savings would increase by 1 percent per year thereafter. In contrast, the ACE model assumes a significantly lower savings rate: the savings rate starts at 0 percent, grows at 1 percent per year, and caps at 5 percent after year six. Based on verified consumption data, Cadmus estimated annual gas consumption per facility was 2.2 million therms.[11] The ACE model assumes gas consumption three times greater (6.7 million therms). Cadmus' estimate of gas consumption is conservative, however, as it represents median gas consumption. Mean gas

[10] The forecast pertains to food processing facilities with 250 or more employees in the Pacific Northwest. Information about employment at food processing facilities was obtained from the Dun & Bradstreet database.

[11] Cadmus estimated facility gas and electric consumption by matching facility employment data from Dun & Bradstreet (2010) to engaged facilities. We calculated average gas and electric consumption per employee in engaged facilities. We then multiplied average consumption per employee in engaged facilities times the number of employees for all facilities in the target market. This resulted in an estimate of gas and electric energy use for each facility in the target market.

consumption in large food processing facilities has been almost 80 percent higher (3.9 million therms).

Table 9.1. Comparison of Food Processing ACE Model and Diffusion Model Assumptions and Results

Assumptions	NEEA ACE Model	Cadmus Diffusion Model
Cost to implement energy management (O&M portion only)	$75,000 in year 1	$75,000 in year 1
Cost to practice energy management after Year 1 (O&M portion only)	$75,000 in year 2 $15,000 per year after year 2	$50,000 in year 2 $30,000 per year after year 2
Facility % electric savings per year	0 percent in year 1; then an average of 3.7 percent per year for 5 years; total savings years 2-6 is 18.7 percent	2.2 percent in year 1; 3.6 percent in year 2; 2.8 percent in year 3; 3.3 percent in year 4; 3.0 percent in year 5; 1 percent savings thereafter; total savings in years 1-5: 14.9 percent.
Facility % gas savings per year	0 percent in year 1; 1 percent per year for 5 years; total savings in years 2-6 is 5 percent	3.2 percent in year 1; 2.5 percent in year 2; 2.9 percent in year 3; 2.5 percent in year 4; 2.5 percent in year 5; 1 percent savings thereafter; total savings in years 1-5: 13.6 percent.
Annual electricity consumption per facility (kWh) in 2009	16,329,643	15,397,921
Annual gas consumption per facility (therms) in 2009	6,666,831	2,228,514
Number of facilities in 2009	191	176
Outputs	**NEEA Ace Model**	**Cadmus Diffusion Model**
Average market adoption rate	5 percent per year	5.1 percent per year
Predicted market penetration in 2009	25 percent	32 percent
Predicted market penetration in 2015	55 percent	57 percent
Predicted electric savings in 2009 (cumulative)	5.6 aMW	8.2 aMW
Predicted gas savings in 2009 (cumulative)	4,129,854 therms (equivalent to 13.82 aMW)	10,676,603 therms (equivalent to 35.7 aMW)
Predicted electric savings for 2015 (cumulative)	29.2 aMW	32.8 aMW
Predicted gas savings projected for 2015 (cumulative)	13,718,321 therms (equivalent to 45.9 aMW)	38,329,171 therms (equivalent to 128.3 aMW)

The ACE and Cadmus models generate similar predictions. Between 2007 and 2015, the models predict similar market adoption rates, overall market penetrations, and electric savings. The Cadmus model predicts higher market penetration in 2009 than the ACE model, but modestly slower growth through 2015. The Cadmus model's predicted market penetration in 2015 is two percentage points higher than the ACE model's. Although the models have similar predicted

market penetrations, the Cadmus model predicts significantly higher gas savings in 2015. The ACE model's low gas savings rate assumption is largely responsible for this difference.

Cadmus is concerned about the ACE model assumptions regarding the annual gas savings rates and facility gas consumption. First, the gas savings rate appears to be too low (1 percent per annum up to 5 percent). The available data on savings rates in engaged facilities (2 percent to 4 percent) do not support this assumption. Second, the gas consumption assumption appears to be too high (6.6 million therms in 2009). Again, available data on gas consumption (2 to 4 million therms) do not support this assumption. On balance, the low savings rate appears to dominate the high average consumption, and the effect is that cumulative gas savings estimates in the ACE model are too low.

Cadmus recommends NEEA reconsider the gas savings and consumption assumptions in the ACE model. In particular, NEEA should consider increasing its estimate of annual gas savings rates, decreasing its estimate of facility gas consumption, or both. NEEA has now accumulated enough gas consumption and savings data from engaged facilities to refine its assumptions. This information could be combined with data from Dun & Bradstreet on employees in targeted facilities to develop more realistic assumptions.

10. Conclusions and Recommendations

In 2004, NEEA conceived the Initiative as a comprehensive effort to bring about a lasting change in industrial energy use by making energy management integral to how industrial firms decided to invest in new equipment and plan routine O&M.

As with all of NEEA's programs and initiatives, NEEA has contracted out an annual evaluation of the Initiative's progress since its inception. Results of this ongoing evaluation indicate the Initiative has largely achieved many of its initial goals in the food processing sector. The increased importance and value of energy management among industrial end users, trade allies, market partners and regional energy planners clearly demonstrate the success of the Initiative in the food processing sector.

Energy Savings

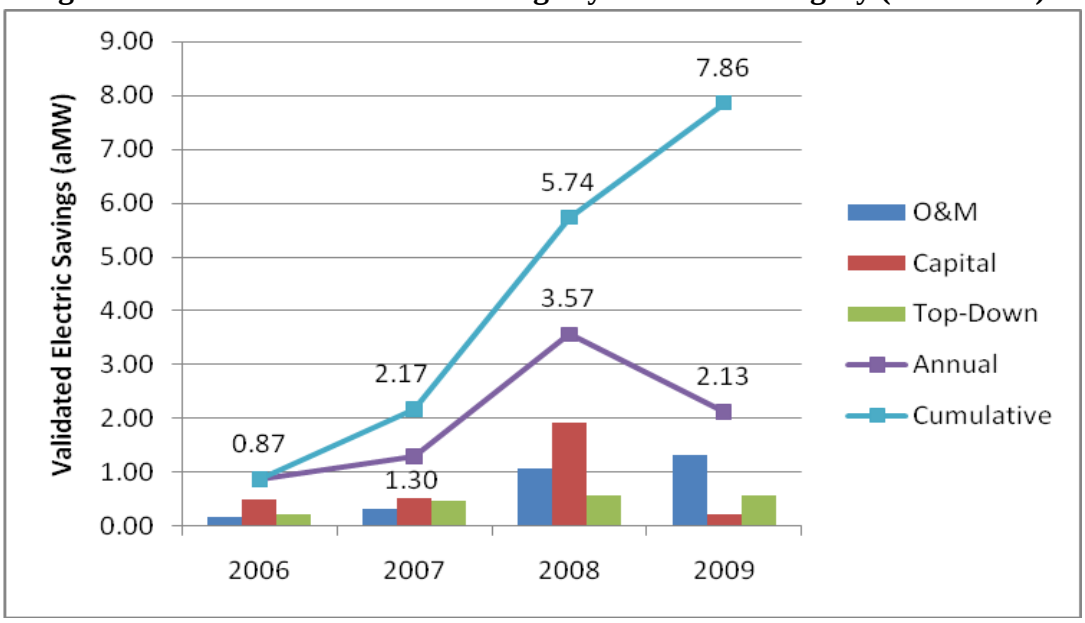
CEI implementation in participant firms has resulted in measurable electricity and natural gas savings due to improved O&M practices and capital investments induced by the Initiative. In 2009, Cadmus began evaluating facility-wide (top-down) energy savings claims to capture savings from behavioral changes as well as O&M and capital improvements not quantified at the measure level. To date, Cadmus has validated 5.646 aMW of electric savings at 26 food processing facilities and 2.217 aMW of electric energy savings at four pulp and paper facilities.[12] Additionally, Cadmus has validated over 4 million therms of natural gas savings at 12 food processing facilities. Results from 2006 through 2009 show that on average, food processing facilities achieved electric savings of 3.07 percent of their annual consumption and gas savings of 2.89 percent of their annual consumption when practicing CEI.

As Figure 10.1 illustrates, an upward trend in annual validated measure-level savings occurred from 2006–2008, with a drop in 2009. The 2009 decrease in validated savings was largely due to cutbacks in capital projects, most likely because of the general economic downturn. However, NEEA's Industrial Tracking System (ITS) lists several projects as completed, but not evaluated because of a lack of documentation or difficulty quantifying savings. Anecdotal information from site visits and surveys indicates a number of projects were completed at several plants, but were not documented through ITS. Evaluation of outstanding measures and accounting for undocumented projects will no doubt show appreciably higher savings for 2009.

Savings from improved O&M practices—the Initiative's mainstay—have steadily increased over time. For the first three program years (2006–2008), a majority of measure-level validated electric savings originated from capital projects. In 2009, however, O&M improvements accounted for 85 percent of validated measure-level savings. This shift provides further evidence of CEI's integration into the Northwest industrial market.

[12] Due to rounding, the sum of individual target market savings may not match total savings.

Figure 10.1. Validated Electric Savings by Year and Category (2006–2009)



The persistence of both capital and O&M measures implemented through CEI is an important gauge of Initiative success, and an indication of whether CEI will continue as the Initiative disengages with these facilities. Cadmus asked participants whether each individual measure installed since 2006 remained in place. Of 41 capital improvement projects about which Cadmus inquired, no measures were reported to have been removed. Out of 50 validated O&M measures about which Cadmus inquired, respondents identified only three no longer in place. These data show a high persistence rate for energy savings achieved through the Initiative. Additionally, the majority (11 out of 13) of facilities believed there would be no change in their CEI practices if the Initiative were to disengage with their facility. Participating facilities have successfully integrated CEI into their cultures, and are ready to disengage with the Initiative and continue practicing energy management on their own.

The Initiative's electricity savings fell short of the 20 aMW revised target. The difference between actual and target savings can be explained through four factors:

1. Unreported projects have potential savings, as have projects not yet validated.
2. The initial 20 aMW goal may have been aggressive, as the pulp and paper industry was expected to achieve the majority of this goal. The pulp and paper market has not been receptive to CEI, as the market is in decline. MPER #5 provided further details on this issue..
3. Evaluation methods used for validating savings do not account for all the Initiative's possible market effects. Because the Initiative is a market transformation program, Cadmus developed a market diffusion model to estimate Initiative impacts beyond facilities engaged with the Initiative. The model shows that at the end of 2009, 8.2 aMW of electricity savings and 10,676,603 gas therms savings resulted from all food processing facilities practicing CEI in the region.

Market Progress

Initiative management established six market progress indicators (MPIs). MPER #6 provides an update on the following MPIs: market penetration (the number of food processing firms implementing CEI); market partner promotion of CEI; trade association promotion of CEI; and the number of food processing firms implementing CEI.

Progress in Market Penetration

The Initiative's goal sought to engage 13 percent of the large[13] food processor market in CEI. As of 2010, an estimated 36 percent of target food processing facilities were practicing CEI. Data indicate an expanding sector, with the industry open to capital and non-capital approaches, including CEI, for improving energy efficiency and controlling energy costs. Data from the survey with participating facilities also indicate that these facilities have successfully integrated CEI into their corporate cultures, supported by evidence of persistence of capital improvement projects and operations and maintenance measures implemented with Initiative involvement. Cadmus also found the majority of the participating facilities practicing CEI attributed their decision to do so to NEEA, the Initiative, and/or the Initiative's implementation team.

Progress in Market Partner Promotion of CEI

Market partner support and promotion of CEI are key aspects of the Initiative's implementation strategy. The Initiative's most significant contribution to promoting energy efficiency in the region has been, perhaps, the influence it had on the Northwest Power and Conservation Council's decision to include continuous energy improvement as a measure in the Sixth Power Plan. This will almost certainly guarantee widespread adoption of energy management practices in utility-sponsored energy-efficiency programs. Further, inclusion of energy management measures in the Sixth Power Plan led other utilities to consider implementing their own programs, and the BPA and ETO began programs in 2009. Seven of the utilities interviewed in 2009 were considering developing their own energy management programs.

Progress in Trade Association Promotion of CEI

NWFPA, one of the Initiative's market partners, is a trade association in the food processing industry. In late 2008, the NWFPA established a goal for its members to reduce energy intensity by 25 percent in 10 years. To measure energy intensity reduction, NWFPA collects data from its members to establish baseline energy intensity for the year 2009 from which progress toward the energy intensity reduction goal can be measured. NWFPA also conducts energy audits and tests and tracks implementation of energy management software systems at food processing facilities. It hopes to include training on software programs in its future budget.

Trade Ally Promotion of CEI

An additional measure of market change is trade ally promotion of CEI. Cadmus identified that at least six companies in the region provide energy management consulting services to industrial facilities. Findings from surveys with five energy management consulting companies in the region indicate the market has changed drastically over the past five years. Industrial facilities

[13] NEEA defines large food processors as companies with at least 250 employees in the region.

have become more aware of energy management practices and benefits due to: increased promotion and marketing; changes in environmental awareness and attitudes; and economic pressures to reduce their bottom lines. Additionally, more resources are available to the industry for obtaining information about energy management, and resources have improved since 2004. The result has been more facilities recognizing energy as a controllable expense, and a substantial increase in the number of facilities practicing CEI since 2004, when most respondents felt almost no facilities were managing energy.

Program Successes Through 2010

The research conducted in 2010 shows the Initiative has succeeded in integrating energy management into food processors' business and manufacturing operations, with energy as a manageable cost for food processors, as evidenced by the following:

- Participant surveys revealed that facilities remain pleased with the program, and the Initiative can disengage with these facilities, confident the facilities will continue practicing CEI.
- Nonparticipant and participant surveys showed that 36 percent of target facilities[14] are practicing CEI, an increase from 13 percent in 2004.
- Trade allies reported facilities have generally become more open to energy efficiency, and awareness has increased regarding energy as a controllable cost and component of maintaining a competitive advantage. Availability and quality of software tools and training opportunities have also increased.
- The Northwest Power and Conservation Council's Sixth Power Plan included CEI as an energy-efficiency measure with savings that can be validated. This has led other regional entities to implement their own programs; they have based their program designs on the Initiative. ETO and BPA implemented programs in 2009, and other utilities are in the planning stages.

Future Direction of the Initiative

Over the next four years, NEEA can build on this success by engaging a new group of participants. Cadmus found 36 percent of the target market practices energy management; however, only two facilities reported practicing CEI without help from NEEA, BPA, or ETO. Trade allies confirmed that very few if any facilities would begin practicing energy management without technical and financial help. This shows a continuing need to provide assistance to the food processing sector to further promote energy management adoption. NEEA could engage with these facilities directly, or advise NWFPA or other entities on how to continue promoting energy management to food processors.

Market partners and trade allies agreed NEEA continues to have a large role to play in this market. Despite energy management's economic benefits, many food processors remain reluctant to adopt CEI. This suggests a market gap NEEA and its market partners can help close with incentives, education and marketing.

[14] More than 250 employees throughout all facilities within a company in the region.

Cadmus requested feedback from respondents on directions the Initiative should take in the future. The majority of trade ally and market partner responses focused on the bulleted suggestions below.

- **Energy Management Software.** Respondents thought promotion of energy management software would provide an effective strategy for promoting energy management practices, with the caveat that one standardized tool will not work for all facilities because of their variability. The tool must be user-friendly and easily integrated with other software used at a facility.
- **ISO 50001.** Most respondents thought promoting the ISO 50001 standard would effectively use NEEA's resources. One respondent thought a barrier exists because industrial customers do not want to make a binding commitment. To overcome this barrier, NEEA could provide customers with information about obligations and costs to make them comfortable with the standards. The respondent also suggested NEEA look at rules for small- and medium-size industries, where assessments have not been free, and projects have had a lower priority for federal funding.
- **Technical Training.** Requests for technical training were consistent among market partners. One respondent mentioned training for process engineers on how to implement energy management practices. Both market partners and trade allies recommended NEEA share more information on how to measure and verify CEI energy savings.
- **Program Implementation Workshop.** Market partners said they would be interested in participating in a workshop on how to design an energy management program. They suggested ETO and BPA participate in the workshop to discuss lessons learned.
- **Standardization of CEI in the Region.** As other market partners begin to implement their own energy management programs, CEI will need standardized components so companies with facilities in different utility territories will receive consistent recommendations and goals.

Appendix A. 2009 Energy Savings Memorandum

Date: **April 15, 2010**

To: **Rita Siong, Robert Russell, and NEEA**

From: **William Jones, Ashley Buckman, and Jim Stewart**

Re: **2009 Energy Savings Memorandum**

Introduction

The Cadmus Group, Inc. (Cadmus) is the independent evaluator of the Northwest Energy Efficiency Alliance (NEEA) Initiative (Initiative). The Initiative began in 2004 and set an electric savings goal of 20 aMW to be reached by the end of the fifth program year. This memo presents Cadmus' results of the energy savings validation work completed in March 2010 and also summarizes the savings validated during prior program years in order to determine if the Initiative five year goal was reached.

Cadmus validated energy savings at eight food processing plants and one pulp and paper facility in the states of Idaho, Oregon, and Washington. Through the Industrial Tracking System (ITS) database, Cadmus identified specific energy savings measures and their associated savings claims at facilities selected for site visits. Cadmus then conducted site visits and phone interviews to collect data to validate the savings claims. Simultaneously, Cadmus evaluated facility-wide energy savings for several facilities based on statistical models provided by NEEA. The facility-wide energy savings capture both the validated individual measures and the other energy savings activities that the facility implemented but was not able to quantify.

The following sections describe the research approach and calculation methodology, findings, and the team's conclusions. Incremental and total energy savings attributable to CEI are included. Detailed savings tables appear in the attached appendices.

Research Approach and Methodology

The savings validation effort consisted of two parts:

- Review and validation of top-down or facility-wide energy savings claims.
- Bottom-up or measure-level energy savings validation.

Top-Down Savings Methodology

NEEA performed a regression analysis of electricity and gas consumption for each facility participating in the CEI program and submitted a report describing the methodology, data, and results to Cadmus. The report included facility-level econometric analyses of electricity and gas consumption, which yielded an estimate of savings in each program year.

In general, the savings claims were based on OLS (ordinary least squares) regressions of facility weekly or monthly therm or kWh (kilowatt per hour) consumption on output, temperature, and program implementation trend or level variables. Cadmus reviewed the savings claims with these criteria in mind:

- **Model specification:** Does the model specification follow from the program theory, and can the savings effects be identified? Are any of the assumptions of classical regression theory violated? What factors are omitted from the model and could they be biasing the results?
- **Establish validity of base years:** Are the selected base years appropriate and representative? Are the results similar when the treatment years are measured against different baseline years? What is the optimal approach to select/establish a base period?
- **Data reliability:** Are the data reliable and accurate? If not, what are the sources, and how are the errors likely to impact the analysis?
- **Model estimation and inference:** Do the regression results, the overall fit (R2), regression estimates, and standard errors of estimated coefficients support the hypothesis of energy savings? Are the results reasonable and plausible?
- **Reasonableness of estimated parameters:** Are the savings estimates plausible? How large are the savings estimates in relation to overall energy usage?
- **Sensitivity and robustness checks:** Are the results sensitive to the assumptions of the model? For instance, are the results sensitive to the exclusion or inclusion of different independent variables? What is the effect of excluding one or more baseline or treatment years?

For some facilities, Cadmus identified issues regarding the validity of the claims and brought these issues to NEEA's attention. NEEA then revised the claims to address the concerns and resubmitted them for review and use in the analyses. This collaborative process improved the reliability of the savings claims.

Cadmus believes that the top-down savings claims reported in this memo satisfy the evaluation criteria listed above.

Table 2 and Table 3 detail the number of reports received and the number of top-down savings claims evaluated (using the criteria listed above) by the facilities' engagement stage in the NEEA Initiative.

Table 2: Distribution of Top-Down Electric Savings Claims

Stage of Engagement	Total Number of Facilities Analyzed	Number of Facilities with 2006 Savings Claim (Electric)	Number of Facilities with 2007 Savings Claim (Electric)	Number of Facilities with 2008 Savings Claim (Electric)	Number of Facilities with 2009 Savings Claim (Electric)
Stage 3 - Committed	1	0	0	0	0
Stage 4 – Practicing*	6	0	3	3	1
Stage 5 – Sustaining*	11	1	2	5	5
Total	18	1	5	8	6

*At time of site visit selection

Table 3: Distribution of Top-Down Gas Savings Claims

Stage of Engagement	Total Number of Facilities Analyzed	Number of Facilities with 2006 Savings Claim (Gas)	Number of Facilities with 2007 Savings Claim (Gas)	Number of Facilities with 2008 Savings Claim (Gas)	Number of Facilities with 2009 Savings Claim (Gas)
Stage 3 - Committed*	1	0	0	0	0
Stage 4 - Practicing*	6	0	0	0	0
Stage 5 - Sustaining*	11	1	2	6	6
Total	18	1	2	6	6

*At time of site visit selection

Site Visit (Bottom-Up Savings) Methodology

Using a list of measures provided by the implementation contractor (Ecos), Cadmus developed an inventory of 14 facilities with energy savings claimed through their participation in CEI. Time and budget constraints, however, limited the number of site visits Cadmus could perform to six, therefore the six facilities with the highest claimed electric savings were selected for site visits. With input from NEEA, it was determined that Cadmus could validate the savings claims at three additional facilities by phone (in lieu of an onsite visit). Together these nine facilities represented over 95 percent of the total claimed energy savings. Table 4 presents the number of site visits and phone verifications Cadmus completed.

Table 4: Site Visit Disposition by Engagement Stage

Stage of Engagement	Number of Plants with Pending Savings Claim(s)*	Number of Completed Site Visits	Number of Completed Phone Verifications	Number of Facilities Not Selected for Site Visit or Phone Verification
Stage 3 - Committed*	2	1	0	1
Stage 4 - Practicing*	3	2	0	1
Stage 5 - Sustaining*	9	3	3	3
Total	14	6	3	5

*At time of site visit selection

Cadmus collected updated savings claims and measure documentation from NEEA's ITS and created a detailed list of completed energy efficiency projects ready for evaluation. The implementation team greatly facilitated this work by populating ITS with the savings claims and measure documentation for each facility.

Cadmus then conducted phone interviews or site visits at all nine facilities to verify measure installations and the validity of the claimed savings. In some instances, the savings claims had to be recalculated before completing the energy savings validation.

Findings

Findings are presented below in the following order:

- Top-down savings analysis,
- Site visit (bottom-up) savings analysis,
- Realization rate calculation,
- Pending savings claims, and
- Total validated savings.

Top-Down Savings Analysis

Table 5 presents both gross and net top-down savings. The gross savings numbers capture all savings at the facility, including savings from measures installed as part of the CEI program. To prevent double counting, Cadmus calculated net savings as the total top-down claim less any validated bottom-up savings that align with the time frame of the top-down claim. In the rare case that validated bottom-up savings exceed the top-down claim, top-down savings are not credited, but the validated bottom-up savings are not decreased (see Appendix A for more detailed facility-level gross and net top-down savings).

Table 4: Top-Down Savings by Year, 2006-2009

Year	Gross Top-Down Savings (aMW)	Net Top-Down Savings (aMW)	Gross Top-Down Savings (therms)	Net Top-Down Savings (therms)
2006	0.242	0.220	73,666	73,666
2007	0.672	0.461	131,378	131,378
2008	0.913	0.563	967,701	967,701
2009	0.816	0.579	1,879,095	1,879,095
Total	2.643	1.823	3,051,840	3,051,840

Site Visit Savings Analysis

Table 6 and Table 7 present electric and gas savings validated during this round of facility site visits and phone verifications. Cadmus validated savings for projects completed in 2007, 2008, and 2009. The bulk of the savings validated occurred in 2009. Operations and maintenance (O&M) improvements account for the majority of the savings validated during this round of site visits and phone verifications (see Appendix B for detailed facility-level validation data).

Table 6: Electric Savings by Year - Validated by Site Visits and Phone Verification (February / March 2010)

Year	O&M (aMW)	Incented Capital (aMW)	Unincented Capital (aMW)	Total Electric Savings (aMW)
2007	0.075	0.101	0	0.176
2008	0.020	0.011	0	0.031
2009	1.239	0.085	0.038	1.362
Total	1.334	0.197	0.038	1.569

Table 7: Gas Savings by Year - Validated by Site Visits and Phone Verification (February/March 2010)

Year	O&M (therms)	Incented Capital (therms)	Unincented Capital (therms)	Total Gas Savings (therms)
2009	0	0	20,600	20,600
Total	0	0	20,600	20,600

Realization Rate Calculation

Cadmus Realization Rate Calculation

During a program evaluation, it is often not possible or desirable for an evaluator to validate energy savings claims at all facilities due to lack of budget or time. In these cases, there may be a need, however, to estimate the percent of claimed savings that are likely to be validated. This can be done by assuming that the sampled measures are representative of the unsampled measures and extrapolating the validated savings from sampled facilities. To do this, the evaluator calculates a realization rate or proxy value which is applied to the unvalidated savings claims.

For this evaluation round, however, Cadmus was unable to develop a proxy value. We decided that the population size (and therefore the sample size) was too small and that the facilities with the largest impact on the realization rate were atypical from the population of food processing and pulp and paper facilities. Therefore, it was not appropriate to apply the realization rate to the outstanding savings claims.

As part of the validation process, Cadmus reviewed each savings claim to determine whether it was a reasonable estimate based on engineering standards and the operating conditions at each facility at the time of project completion. In some instances, Cadmus's calculations of energy savings differed from the savings claim. Measures were then validated based on the adjusted savings calculations, not the original savings claim.

Table 8 displays the overall realization rate for each facility. The realization rate is the ratio, expressed in percent, between the engineer's facility-level validated savings and the total savings claimed for that facility. In most cases there was either no difference or less than a 5 percent difference between claimed and validated savings. For two facilities, however, there was a significant difference between the claimed savings and the engineer's validated savings (see the following subsection for discrepancy discussion). Since the overall realization rate was calculated using a weighted average, these two facilities had a significant downward impact on the realization rate.

Table 8: Realization Rate

Plant	Number of Measures Claimed	Number of Validated Measures	Total Claimed Savings (aMW)	Total Validated Savings (aMW)	Savings Realization Rate
O-011	1	1	2.100	0.832	39.6%
I-009	3	3	0.043	0.043	100.0%
I-012	6	6	0.201	0.195	97.3%
W-017	1	1	0.101	0.101	100.0%
O-005	3	3	0.205	0.103	50.4%
O-006	1	1	0.006	0.006	100.0%
W-007	5	4	0.274	0.265	96.7%
O-003	1	1	0.001	0.001	100.0%
O-008*	2	2	0.023	0.023	100.0%
Total	23	22	2.959	1.569	53.0%

*Two measures that were added after the decision to do phone verification are not included in table. They are reported as pending savings in Table 9 below.

Reasons for Savings Claim Discrepancies

Cadmus reduced the savings claim at facility O-011 by 60 percent for two reasons. First, the project occurred in several phases spanning 2005–2009. Since the facility was not involved in the Initiative until 2007, the savings which occurred as part of the initial phases (2005–2007) could not be included. Second, the facility has significantly reduced their operating hours over the past two to three years. Therefore, the validated savings reflect the operating hours at the time the project was completed.

Cadmus reduced the savings claim at facility O-005 by approximately 50 percent. Although minor adjustments were made to other savings claims evaluated at this facility, the majority of the difference can be attributed to a reduction in savings for a single measure, the condenser spray nozzle replacement. Cadmus recalculated the energy savings for this measure with a 15 psig average condensing pressure reduction, a much more conservative estimate than the 30 psig reduction previously used. The 15 psig average condensing pressure reduction is consistent with operating conditions described by the facility's refrigeration engineer. Further, Cadmus applied a more conservative estimate of break horsepower. These factors reduced the overall savings for this measure by about 57 percent.

Why Our Realization Rate Is Not a Good Proxy

Given the facility sample and the measures validated, Cadmus is reluctant to apply the realization rate presented in Table 7 to estimate the realized savings for any non-validated savings claims. To apply a proxy to the non-validated claims, a more rigorous statistical

methodology is necessary. The methodology we have used does not meet that standard for the following reasons:

- Cadmus selected the facilities for measure validation based on the size of the savings claim, not on a statistical representation of the facility population, so it would be impossible to suggest that they were representative of the expected savings for non-validated measures.
- The measures Cadmus validated may not have been representative of the entire population of energy savings measures. This was the first time in four years of validation that Cadmus had encountered a discrepancy between an energy savings claim and a validation.
- A small number of measures and facilities had an inordinate influence on the overall realization rate. Measures at seven of the nine facilities had greater than 95 percent of validated savings/claimed savings ratios, while measures at two of the nine facilities had low validated savings/claimed savings ratios (less than 55 percent). One of those two facilities had only one measure validated. Yet, because this single measure had a significant savings claim associated with it which was adjusted, this single measure significantly reduce the overall realization rate.
- The number of measures that Cadmus validated during this evaluation is a fraction of the total measures validated over the course of the program. We validated 22 measures, which represent approximately 15 percent of the total number of measures validated since 2006 (a total of about 150 measures).

Cadmus believes that in future energy savings validations we can calculate a proxy for claimed energy savings if we select facilities for site visits which are representative of the sample population. A realization rate representative of the population may then be extrapolated to all participants. Until such a proxy is calculated Cadmus does not believe it can justify altering any pending savings claims listed in Table 8.

Outstanding Pending Savings

As previously mentioned, time and budget constraints limited the number of site visits. Table 9 lists outstanding pending savings for facilities in the food processing and pulp and paper markets. Pending savings refer to completed measures that have been documented and flagged as ready for evaluation. Savings numbers are listed as claimed on ITS, with no adjustments applied.

Table 9: Outstanding Pending Savings

Market	Outstanding Pending Electric Savings (kWh)*	Outstanding Pending Electric Savings (aMW)	Outstanding Pending Gas Savings (therms)*
Food Processing	5,476,110	0.625	7,476
Pulp & Paper	462,000	0.053	64,000
Total	5,938,110	0.678	71,476

*Listed as Pending on ITS as of 3/2/2010. Represents facilities that have reached Engagement Stage 3 or higher.

Total Savings

Table 10 presents total validated electric savings, including net top-down savings. Through the end of 2009, CEI has saved the region 7.864 aMW.

Table 10: Total Validated Electric Savings (2006-2009)

	O&M (aMW)	Incented Capital (aMW)	Unincented Capital (aMW)	Net Top-Down (aMW)	Total Electric Savings (aMW)
2006	0.161	0.489	0	0.220	0.869
2007	0.329	0.227	0.285	0.461	1.303
2008	1.079	1.306	0.617	0.563	3.565
2009	1.324	0.186	0.038	0.579	2.126
Total	2.893	2.208	0.940	1.823	7.864

Table 11 presents total validated gas savings to date, including net top-down savings. As previously noted, Cadmus did not track gas savings until 2008. The savings reported for 2006 and 2007 are solely the result of top-down analyses.

Table 11: Total Validated Gas Savings (2006-2009)

	O&M (therms)	Incented Capital (therms)	Unincented Capital (therms)	Net Top-Down (therms)	Total Gas Savings (therms)
2006	n/a	n/a	n/a	73,666	73,666
2007	n/a	n/a	n/a	131,378	131,378
2008	68,750	0	988,664	967,701	2,025,115
2009	0	0	20,600	1,879,095	1,899,695
Total	68,750	0	1,009,264	3,051,840	4,129,854

Conclusions

While the energy savings validation Cadmus carried out for these nine facilities added to the total energy savings for which the Initiative is responsible, in certain cases the total validated energy savings differed from the savings claims. Cadmus believes, however, that the validations present an accurate picture of the actual savings at each of these nine facilities.

One area that Cadmus and NEEA will need to address in the future is the development of a proxy value that can be applied to estimate energy savings claims. The realization rate that Cadmus calculated does not meet the standard that is necessary to estimate adjustments to energy savings claims. In future energy savings validation work, Cadmus believes that it will be possible to calculate a proxy to estimate savings claims. Until then, the outstanding pending claims will remain unadjusted.

Appendix B. Additional Energy Savings Tables and Site Visit Reports

Table 12. Top-Down Electric Savings by Facility and Year (2006 - 2009)

Site ID	2006			2007			2008			2009			Total Validated Net Top-Down Savings (kWh)
	Top-Down Claim (kWh)	Validated Bottom-Up Savings (kWh)	Validated Net Top-Down Savings (kWh)	Top-Down Claim (kWh)	Validated Bottom-Up Savings (kWh)	Validated Net Top-Down Savings (kWh)	Top-Down Claim (kWh)	Validated Bottom-Up Savings (kWh)	Validated Net Top-Down Savings (kWh)	Top-Down Claim (kWh)	Validated Bottom-Up Savings (kWh)	Validated Net Top-Down Savings (kWh)	
O-008	0	n/a	0	0	n/a	0	157,505	300,488	0	447,027	199,500	247,527	247,527
O-009	0	n/a	0	650,334	0	650,334	650,334	413,156	237,178	0	n/a	0	887,512
O-005	2,120,141	196,700	1,923,441	2,120,141	922,840	1,197,301	2,120,141	241,987	1,878,154	2,120,141	1,504,798	615,343	5,614,239
I-011	0	n/a	0	0	n/a	0	700,432	41,783	658,649	1,804,960	0	1,804,960	2,463,609
I-013	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
I-016	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
W-002	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
W-017	0	n/a	0	1,065,256	882,000	183,256	1,597,884	1,201,556	396,328	0	n/a	0	579,584
I-009	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
W-015	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
I-012	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
O-004	0	n/a	0	366,738	40,000	326,738	366,738	701,556	0	366,738	0	366,738	693,476
O-003	0	n/a	0	0	n/a	0	721,608	603,252	118,356	721,608	218,852	502,756	621,112
O-004	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
W-007	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
O-007	0	n/a	0	1,684,272	0	1,684,272	1,684,272	39,420	1,644,852	1,684,272	150,394	1,533,878	4,863,002
O-006	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
I-007	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
Total kWh	**2,120,141**	**196,700**	**1,923,441**	**5,886,741**	**1,844,840**	**4,041,901**	**7,998,914**	**3,543,198**	**4,933,517**	**7,144,746**	**2,073,544**	**5,071,202**	**15,970,061**
Total aMW	**0.242**	**0.022**	**0.220**	**0.672**	**0.211**	**0.461**	**0.913**	**0.404**	**0.563**	**0.816**	**0.237**	**0.579**	**1.823**

Table 13. Top-Down Gas Savings by Facility and Year (2006 - 2009)

Site ID	2006			2007			2008			2009			Total Validated Net Top-Down Savings (therms)
	Top-Down Claim (therms)	Validated Bottom-Up Savings (therms)	Validated Net Top-Down Savings (therms)	Top-Down Claim (therms)	Validated Bottom-Up Savings (therms)	Validated Net Top-Down Savings (therms)	Top-Down Claim (therms)	Validated Bottom-Up Savings (therms)	Validated Net Top-Down Savings (therms)	Top-Down Claim (therms)	Validated Bottom-Up Savings (therms)	Validated Top-Down Savings (therms)	
O-008	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
O-009	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
O-005	73,666	0	73,666	73,666	0	73,666	73,666	0	73,666	73,666	0	73,666	294,664
I-011	0	n/a	0	0	n/a	0	308,178	0	308,178	794,151	0	794,151	1,102,329
I-013	0	n/a	0	0	n/a	0	272,142	0	272,142	701,289	0	701,289	973,431
I-016	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
W-002	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
W-017	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
I-009	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
W-015	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
I-012	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
O-004	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
O-003	0	n/a	0	57,712	0	57,712	57,712	0	57,712	57,712	0	57,712	173,136
O-004	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
W-007	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
O-007	0	n/a	0	0	n/a	0	225,838	0	225,838	225,838	0	225,838	451,676
O-006	0	n/a	0	0	n/a	0	30,165	0	30,165	26,439	0	26,439	56,604
I-007	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a	0	0
Total (therms)	**73,666**	**0**	**73,666**	**131,378**	**0**	**131,378**	**967,701**	**0**	**967,701**	**1,879,095**	**0**	**1,879,095**	**3,051,840**

Table 14. Validated Electric and Gas Savings by Facility and Year (2006 - 2009)

				Validated Electric Savings (kWh)*					Validated Gas Savings (therms)*				
Site ID	Savings Year	Market	State	O&M	Incented Capital	Un-incented Capital	Top-Down	Electric Total	O&M	Incented Capital	Un-incented Capital	Top-Down	Gas Total
O-011	2009	PnP	OR	7,288,320	0	0	0	**7,288,320**	0	0	0	0	**0**
I-011	2008	FP	ID	0	0	0	658,649	**658,649**	0	0	0	308,178	**308,178**
I-011	2009	FP	ID	0	0	0	1,804,960	**1,804,960**	0	0	0	794,151	**794,151**
I-013	2008	FP	ID	0	0	0	0	**0**	0	0	0	272,142	**272,142**
I-013	2009	FP	ID	0	0	0	0	**0**	0	0	0	701,289	**701,289**
I-009	2009	FP	ID	190,409	0	184,977	0	**375,386**	0	0	20,600	0	**20,600**
I-012	2008	FP	ID	127,444	67,993	0	0	**195,437**	0	0	0	0	**0**
I-012	2009	FP	ID	869,760	501,960	144,185	0	**1,515,905**	0	0	0	0	**0**
W-017	2007	FP	WA	0	882,000	0	183,256	**1,065,256**	0	0	0	0	**0**
W-017	2008	FP	WA	0	0	0	396,328	**396,328**	0	0	0	0	**0**
O-005	2006	FP	OR	0	0	0	1,923,441	**1,923,441**	0	0	0	73,666	**73,666**
O-005	2007	FP	OR	659,154	0	0	1,197,301	**1,856,455**	0	0	0	73,666	**73,666**
O-005	2008	FP	OR	0	0	0	1,878,154	**1,878,154**	0	0	0	73,666	**73,666**
O-005	2009	FP	OR	77,913	169,177	0	615,343	**862,433**	0	0	0	73,666	**73,666**
O-006	2008	FP	OR	0	0	0	0	**0**	0	0	0	30,165	**30,165**
O-006	2009	FP	OR	50,400	0	0	0	**50,400**	0	0	0	26,439	**26,439**
W-007	2008	FP	WA	39,000	29,580	0	0	**68,580**	0	0	0	0	**0**
W-007	2009	FP	WA	2,251,296	0	0	0	**2,251,296**	0	0	0	0	**0**
O-004	2007	FP	OR	0	0	0	326,738	**326,738**	0	0	0	0	**0**
O-004	2009	FP	OR	0	0	0	366,738	**366,738**	0	0	0	0	**0**
O-003	2007	FP	OR	0	0	0	0	**0**	0	0	0	57,712	**57,712**
O-003	2008	FP	OR	10,860	0	0	118,356	**129,216**	0	0	0	57,712	**57,712**
O-003	2009	FP	OR	0	0	0	502,756	**502,756**	0	0	0	57,712	**57,712**
O-007	2007	FP	OR	0	0	0	1,684,272	**1,684,272**	0	0	0	0	**0**
O-007	2008	FP	OR	0	0	0	1,644,852	**1,644,852**	0	0	0	225,838	**225,838**
O-007	2009	FP	OR	0	0	0	1,533,878	**1,533,878**	0	0	0	225,838	**225,838**
O-009	2007	FP	OR	0	0	0	650,334	**650,334**	0	0	0	0	**0**
O-009	2008	FP	OR	0	0	0	237,178	**237,178**	0	0	0	0	**0**
O-008	2009	FP	OR	123,900	75,600	0	247,527	**447,027**	0	0	0	0	**0**
Total Savings Validated Feb. 2010				**11,688,456**	**1,726,310**	**329,162**	**15,970,061**	**29,713,989**	**0**	**0**	**20,600**	**3,051,840**	**3,072,440**
Total Validated Savings (2006-2009)				**Electric (aMW)****					**Gas (therms)****				
2006 Savings (Previously Validated)				0.161	0.489	0.000	0.000	**0.650**	n/a	n/a	n/a	0	**0**
2006 Savings (Validated 2010)				0.000	0.000	0.000	0.220	**0.220**	0	0	0	73,666	**73,666**
2007 Savings (Previously Validated)				0.254	0.126	0.285	0.000	**0.665**	n/a	n/a	n/a	0	**0**
2007 Savings (Validated 2010)				0.075	0.101	0.000	0.461	**0.637**	0	0	0	131,378	**131,378**
2008 Savings (Previously Validated)				1.059	1.295	0.617	0.000	**2.971**	68,750	0	988,664	0	**1,057,414**
2008 Savings (Validated 2010)				0.020	0.011	0.000	0.563	**0.595**	0	0	0	967,701	**967,701**
2009 Savings (Previously Validated)				0.085	0.101	0.000	0.000	**0.186**	0	0	0	0	**0**
2009 Savings (Validated 2010)				1.239	0.085	0.038	0.579	**1.941**	0	0	20,600	1,879,095	**1,899,695**
Total Validated Savings				**2.893**	**2.208**	**0.940**	**1.823**	**7.864**	**68,750**	**0**	**1,009,264**	**3,051,840**	**4,129,854**

* Presents savings validated during site visits, phone verifications and top-down analyses conducted Feb. 2010.

** Presents sum of savings validated during this round of site visits, phone verifications and top-down savings analyses and all previous site visit efforts.

Table 15. Total Validated Electric (aMW) and Gas (therms) Savings by Market (2006 - 2009)

	Validated Electric Savings (aMW)					Validated Gas Savings (therms)				
	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Electric Savings	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Gas Savings
Food Processing	1.457	2.005	0.361	1.823	**5.646**	68,750	0	1,009,264	3,051,840	**4,129,854**
Pulp & Paper	1.436	0.203	0.578	0	**2.217**	n/a	n/a	n/a	n/a	**n/a**
TOTAL*	**2.893**	**2.208**	**0.940**	**1.823**	**7.864**	**68,750**	**0**	**1,009,264**	**3,051,840**	**4,129,854**

*TOTAL = Aggregate of Food Processing and Pulp & Paper

Table 16. Annual Validated Electric (aMW) and Gas (therms) Savings by Market (2009)

	Validated Electric Savings (aMW)					Validated Gas Savings (therms)				
	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Electric Savings	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Gas Savings
Food Processing	0.492	0.186	0.038	0.579	**1.294**	0	0	20,600	1,879,095	**1,899,695**
Pulp & Paper	0.832	0	0	0	**0.832**	n/a	n/a	n/a	n/a	**n/a**
TOTAL*	**1.324**	**0.186**	**0.038**	**0.579**	**2.126**	**0**	**0**	**20,600**	**1,879,095**	**1,899,695**

*TOTAL = Aggregate of Food Processing and Pulp & Paper

Table 17. Adjustments to Annual Validated Electric (aMW) and Gas (therms) Savings by Market and Year (2006 - 2009) from 2010 Data Collection and Analysis Activities

	Validated Electric Savings (aMW)					Validated Gas Savings (therms)				
	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Electric Savings	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Gas Savings
Food Processing										
2006	0	0	0	0.220	**0.220**	0	0	0	73,666	**73,666**
2007	0.075	0.101	0	0.461	**0.637**	0	0	0	131,378	**131,378**
2008	0.020	0.011	0	0.563	**0.595**	0	0	0	967,701	**967,701**
2009	0.407	0.085	0.038	0.579	**1.109**	0	0	20,600	1,879,095	**1,899,695**
Food Processing Total	**0.502**	**0.197**	**0.038**	**1.823**	**2.560**	**0**	**0**	**20,600**	**3,051,840**	**3,072,440**
Pulp & Paper										
2006	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
2007	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
2008	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
2009	0.832	0	0	0	0.832	n/a	n/a	n/a	n/a	n/a
Pulp & Paper Total	**0.832**	**0**	**0**	**0**	**0.832**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
TOTAL*	**1.334**	**0.197**	**0.038**	**1.823**	**3.392**	**0**	**0**	**20,600**	**3,051,840**	**3,072,440**

*TOTAL = Aggregate of Food Processing and Pulp & Paper

Table 18. Validated Electric (aMW) and Gas Savings (therms) in the Food Processing Market by Year (2006 - 2009)

Year	Validated Electric Savings (aMW)					Validated Gas Savings (therms)				
	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Electric Savings	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Gas Savings
2006	0.152	0.489	0	0.220	**0.860**	n/a	n/a	n/a	73,666	**73,666**
2007	0.286	0.114	0.272	0.461	**1.133**	n/a	n/a	n/a	131,378	**131,378**
2008	0.528	1.216	0.051	0.563	**2.359**	68,750	0	988,664	967,701	**2,025,115**
2009	0.492	0.186	0.038	0.579	**1.294**	0	0	20,600	1,879,095	**1,899,695**
TOTAL*	**1.457**	**2.005**	**0.361**	**1.823**	**5.646**	**68,750**	**0**	**1,009,264**	**3,051,840**	**4,129,854**

*TOTAL = Aggregate of All Years

Table 19. Validated Electric Savings (aMW) in the Pulp and Paper Market by Year (2006 - 2009)

Year	Validated Electric Savings (aMW)				
	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Electric Savings
2006	0.009	0	0	0	**0.009**
2007	0.044	0.113	0.013	0	**0.170**
2008	0.551	0.090	0.566	0	**1.206**
2009	0.832	0	0	0	**0.832**
TOTAL*	**1.436**	**0.203**	**0.578**	**0**	**2.217**

*TOTAL = Aggregate of All Years

Table 20. Total Validated Electric Savings (aMW) by Year (2006 - 2009)

Year	Validated Electric Savings (aMW)				
	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Electric Savings
2006	0.161	0.489	0	0.220	**0.869**
2007	0.329	0.227	0.285	0.461	**1.303**
2008	1.079	1.306	0.617	0.563	**3.565**
2009	1.324	0.186	0.038	0.579	**2.126**
TOTAL*	**2.893**	**2.208**	**0.940**	**1.823**	**7.864**

*TOTAL = Aggregate of All Years

Table 21. Validated Electric (aMW) and Gas (therms) Savings by State (2009)

State	Validated Electric Savings (aMW)					Validated Gas Savings (therms)				
	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Electric Savings	O&M	Incented Capital	Unincented Capital	Net Top-Down	Total Gas Savings
Oregon	0.946	0.129	0	0.373	**1.447**	0	0	0	383,655	**383,655**
Washington	0.257	0	0	0	**0.257**	0	0	0	0	**0**
Idaho	0.121	0.057	0.038	0.206	**0.422**	0	0	20,600	1,495,440	**1,516,040**
TOTAL*	**1.324**	**0.186**	**0.038**	**0.579**	**2.126**	**0**	**0**	**20,600**	**1,879,095**	**1,899,695**

*TOTAL = Aggregate of All States

Table 22. Site Visit Report - O-011

Company Information		Evaluation Information		CEI Information	
Company	O-011	Evaluation By	Randy McCall	Stage of Engagement	Stage 3 Committed
Location	OR	Evaluation Date	2/18/2010	Date Current Stage Reached	4/21/2008
NAICS Code	322			Date of Current Envinta	July 2007

Facility Details

Description of Actions taken	
O&M Projects	1. Changed refiner plates to optimize performance
Capital Projects	None
Number of Employees	240
Product Manufactured	Newsprint and paper bag material
Production Process	Process is all off peak at current time; production scheduled afternoon in advance based on electricity rates
Production Trends	Currently operating at 56 hours per week, or 2900 hours/year
Metering in Place	Yes
Annual Operating Hours	2,900

Energy Use Details

Annual Energy Use	*kWh*	336,000,000	*therms*	0
Energy Systems Breakdown	*Compressed Air*		*Motors*	
	Refrigeration		*Steam*	
	Gas		*Other*	
Types of Energy Used	*Electric*		*Gas*	
	Other			

Energy Savings

O&M Savings	7,288,320 kWh
Capital Savings	None
Comments	1. Savings of refiner plate measure revised to reflect operating hours during 2009, and phases of the overall improvement in refiner plate energy use reductions.

Utility Information

Utility Involved (Y/N)	No
Utility Name	Portland General Electric
Incentive Provided (Y/N)	No

Table 23. Site Visit Report - I-009

Company Information		Evaluation Information		CEI Information	
Company	I-009	Evaluation By	Randy McCall	Stage of Engagement	Stage 4 Practicing
Location	ID	Evaluation Date	2/8/2010	Date Current Stage Reached	9/11/2009
NAICS Code	311			Date of Current Envinta	November 2007

Facility Details

Description of Actions taken	
O&M Projects	1. Energy Efficient Lighting - Lighting Upgrade 2. High Efficiency Motors
Capital Projects	1. Upgraded to Opti-Sorts - to automatically separate defective product, defective product is no longer refrigerated. Compressed air- increases recovery ratios, Electrical & Steam. Part 1, kWh Savings
Number of Employees	278
Product Manufactured	French fries
Production Process	French fry production: cooking, freezing, packaging
Production Trends	Facility runs 24/7 - down for project for 30 days in 2009 (Sept. to Sept.); also 24hr shut down every three weeks
Metering in Place	Utility meter for facility only - no submetering by end use
Annual Operating Hours	7200

Energy Use Details

Annual Energy Use		*kWh*	40,087,621	*therms*	4,066,030
Energy Systems Breakdown		*Compressed Air*		*Motors*	
		Refrigeration		*Steam*	
		Gas		*Other*	
Types of Energy Used		*Electric*	40 percent	*Gas*	60 percent
		Other			

Energy Savings

O&M Savings	190,409 kWh
Capital Savings	184,977 kWh 20,600 therms
Comments	Other Projects: 1. Heat Exchange loops for Hot Cleaning Water and Preheating Wastewater 2. LED lighting for freezers

Utility Information

Utility Involved (Y/N)	Yes
Utility Name	Idaho Power Company
Incentive Provided (Y/N)	Yes

Table 24. Site Visit Report – 1-012

Company Information		Evaluation Information		CEI Information	
Company	I-012	Evaluation By	Randy McCall	Stage of Engagement	Stage 4 Practicing
Location	ID	Evaluation Date	2/9/2010	Date Current Stage Reached	9/23/2009
NAICS Code	311			Date of Current Envinta	October 2008

Facility Details

Description of Actions taken	
O&M Projects	1. Steam Condensate Improvements- improvement to their steam condensate system by routing the fryer condensate to the Low Pressure steam system rather than to boiler 2. Condenser Spray Nozzle Upgrade
Capital Projects	1. Air Compressor Retrofit, replace with VFD 2. Receiving Upgrade-upgrade pumps to electric motors and addition to rock trap system. 3. Cold grading upgrade- reducing the size of the motors and installing more advanced controls to cold grading process 4. Nebraska Boiler Shutdown Mode Controls - added controls that allow the boiler cycle in the 25-160 psi range during plant shutdowns resulting in 440 hours per year less run time on a pump and a fan.
Number of Employees	314
Product Manufactured	French fries, hashbrowns
Production Process	French fry and hashbrown processing: cooking, freezing, packaging
Production Trends	Flat 24/7 with shut down for 24hr clean up every three weeks
Metering in Place	No sub-metering of end uses
Annual Operating Hours	7100

Energy Use Details

Annual Energy Use	*kWh*	41,800,645	*therms*	3,915,290
Energy Systems Breakdown	*Compressed Air*		*Motors*	
	Refrigeration		*Steam*	
	Gas		*Other*	
Types of Energy Used	*Electric*	40 percent	*Gas*	60 percent
	Other			

Energy Savings

O&M Savings	997,204 kWh
Capital Savings	714,138 kWh
Comments	1. Savings estimate for steam condensate improvements measure revised for PF and efficiency. 2. Savings estimate for receiving upgrades measure revised for PF and efficiency. 3. Savings estimate for cold grading upgrade measure revised for PF and efficiency. 4. Savings estimate for Nebraska boiler measure revised for PF and efficiency. Other Projects: 1. Thermosyphon Oil Cooling for Refrigeration Compressors (proposed/planned for spring)

Utility Information

Utility Involved (Y/N)	Yes
Utility Name	Idaho Power Company

Incentive Provided (Y/N)	Yes

Table 25. Site Visit Report – W-017

Company Information		Evaluation Information		CEI Information	
Company	W-017	Evaluation By	Randy McCall	Stage of Engagement	Stage 4 Practicing
Location	WA	Evaluation Date	2/10/2010	Date Current Stage Reached	10/30/2009
NAICS Code	311			Date of Current Envinta	Unknown

Facility Details					
Description of Actions taken					
O&M Projects	None				
Capital Projects	1. Compressed Air Upgrade-Upgrade of Flow Control, 1 new vessel, and new compressor controls, Complete 5/8/2009				
Number of Employees	412				
Product Manufactured	French fries and potato products				
Production Process	French Fries are cut, fried, and frozen for packaging roughly 260 days per year; product is moved out of the facility quickly with approximately 5 days based on storage capacity and production rate.				
Production Trends	Continuous during processing season (24/7)				
Metering in Place	None				
Annual Operating Hours	7,200				
Energy Use Details					
Annual Energy Use		*kWh*	55,604,138	*therms*	8,048,470
Energy Systems Breakdown		*Compressed Air*		*Motors*	
		Refrigeration		*Steam*	
		Gas		*Other*	
Types of Energy Used		*Electric*		*Gas*	
		Other			
Energy Savings					
O&M Savings	None				
Capital Savings	882,000 kWh				
Comments	Additional Projects: 1. Spiral Freezer Belt Replacement with Plastic Belt 2. Boiler improvements including new fin tube feedwater economizer and additional direct contact condensing economizer 3. Fryer stack heat recovery (steam vapor from fryers) 4. New evaporative condenser for ammonia refrigeration system				
Utility Information					
Utility Involved (Y/N)	Yes				
Utility Name	Avista Utilities				
Incentive Provided (Y/N)	Yes				

Table 26. Site Visit Report – O-005

Company Information		Evaluation Information		CEI Information	
Company	O-005	Evaluation By	Randy McCall	Stage of Engagement	Stage 5 Sustaining
Location	OR	Evaluation Date	2/18/2010	Date Current Stage Reached	11/9/2009
NAICS Code	311			Date of Current Envinta	April 2006

Facility Details

Description of Actions taken	
O&M Projects	1. Replace Condenser Spray Nozzles 2. Refrigeration Tunnel Operation Reduction changed refrigeration tunnel start up time
Capital Projects	1. New Condenser for Brooks Cold Storage (BCS)- 2/19/2009-7/10/2009 - ETO.
Number of Employees	838
Product Manufactured	Frozen fruits and vegetables, canned fruits and vegetables
Production Process	Frozen, canned
Production Trends	Seasonal - full production during May-Nov; very limited rework Nov.-May
Metering in Place	No
Annual Operating Hours	3,700

Energy Use Details

Annual Energy Use		*kWh*	19,586,105	*therms*	69,712
Energy Systems Breakdown		*Compressed Air*	5%	*Motors*	5%
		Refrigeration	45%	*Steam*	45%
		Gas		*Other*	
Types of Energy Used		*Electric*	55%	*Gas*	45%
		Other			

Energy Savings

O&M Savings	737,067 kWh
Capital Savings	169,177 kWh
Comments	1. Savings for condenser spray nozzle measure revised to reflect more reasonable decrease in condenser lift. 2. Refrigeration savings portion of tunnel operation reduction measure revised because it was calculated too high.

Utility Information

Utility Involved (Y/N)	Yes
Utility Name	Portland General Electric
Incentive Provided (Y/N)	Yes

Table 27. Site Visit Report – O-006

Company Information		Evaluation Information		CEI Information	
Company	O-006	Evaluation By	Randy McCall	Stage of Engagement	Stage 5 Sustaining
Location	OR	Evaluation Date	3/1/2010	Date Current Stage Reached	10/21/2009
NAICS Code	311			Date of Current Envinta	February 2009

Facility Details

Description of Actions taken	
O&M Projects	1. Shift to 4 day work week during off-season, Completed 1/1/2009.
Capital Projects	None
Number of Employees	240
Product Manufactured	Frozen vegetables
Production Process	Processes a variety of vegables during the spring (incl. corn, green beans, peas and carrots), process consists of cleaning, sorting, cutting, blanching and freezing
Production Trends	28 weeks of production season (~7 months)
Metering in Place	No (utility metering only)
Annual Operating Hours	5,260

Energy Use Details

Annual Energy Use	*kWh*	10,859,280	*therms*	4,408,712
Energy Systems Breakdown	*Compressed Air*		*Motors*	
	Refrigeration		*Steam*	
	Gas		*Other*	
Types of Energy Used	*Electric*	56%	*Gas*	44%
	Other			

Energy Savings

O&M Savings	50,400 kWh
Capital Savings	None
Comments	None

Utility Information

Utility Involved (Y/N)	No
Utility Name	Umatilla Electric Cooperative
Incentive Provided (Y/N)	No

Table 28. Site Visit Report – W-007

Company Information		Evaluation Information		CEI Information	
Company	W-007	Evaluation By	Randy McCall	Stage of Engagement	Stage 4 Practicing
Location	WA	Evaluation Date	2/10/2010	Date Current Stage Reached	9/30/2009
NAICS Code	311			Date of Current Envinta	March 2008

Facility Details

Description of Actions taken	
O&M Projects	1. Shut Down One Compressor (65hp). Reduce the use of 3 compressors to two by keeping the air system with minimal leaks 2. Replace Rotary Screen (Contra shear) with stationary screens 3. Energy efficient spray nozzle replacement to prep condensers for efficient operation
Capital Projects	1. Replace Metal Halide 400w with T5HO- 4 bulb lights. Replace 400w metal halide lights with energy efficient T50HO 4 bulb fluorescent fixtures
Number of Employees	187
Product Manufactured	Frozen vegetables
Production Process	Blanching, freezing and packaging
Production Trends	Season starts roughly June 1, and runs through about Dec 1; rework during off season
Metering in Place	Boiler feedwater, fresh & waste water, electric utility interval data, manual log for compressed air
Annual Operating Hours	7,400

Energy Use Details

Annual Energy Use	*kWh*	28,968,960	*therms*	77,307
Energy Systems Breakdown	*Compressed Air*	35%	*Motors*	15%
	Refrigeration	50%	*Steam*	25%
	Gas		*Other*	
Types of Energy Used	*Electric*	70%	*Gas*	30%
	Other			

Energy Savings

O&M Savings	2,290,296 kWh
Capital Savings	29,580 kWh
Comments	Other Projects: 1. Motor Replacement with pumps with VFD controls. Eliminated 5 each 10hp motors and replaced with 2 each 15hp pumps with VFD controls (documented and verified but not yet complete at time of site visit) 2. Hydraulic Room Controller - VFD

Utility Information

Utility Involved (Y/N)	Yes
Utility Name	Grant County PUD

Incentive Provided (Y/N)	Yes

Table 29. Site Visit Report – O-003

Company Information		Evaluation Information		CEI Information	
Company	O-003	Evaluation By	Randy McCall	Stage of Engagement	Stage 5 Sustaining
Location	OR	Evaluation Date	3/4/2010	Date Current Stage Reached	12/3/2009
NAICS Code	311			Date of Current Envinta	February 2009

Facility Details					
Description of Actions taken					
O&M Projects	1. Shift to 4 day work week during off-season				
Capital Projects	None				
Number of Employees	628				
Product Manufactured	Vegetables				
Production Process	Canning and some freezing				
Production Trends					
Metering in Place					
Annual Operating Hours	3,300				
Energy Use Details					
Annual Energy Use		*kWh*	2,842,790	*therms*	475,683
Energy Systems Breakdown		*Compressed Air*		*Motors*	
		Refrigeration		*Steam*	
		Gas		*Other*	
Types of Energy Used		*Electric*	21%	*Gas*	79%
		Other			
Energy Savings					
O&M Savings	10,860 kWh				
Capital Savings	None				
Comments	None				
Utility Information					
Utility Involved (Y/N)	No				
Utility Name	Portland General Electric				
Incentive Provided (Y/N)	No				

Table 30. Site Visit Report – O-008

Company Information		Evaluation Information		CEI Information	
Company	O-008	Evaluation By	Randy McCall	Stage of Engagement	Stage 5 Sustaining
Location	OR	Evaluation Date	3/4/2010	Date Current Stage Reached	11/9/2009
NAICS Code	311			Date of Current Envinta	February 2009

Facility Details					
Description of Actions taken					
O&M Projects	1. Leak detection and repair program for 2008, Completed 12/2/2008.				
Capital Projects	1. Replace Joy compressor with a VFD compressor.				
Number of Employees	838				
Product Manufactured	Fruit products				
Production Process	Concentrate line, fruit flake line, formulated line, berry fresh pack in summer				
Production Trends					
Metering in Place					
Annual Operating Hours	3,700				
Energy Use Details					
Annual Energy Use		*kWh*	19,586,105	*therms*	69,712
Energy Systems Breakdown		*Compressed Air*		*Motors*	
		Refrigeration		*Steam*	
		Gas		*Other*	
Types of Energy Used		*Electric*	13%	*Gas*	87%
		Other			
Energy Savings					
O&M Savings	123,900 kWh				
Capital Savings	75,600 kWh				
Comments	None				
Utility Information					
Utility Involved (Y/N)	Yes				
Utility Name	Portland General Electric				
Incentive Provided (Y/N)	Yes				

Appendix C. A Review of Market Effects (2005-2010) Memorandum

The Industrial Sector Initiative:

A Review of Market Effects (2005-2010)

Prepared for
The Northwest Energy Efficiency Alliance

Prepared by
The Cadmus Group, Inc. / Energy Services
720 SW Washington Street, Suite 400
Portland, OR 97205
503-228-2992

May 17, 2010

Introduction

The Cadmus Group, Inc., (Cadmus) has been the third-party evaluation contractor for the Initiative of the Northwest Energy Efficiency Alliance (NEEA) since the Initiative was launched in 2005. Cadmus (formerly Quantec, LLC) has been tracking the implementation of the initiative and reporting its progress and accomplishments to NEEA through formal market evaluation reports (MPERs), *ad hoc* briefings, and memoranda.

In this report, Cadmus offers a brief account of the Initiative's progress and empirical market effects over the past five years. This report describes the original intent, strategic vision, goals, and the evolution of the Initiative from the perspective of an independent evaluator. It then identifies key options available to NEEA as it formulates a future direction and market strategy for the Initiative. Our purpose for this review is to provide additional perspective on the history of the Initiative and to offer a vantage point for NEEA as it evaluates alternative paths for the Initiative's future. The observations and conclusions in this report derive from existing evaluation data and documents, including MPERs, and recent informal interviews with the Initiative's implementation staff and conservation resources staff at the Northwest Power and Conservation Council (the Council).

Background

In July 2004, NEEA's board of directors approved funding for a five-year project designed to improve energy management practices and to stimulate demand for energy-efficient products and services in the Northwest's industrial sector. The result was the Industrial Efficiency Alliance (IEA), which was renamed the Initiative later.

NEEA was motivated to create the Initiative by market research that indicated the following:

1. There was significant potential for energy efficiency in the regional industrial market, and
2. There was little evidence of market development for industrial energy-efficiency products and services.

Potential for Energy Efficiency

NEEA noted that the industrial sector was a large regional economic driver and employer as well as a major energy consumer that had significant energy conservation potential. Data from the Northwest Power and Conservation Council (Council) indicated that industry consumed 27 percent of the region's non-DSI (direct service industry) electricity. The Council's forecasts also indicated industrial sector loads were expected to grow at an annual rate of nearly 1.6 percent through 2025. In addition, energy conservation potential studies had estimated that Northwest industries could achieve significant energy conservation (as much as 23 percent) at the end-use level.

Opportunities for Market Development

NEEA found little evidence of market development for energy-efficiency products and services in the industrial sector. In 2004, market transformation literature had shown that the industrial

sector appeared reluctant to invest in energy-efficiency improvements, even when such investments yielded returns that were similar to, if not higher than, other investments.

Strategic Goals of the Initiative

NEEA designed the Initiative to overcome or mitigate the market barriers that were believed to impede the adoption of good energy management practices in the sector. These barriers were primarily a lack of awareness and technical knowledge; a shortage of—and, in some cases, an absence of—a specialized network of trade allies; and an inadequate or non-existent delivery structure for energy-efficient products and services. The Initiative's strategic plan highlighted two goals:

1. Make energy management a more integral part of the process at the corporate and plant levels where decisions are made regarding facility expansions, improvements, and operations within targeted vertical markets. This change would create a natural demand for systems-oriented efficiency improvements.
2. Transform the market for industrial equipment and service suppliers so that they could better provide and actively promote systems optimization services and products to their end customers.

By working directly with firms and their trade allies, the Initiative aimed to foster a natural, market-based demand for system-oriented energy improvements with the goal of making continuous energy improvement (CEI) a routine part of management and operation for the Northwest's industrial firms. The Initiative designed a two-pronged intervention strategy consisting of (1) a vertical market-oriented approach, and (2) a cross-cutting systems-oriented approach.

Employing a Vertical Market Intervention Approach

The vertical market intervention incorporated a bottom-up (plant- and employee-level) component designed to stimulate demand at the plant level and a top-down (corporate-level) component designed to increase executive commitment, leadership, and financial resources that supported energy management. At the same time, demonstrations and case studies showcased tangible energy savings results from adopting energy-efficient products and technologies.

Employing a Cross-Cutting, System-Oriented Approach

The cross-cutting, systems-oriented market interventions aimed to build the necessary infrastructure to support market development for energy management products and services. NEEA relied on training and education to address a facility's technical needs for systems-oriented energy management. NEEA employed a concurrent effort related to channel management, encouraging trade allies to develop services that supported energy management needs. As with the vertical market counterpart, NEEA reinforced the concept of incorporating systems-oriented energy management by using demonstrations and case studies that exemplified energy saving results.

In 2006, the Initiative began revising its implementation strategy based on additional market research, new program logic models, and an internal assessment of implementation procedures. The revised strategy eliminated the cross-cutting component and instead began placing greater emphasis on more focused trainings. Accordingly, resources were diverted into developing more

industry-specific tools and staff support to better align the Initiative's products with specific market needs.

Measuring Performance

NEEA developed a set of key performance indicators (KPIs) to measure program impact and activity. These KPIs provided the principal link between implementation and the resulting market effects and, ultimately, energy savings. KPIs tracked progress on training, business practices, market coordination, channel management, and product and services development. Measurement data came from surveys (market partner, target audience and training follow-up), staff interviews, and site visits.

Industry-Specific Efforts

To narrow its focus, the Initiative targeted the pulp and paper industries and the food processing industries, due to their strong regional presence, large energy demand, broad economic contribution, differing corporate structure and plant sizes, and savings potentials.

- Pulp and paper, was characterized by a small number of vertically organized businesses (28) that produced 10 percent of all national pulp and paper sales.
- Food processing in the Northwest comprised numerous firms with a wide range of corporate structures and sizes and had the largest share of the region's industrial capital expenditure. This industry also benefitted from a strong and active local association, the Northwest Food Processers Association (NWFPA), which could serve as an effective conduit for marketing communications.

Together, the two industries accounted for nearly 20 percent of the Northwest's aggregate industrial electricity use. Much of this energy was expended on motor systems, facility lighting and HVAC, operations and maintenance, and refrigeration.

KPIs, Targets, and Progress

To monitor progress, NEEA set five- and ten-year performance targets for the Initiative as well as 33 KPIs at the outset of the program. The performance indicators included a cumulative electricity savings target of 130 aMW by 2015, of which 35 percent (45 aMW) would be achieved in the first five years.

As the program evolved over five years, the Initiative revised both the energy saving targets and various KPIs to reflect the market conditions more realistically. For example, as it became clear that the five-year 45aMW energy savings goal was not realistic, the savings target dropped to 20 aMW. Also, the Initiative condensed the original 33 KPIs to six Market Progress Indicators (MPIs) that were considered better measures of the Initiative's progress:

- MPI 1: Percent of large food processing firms (as measured in terms of employment share) and pulp and paper firms (as measured in terms of output capacity) that implement CEI.
- MPI 2: Percent of industrial firms from non-targeted markets that implement CEI.
- MPI 3: Number of large (multi-facility) food processing or pulp and paper firms that adopt CEI in plants or mills without Initiative involvement.

- MPI 4: Number of large food processing or pulp and paper firms that adopt CEI in plants or mills outside the Northwest.
- MPI 5: Percent of Northwest utility representatives that promote CEI as part of their energy efficiency activities.
- MPI 6: Trade associations in the target markets promote CEI.

The progress measurement activities to date have focused on MPI 1, MPI 5, and MPI 6 as these indicators are more easily tracked by the Initiative. For the 2010 MPER, Cadmus will collect and analyze data measuring progress on MPI 2, MPI 3, and MPI 4.

Current Situation

NEEA has completed the five-year project and is at a point now where it must determine how best to build upon the Initiative's success. As NEEA develops the strategy for the next five years (2010-14), they face a number of questions about the future direction of the program.

- Should the Initiative continue its current vertically oriented outreach program targeting new facilities/companies and industries but, perhaps, with more intensive energy management programs?
- Should the cross-cutting components be expanded to integrate current outreach efforts with knowledge transfer, training, and educational outreach?
- Should NEEA create new programmatic initiatives that leverage the market transformation effects for which the Initiative has been responsible?
- Should a hybrid approach be adopted that incorporates vertical and cross-cutting measures targeting the broader industrial market?

As NEEA grapples with these questions, it is instructive to consider the accomplishments and empirical market effects of the Initiative during its first years of operation.

Findings

The results of the independent evaluation of the Initiative over the past five years indicate different outcomes in the two target markets. While the food processing market showed success, as discussed in the next section, the pulp and paper market did not show the same progress due to a number of factors:

- First, Cadmus noted in MPER#1 that based on evaluation results, as well as national statistics available from the Department of Energy - Energy Information Administration, the pulp and paper industry had already shown a trend in decreasing energy intensity, perhaps indicating a higher awareness and knowledge of energy efficiency practices.
- Second, the industry was impacted by the economic downturn, which resulted in production curtailment and plant closures.
- Third, many regional mills are owned by companies with headquarters outside the Northwest, making it difficult to gain corporate buy-in for CEI.

- Finally, the absence of a strong regional association made it difficult to reach the regional industry in a consistent and lasting manner.

As such, the Initiative shifted their focus in 2009 to the food processing industry and backed away from actively pursuing pulp and paper participants. Due to this change in strategy, the evaluation also recently shifted focus to the food processing industry as well.

The Initiative has shown much more success with the food processing industry and has made progress with MPI1 (target market firms practicing CEI), MPI 5 (utility promotion of CEI), and MPI 6 (coordination with NWFPA). In MPER# 5 published in May 2009, Cadmus reported that nearly 20 percent of the food processing target market, as measured in terms of total employment, was implementing CEI, suggesting the Initiative would exceed its stated MPI 1 target of 13 percent of large food processors practicing CEI by December 2009.[15] In regards to MPI 5, the 2009 Utility Survey indicated that almost all utilities understood CEI and over half of the utility respondents promoted some version of CEI. In regards to MPI 6, the NWFPA has adopted aggressive energy intensity targets for its members.

The most compelling evidence of the Initiative's success in the food processing sector is found in (1) the response of the target audience and market partners to the Initiative, and (2) the impact of the Initiative on regional energy planning and policy. These results are summarized below.

Response of End-Users

Cadmus has conducted annual Target Audience Follow-Up (TAFU) interviews with Initiative participants since 2006. The interviews were designed to (1) collect participants' feedback regarding their involvement in the Initiative and (2) determine the Initiative's role in the participants' decisions to implement Continuous Energy Improvement (CEI) at their plants.

In 2006, the Initiative had 11 industrial plants (including two pulp and paper and nine food processing plants) classified as participants, and Cadmus interviewed eight of them. Cadmus found that the most important overarching issues for industrial end users were staying competitive and reducing operating costs, including energy costs. With respect to energy management, six interviewees indicated they had formal energy management plans, and most interviewees indicated they held formal discussions on energy usage and CEI with staff. Only half of the participants mentioned data tracking, and most noted that data tracking was only discussed on a monthly or annual basis. Participants also indicated that they valued the Initiative and relied on the face-to-face meetings with Initiative staff to advance energy management within their firm. The 2006 TAFU results also indicated that participants were not coordinating with their utility and that the Initiative was not leveraging utility resources to spread the word about the Initiative.

By May 2009, participation in the food processing market had grown to 21 plants that were practicing CEI at Stage 3 (Committed or higher). In Cadmus' interviews with 18 of these participants, Cadmus determined that some issues (such as the industrial end user's interest in

[15] The market penetration percentage in the food processing market is defined in terms of the total number of employees at plants with 250 or more employees at an Engagement Stage of 3 or higher, relative to the total number of employees in the target market (41,765).

staying competitive and reducing costs) stayed constant since the first TAFU interviews. Industrial end users continue to face a tight market, where capital and time constraints limit a firm's ability to focus on energy efficiency.

However, the 2009 TAFU, which focused on the food processing market, also revealed a markedly evolved participant profile. Of the 18 participants Cadmus interviewed, the majority indicated they had an energy champion, an energy action plan, and some type of data tracking plan in place. More than half of the firms were able to quantify energy savings related to their capital and operations and maintenance (O&M) efficiency projects. The Initiative also made progress in improving end user and utility relationships; all but one of the 2009 interviewees rated their relationship with their utility as good or very good, and eight interviewees noted that their relationships improved after engaging with the Initiative. Cadmus' surveys revealed that 15 of the 18 interviewed participants fully grasped the CEI concept and its value. Cadmus also found that the majority of the facilities practicing CEI attributed their decision to NEEA, the Initiative, and/or the Initiative's implementation team.

Impact on the Industrial Market

Cadmus' evaluation results also indicated that the Initiative has been successful in influencing and bringing about lasting changes in the Northwest's industrial energy-efficiency market. We specifically note the Initiative's influence in catalyzing the adoption of energy-tracking and goal-setting practices by the NWFPA. Due in part to the Initiative's regional work, energy efficiency has become a priority in the Northwest's food processing market, as the NWFPA launched a program in 2008 to set a goal of lowering energy intensity in the regional food processing industry by 50 percent over the next 20 years. While participation in the energy intensity reduction goals is voluntary, the NWFPA has devoted considerable resources to promote the program and to assist its members with energy efficiency. Recent reports indicate many of the association's member plants have volunteered data to help the NWFPA establish a baseline for energy intensity among its membership.

Utilities

In addition to participant surveys, Cadmus conducted annual surveys of utilities to gain insight on their awareness of and response to the Initiative's presence and activities in the regional industrial market. The first utility survey, conducted in 2006, highlighted a number of problem areas in the relationships between the Initiative, the regional utilities, and the market partner organizations. These problem areas included poor communication, a limited understanding of the Initiative's role, lack of familiarity with the Initiative's goals, and the perception that the Initiative was competing with utilities' own Demand Side Management (DSM) programs. Specifically, Cadmus found:

- Utility respondents reported the Initiative's directors did not make sufficient effort to coordinate the Initiative work with local utilities, resulting in general confusion among utilities and (in a few cases) strained relationships.

Several utilities noted they were not adequately informed about the goals and strategic intent of the Initiative and at least eight of 18 utilities noted they felt the Initiative was in direct competition to their programs.

- Only 40 percent of the respondents were familiar with the Initiative and its energy management offerings.

To address these challenges, the Initiative team (led by the Initiative's Utility Coordinator) made a concerted effort to shift its perspective to recognize utilities as a specialized target audience. The Initiative's revised approach paid off, as revealed in the next utility survey in 2007. Improvements were shown in increased familiarity with the Initiative, better communication, an appreciation of the Initiative's role in helping them to do their jobs, and a markedly more positive attitude toward their relationships with the Initiative.

Specifically, Cadmus' surveys noted the following:

- Utilities reported noticeable improvement in the communication between the Initiative and utilities, especially regarding the Initiative's direct contact and interactions with utility customers. Fourteen of the sixteen utility respondents (88 percent) regarded the quality of these communications as either "good" or "excellent."
- Fifteen of the 16 respondents (94 percent) no longer perceived the Initiative as being in conflict with utility conservation programs' goals and objectives.
- Over 80 percent of respondents reported being "familiar" or "very familiar" with the Initiative.

While overall relationships had improved by the 2007 survey, utilities still had limited understanding of the CEI concept, thus, the Initiative was tasked with increasing utility understanding and promotion of CEI among its utility partners.

Measurable transformation in the industrial energy management market was noted in 2008, when surveys revealed that nearly all interviewed utilities were familiar with CEI, and a majority was able to articulate the concept of CEI. Also in 2008, 37 percent of utility respondents reported they promoted the Initiative's CEI.

By the end of 2009, many of the public utilities and major investor-owned utilities in the region had begun offering products similar to CEI, particularly improved operation and maintenance practices, as part of their resource acquisition programs.

Training Activities

In addition to direct promotion of CEI among industrial end users and coordination with utilities, the Initiative has supported training events for four end-use systems: refrigeration, pumps, motors, and compressed air. After the 2007 and 2008 trainings, Cadmus conducted follow-up surveys to elicit feedback from attendees. Survey respondents overwhelmingly noted that the trainings increased awareness and knowledge of energy-efficiency opportunities. A majority of training attendees also reported that they implemented projects or made changes as a direct result of the trainings. In end-user and utility interviews, the Initiative's trainings were generally noted as a very useful and productive regional activity.

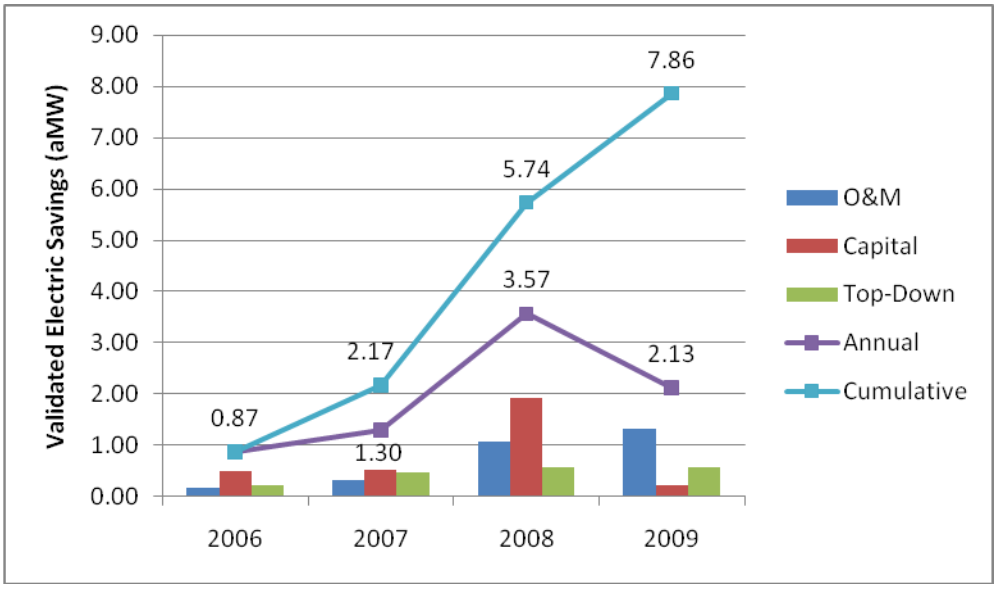
Energy Savings

The implementation of CEI among participant firms also resulted in measurable electricity and natural gas savings due to improved O&M practices and capital investments induced by the Initiative. Cadmus validated measure-level energy savings at participant plants from 2006 through 2009. In 2009, Cadmus also began evaluating facility-wide (top-down) energy savings

claims to capture savings from behavioral changes, as well as O&M and capital improvements that were not quantified at the measure level. To date, Cadmus has validated 5.65 aMW of electric savings at 26 food processing facilities and 2.22 aMW of electric energy savings at 4 pulp and paper facilities[16]. In addition, Cadmus has validated over 4 million therms of natural gas savings at 12 food processing facilities.

As **Figure 10.1** illustrates, an upward trend in annual validated measure-level savings occurred from 2006-2008, with a drop in 2009. The decrease in validated savings in 2009 was largely attributable to cutbacks in capital projects, most likely due to the general economic downturn. The records in the Initiative's tracking system (ITS) lists several projects that were completed but not evaluated because of a lack of documentation or the fact that savings were hard to quantify. Anecdotal information from site visits also indicates that a number of projects were completed at several plants, but were not documented through ITS. Evaluation of the outstanding measures and accounting for undocumented projects will no doubt show appreciably higher savings for 2009.

Figure 2. Validated Electric Savings by Year and Category (2006-2009)



Cadmus' validation results also showed that savings from improved operation and maintenance practices, which are the mainstay of the Initiative, have steadily increased over time. For the first three program years (2006-2008), a majority of validated electric savings originated from capital projects. In 2009, O&M improvements accounted for most of the validated savings. This shift is further evidence of the integration of CEI into the Northwest industrial market.

The evaluation results indicate the Initiative's electricity savings fell short of the revised target of 20 aMW. The variance between the actual and target savings is at least partly explained by three factors.

[16] Due to rounding, the sum of individual target market savings may not match total savings.

- First, as discussed earlier, are the potential savings from unreported projects and savings from projects which were reported but have not yet been validated.
- Second, there is reason to believe that the initial goal of 20 aMW might have been aggressive, particularly in the pulp and paper industry, for reasons already discussed in the Findings section above.
- More importantly, as we will discuss later in this document, the evaluation methods used for validating savings did not account for all possible market effects of the Initiative.

Regional Energy Efficiency Policy

The recognition in the Northwest's Sixth Power Plan of CEI as an energy-efficiency measure with savings that can be validated is, perhaps, the Initiative's most far-reaching achievement. Prompted in no small part by the results of the research conducted under the Initiative, in 2008 the Council issued an RFP to investigate the savings opportunities in industrial facilities. As anticipated by the Initiative, this assessment found that there are significant savings opportunities from energy optimization measures in addition to discrete equipment upgrades. As a result, the industrial supply curves for the Sixth Power Plan include savings from such optimization activities, including demand-side assessment; proper design, sizing, and/or reconfigurations to match supply to demand; system "commissioning"; sustainable O&M; and supporting management practices.[17]

The activities relating to energy optimization type measures were grouped into three tiers of measure bundles for the Sixth Plan. In order of comprehensiveness, these bundles are: Plant Energy Management, Energy Project Management and Integrated Plant Energy Management. Each higher tier is inclusive of all measures in the lower tiers. The "Integrated Plant Energy Management" level of savings, which encompasses systematic systems management practices, is comparable to the end goal of NEEA's CEI program (Stage 5: Sustaining).

The regional 20-year achievable potential from these measures was 245 aMW, with a levelized cost less than $0.05/kWh. This constitutes about one-third of the projected total energy-efficiency potential in the industrial sector. Given this, regional entities such as the Bonneville Power Administration (which has electricity savings targets tied to the Sixth Power Plan) have or will be developing programs to capture these savings. BPA's Energy Smart Industrial (ESI) program, launched in October 2009, has a large focus on capturing savings from energy management activities such as those historically promoted by the Initiative. Other utilities, particularly those under Washington I-937 rules, are also considering adoption of similar types of programs for their industrial customers. The results from the 2009 utility survey supported this trend, as at least seven utilities noted they are moving either to adopt BPA's or to develop their own program.

[17] From "System Optimization Measures Guide", prepared for Charlie Grist; Strategic Energy Group, March 23, 2009.

Initiative's Plans for the Future

The Initiative is now at a point where it must determine how best to proceed and build upon its success. NEEA faces fundamental questions about the future direction of the Initiative. As noted on pages 3 and 4 of this memo, the key questions are:

- Should NEEA continue its current, vertically oriented outreach program targeting new facilities/companies and industries, but with perhaps more intensive energy management programs?
- Should it expand its cross-cutting programs that integrate current outreach efforts with knowledge transfer, training and educational outreach?
- Should it create new program initiatives that capitalize on the market transformation trends for which the Initiative has been responsible?
- Should it create a hybrid that incorporates vertical and cross-cutting measures with the broader market transformation trends?

To address these issues, NEEA is considering a three-dimensional vehicle consisting of:

1. Collaborative Energy Strategies (CES)
2. Strategic Energy Management (SEM)
3. Regional Technical Services (RTS)

Each dimension has an important role to play in the Initiative's ability to continue to achieve effective and verifiable transformation of the industrial energy market. At the broadest level, CES brings together decision-makers in industry, utilities, and government entities to work together to devise strategies for improving energy efficiency across the industrial sector.

Next, SEM is designed to promote energy management by encouraging industrial firms to deploy a framework for documenting energy use, controlling energy costs and improving efficiency.

The third dimension is RTS, which relies on working with regional utilities to bring together industrial end users from across the region for exchange of technical information and training.

To date, the focus of the Initiative has been on CEI, which remains a major component of SEM. While NEEA needs to continue with certain elements of SEM, many utilities are (or are planning to) offer technical support and financial incentives for energy management practices. With a widespread adoption of CEI among utilities, the Initiative will have to shift its focus from CEI and concentrate instead on CES and RTS, activities that tap into NEEA's strengths and its unique position as an agent of market transformation in the Northwest's energy market.

In keeping with the Initiative's initial strategic intent, this shift will bring about a renewed emphasis on several critical services, which include the following:

- **Training and education** continues as an important NEEA role. Dissemination of information about energy-efficiency options and benefits (a previously identified market barrier) will remain as a necessary condition for adoption of energy-efficient options. Training and education can range from shop/facility level technical training to partnering with industry associations to develop curricula that can be disseminated across an industry. While awareness is increasing, there continues to be new technologies, equipment, and energy-efficiency concepts to be delivered to market participants at all levels.

- **Demonstrations/case studies** can continue to showcase energy management techniques and successful projects. While all investments are based on businesses' own risk profiles, providing examples of successful projects or demonstrating how investments in energy management can meets typical expectations for return on investment and help industrial firms overcome misperceptions concerning the value of energy efficiency.
- **Channel management** is another area that NEEA can help to extend the energy-efficiency market. The regional market infrastructure still lacks the expertise and number of service providers needed to support a developed market. Equipment dealers and support services (such as repair, installation, O&M) are needed, as are design, engineering, planning, and construction services to support the energy management market. NEEA should continue its role in communicating with manufacturers, professional and trade organizations, and labor organizations to provide information to and encourage development of the skills and the equipment for a well-functioning energy management market.
- **Utility partnering** will continue to be a critical service. In an increasingly resource- and energy-constrained world, utilities need support to help them slow (or possibly reverse) energy demand and consumption. Pressure is rising for utilities to implement conservation programs through mandated energy-efficiency targets similar to Washington's I-937 Initiative, renewable portfolio standard (RPS), and climate change regulations, which are forcing utilities to find new and innovative ways to influence energy consumption. Through the Initiative, NEEA can help utilities design and market superior products and programs by acting as a clearinghouse for information, research and development, and help in creating a much needed infrastructure for delivering CEI.
- **Trade ally and cross-industry collaboration** are already underway but the success of this effort could be expanded to other trade allies and industries. As it has done with the NWFPA, NEEA could identify and work with non-targeted industrial association, and the Initiative's CES would be an ideal platform for this purpose. NEEA could use CES to identify and coordinate outreach and intervention to trade allies and industries that are not familiar with the Initiative.

The main focus of these options is to reinforce and expand on the previous market transformation efforts of the Initiative. While NEEA has outlined a multi-dimensional platform that could be used to implement these options, successful market transformation requires NEEA to rethink and redeploy its resources in response to the emerging needs for energy information in the industrial sector.

Implications for Evaluation

As it evaluates alternative options for setting a future course for the Initiative, it is important for NEEA to consider appropriate methods for tracking the progress of the Initiative and measuring its performance, including how energy savings are measured. Currently, savings are validated through a two-part process. First, savings are estimated at the aggregate facility level, using a top-down, statistical modeling of energy demand. Second, measure-level impacts are validated through on-site inspection and expert evaluation. The difference between the two top-down and bottom up savings estimates represents energy savings attributable to behavior-based measures.

While the existing evaluation framework has enabled NEEA to gauge program impacts in participating facilities, it is not well suited for the evaluation of NEEA's efforts at transforming the industrial energy efficiency market. The current framework is based on methods designed for *ex post* validation of gross savings in resource acquisition programs. This method is less suitable for projecting the impacts of market transformation programs that focus principally on *ex ante* savings. The impact evaluation methods being used currently do not account for future indirect effects of the Initiative, including market diffusion within the target market, spillover to facilities in non-targeted markets and the adoption of CEI by utilities. Nor do these methods properly account for the energy saving impacts of other elements of the Initiative such as information and training. NEEA might be able to claim partial and indirect credit for the future energy savings of these activities given a different, more suitable evaluation framework.

A framework better suited for evaluating NEEA's market transformation efforts would be both forward-looking and broader in perspective, focusing on prospective indirect impacts in addition to direct impacts. A market diffusion model of industrial energy-efficiency measures and behaviors would better capture the true impacts of NEEA's industrial programs, including market diffusion within the target market, spillover into non-targeted markets and efforts at market transformation by other actors. Such a model would explicitly account for the dynamics of diffusion of information on energy-efficient options and practice. The model would also account for the profit-maximizing behavior by firms that are likely to lead to the adoption of energy-efficient practices. Such framework will allow NEEA to account properly for and claim credit for all savings attributable to the Initiative.

Conclusions

The Initiative was conceived by NEEA five years ago as a comprehensive effort to influence views on energy use and perceptions regarding energy efficiency among the Northwest's industrial firms. The Initiative aimed to bring about a lasting change in industrial energy use by making energy management integral to how industrial firms made their decisions about investing in new equipment and planned routine operation and maintenance.

As with all of NEEA's programs and initiatives, the progress of the Initiative was evaluated continuously for five years. The results of this on-going evaluation indicate the Initiative has largely achieved many of its initial goals in the food processing sector. This success is clearly demonstrated by the empirical evidence of change in attitudes and perceptions regarding the importance and value of energy management among industrial end users, trade allies, and market partners, particularly regional utilities. The most significant contribution of the Initiative to promoting energy efficiency in the region was, perhaps, the influence it had on the Northwest Power and Conservation Council's decision to include continuous energy improvement as a measure in the Sixth Regional Power Plan. This will almost certainly guarantee a widespread adoption of energy management practices in utility-sponsored energy-efficiency programs.

As NEEA charts a course for the Initiative's future, it needs to consider how to shift focus from direct marketing of continuous energy improvement to industrial end users, concentrating instead on broader market intervention strategies. These strategies include a renewed emphasis of education, training, research, development, and partnering with utilities to build an infrastructure for promoting and deployment of continuous energy improvement. These activities will be more difficult to monitor and their impacts will be more difficult to measure. To meet these

challenges, NEEA will also have to use methods better suited for measuring long-term market effects.

Appendix D. 2010 Survey Instruments

Target Audience Follow-Up (TAFU) Survey

Nonparticipant Survey

Market Partner Survey

Trade Ally Survey

Industrial Initiative 2010 Participant Survey

(MPER #6)

Research Objectives

The participant surveys will target food processing facilities. Cadmus will interview up to 15 program participants. The goals of the surveys are to gather information about:

- Persistence of measures and processes implemented in previous program years
- Future plans for reducing energy consumption
- Factors which influenced their decision to sustain CEI
- Projects which participating facilities have implemented on their own
- How the withdrawal of NEEA may affect CEI persistence

Results from previous surveys may be used to estimate the rate at which facilities reach Stage 3 or Stage 5. Cadmus will compile a list of facilities for interviews and submit it to NEEA for approval before contacting them.

Interviewer's Name: _____

Date: _____

INTERVIEWER: Fill in as much of the firmographics section as possible from database before conducting interview .

Introduction

i. Confirm Data [Enter Following Data Before Calling]
ii. Contact Name: _____
iii. Company: _____
iv. Phone Number: _____
v. NWFPA Member: Yes/No
vi. Year began engagement with NEEA: _____
vii. Level of engagement as of Jan 2010:_____

S. Screening

I would like to speak with [Contact Name]

Hello, my name is _____, and I am calling from The Cadmus Group on behalf of the Northwest Energy Efficiency Alliance or NEEA and the Northwest Food Processors Association (NWFPA). I believe [Ecos contact name] at Ecos let you know we would call. (If needed: This is not a sales call)

If same contact as in 2009: We are updating our 2009 study on how facilities engaged with NEEA's Industrial Initiative are managing their energy usage. We know we've contacted you a lot lately so we will try to make this quick. This will take approximately **20 minutes**. Do you have time to talk now or would another time be more convenient?

If different contact from 2009: This interview is part of our annual independent study of the Initiative and will update our 2009 study on how facilities are managing their energy use. This will take approximately **20 minutes**. Do you have time to talk now or would another time be more convenient?

Before we get started, I'd like to note that your responses are confidential and will only be reported in aggregate and individual facility responses will not be identified.

S1. According to our records your title is [TITLE]. Is this still correct?

S2. How do your job duties relate to energy use at your facility? **[THEY SHOULD ALL BE THE ENERGY CHAMPION, BUT WE ALSO WANT TO KNOW WHAT ELSE THEY DO]**

EM. Energy Management

The next few questions are focused on how your company manages energy.

[IF SAME CONTACT FROM 2009] Some of these questions are the same as last year, but we are asking them again because we want to be sure we have the most recent information.

[ASK IF NWFPA MEMBER]

EM0. NWFPA has a goal for their members to reduce energy intensity by 25% in 10 years. Is your facility taking steps to try to meet that goal?

1. Yes
2. Maybe in the future
3. No, was not aware of goal
4. No, was aware of goal but not participating –

-99. Don't Know

[ASK ALL]

EM1. What are your facility's specific goals (independent of the NWFPA goal) for reducing your energy intensity? **[BE SURE THEY INCLUDE A TIMEFRAME AND UNITS (E.G. PER POUND PRODUCTION]**

[IF THEY HAVE GOALS]

EM1a. What is your strategy to meet those goals?

EM2. How likely are you to meet the goal?

1. Not likely
2. Somewhat Likely
3. Likely
4. Very Likely

EM2a. What are the reasons for saying [INSERT RATING]?

[PULL LIST OF EQUIPMENT AND O&M MEASURES AND DATE INSTALLED FROM ITS AND FILL IN BELOW BEFORE CONDUCTING THE INTERVIEW]

The Industrial Initiative has provided us with a list of improvements you have made at your facility. [INTERVIEWER WILL REFER TO THE INDUSTRIAL INITIATIVE PROGRAM ACCORDING TO HOW THE RESPONDENT RECOGNIZES IT. THE INTERVIEWER WILL BE FAMILIAR WITH ALL OTHER NAMES OF THE INDUSTRIAL INITIATIVE AND NAMES OF PEOPLE INVOLVED.]

EM3a. We would like to go through a few of those changes to see if they are still in place.

Our records show that you have made several equipment upgrades including: [INSERT LIST BEFORE CONDUCTING INTERVIEW]

Are all of these still in place?

5. Yes **[GO TO EM4a]**
6. No **[GO TO EM3a1]**
-99. Don't Know **[GO TO EM4a]**

EM3a1. **[IF NO]** Which ones are no longer in place and what were the reasons for removing the equipment?

[FOR EM4 INSERT INDIVIDUAL O&M MEASURES]

Now I'm going to go through a couple of O&M improvements we have in our records.

EM4a. The first one I have down is [_____] in 200__. Is that change still in place?

7. Yes **[GO TO EM4b]**
8. No **[ASK EM4a1]**
-99. Don't Know **[GO TO EM4b]**

[IF EM4a = No]

EM4a1. What were the reasons for not continuing this activity? **[MULTIPLE RESPONSE; DO NOT READ]**

9. (Expensive to maintain)
10. (Do not have technical skills to maintain)
11. (Management did not support)
12. (Other priorities demand resources)
-77. (Other [SPECIFY: _____])
-99. (Don't know)

EM4b. The next one I have down is [_____] in 200__. Is that change still in place?

13. Yes **[GO TO EM4c]**
14. No **[GO TO EM4b1]**
-99. Don't Know **[GO TO EM4c]**

[IF EM4b = No]

EM4b1. What were the reasons for not continuing this activity? **[MULTIPLE RESPONSE; DO NOT READ]**

15. (Expensive to maintain)
16. (Do not have technical skills to maintain)
17. (Management did not support)
18. (Other priorities demand resources)
-77. (Other [SPECIFY: _____])
-99. (Don't know)

EM4c. The next one I have down is [_____] in 200__. Is that change still in place?

19. Yes **[GO TO EM4d]**
20. No **[GO TO EM4c1]**
-99. Don't Know **[GO TO EM4d]**

[IF EM4c = No]

EM4c1. What were the reasons for not continuing this activity? **[MULTIPLE RESPONSE; DO NOT READ]**

21. (Expensive to maintain)
22. (Do not have technical skills to maintain)
23. (Management did not support)
24. (Other priorities demand resources)
-77. (Other [SPECIFY: _____])
-99. (Don't know)

EM4d. The next one I have down is [_____] in 200__. Is that change still in place?

25. Yes **[GO TO EM5]**
26. No **[GO TO EM4d1]**
-99. Don't Know **[GO TO EM5]**

[IF EM4d = No]

EM4d1. What were the reasons for not continuing this activity? **[MULTIPLE RESPONSE; DO NOT READ]**

27. (Expensive to maintain)
28. (Do not have technical skills to maintain)
29. (Management did not support)
30. (Other priorities demand resources)
-77. (Other [SPECIFY: _____])
-99. (Don't know)

Our records indicate that you have also completed these O&M projects: [INSERT LIST BEFORE CONDUCTING INTERVIEW]

EM5. Have you implemented any other energy related projects in addition to the ones we've discussed?

31. Yes **[GO TO EM5a]**
32. No **[GO TO EM6]**
33. -99. Don't know **[GO TO EM6]**

[IF EM5 = Yes]

EM5a. What other projects have you implemented? **[ASK THEM TO BE SPECIFIC; PROBE FOR O&M]**

EM5a1. What motivated you to implement these projects?

[IF EM5 = Yes]

EM5b. Did you receive technical assistance for any of these additional projects you mentioned?

34. Yes
35. No
-99. Don't know

[IF EM5b = yes to any]

EM5b1. Who provided assistance? **[DO NOT PROMPT, MULTIPLE RESPONSES POSSIBLE]**

1. NEEA/ Ecos
2. NWFPA
3. BPA/Cascade Energy Engineering/Strategic Energy Group/Evergreen Consulting
4. ETO
5. Utility: [SPECIFY:_____]
6. Equipment distributor/manufacturer
7. Energy consulting firm (e.g. Global Energy Partners, Fluid, others): SPECIFY
8. State energy agency (e.g. ODOE, WSU energy extension program, Idaho Dept of Energy Resources, Montana Dept of Environmental Affairs): [SPECIFY:_____]

-77. Other [SPECIFY: _____]

[IF EM5 = Yes]

EM5c. Did you receive a tax credit, incentive or rebate for any of the projects you mentioned?

36. Yes, tax credit (federal and/or state)
37. Yes, incentive or rebate
38. No
39. Don't know

[IF EM5c =2]

EM5c1. Who provided the incentive? **[DO NOT PROMPT]**

1. ETO
2. BPA
3. Pacific Power
4. Tacoma Power
5. Puget Sound Energy
6. Snohomish County PUD
7. Grays Harbor PUD
8. Idaho Power

-77. Other: [SPECIFY:_____]
-99. Don't know

[ASK ALL]

EM6. What information do you rely upon to tell you if a piece of equipment or O&M practice is energy efficient? **[IF NEEDED:** This could be written information or people or experience.**]**

40. Efficiency rating or label of equipment
41. Equipment dealer said it was efficient
42. Personal experience
43. Met utility rebate requirements
-77. Other: SPECIFY
-99. Don't Know

EM7. In your opinion, how successful has your facility been in integrating energy management into their business practices? **[READ OPTIONS 1-4]**

44. not successful
45. somewhat successful
46. successful
47. very successful
-99. Don't know **[GO TO EM8]**

EM7a. What are your reasons for saying [INSERT RATING]?

EM8. Has implementing energy management practices at the facility had an impact on employee perceptions about energy conservation?

1. Yes **[GO TO EM8a]**
2. No **[GO TO EM8a]**
-99. Don't know **[GO TO EM9]**

EM8a. Can you explain? **[IF EM8=yes, ask for examples]**

EM9. Have the energy projects that we've discussed provided benefits beyond energy savings?

1. Yes **[GO TO EM9a]**
2. No **[GO TO EM9a]**
-99. Don't know **[GO TO EM10]**

EM9a. Can you explain**? [IF EM9=yes, ask for examples]**

EM10. On a scale of 1 to 5, where 1 is not at all and 5 is completely, currently how much do you rely on Initiative staff or Ecos for providing assistance for energy management projects at your facility?

ID. Information Dissemination

[ASK ALL]

The next three questions focus on your interactions and communications regarding energy efficiency and behavioral change within and outside your company.

ID1. Outside of your company staff, who would you go to first to talk about improving energy efficiency at your facility? **[DO NOT READ RESPONSES. DO NOT ACCEPT Staff names without checking their affiliation and role].**

1. NEEA
2. NWFPA
3. BPA
4. ETO
5. Utility [SPECIFY:_____]
6. Equipment distributor
7. Energy consulting company [SPECIFY:_____]
8. State energy agency [SPECIFY:_____]
9. Trade Conference [SPECIFY:_____]
10. Ecos

-77. Other: [SPECIFY:_____]

ID2. Who else would you to talk about improving energy efficiency at your facility? **[DO NOT READ RESPONSES. DO NOT ACCEPT Staff names without checking their affiliation and role].**

1. NEEA
2. NWFPA
3. BPA
4. ETO
5. Utility [SPECIFY:_____]
6. Equipment distributor
7. Energy consulting company [SPECIFY:_____]
8. State energy agency [SPECIFY:_____ _____]
9. Trade Conference [SPECIFY:_____]
10. Ecos

-77. Other: [SPECIFY:_____]

ID3. How often do you discuss energy management techniques with colleagues at different facilities within your company? **[READ RESPONSES]**

1. Never
2. Rarely
3. Occasionally
4. Often
5. Very often

ID3. How often do you discuss energy management techniques with colleagues outside of your company? **[READ RESPONSES]**

1. Never
2. Rarely
3. Occasionally
4. Often
5. Very often

ID4. If the Industrial Initiative were to disappear, what would happen to energy management at your company?

ID4a. What resources would you need to continue managing energy successfully?

[END INTERVIEW] Thank you for your time. Do you have any questions?

Industrial Initiative Nonparticipant Survey 2010

MPER #6

Research Objectives

Conducting non-participant surveys will be a critical step in quantifying the impact of the Industrial Initiative on non-participating facilities. The surveys will be used to establish the timing and extent of adoption of CEI and other energy management practices in non-participating facilities. The surveys will target approximately 55 non-participating facilities in the food processing industry to achieve +/- 10 percent precision with 90 percent confidence. The surveys will cover the following topics:

- What are facilities' current perceptions of energy efficiency? Does their definition of energy efficiency and energy management coincide with NEEA's definition?
- Are the facilities aware of CEI practices? If so, how and when did they become aware?
- Are facilities implementing elements of CEI? If yes, why did they decide to implement CEI?
- Did they adopt CEI on their own? Or did they receive assistance? From whom did they receive assistance? What kind of assistance did they receive?
- Will the facilities consider energy efficient equipment and practices in their plans for plant upgrades? What sort of energy efficient improvements are they planning?

Interviewer's Name:

Date:

INTERVIEWER: Fill in as much of the firmographics section as possible from database before conducting interview.

Introduction

viii. Confirm Data [Enter Following Data Before Calling]
ix. Contact Name: _____
x. Company: _____
xi. Phone Number: _____
xii. NWFPA Member: Yes/No

S. Screening

Hello, my name is _____, and I am calling from The Cadmus Group, an energy consulting firm in Portland, Oregon. I am calling on behalf of the Northwest Energy Efficiency Alliance and the Northwest Food Processors Association to perform a study on energy practices at food processing facilities. This is not a sales call. I would like to speak with [Contact Name], or May I speak with [designated respondent] or with the person who is responsible for overseeing food processing equipment [food processing operations] for your facility?

IF REACH CORRECT PERSON: We are doing a study on how the food processing sector thinks about and uses energy. Your responses will benefit the food processors in the region by informing NEEA and NWFPA in how best to aid facilities in reducing energy use. Do you have some time to answer a few questions? Your responses will be kept strictly confidential and only reported in aggregate.

Timing: 15 minutes?

S1. Would you please tell me your title at (name of company)?

S1a. How long have you worked at (name of company)?

S2. What are some of your key responsibilities at the facility? [Probe for answers related to making decisions about equipment upgrades, production efficiency, energy efficiency, tracking energy, etc. If they say they track energy follow up with "how do you track energy?"]

S3. Which electric utility serves your facility?

AW. Awareness and Timing

For the purposes of this survey, energy management practices includes activities such as purchasing efficient equipment, tracking your energy bills, efficient operating and maintenance practices and training your personnel in managing energy or to operate your equipment efficiently. Before I continue, do you have any questions for me, particularly about the definition of "energy management practices?"

AW0. How aware is your facility about energy management practices, with 1 indicating not at all aware and 5 indicating very aware?

AW0a. Can you explain why you gave that rating [Probe to get at what they know about energy efficient equipment and operating practices]?

[IF AW0 =1 (not aware) then terminate survey]

AW1. When did you first learn about energy efficient equipment?

1. 2010 (< 1 year ago)
2. 2009 (approximately 1 year ago)
3. 2008 (approximately 2 years ago)
4. 2007 (approximately 3 years ago)
5. Before 2007 (more than 3 years ago)

-99. Never learned about energy efficient equipment

AW2. When did you first learn about energy efficient operating practices, for example turning equipment or lights off when not in use, maintaining equipment so that it runs efficiently, checking for air leaks, etc

1. 2010 (< 1 year ago)
2. 2009 (approximately 1 year ago)
3. 2008 (approximately 2 years ago)
4. 2007 (approximately 3 years ago)
5. Before 2007 (more than 3 years ago)

-99. Never learned about efficient operating practices

AW3. How did you first learn about energy management practices? **[MULTIPLE RESPONSE; DO NOT READ]** *[DO NOT ACCEPT Staff names without checking their affiliation and role].*

11. NEEA
12. NWFPA
13. BPA
14. ETO
15. Utility [SPECIFY:_____]
16. Equipment distributor
17. Energy consulting company [SPECIFY:_____]
18. State energy agency [SPECIFY:_____ _____]
19. Trade Conference [SPECIFY:_____]
20. Ecos
21. DOE

-77. Other: [SPECIFY:_____]

EM. Energy Management Practices

EM0. How active is your facility in managing energy use, with 1 indicating energy use is not managed and 5 indicating that energy use is very closely managed? [Again, for the purposes of this survey energy management includes purchasing efficient equipment, tracking your energy bills, efficient operating and maintenance practices and training your personnel in managing energy or to operate your equipment efficiently]

EM0a. Can you explain why you gave that rating [Probe to get at how they manage energy, what activities are you doing]?

[If answer to EM0 > 1]

EM0b. When did your facility begin to actively manage energy use?

1. 2010 (< 1 year ago)
2. 2009 (approximately 1 year ago)
3. 2008 (approximately 2 years ago)
4. 2007 (approximately 3 years ago)
5. Before 2007 (more than 3 years ago)

-99. Don't know

EM1. How would you rate the level of management support for dedicating FTE (Full Time Employee) resources to energy management? **[Read responses]**

1. No support
2. Little support
3. Some support
4. Total support

EM2. Does staff receive training on energy management?

1. Yes
2. No

-99. Don't Know

[if EM2 = YES]

EM2a. What types of energy management activities does the training typically involve? **[Read responses; multiple responses]**

1. Purchasing efficient equipment
2. Efficient operation of equipment
3. Tracking energy use
4. Setting energy reduction goals
5. Writing an energy management plan
6. Available technical resources (where to go for help)
7. Availability of financial incentives for projects

-77. Other: [SPECIFY:_____]

-99. Don't Know

[SKIP IF RESPONDENT SAID THEY ARE THE ENERGY MANAGER IN S1 OR S2]

EM3. Is someone at your facility a designated "energy manager"?

1. Yes
2. No

-99. Don't Know

Now I'd like to ask you about some practices that are often associated with energy management.

[SKIP IF THEY SAY THEY TRACK ENERGY IN S2]

EM4. Does someone at the company track electricity or natural gas use at your facility? Tracking energy use would include activities such as monitoring billing data or metering energy use of certain equipment.

1. Yes, both electricity and natural gas
2. Yes, just electricity
3. Yes, just natural gas
4. No **[GO TO EM4]**

-99. Don't Know **[GO TO EM4]**

[ASK ONLY IF EM4 IS Yes and if they do indeed track energy

OR if they said they track energy in S2 lead with "You noted that one of your responsibilities is to track energy use…]

EM4a. How is energy tracked? [**DO NOT READ RESPONSES; RECORD IF DIFFERENT FOR NATURAL GAS VS. ELECTRICITY**]

1. Review billing data
2. Meter energy use

-77. Other: [SPECIFY:_____]

-99. Don't Know

[IF EM4 = YES]

EM4b. How often is that information reviewed? [**DO NOT READ RESPONSES; RECORD IF DIFFERENT FOR NATURAL GAS VS. ELECTRICITY**]

1. Daily
2. Weekly
3. Monthly
4. Quarterly
5. Twice a year
6. Annually

-77. Other: [SPECIFY:_____]

-99. Don't Know

I'd like to ask you about your facility policies regarding energy efficiency, equipment replacement or energy project funding. Where facility practices or policies differ from the corporate practices, we would like to know what is happening at the facility.

EM5. Does your facility set energy reduction goals or goals to reduce energy intensity?

1. Yes
2. No

-99. Don't Know

[ASK IF NWFPA MEMBER]

EM6. Will your facility participate in NWFPA's goal for their members to reduce energy intensity by 25% in 10 years?

1. Yes
2. Maybe in the future
3. No

-99. Don't Know

EM7. Does your facility have an energy management plan? An energy management plan would consist of energy reduction goals to be reached within a certain timeframe and may also include a prioritized list of activities to be done to achieve those goals

1. Yes
2. No

-99. Don't Know

[IF EM7 = YES]

EM6a. Do you revisit your plan on a regular basis, or update it as operations change?

1. Yes, we update on a regular basis
2. Yes, we update as operations change
3. No

-99. Don't Know

I would now like to ask questions about actions that may have been taken at your facility to save energy.

EM8. Have you implemented any of the following actions in the past two years in order to save energy: **[READ LIST, RANDOMIZE ORDER.]**

Leak tag program / leak detection and repair (check for air leaks.)	Y / N / DK
Lighting reduction, turning lights off when not in use	Y / N / DK
Equipment operation schedule or turning equipment off when not in use	Y / N / DK
Equipment settings (decreasing temperature, pressure, motor speed)	Y / N / DK
Removing equipment	Y / N / DK
Equipment Maintenance	Y / N / DK
Production floor cleaning practices	Y / N / DK
Insulate pipes or tanks	Y / N / DK
Other: SPECIFY_____	Y / N / DK

[IF Y TO AT LEAST ONE ACTION IN EM8]

EM9. Have you observed energy savings from any of these actions?

1. Yes
2. No

-99. Don't Know

[IF Y TO AT LEAST ONE ACTION IN EM8]

EM10. Did you receive technical assistance for any of these actions?

1. Yes
2. No

-99. Don't Know

[IF EM10 = YES]

EM10a. Who provided the technical assistance?

1. NEEA/Ecos
2. NWFPA
3. BPA/Cascade Energy Engineering/Strategic Energy Group/Evergreen Consulting
4. ETO
5. Utility [SPECIFY:_____]
6. Equipment distributor/manufacturer
7. Energy consulting company [SPECIFY:_____]
8. State energy agency [SPECIFY:_____ _____]

-77. Other: [SPECIFY:_____]

-99. Don't Know

[IF NO TO ALL ACTIONS IN EM8]

EM11. What were the barriers to implementing any of these actions? **[MULTIPLE RESPONSE; DO NOT READ]**

1. (Too expensive to implement)
2. (Expensive to maintain)
3. (Do not have technical skills to implement)
4. (Cannot get approval from management)
5. (Not aware of the activities)
6. (Other priorities demand resources)

-77. Other: [SPECIFY:_____]

-99. (Don't know)

EM12. Over the past 2 years, have you installed, or are you currently installing, any equipment that you would consider energy efficient?

1. Yes, have installed energy efficient equipment over past 2 years
2. Yes, currently installing energy efficient equipment
3. Yes, both installed energy efficient equipment over past 2 years AND currently installing
4. No **[SKIP TO EM17]**

-99. Don't know **[SKIP TO EM17]**

[IF EM12 IS 1, 2, OR 3 (YES)]

EM13. What information do you rely upon to tell you if the equipment you are buying is energy efficient? **[If needed:** This could be written information or people or experience.**] [MULTIPLE RESPONSE; DO NOT READ]**

1. Efficiency rating or label of equipment
2. Equipment dealer said it was efficient
3. Personal experience
4. Met utility rebate requirements

-77. Other: [SPECIFY:_____]

-99. Don't Know

[IF EM12 IS 1, 2, OR 3 (YES)]

EM14. Have you quantified the amount of energy savings from these projects? **[DO NOT READ:** Here we want to know if they know the energy savings of each project, not just whether their bill decreased**]**

1. Yes
2. No

-99. Don't Know

[IF EM12 IS 1, 2, OR 3 (YES)]

EM15. What motivated you to install energy efficient equipment? **[MULTIPLE RESPONSE; DO NOT READ]**

1. Save energy and money
2. The equipment distributor or manufacturer recommended it
3. Recommended in an energy audit
4. Tax incentives or rebates

-77. Other: [SPECIFY:_____]

-99. Don't Know

[IF EM12 IS 1, 2, OR 3 (YES)]

EM16. Did you receive any financial incentives like tax credits, rebates or incentives from your utility or other institutions for these measures? **[MULTIPLE RESPONSE]**

1. Yes, Federal tax credit
2. Yes, State tax credit
3. Yes, Utility rebate or incentive
4. No

-99. Don't Know

[IF EM16 = 3]

EM16a. Which utility or institution provided the incentive? **[DO NOT READ; COULD HAVE MULTIPLE RESPONSE IF THERE WERE MULTIPLE MEASURES]**

9. ETO
10. BPA
11. Pacific Power
12. Tacoma Power
13. Puget Sound Energy
14. Snohomish County PUD
15. Grays Harbor PUD
16. Idaho Power

-77. Other: [SPECIFY:_____]

-99. Don't know

EM17. When considering energy efficiency projects versus other capital investments, is there a difference in the Return on Investment (ROI) requirements?

1. Yes
2. No

-99. Don't Know

EM18. Does your facility have a specific policy that says you should replace worn out equipment with high efficiency equipment? **[IF NEEDED:** high efficiency refers to equipment that is more efficient than what is considered standard efficiency or code at the time of purchase.**]**

[DO NOT READ]

3. Yes
4. No policy
5. No, but we have an informal policy **[DO NOT READ:** for example they consider efficient equipment when purchasing new equipment but don't necessarily purchase efficient option**]**

-99. Don't Know

EM19. Do your equipment dealers emphasize energy efficiency when explaining your equipment options?

1. Yes, always
2. Yes, sometimes
3. No, never

-99. Don't Know

AW4. Have you heard of the term Continuous Energy Improvement or CEI? If yes, how did you hear about CEI? What is your understanding of CEI?

> **[if needed: NEEA's definition of the Industrial Initiative and CEI]** The Industrial Initiative focuses on achieving market transformation in the industrial sector. It targets end users, trade allies, and utilities in an effort to promote a market-wide energy efficiency strategy. A main objective of the Initiative is to encourage industrial firms in the food processing sector to incorporate energy management practices into their management and operations. CEI is the integration of energy management into all aspects of business operations—from the corporate office to the shop floor. While CEI leads to specific behavioral changes and the adoption of energy efficiency measures, its core idea is to position energy as an input in production that can be managed.

[END INTERVIEW] Thank you for your time. Do you have any questions?

Industrial Initiative Market Partner Survey 2010

MPER #6

Research Objectives

The interviews will inform our understanding of the diffusion of CEI in the food processing market and the forecast of market penetration and energy savings. The goals of the interviews will be to:

- understand the impact of the Industrial Initiative in the industrial market from the market partner perspective;
- learn how many of the utilities are offering programs similar to the Industrial Initiative. Find out the components, goals, budget, and marketing strategies of these programs, and NEEA's influence in the design of the programs; and
- identify new directions for NEEA in the industrial market and how NEEA can best work with the utilities in the future. Among the directions that NEEA is considering are:

    - Training and education. NEEA can organize training and education, ranging from shop/facility level technical training to partnering with industry associations to develop curricula that can be disseminated across an industry.
    - Demonstrations/case studies. NEEA can showcase energy management techniques and highlight successful projects to overcome misperceptions concerning the value of energy efficiency.
    - Channel management. NEEA can continue communicating with manufacturers, professional and trade organizations, and labor organizations to provide information about and encourage development of CEI.
    - Utility partnering. Many utilities are mandated to meet energy-efficiency targets. Through the Initiative, NEEA can help utilities design and market CEI.
    - Trade ally and cross-industry collaboration. NEEA could identify and coordinate outreach and intervention to trade allies and industries that are not familiar with the Initiative.

Interviewer's Name:

Date:

Utility/Market Partner**:**	
Name**:**	
Title**:**	
Phone	Email:
Utility Engagement Status**:**	# of FP and PnP Facilities at Level 3 or higher:
# of FP Facilities:	Interviewed in 2009? Yes/No

S. Screening

Hello, my name is _____, and I am calling from The Cadmus Group, an energy consulting firm in Portland, Oregon. I am calling on behalf of the Northwest Energy Efficiency Alliance as part of the Industrial Initiative (or IEA) program evaluation. I would like to speak with [Contact Name]?

IF REACH CORRECT PERSON: We are evaluating the Northwest Energy Efficiency Alliance Industrial Initiative and would like to speak with you about energy management practices in industrial facilities in your utility's service territory. Our 2009 study found that many of the utilities were offering energy management programs. As a result, NEEA is shifting its focus in the industrial market. We are interested in hearing your thoughts on how NEEA should proceed and how it can best help your customers in implementing energy management practices.

Do you have some time to answer a few questions? Your responses will be kept strictly confidential and only reported in aggregate.

Timing: 30 minutes

Industrial Energy Management Program Offerings

[if the contact is the same from 2009 lead in with "Thanks for taking part in this survey again. Just for the record…]

PO1. Are you familiar with NEEA's Industrial Initiative and Continuous Energy Improvement, or CEI?

[For a respondent who answers "yes", ask them to explain their understanding of what the Industrial Initiative and CEI are.]

[If respondent answers "no" or if definition is different than NEEA's then explain what the Industrial Initiative and CEI are.]

The Industrial Initiative focuses on achieving market transformation in the industrial sector. It targets end users, trade allies, and utilities in an effort to promote a market-wide energy efficiency strategy. A main objective of the Initiative is to encourage industrial firms in the food processing sector to incorporate energy management practices into their management and operations. CEI is the integration of energy management into all aspects of business operations—from the corporate office to the shop floor. While CEI leads to specific behavioral changes and the adoption of energy efficiency measures, its core idea is to position energy as an input in production that can be managed.

[To all]

Throughout this survey we refer to energy management and CEI interchangeably. For the purposes of this survey, energy management and CEI are a self-sustaining management system based on the well-established principles of process management and continuous improvement. CEI helps companies permanently embed energy management into the four key areas of their operations – organizational structure, people, manufacturing systems, and measurement – to enable them to management energy as a controllable expense.

PO2. Does your utility actively promote **[still promote (if promoted energy management in 2009)]** energy management practices to your customers as part of your energy efficiency offerings?

[if "yes" to PO2, go to PO2a. If "no", go to PO4]

PO2a. Does your utility have budget to promote energy management? **[DO NOT READ: This is how we are defining if the utility has its own program]**

[If respondent answers "yes" to PO2a, go to PO3. If respondent answers "no", then go to PO2b.]

PO2b. How is your utility promoting energy management? **[Then go to PO4]**

[Ask PO3 if answer to PO2a was "yes"]
[This PO3 series is specifically for utilities. See page 8 for non-utility series]

PO3. I'd like to ask you a few questions about your utility's energy management program offerings.

PO3.a. **[If respondent answered "yes" to PO2]** Did your utility[will your utility (if no program yet)] use NEEA's program as a guide for developing your energy management program?

PO3.b. What are the program goals?

PO3.c. When did/will the program start and how long will it be offered?

PO3.d. What is the budget? **[note whether the budget is annual or overall]**

PO3.e. How much of the budget is/will be devoted to for marketing?

PO3.f. How is your utility marketing the program?

PO3.g. What industrial segments is the program targeting? **[large vs. small, food processing, chemicals, etc.]**

PO3.h. Does your program involve any of the following? **[Circle all that apply.]**

a. Trainings for customers
b. Demonstration projects
c. Technical forums
d. Energy audits
e. Other _____

PO3.i. Does the program offer incentives?

a. If yes, for what measures or practices?

b. If yes, what are the incentive amounts? **[focus on O & M]**

c. What measurement and verification approach does your organization take to estimate energy savings?

PO3.j. Are you working with a contractor to implement the program? If yes, who?

PO3.k. What are your reasons for offering an energy management program? **[Circle all that apply.]**

a. CEI has been incorporated into the region's 6th Power Plan
b. CEI is demanded by our industrial customers
c. CEI is a cost effective means of achieving our energy savings goals
d. Other _____

[If respondent answered "no" to PO2.]

PO4. What are your reasons for not offering a program that promotes CEI? **[energy management practices]**

a. Insufficient number of industrial customers
b. Insufficient interest by industrial customers
c. Utility staff lack knowledge about CEI practices to implement program
d. Utility lacks funding to implement program
e. Utility staff do not have time
f. Do not believe the program would be cost-effective
g. Other _____

Customer Attitudes and Interest in CEI

Next, I'd like to ask you several questions about your industrial customers' interest in energy management practices.

CA1. What percentage of industrial customers are aware of the opportunity to save energy using energy management practices?

CA2. In general, on a scale from 1-5 where 1 is not at all interested and 5 is very interested, how interested are the aware industrial customers in integrating/adopting energy management practices?

CA3. What percentage of industrial facilities would you estimate are practicing energy management strategies?

CA4. What percentage of industrial facilities do you think are practicing energy management on their own, i.e., without the assistance of NEEA or their utility?

[If > 0%]

Do you think these facilities are receiving technical assistance? If yes, do you know who is providing the assistance?

CA5. What has your utility's experience been in promoting energy management practices and other energy efficiency programs to industrial facilities? **[Have facilities been receptive? Leads into next question about barriers]**

Market Barriers to Adoption of Energy Management Practices

Now, I'd like to ask you a few questions about barriers to the adoption of energy management practices in industrial facilities.

MB1. What are some of the key barriers to customers adopting energy management? **[Check all that apply]**

a. Customers are not aware of energy management and opportunities for savings
b. Energy savings are not a priority or an interest
c. Customers lack capital or bank financing to implement energy management
d. Energy management is not perceived to be cost-effective
e. Customers lack technical skills to implement
f. Other_____

[If familiar with NEEA program (PO1 response was "yes")]

MB2. Do you think NEEA is effectively addressing these barriers?

MB2a. If not, why not?

MB3. What else could NEEA do to assist you or your customers in overcoming these barriers?

NEEA'S Current Relationships with Utilities

[Utilities Only for questions NF1 – NF3]

The next few questions are about NEEA's current relationship with your utility.

NF1. One a scale from 1 to 5 (1 being poor and 5 very good) how would you rate your **utility's** current relationship with NEEA's Industrial Initiative (aka IEA) in particular?

1 2 3 4 5

[If < 3] What are your reasons for giving that rating?

NF2. On a scale from 1 to 5 (1 not at all helpful, 5 very helpful) how helpful do you consider NEEA's Industrial Initiative (IEA) and its offerings to be in your utility's efforts to promote EE to its industrial customers?

1 2 3 4 5

a. What elements of the Industrial Initiative (aka IEA) support your utility's conservation efforts?

NF3. How is the NEEA's Industrial Initiative team communicating with you/your utility? Do you consider it effective?

NEEA's Future Work with Market Partners

Now, I'd like to ask you some questions about how NEEA can best work with your organization in the future.

[Utilities/ETO only]

NF4. If NEEA were to offer assistance or training in designing an energy management program, would your utility be interested in participating?

[All]

NF5. NEEA is considering encouraging facilities to utilize energy management software. Do you think this would be an effective strategy for promoting energy management practices?

NF6. Are you familiar with ISO 50001?

[if yes]

NF6a. Do you think that promoting the ISO 50001 standard would be an effective use of NEEA's resources? What are your reasons for saying that?

NF7. Is there other assistance that NEEA could provide to help promote energy management to your customers?

[END INTERVIEW] Thank you for your time. Do you have any questions?

Industrial Initiative Trade Ally Survey 2010

MPER #6

Research Objectives

The interviews will inform our understanding of the diffusion of CEI in the food processing market and the forecast of market penetration and energy savings. The goals of the interviews will be to:

- Determine the number of trade allies in the Northwest consulting on energy management practices;
- Understand what elements of CEI are being promoted by trade allies;
- Understand trends in awareness and market penetration of CEI over the last five years;
- Understand the factors that influence CEI adoption from the trade ally perspective;
- Understand how trade allies are marketing and promoting CEI;
- Obtain trade ally projections of future adoption of CEI;
- Understand the barriers to CEI adoption from the trade ally perspective; and
- Identify how NEEA can best work with the trade allies in the future.

The sample for the survey includes energy management consulting companies in the Northwest who work with industrial facilities.

-

Interviewer's Name:

Date:

Trade Ally**:**	
Name**:**	
Title**:**	
Phone	Email:

Hello, my name is _____, and I am calling from The Cadmus Group, an energy consulting firm in Portland, Oregon. I am calling on behalf of the Northwest Energy Efficiency Alliance as part of the Industrial Initiative program evaluation. I would like to speak with [Contact Name] OR [someone directly involved with industrial energy management consulting at your company].

IF REACH CORRECT PERSON: We are evaluating the Northwest Energy Efficiency Alliance (NEEA) Industrial Initiative and would like to speak with you about energy management practices in industrial facilities in the Northwest. Do you have some time to answer a few questions? Your responses will be kept strictly confidential and only reported in aggregate.

Timing: 30 minutes

AW1. Are you aware of the NEEA Industrial Initiative program?

1. Yes
2. No

[For a respondent who answers "yes", ask them to explain their understanding of what the Industrial Initiative and CEI are.]

[If respondent answers "no" or if explanation not correct, explain what the Industrial Initiative and CEI are.]

The Industrial Initiative focuses on achieving market transformation in the industrial sector. It targets end users, trade allies, and utilities in an effort to promote a market-wide energy efficiency strategy. A main objective of the Initiative is to encourage industrial firms in the food processing sector to incorporate energy management practices into their management and operations. Continuous Energy Improvement (CEI) is the integration of energy management into all aspects of business operations—from the corporate office to the shop floor. While CEI leads to specific behavioral changes and the adoption of energy

efficiency measures, its core idea is to position energy as an input in production that can be managed.

[To All]

NEEA began this program in 2005 and would like to know how interest in energy management has changed since then and what the interest may be over the next 5 years. We would also like to hear your thoughts on how NEEA could best help your company and your customers in implementing energy management practices in the future.

For the purposes of this survey, energy management practices includes activities such as purchasing efficient equipment, tracking energy usage, efficient operating and maintenance practices and training personnel in managing energy or to operate equipment efficiently. Before I continue, do you have any questions for me, particularly about the definition of "energy management practices?"

S. Screening

S1. Please indicate which of the following best describes your role at the company:

1. Owner
2. Business Manager
3. Engineer
4. Contractor
5. Sales Manager/Business Development

-77. (Other **[SPECIFY: _____]**)

S2. What is your primary area of responsibility?

1. Management
2. Sales and service
3. Design or Engineering
4. Planning

-77. (Other **[SPECIFY: _____]**)

[If respondent is NOT a consultant or engineer directly working with industrial facilities: Is there someone at your company I could speak with who is working directly with industrial facilities to make recommendations on energy efficiency improvements?]

S3. How long have you worked there?

[If < 1 year]

S3a. How long have you been working in the energy management industry?

[If < 1 year: Is there someone at your company I could speak with who is more familiar with industrial facility energy management practices?]

S5. What energy management related services does your company offer to industrial customers? **[Read Responses; Multiple Responses]**

1. Energy audit
2. Analysis of energy intensity (i.e. amount of energy to produce one unit of output)
3. Set energy reduction goals
4. Design energy plan to reach goals
5. Tracking energy use
6. Efficient equipment trainings
7. Efficient O&M practices trainings
8. Quantifying energy savings from measures
9. Visit facility regularly to update strategy and/or goals

-77. (Other [SPECIFY: _____])

S6. How long has your company been offering energy management consulting services to your customers?

S7. How many employees are working on energy management consulting for industrial facilities?

S8. Are these employees working on energy management consulting full-time or do they also work on other types of projects? **[Getting at FTE here, but these questions should be easier to answer than just asking about FTE]**

S9. Which market segments does your business serve for energy management consulting? **[DO NOT READ, prompt if needed]**

1. Agriculture
2. Food products and beverages
3. Textiles and apparel
4. Wood products
5. Paper mfg.
6. Printing and publishing
7. Petroleum/chemicals
8. Rubber and plastics
9. Nonmetallic mineral prod.
10. Primary metals
11. Industrial machinery
12. Computers and electronic mfg.
13. Electrical equipment
14. Transportation equipment
15. Furniture and fixtures
16. Misc. manufacturing
17. Commercial/Educational
18. Health Care
19. Mining/minerals
20. Irrigation
21. Water/Wastewater
22. Cold storage

-77. (Other **[SPECIFY: _____]**)

Customer Attitudes and Interest in CEI

Next, I'd like to ask you several questions about your industrial customers' interest in energy management practices.

CA1. In your estimation, what percentage of industrial customers is aware of the opportunity to save energy using energy management practices?

CA2. For the industrial customers that are aware of energy management, in general, on a scale from 1-5 where 1 is not at all interested and 5 is very interested, how interested are they in integrating/adopting energy management practices?

1 2 3 4 5

CA3. For the range of industries you serve, which three industries are typically MOST receptive to energy efficient options and/or a systems based approach? Please list the top 3 with the MOST receptive industry first.

[USE SAME LIST AS S5 to code segments]

1.
2.
3.

CA4. For the range of industries you serve, which three industries are typically LEAST receptive to energy efficient options and/or a systems based approach? Please list the bottom 3 with the least receptive industry first.

[USE SAME LIST AS S5 to code segments]

1.
2.
3.

CA5. What percentage of industrial facilities would you estimate are currently practicing energy management strategies?

CA5a. How does this compare to 5 years ago?

CA5b. How many of those are practicing energy management on their own, i.e., without technical or financial assistance from NEEA or their utility?

CA6. From your experience, what factors motivate industrial facilities to look at energy management? **[Multiple Response]**

1. Electricity prices
2. Natural gas prices
3. See or hear about other facilities doing it
4. Want to stay competitive

-77. (Other **[SPECIFY: _____]**)

CA6a. Which factor is most important?

CA7. In general, how important are energy costs to your industrial customers? **[Read responses]**

1. Not at all important
2. Not very important
3. Somewhat important
4. Very important

-99. Don't know/not sure **[DO NOT READ]**

CA8. What is the typical payback period that industrial facilities need to meet when considering energy projects? **[In years]**

Company Promotion of Energy Management

CP1. What activities has your company done over the past year to market energy management practices at industrial facilities? **[Read responses]**

1. Offer free or discounted energy audits
2. Offer trainings on energy efficient equipment
3. Offer trainings on efficient O&M practices
4. Offer trainings on quantifying energy intensity
5. Offer trainings on tracking energy use
6. Perform demonstration projects
7. Give presentations at conferences/trade shows
8. Have a table or booth at conferences/trade shows

-77. (Other **[SPECIFY: _____]**)

CP2. What marketing method or activity do you find to be most effective?

CP3. How many industrial facilities did you provide an energy management budget proposal or bid to over the past year?

CP4. What percent of those facilities accepted the proposal?

_____%

-99. Don't know/not sure **[DO NOT READ]**

CP5a. What percentage of their electric bill can an industrial facility expect to save during the initial (one to two) years? Does this rate of savings continue after the initial years? If not, how does it change?

CP5b. What is the cost per kWh to implement CEI during the first one to two years? Please include consulting fees, software costs, O&M practices upgrades costs, and employee training costs. **[will be compared to NEEA's estimate of $75k per year for the first two years (so $150k total)]**

CP5c. And how much does it cost an industrial facility per year to continue practicing energy management?

CP6. On average, how long are your contracts with industrial facilities who hire you for energy management consulting?

1. < 6 months
2. 6 months to 1 year
3. 1 – 2 years
4. 2 - 3 years
5. 3 – 4 years
6. 4 – 5 years
7. > 5 years

-77. (Other **[SPECIFY: _____]**)

CP7. Do you provide your industrial customers with software tools to track and measure energy use?

[if yes]

CP7a. Which software do you typically recommend that they use? **[multiple response]**

1. Energy Expert (Energy Worksite) from Northwrite
2. US DOE's Industrial Technologies Program Software Suite
3. Other **[Specify_____]**

CP7b. Do you choose the tool for them, or do they choose the tool themselves?

CP7c. In your experience, what is the most common software tool being used to track energy use?

CP7d. What are the top three features that you believe any software/spreadsheet tool needs to have to be effective? Please list the most important feature first, then the 2nd and 3rd most important.

CP8. What percentage of industrial facilities would you estimate continue improving energy efficiency on their own after the consulting contract has expired?

MT. Market Transformation Progress and Future

Next, I'd like to ask you several questions about energy management awareness and practices in the industrial sector over the last five years and what you expect the market to look like during the next five years.

MT1. In your opinion, has industrial facility awareness of energy management practices increased, decreased, or stayed the same over the last 5 years?

1. Increased
2. Decreased
3. Stayed the same

-99. Don't know/not sure **[DO NOT READ]**

MT2. In your opinion, has the number of industrial facilities practicing energy management increased, decreased, or stayed the same over the last 5 years?

1. Increased
2. Decreased
3. Stayed the same

-99. Don't know/not sure **[DO NOT READ]**

MT3. How have industrial facilities' perceptions of energy efficiency changed over the last 5 years?

MT4. Are there other ways the industrial market for energy management has changed over the last 5 years? **[Probe for availability of services, availability of training and information]**

MT5. What have been the drivers in the industrial market change? This could include people, groups, or market factors. **[Multiple Response; Do not prompt]**

1. NEEA's Industrial Initiative Program
2. Other utility energy efficiency programs **[SPECIFY:_____]**
3. Electricity or natural gas prices
4. Other facility costs increased
5. Changes in environmental awareness and attitudes
6. Facilities want to present themselves as "green"

-77. (Other **[SPECIFY: _____]**)

MT6. What percent of the industrial facilities that are not currently actively managing energy would you expect to begin managing energy over the next 5 years?

MT6a. **[If < 30%]** What are your reasons for saying that? **[OPEN END; DO NOT READ LIST]**

1. Energy costs are unimportant
2. Industrial facilities are already quite efficient
3. Industrial facilities have little interest
4. Industrial facilities will not pay the added up-front costs

-77. (Other **[SPECIFY: _____]**)

Market Barriers to Adoption of Energy Management Practices

Now, I'd like to ask you a few questions about barriers to the adoption of energy management practices in industrial facilities.

MB1. What are some of the key barriers to industrial facilities adopting energy management? **[Check all that apply]**

1. Industrial facility staff are not aware of energy management and opportunities for savings
2. Energy savings are not a priority or an interest
1. Industrial facilities lack capital or bank financing to implement energy management
2. Energy management is not perceived to be cost-effective
3. Industrial facility staff lack technical skills to implement
4. Lack of compatible equipment

-77. (Other [SPECIFY: _____])

MB2. Do you think NEEA or other energy efficiency programs are effectively addressing these barriers?

MB2a. What are your reasons for saying that?

MB4. What else could NEEA or other energy efficiency programs do to assist you or your customers in overcoming these barriers?

MB5. Has the current economy had an impact on industrial facilities' interest in energy management?

1. Yes
2. No

-99. Don't know/not sure **[DO NOT READ]**

[If MB1 = 1]

MB1a. How has it impacted interest?

NEEA's Future Work with Your Company

Now, I'd like to ask you some questions about how NEEA can best work with your company in the future.

NF1. Are you familiar with the upcoming ISO 50001 standard?

[if yes]

NF1a. What percent of your clients or prospective clients do you think will seek ISO 50001 registration over the next five years?

NF1b. Along with providing for registration for companies, ISO 50001 will have a certification program for field advisors. Are you or anyone in your company planning on becoming an ISO certified field advisor?

NF2. Is there any assistance that NEEA could provide to help promote energy management to your customers?

Firm Characteristics

F1. Do you provide sales/services in: **[CHECK ALL THAT APPLY]**

1. Oregon
2. Washington
3. Idaho
4. Montana
5. Outside of the Pacific Northwest

[if some outside of the NW]

F1a. What percent of your energy management projects are in the Northwest (Oregon, Washington, Idaho, and Montana)?

_____%

-99. Don't know **[DO NOT READ]**

F2. What percent of your industrial energy management projects are:

1. Existing facilities _____%
2. New construction _____%

-99. Don't know **[DO NOT READ]**

[END INTERVIEW] Thank you for your time. Do you have any questions or other comments?

Appendix E. Survey Frequencies

Target Audience Follow-Up (TAFU) Survey

Nonparticipant Survey

Market Partner Survey

Trade Ally Survey

2010 Target Audience Follow Up Survey Frequencies

Table 31. QS1. "According to our records your title is [TITLE]. Is this still correct?

Response	Frequency (n=13)
Energy Champion and Project Engineer	2
Energy Champion and Maintenance Manager / Supervisor / Planner	3
Energy Champion and Production Manager	4
Energy Champion and Store Room Supervisor	1
Energy Champion and Accounting Manager / Site Accountant	2
Energy Champion and Shift Manager	1

Table 32. QS2. "How do your job duties relate to energy use at your facility?"

Response	Frequency (n=13)
Manage Energy Team	10
Track and Monitor Energy Use	6
Implement, Manage or Develop Energy Projects	6
Organize Employee Awareness Activities	3

Note: More than one response allowed.

Table 33. QEM0. "NWFPA has a goal for their members to reduce energy intensity by 25% in 10 years. Is your facility taking steps to try to meet that goal?"

Response	Frequency (n=13)
Yes	10
Maybe in the future	0
No, was not aware of goal	1
No, was aware of goal but not participating	2

Table 34. QEM1. "What are your facility's specific goals (independent of the NWFPA goal) for reducing your energy intensity*?"

Response	Frequency (n=13)
25% in 10 years	4
5% per year for 5 years	1
5% per year (no duration)	2
3% per year (no duration)	4
Don't know	1
No goals	1

*Energy intensity measured as energy use per pound of product.

Table 35. QEM1a. "What is your strategy to meet those goals?"

Response	Frequency (n=12*)
Implement capital projects	8
Implement O&M improvements	9
Increase employee awareness	6
Track and monitor energy use	1

Note: Asked of those who responded that they have goals in QEM1. One respondent did not articulate specific goals, but was familiar with the energy reduction strategies of the facility and his responses are included in

Table 35. More than one response allowed.

Table 36. QEM2. "How likely are you to meet the goal?"

Response	Frequency (n=12*)
Not likely	1
Somewhat likely	1
Likely	3
Very likely	7

Note: Asked of those who responded that they have goals in QEM1. One respondent did not articulate specific goals, but was familiar with the energy reduction strategies of the facility and his responses are included in Table 36.

Table 37. QEM2a. "What are the reasons for saying [INSERT RATING]?"

Response	Frequency (n=12*)
Good management support	1
Historical success	7
Energy is a priority	1
Good employee / team support	1
Efficiency depends on crops	3
Changes in production process	1
No Response	1
Not Applicable	1

Note: Note: Asked of those who responded that they have goals in QEM1. One respondent did not articulate specific goals, but was familiar with the energy reduction strategies of the facility and his responses are included in Table 37. More than one response allowed.

Table 38. Crosstab of QEM2. "How likely are you to meet the goal?" and QEM2a. "What are the reasons for saying [INSERT RATING]?"

Facility's Likelihood of Meeting Energy Intensity Reduction Goals	Factors Influencing Facilities' Likelihood of Reaching Goal to Reach Goal						
	Good management support	Historical success	Energy is a priority	Employee/ team support	Efficiency depends on crops	Production process change	No Response
Not likely (n = 1)	0	0	0	0	0	1	0
Somewhat Likely (n = 1)	0	0	0	0	1	0	0
Likely (n = 3)	0	2	0	0	1	0	1
Very Likely (n = 6)	1	5	1	1	1	0	1
Total (n = 12)	1	7	1	1	3	1	1

Note: Note: Asked of those who responded that they have goals in QEM1. One respondent did not articulate specific goals, but was familiar with the energy reduction strategies of the facility and his responses are included in Table 38. One respondent did not provide a response to this question. More than one response allowed.

Table 39. QEM3a. "The Industrial Initiative has provided us with a list of improvements you have made at your facility. We would like to go through a few of those changes to see if they are still in place. Our records show that you have made several equipment upgrades including: [INSERT LIST]. Are all of these still in place?"

Response	Frequency (n=13)
Yes	36
No	0
Don't know	5
Not applicable	2

Note: Represents number of measures, except in the case of not applicable, which represents the number of plants with no validated capital projects. This question covered a total of 41 measures.

Table 40. QEM4a. "Now I'm going to go through a couple of O&M improvements we have in our records. The first one I have down is [_____] in 200__. Is that change still in place?"

Response	Frequency (n=13)
Yes	10
No	1
Don't know	1
Not applicable	1

Note: Represents number of measures, except in the case of not applicable, which represents the number of plants with no validated O&M projects. This question covered a total of 12 measures.

Table 41. QEM4a1. "What were the reasons for not continuing this activity?"

Response	Frequency (n=1)
It limited production capabilities	1

Note: Asked of those who responded "No" to QEM4a.

Table 42. QEM4b. "The next one I have down is [_____] in 200__. Is that change still in place?"

Response	Frequency (n=13)
Yes	11
No	0
Don't know	0
Not applicable	2

Note: Represents number of measures, except in the case of not applicable, which represents the number of plants with no validated O&M projects and plants with no additional validated O&M projects (i.e., all validated O&M measures were covered in previous questions). This question covered a total of 11 measures.

Table 43. QEM4c. "The next one I have down is [_____] in 200__. Is that change still in place?

Response	Frequency (n=13)
Yes	7
No	0
Don't know	1
Not applicable	5

Note: Represents number of measures, except in the case of not applicable, which represents the number of plants with no validated O&M projects and plants with no additional validated O&M projects (i.e., all validated O&M measures were covered in previous questions). This question covered a total of 8 measures.

Table 44. QEM4d. "The next one I have down is [_____] in 200__. Is that change still in place?

Response	Frequency (n=13)
Yes	5
No	0
Don't know	0
Not applicable	8

Note: Represents number of measures, except in the case of not applicable, which represents the number of plants with no validated O&M projects and plants with no additional validated O&M projects (i.e., all validated O&M measures were covered in previous questions). This question covered a total of 5 measures.

Table 45. QEM4d (additional). "Our records indicate that you have also completed these O&M projects: [INSERT LIST]. Are these measures still in place?"

Response	Frequency (n=13)
Yes	11
No	2
Don't know	1
Not applicable	10

Note: More than one response allowed. Represents number of measures, except in the case of not applicable, which represents the number of plants with no validated O&M projects and plants with no additional validated O&M projects (i.e., all validated O&M measures were covered in previous questions). This question covered a total of 14 measures.

Table 46. QEM4d1 (additional). "What were the reasons for not continuing this activity?"

Response	Frequency (n=2)
Removed to prevent damage to facility	2

Note: Note: Asked of those who responded "No" to QEM4d (additional).

Table 47. QEM5. "Have you implemented any other energy related projects in addition to the ones we've discussed?"

Response	Frequency (n=13)
Yes	13
No	0
Don't know	0

Table 48. QEM5a. "What other projects have you implemented?"

Response	Frequency (n=13)
Heat recovery	3
Lighting	3
Fans / Motors / Pumps / VFDs	3
Steam trap	3
Compressed air	1
Refrigeration	3
Alternative Fuels	1
Boilers	1
Less Equipment Use	1
Other	3

Note: More than one response allowed.

Table 49. QEM5a1. "What motivated you to implement these projects?"

Response	Frequency (n=13)
Upper management	4
Reduce cost of finished product, save money	3
Provides a competitive advantage	1
Low payback	1
Safety concerns	1
Environmental benefits	1
Operational benefits	1
Other	1
Don't know	1
No response	2

Note: More than one response allowed.

Table 50. QEM5b. "Did you receive technical assistance for any of these additional projects you mentioned?"

Response	Frequency (n=13)
Yes	9
No	1
Don't Know	2
No Response	1

Table 51. QEM5b1. "Who provided assistance?

Response	Frequency (n=9)
NEEA/ Ecos	2
NWFPA	0
Cascade Energy Engineering	2
ETO	0
Utility	0
Equipment distributor / manufacturer	3
Energy consulting firm	0
State energy agency	0
Other: Association of Energy Engineers	1
Other: Internal engineering department	3
Not applicable	4
Total	15

Note: Asked of those who responded "Yes" to QEM5b. More than one response allowed.

Table 52. QEM5c. "Did you receive a tax credit, incentive or rebate for any of the projects you mentioned?"

Response	Frequency (n=13)
Yes, incentive or rebate	10
No	1
Don't Know	1
Not applicable	1

Table 53. QEM5c1. "Who provided the incentive?"

Response	Frequency (n=10)
ETO	3
BPA	0
Pacific Power	0
Tacoma Power	0
Puget Sound Energy	0
Snohomish County PUD	0
Grays Harbor PUD	0
Idaho Power	3
Other: Grant County PUD	3
Other: Rocky Mountain Power	1
Don't Know	0
Not applicable	3
Total	13

Note: Asked of those who responded "Yes" to QEM5c.

Table 54. QEM6. "What information do you rely upon to tell you if a piece of equipment or O&M practice is energy efficient? [IF NEEDED: **This could be written information or people or experience.**]"

Response	Frequency (n=13)
Efficiency rating or label of equipment	8
Equipment dealer said it was efficient	4
Personal experience	1
Met utility rebate requirements	1
Other: Monitor energy use	2
Other: Internal engineering department	1
Other: Monitor / Measure equipment	2
Other: Self-education	1
Don't know	0
Total	20

Note: More than one response allowed.

Table 55. QEM7. "In your opinion, how successful has your facility been in integrating energy management into their business practices?"

Response	Frequency (n=13)
Not successful	0
Somewhat successful	0
Successful	7
Very successful	4
Don't know	2

Table 56. QEM7a. "What are your reasons for saying [INSERT RATING]?"

Response	Frequency (n=13)
Increased Employee Awareness	6
Good management support	4
Energy is now considered on a daily basis	2
Energy efficiency always considered for capital installations	1
Good support from plant staff	3
Energy has a place at the table now	1
Realizing consistent energy savings	1
Still need to increase employee awareness	2

Note: More than one response allowed.

Table 57. Crosstab of QEM7. "In your opinion, how successful has your facility been in integrating energy management into their business practices?" and QEM7a. "What are your reasons for saying [INSERT RATING]?"

Success of Integration of CEI into Business Practices	Increased Employee Awareness	Good Management Support	Energy Is Now Considered On a Daily Basis	Energy Efficiency Always Considered for Capital Installations	Good Support from Plant Staff	Energy Has a Place at the Table Now	Realizing Consistent Energy Savings	Still Need to Increase Employee Awareness
Not successful (n = 0)	0	0	0	0	0	0	0	0
Somewhat successful (n = 0)	0	0	0	0	0	0	0	0
Successful (n = 7)	3	2	0	1	0	1	1	2
Very successful (n = 4)	2	1	1	0	2	0	0	0
Don't know (n = 2)	1	1	1	0	1	0	0	0
Total (n = 13)	6	4	2	1	3	1	1	2

Table 58. QEM8. "Has implementing energy management practices at the facility had an impact on employee perceptions about energy conservation?"

Response	Frequency (n=13)
Yes	13
No	0
Total	13

Table 59. QEM8a. "Can you explain?"

Response	Frequency (n=13)
Employee awareness has increased	13
Employees are taking steps to save energy	3
Would still like to see employee awareness continue to increase	4

Note: More than one response allowed.

Table 60. QEM9. "Have the energy projects that we've discussed provided benefits beyond energy savings?"

Response	Frequency (n=13)
Yes	11
No	1
No response	1

Table 61. QEM9a. "Can you explain?"

Response	Frequency (n=12)
Additional energy benefits	1
Increased technical knowledge	2
Lower maintenance costs	3
Extended product life	1
Environmental benefits	1
Safety benefits	3
Increased productivity	3
Less waste	1
Water savings	1
Other	1
Can't think of any additional benefits	1

Note: Asked of those who responded to QEM9. More than one response allowed.

Table 62. Crosstab of QEM9. "Have the energy projects that we've discussed provided benefits beyond energy savings?" and QEM9a. "Can you explain?"

	Additional energy benefits	Increased technical knowledge	Lower maintenance costs	Extended product life	Environmental benefits	Safety benefits	Increased productivity	Less waste	Water savings	Other	Can't think of any additional benefits
Yes (n = 11)	1	2	3	1	1	3	3	1	1	1	0
No (n = 1)	0	0	0	0	0	0	0	0	0	0	1
Total (n = 12)	1	2	3	1	1	3	3	1	1	1	1

Note: More than one response allowed.

Table 63. QEM10. "On a scale of 1 to 5, where 1 is not at all and 5 is completely, currently how much do you rely on Initiative staff or Ecos for providing assistance for energy management projects at your facility?"

Response	Frequency (n=13)
1	3
2	3
3	5
4	1
5	0
Don't know	1

Table 64. QID1. "Outside of your company staff, who would you go to first to talk about improving energy efficiency at your facility?"

Response	Frequency (n=13)
NEEA	0
NWFPA	0
BPA	1
ETO	0
Utility: Idaho Power	3
Utility: Rocky Mountain Power	1
Utility: Portland General Electric / NW Natural	1
Equipment distributor	0
Energy consulting company: Cascade Energy Engineering	1
Trade conference	0
Ecos	4
Other: Association of Energy Engineers	1
No one outside of company staff	1

Table 65. QID2. "Who else would you to talk about improving energy efficiency at your facility?"

Response	Frequency (n=13)
NEEA	0
NWFPA	0
BPA	0
ETO	1
Utility: Intermountain Gas	1
Utility: Grant County PUD	2
Utility: Idaho Power	1
Utility: Portland General Electric	1
Utility: Umatilla Electric Cooperative	1
Equipment distributor	3
Energy consulting company: Cascade Energy Engineering	1
State energy agency: DOE	1
Trade conference	0
Ecos	1
Other: WSU / OSU	2
Other: Energy West	1
Other: Engineering staff within Company	3
Other: Other Company staff	1
No one	1

Note: More than one response allowed.

Table 66. QID3. "How often do you discuss energy management techniques with colleagues at different facilities within your company?"

Response	Frequency (n=13)
Never	0
Yearly	0
Biannually	0
Quarterly	6
Monthly	5
Bimonthly	0
Weekly	1
Other: Daily	1

Table 67. QID3a. "How often do you discuss energy management techniques with colleagues outside of your company?"

Response	Frequency (n=13)
Never	1
Yearly	1
Biannually	0
Quarterly	2
Monthly	1
Bimonthly	2
Weekly	1
Other: Every two months	1
Other: Quarterly to biannually, depending on activities	1
Other: Not on a regular basis	1
Other: Rarely	2

Table 68. QID4. "If the Industrial Initiative were to disappear, what would happen to energy management at your company?"

Response	Frequency (n=13)
Continue as before	11
Continue, but at a slower pace	2

Table 69. QID4a. "What resources would you need to continue managing energy successfully?"

Response	Frequency (n=13)
Training	1
Capital / Rebates for installing efficient equipment	1
Trade shows / Communication with other facilities	1
Software tools	1
Vendors of energy using equipment	1
Continued support from current external resources	4
Already have sufficient in-house resources	5

Note: More than one response allowed.

2010 Nonparticipant Facility Frequencies

Table 70. QS1. "What is your title at (name of company)?"

Response	Frequency (n=21)
Engineering Manager	5
Plant Manager	9
VP of Operations	2
Maintenance Manager	2
Operations Manager	1
Other	2

Table 71. QS1a. "How long have you worked at (name of company)?"

Response	Frequency (n=21)
<5	3
5-10	1
11-15	2
16-20	1
21-25	1
25+	1
No response	12

Table 72. QS2. "What are some of your key responsibilities at the firm?"

Response	Frequency (n=21)
Capital projects	3
Facility management	5
Maintain machinery	2
Product production	4
Energy review	4
Track water use	1
Track energy	6
Meter electricity	1
Manage operations	9
Equipment upgrades	6
Energy mgmt	2
Other	1

*Multiple responses were allowed.

Table 73. QS3. "What electric utility serves your facility?"

Response	Frequency (n=21)
PGE	2
Chelan PUD	1
City of Tacoma	1
Pacific Power	4
Idaho Power	4
Puget Sound Energy	2
Franklin PUD	1
Avista	1
Seattle City Light	1
Grant County PUD	1
No response	3

Table 74. QAW0. "How aware is your facility about energy management practices?"

Response	Frequency (n=21)
1 (Not Aware)	0
2	3
2.5*	1
3	2
3.5	1
4	4
5 (Very Aware)	10

*Some respondents answered with a range (e.g. "3 or 4"). In these cases, responses were tabulated as the median between the two responses (e.g. 3.5).

Table 75. QAW0a. "Can you explain why you gave that rating?"

Response	Frequency (n=21)
Tracking Energy	4
Not a priority	3
EE equipment upgrades	4
Look to improve production efficiency	1
Energy audit	4
Energy team meetings	1
It's a key performance indicator	1
Purchase natural gas on the market	1
Attentive to energy costs	6
Could do more	2
Don't always have the budget for it	3

*Multiple responses were allowed.

Table 76. Crosstab of "How aware is your facility about energy management practices?" and QAW0a. "Can you explain why you gave that rating?"

Awareness Rating	Tracking energy	Not a priority	EE equipment upgrades	Look to improve production efficiency	Energy audit	Energy team meetings	It's a key performance indicator	Purchase natural gas on the market	Attentive to energy costs	Could do more	Don't always have the budget for it
1 Not aware (n=0)	0	0	0	0	0	0	0	0	0	0	0
2 (n=3)	1	2	0	0	0	0	0	0	0	1	0
2.5 (n=1)	0	0	0	0	0	0	0	0	0	1	1
3 (n=2)	1	1	0	0	0	0	0	0	0	0	0
3.5 (n=1)	0	0	0	0	1	0	0	0	0	0	1
4 (n=4)	0	0	1	0	1	0	0	1	1	0	0
5 Very aware (n=10)	2	0	3	1	2	1	1	0	5	0	1
Total (n = 21)	4	3	4	1	4	1	1	1	6	2	3

*Note: Multiple responses were allowed.

Table 77. QAW1. "When did you first learn about energy efficiency equipment?"

Response	Frequency (n=21)
2010 (< 1 year ago)	0
2009 (approximately 1 year ago)	1
2008 (approximately 2 years ago)	0
2007 (approximately 3 years ago)	1
Before 2007 (more than 3 years ago)	19

Table 78. QAW2. "When did you first learn about energy efficiency operating practices?"

Response	Frequency (n=21)
2010 (< 1 year ago)	0
2009 (approximately 1 year ago)	2
2008 (approximately 2 years ago)	0
2007 (approximately 3 years ago)	2
Before 2007 (more than 3 years ago)	17

Table 79. QAW3. "How did you first learn about energy management practices?"

Response	Frequency (n=21)
NEEA	2
NWFPA	5
BPA	1
ETO	0
Utility	3
Equipment distributor	3
Energy consulting company	5
State Energy Office	0
Trade Conference	2
Ecos	0
DOE	1
Other	12

*Multiple responses were allowed.

Table 80. QEM0. "How active is your facility in managing energy use?"

Response	Frequency (n=20)
1 (Not Active)	0
2	2
3	9
3.5	4
4	0
5 (Very Active)	5

*Some respondents answered with a range (ex., "3 or 4"). In these cases, responses were tabulated as the median between the two responses.

Table 81. QEM0a. "Can you explain why you gave that rating?"

Response	Frequency (n=20)
Other things are higher priority	3
Could do more	9
Have done several projects lately	6
Have several projects planned	1
Track energy	7
Need to control energy costs	2
No capital for EE improvements	1
Don't have the staff	1
Perceived to not have control over energy use	2
No response	1

Table 82. Crosstab of QEM0. "How active is your facility in managing energy use?" and QEM0a. "Can you explain why you gave that rating?"

Response	Other things are higher priority	Coul d do more	Have done several projects lately	Have several projects planned	Track energy	Need to control energy costs	No capital for EE improve ments	Don't have the staff	Perceived to not have control over energy use	No response
1 Not Managed (n=0)	0	0	0	0	0	0	0	0	0	0
2 (n=2)	0	2	1	0	1	0	0	0	0	0
3 (n=9)	2	3	0	1	3	0	1	1	0	0
3.5 (n=4)	1	2	2	0	1	0	0	0	1	0
4 (n=0)	0	0	0	0	0	0	0	0	0	0
5 Very Closely Managed (n=5)	0	0	2	0	2	2	0	0	0	1
Total (n = 20)	3	7	5	1	7	2	1	1	1	1

*Note: Multiple responses were allowed.

Table 83. QEM0b. "When did your facility begin to actively manage energy use?"

Response	Frequency (n=21)
2010 (< 1 year ago)	0
2009 (approximately 1 year ago)	0
2008 (approximately 2 years ago)	1
2007 (approximately 3 years ago)	4
Before 2007 (more than 3 years ago)	14
Don't Know	2

Table 84. QEM1. "How would you rate the level of management support for dedicating Full Time Employee resources to energy management?"

Response	Frequency (n=21)
No support	1
Little support	5
Some support	9
Total support	6

Table 85. QEM2. "Does staff receive training on energy management?"

Response	Frequency (n=21)
Yes	16
No	5

Table 86. QEM2a. "What types of energy management activities does the training typically involve?"

Response	Frequency (n=16)
Purchasing efficient equipment	14
Efficient operation of equipment	15
Tracking energy use	10
Setting energy reduction goals	6
Writing an energy management plan	1
Available technical resources (where to go for help)	10
Availability of financial incentives for projects	13
Other	2

Table 87. QEM3. "Is someone at your facility a designated 'Energy Manager'?"

Response	Frequency (n=21)
Yes	4
No	17

Table 88. QEM4. "Does someone at the company track electricity or natural gas use at your facility?

Response	Frequency (n=21)
Yes, both electricity and natural gas	14
Yes, just electricity	2
Yes, just natural gas	0
No	0
Yes, but did not specify between electricity and natural gas	5

Table 89. QEM4a. "How is energy tracked?"

Response	Frequency (n=21)
Review billing data	10
Meter energy use	6
Other	1
Don't know	1
No response	6

*Note: Multiple responses were allowed.

Table 90. Crosstab of "Does someone at the company track electricity or natural gas use at your facility?" and "How is energy tracked?"

	Review Billing Data	Meter Energy Use	Other	Don't Know	No Response
Yes, both electricity and natural gas (n = 14)	9	6	0	1	1
Yes, just electricity (n = 2)	1	0	1	0	0
Yes, just natural gas (n = 0)	0	0	0	0	0
No (n = 0)	0	0	0	0	0
Yes, but did not specify between electricity and natural gas (n = 5)	0	0	0	0	5
Total (n = 21)	10	6	1	1	6

*Note: Multiple responses were allowed.

Table 91. QEM4b. "How often is that information reviewed?"

Response	Frequency (n=21)
Daily	2
Weekly	2
Monthly	11
Quarterly	1
Annually	1
Other	1
Don't Know	3
No response	5

*Note: Multiple responses were allowed.

Table 92. QEM5. "Does your facility set energy reduction goals or goals to reduce energy intensity?"

Response	Frequency (n=21)
Yes	13
No	8

Table 93. QEM6. "Will your facility participate in NWFPA's goal for their members to reduce energy intensity by 25% in 10 years?"

Response	Frequency (n=21)
Yes	7
Maybe in the future	3
No	2
Don't know	7
No Response	2

Table 94. QEM7. "Does your facility have an energy management plan?"

Response	Frequency (n=21)
Yes	5
No	15
No Response	1

Table 95. QEM6a. "Do you revisit your plan on a regular basis, or update it as operations change?"

Response	Frequency (n=5)
Yes, we update on a regular basis	4
Yes, we update as operations change	1

Table 96. QEM8. "Have you implemented any of the following actions in the past two years in order to save energy?"

Response	Frequency (n=21)
Leak tag program / leak detection and repair (check for air leaks.)	16
Lighting reduction, turning lights off when not in use	17
Equipment operation schedule or turning equipment off when not in use	19
Equipment settings (decreasing temperature, pressure, motor speed)	17
Removing equipment	9
Equipment Maintenance	19
Production floor cleaning practices	11
Insulate pipes or tanks	17
New equipment fuel switching	1
Updating hydraulic pump system	1
Steam and compressed air systems, condensate recovery	1
Replace lights	1
Energy audits	1
Replaced pulp drying using old conventional drums that used 200 tons of coal a day with steam dryers	1
Total Product Management- has an energy component	1
Boiler efficiency, oxygen trim, heat recovery, economizers	1
Ongoing review	1

*Note: Multiple responses were allowed.

Table 97. QEM9. "Have you observed energy savings from any of these actions?"

Response	Frequency (n=21)
Yes	14
No	4
Don't Know	2
No Response	1

Table 98. QEM10. "Did you receive technical assistance for any of these actions?"

Response	Frequency (n=21)
Yes	19
No	2

Table 99. QM10a. "Who provided the technical assistance?"

Response	Frequency (n=19)
NEEA/Ecos	3
NWFPA	2
BPA/Cascade Energy Engineering/Strategic Energy Group/Evergreen Consulting	6
ETO	1
Utility	13
Equipment distributor/manufacturer	8
Energy consulting company	3
Other	6
Don't know	1

*Note: Multiple responses were allowed.

Table 100. QEM11. "What were the barriers to implementing any of these actions?"

Response	Frequency (n=21)
Too expensive to implement (Includes too long of ROI)	15
Cannot get approval from management	2
Lack of knowledge	1
Other priorities demand resources	3
Other	5
No Barriers	1

*Note: Multiple responses were allowed.

Table 101. QEM12. "Over the past 2 years, have you installed, or are you currently installing, any equipment that you would consider energy efficient?"

Response	Frequency (n=21)
Yes, have installed energy efficient equipment over past 2 years	12
Yes, currently installing energy efficient equipment	0
Yes, both installed energy efficient equipment over past 2 years AND currently installing	6
Don't Know	1
No response	2

Table 102. QEM13. "What information do you rely upon to tell you if the equipment you

are buying is energy efficient?"

Response	Frequency (n=21)
Efficiency rating or label of equipment	6
Equipment dealer said it was efficient	14
Personal experience	2
Met utility rebate requirements	2
Other	9
No Response	2

*Note: Multiple responses were allowed.

Table 103. QEM14. "Have you quantified the amount of energy savings from these projects?"

Response	Frequency (n=18)
Yes	11
No	6
No response	1

Table 104. QEM15. "What motivated you to install energy efficient equipment?"

Response	Frequency (n=18)
Save energy and money	15
The equipment distributor or manufacturer recommended it	1
Recommended in an energy audit	1
Tax incentives or rebates	4
Other	9
No Response	1

*Multiple responses were allowed

Table 105. QEM16. "Did you receive any financial incentives like tax credits, rebates or incentives from your utility or other institutions for these measures?"

Response	Frequency (n=18)
Yes, Federal tax credit	1
Yes, State tax credit	3
Yes, Utility rebate or incentive	14
No	1
Don't know	1

*Multiple responses were allowed

Table 106. QEM16a. "Which utility or institution provided the incentive?"

Response	Frequency (n=16)
ETO	1
BPA	3
Pacific Power	1
Puget Sound Energy	1
Grays Harbor PUD	1
Idaho Power	5
Other Utility	4
No Response	2

*Multiple responses were allowed.

Table 107. QEM17. "When considering energy efficiency projects versus other capital investments, is there a difference in the Return on Investment requirements?"

Response	Frequency (n=21)
Yes	7
No	13
No response	1

Table 108. QEM18. "Does your facility have a specific policy that says you should replace worn out equipment with high efficiency equipment?"

Response	Frequency (n=21)
Yes	5
No policy	7
No, but we have an informal policy	9

Table 109. QEM19. "Do your equipment dealers emphasize energy efficiency when explaining your equipment options?"

Response	Frequency (n=21)
Yes, always	8
Yes, sometimes	10
No, never	2
Don't know	1

Table 110. QAW4. "Have you heard of the term Continuous Energy Improvement or CEI? If yes, how did you hear about CEI? What is your understanding of CEI? ?"

Response	Frequency (n=21)
Yes	10
No	11

Table 111. QAW4. "Have you heard of the term Continuous Energy Improvement or CEI? If yes, how did you hear about CEI? What is your understanding of CEI? " – Individual responses for those answering "Yes"

Responses (n = 10)
(We) heard through NEEA, it helps manage (our) energy as a controllable expense
Yes, this was part of the kaizen blitz- you're never done- you're not all knowing- have to keep looking at the issues. It goes right along with continuous process improvement. ETO was the sponsor of the kaizen blitz- I think the technique came from Toyota- it's Japanese for continuous improvement.
Yes heard about it during training 2 years ago during energy efficiency spree, with SEG
(We've) used it as part of their corporate culture.
Heard about it through the NEEA seminar given here in Sunnyside in April or May, It's a continuous process to become more energy efficient.
Don't remember, maybe NEEA. It is the application of continuous improvement processes specific to energy, re-examine process from energy standpoint
Yes- have been involved in lean manufacturing and CEI continuously- it means to essentially keep up- good enough is never good enough.
Yes have heard of this from the NWFPA- NEEA within the past three years- have our own internal program- Continuous Improvement Program- covers Energy, Environmental, Safety- everything important. (The CEI definition would be) to make you aware of and continually look for energy efficient opportunities.
Yes. I heard about it through publications. My understanding of it is to always look for better ways to use energy more efficiently.
Yes I heard about it through the Corporate office- they brought up CEI at last April's staff meeting. CEI is just continually trying to reduce energy and fuel use- it also reduces our costs.

Note: n = 1 for each response above.

2010 Market Partner Frequencies

Table 112. QPO1 "Are you familiar with NEEA's Industrial Initiative and Continuous Energy Improvement, or CEI?"

Response	Frequency (n=10)
Yes	8
Somewhat	2
No	0

Table 113. QPO2 "Does your utility actively promote [still promote (if promoted energy management in 2009)] energy management practices to your customers as part of your energy efficiency offerings?"

Response	Frequency (n=10)
Yes	7
No	3

Table 114. QPO3a "Did your utility [will your utility (if no program yet)] use NEEA's program as a guide for developing your energy management program?"

Response	Frequency (n=6)	Verbatim
Yes	3	• Yes, It was hard work designing the three components of energy management program. The design was based on CEI and we give a lot of credit to NEEA for program design. We wanted to use CEI brand in our program offerings but NEEA refused. We believe that NEEA missed an opportunity here • Definitely, the content was straight out of CEI. We also pay incentives (which NEEA can't do). The cost to launch was minimal, because content was already developed by NEEA. NEEA wouldn't let us use the term "CEI" and so we were forced to use other names. We believe this was a huge mistake because it isn't market transformation.
No	3	• Will be based on the BPA program • Will be based on the BPA program • Program was around before NEEA's program

Table 115. QPO3b "What are the program goals?"

Response (n=4)
Reduce energy use by 25% in 10 years
No quantitative goal. Program goal is to achieve measurable energy intensity reductions through behavior change
12 aMW goal in 2010, 15 aMW goal in 2011.
Reduce energy intensity by 25% over 10 years

Table 116. QPO3i "Does the program offer incentives?"

Response	Frequency (n=4)
Yes	3
No	1

Table 117. QPO3ia "If yes, for what measures or practices?"

Response (n=3)
Everything that saves energy that they can analyze.
Equipment upgrades and O&M; leak tag programs, O_2 on boilers, process heating and steam areas is what they like to focus on
Energy Management

Table 118. QPO3ib "If yes, what are the incentive amounts?"

Response (n=3)
• O&M $0.08 cents/kWh capped at 50% of cost. Custom measures $0.025/kWh capped at 50% for measure life • IEI $0.02 cents/kWh capped at 50% • Self-direct gets $0.001 cents kWh capped on cost. Kaizen blitz gets $00.008 cents/kwh capped at cost
$100k or less
• One aspect offers funding for a salaried energy manager position • Other aspect offers $0.25/kWh or 70% of project cost (whichever is lowest)

Table 119. QPO3k "What are your reasons for offering an energy management program?"

Response	Frequency (n = 4)
CEI has been incorporated into the region's Sixth Power Plan	1
Industrial customers saw benefits from other programs, and expressed interest in having access to a program they could participate in	1
CEI provides a cost-effective means of achieving energy savings goals, and an effective way to achieve low-cost energy savings, with little capital outlay required for participants during a difficult economic period	1
The market partner is strongly committed to providing comprehensive services to industrial customers/sites, and formal planning to achieve comprehensive savings proved the best approach for this	1

Table 120. QPO4 "What are your reasons for not offering a program that promotes CEI?"

Response	Frequency (n = 4)
Insufficient number of industrial customers, who are diverse in their energy usage, staffing, structure, and products	1
Insufficient number of LARGE industrial customers	1
Very few large customers are interested	1
Market partner does not know how to quantify savings to perform the required TRC test	2
Market partner does not have funding and staff do not have time	1

Note: More than one response allowed.

Table 121. QCA1 "What percentage of industrial customers are aware of the opportunity to save energy using energy management practices?"

Response	Frequency (n = 10)	Verbatim
25%	2	• Growing, around 25% • 25% of largest customers
50%	1	• Within the larger facilities, approximately 50% are aware of opportunities for energy savings
75%	1	• 75% are aware, but it is hard for them to quantify savings, costs, or which opportunities are the most valuable
80%	1	
Almost 100%	1	• Almost all are aware, but actual implementation varies by size. Larger facilities are much more likely to have an energy manager or someone who knows a little bit like who to call or where to go for help. There is lots of help and training out there if they look for it. Small plants typically do not have anyone who can spend the time on energy
100%	1	
No numerical response	1	• Just their largest customer (represents 10% of utility load)
Don't know	2	• Don't know, but most know that how they run their equipment affects their bill. They tend to be pretty knowledgeable about these things. The larger issue is conveying the issue to everyone else

Table 122. QCA2 "In general, on a scale from 1-5 where 1 is not at all interested and 5 is very interested, how interested are the aware industrial customers in integrating/adopting energy management practices?"

Response	Frequency (n = 10)	Verbatim
1 to 2 (1 = not at all interested)	1	• If no utility incentive, then 1-2.
3	1	• So many customers that have huge opportunities for capital investments, including EE. Energy efficiency equipment is the highest priority of those energy efficiency opportunities because the savings are quantifiable. Energy management (i.e. difficult to quantify) savings are second to that. Because industrial programs are still fairly new, there is still low-hanging fruit for capital energy efficiency investments that customers are going to take advantage of first
4	2	• Once industrial customers learn about CEI, they are very interested. However, for most facilities there is a real conscientious assessment about whether participation in a program is worth it. Many facilities do not want to be held to the expected 1,000,000 kwh savings goal in order to receive the incentive • Large facilities are more interested, but it is not a priority
5 (Very Interested)	1	
No numerical response	2	• Very few small facilities are aware of energy management.
No response	3	

Table 123. QNF1 "One a scale from 1 to 5 (1 being poor and 5 very good) how would you rate your utility's current relationship with NEEA's Industrial Initiative (aka IEA) in particular?"

Response	Frequency (n=7)
5	1
4	4
3	1
2	0
1	1

Table 124. QNF4 "If NEEA were to offer assistance or training in designing an energy management program, would your utility be interested in participating?"

Response	Frequency (n = 5)	Verbatim
Yes	3	• Yes, they would like to see how the other programs are designed so that they can roll out their own program.
No	2	• No because they can't quantify savings/costs and conduct the Total Resource Cost test. NEEA could offer this to their customers, but because [Market Partner] is restricted by the Commission, they can't offer programs that they can't prove are cost-effective up front. • No, not until either a) NEEA comes up with a proven method for quantifying energy savings; or b) PUC accepts energy savings that are less quantifiable (i.e., energy management). The PUC does a prudency review of all of the [Market Partner] expenses. If any money is being spent that is not prudent, then they get penalized for spending ratepayer dollars that aren't cost-effective.
No response	0	

Table 125. QNF5 "NEEA is considering encouraging facilities to utilize energy management software. Do you think this would be an effective strategy for promoting energy management practices?"

Response	Frequency (n = 10)	Verbatim
Yes	3	• [MARKET PARTNER] has done a lot of training in this area. DOE has a comprehensive software suite; always the need for training; tool user groups would be useful.
Maybe/Mildly/ Possibly	4	• Most customers tend to have some sort of system, it's more a matter of seeing what needs to be added to it. Doesn't think there is one software everyone can use. • Maybe, trick is that it has to be software that the utility can also make use of and communicate back and forth with utility/NEEA/customer. • Possibly, it depends on software. There has been a lot of time and money trying to get their MT&R to work, when it's just a simple regression analysis. Good for smaller commercial where they have one product. • It is kind of applicable but it is one more piece of software that the facility would have to learn to use and it does not directly monitor the system.
Don't Know	1	• Don't know, but not likely because most supply customers are not interested because it's not cost-effective or tangible for them.
No	0	
No response	2	

Table 126. QNF6 "Are you familiar with ISO 50001?"

Response	Frequency (n = 10)
Yes	8
No	0
No response	2

Table 127. QNF5a "Do you think that promoting the ISO 50001 standard would be an effective use of NEEA's resources? What are your reasons for saying that?"

Response	Frequency (n = 10)	Verbatim
Yes	4	• Yes, but they shouldn't focus on it exclusively because not everyone will do it • Yes, NEEA could focus on specific customers that would be open to it. Wouldn't suggest that it would be a great tool for broad promotion. • Definitely, it is a great concept and one of the ways to address the group of willing customers. I think ISO 50001 is better than CEI. • Yes, DOE is putting together documents to standardize pieces of ISO 50001. When a large facility signs up, assessments are free (DOE is focused on larger facilities); NEEA should look at rules for small and medium size industries where assessments are not free. NEEA could provide local support to get plants to participate in the federal programs. The barrier is that plants do not want to make a commitment they see as binding. NEEA could get them comfortable with it by explaining their obligations and the potential costs.
No	2	• Only applicable to larger customers • Hard to prove energy savings
Possibly	1	
Don't Know	1	
No response	2	

Table 128. QNF7 "Is there other assistance that NEEA could provide to help promote energy management to your customers?"

Response	Frequency (n = 10)	Verbatim
More collaboration with utilities	2	• Right now it's just the utilities sharing info. Would like NEEA to set up a collaboration so that other utilities can learn from those programs in order to do their own • I would like to NEEA to share more about how they verify and measure savings. Need to find a way to share NEEA's story about how to measure energy savings from CEI.
Trainings and demonstrations	2	• I would like to see trainings for energy management for process engineers - how to set it up, how to measure, how to manage it • I would like NEEA to provide demonstrations for new technologies
Promote investigation of widget-based opportunities	1	
Investigate how to change corporate culture	1	
RTF review and approval of measure savings	1	• NEEA should take measures to the RTF, but not by themselves. They need to do it with some input.
Collateral materials for broader marketing	1	
More field staff working directly with facilities	1	
None	2	
No response	1	

Note: More than one response allowed.

2010 Trade Ally Frequencies

Table 129. QS5 "What energy management related services does your company offer to industrial customers?"

Response	Frequency (n=5)
Energy audit	4
Analysis of energy intensity	4
Set energy reduction goals	4
Design energy plan to reach goals	4
Tracking energy use	5
Efficient equipment trainings	3
Efficient O&M Practices trainings	3
Quantifying energy savings from measures	5
Visit facility regularly to update strategy and/or goals	4
Other: Identifying projects and opportunities	1

Note: More than one response allowed.

Table 130. QS9 "Which market segments does your business serve for energy management consulting?"

Response	Frequency (n=5)
Agriculture	1
Food products and beverages	3
Textiles and apparel	0
Wood products	3
Paper manufacturing	3
Printing and publishing	0
Petroleum / Chemicals	1
Rubber and plastics	0
Nonmetallic mineral products	0
Primary metals	2
Industrial machinery	1
Computers and electronic manufacturing	2
Electrical equipment	0
Transportation equipment	0
Furniture and fixtures	0
Miscellaneous manufacturing	1
Commercial / Educational	0
Health Care	0
Mining / Minerals	1
Irrigation	1
Water / Wastewater	1
Cold storage	1

Note: More than one response allowed.

Table 131. QCA1 "In your estimation, what percentage of industrial customers is aware of the opportunity to save energy using energy management practices?"

Response	Frequency (n=5)
30%	1
50%	1
70%	2
Most	1

Table 132. QCA2 "For the industrial customers that are aware of energy management, in general, on a scale from 1-5 where 1 is not at all interested and 5 is very interested, how interested are they in integrating/adopting energy management practices?"

Response	Frequency (n=5)
1	0
2	2
3	1
4	1
5	0

Note: One respondent did not provide numerical response, but said: "Most would be interested in adopting improvements, but don't necessarily know how to go about it. Usually interested because energy is one of the top expenses." Response not coded above.

Table 133. QCA3 "For the range of industries you serve, which three industries are typically MOST receptive to energy efficient options and/or a systems based approach? Please list the top 3 with the MOST receptive industry first."

Response (n=5)
1. Food products and beverages (Food Distribution) 2. Paper mfg. (Pulp & Paper) 3. Food products and beverages (Food Processing)
1. Food products and beverages (Food Processing)
1. Food products and beverages (Food Processing)
1. Wood products 2. Computers and electronic manufacturing 3. Primary metals
1. Petroleum/chemical 2. Food processors 3. Wood products

Table 134. QCA4 "For the range of industries you serve, which three industries are typically LEAST receptive to energy efficient options and/or a systems based approach? Please list the bottom 3 with the least receptive industry first."

Response (n=2)
1. High tech industries (ex. silicon wafer manufacturing, micro processor manufacturing)
1. Water / wastewater because they are risk averse 2. Paper mfg. (Pulp & Paper) 3. Agriculture

Table 135. QCA5 "What percentage of industrial facilities would you estimate are currently practicing energy management strategies?"

Response	Frequency (n=5)
1%	1
20%	1
50%	1
Don't Know	1
No response	1

Table 136. QCA5a "How does this compare to 5 years ago?"

Response (n=3)
More than 5 years ago – it would've been zero or 0.1% back then.
Up from 10%.
It has increased. I'd say it was 30% five years ago.

Table 137. QCA5b "How many of those are practicing energy management on their own, i.e., without technical or financial assistance from NEEA or their utility?"

Response	Frequency (n=4)
Probably none	1
Not many	1
10%	1
25%	1

Table 138. QCP5a "What percentage of their electric bill can an industrial facility expect to save during the initial (one to two) years? Does this rate of savings continue after the initial years? If not, how does it change?"

Response (n=5)	Frequency (n=5)
2%	1
10%; It increases	1
15%; Sustains and improves but then plateaus	1
Don't know	2

Table 139. QCP5b "What is the cost per kWh to implement CEI during the first one to two years? Please include consulting fees, software costs, O&M practices upgrades costs, and employee training costs."

Response (n=3)	Frequency (n=5)
$50,000 - $500,000	1
25 cents per kWh	1
$60,000	1

Table 140. QCP5c "And how much does it cost an industrial facility per year to continue practicing energy management?"

Response	Frequency (n=3)
$20,000	2
5 cents per kWh	1

Table 141. QMT1 "In your opinion, has industrial facility awareness of energy management practices increased, decreased, or stayed the same over the last 5 years?"

Response	Frequency (n=5)
Increased	3
Decreased	0
Stayed the same	0
Don't know / not sure	2

Table 142. QMT2 "In your opinion, has the number of industrial facilities practicing energy management increased, decreased, or stayed the same over the last 5 years?"

Response	Frequency (n=5)
Increased	4
Decreased	0
Stayed the same	0
Don't know / not sure	1

Table 143. QMT3 "How have industrial facilities' perceptions of energy efficiency changed over the last 5 years?"

Response	Frequency (n=5)
There is awareness that energy has a cost and that that cost is controllable.	1
They are more open to it now	2
No response	2

Table 144. QMT4 "Are there other ways the industrial market for energy management has changed over the last 5 years?"

Response	Frequency (n=5)
Economic pressure to reduce costs, new technologies and practices, new resources and the resources that were around five years ago have improved. Also NEEA's program has improved a lot.	1
There are more training opportunities and incentives available for energy management.	1
There are more energy management software solutions available	1
No response	2

Table 145. QMT5 "What have been the drivers in the industrial market change? This could include people, groups, or market factors."

Response	Frequency (n=4)
NEEA's Industrial Initiative Program	1
Other utility energy efficiency programs	0
Electricity or natural gas prices	1
Other facility costs increased	0
Changes in environmental awareness and attitudes	2
Facilities want to present themselves as "green"	2
Other: Increased marketing	1
Other: Utility, state and federal incentives.	1
Other: Energy is more visible now than 5 years ago	1

Note: More than one response allowed.

Table 146. QMB1 "What are some of the key barriers to industrial facilities adopting energy management?"

Response	Frequency (n=5)
Industrial facility staff are not aware of energy management and opportunities for savings	2
Energy savings are not a priority or an interest	2
Industrial facilities lack capital or bank financing to implement energy management	2
Energy management is not perceived to be cost-effective	0
Industrial facility staff lack technical skills to implement	2
Lack of compatible equipment	0
Other: Lack of employee time	2
Other: The ability to effectively market the opportunity	1
Other: Outside parties like [CONTRACTOR] and NEEA being able to deliver a compelling message for the facility to do energy management	1
Lack of upper management support or direction	1
Other: Lack of a dedicated resource (an empowered energy champion),	1
Other: Lack of a strategic plan	
Other: Not everyone who has an impact on energy use is engaged	1
Other: Structure not in place to support ongoing tracking and management of KPIs	1
Other: Capital often used for other priorities (financial benefits are not always fully understood)	1
Other: Information about projects is often coming from vendors who are biased – they need an unbiased source of information	1
Other: O&M practices are not what they need to be – equipment not running efficiently	1
Other: Facility managers may not have tools to sell project to their executive team	1
Other: Unwillingness to change	1

Note: More than one response allowed.

Table 147. QMB2 "Do you think NEEA or other energy efficiency programs are effectively addressing these barriers?"

Response	Frequency (n = 5)	Verbatim
Yes	3	
Somewhat	2	• The NEEA program helps because there is a platform, but doesn't affect decisions at plant level. • I think all programs could do a better job of communicating the concrete results that have occurred from the facilities that have done energy management and explain what changes have been made to realize these changes.
No	0	

Table 148. NF2. "Is there any assistance that NEEA could provide to help promote energy management to your customers?"

Response	Frequency (n = 5)
Raise facilities' interest and effectively communicate how they can participate.	1
Communicate concrete results of implementing energy management strategies and changes necessary to realize these results.	1
Continue to educate and gain support from upper management	1
Continue to explore other target markets	2
Create messaging about utilizing energy management to manage risk	1
Offer training on basic energy management concepts and energy tracking principles	2
Continue to offer the Initiative in regions not covered by BPA, the ETO, or other utility programs.	1
Improve ability to quantify savings	1
Promote ISO 50001 activities	1
Promote energy management software	1
Standardize CEI in the region	1
Coordinate efforts with utility incentive programs	1

Appendix F: Market Diffusion Model Methodology and Assumptions

This appendix describes the theoretical model underlying the market diffusion curve and the development of data inputs for populating and calibrating the model.

Model Overview

The market diffusion of an energy-efficiency measure depends on awareness of the measure and the perceived benefits of its adoption. Cadmus modeled both the diffusion of awareness and adoption of energy management practices in the Pacific Northwest. Cadmus used a Bass model, which has its roots in epidemiological models of disease transmission, to model the diffusion of awareness of energy management practices. In the Bass model, diffusion of awareness is a function of word-of-mouth transmission, as adoption is assumed to depend solely on whether one has knowledge of the measure. In the model, NEEA's efforts at marketing the Industrial Initiative and CEI increase the rate at which awareness of energy management grows in the population of food processors.

While measure awareness is necessary for adoption, it is not sufficient in and of itself. A measure's probability of adoption, conditional on awareness, is a function of adoption's economic benefit and other, noneconomic factors, such as potential adopters' tastes. Cadmus modeled an adoption decision using a probabilistic, rank-probit approach, taking into account the discount rate; the cost of implementing energy management; the value of the expected energy savings; and economic incentives.

Model Description

We begin by modeling the pecuniary value of two competing technologies: one that is energy efficient (EE) and promoted by NEEA, and the other which is the next-best alternative (A). The pecuniary value of a new technology is the net present value of the stream of pecuniary benefits, less costs, over the course of the technology's lifetime. We assume the technology is a strict necessity (e.g. ,light, heat, refrigeration, etc.); without it, income (Y) for households or firms would be zero. This implies EE or A will be used in each period.

Each individual unit of an EE or A technology is assumed to have an uncertain lifespan, which we model as a probability that the technology does not fail and have to be replaced (q). We let the probability of replacement increase with the age (a), years of service, of the technology.

Borrowing a clever mathematical apparatus from discrete dynamic programming, we can recursively specify the expected net present value of a new EE technology (with the expectation of replacing it, when it fails, with another EE technology):

$$V_{EE,a=1} = [- OC_{EE}] + IC_{EE} + \beta [- q_{EE} (1) \tilde{Y}_{EE,1} + q_{EE} (1) \tilde{Y}_{EE,a=2}]$$
$$V_{EE,a>1} = [- OC_{EE}] + \beta [- q_{EE} (\tilde{Y}_{EE,1} + q_{EE} (\tilde{Y}_{EE,a+1}]$$

Where

V_{EE},a = the pecuniary value of a unit of EE technology in the a[th] period of its life (i.e., a = 1 when it is new)

Y = time-invariant (expected) income (revenue)

OC_{EE} = the total costs operating while using a unit of the EE technology

IC_{EE} = the initial cost of getting a unit of the new EE technology

β = time-invariant discount factor: 1/(1 + interest rate)

$1 - q_{EE}(a)$ = probability of a unit of the EE technology failing in the a[th] period of its life

After recursive substitution and gathering like terms, we arrive at:

$$V_{EE,a=1} = -IC_{EE} + (Y - OC_{EE}) + \beta q_{EE}(1) + \beta^2 q_{EE}(1) q_{EE}(2) + \beta^3 q_{EE}(1) q_{EE}(2) q_{EE}(3) + \cdots + V_{EE,1}\left[\beta(1 - q_{EE}(1)) + \beta^2 q_{EE}(1)(1 - q_{EE}(2)) + \beta^3 q_{EE}(1) q_{EE}(2)(1 - q_{EE}(3)) + \cdots\right]$$

Letting the sum in first bracketed term be denoted as $S_q(a)$ and second as $S_{1-q}(a)$:[18]

$$S_{q,EE}(1) = 1 + \beta q_{EE}(1) + \beta^2 q_{EE}(1) q_{EE}(2) + \beta^3 q_{EE}(1) q_{EE}(2) q_{EE}(3) + \cdots$$
$$S_{1-q,EE}(1) = \beta(1 - q_{EE}(1)) + \beta^2 q_{EE}(1)(1 - q_{EE}(2)) + \beta^3 q_{EE}(1) q_{EE}(2)(1 - q_{EE}(3)) + \cdots$$

Substituting in and solving for the pecuniary value of a unit of the EE technology yields an intuitive equation for the present value of the technology for any later vintage:

$$V_{EE,a>1} = (Y - OC_{EE}) S_{q,EE}(1) + V_{EE,1} S_{1-q,EE}(1)$$
$$V_{EE,1} = -IC_{EE} + (Y - OC_{EE}) S_{q,EE}(1) + V_{EE,1} S_{1-q,EE}(1)$$

These expressions suggest an intuitive interpretation of the S terms. S_q is the sum of the discounted stream of probabilities of accruing revenue without replacing the technology, and S_{1-q} is the sum of the discounted stream of probabilities of the technology failing, and thus having to be replaced and started over with a new technology. Manipulating the second equation to solve for the present value of the technology when it is new, we obtain:

$$V_{EE,1} = \frac{1}{1 - S_{1-q,EE}(1)}\left[(Y - OC_{EE}) S_{q,EE}(1) - IC_{EE}\right]$$

[18] Note that because Sq(a) and S1-q(a) sum over bounded monotone sequences, each has a finite sum. Hence, time-invariant probabilities exist that would generate the certainty equivalent of each of these two sums.

We can combine these two equations for the present value of the device to give a general equation that works for every vintage:

$$V_{EE,a} = (Y - OC_{EE}\left[S_{q,EE}(a) + \frac{S_{q,EE}(S_{1-q,EE}(a)}{1-S_{1-q,EE}(a)}\right] - \frac{IC_{EE}}{1-S_{1-q,EE}(a)}S_{1-q,EE}(a)^{-1}$$

Note that other than the subscripts, these equations are the same for the alternative device A. Assuming the customer plans to stick with the same device, it is optimal to wait until that device fails to replace it because it postpones the initial cost of a new device (and, hence, discounted by the interest rate in pecuniary value):

$$V_{EE,1} < V_{EE,a}$$

The customer's objective is to pick a technology that maximizes the net present value of the future stream of income, plus an idiosyncratic term that represents the customer's relative tastes for the EE technology, and a term (D) that captures deviations from linearity due to risk aversion and/or behavioral heuristics. The idiosyncratic term is included because some customers do not care for the non-energy attributes of energy-efficient technologies (e.g., the color of light produced by CFLs), while others derive satisfaction from reducing their impact on the environment.

A customer with an age a technology of type A will switch to an E type if:

$$V_{EE,1}(\beta, p_{EE}, IC_{EE}, OC_{EE}, Y) + D(a, IC_{EE}) + \varepsilon \geq V_{A,a}(a, \beta, p_A, OC_A, Y)$$

Given that taste for the EE device is unobserved by the statistician, the probability that a customer with an age a technology of type A will switch to a type E technology is given as:

$$\Pr(Switch_{TO}EE_{FROM}|A,a) = \Pr(\varepsilon \geq V_{A,a}(\cdot) - V_{EE,1}(\cdot) - D(\cdot)|A,a)$$

The unconditional probability of switching from A to EE is then:

$$\Pr(Switch_{TO}EE_{FROM}|A) = \sum_a \Pr(\varepsilon \geq V_{A,a}(\cdot) - V_{EE,1}(\cdot) - D(\cdot)|A,a)\Pr(A,a)$$

By specifying a parametric family of distributions for ε, we specify an estimable functional form for the parameters, describing the probability that a customer switches to the EE technology.[19] Looking carefully at the economic model shows there are many reasons why a customer may not switch to the EE technology:

1. The existing type A technology is too valuable to scrap because it is too new.
2. The incentive (e.g., NEEA's subsidization of IC) may be too low to justify the additional expense of the EE technology, despite the reduced operating costs.
3. Interest rates may be too high, given the reliability of the technology, to make it worthwhile.
4. A distaste for the EE technology.

To nest this economic model in a standard Bass diffusion model, which is actually an application of an epidemic model to technological diffusion, we make a few additional assumptions. First, we make the standard assumption that once a customer decides to switch to the EE technology, they never switch back. Second, we assume there is imperfect information in the market, hence a customer with a type A technology can only switch to the EE technology if they are fully aware of it.

We model this uncertainty in a highly stylized manner: the customer is either completely aware of the EE technology, its quality, and its price (net of incentive), or they are completely unaware. Hence, the possible information sets are $I_0 = \{A\}$ and $I_1 = \{A,EE\}$. The above probability for switching from A to EE, conditional on a, can be reformulated as:

$$\Pr(switch_{TO}\, EE_{FROM}\, A \mid a, I_1) = \Pr(\varepsilon \geq V_{A,a}(\cdot) - V_{EE,1}(\cdot) - D(A, a))$$
$$\Pr(switch_{TO}\, EE_{FROM}\, A \mid a, I_0) = 0$$
$$\Pr(switch_{TO}\, A_{FROM}\, EE \mid a, I_1) = 0$$
$$\Pr(switch_{TO}\, A_{FROM}\, EE \mid a, I_0) = 0$$

Letting N denote the number of customers aware of the EE device and P denote the entire population of customers.

[19] Either the generalized logistic distribution or the Gumbler/Gompertz/Fisher-Tippett/Extreme Value distribution would work, as both have unbounded support and permit right-skewedness, which a priori theory would suggest is the proper shape of the distribution. The simplest implementation would be the logistic distribution. The LogLogistic/Fisk distribution, a special case of the Burr distribution, would also work, but its support has a lower bound at 0.

The time path of the diffusion of awareness is described by a generalization of the logistic function:[20]

$$N_t = \frac{P}{\left[1 + e^{\frac{\alpha_o + \alpha_1 M - t}{\tau}}\right]^{\sigma}}$$

Here, σ denotes the speed of the diffusion of awareness, τ pins down the initial awareness, and α covers the timing of the diffusion of awareness, which may be affected by the cumulative marketing expenditures (M) promoting the EE technology.[21] We can take this measure of awareness and the probability of switching given awareness, and produce the difference equation describing the evolution of market share:

$$S_{t+1} = S_t + \left[\frac{N_t - PS_t}{P}\right] \sum_a \Pr(switch_{TO\,EE_{FROM}} A \mid a, I_1) \Pr(A, a; t)$$

Although this may appear to be a simple, linear, first-order difference equation, that appearance is deceiving because of the implicit evolution overtime of the distribution of existing stock of type A devices. Hence, the model's output is designed to be regularly computable, rather than to produce closed-form mathematical solutions. Nonetheless, we can show the outputted time path will be a well-behaved sigmoid. Moreover, this model reduces to the classic Bass model when the following two conditions are met:

1. σ=1, so awareness follows the logistic function.
2. The unconditional probability of switching to an EE device from a type A device is 1, all who are aware of the EE device.

Note that, unlike the common Rank (or Probit) models of diffusion, we have the flexibility of choosing to model the customers' relative taste as stable over time, independently changing, or evolving at random with some persistence (although this last case gets rather complicated).

[20] Note this is the continuous-time solution for a (generalized) logistic differential equation, just written as if it were discrete, even though time here is modeled as discrete. The logistic difference equation was not used because it generically suffers from chaotic cycling around the continuous-time solution. A sufficient, but not necessary, interpretation is awareness propagates in continuous time while device replacements evolve in discrete time.

[21] Although awareness is spread via contact, a la the Bass model, marketing expenditures can be seen as increasing the number of contacts—in this context, it would not be interpreted as an effect on the number of people interacted with but rather the probability of discussing the EE device during the interaction.

Data Development

In the model, the following parameters must be calibrated or estimated to make the model fully operational:

Model Inputs (e.g. Parameters, Exog Variables)	Description	Source for Identification
Y	Income (net revenue)	Dun and Bradstreet Food Processor Facility Data
OC	Technology operating costs	NEEA Ace Model assumptions and interviews with facilities, trade allies, and market partners
IC	Technology initial costs	NEEA Ace Model assumptions and interviews with facilities, trade allies, and market partners
Energy savings (V_A, V_{EE})	Energy savings in facilities practicing energy management	Energy savings verification data
Incentives (V_{EE})	Incentives from NEEA and other market partners	NEEA program data and interviews with market partners
R	Interest rate	Standard economic source
q (a)	Reliability of technology, decaying with age	NEEA program participation data and interviews with facilities, market partners, and trade allies
Pr(A,a)	Distribution of age of stock of existing type A technology	Assume probability of adoption does not depend on facility vintage
Σ	Maximum speed of diffusion of awareness, increasing in marketing budget	Interviews with NEEA and market partner staff
τ	Timing of maximum speed of diffusion of awareness, improving with marketing budget increases	Interviews with NEEA and market partner staff
α	Controls level of awareness at time 0	Surveys of food processing facilities
D(a,IC_{EE})	Deviations from linearity due to risk aversion and behavioral heuristics as a function of vintage and initial costs	Estimation of conditional probability of switching using historical estimate of market diffusion data
μ_ε	Mode of distribution of relative taste for EE device	Estimation of conditional probability of switching using historical estimate of market diffusion data
v_ε	Dispersion of distribution of relative taste for EE device	Estimation of conditional probability of switching using historical estimate of market diffusion data

Income

Cadmus estimated the pre-tax income of a typical large food processing facility using revenue data from Dun and Bradstreet and information about pre-tax income for publically traded food processing companies.

Technology Initial and Operating Costs

Technology initial and operating costs are a representative food processing facility's costs of implementing energy management in year one and in subsequent years. Cadmus developed assumptions about annual facility operating costs using information from NEEA's ACE model and interviews with market partners and trade allies. Cadmus assumed the costs of implementing energy management are: $75,000 in year 1, $50,000 in year 2, $30,000 in year 3, with costs in subsequent years increasing at an annual inflation rate of 2.5 percent.

Energy Savings and Consumption

Energy savings are an input in the calculation of the net present value of adopting energy management. The model assumes that in the adoption decision plant managers only take into account expected energy savings from O & M-related energy management practices. They do not take into account expected savings from capital projects, which are a by-product of energy management and might be harder to quantify.

Cadmus estimated O & M energy savings and facility consumption using validated energy use and savings data from food processing facilities engaged with NEEA. Cadmus used conservative estimates of electric and gas consumption equal to the median annual energy consumption of large food processing facilities in the target market (15,397,921 kWh and 2,228,514 therms). Cadmus estimated facility gas and electric consumption by matching facility employment data from Dun and Bradstreet (2010) to engaged facilities. We then calculated average gas and electric consumption per employee in engaged facilities. Then we multiplied average consumption per employee in engaged facilities by the number of employees in facilities in the target market. This resulted in an estimate of gas and electric energy use for each facility in the target market.

Using the verified savings data, we estimated facility electric savings from energy management to be 2.2 percent in year 1; 3.6 percent in year 2; 2.8 percent in year 3; 3.3 percent in year 4; 3.0 percent in year 5; and 1 percent savings, thereafter. We estimated annual electric and gas savings from O & M projects as 50 percent of energy management electricity savings. We estimated facility gas savings from energy management to be: 3.2 percent in year 1; 2.5 percent in year 2; 2.9 percent in year 3; 2.5 percent in year 4; 2.5 percent in year 5; and 1 percent savings, thereafter. We estimated that annual gas savings from O & M projects were 25 percent of all energy management gas savings.

Electric and gas savings in the report include savings from both O & M and capital projects.

Incentives

Incentives are another input in the calculation of the net present value of energy management. Cadmus estimated the annual money incentives available to food processors between 2005 and 2015. We relied on program budget data from NEEA and interviews with market partners to estimate incentives.

NEEA does not offer incentives directly to food processing facilities. Instead, it contracts with energy consultants and engineers to work with participating facilities to implement CEI. NEEA's payments to consultants and engineers can, however, be viewed as an indirect incentive to facilities. We counted such payments as monetary incentives, because they covered all or some of a facility's implementation costs. In calculating incentives for energy management, Cadmus assumed that NEEA did not engage with new facilities after 2009 but continued to engage with existing participants.

After 2009, incentives were available from several market partners including Energy Trust of Oregon, BPA, Northwest Food Processors Association, and Washington State University. Cadmus collected data about incentives offered in 2010 and subsequent years from surveys of market partners conducted for the 2010 MPER.

To estimate the incentive available to the average large food processing facility, Cadmus mapped the facilities in Dun and Bradstreet to the service territories of the market partners. We then calculated the total incentive available to each facility and then averaged the total incentives.

Interest Rate

The interest rate is used in the calculation of the firm's discount rate. We used an estimate of a typical large food processors weighted average cost of capital in place of the interest rate.

Reliability of Technology

The reliability of technology refers to a technology's probability of failure as a function of its vintage. Cadmus used information about measure persistence from participant facility surveys to estimate the reliability of technology. As this information showed a very high level of persistence for O & M measures, Cadmus assumed the probability of failure was zero for all vintages.

Distribution of Vintages

Cadmus assumed that the vintage of a facility did not affect the probability of adopting energy management.

Diffusion of Awareness

Cadmus estimated the historical diffusion of awareness of energy management practices. Cadmus used surveys of nonparticipating food processing and other industrial facilities in 2005, 2006, 2007, and 2010 for this purpose. Cadmus first established a definition of awareness of energy management (see the main text). We then reviewed the survey instruments to identify questions that could be used in measuring awareness. Cadmus then selected appropriate questions that appeared in each of the surveys to generate a consistent series of awareness over time. Next, we established a set of criteria based on the answers to the awareness questions for establishing whether a facility was aware. Finally, we classified individual facilities as aware or unaware of energy management based on their survey responses. Cadmus assumed that facilities engaged with NEEA or practicing energy management independently or with another partner were aware. Cadmus then estimated a weighted average of awareness in the market using the estimates of awareness among engaged and non-engaged facilities. We interpolated values for 2008 and 2009.

Cadmus then selected parameters for the awareness equation to match the historical pattern of awareness.

Market Expenditures

In the model, marketing expenditures accelerate the diffusion of awareness. Cadmus collected data from NEEA about its marketing expenditures between 2005 and 2009 and expected marketing expenditures between 2010 and 2015. We also collected data about the planned marketing expenditures of market partners between 2010 and 2015.

The parameters of the awareness equation imply that approximately $250,000 in marketing expenditures accelerates the growth of food processing facility awareness by one year.

Diffusion of Energy Management

Cadmus also developed an estimate of the historical diffusion of energy management practices equivalent to CEI Stage 3 or higher. This series was used to calibrate the model's forecast of the diffusion of energy management between 2010 and 2015.

Cadmus estimated the historical market diffusion of energy management for facilities engaged with NEEA and those not engaged. For facilities engaged with NEEA, Cadmus relied on NEEA's Market Progress Indicator History, which tracks engagement levels for all facilities that were or are participating in the program. For facilities not engaged with NEEA, Cadmus estimated the percentage practicing energy management using surveys from 2005, 2007, and 2010.[22] Cadmus identified questions that could be used to gauge the level of engagement and that appeared in each survey. If a facility tracked energy use, had an energy plan in place, and had an energy champion or gave staff energy management responsibilities, Cadmus classified the facility as practicing energy management. (Using information about specific energy management measures and activities in food processing facilities from the 2010 survey, Cadmus found a strong correspondence between our classification of facilities practicing energy management and energy management practices reported by facilities.) Cadmus then constructed a market energy management penetration series by weighting the series for the engaged and non-engaged facilities.

Cadmus calibrated the forecast of the market diffusion of energy management practices in a series of steps. First, we generated a forecast and "backcast" (predicted values in the historical period) assuming that a food processor's decision to adopt energy management depended only

[22] A concern was whether nonparticipating facilities that responded to our survey were representative of the population of nonparticipating facilities. For example, facilities practicing energy management may have been most likely to respond to our survey, which would bias our estimate of the percentage of nonparticipating facilities practicing energy management. We used information in Dun and Bradstreet about facility characteristics to assess whether our completed sample suffered from survey response bias. Using a variety of specifications, we regressed whether a facility responded to our survey on the facility's location (state), revenues, number of employees, and NWFPA membership status. Significance of the regressors would suggest the presence of selection bias. The only variable that was significant in some regressions was NWFPA membership. NWFPA membership increased the probability of responding to our survey by approximately 20 percent. However, NWFPA membership was not significant in regressions that controlled for number of employees and sales. Though NWFPA is promoting energy efficiency, facilities do not join NWFPA for that reason, therefore Cadmus concluded that the nonparticipant sample did not suffer from survey non-response bias.

on awareness and the economic benefit of adoption. We selected parameters of the market diffusion equation to minimize the sum of squared deviations between the predicted values and the historical values. Cadmus then compared the predicted series in the historical period to the actual historical series. If there was a discrepancy, Cadmus adjusted the μ parameter, which accounts for tastes for energy efficiency, until we achieved a satisfactory fit between the predicted and historical series. We then used these parameters as starting values in solving for parameters of the market diffusion equation that minimized the sum of squared deviations.

Potential Adopters of Energy Management

To construct historical series of awareness and market diffusion and to generate a market diffusion forecast, it was necessary to develop historical and forecast series of the number of large food processing facilities in the Pacific Northwest. Cadmus relied on Dun and Bradstreet data from 2005 and 2010 for this purpose.

Cadmus started with the population of food processing facilities in the Dun and Bradstreet database. Most food processing facilities had three digit primary NAICs codes of 311, but some had primary NAICs codes in the following ranges 111-115, 424, and 493. We then filtered out facilities belonging to food processors with fewer than 250 employees in the Pacific Northwest, as this is the market that the Initiative is targeting. Finally, we manually filtered out some facilities that did not appear to be food processing facilities such as small bakeries with fewer than five employees.

Market Diffusion Model Results

Cadmus developed a market diffusion forecast for energy management practices in Pacific Northwest large food processing facilities[23] to capture market effects and compare findings to the existing Alliance Cost Effectiveness (ACE) model assumptions. The forecast provides our best estimate of shares of large food processing facilities, between 2011 and 2015, that will practice energy management at a level equivalent to or higher than the Initiative's Stage 3. To forecast the market's energy savings, the market share forecast was combined with validated estimates of gas and electric savings in food processing facilities engaged with NEEA.

The Diffusion Model

Using an Excel-based model it designed and built, Cadmus generated market diffusion and energy savings forecasts. The model can forecast market penetration and energy savings for a wide variety of energy-efficiency measures, and program planners can use it to predict impacts of incentive and marketing expenditure changes on market share.

The model makes several assumptions. First, it assumes potential energy management (e.g., CEI) adopters must be aware of energy management practices before they can adopt them. By "aware," we mean a potential adopter must understand energy management's basic concepts and adoption's benefits and costs.[24] Second, the model assumes, conditional on awareness, the

[23] The forecast pertains to food processing facilities with 250 or more employees in the Pacific Northwest. Information about employment at food processing facilities was obtained from the Dun and Bradstreet database.

[24] Cadmus used surveys of food processing facilities between 2005 and 2010 to estimate awareness of energy management practices among food processors. We attempted to use similar questions in the surveys to develop a consistent series on awareness. See Appendix G for more details.

probability a food processing facility will adopt energy management is an increasing function of adoption's economic benefits. For example, the probability would increase if energy prices or facility production were to rise. Third, the model assumes adoption's probability increases depending on a facility's taste for energy efficiency. Economists have observed energy-efficiency measures diffuse at a slower rate than economic theory predicts. Firms often do not adopt energy-efficiency practices, despite their large economic benefits. This phenomenon is known as the "Energy Efficiency Paradox".[25] To account for facility managers' energy efficiency tastes, the model incorporates a behavioral parameter. In fitting the model, Cadmus uses this parameter to bridge any gaps between the model's adoption forecast, based on economic factors, and actual adoption during a historical period.

To forecast energy management's market diffusion, Cadmus populated the model with: basic data about numbers of potential adopters; energy use with and without energy management; costs of implementing energy management; NEEA and market partner incentive amounts and marketing expenditures; gas and electric rates; and other economic adoption drivers, such as discount rates and facility net incomes. In developing these inputs, Cadmus relied on Initiative program data, including: validated energy savings data from engaged facilities; past and current MPER surveys of participants, nonparticipants, and market partners; and Dun and Bradstreet data on food processing facilities.

Cadmus also calibrated the model to fit adoption patterns observed before 2010. Calibration involved selecting parameter values governing the growth rates of awareness and market diffusion. Using MPER survey data, Cadmus developed historical estimates of awareness and energy management market share for use in estimating the model parameters. Cadmus then selected parameters for awareness and market penetration equations minimizing sums of squared deviations between values predicted by the model and historical values. Appendix G contains more details about the data development and calibration process.

Forecast Results

Using the model, Cadmus generated a market penetration forecast for energy management practices in large food processing facilities for 2010 to 2015. The forecast included facilities engaged with NEEA or another market partner as well as facilities practicing energy management without the assistance of a market partner. The forecast's main assumptions included the following:

- Numbers of food processing facilities would grow very modestly between 2010 and 2015.[26]
- Food production would continue at historical levels, and energy use in food processing facilities would remain at historical levels in the absence of energy-efficiency measures.
- Retail prices for electricity and gas in food processing facilities would remain the same as those in the Council's Sixth Power Plan forecast.

[25] Jaffe, Adam B., and Robert N. Stavins, 1994. The Energy Paradox and the Diffusion of Conservation Technology. Resource and Energy Economics 16, 91-122.

[26] Globalwise, June 10, 2009. Economic Performance of the Northwest Food Processing Industry: Trends and Analysis from the Benchmark Data.

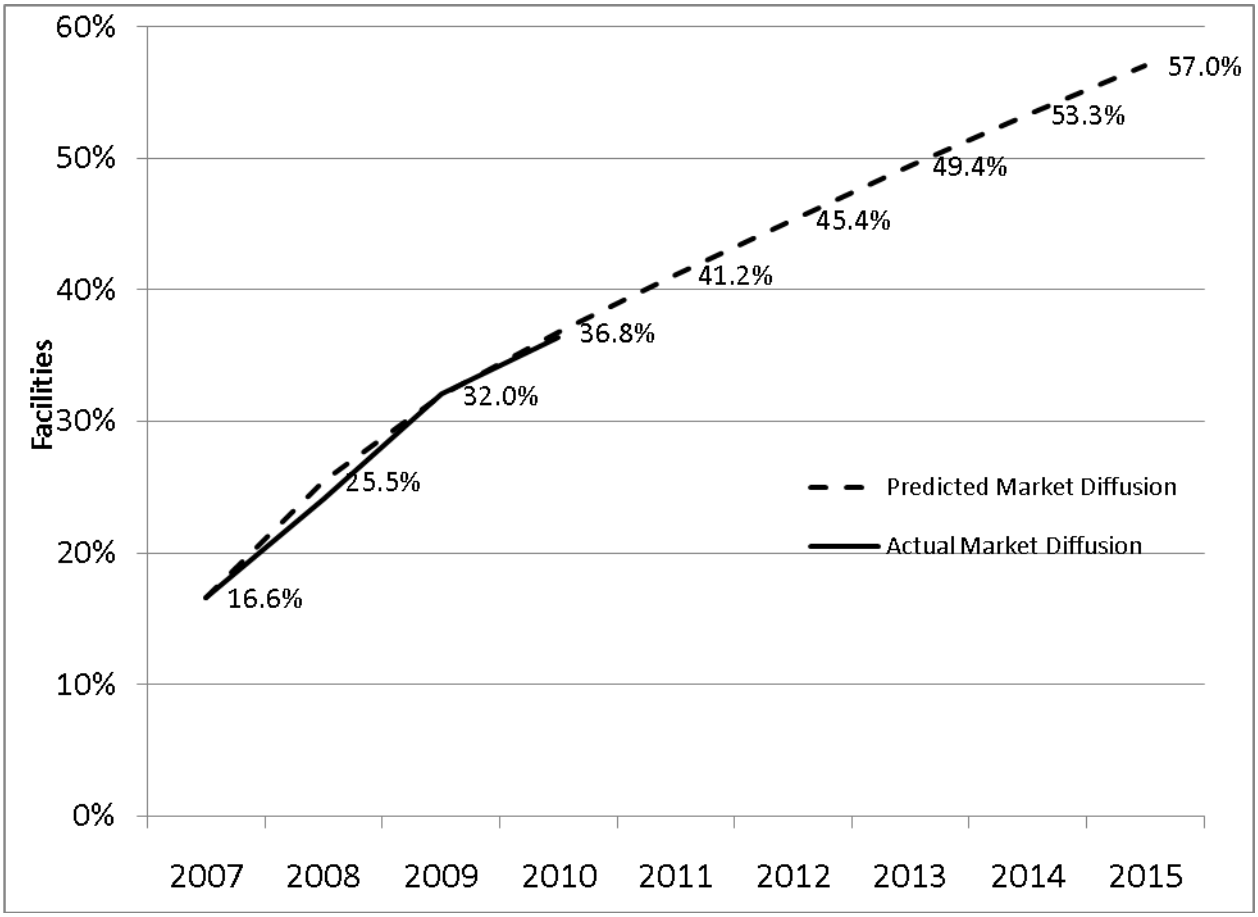
- NEEA would not engage directly with new food processing facilities; however, it would continue to promote adoption of energy management practices in the food processing industry by: sponsoring training and other education efforts; expanding the supply of vendors; engaging with the NWFPA; and providing technical solutions.[27]
- Other market partners, such the BPA and its partner utilities, and ETO, would promote adoption of energy management practices through their own programs, using marketing and incentives.[28]
- Attrition would not occur in facilities practicing energy management. Once a facility adopted energy management, it would practice energy management indefinitely.
- Savings degradation would not occur from energy management over time.

Figure 10.3 shows our estimate of energy management's historical market diffusion, and our forecast of diffusion between 2010 and 2015. In the historical period, our estimates show the energy management market in food processing facilities has grown rapidly. At the beginning of 2007, just 17 percent of facilities practiced energy management at an engagement level of Stage 3 or higher. Three years later, in 2010, market penetration climbed to 36 percent. This growth averaging 31 percent per year was driven by NEEA's marketing and education efforts, and direct engagement with food processing facilities. It was also driven by growth in energy management's adoption by facilities not engaged with NEEA.

[27] NEEA's Food Processing Market Logic Model, 2010-2014 and NEEA's Industrial Sector Strategy for 2010–2014.

[28] Based on information from 2010 interviews with market partners.

Figure 10.3. Cumulative Market Diffusion of Energy Management in Large Food Processing Facilities through 2015



Cadmus forecasts the energy management market in food processing facilities will grow from 33 percent in 2010 to 57 percent in 2015. The annual average growth rate in food processing facilities practicing energy management will be slower than in the past, but will remain high (9 percent). Cadmus believes this forecast is reasonable, given BPA's entry, its partner utilities, and other market partners in the market; the growth in the number and capabilities of trade allies; expectations of increasing prices for electricity and natural gas; and industrial energy management goals in the Council's Sixth Power Plan.

The slight concavity (bending) of the market diffusion curve in Table 6.1 reflects a slowing in the growth rate of awareness about energy management over time, and a relatively high level of initial awareness (approximately 60 percent in 2005). Also, despite significant economic benefits of adopting energy management, the model predicts the probability of adoption, conditional on awareness, as relatively low.

Table 10.149 reports energy savings forecasts for both electricity and gas from energy management adoption in large food processing facilities. For electricity, we report annual MWh and aMW of savings.

Table 10.149. Forecast of Market Diffusion and Energy Savings

Year	Historical Market Saturation	Predicted Market Saturation	Market Annual Electric Savings (MWh)	Market Annual Savings (aMW)	Market Annual Gas Savings (millions of therms)
2007	16.6%	16.6%	14,170	1.6	3,020,727
2008	24.1%	25.5%	42,278	4.8	6,377,096
2009	32.1%	32.0%	72,117	8.2	10,676,603
2010	36.4%	36.8%	108,638	12.4	15,165,193
2011		41.2%	147,572	16.8	20,076,344
2012		45.4%	190,108	21.7	25,404,197
2013		49.4%	223,233	25.5	29,759,871
2014		53.3%	255,355	29.2	34,041,736
2015		57.0%	287,313	32.8	38,329,171

* Energy savings realized at food processing facilities. The estimates of electricity savings do not include line losses.

Cadmus forecasts annual electricity savings from energy management-related O&M and capital projects will grow approximately from 100,000 MWh in 2010 to 287,000 MWh in 2015. This growth directly mirrors that of energy management adoption in food processing facilities over this time, as depicted in Figure 10.3. The market is expected to achieve 32.8 aMW of savings by 2015. We forecast gas savings will grow from approximately 15,200,000 therms in 2010 to nearly 38,300,000 therms in 2015.

Figure **10.4** depicts predicted growth in aMW and therm savings between 2007 and 2015.

Figure 10.4. Forecast of Cumulative aMW and Therm Savings from Energy Management in Large Food Processing Facilities