Market Progress Evaluation Report #3

Evaluation of the Industrial Efficiency Alliance

Prepared for:
The Northwest Energy Efficiency Alliance

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Executive Summary

This report is the third Market Progress Evaluation Report (MPER) on the Northwest Energy Efficiency Alliance's (NEEA's) Industrial Efficiency Alliance (IEA). MPER#1 presented an overview of the Initiative, its background, strategy, and evaluation methodology. MPER#2 focused primarily on presenting findings from interviews with market partners, targeted industrial users and trade allies, and training participants. This report presents evaluation findings based on survey data collected from targeted industrial users and training participants as well as site visits. This report also presents first estimates of the amount of energy savings associated with IEA's activities.

Project Status

Drawing heavily from its nearly two years of market experience, IEA management is currently working on completing a comprehensive review of its implementation strategy. Starting in the Fall of 2006, this review has focused on short- and long-term goals and objectives, target audiences, products and services, as well as internal management and operations. As this process is in its early stages of development and still on-going, in this MPER Quantec made no attempt to fully describe the new strategy or to analyze its effectiveness.

Based on the data collected for this MPER, it appears that IEA has been generally successful in making itself known within the two target markets as well as to engaging a significant number of key market actors. However, awareness and engagement have not translated into consistent adoption of all elements of Continuous Energy Improvement (CEI).

Market Progress

Feedback from participant firms suggests that IEA's impact has been relatively more pronounced in the food processing market than in the pulp and paper market. Survey results clearly indicate that, to a significant extent, this success is attributable to the efforts of the Northwest Food Processor's Association (NWFPA), which was reportedly responsible for introducing more than half of the respondents to IEA. The pulp and paper market lacks a comparable trade association and thus direct outreach by IEA staff has been the sole means of promoting the Initiative in this market.

Survey data on the adoption of CEI elements suggests that while nearly all participants in both markets report high levels of adoption, the majority of firms also report having had at least some of these elements in place prior to engaging with IEA. This suggests that the IEA might have helped facilitate and/or accelerate the adoption of CEI elements, rather than causing it.

In order for CEI to become a sustainable part of industrial facilities' operations, a comprehensive and effective use of energy assessments and ongoing measurements is pivotal. Based on survey data, it appears that the majorities of participant firms in both markets make heavy use of assessments and place a high value on them as well as their repeated usage. Most frequently,

participants report using the results from energy assessments to develop action plans and to keep management and staff informed of energy use and costs.

While the majority of firms (participant and non participant) in both markets report using Key Performance Indicators (KPIs), the detail and rigor associated with their use varies greatly between markets. Food processing firms generally report great challenges associated with identifying and measuring KPIs caused primarily by lack of sufficient instrumentation, inability to measure energy and output by product line, as well as limited resources (staff and time). The KPI most commonly used in this market is total monthly energy use based on utility records. In comparison, usage of KPIs among pulp and paper firms seems to be widespread and part of normal operations. Based on survey data, energy use per pound of product measured daily and/or monthly appears to be the most commonly used KPI.

Data collected from the surveys and site visits indicate that participant food processing firms generally regard IEA as a valuable partner in controlling energy costs. Participant food processing firms report that IEA has led them to adopt more energy-saving measures than they would have in its absence. Furthermore, participants credit IEA with starting to bring about some changes in corporate attitudes toward tracking energy use. On the other hand, the majority of pulp and paper participants report only marginal changes in their adoption of energy-saving measures or corporate attitudes toward energy tracking as a result of their involvement with IEA.

The data further suggest that the time lag between a firm's exposure to IEA and taking action is typically two years. It is, therefore, likely that additional impacts from the IEA services and efforts may occur in the future. Using the engagement status indicators to track progress within each market, IEA's June 2007 pipeline documents suggest that five food processing plants, representing slightly less than 5% of the market[1], have reached the practicing stage. Another five plants (3% of market share) and seven plants (approximately 8% of market share) are currently at the committed and engaged stages. Quantec estimates that IEA's work to date, as documented by its pipeline, has the potential of having nearly 15% of the food processing market practicing CEI by 2009. According to NEEA' Strategic Plan[2], one of IEA's goal is to have 13% of large food processors (>250 employees) practice CEI. Given this goal, a review of IEA's pipeline suggests that IEA is likely to meet and even slightly exceed this goal by 2009.

Based on the June 2007 pipeline report for the pulp and paper market, three plants, representing roughly 12% of the market[3], are practicing CEI. One additional plant (approximately 4% of market share) is at the committed state and seven more (approximately 36%) at the engaged state. Assuming all these plants reach the practicing stage by the end of 2009, roughly 50% of the regional pulp and paper market will be practicing CEI. NEEA's Strategic Plan set a goal for 10 plants to have implemented CEI by 2009. Given this goal and the data contained in the June 2007 pipeline documents, it appears likely that IEA will meet and or slightly exceed this goal.

[1] Based on employment. NWFPA members only.

[2] Strategic & Business Plans 2005-2009. NEEA Website.

[3] Based on production as published in the 2006 Pulp and Paper Directory published by Lockwood & Post.

However, applicable to both markets, it is important to note that the relatively high level of CEI practice prior to IEA reported by participants, implies that not all of the credit of firms reaching the practicing stage is due to IEA.

Energy Savings

Based on the data collected during 21 site visits, Quantec was able to validate a total of 1.1 aMW in electric savings resulting from IEA's training activities. Nearly 20% of these savings resulted from Industrial Mentored Training[4]. However, due to the fact that each training event is largely unique, these energy savings estimates cannot be extrapolated and are not suitable for forecasting the expected impact of this type of training.

Despite the fact that the majority of participant firms report electric savings as a result of their involvement with CEI, in only four cases firms reported that they had actually measured these savings, of which only two could provide an estimate. Based on the data provided by the firms, Quantec was able to validate a total of 809,700 kWh/year (0.09 aMW) of electric savings resulting from IEA's work with the facilities. For the rest of the facilities, however, due to participants' inability to measure and document energy use or longitudinal output data, Quantec was unable to validate any additional energy savings associated with IEA's efforts in improving business practices. The majority of participant firms in both markets also reported observing Non Energy Benefits as a result of their engagement with IEA. None, however, were able to quantify or document these benefits.

Recommendations

Based on the findings presented in this MPER, following are our key recommendations:

- IEA management should continue its work in revising IEA's updated implementation strategy and provide NEEA and Quantec with sufficient documentation to better understand the proposed strategy including milestones and progress indicators.

- Formally address the barriers preventing industrial firms' measurement and tracking of pre and post-energy consumption data (and therefore energy savings) due to a lack of instrumentation, tools, and/or training. This appears to be a widespread problem with the potential to limit the long-term sustainability of CEI in the market.

- Consider developing processes and/or methodologies that assist firms in measuring the impact of a selected number of typical Non Energy Benefits.

[4] IEA used to refer to Industrial Mentored Training as Regional Cluster Training.

Chapter 1: Introduction

Project Overview

The Northwest Energy Efficiency Alliance (NEEA) creates and manages cost-effective market transformation efforts in Idaho, Montana, Oregon, and Washington. In partnership with local utilities and public service administrators, NEEA's work encourages marketplace adoption of energy-saving technologies and services, and supports regional education and marketing platforms.

NEEA's efforts target the residential, commercial, and industrial sectors. In addition, NEEA focuses on developing new energy-efficient technologies and providing marketing and training resources across sectors.

The Industrial Efficiency Alliance (IEA) is the brand name for NEEA's Industrial-Sector Initiative, which encompasses all market transformation activities targeting the industrial sector. Unlike more traditional market transformation efforts, which focus nearly exclusively on technology, IEA was conceived to take a "holistic" approach targeting end users, trade allies, and utilities to promote a whole-systems strategy. Specifically, IEA set out to encourage industrial firms in the food processing and pulp and paper markets to incorporate continuous energy improvement (CEI) processes into their management and operational practices. IEA's original implementation strategy was concentrated on working directly with industrial firms as well as trade allies, utilities, and other market actors (e.g., the Bonneville Power Administration (BPA), the Energy Trust of Oregon (ETO), the Northwest Food Processors Association (NWFPA), and the Oregon Department of Energy (ODE)) functioning within the food processing and pulp and paper sectors to mitigate market barriers. Working to overcome the lack of sufficient trade ally support identified in the Initiative's Strategic Plan, IEA's strategy placed special attention on developing energy-efficient products and services to overcome this barrier.

Continuous Energy Improvement

Continuous Energy Improvement (CEI) is IEA's primary vehicle for providing industrial firms with a systematic process for managing their energy use and represents the key strategic component of IEA. CEI is a variant of "Continuous Improvement Process" (CIP), a well-established concept in quality management. CEI as promoted by IEA contains seven elements[5]:

1. Management/Corporate/Plant Commitment
2. Energy Assessment
3. Action Plan

[5] See Appendix F for more details,

4. Key Performance Indicators

5. Energy Champion/Team

6. Dedicated Training and Education with Follow-Up

7. Qualified Vendors

Since the last MPER, IEA has developed a systematic framework of working with industrial firms in its target markets, which includes five general elements:

1. Commitment: The firm makes a commitment to continuously improve its energy management practices.

2. Assessment: The firm completes a comprehensive assessment to identify and assess the companies existing energy management practices.

3. Plan: The firm and IEA develop a customized action plan that ties energy management activities to company objectives (e.g., production, safety, environment).

4. Execution: The firm implements the action plan.

5. Measurement: The firm conducts ongoing measurement and evaluation activities that form the basis to ensure the firms' stated energy improvement goals and objectives are met.

Evaluation History

Over the past two years, Quantec has documented its evaluation findings in two market progress evaluation reports (MPER), which were published in May and October 2006. MPER#1 focused on the early stages of implementation and reported on IEA's initial challenges in developing administrative tools, marketing materials, and establishing effective working relationships with market actors. One of the key findings of MPER#1 was that entrance into IEA's target markets required significantly more resources and time than expected. Furthermore, the report highlighted the need to develop market-specific implementation strategies, including appropriate value propositions, tools, and communication methods, as well as to actively address utility relationships.

Some of the key findings from MPER#2, which reported on one and a half years of implementation activities, included generally positive reactions toward IEA from industrial firms, initial successes in engaging industrial firms, yet some challenges in facilitating the adoption of CEI. Other findings included mixed reactions to IEA from trade allies as well as a "wait-and-see" attitude from many utilities. Lastly, the report identified IEA's training activities as successful and well received among all market actors.

Adaptive Management

In addition to these findings, both MPERs reported on IEA's adaptive management practices in addressing both internal and external challenges. While the majority of these challenges consisted of specific administrative, organizational, and communication issues, NEEA has since started to review and adjust its IEA implementation strategy. This ongoing process began in Fall 2006.

To gather more information regarding NEEA's current vision of its revised IEA implementation strategy, Quantec interviewed IEA management in late July 2007. In general, the interview revealed that IEA management is taking a detailed and systematic look at all IEA aspects, including short- and long-term objectives and goals, target audiences, and the entire implementation strategy. Efforts include conducting additional market research, developing new program logic models and assessing implementation tools and procedures. While IEA management has completed a significant portion of this work, they were still addressing several key elements at the time of the interview. Because of the work's unfinished status, IEA management was not able to provide a comprehensive overview of key changes and specific details of its revised strategy; rather, they requested the description be postponed until Market Progress Evaluation Report (MPER) #4, expected for publication in Spring 2008.

While a comprehensive overview cannot be presented in this MPER, some of the key changes IEA management highlighted during the interview include:

- Developing and realizing two distinct implementation strategies, tools, and products for food processing and pulp and paper;
- Creating separate teams for each of the two vertical target markets, composed of additional technical and support staff to assist channel managers;
- Limiting the focus of the food processing team to Northwest Food Processing Association (NWFPA) members only;
- Eliminating trade allies (also known as cross-cutting technologies) as one of IEA's key target markets;
- Shifting resources from offering general industrial training to focus more on results-oriented cluster training, currently referred to as Industrial Mentored Training; and,
- Assessing and revising IEA's products and services in order to be more closely aligned with specific market needs.

Program Logic Model

IEA's initial program logic model specified largely identical implementation strategies for both target markets, with some of the key differences being the cooperation level from market partners such as the NWFPA (See MPER#2, page 3, for a copy of IEA's original logic model). One of IEA management's key tasks during the first half of 2007 was to revisit the theory of

change underlying IEA's implementation strategy. This work has culminated in the development of two market-specific program logic models. Both models are focused on developing a targeted implementation strategy that accurately reflects each market's unique conditions, actors, and barriers, and effectively matches them with appropriate activities and products. While IEA management shared preliminary versions of its revised logic model for the food processing market with Quantec, finalized versions of the logic models were not available for inclusion in this MPER. Quantec anticipates finalized copies of the logic models will be included in MPER#4.

Market Progress Indicators

MPER #2 published a proposed set of Market Progress Indicators for IEA. Individually or combined, Market Progress Indicators demonstrate progress toward the intended outcomes of the project interventions (designated to overcome market barriers) and reflect the progress made in transforming the market.

Given the ongoing revisions to IEA's implementation strategy, Quantec and the NEEA Evaluation Project Manager for this initiative have adjusted some of the initial indicators based on the information available to date. Depending on the proposed changes, the set of indicators and their definitions may change again to accurately reflect IEA's new implementation strategy. For now, the Market Progress Indicators are:

1. Percent of Food Processing Firms (as measured in terms of employment share) and Pulp and Paper Firm (as measured in terms of output capacity) that implement Corporate Continuous Energy Improvement Plans.

2. Percent of Industrial Firms from non-targeted sectors that implement Corporate Continuous Energy Improvement plans.

3. Number of multi-facility Food Processing or Pulp and Paper firms that adopt Continuous Energy Improvement in plants or mills without initiative involvement.

4. Number of multi-facility Food Processing or Pulp and Paper firms that adopt Continuous Energy Improvement in plants or mills outside the Northwest.

5. Percent of Northwest utilities by sales that promote Continuous Energy Improvement as part of their resource acquisition and energy efficiency activities.

6. Additional trade associations promoting Continuous Energy Improvement.

The current evaluation plan does not specifically include data collection activities focused on Indicators 3 and 4. While systematic collection of these data should be part of the next evaluation plan, in this MPER, Quantec used information collected as part of the Target Audience Follow-Up surveys to provide at least some qualitative progress assessments for these two indicators.

Focus of Report

IEA's evaluation is being documented in four MPERs. MPER#1, published in June 2006, provided extensive background information on the IEA as well as Quantec's evaluation methodology. MPER#2, published in October 2006, concentrated on providing additional evaluation findings on a select number of topics including updates and/or changes to the evaluation methodology, market research findings, and an update on IEA's progress vis-à-vis KPIs. MPER#3 focuses mainly on providing a market progress update informed primarily by the Target Audience Follow Up (TAFU) Surveys, Training Follow-Up Surveys, and 2007 site visits. For a number of reasons, including the timing of a significant reworking of IEA's implementation strategy, the Process Evaluation and Market Partner Survey initially scheduled for MPER#3 have been postponed until later in the year. Both data collection activities will be reported in MPER#4, which is scheduled for publication in March 2008.

Table 1 provides an overview of key evaluation activities by MPER.

Table 1. Schedule of Evaluation Activities and Products by Year

Evaluation Activities	MPER#1 (June '05)	MPER#2 (July '06)	MPER#3 (August '07)	MPER#4 (Spring ' 08)
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)		☑		☑
Energy Savings Validation & Estimation (From Training)			☑	☑
Energy Savings Validation & Estimation (From Business Practices Services)			☑	☑

Chapter 2: Evaluation Activities

The findings and conclusions in this report are based on data collected through the Spring of 2007 through four principal data collection activities:

- TAFU Surveys, Spring 2007 (Participants and Nonparticipants)
- Training Follow-Up Surveys
- Site Visits, Business and Technical Practices Focused
- Site Visits, Training Focused

Table 2 presents a summary of the sample sizes for each data collection activity.

Table 2. Summary of Data Collection Activities and Sample Sizes

Data Collection Activity	Number Attempted	Number Completed	Time Frame
Target Audience Follow-Up Surveys			
Food Processing	29	22	May/June 2007
Pulp & Paper	16	15	May/June 2007
Training Follow-Up Surveys			
2006 (Jul-Dec)	296	50	Jan-June 2007
2006 (All)	420	69	July 2006-June 2007
Site Visits—Business Practices	9	9	May/June 2007
Site Visits---Training	21	21	October/November 2006

Note: For each site visit focused on Business Practices, Quantec also conduced separate surveys with corporate staff. Thus, the same firms are counted in both the TAFU completes and for the Business Practice-focused site visits.

Methodology Updates

The only change to the evaluation plan published in the previous MPERs pertains to the TAFU Surveys. Instead of only conducting phone surveys, Quantec conduced both in-person interviews with corporate leaders as well as site visits and interviews with plant staff for nine participating plants (six food processing and three pulp and paper plants) identified by the IEA team as "Innovators" or "Early Adopters." Quantec's site visit team consisted of two individuals, including one who focused on business practices and organizational elements of continuous energy improvement (CEI), while the other focused on the facility's mechanical aspects and any capital projects that may have been referenced. To maintain consistency between survey methods, Quantec utilized the same survey instruments for both in-person and phone surveys. Chapter 3 presents the combined findings for the TAFU Survey as well as highlights of the site visits to the nine targeted plants.

Chapter 3: Findings

Target Audience Follow-Up Surveys

Survey Purpose and Focus

Quantec interviewed participant and nonparticipant industrial firms in IEA's two target markets. Surveys sought to determine the respondents' understanding of and activities regarding energy management, particularly in terms of their manufacturing processes. Quantec's survey instruments addressed[6]:

- Respondents' familiarity with and understanding of IEA and CEI
- The degree to which respondents implemented various CEI elements.
- The realization of energy savings due to their work with IEA.
- Other related topics.

Sample Disposition

Sample selection was based on the December 2006 pipeline report[7] maintained by IEA. Quantec completed interviews with individuals from 41 mills or plants, representing 37 firms. Of the surveyed firms, 22 were food processing (fourteen participants and eight nonparticipants) and 15 were pulp and paper firms (five participants and ten nonparticipants). The food processing group included one cold storage facility (Table 3).

Quantec developed two survey instruments, one for participants and one for nonparticipants. The implementation team provided Quantec with assistance in identifying key contacts, provided contact information, and alerted firms of the upcoming survey and the survey's importance. Quantec interviewed representatives of nine firms in person, with the remaining surveys conducted by telephone. Table 3 lists the number of participant and nonparticipant firms by vertical market.

[6] See Appendix B for the survey instruments.

[7] The pipeline report contains a list of all industrial firms targeted by IEA, their current engagement status and other firm-specific details. The reports are updated monthly.

Table 3. Attempted and Completed by Participant Type and Sector

	Targeted Sample	Completed Interviews
Pulp and Paper		
Participants	7	5
Nonparticipants	19	10
Food Processing		
Participants	16	13
Nonparticipants	13	9
Total	55	37

Based on the survey data, plant sizes for the survey samples ranged from 31 to 1,500 employees for participant food processors and from 82 to 2,500 employees for participant pulp and paper firms. As shown in Table 4, participant food processing firms averaged 331 employees; pulp and paper firms averaged 813. The number of employees at a given plant averaged 474 for nonparticipant pulp and paper firms and 707 for nonparticipant food processing firms.

Table 4. Average Number of Employees (Survey Data Sample)

Type of Respondent	Food Processing	Pulp & Paper
Participant	331	813
Nonparticipant	707	474

Key Findings—Food Processing Market

Food Processing firms report high levels of familiarity with IEA and CEI.

When asked, respondents indicated a high level of familiarity with both IEA and the general concept of CEI. All participants and nearly one-half of nonparticipants demonstrated familiarity with IEA and the general concept of CEI.

Table 5. Nonparticipants' Familiarity with IEA

Answer	Participants (n=13)	Nonparticipants (n=9)
Familiar	13	6
Unfamiliar	0	3

Table 6. Familiarity with CEI

Answer	Participants (n=13)	Nonparticipants (n=9)
Familiar (Unprompted)	7	2
Familiar (Prompted)	6	2
Unfamiliar	0	5

When asked about other names used for CEI, participant respondents most frequently listed "energy program" (2), or "energy efficiency initiative" (1).

NWFPA introduced more than half of food processing firms (participants and nonparticipants) to IEA.

When asked how they first learned about IEA, the majority of participants cited the NWFPA followed by IEA staff. Of the nonparticipants familiar with IEA, three credited the NWFPA and two cited IEA staff. Based on the data, respondents appear to regard utilities' roles in promoting IEA as limited.

Table 7. Source of First Information About IEA

Answer	Participants (n=13)	Nonparticipants (n=9)
NWFPA	7	3
IEA Staff	4	2
Utility	1	1
Other Firm	1	0
Not Familiar with IEA	0	3

The majority of participant firms report having had at least some CEI elements in place prior to engaging with IEA.

When asked whether they had implemented any CEI elements at their facilities, 12 out of 13 participants stated that they had. Of these twelve, nine reported having had at least some of these elements in place prior to engaging with IEA (Table 9).

Table 8. Participant Firms Reporting Implementation of CEI (n=13)

Answer	Number of Firms
Yes	12
No	0
Don't Know	1

Table 9. CEI Elements Implemented Prior to Engaging with IEA (n=13)

Answer	Number of Firms
Yes	9
No	2
Don't Know	0
No Answer Provided	2

Food processing firms most frequently report implementation of energy assessments, action plans, and training. Most participants found their investment in CEI worthwhile.

As shown in Table 10, participants most frequently reported using energy assessments, action plans, training with follow up, and management commitment. Comparatively, over half the nonparticipants (five of nine) stated they were not familiar with CEI. Of the four nonparticiants

indicating familiarity with CEI, nearly all indicated use of energy assessments and management commitment while the reported frequency of use for the other CEI elements is lower.

Table 10. Implementation of CEI Elements

Answer	Management Commitment	Energy Assessment	Action Plan	KPIs	Energy Champion	Training with Follow up	Qualified Vendors
	Participants (n =13)						
Yes	11	13	12	9	10	11	8
No	2	0	1	4	2	1	1
Don't Know	0	0	0	0	0	0	3
No Answer Provided	0	0	0	0	1	1	1
	Nonparticipants (n=9)						
Yes	3	4	2	2	2	1	1
No	1	0	2	2	2	2	1
Stated not familiar with CEI	5	5	5	5	5	5	5
Don't Know	0	0	0	0	0	0	1
No Answer Provided	0	0	0	0	0	1	1

When asked to reflect on the perceived benefits and costs of employing CEI, nine of the 13 participant respondents reported that the benefits outweighed the costs (Table 11). One of the participant firms indicated no net benefits and three did not know.

Table 11. Perceived Value of Investment in CEI

Perceived Value	Participants (n=13)
Benefits > Costs	9
Benefits = Costs	1
Don't Know	3

Participants' use data gathered during energy assessment to develop action plans. Majority of participants report high likelihood of repeating assessment.

Based on survey data, all participants and all nonparticiants familiar with CEI (four out of nine) report the use of energy assessments (Table 10). When asked about the type of assessment they pursued, the majority of participant firms cited EnVinta One-2-Five. Nonparticipants appeared to favor professional audits and other non-specified systems assessments (Table 12).

Table 12. Types of Assessment Used

Assessment Type	Participants (n=13)	Nonparticipants (n=9)
EnVinta One-2-Five	9	0
Professional Audit	1	4
None	1	0
Don't Know	1	0
Stated not familiar with CEI	0	5
No Answer Provided	1	0

When asked about the most common outcomes of an energy assessment, eight participant respondents reported using the assessment data and recommendations to develop action plans, as shown in Table 12.

Table 13. Results of Energy Assessment Among Participants (n=13)[8]

Assessment Outcome	Number of Firms
Develop Action Plans	9
Circulated Among Management	5
Circulated Among Employees	2
Nothing/Not used	2
Don't know	1
No Answer Provided	1

Rating the likelihood of repeating an energy assessment at their facility, the majority of respondents (nine out of thirteen) indicated they would do so "definitely" or "more likely than not" (Table 14).

Table 14. Number of Participant Firms Indicating Likelihood of Repeating Assessments at same facility (n=13)

Answer	Number of Firms
Not at all	0
Some possibility	2[9]
More likely than not	5
Definitely will	4
No Assessment Used	2

[8] More than one answer permitted.

[9] Includes answer from one respondent that could not decide between "Some possibility" and "More likely than not".

Participating food processing firms identified Action Plans as the most effective elements of CEI at their facilities.

When asked about the CEI component that has proven to be most effective at their facilities, responses from food processors indicated action plans (for participants) and Employee Awareness Programs (for nonparticipants) were the most effective. Two participants stated IEA's efforts to pull all CEI elements together were the most valuable.

Table 15. Most Effective CEI Elements

	Mgmt Commitment	Action Plan	KPIs	Energy Champion	Employee Awareness Program	Energy Assessment	Training	Qualified Vendors	Don't Know	Not familiar with CEI	No Answer
Participants (n=13)	1	4		1	1	1	1	0	2	-	2
Nonparticipants (n=9)	0	1	1	0	2	1	0	0	1	2	1

Food processing firms struggle to identify and track relevant energy KPIs.

When asked about using energy KPIs, the majority of participants confirmed they used KPIs or other metrics to track operations and/or energy use. For two participant firms, energy KPI usage represented a new development since engaging with IEA. However, of the eight firms indicating energy KPI usage, only half were able to provide reasonably detailed descriptions. Based on these descriptions, the simple tracking of energy, gas, and/or steam use based on utility bills was most common, with only one respondent citing the practice of tracking electricity use per pound of output.

The use of energy KPIs was relatively less common among nonparticipants. However, when KPIs were used, they were generally described in detail. Examples include pounds of product per labor hour, raw material usage, energy per pound of product, ongoing chemical usage, and steam produced per therm purchased. Review of the descriptions provided by participants and nonparticipants showed nonparticipants generally were able to provide as much detail and specificity in their descriptions as IEA participants.

Table 16. Usage of Energy KPIs

Level	Participant (n=13)	Nonparticipant (n=9)
Yes	9	4
In Progress	3	0
No	0	5
No Answer Provided	1	0

The majority of participant food processing firms reported facing challenges when implementing energy KPIs, including lack of sufficient instrumentation on the right equipment, ability to measure use by product line, and limited resources (time or staff) available to focus on the issue.

When asked about what the IEA channel manager could have done more effectively to help firms establish and implement energy KPIs, the only suggestions cited focused on providing metering or monitoring system improvements.

The majority of participants credit the IEA with assisting them in taking energy-saving actions.

Responding to the question of how likely they would have been to pursue the same activities or energy saving measures without IEA, the majority of respondents thought they would have done at least some of the same things, but credited IEA with helping them in taking action. Two respondents indicated they would have done nothing without IEA and two stated that they would have done the same without IEA.

Table 17. Perceived Impact of IEA on Participants to Motivate Energy Saving Actions (n=13)

Answer	Number of Responses
We wouldn't have done anything without the IEA.	2
We would have been doing some things but the IEA has really helped.	7
We would be doing the same level of effort	2
We would be doing more without the IEA.	0
No Response	2

In terms of specific ways in which IEA had assisted them, four respondents credited the IEA (the Channel Director in particular) with providing important assistance in developing their action plans. Four participant food processing firms credited the IEA with being directly involved in sponsoring training programs that resulted in improved energy efficiencies.

When asked whether work with IEA and the channel manager led them to pursue additional energy savings opportunities, two participants reported they had. Specifically, these opportunities included improving options for employee feedback, encouraging behavioral changes such as turning off lights and following up on equipment leaks.

In managing energy costs, food processors (participants and nonparticipants) cite close working relationships with their utilities and/or the Bonneville Power Administration (BPA).

Feedback from participant and nonparticipant food processing firms suggests a majority regularly rely on their local utility (or BPA, if applicable) to help manage energy cost. The available data from 13 participants and nine nonparticipants suggest that incentives for capital projects and provision of utility-sponsored training comprised the most common types of assistance.

Table 18. Reliance on Utilities/BPA to Control Energy Cost

Answer	Participants (n=13)	Nonparticipants (n=9)
Regularly	7	6
Moderately	1	1
Occasionally	1	1
Not At All	1	0
No Answer Provided	3	1

When asked to characterize their utility's (or BPA's) role in working with IEA, the majority of participant firms indicated they had been actively involved throughout the entire process. By contrast, the majority of nonparticipants did not indicate significant utility involvement.

Food processing firms find it difficult to quantify and document energy savings.

Despite the general agreement that the IEA had helped them to undertake more energy saving actions, eight out of thirteen firms were not able to measure the amount of energy they had saved. Of the four firms reporting to have measured the savings, only one was able to provide a monetary savings estimate which is one of the most tenuous of possible measurements. Due to lack of available documentation, Quantec was not able to validate this estimate.

Table 19. Observed Energy Savings As Result of Working with IEA (n=13)

Answer	Number of Firms
Yes	12
No	0
Don't Know	1

Table 20. Firms Measuring Energy Savings (n=13)

Answer	Number of Firms
Yes	4
No	8
Don't Know	1
No Answer Provided	0

Data further indicated participant firms were largely unable to attribute energy consumption to a particular product line at a particular time. Five participant food processing firms identified ongoing changes in product mixes (such as the addition of a more energy-intense product one season versus another) as one of the key challenges in tracking energy use per unit of output. Furthermore, five respondents described a lack of sufficient submetering and instrumentation as a primary challenge in measuring energy consumption related to a specific product.

Food processing firms acknowledge Non Energy Benefits (NEBs), but uniformly lack the ability to measure and track them.

When asked to identify any non-energy benefits (NEBs) resulting from their involvement with IEA, half the participant food processing firms listed at least one NEB each. However, when asked about their ability to track and measure these benefits, none of the firms reported having measures and methodologies to do so.

Table 21. Non-Energy Benefits Observed by Participants (n=13) [10]

Answer	Number of Firms
Improved productivity	4
Improved work environment	3
Improved employee retention	5
Enhanced employee awareness	2
Not sure	0

Lack of time and resources continue to be major barriers to participating in energy efficiency programs.

When asked about the greatest barriers to participating in energy-efficiency programs in general, lack of resources and time remain to be the major barriers to greater participation in energy efficiency programs.

Table 22. Reasons for Nonparticipation [11]

Answer	Participants(n=13)	Nonparticipants (n=9)
Upfront Cost		2
Total Cost	2	0
Management commitment		1
ROI	1	1
Lack of time or resources	2	2
Ability to sell idea to management		1
No Interest-Different Values		1
No Response	8[12]	3

Responding specifically to the reasons for not participating in IEA, feedback from nonparticiants was minimal with two respondents listing schedule conflicts and lack of time as primary reasons. Both indicated they were still interested in working with IEA.

[10] Respondents could choose more than one category.

[11] Respondents could choose more than one category.

[12] These questions were asked toward the end of the survey. Due to time constraints on behalf of many interviewees, not all respondents were asked this question.

Key Findings—Pulp and Paper Market

Interviewed Pulp and Paper firms report high levels of familiarity with IEA and CEI.

Survey data indicated all participant and nonparticipant pulp and paper respondents were familiar with IEA. When asked how they were introduced to the IEA, all participant and nonparticipant respondents cited the IEA channel manager or other IEA/NEEA staff.

Similarly, the majority of participant and nonparticipant pulp and paper firms recognized CEI right away or with minor prompting.

Table 23. Familiarity with CEI

Answer	Participants (n=5)	Nonparticipants (n=10)
Familiar (Unprompted)	4	4
Familiar (Prompted)	1	2
Unfamiliar	0	2
No Answer	0	2

Most participants reported using all CEI elements. The majority found their investment in CEI worthwhile.

When asked to identify which of the seven CEI elements they had implemented at their facilities, survey data indicated that nearly all participants reported implementation of all seven elements. It is important to note, however, that Quantec collected these data in form of an inventory without assuming or controlling for any specific order or consistency in how or when the elements were implemented. (Table 24).

Table 24. Participant Adoption of CEI (n=5)

	Management Commitment	Energy Assessment	Action Plan	KPIs	Energy Champion	Training with Follow up	Qualified Vendors
Yes	5	4	5	4	4	5	5
No	0	1	0	1	1	0	0

Responding to the request to identify the perceived benefit cost ratio associated with CEI use, the majority of participants reported the benefits outweighing the costs (Table 25).

Table 25. Perceived Value of CEI Investment

Perceived Value	Participants (n=5)
Benefits > Costs	4
Don't Know	1

The majority of participant firms reported that many CEI elements were in place prior to engaging with IEA.

When asked to specify whether they had implemented any of the CEI elements at their facilities, all participant respondents indicated that they had. Of these firms, four out of five reported having had some of these elements in place prior to engaging with IEA (Table 26).

Table 26. CEI Elements Implemented Prior to Engaging with IEA (n=5)

Answer	Number of Firms
Yes	4
No	1
Don't Know	0

Based on feedback from participant firms, Table 27 provides an overview of the CEI elements participants reported to have had in place before engaging with IEA.

Table 27. Adoption of CEI Elements (n=5) Pre- and Post-IEA Engagement

	Management Commitment	Energy Assessment	Action Plan	KPIs	Energy Champion	Training with Follow up	Qualified Vendors
Element Existed Prior to IEA	3	2	3	4	2	3	3
Element New Since Working with IEA	2	2	2	0	2	2	2

Energy use per pound of product is the most commonly used KPI among pulp and paper firms.

When asked to elaborate on their use of KPIs, four out of five participants and all nonparticipants indicated they had KPIs in place. The fifth participant firm stated they were in the process of putting KPIs in place. The majority of respondents (participant and nonparticipant) reported tracking electric use (kWh) per ton of product, mostly on a daily or monthly basis. Other indicators mentioned by nonparticipants include use of gas, fuel oil, steam, water, and generated electricity.

Table 28. Usage of KPIs[13]

	Participants (n=5)			Nonparticipants (n=10)		
Indicator/KPI	# of Firms	Daily Tracking	Monthly Tracking	# of Firms	Daily Tracking	Monthly Tracking
Electric use (kWh/ton of product)	3	2		7	3	6
Electric cost ($)	1		1			
Steam use (BTU/ton of product)	2	2		4		3
Propane use (BTU/ton of product)				2	1	3
Natural Gas use (BTU/ton of product)	1	1		3	1	1
Water use				1		
Oil use ($/ton of product)				3		1
Generated electricity				2	1	
Purchased Fuel				2		2

Only one respondent provided feedback on specific challenges in implementing KPIs. These included the need for more automatic meters and timely updates and summaries of energy use. Participant respondents did not identify any improvements the Channel Manager could have made to help them establish and implement KPIs.

Reliance of pulp and paper firms (participant and nonparticipant) on their utility and/or BPA to manage energy costs is limited.

As a rule, the majority of pulp and paper firms (participants and nonparticipants) relied on their utility/BPA only occasionally or not at all to help manage energy costs (Table 29).

Table 29. Reliance on Utilities/BPA to Control Energy Cost

Answer	Participants (n=5)	Nonparticipants (n=10)
Regularly	1	2
Moderately	0	1
Occasionally	2	1
Not At All	0	5
No Answer Provided	2	1

[13] Multiple responses allowed.

IEA's impact in bringing about implementation of energy savings actions/measures appears limited.

When asked to comment on the likelihood of pursuing the same activities and/or energy savings measures in the absence of IEA, the limited feedback available appeared to indicate only a moderate IEA impact on their activities.

Table 30. Perceived Impact of IEA on Motivating Energy Saving Actions (n=5)

	Number of Responses
We wouldn't have done anything without the IEA.	1
We would have been doing some things but the IEA has really helped.	1
We would be doing the same level of effort	2
We would be doing more without the IEA.	0
No Response	1

When asked to describe any additional energy saving opportunities their firm pursued as a result of working with IEA, three firms listed installation of and training on VFDs as well as implementing continued replacement of compressed air valves and nozzles, as suggested and demonstrated by IEA. The latter reportedly resulted in an increase, albeit unspecified, in productivity.

When asked whether involvement with IEA brought about any changes in corporate attitudes toward tracking energy use, none of the three participant respondents reported any changes. However, three respondents indicated engagement with IEA had resulted in changes on the shop floor, specifically increased employee awareness and ownership.

Participants find it difficult to quantify and document energy savings.

When asked whether they their work with IEA had resulted in any electric energy savings, four out of five participants reported that it had. However, none indicated they had measured any of these savings.

Table 31. Reported Electrical Savings As Result of Working with IEA (n=5)

Answer	Number of Responses
Yes	4
No	1

Table 32. Participants Measuring Savings (n=5)

Answer	Number of Responses
Yes	0
No	4
No Savings Reported	1

A majority of firms report NEBs; however, participants cannot generally track them.

Survey data suggest the majority of firms (participant and nonparticipant) had observed some amount of NEBs as a result of working with IEA.

Table 33. Indication of Non-Energy Benefits

	Participant	Nonparticipant
	(n=5)	(n=10)
Yes	3	7
Don't Know	0	1
No Answer Provided	2	2

The most commonly reported NEB are improvements in productivity and product quality as well as reductions in production losses.

Table 34. Non-Energy Benefits Among Pulp and Paper Firms[14]

	Participant (n=5)	Nonparticipant (n=10)
Improved Productivity	2	2
Improved Work Environment	1	1
Reduced Maintenance	1	1
Increase in Reliability	1	
Improved Product Quality		3
Improved Safety		1
Reduction in Product Losses		2

While none of the respondents (participant and nonparticipant) were able to provide specific estimates (monetary or otherwise) of the observed NEB, five nonparticipants were able to cite reasonable methodologies or processes to track and measure the changes. Examples include automated product quality testing for strength, clarity, and brightness, etc., detailed tracking of equipment maintenance time/cost and a reduction in down time (non-production time). None of the respondents from participant pulp and paper firms were able to cite any methodologies or processes used to identify and track NEB.

Lack of time and resources continues to be a major barrier to participation.

When asked about the greatest barriers to participating in energy efficiency programs in general, respondents most frequently cited lack of time and resources, lacking value position. When asked to about the reasons for not participating in the programs offered by IEA, respondents most frequently listed competing priorities and the existence of more promising opportunities (Table 35).

[14] Firms could choose more than one response.

Table 35. Reasons for Non Participation in Energy Efficiency Programs[15]

Answer	Participants (n=10)	Nonparticipants (n=5)
There are more promising opportunities		2
Competing priorities		2
Unsure of IEA's long-term effectiveness in saving money and energy		1
ROI	1	
Energy Efficiency is not a big priority		1
Short of time/staff/resources	1	1
Focus on Cogeneration capabilities		1
"Old School" Management Approach to Problems	1	
No Information Provided	2	5

Training Follow-Up Surveys

Purpose and Focus

As in the past two years, the main focus of the Training Follow-Up Survey was to collect feedback from trainees on the training's actual impact, specifically the implementation of system or operational changes resulting in energy and other non-energy savings. The survey data were also used to identify potential sites to visit to validate training-related energy savings.

Methodology and Sample Disposition

The Training Follow-Up Surveys were conducted using a Web-based survey form, a link to which was provided to each training attendee[16] in the form of an e-mail introducing the survey. The targeted time frame for survey completion was roughly two to three months after the training date. To increase awareness of the surveys as well as to offer trainees the opportunity to complete the survey over the phone, Quantec staff called each participant one to two days prior to sending out the survey e-mails. Surveys were specific to the type of class attended. MPER#2 reported on survey results for training conducted in 2005 and the first six months of 2006. Table 36 presents survey statistics for training conducted in the second half of 2006, while Table 37 presents the combined responses for all 2006 training.

Table 36. Number of Attempted and Completed Training Follow-Up Surveys (July Through December 2006)

Type of Training	Attempted	No. Completed	Response Rate

[15] More than one answer allowed. These questions were asked toward the end of the survey. Due to time constraints on behalf of many interviewees, not all respondents were asked this question.

[16] Includes all those from industrial facilities who attended an IEA training as identified by IEA data. Training attendees can represent firms already participating in other aspects of IEA offerings, firms that have chosen not to participate in any other IEA offerings, or firms only at the initial stage of getting familiarized with IEA and its offerings.

	(No. of good emails)		
Refrigeration/ RETA	118	11	9%
Motors	55	12	22%
Pumps	55	10	18%
Compressed Air	68	17	24%
Total	296	50	17%

Table 37. Number of Attempted and Completed Training Follow-Up Surveys (All Training 2006)

Type of Training	Attempted (No. of good emails)	No. Completed	Response Rate
Refrigeration/ RETA	177	20	11%
Motors	94	16	17%
Pumps	61	12	20%
Compressed Air	88	21	24%
Total	420	69	16%

Compared to surveys conducted in 2006 and reported in MPER#2, response rates from individual attendees doubled on average (from 8% to 16%). Table 15 of MPER#2 presented a projection of survey estimates for the three-year study period necessary to achieve a 90% confidence level for the survey results and resulting savings estimates. According to these estimates, the anticipated number of surveyed trainees and completed surveys were 450 and 42, respectively. Data shown in Table 37 above indicate that while slightly fewer trainees received surveys, the number of completed surveys exceeded the target by 27, or roughly 64%. Given the IEA's projected reduction in focus on training activities for 2007, this year's survey results will go a long way to ensure statistical reliability of survey results.

Results of a firm by firm analysis indicate survey responses represent 17 % of food processing firms[17] and 20% of pulp and paper plants participating in IEA-sponsored trainings. Table 38 through Table 41 present the survey statistics for 2005 and 2006, counting only unique firms on a firm by firm basis.

Table 38. Number of Food Processing Firms Engaged in Training 2005 and 2006

Type of Training	Plants Participating In Training	Plants with Completed Surveys	Response Rate
Refrigeration/ RETA	71	12	17%
Motors	28	6	21%
Pumps	21	3	14%
Compressed Air	22	8	36%

Table 39. Number of Pulp and Paper Plants Engaged in Training

Type of Training	Plants Participating In	Plants with Completed	Response Rate

[17] Includes all food processing firms regardless of their membership status with NWFPA.

	Training	Surveys	
Motors	8	0	0%
Pumps	12	3	25%
Compressed Air	8	1	13%

Table 40. Number of Non-Targeted Plants Engaged in Training

Type of Training	Plants Participating In Training	Plants with Completed Surveys	Response Rate
Refrigeration/ RETA	51	6	12%
Motors	121	17	14%
Pumps	26	8	31%
Compressed Air	67	12	18%

Table 41. Summary of Firms Responding to Survey

Market	Plants Participating In Training	Plants with Completed Surveys	Response Rate
Food Processing	126	25	20%
Pulp & Paper	24	4	17%
Other	260	42	16%
Total	**410**	**71**	**17%**

Key Findings

The survey responses for all training conducted in 2006 form the basis for the key findings. Appendix C presents detailed results and frequencies separated for training conducted between July and December 2006 and all of 2006 training.

Training appears to increase participants' knowledge and understanding of energy-efficiency opportunities.

Feedback from training participants indicated training in all four systems (refrigeration, pumps, motors, and compressed air) had a sizable effect on increasing awareness and knowledge of energy-efficiency opportunities. When asked to rate their knowledge level after the training compared to pre-training levels, the percent of trainees choosing *knowledgeable* or *extremely knowledgeable* increased by 25% for refrigeration and pumps training and 30% and 37% for motors and compressed air training, respectively.

The majority of trainees report having made changes following training.

Feedback from 69 respondents indicated nearly 57% (up from 49% reported in the last MPER) made some changes to optimize their systems following training. Based on the results by system, compressed air (70%) and refrigeration (60%) appeared to result in the greatest amount of system changes, followed by pumps (50%) and motors (44%). For a detailed list of specific changes by system, please refer to Appendix C.

Table 42. Percent of Respondents Indicating System Optimization Changes Following Training

Made Changes	Refrigeration (n=20)	Pumps (n=16)	Motors (n=12)	Compressed Air (n= 21)	All Channels (n=69)
No	35%	42%	56%	20%	37%
Yes	60%	50%	44%	70%	57%
Don't Know	5%	8%	0%	10%	6%

When prompted to indicate whether they had made specific system changes before and after the training, nearly 40% of all respondents indicated having made at least one of the changes as a result of the training.

Table 43. Time Frame of System Optimization Training Changes

Time Frame of Changes	Refrigeration (n=20)	Pumps (n=16)	Motors (n=12)	Compressed Air (n= 21)	All Channels (n=69)
Before Training	41%	35%	17%	17%	26%
After Training	38%	17%	49%	50%	39%
Plant to Next Year	17%	20%	16%	15%	17%
No Plan	4%	28%	18%	18%	18%

Based on the data presented in Table 43, training focusing on compressed air (65%) and motors (64%) most successfully elicited system changes either immediately following or within one year of attending the training.

When asked the reasons respondents were prevented from making system changes, most frequently listed were: long payback periods (28%), no authority (26%), lack of support from management (13%), and lack of resources (10%). While their relative importance changed slightly from last year, the top four reasons remain the same as those reported in MPER#2.

The majority of trainees that planned to make changes indicated that those changes will take place in the next year.

When asked whether respondents expected to make additional system changes in the future, 67% (up 7% from the data presented in MPER#2) indicated they thought they would. Similar to the findings of the changes after training, refrigeration and compressed air appeared to be effective in motivating trainees to undertake changes, at least based on self-reported data, while motors and pumps training did to a lesser degree. Table 44 summarizes the responses by system type.

Table 44. Percent of Respondents Expecting to Make Additional System Optimization Changes

Made Changes	Refrigeration (n=20)	Pumps (n=16)	Motors (n=12)	Compressed Air (n= 21)	All Channels (n=69)
No	10%	50%	31%	29%	28%
Yes	80%	50%	63%	67%	67%
Don't Know	10%	0%	6%	5%	6%

As shown in Table 45 below, 74% of respondents across all systems expected to implement the majority of changes within one year. It is interesting to note that attendees of compressed air training (61%) and refrigeration (31%) planned to make the majority of changes within only six months, while the majority of changes in the other channels were expected within one to two years. In addition, participants in compressed air training indicated more than twice as many expected system changes (28) than participants in the channel, indicating the next largest number of expected changes (13). This might be a result of IEA conducting two sets of Industrial Mentored Trainings for compressed air, while only offering one set of these trainings for refrigeration and none for the other two channels (motors and pumps). However, given the small amount of data currently available, Quantec will conduct a more detailed evaluation of the impact of cluster training for MPER#4.

Industrial Mentored Training offers additional activities beyond typical classroom training, providing participants with an effective mix of theoretical and practical knowledge. The geographic cluster training combines pre-classroom homework assignments where participants collect system-specific data, in-class instruction and a plant tour. In addition, trainees from each company are paired with a technology expert or mentor who works with participants one-on-one to develop a plant-specific "to-do" list that participants can take back to their plants and implement. Follow up with participants is provided for as long as three months after the training.

Table 45. Expected Time Frame for Future System Changes

Time Frame of Changes	Refrigeration (n=20)	Pumps (n=16)	Motors (n=12)	Compressed Air (n= 21)	All Channels (n=69)
6 Months	31%	25%	25%	61%	43%
1 Year	23%	50%	50%	21%	31%
2 Years	31%	8%	13%	14%	16%
No Time Frame	15%	17%	13%	4%	10%

Based on self-reported data, training attendance appeared to generate electricity savings. However, savings tend to take up to two years to materialize.

Table 46 summarizes the percent of respondents indicating system changes and electricity savings, reported as savings achieved and savings expected. Of respondents reporting system optimization changes, only 28% (16% of all respondents) noted that changes following training resulted in any electricity savings. By contrast, more than 62% of those indicating change (35% of all respondents) stated they still expected additional electricity savings. Most of these respondents expected savings to materialize within one year following training, with the

remainder hoping to realize savings within two years. Of those expecting to make future system changes (Table 46), nearly 40% anticipated electricity savings as a result.

Respondents were further asked to estimate the amount of their achieved or expected electricity savings. Most savings estimates were provided from attendees of refrigeration and compressed air training and varied widely. For instance, for changes to compressed air systems, respondents reported savings of 5% to 30% of system load. The range of self-reported savings indicated from updates to the refrigeration system spanned 1% to 40%.

Table 46. Percent of Respondents Indicating Change and Energy Savings

	Refrigeration (n=20)	Pumps (n=16)	Motors (n=12)	Compressed Air (n= 21)	All Channels (n=69)
Already Achieved Savings	25%	17%	14%	43%	28%
Expect Additional Savings	58%	33%	71%	71%	62%

For an overview of respondents' self-reported savings estimates, please see Appendix C.

Refrigeration and Compressed Air training appear to be the most successful in motivating energy saving measures.

As data in the preceding tables illustrates (albeit based on small sample sizes), refrigeration and compressed air training generally motivate more system changes and energy savings than do motor and pump training. These findings are consistent with findings reported in MPER#2.

In addition to data on system changes and energy savings, feedback from roughly 50% of refrigeration and compressed air trainees credit IEA training attendance as either "important" or "very important" in bringing about energy savings. Comparatively, only 31% of motor and 8% of pump training attendees saw IEA training as having a similar role.

Expected or observed non-energy savings due to training were minimal.

In response to the question regarding whether a respondent's plant had observed or expected to observe non-electric savings resulting from training, virtually none of the respondents identified savings. In a few cases, respondents identified water and/or gas savings; however, none of the respondents were able to quantify the savings. This findings appears to be contrary to the IEA's original theory of change that anticipated generation of significant NEBs.

Site Visits—Training Related

Purpose and Key Focus

Quantec conducted site visits to validate and estimate the impact of IEA's training on the implementation of energy-efficient practices on the shop floor.

Methodology and Sample Disposition

As outlined in more detail in Chapter 3 of MPER#1, Quantec used site visits as the primary tool to estimate and verify energy savings related to IEA's training activities identified by the training follow-up surveys. Specifically, the site visits were intended to generate a savings estimates (as a percent of system use). Quantec used these average savings estimates to develop realized energy savings to date as well as to develop estimates of IEA's likely impact in the market.

Based on the information provided by the survey respondents, Quantec's industrial engineer contacted each facility and scheduled verification site visits in some cases. Table 47 summarizes the number of plants reporting savings (43), the number of completed site visits (21), and the number of potential additional site visits for plants receiving training late in 2006 (8).

Table 47. Summary of Training Impact and Site Visit Activities by Industry for Unique Plants

Training Type	Number of Plants Participating in Training	Plants Indicating Action	Number of Completed Site Visits[18]	Potential Site Visits[19]	Plants with Validated Savings
Pulp and Paper	24	3	1	2	1
Food Processing	126	15	15	6	11
Other	260	25	7		5
Total	410	43	23	8	17

Key Findings

Total validated energy savings related to training activities total 1.1 MW.

Our independent assessment of the data indicates that in 17 of the 21 site visit assessments, energy savings could be validated, or it was confirmed that it was highly probable that measures would be implemented within a 12-month period. Based on information collected during the site visits, validated savings associated with IEA's training activities total 1.1 aMW, 0.50 aMW of which are expected to be implemented within one year from the date of the site visit. Due to a lack of consistent and reliable energy-use data on the system level, all savings were expressed as a percentage of total plant energy use. Plant energy use was estimated as the product of the number of employees at the plant (data collected during the site visit) and the energy use per employee (aMW) by 4-digit NAICS codes, calculated using the 2003 Manufactures Energy Consumption Survey data. See Appendix B for a summary table of the site visits as well as detailed descriptions and savings estimates for each site.

[18] For three plants, Quantec did not receive necessary data to complete the site visit evaluation. Thus, the total number of site visits completed as of August 2007 was 21, including two at the same plant.

Industrial Mentored Training Generated More than 20% of all validated savings.

Four of the completed site visits[20] validated savings associated with one of IEA's Compressed Air Industrial Mentored Training sessions (formerly referred to as Regional Cluster Training). The combined savings associated with these four facilities totaled approximately 0.21 aMW representing roughly 20% of the overall savings validated by Quantec.

In all, IEA has offered four Technical Mentored Trainings since its inception. However, based on information provided by IEA staff, each Industrial Mentored Training was designed to meet specific needs of IEA, one or more firms, or utilities. Because each training was unique, the savings estimates were not transferable to other trainings.

Site Visits— Business Practices and Technical Evaluation

Purpose and Key Focus

In Spring 2007, Quantec completed detailed interviews and site visits with nine manufacturing firms (six food processing and three pulp and paper). The IEA team suggested these nine companies or plants based on their perceived status as "Innovators" or "Early Adopters" of energy efficiency and their relationship with IEA. These interviews provided an important opportunity to collect feedback on IEA and the perceived impacts of involvement with IEA. Quantec used the same survey instruments for these and other TAFU surveys. However, the site visits also allowed the team to explore some questions in greater depth, depending upon respondent interest. The survey questions focused on business organization, decision making, and some of the manufacturing facilities' technical aspects. The team also inquired about claimed energy savings resulting from energy-efficiency strategies.

Methodology and Sample Disposition

The IEA Channel Managers provided Quantec with suggestions regarding the selection of particular firms in their respective industry sectors. IEA also provided contact information and informed company managers they might be contacted by Quantec.

Key Findings

Because the site visits are formally part of the TAFU Survey, their results are included in the general discussion of the survey results earlier in this chapter. However, given the special interest in this group of companies and plants, the following discussion offers findings specific to this subset of respondents.

Survey data indicate that a number of general findings true for the TAFU group as a whole are also true for the site visit group. For instance, respondents from this group generally credited

[20] W002,W003, W006, and W007.

their work with IEA as a catalyst for bringing about electric savings. Similar to the general findings, however, all but one firm were unable to quantify the amount of savings due to interaction with IEA.

Key Findings—Applicable to Food Processing Only

Fifty percent of the "Early Adopters" are working on developing energy KPIs.

Food processing companies typically produce a greater variety of products from year to year than do pulp and paper companies. A comparison of year-to-year energy consumption alone is insufficient to determine if there have been any improved energy efficiencies, highlighting the need for a product-based KPI. However, while none of the interviewed firms had product-based KPIs prior to working with IEA, three of the six food processing firms had recently established KPIs. One company had already adopted the metric, but, according to the Energy Champion, had not started calculating it at the time of the interview. The second company was preparing to start measuring cost per kWh and cost per therm as well as developing prescribed recommendations for energy consumption for each product. The last company reported having recently started to measure kWh per ton of output and therms per ton of output. The interviewee reported the firm recently installed several metering tools in their plant and had begun to take measurements manually throughout the day.

Correlating energy savings with IEA actions/involvement is difficult. Yet, 809,700 kWh/year of savings could be attributable to IEA actions.

While all interviewed firms reported that they had at least some energy savings due to their involvement with IEA, only two firms were able to quantify or document the savings and their cause. In one instance, the plant manager informed Quantec staff that his company had developed a system to measure energy usage at his facility for multiple years of production. According to internal estimates, the facility was able to reduce total energy consumption by 3% to 5%. Review of plant records by a third party concluded these estimates appeared reasonable. During the site visit, Quantec staff also learned that prior to IEA involvement, the plant had implemented a number of efficiency improvements which were estimated to represent about 25% of the savings. The balance of savings is likely a result of combined influences of the local utility, vendors, and IEA. The methodology to estimate energy savings involved comparing the current year (2006) consumption to a baseline year (average of three prior years). To account for year-to-year variations in production, each year's consumption was normalized as MMBtu/pound. Electric savings for improvements implemented prior to IEA engagement were estimated and deducted from the total savings, resulting in validated savings of 196,700 kWh/year.

The second instance involved an internally financed capital project attributable to IEA Industrial Mentored Training training. Electric savings for improvements resulted in validated savings of 613,000 kWh/year.

Based on the available information on utility, vendor, and IEA involvement for both sites, Quantec was able to validate total electric savings of 809,700 kWh/year (0.09 aMW)[21].

Key Findings—Applicable to Pulp and Paper Only

Employee awareness of energy consumption fostered through public postings and employee orientation.

Each of the three pulp and paper plants visited all monitored their energy usage on a daily basis and produced a report to document thermal and electric energy consumption. The reports were shared with some or all employees. At two of the plants, this information was available throughout the plant, while at the third it was shared primarily with the energy team. At one site, a daily posting showed how actual energy consumption on a given day compared to predicted energy usage. The company's Energy Champion had met with the IEA Channel Manager; however, the firm started these postings under its own initiative.

For each firm, increased employee awareness was part of a general trend toward greater employee engagement in energy-related policies or at least toward a greater understanding of these policies. Employees were encouraged to share their suggestions for increased energy efficiencies at each firm. One of the firms hosted a company-wide education session on the importance of energy efficiency where employees learned how their own actions could have an impact on energy consumption. The event was organized with the assistance of the IEA Channel Manager. The Channel Manager also played a key role in assisting this firm in establishing its energy action plan and KPIs.

Systems Champions and Energy Teams are working at each of the site visit plants.

At each of the three pulp and paper plants, one or more Systems Champion positions had been created, or a Systems Champion had been selected. The firms selected Systems Champions internally and on a rotating basis. The Systems Champions, who may focus on compressed air and/or air leaks, steam, or boilers, assume responsibility for the proper functioning of specific machinery. He or she reports problems as soon as they are noted and has the authority to authorize systems repair without requesting additional permission (up to a given dollar amount).

Respondents indicated having a Systems Champion led to increased accountability and efficiency. One respondent hoped all of his company's plants would adopt the System Champion approach. The IEA has provided support to fund the Energy Champion position at one of the three facilities, on a limited term basis of one year. Quantec observed that the IEA Channel Manager had a working relationship with each of the site visit Energy Champions, but cannot report on the extent to which the Systems Champion positions were created as a result of the IEA or independently.

[21] See Appendix G for a write up of the site visit findings, data consulted, and methodology.

Based on survey data collected as part of the Training Follow Up and TAFU Surveys of participant and nonparticipant firms, Quantec observed clear evidence that IEA's work positively impacted firm perceptions and behavior toward energy efficiency (in general) and CEI (in particular).

Chapter 4: Market Characterization

This chapter presents a brief overview of changes in market trends for the Northwest Industrial market in general, and IEA's two target markets in particular. The information presented is primarily based on findings from the 2007 TAFU survey, the Training Follow-Up Survey and secondary research compiled by Quantec in July 2007.

Northwest Industrial Market

At the outset of IEA commencing its activities in the Northwest industrial market, Quantec completed a set of 64 surveys aimed at identifying market-wide trends in the industrial firms' corporate energy management practices prior to IEA entering the market. The findings from this survey are statistically valid only on the market-wide level. Some of the key survey findings published in MPER#1 included:

- There was a high level of awareness among industrial firms concerning energy issues and controlling energy costs was a high priority for most (90% of respondents)
- Opportunities for improving energy efficiency were perceived to be high with nearly 75% of respondents identifying at least some energy savings opportunities.
- Many firms had either taken, or were taking steps to track and manage their energy costs with 47% of respondents reported to be engaged in controlling their energy costs. Approximately one third of these firms cited behavioral changes as main measures for energy use reduction.
- There was a deficiency of formal energy management planning and oversight among industrial firms with only 25% of surveyed firms reporting an energy management plan in place, and only 13% tracking energy costs using key performance indicators.

The TAFU surveys conducted by Quantec for both MPER#2 and MPER#3 were focused exclusively on participants and nonparticipants of IEA's two target markets. Quantec did not collect any data from firms outside of these two target markets. Given that, the TAFU findings by themselves are not comparable to the findings of the Corporate Energy Management survey reported in MPER#1.

However, in general, TAFU survey findings suggest that general market awareness and interest in controlling energy costs remain high among industrial firms. As discussed in more detail in the Findings section of this report, the increase in competitive pressures coupled with rising costs of raw materials, energy, and labor have resulted in firms paying greater attention to identifying and implementing cost-reducing measures. Quantec does not consider these trends to be materially different from those dominating the Northwest industrial market at the outset of IEA.

Food Processing Market

The Northwest food processing industry has seen an increasing trend in production costs over the past years. For instance, over the last two years, food processing companies nationwide experienced increased costs in energy, raw materials, and employee benefits.[22] According to one source, the first half of 2006 saw a record growth in commodity price inflation in the food processing industry.[23] Part of this inflation is due to labor costs; in fact, payroll for food processing workers in Oregon, Idaho, and Washington collectively rose by 5.7% between 2001 and 2005.[24] According to a 2007 report prepared for the NWFPA, the rate of pay for workers in the Northwest grew faster than the loss in the number of food processing jobs.[25]

Changes in demand for different products varied, spurring increased production of milk, processed potatoes, and other processed vegetables, but declines in demand for apple processing. In the U.S. as a whole, demand is increasing for fresh processed foods, which is driven by demographic trends favoring ready-to-eat food items and more disposable income dedicated to food items.[26] According to a 2006 national survey conducted by the publication *Food Processing*, 44% of respondents stated they plan to address the additional demand for products by increasing their workforce while another 35% percent plan to maintain their current workforce.[27] The survey also reported three in four processors expect total production to increase by at least 5% in 2007.[28] Nationally, an increased demand for fresh processed foods has driven energy demand in the food processing sector. One estimate stated energy consumption by food manufacturers will increase10% from 1997 to 2020.[29]

Results from this year's TAFU and Training Follow-Up surveys suggest that many food processing firms still face many of the same obstacles they did two years ago. For instance, findings from the TAFU survey indicate many plants are unable to measure and track KPIs because they do not have instrumentation, equipment, and staff resources. Based on findings from the Training Follow-Up survey, in many plants the lack of management support and resources as well as long payback periods continue to prevent operation and maintenance changes and installation of energy savings measures. The same group of respondents cited that even when potential energy-saving measures are identified, implementation of these changes can take up to two years. The data collected for this MPER validate the market barriers previously identified by IEA. However, evaluation data collected (TAFU Survey, Training Follow-Up Survey, and site visits) clearly identify firms' general inability to document and track energy use and therefore savings as a persistent problem that has not yet been formally addressed by IEA.

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[22] Dave Fusaro, Food Processing on-line magazine. 2006. http://foodprocessing.com/articles/2006/152.html?page=print

[23] Ibid.

[24] Globalwise Inc. Economic Performance of the Northwest Food Processing Industry: Trends and Analysis from the Benchmark Data. May 2007. Report prepared for the NWFPA.

[25] Ibid.

[26] EPA, Sector Energy Scenarios: Food Processing. March 2007.

[27] David Feeder, Food Processing on-line magazine, 2007. http://foodprocessing.com/articles/2007/016.html?page=1

[28] Ibid.

[29] EPA, Sector Energy Scenarios: Food Processing. March 2007.

Pulp and Paper Market

The pulp and paper market, which is characterized by a limited number of generally large producers, has witnessed increased competition in the global pulp and paper market over the past five years. Increase in demand for, and reduced supply of, high-quality wood has resulted in a direct increase in the cost of raw materials as well as an indirect increase in the amount of energy necessary to produce lower-quality woods and wood by-products. In addition, due to factors such as increased facility automation, greater harvesting of lower-quality timber that requires more energy intensive processing, and stricter pollution control requirements, the energy costs of pulp and paper firms have been increasing.[30] Lastly, this industry has seen an increase in the costs related to environmental compliance, which includes their responsibility to monitor emissions and water quality, and the legal costs they have faced in complying with the law. These costs are substantial; the U.S. Department of Energy has estimated that between 1997 and 2002, 14% of annual capital equipment expenses were dedicated to environmental protection measures.[31]

Similar to the findings for the food processing market, firms' inability to track and document energy savings related to interactions with the IEA has been identified in both the TAFU and the Training Follow-Up surveys and validated by site visits. Given the lack of detailed information on IEA's updated implementation strategy, this might not be true in the future, but based on the information available to Quantec at this time, IEA does not have any specific activities or intervention strategy to address this.

Another issue discovered as part of Quantec's research is that among pulp and paper firms, four out of five (80%) plants interviewed as part of the TAFU indicated they had at least one CEI step in place prior to engaging with IEA. Although lack of sufficient data from the Corporate Management Practice survey prohibits a detailed comparison, this finding appears to be in opposition to the finding that only about 43% of firms (sector-wide) had been engaged in controlling energy costs by means of one or more CEI components. While this suggests that the level of CEI components utilized by pulp and paper plants, either formally or informally, is likely higher than previously assumed, there is significant need and opportunity for IEA to continue working with firms to approach CEI in a comprehensive and sustainable manner.

[30] U.S. Environmental Protection Agency (EPA), Sector Energy Scenarios: Forest Products. March 2007.
[31] Ibid.

Chapter 5. Market Progress

MPER #2 published a proposed set of Market Progress Indicators for IEA. Given the ongoing revisions to IEA's implementation strategy, Quantec and the NEEA Evaluation Manager have adjusted some of the initial indicators. Below is an overview of refined MPIs as well as progress assessments where data were available.

While Quantec is aware that IEA uses ITS to track engagement status, Quantec's ongoing concerns about the data integrity, accuracy, and usability issues of ITS has resulted in Quantec no longer using ITS for evaluation purposes. Based on our discussions with IEA staff, it is clear that IEA and its management are also aware of the shortcomings of ITS. The degree to which IEA management will work on addressing some of these issues is unknown at this time.

As a result, the self-reported data contained in IEA's pipeline reports for December 2006 and June 2007 form the primary data source for the progress evaluation. Wherever possible, Quantec used TAFU survey data to validate the data contained in the pipeline documents.

Because IEA has recently narrowed the scope of the target market for food processing to NWFPA members only, Quantec updated the market share estimates using employment estimates provided by IEA staff. While the definition of the pulp and paper market remained the same, Quantec updated the market share percentages based on data published in the 2006 Lockwood & Post Directory.[32]

Sufficient data were not available to inform a comprehensive progress review for indicators targeted at detecting potential market transformation effects and IEA's impact on utilities in the region. In the case of the indicators focused on market transformation, Quantec used information from this years' TAFU surveys and the IEA pipelines to present temporary updates, where possible. In the case of the utility-focused indicator, Quantec will conduct another set of Market Partner Interviews, including 20 utilities, in September 2007. Quantec plans to use the findings from these interviews to identify and report on IEA's impact on utilities' actions and offerings. Quantec anticipates reporting these data in MPER#4, scheduled for publication in March 2008.

Although IEA management plans to track corporate, plant, and system engagement level separately in the future, IEA currently only tracks engagement at the corporate and plant levels. Following is a summary of firms' engagement levels[33] using the December 2006 data, which also served as the basis for the Target Audience Follow Surveys, and a more recent document for June 2007. Table 48 and Table 49 provide overviews of the number of plants at each engagement level. Comparing the two tables suggests that while a few changes have occurred, engagement levels have been upgraded and downgraded, resulting in very similar market shares.

[32] In all cases, a total plant's production is equal to the sum of the plant's pulp and paper products' capacity.

[33] IEA tracks engagement in five levels: Practicing, Committed, Engaged, Interested, and Aware.

Table 48. Plant Engagement Levels and Market Shares, December 2006

Engagement Level	Food Processing (NWFPA Members)		Pulp & Paper	
	# of Facilities	% of Market Employment	# Facilities	% of Market Production[34]
Practicing	5	4.4%	3	11.9%
Committed	5	3.0%	1	4.1%
Engaged	8	6.8%	5	22.9%
All Others	13	36.9%	18	61.10%
Non-Targeted (Non NWFPA)	69	48.5%		
Total	100	100%	27	100%

Table 49. Plant Engagement Levels and Market Shares, June 2007

Engagement Level	Food Processing (NWFPA Members)		Pulp & Paper	
	# of Facilities	% of Market Employment	# of Facilities	% of Market Production
Practicing	5	4.4%	3	11.9%
Committed	5	3.0%	1	4.1%
Engaged	7	7.9%	7	35.7%
All Others	15	36.2%	16	48.3%
Non-Targeted (Non-NWFPA)	68	48.5%		
Total	100	100%	27	100%

A comparison of the engagement level indicators reported in IEA's monthly pipeline reports to those identified by the TAFU Survey data showed no significant deviation in the data.

Industrial End-Users

Market Progress Indicator #1: Percent of Food Processing facilities (as measured in terms of employment share) and Pulp and Paper firms (as measured in terms of output capacity) that implement Corporate Continuous Energy Improvement plans.

Food Processing: Based on data contained in the June 2006 Pipeline Report, five food processing plants, representing roughly 4.4% of the NWFPA-target market (based on employment), have reached the practicing engagement status. Another five (3% of market share) are at the committed stage and working toward practicing.

Despite feedback from the IEA team that the Initiative is making good progress, comparison of the pipeline documents suggests the engagement status of nine plants, five of which were NWFPA members, changed between December 2006 and June 2007. Of the nine plants changing status, three increased their involvement, while six slowed progress or reduced their

[34] Based on data published in Lockwood & Post Directory of Pulp & Paper Mills, 2006.

engagement with IEA. As shown in Table 48 and Table 49 on the previous page, the net impact of these changes as a percent of targeted market share is, however, marginal.

Quantec considers that the six firms which have slowed progress or reduced their engagement with IEA to be doing so for a number of reasons. One of these is that IEA management has focused its resources on plants with a high propensity for adopting Continuous Energy Improvement (CEI), while IEA management works on completing its revision/update of its implementation strategy.

Furthermore, the current set of engagement level indicators lack the necessary granularity to accurately reflect IEA's progress on the corporate, plant, and systems levels. Currently, IEA tracks engagement only on the plant and/or corporate levels, while much of IEA's work is also focused on the systems level. To provide better data to track specific progress over time, IEA management is working on developing and implementing a system of tracking engagement status separately for the corporate, plant, and systems levels. Quantec views this effort as appropriate and will start using the updated engagement indicators once they become available.

Comparing the status indicators listed in the pipelines to those assigned to participating plants responding to the Target Audience Follow-Up (TAFU) Surveys suggests that in all but two cases, status indicators shown in the pipelines generally reflect the actions and amount of commitment described by the respondents. In those two cases, information provided by the respondent prompted Quantec to increase the status of one plant from receptive to engaged, and reduce the status of the other from engaged to receptive.

Based on data provided by the implementation team Table 50, it appears that the average time for a plant to reach the practicing indicator is about nine months. Given that, Quantec considers it possible that the firms currently shown at the engaged status indicator may reach the practicing stage by the end of 2009. Given this, the current pipeline indicates that nearly 15% of the market would be practicing CEI by 2009.

Table 50. Average Time and Effort Required for Plants to Reach Engagement Status

Engagement Status	Avg. #Months to Reach Status	Avg. Contacts Made
Engaged	3	6
Committed	8	13
Practicing	9	21

According to NEEA' Strategic Plan[35], one of IEA's goal is to have 13% of large food processors (>250 employees) practice CEI. Given this goal, a review of IEA's pipeline suggests that IEA is likely to meet and even slightly exceed this goal by 2009. Based on the data available in the current pipeline reports, Quantec considers that IEA has a good chance of meeting its internal goal.

Pulp and Paper: Based on the June 2007 pipeline and production capacity estimates published by Lockwood & Post in 2006, three plants, representing roughly 12% of regional production, were indicated to be at the practicing stage. As shown in Table 1, one additional plant (4.1%) is committed, and seven (35.7%) are shown to be engaged. Assuming all the plants at committed and engaged status reach practicing status by the end of 2007, roughly 51% of the market, based on production, will be practicing CEI in the region.

Comparison of plant engagement status in the pipelines for December 2006 and June 2007 suggests four plants increased their engagement levels with IEA, while the engagement levels for two plants were reduced to reflect decreased engagement levels. The net impact of IEA's work over the past six months has resulted in an increase in the active pipeline (engaged or better) for pulp and paper of nearly 13%. Given the industry's historical propensity for slow adoption, requirement of short pay-back periods and relatively high aversion to risk or change, Quantec considers the progress to date and resulting potential future progress as significant.

Given that IEA's internal goals for this market are not available, an evaluation of the likelihood that IEA will meet its goal is not possible at this point. However, even without a specific goal, a potential adoption rate of CEI by 50% of the market appears to be a strong sign for market transformation in the regional market. NEEA's Strategic Plan set a goal for 10 plants to have implemented CEI by 2009. Given this goal and the data contained in the June 2007 pipeline documents, it appears likely that IEA will meet and or slightly exceed this goal.

However, applicable to both markets, it is important to note that the relatively high level of CEI practice prior to IEA reported by participants, implies that not all of the credit of firms reaching the practicing stage is due to IEA. Quantec will be working on developing a more appropriate market progress indicator to account for this finding.

Market Progress Indicator #2: Percent of Industrial Facilities from non-targeted sectors that implement Corporate Continuous Energy Improvement plans.

Market Progress Indicator #2 tracks CEI adoption in all industrial markets other than food processing and pulp and paper. However, given management's decision to limit IEA's target

[35] Strategic & Business Plans 2005-2009. NEEA Website.

market to NWFPA members, this indicator will also pertain to all non-NWFPA members IEA may or may not have worked with in the past. In addition, this group incorporates several of the cold-storage facilities working with IEA.

Based on the June 2007 pipeline for food processing, IEA has or is currently working with at least ten plants that are not members of NWFPA and six cold storage facilities. Of these companies, one food processing plant and two cold storage facilities are practicing CEI as indicated by the practicing status indicator. Five additional food processors are shown to be at the engaged status.

Because IEA formerly targeted these facilities, the results cannot solely be attributed to market transformation effects. In the process of completing training-related site visits, however, Quantec identified facilities in non-targeted industries (e.g., mining, wood manufacturing, chemical manufacturing, etc.) associated with targeted food processing or pulp and paper plants that appear to be meeting these first steps applying some concepts promoted by IEA (Appendix E provides additional information).

Given the lack of sufficient data and the recent shift in IEA's market definition for Food Processing, Quantec cannot currently identify any significant trend among non-targeted industries toward implementing CEI that could be associated to IEA market transformation rather than simply a refocusing of IEA's efforts.

Market Progress Indicator #3: Number of Multi-Facility Food Processing or Pulp and Paper Firms that Adopt Continuous Energy Improvement in Plants or Mills without Initiative Involvement.

Among the nonparticipant firms answering the Target Audience Follow-Up Survey, 14 operate multiple manufacturing facilities (six are pulp and paper and eight are food processing firms). Ten of these multi-facility firms (five food processing and five pulp and paper) indicated they had adopted one or more elements of CEI (such as Key Performance Indicators [KPIs], energy assessment, or management commitment to energy efficiency) without assistance from the IEA. Nonparticipants indicated the most useful CEI elements included the establishment of KPIs (five food processing and one pulp and paper firm) and employee awareness programs (two pulp and paper firms).

Market Progress Indicator #4: Number of Multi-Facility Food Processing or Pulp and Paper Firms that Adopt Continuous Energy Improvement in Plants or Mills outside the Northwest.

While the TAFU Surveys focused primarily on gathering information from firms located in the Northwest, two participating food processing firms and two participating pulp and paper firms indicated they are considering or are implementing CEI at plants outside of the region. Survey respondents did not provide time frames for these changes.

Trade Allies

Due to the revised IEA implementation strategy, which, among other things, included an elimination of the role of trade allies, the evaluation team considers the trade ally-focused market progress indicators published in MPER#2 no longer relevant; thus, they have been dropped.

Market Partners (Utilities, BPA, PBAs, Trade Associations)

Market Progress Indicator #5: Percent of Northwest Utilities by sales that promote Continuous Energy Improvement as part of their resource acquisition and energy efficiency activities.

The evaluation team plans to conduct another set of Market Partner Interviews, including 20 utilities, in September 2007. Quantec anticipates using findings from these interviews to provide a progress update for this particular MPI, which will be reported in MPER#4, scheduled for publication in March 2008.

Market Progress Indicator #6: Additional trade associations promoting Continuous Energy Improvement.

Similar to the progress with utilities, Quantec will report for this particular MPI after the Market Partner Surveys have been completed.

Chapter 6. Conclusions and Recommendations

Since its inception in 2005, the IEA has focused on assisting Northwest industries to gain a competitive advantage by adopting energy-efficient business practices. Given the unique nature of IEA and its focus on market transformation, IEA has had to overcome significant market and operational challenges in order to continue its work within its two target markets. During the first two years of implementation, IEA management effectively addressed challenges and obstacles, albeit on an ad hoc basis. However, in the Fall of 2006 IEA management began work on a comprehensive review of its implementation strategy, drawing heavily from IEA's nearly two years of market experience.

IEA management reports that, as of July 2007, this comprehensive review consists of a detailed and systematic examination of all aspects of IEA, including short- and long-term objectives and goals, target audiences, products and services, as well as internal management and operations. As this process is currently underway, it is difficult to describe the specifics of the proposed changes or to judge their effectiveness. Quantec believes it is important to accelerate the process, document its outcomes and communicate its results to the IEA's team.

Market Characterization

Based on Quantec's secondary research, as well as on feedback from the TAFU Survey, Quantec finds that IEA's target markets have not materially changed over the past two years. The research and feedback from industrial firms indicated an increase in competitive pressures and input costs, in general, and energy, in particular. These trends have further increased industrial firms' interest in identifying and applying cost-saving measures without impacting production capacity or product quality. Quantec anticipates these trends are likely to continue over the next five years, providing the IEA with a more receptive audience.

Evaluation Findings

Based on the findings from this year's TAFU survey it appears that IEA has been successful in making itself known among industrial firms within its two target markets. This is evidenced by the fact that in addition to all participant firms, 67% of nonparticipant food processing firms and all interviewed nonparticipant pulp and paper firms report familiarity with the IEA. Feedback from food processing participants and nonparticipants alike further indicate that the partnership with the Northwest Food Processors Association (NWFPA) has been highly effective in promoting IEA and its mission, in that it introduced more than half of all respondents to IEA.

Data from participant firms in both markets indicate high adoption rates of individual CEI elements and a general perception that the benefits of CEI exceed its costs. While pulp and paper participants report consistent use of all seven elements, feedback from food processing firms suggests that energy assessments, action plans and securing management commitment are the most frequently implemented elements. When asked to identify which of the seven CEI elements proved to be most effective at their facilities, participant food processing firms identified action

plans while their pulp and paper counterparts identified KPIs. The data further suggest that the majority of participants in both markets had at least a portion of the CEI elements in place prior to engaging with IEA. This suggests that IEA acts as an accelerant for change rather than an originator.

It is important to note that during the development of the survey instrument, IEA has shifted its method of promoting CEI from one focused on promoting the adoption of individual elements to a more systematic process that incorporates the individual CEI elements into a set of interconnected steps aimed at encouraging the sustainable practice of CEI among industrial firms. Lack of information about this change in approach at the time of survey instrument development resulted in the survey collecting CEI implementation data on an element by element basis only. Given this, the finding that the majority of participants report having had at least some of the CEI elements in place prior to engaging with IEA does not necessarily indicate a lack of opportunity for IEA to improve industrial firms' systematic and sustaining use of CEI.

The reported high incidence of CEI element adoption prior to engaging with IEA does impact the methodology for measuring market progress. Specifically, if it is true that the pulp and paper market as a whole had relatively high adoption rate of CEI elements prior to IEA entering the market, an accurate assessment of market progress needs to account for this by changing the baseline from which changes in CEI adoption should be assessed. In light of that, Quantec and the NEEA Evaluation Project Manager will commence work on developing an appropriate methodology and identify additional data collection activities, if necessary.

Based on the survey data, all food processing participants and four out of five pulp and paper participants have used energy assessments, of which the majority considered the assessment to be of high value. Most frequently, participants reported using the data gathered during energy assessment to develop action plans and circulate the information among management and employees. The majority of food processing participants (nine out of thirteen) and pulp and paper participants (three out of five) reported a high likelihood of repeating the energy assessments at their facility. Given the importance of ongoing assessments in the CEI framework, this finding underscores the potential for a sustainable adoption of CEI in the food processing market.

While the majority of food processing firms and nearly all pulp and paper firms reported using KPIs, the detail and rigor associated with the KPIs varied greatly by market. Of the food processing firms indicating use of KPIs, only half were able to provide any additional details. Based on these details it appears that the majority of food processors tracked energy use based on monthly utility bills. Also, the majority of participant food processing firms reported challenges when implementing KPIs including lack of sufficient instrumentation on the right equipment, ability to measure use by product line, and limited resources (time or staff) to devote to KPIs' implementation.

In comparison, the majority of respondents from pulp and paper firms were able to provide very detailed information about their facility's use of KPIs. Based on this feedback, it appears that tracking energy/gas/steam use per pound of product both on a daily and monthly basis is the most commonly KPI used in the market. Also, only one of the pulp and paper participants providing feedback indicated any challenges in tracking KPIs. In addition to conducting energy

assessments on a regular basis, the effective use of KPIs is an essential element of a sustainable practice of CEI. While food processing firms in particular are still working to overcome some of their industry-specific challenges, the survey findings generally suggest a significant interest in and adoption of KPIs in IEA's target markets.

To further underscore the differences in the two target markets, survey findings indicate a significant difference in how firms in both markets interact with utilities. For instance, more than half of food processing firms (participant and nonparticipant) cited a close working relationship with their utilities/BPA in an effort to control energy costs. Furthermore, when asked to comment on their utility's (or BPA's) role in working with IEA, the majority of participant firms reported an active and ongoing involvement throughout. This compares sharply to the feedback provided by pulp and paper firms, which indicated very limited and inconsistent coordination with utilities to control energy costs. This conclusion suggests that IEA's continued focus on developing and maintaining effective working relationships with utilities and BPA is especially important for IEA's work in the food processing market.

The data further suggest that participant food processing firms regard IEA as valuable partner in controlling energy costs. According to feedback provided by industrial firms as part of TAFU and training follow-up surveys, the majority of firms reported that their engagement with IEA had resulted in a greater adoption of energy saving measures. Responding to the TAFU survey question of how likely they would have been to pursue the same activities or energy savings measures without IEA, the majority (seven out of thirteen) of food processing participants thought they would have done at least some of the same things, but credited IEA with helping them in taking action. Two respondents indicated they would have done nothing without IEA and two stated that they would have done the same without IEA. In addition, eight food processing participants reported that their involvement with IEA resulted in at least some minor improvements in corporate attitudes toward tracking energy costs.

Based on the collected data, IEA's impact in the pulp and paper market appears more limited. Based on TAFU survey data, only one firm each reported that they would have either done nothing or implemented fewer energy saving actions without IEA. Pulp and paper participants reported no change in corporate attitudes toward tracking energy use.

The majority of participant firms (twelve out of thirteen food processing firms and four out of five pulp and paper firms) reported that their work with the IEA had resulted in energy savings. However, only four of the food processing firms and none of the pulp and paper firms indicated that they had measured the savings. Of these firms, only one firm was able to provide any documentation of the savings. When asked about the reasons for not being able to measure and/or provide documentation of the measurements TAFU survey respondents identified: (1) lack of sufficient tracking and monitoring equipment; (2) lack of resources; and, (3) ongoing changes in the type and mix of products make up. Based on the data collected for this MPER, Quantec finds that firms' inability to measure and track energy use, and therefore savings, is a widespread problem in both markets. Quantec considers this issue to be problematic for three reasons:

1) the tracking of energy use is in and of itself a part of the IEA's theory of change based on the concept that "things that are measured tend to improve";

2) it is questionable whether firms who adopt CEI are likely to continue with these practices without the ability to measure and demonstrate their value once IEA exits the market; and,

3) finally, this kind of measurement and tracking is critical to IEA's ability to demonstrate its effectiveness in producing energy savings.

When asked about non energy benefits (NEBs), the majority of firms in both markets indicated having observed at least some. Among food processing firms, the NEBs most commonly cited included improvements in employee retention, productivity, and work environments. Among pulp and paper firms citing NEBs, the most frequent NEBs were improvements in productivity, improvements in product quality, and reductions in product losses. None of the respondents were able to provide quantitative estimate of NEBs. In addition, none of the participants (food processing and pulp and paper) were able to provide any details on measurement processes or methodologies.

Feedback regarding the barriers to participating in energy efficiency programs identified lack of time and resources as primary reasons. This finding is in line with the initiative's planning documents, as well as previous MPERs.

Energy Savings

Based on data collected during 21 site visits, Quantec was able to validate a total of nearly 1.1 MW in electricity savings resulting from IEA's training activities[36]. While Industrial Mentored Training generated approximately 20% of these savings, feedback from IEA staff suggests that each training event is unique. Thus, the validated savings reported here are not transferable to any other trainings of this type nor are they scalable for the purpose of forecasting future energy savings.

As part of the TAFU surveys, Quantec conducted nine site visits. While representatives of four firms indicated electric savings, only two were able to provide documentation that allowed Quantec to validate 809,700 kWh/year (0.09 aMW) in electric savings. For the rest of the firms, however, lack of proper documentation and data of energy use and production pre and post intervention precluded Quantec from validating any additional energy savings.

Quantec was not able to validate any savings related to IEA's business practice activities nor any NEBs. Based on Quantec's experience in validating savings to date, it has become clear that validating savings related to training activities is significantly easier than doing so for IEA's business practice work. Focus on improving firms' ability to measure and track energy use would go a long way to improving Quantec's ability to validate savings associated with IEA. Improvement in measurement will also allow participating firms to quantify the benefits of CEI and justify continued CEI implementation to the leadership of the industrial end-users.

[36] See Appendix F for more details.

Market Progress

The survey data collected for this MPER suggest that the timeframe between a firm's exposure to IEA and its message and action on the part of the firms can span up to two years. Specific to training, survey data indicate that the majority of system changes take place within two years following the training. IEA's experience with promoting CEI shows that moving an average food processing plant to the practicing stage can take up to nine months, requiring upward of 21 contacts with IEA staff. IEA's experience with pulp and paper plants signals a significantly longer timeframe, with data indicating that bringing a plant to the engaged status indicator can take roughly one year. While not unexpected, these findings shed light on the fact that the true impact of IEA is likely to be observed with a one to two year lag.

Using the engagement status indicators to track progress within each target market, the IEA's pipeline documents illustrate that, as of June 2007, five food processing plants, representing roughly 4.4% of the NWFPA target market based on employment, had reached the practicing engagement status. Another five plants (3% of market share) and seven plants (7.9% of market share) were at the committed and engaged stages, respectively. Quantec estimates IEA's work to date has the potential of resulting in nearly 15% of the food processing market (NWFPA members only). According to NEEA' Strategic Plan, one of IEA's goal is to have 13% of large food processors (>250 employees) practice CEI by 2009. Given this goal, a review of IEA's pipeline suggests that IEA is likely to meet and even slightly exceed this goal by 2009.

For the pulp and paper market, the June 2007 pipeline shows three plants, representing roughly 12% of regional production, at the practicing stage. One additional plant (4.1%) is shown as committed, and seven additional plants (35.7%) are shown at the engaged level. Assuming all these plants reach practicing status by the end of 2009, roughly 50% of the market, based on production, will be practicing CEI in the region. NEEA's Strategic Plan set a goal for 10 plants to have implemented CEI by 2009. Given this goal and the data contained in the June 2007 pipeline documents, it appears likely that IEA will meet and or slightly exceed this goal.

Given that the TAFU findings from pulp and paper firms suggest relatively high levels of CEI use by market actors in the absence of IEA, this estimate more closely represents a market status rather than progress brought solely about by IEA. Quantec will work to develop more appropriate market progress indicators for pulp and paper and publish them in MPER#4, scheduled for publication in March 2008.

Recommendations

Following is list of recommendations based on Quantec's evaluation activities to date:

- IEA management should continue its work in revising IEA's implementation strategy and provide NEEA and Quantec with appropriate documentation to develop a better understanding of the proposed strategy including proposed milestones and progress indicators.

- Formally address the barriers preventing industrial firms' measurement and tracking of pre and post-energy consumption data (and therefore energy savings) due to a lack of instrumentation, tools, and/or training. This appears to be a widespread problem with the potential to limit the long-term sustainability of CEI in the market.
    - IEA might consider conducting additional research as to the specific reasons firms struggle with this issue.
    - Provide technical and financial assistance strategies to support firms' efforts to increase facility instrumentation and automated energy consumption readings.
    - Develop appropriate tools and trainings that are specifically targeted at tracking and analyzing energy use data. (Quantec is aware that the IEA team is currently working on developing a tool potentially capable of assisting food processors in tracking and analyzing energy use and potential savings. Given the early stage of this process, Quantec cannot comment on the potential of this tool.)
- Consider developing processes and/or methodologies that assist firms in measuring the impact of a selected number of typical NEBs.

Next Steps

The fourth and final MPER is scheduled for publication in March 2008. MPER #4 will include a review of strategies and assumption, including an update on IEA's approach and Logic Model, and an updated market characterization, process evaluation, and market progress assessment. In Fall 2007, Quantec will conduct staff and contractor surveys to inform the process evaluation. Market Partner Surveys will be conducted in the fall and winter months. MPER#4 will also include an assessment of energy savings resulting from the IEA's training programs and business practice services.