research/into/action inc

Final Report

2006 Production Efficiency Program: Process and Impact Evaluation

Funded By:

EnergyTrust of Oregon, Inc.™

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research/into/action inc

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The evaluation team would like to thank Dr. Phil Degens, Evaluation Manager, Energy Trust of Oregon, Inc. for the direction he provided to this study. A process and impact evaluation cannot be conducted without the cooperation and effort of the many people we need to interview or survey. First of all, we wish to thank Energy Trust staff who contributed their time to this study: Elaine Prause, Senior Industrial Sector Manager; Steve Lacey, Energy Efficiency Director; Fred Gordon, Director of Planning and Evaluation; and Philip Kelsven, Evaluation Analyst.

We also wish to thank the managers and staff of the program implementation contractor, the program delivery contractors, and the allied technical analysis contractors that make the program run on a day-to-day basis. We thank the participating vendors we spoke with, as well.

We contacted more than half of the 2006 Production Efficiency participants, visiting 66 customers on-site and interviewing others by telephone. We appreciate the time they spent with us and the access to their facilities. Finally, we contacted nonparticipating industrial customers and we thank them for taking the time to help the evaluation team and Energy Trust to understand their programmatic needs.

The evaluation team comprises many individuals: Dr. Jane S. Peters provided the overall direction and Dr. Marjorie McRae managed the evaluation. Assisting them in key roles were Robert Scholl and Natalie Yager of Research Into Action. Steven Scott of Strategic Energy Group directed the impact evaluation, assisted by Brian Crumrine. WTR Consulting Engineers provided two engineering field staff: Matt Jaynes and Ryan Severson. Finally, Laurie Lago of Business Service Bureau provided report editing and production.

ACKNOWLEDGEMENTS

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ES EXECUTIVE SUMMARY

Energy Trust of Oregon, Inc. (Energy Trust) was incorporated as an Oregon nonprofit public benefit corporation in March 2001 to fulfill a mandate to invest "public purposes funding" for new energy conservation and related activities in Oregon. It receives funding from a three-percent public purpose charge to the rates of the two investor-owned electric utilities in the state. Energy Trust has a responsibility to report to the Oregon Public Utilities Commission (OPUC) on how it is spending its funding and what it achieves.

Energy Trust launched the Production Efficiency (PE) program in May 2003. The primary goal of the program is the acquisition of large volumes of electric savings at modest cost through a wide variety of efficiency strategies for industrial processes. Available to both industrial and institutional customers of the state's investor-owned utilities, the program addresses both new and existing industrial manufacturing processes and process support systems.

In 2006 alone, Production Efficiency has saved an estimated 0.5% of Oregon's total industrial electricity consumption. Since its inception through 2007, Production Efficiency has saved an estimated 2% of Oregon's total industrial electricity consumption and has engaged about 10% of industrial customers, responsible for about 20% of industrial electricity consumption.

This document assesses the impact of completed Production Efficiency projects recognized in 2006. For 2006, 157 project sites had a combined recorded savings of 71,984,735 kWh (roughly 8.9 average megawatts). The evaluation estimated savings for these projects totaling 73,136,251 kWh, for a realization rate of 101.6%. For the assessment, the team visited 65 of the projects with the largest savings; the reported energy savings for this sample totaled 63,963,306 kWh, or 89% of recognized 2006 program savings. The team interviewed staff at each site visited, plus conducted additional interviews by telephone. From this sample of 97 contacts, free-ridership was estimated. Participants reported taking actions that constitute program spillover, saving both electricity and natural gas, but the current research was not able to estimate the magnitude of the savings. Table ES.1 provides the indices of program savings.

This document also updates a previous process evaluation completed for the Production Efficiency program in early 2005. To accomplish the update, the evaluation team interviewed representatives from all of the organizations involved in implementing the program, including the program management contractor (PMC), the program delivery contractors (PDCs), allied technical analysis contractors (ATACs), and market actors (industrial equipment vendors and contractors), and surveyed participant contacts to assess the program's strengths and weaknesses.

Table ES.1: Gross and Net Electricity Savings from the 2006 Production Efficiency Program

INDICES OF PROGRAM SAVINGS	VALUE
Working Estimate of 2006 Savings	71,984,735 kWh
Realization Rate	101.6%
Gross Savings Estimate	73,136,251 kWh
Free-Ridership Estimate*	17.6%
Net Savings Estimate	60,242,106 kWh
Net-to-Gross Ratio	82.4%
Net Savings as a Percent of Working Savings	83.7%

* This estimate is the mid-point of a free-ridership range estimated for the program.

Finally, this document assesses the remaining industrial market for program services. This was done through an analysis of a database of the state's industrial customers and a survey of a sample of nonparticipating industrial firms to learn about their program awareness and some of their energy-use behaviors.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The Production Efficiency program is successful from a number of perspectives. It has conducted a large number of projects with a variety of industrial firms and is acquiring large quantities of cost-effective energy savings. Industrial participants are pleased with the program overall and with the program's various aspects in particular, including the services they receive from program representatives.

Since its inception, the Production Efficiency program has worked with industrial sites corresponding to 20% of estimated total industrial electricity consumption (kWh). Energy Trust, as a whole, has worked with industrial sites corresponding to 25% of estimated total industrial electricity consumption through the Production Efficiency, Building Efficiency, and New Building Efficiency programs.

Within the industrial sector, Production Efficiency, since its inception, has worked with facilities corresponding to over 30% of total electricity consumption in three high-use manufacturing subsectors: paper, food, and machinery.

The Production Efficiency program is well positioned to meet many of the needs of nonparticipants. When nonparticipants were asked about the types of external support they would find most valuable, incentives for energy-efficient equipment (41%) and efficient process improvements or plant upgrades (39%) topped the list. Following closely, was information on energy management best practices in their industry (35%).

Below, we summarize our specific conclusions and recommendations on research issues investigated by this evaluation.

Marketing

Conclusion

Since program inception, the numbers of PDCs and ATACs have decreased; funding for individual PDCs has also decreased, while their territories have expanded. At the same time, the success of the program's marketing strategy has made that strategy more challenging, as the program has already gained entry in the more welcoming facilities and has identified the most pressing projects for those facilities.

PGE customers were significantly more likely than were PacifiCorp customers to be uncertain about whom to call with questions about the program. PGE customers were also significantly less likely than were PacifiCorp customers to have called, or to contemplate calling, their program representative when considering an additional equipment purchase, suggesting a need for more aggressive marketing in PGE territory.

The Production Efficiency program appears to be successful in appealing to equipment vendors and contractors. Most equipment vendors and contractors interviewed for this evaluation initiate conversations about program participation with their customers. However, this component of program marketing can continue to be strengthened, as less than one-half of 2006 participants learned of the program from these market actors.

Recommendation

For maximum effectiveness of program marketing, program staff should take steps to increase program understanding and augment the skills of those expected to market the program, including PDCs, ATACs, and vendors. To provide the greatest opportunities to obtain program savings, program staff should review the allocation of PDC resources, and the marketing roles of PDCs and ATACs.

Communications

Conclusion

Energy Trust staff have acted on a recommendation from a previous evaluation and now hold quarterly meetings with the program management and delivery contractors (the PMC and PDCs). All parties interviewed viewed this as "moving in the right direction" and an improvement in communications. Nonetheless, gaps in communications with PDCs remain. In addition, vendors reported a desire for additional program information.

Recommendation

To minimize uninformed speculation among program contractors about PE activities and procedures, program staff should continue to expand its ongoing communications with PDCs. Specifically, the details of the reservation system and the cost-effectiveness payback

threshold should be explained to those contractors and to the other market actors expected to market the program. ATACs should be given the opportunity to attend PDC meetings by receiving notice of and agendas for those meetings.

Ensure PDCs convey to their not-for-profit and municipal clients that they can benefit from the BETC tax credits using the pass-through mechanism.

Increase communication with vendors and their program-related training, and pursue ways to make program eligibility requirements and incentive calculations more transparent. Encourage vendors to promote BETC tax credits to their customers.

Program Data Collection, Tracking, and Processing Activities

Conclusion

In the course of this evaluation, inconsistencies between data obtained by the evaluation team from different sources, and even from the same source (Energy Trust), were noted. The evaluation team does not believe these inconsistencies are program critical. However, improvements in data collection, data tracking, and data processing activities will add credibility to program reporting and enhance program marketing efforts.

Recommendation

To address data and list discrepancies, we recommend a review of program data collection and entry procedures internal to Energy Trust and with program contractors. In particular, specific and consistent definitions of data-entry categories (such as *project* and *site*) should be developed and used. Energy Trust should identify one of the several date variables, which reflect different steps in the conclusion of a project, as the default date to be consistently used to report program activity by year, with any exceptions to this selection carefully identified and justified. Further, Energy Trust needs to clarify that some reported numbers will differ due to the factors used.

2006 Funding Limitation

Conclusion

There was evidence from all groups contacted for the research – program contractor staff, vendors, and participants – that the 2006 funding limitation and the resulting incentive-level changes were setbacks for the program, creating confusion among some participants and vendors as to whether there was funding and, among all groups, the method used to allocate it. Decision-making for complex industrial projects can be protracted and sometimes span several years; when project incentives change or appear to be in jeopardy partway through firms' internal deliberations, efficiency projects can be scuttled.

Recommendation

Program funds should be managed and accounted for in a way that provides steady, dependable funding for projects. Frequent changes to the incentive level and program starts and stops as a means of managing annual program expenditures should be avoided. Any changes in funding and funding allocation procedures need to be clearly communicated to all parties several months in advance of the change.

Technical Studies

Conclusion

A prior evaluation recommended the adoption of procedures or guidelines for technical studies. While the current research found an improvement in the quality of technical studies, nonetheless, no written procedures or guidelines have been produced. The evaluation team believes such guidelines are still warranted.

Recommendation

To simplify the program review and oversight function, and to enhance quality control of technical studies, program staff should promulgate and implement uniform procedures and standards or guidelines for both the technical studies and the review of those studies.

Staff Response to the 2006 Production Efficiency Evaluation

As follows.

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EnergyTrust of Oregon, Inc.

MEMO

Date: August 1, 2008
To: Board of Directors
From: Philipp Degens, Evaluation Manager
Elaine Prause, Sr. Industrial Sector Manager
Subject: Staff Response to the 2006 Production Efficiency Process and Impact Evaluation

The impact evaluation of the Production Efficiency (PE) program covered the fourth program year, the first full program year that used the reservation system. The evaluation shows that the program is doing a good job at delivering the predicted savings with a 102% realization rate. The program also did much better at predicting savings as the variance of the predicted to estimated savings is lower than that found in the earlier program years.

After lengthy discussion and review by the Evaluation Committee and staff, a new free rider estimation method was adopted. This resulted in a free rider rate was just under 20% and similar to that of the last evaluation[1]. However, estimates are not directly comparable as the method used to estimate them were different.

The evaluation also indicates that the program is viewed favorably by participating firms as most are satisfied with program and program representatives and often include PE in future investment decisions. Participants are also viewed as a good resource for future projects.

The PE program has made headway into the industrial sector as Energy Trust has worked with firms representing 25% of the manufacturing employment in Oregon. However, Energy Trust sees that it needs to expand the program and attract more nonparticipating firms. The PE program offerings of incentives and information fits in well with the stated needs

[1] The 2003-2005 Evaluation estimated the free rider rate to be 17%. The program had an overall 9% savings weighted free rider rate because the Mega-Projects, who had a zero percent free rider rate, were included in the program total.

of nonparticipants many of whom are actively involved in controlling energy costs.

Vendors appear to be a good prospective channel for program services. The Small Industrial Initiative is expected to increase the volume of activity and attract new vendors, as well as expand into the smaller harder to serve markets. Increasing vendor exposure and experience with the program may also help in the long-term to increase the Allied Technical Assistance Contractor (ATAC) pool.

Energy Trust is in the process of finalizing ATAC study guidelines. This has involved both the Program Delivery Contractors (PDCs) and ATACs.

1 INTRODUCTION

The Energy Trust of Oregon, Inc. (Energy Trust) hired the team of Research Into Action, Inc., Strategic Energy Group, and WTR Consulting Engineers to conduct this third process and second impact evaluation, as well as a market characterization, for its Production Efficiency program, launched in May 2003. This report provides a process assessment of the 2006 program, including some discussion of the preceding and subsequent years, with the intent of facilitating continual program improvement. An assessment of the program's energy savings impact looks at projects completed in 2006.

The Production Efficiency (PE) program continues to evolve, with ongoing adaptation and learning occurring throughout – by program staff, by the program implementation contractors, and on the part of the participating customers themselves. Except for the survey of nonparticipating facilities, which was concluded in February 2008, the interviews and surveys conducted for the evaluation were completed by the end of December 2007. Program status is current as of December 31, 2006.

This chapter is organized into four sections:

- *Prior Program Evaluations* – describing previous evaluations of the program
- *Evaluation Goals* – describing the goals and objectives of this evaluation
- *Evaluation Approach* – describing the data sources and methods used in this evaluation
- *Organization of the Report* – identifying the subsequent chapters in this report

PRIOR PROGRAM EVALUATIONS

The current evaluation follows two previous process evaluations of the Production Efficiency program. The prior studies were a process evaluation conducted at the end of the program's first six months of operation,[2] and a second process evaluation and impact evaluability assessment completed at the end of 2005.[3] This document updates the latter process evaluation. To accomplish the update, the evaluation team interviewed representatives from the organizations involved in program implementation, and surveyed a sample of industrial equipment vendors and

[2] Energy Trust's website makes available this report, entitled: *Production Efficiency Program: End-of-First Year Progress Evaluation.* See: Energytrust.org/Pages/about/library/reports/062204_PE_MPER1.pdf.

[3] *Production Efficiency Program Process Evaluation and Impact Evaluability Assessment.* See: *http://www.energytrust.org/library/reports/051230_2003_2004_PE_Evalution.pdf?s_report_type_description=PROCESS&s_program_description=PEF&s_date_from=12%2F1%2F2003&s_date_to=12%2F27%2F2007.*

contractors who had program-participant customers, as well as a sample of the participants themselves, to reveal the program's strengths and weaknesses.

The previous process evaluation offered four recommendations:

1. Energy Trust should ensure the adoption of procedures, formats, or standards that will improve the quality of project analysis and documentation, and facilitate impact evaluation.
2. Energy Trust should conduct a full-scale impact evaluation of the Production Efficiency program after December 31, 2005.[4]
3. Energy Trust staff should meet more frequently with program participants to further build relationships with customers and should meet periodically with the Program Delivery Contractors (PDCs) to obtain feedback and discuss lessons learned.
4. Energy Trust should consider contracting directly with each of the firms involved in program delivery, contracting with the PDCs to attain energy savings goals, and with the Program Management Contractor (PMC) to provide program support services to the Trust, the PDCs, and the Allied Technical Assistance Contractors (ATACs).

Responses to these recommendations are addressed in topically-related sections of this report.

This document also constitutes a second impact evaluation of the program. It evaluates the impact of a sample of Production Efficiency projects completed during 2006. As an outcome of this analysis, the evaluation team developed adjusted energy savings for 66 projects; this sample comprises 89% of the program's 2006 savings.

EVALUATION GOALS

The current evaluation has two primary goals:

1. To obtain feedback on program design and implementation that can be used to improve the implementation of the Production Efficiency program; and
2. To develop reliable estimates of program-, site-, and measure-specific electric savings (kWh and kW) for 2006.

To meet these goals, the evaluation will:

1. Present an overview of the program's history and describe recent program changes;

[4] Energy Trust acted on this suggestion, culminating in *Energy Trust of Oregon, Production Efficiency Program 2003-2005 Impact Evaluation,* prepared by Strategic Energy Group for Energy Trust, Final Report December 14, 2007.

2. Assess program data collection, data tracking, and data processing activities;
3. Assess program marketing, communications, and outreach strategies;
4. Assess and characterize the industrial market in Energy Trust territory;
5. Document the presence of the installed measures, as well as any changes to production processes, schedules, or other operating parameters that might affect the measures' energy savings;
6. Based on the preceding documentation of operating changes, make adjustments to the measures' reported energy savings, and calculate the projects' realization rates; and
7. Estimate the Production Efficiency program's free-ridership and spillover effects.[5]

In addition to these issues, based on the evaluations of prior program years, the evaluation team identified another issue of interest to the program, namely: *To what extent do participating customers perceive they have an ongoing relationship with Energy Trust and the Production Efficiency program?*

EVALUATION APPROACH

This evaluation employed six basic methods to achieve its objectives. These included in-depth interviews with program staff and implementation contractors, a survey of equipment vendors who have served program participants, project file reviews, customer on-site visits, participant telephone interviews, and nonparticipant industrial customer interviews. The evaluation team also reviewed information from the program database, notes from Energy Trust meetings, prior program evaluations, and other program documents.

In-Depth Interviews

The process component of the evaluation included in-depth interviews with program staff and contractors, conducted in November and December 2007. Individuals contacted for the interviews included:

- Three Energy Trust staff
- One staff member of the Program Management Contractor

[5] Free-ridership estimation provides an indication of the likelihood the identical project would have been undertaken at about the same time in the absence of incentives. Spillover assessment indicates the extent to which participants go on to install additional energy-efficient equipment without requesting incentives.

- One staff member from each of the three Program Delivery Contractors (PDCs), one staff member from a former PDC, and one staff member from an Allied Technical Assistance Contractor that is functionally a de facto PDC [6]
- One staff member from the program contractor that developed and manages the network of lighting trade allies
- Four Allied Technical Assistance Contractors, one of whom is also an equipment vendor

The in-depth interviews focused on: changes in the program during 2005 and 2006; the impact of the 2006 funding limitation; program marketing activities and their effectiveness in reaching all industrial customers within Energy Trust's territory; quality control for program studies; and communications among the various parties. Chapter 3, *Program Activities and Experiences of Key Contacts*, reports the findings from these interviews.

Vendor Interviews

The evaluation team spoke with 19 equipment vendors about their involvement with and the participation of their customers in the program. The vendor interviews focused on the extent of their involvement in their customers' program participation. It included questions about customers': repeat program participation; interest in renewable energy; utilization of the Oregon Department of Revenue's Business Energy Tax Credits (BETC); problems with or concerns about the Production Efficiency program; and non-program equipment installations for purposes of free-ridership and program spillover analysis. Chapter 4, *Equipment Vendors' and Installers' Feedback*, reports the findings from these interviews.

On-Site Investigations

On-site investigations addressed both evaluation goals: the development of reliable estimates of program-, site-, and measure-specific electric savings (kWh) for 2006, and obtaining feedback on program design and implementation that can be used to improve the implementation of the program. To ensure firms comprising the majority of the program's energy savings were represented in the on-site evaluation sample, a population was drawn from participating projects with the largest kWh savings. On-site visits were conducted with 65 customers from that group. An additional customer contact from this population was interviewed by telephone about his 2006 measure-specific energy savings, for a total of 66 in-depth contacts.

Before conducting each site visit, the evaluators examined the available project reports and any documents verifying savings in the project files; the project was discussed with the responsible PDC and evaluators then arranged to meet with the participant's facility staff most familiar with

[6] At the time of these interviews, all five of these PDC contacts were also ATACs.

the Production Efficiency project. For impact evaluation purposes, the site visit typically included four elements:

1. A walk-through of the facility with the site contact, focusing on the installed energy efficiency measures;
2. An interview with the site contact and others as needed to understand plant and measure operation;
3. Where possible, collection of data from the participants' own energy monitoring and control; and
4. Where appropriate and practical, installation of short-term metering of the project or system (usually for two weeks).

Chapter 7, *Impact Analysis*, provides a more detailed discussion of the methodologies used to assess participant's projects.

Participant Interviews

During the on-site visits, contacts were interviewed using the same survey instrument as that used for a telephone survey of program participants. For the telephone interviews, a population of the remaining projects with the largest kWh savings was selected. A total of 70 in-person and telephone interviews with program participants occurred from October 10 to November 14, 2007. The participant interviews focused upon their program awareness, their relationship with Energy Trust, their overall program satisfaction, their views of the clarity and consistency of program information, and their equipment purchasing practices. Chapter 5, *Participants' Feedback*, reports the findings from these interviews.

Free-Rider and Spillover Assessment

Both the site-visit and the telephone interviews contained questions designed to elicit measures of free-ridership and spillover. Free-ridership was assessed through reviewing responses to a series of questions about changes to the project that would have occurred in the absence of a program incentive, the importance of incentives, the organization's overall approach to energy efficiency, and the likelihood that the customer would have installed the efficiency measures without incentives. Spillover was assessed by asking about additional energy efficiency measures installed following participation in the program and whether the program had influenced the decision to take this further action. Chapter 7, *Impact Analysis*, provides a discussion of our assessment of these effects.

Nonparticipant Industrial Customer Surveys

The evaluation included telephone surveys with 75 nonparticipating industrial customers – including 36 surveys of large customers and 39 surveys of smaller customers. Larger customers

were designated as those with 100 or more employees and smaller customers as those with 20 to 99 employees, according to a purchased list of industrial firm data. These surveys occurred between December 17, 2007, and February 13, 2008. The nonparticipant surveys focused on their program awareness, equipment purchases, and energy-related business practices.

ORGANIZATION OF THE REPORT

This introductory chapter gives background on the program and frames the results of this evaluation. The report has seven additional chapters:

- *Chapter 2. Program Description and Overview*
- *Chapter 3. Program Activities and Experiences of Key Contacts*
- *Chapter 4. Equipment Vendors' and Installers' Feedback*
- *Chapter 5. Participants' Feedback*
- *Chapter 6. Nonparticipants' Feedback*
- *Chapter 7. Impact Analysis*
- *Chapter 8. Market Penetration*
- *Chapter 9. Conclusions and Recommendations*

Three appendices follow the body of the report.

- *Appendix A. Free-Ridership Estimation*
- *Appendix B. Project Savings Evaluation Summaries*
- *Appendix C. Interview Guides and Survey Instruments*

2 PROGRAM DESCRIPTION

This chapter presents an overview of the Production Efficiency program since its inception in May 2003 through the first half of 2007. All data presented in the chapter were provided by Energy Trust or were obtained from Energy Trust documents.

The Energy Trust of Oregon, Inc. was incorporated as an Oregon nonprofit public benefit corporation in March 2001 to fulfill a mandate to invest "public purposes funding" for new energy conservation, for the above-market costs of new renewable energy resources, and to support energy-efficiency market transformation in Oregon. It receives funding from a 3% public purposes charge to the rates of the two investor-owned electric utilities in the state – PacifiCorp and Portland General Electric Company (PGE). Energy Trust has the responsibility to report how it is spending its funding and what it achieves to the Oregon Public Utilities Commission (PUC).

The Production Efficiency program is available to all industrial and select institutional customers of PacifiCorp and PGE. Both new and existing industrial manufacturing processes and manufacturing process support systems are within the program's purview. The stated program goals are to achieve:

- A significant increase in industrial electric efficiency activity
- Low-cost savings
- Broad participation

PROGRAM APPROACH

Rather than focusing entirely on equipment replacement or upgrade projects, the Production Efficiency program encourages efforts involving substantial changes to the production process itself. The inclusion of such projects significantly distinguishes the program from its predecessors operated by the electric utilities. Process efficiency projects, in contrast to those for equipment replacement alone, imply larger energy savings and typically have lower per-unit energy-acquisition costs. These projects often have non-energy benefits that are greater, both in absolute and relative terms, than those that accrue to smaller projects; examples include reduced emissions, better labor utilization, less maintenance cost, and improved products.

The PE program is able to accommodate projects that result in increased facility output through changes that increase the energy efficiency of the process and reduce electricity per unit of output. These projects may free up resources that enable an organization to increase plant output and total energy used at the meter, provided the projects are cost-effective. Projects of this nature are approved on a case-by-case basis.

Water and wastewater treatment projects were originally not included in the Production Efficiency program. These projects fit within the Energy Trust's Building Efficiency program's public and institutional market focus, so that including them within Building Efficiency offerings minimized confusion about program options available to public and institutional participants. In August 2003, the Energy Trust Board of Directors reallocated these projects, as well as their budget and energy goals, to the Production Efficiency program.

Incentives for design, installation, and materials are calculated for each project to bring the payback of energy-efficiency measures down to eighteen months for the customer, capped at 50% of measure cost. Should the project's actual cost exceed its estimated costs, incentives may be proportionately adjusted, up to a maximum of 120% of the initial incentive offer. If a participant wants to recoup a portion of project costs in excess of 120% of the estimated costs, the firm must reapply to the program in order to receive a higher incentive. Acceptance of the new application is contingent upon the availability of funds.

The Production Efficiency program launched with a per-customer incentive cap of $500,000 per calendar year. In November 2003, following the identification of several very large projects with high energy savings potential, the Energy Trust's Board of Directors approved a waiver of the incentive cap on a case-by-case basis for certain extraordinarily cost-effective projects. The waiver allows an industrial facility a once-in-a-lifetime opportunity to exceed the incentive cap. Projects that exceed the cap are reviewed for approval by Energy Trust in a process distinct from Production Efficiency processes.

For projects other than water treatment projects, the incentive was diminished to 20¢ per kWh in 2005. At the end of 2005, it became apparent that funds for Production Efficiency projects had been overcommitted. To stretch the available funding during 2006, the incentive was reduced further to 12¢ per kWh. Since then, the incentive has been raised to its current 15¢ per kWh for projects other than municipal water and wastewater treatment projects, which are eligible for an incentive of 26¢ per kWh. (The higher incentives for municipal water and wastewater projects reflects their longer projected lifetimes and documented non-energy benefits.)

The program also offers free analytical services to identify potential efficiency projects. It pays 100% of the cost for detailed technical analysis studies for prospective efforts, provided the customer agrees to initiate the project within six months of the study's completion.

PROGRAM DELIVERY

Initially, Energy Trust contracted with Aspen Systems Corporation, subsequently acquired by Lockheed Martin (Lockheed), to serve as the Program Management Contractor (PMC) for the first eighteen months of the program, with an option to continue a third year if requested to do so. Subsequently, the Energy Trust Board of Directors twice renewed the PMC's contract to run through the end of 2007.

Until early 2007, when the relationship with one of the Program Delivery Contractors (PDCs) was discontinued, the PMC oversaw the program through four contractually-recognized PDCs.

The discontinued PDC had responsibilities that were industry-specific; they included all pulp and paper and primary metals facilities throughout the state, and wood products facilities located in Northwestern Oregon. The other three PDCs were responsible for geographic territories: Southern Oregon, Eastern Oregon, and Northwestern Oregon (including the Willamette Valley). The former responsibilities of the discontinued PDC have been allocated among the three remaining PDCs. The terms of the PDCs' subcontracts with the PMC mirror those of the PMC's contract with Energy Trust. In addition to these three remaining PDCs, the Allied Technical Assistance Contractor (ATAC) working with municipal water and wastewater treatment facilities works directly with the PMC, rather than through a PDC, as all other ATACs do. Thus, that ATAC serves de facto as a PDC for those projects.

The PMC manages the network of ATACs who conduct detailed audits (also referred to as *detailed studies* and as *technical analysis studies*). The ATACs are diverse in size and type. They include engineering firms, equipment vendors, and all of the PDCs. However, the number of ATACs has declined from 14 in 2003 to 8 in 2007.

The PMC provides overall management to the process of project identification and completion. The PDCs and, to a much lesser extent, ATACs market the program to industrial firms. They assess the interest of prospective participants in efficiency programs, a facility's ability to undertake efficiency measures, and the best direction for further activities. This assessment leads to a scoping study for facilities having the interest and ability to pursue an efficiency project, or the assessment may itself constitute a scoping study. The scoping study results in a list of recommended measures for further study or for immediate action.

The program relies on three levels of technical analysis to assure the level of study for a given project is useful, timely, and cost-effective. The different levels of study are intended to allow the technical review to be tailored to each project. The review process begins with a scoping study that simply identifies opportunities and verifies existing processes and equipment. The scoping study is typically followed by a short technical analysis study, paid for by Energy Trust up to a cost of $3,000. The emphasis of these studies is upon quick identification of projects and expected savings. Such studies offer industrial facilities a risk-free introduction to the program. If further evaluation is warranted, the PMC may require a third, even more detailed, assessment.

The completed studies, at whatever level is required, provide information needed by the PMC to determine whether or not the identified project meets Energy Trust's cost-effectiveness criteria. The PMC does this by using an *Excel* spreadsheet designed by Energy Trust.

After a review of the studies by the PDC and the PMC, an incentive offer for cost-effective projects is presented to the customer by the PDC. Upon the customer's acceptance of the offer, it is signed by the PMC. If requested, the PDC will help the customer to identify qualified vendors to perform the specified equipment and measure installation and process changes.

When a project has been completed, the PDC verifies project installation and delivers the incentive payment to the customer. Throughout the process, the PDC facilitates the completion of all program-related forms and delivers them to the PMC for processing.

RECENT PROGRAM CHANGES

Among other things, contracting with an outside program manager in 2003 allowed the program to ramp up quickly and brought technical skills and experience to the program that was not then available among Energy Trust staff. However, that delivery model had limitations in contracting, communications, data collection, and reporting, as assessed in the prior process evaluations. Energy Trust was removed from the customer and often had to take the initiative to remain informed of program activities.

Because communications were indirect, they were also slow and misunderstandings arose. The over commitment of program funds by 2006 is the most striking example of such misunderstandings. There was also some duplication between Energy Trust and PMC program management and reporting roles. For these and other reasons, Energy Trust's Board of Directors approved bringing program management in-house as of January 1, 2008. As part of taking over the role of PMC, Energy Trust will contract directly with the PDCs, who will, in turn, become responsible for attaining the energy savings goals that were formerly the responsibility of the PMC.

In PGE and PacifiCorp service territories in Oregon, 90% of the estimated 7,300 accounts designated as industrial are classified as small or medium, with less than 500,000 kWh annual consumption per firm. These small and medium industrial customers account for less than 20% of total industrial energy consumption. To serve these customers more effectively, Energy Trust will introduce a Small Industrial Initiative in 2008. The initiative, as currently designed, focuses on three market sectors: dairies, farms, and general manufacturing facilities.

The Small Industrial Initiative will have its own PDC, who will be a subcontractor to an existing PDC, and who will be responsible for delivering program services and ensuring all program objectives are met. The Small Industrial PDC will maintain communications with program participants and contractors, and will guide them in the process necessary to complete their energy efficiency projects and to receive an incentive.

Fabricated metals, food products, printing, wood products, and industrial machinery are the main market segments of electric energy consumption for this targeted customer size. Regarding gas efficiency potential, there could be as many as 5,000 small industrial facilities that are paying into NW Natural's public purpose fund and are therefore eligible to be served through this initiative. Textiles, transportation equipment, food products, electronics, and primary metals are the top natural gas customer segments at this targeted size.

These recent changes are revisited and, with other aspects, are discussed in greater detail in the following chapter reporting the results of interviews with key program contacts.

3 PROGRAM ACTIVITIES AND EXPERIENCES OF KEY CONTACTS

From the previous process evaluation (conducted at the end of 2004) through the end of 2006, the Production Efficiency program has expanded the number of its installed projects from about 230 to about 660, its program savings from about 90 million kWh to about 250 million kWh, and the amount of incentives paid from about $7 million to about $22 million. It has done this while encountering turbulence and experiencing an array of changes. This chapter describes the program's challenges, changes, and other experiences since 2004, as related by key program staff, and by program management and delivery contractors. These contacts described their experiences during in-depth, open-ended interviews conducted in November and December 2007. The contacts included:

- Three Energy Trust staff
- One staff member of the Program Management Contractor (PMC)
- Staff from five Program Delivery Contractors (PDCs), including staff from a former PDC and staff from an Allied Technical Assistance Contractor (ATAC) who is functionally a de facto PDC
- Four ATACs
- One staff member from the program contractor that developed and manages the lighting trade ally network

All of the PDC contacts also currently work as ATACs. In addition to being an ATAC, the de facto PDC is also an equipment vendor and installation contractor. The four ATACs include three firms that sell engineering and design services only, and one firm that is also an equipment vendor.

The chapter is organized into the following sections:

- *Program Marketing and Outreach Strategies*
- *Data Tracking*
- *Quality Control for Program Studies*
- *2006 Funding Limitation*
- *Program Communications*
- *Remaining Program Opportunities*
- *Program Changes*

- *Further Changes Desired by Program Contractors*
- *Summary*

PROGRAM MARKETING AND OUTREACH STRATEGIES

The Production Efficiency program design included a description of the marketing plan for the program as follows:

> "The [Production Efficiency] program management contractor will develop a sales force to personally market the program opportunity and benefits to customers directly through vendors, trade associations, utility customer service representatives, the Northwest Energy Efficiency Alliance, the Oregon Department of Energy [Business Energy Tax Credits – BETC], industrial trade associations, and others."[7]

As reported in the previous process evaluation, PDCs are the marketing arm of the program and are responsible for all program activities having a customer-contact component or intent. PDCs contact industrial firms, identify projects, and perform scoping studies for facilities. They assist customers through the program participation processes until their projects are complete and their project incentives are paid. The level of support required varies among participants and may include completing program and BETC forms, framing the costs and benefits of a project for decision-makers, or simply maintaining communications.

Existing relationships are a powerful avenue for marketing energy efficiency programs. PDC firms have a variety of pre-existing relationships within Oregon's industrial market, stemming either from the firm's engineering expertise or from the experience of its staff in managing and implementing utility energy efficiency programs. The PDCs have relied heavily on these pre-existing relationships to identify projects and this approach has served the program well.

Prior participants are likely to remain the best prospects for future participation. A review of the program participant database indicates that to date about 60% of projects have been installed by firms that have participated multiple times since the program's inception. Even so, key contacts at both the PDCs and at the PMC recognize future program activities will increasingly require establishing new relationships with industrial firms that were not yet served by the program. As illustrated in Figure 8.1 of Chapter 8, an estimated 90% of industrial facilities have yet to participate in Production Efficiency.

Establishing new relationships requires active marketing and networking. The PDC contacts report different degrees of pro-active marketing efforts. In particular, two of the three formally recognized PDCs described their marketing efforts as somewhat passive, being heavily dependent upon leads provided by utility account representatives and vendor contacts. (Note that the most recent contracts PDCs signed for Production Efficiency calls for them going forward to

[7] Research Into Action, *Production Efficiency Program: Process Evaluation and Impact Evaluability Assessment,* p 41, January 10, 2006.

develop marketing plans.) The somewhat passive approach to marketing to date may provide a partial explanation of the finding from program participants (described in Chapter 5) that only 7% of those respondents reported first becoming aware of PE from a program representative.

The differences in the degree of pro-active marketing among the PDCs may underlie, in part, an imbalance reported by key contacts in the total incentives paid to customers of the two electric utilities served by Energy Trust. Specifically, one contact pointed out, "Energy Trust funding is 60% from PGE customers and 40% from PacifiCorp customers. However, incentive expenditures have been roughly 60% to PacifiCorp customers and 40% to PGE customers."[8]

This perceived imbalance is important because of the influence it has had upon the program's marketing focus. To correct the perceived imbalance, the PDC with the most aggressive marketing tactics has been directed to curtail its marketing efforts. Further, the perceived imbalance may be a factor in the renewed focus upon high-technology manufacturing. One contact reported, "Energy Trust is looking at underserved markets, such as high tech, which has a big load, and is located mostly in PGE territory, the utility from which the Energy Trust receives most of its funding." And the incentive-payment imbalance may have affected the rollout of the new Small Industrial Initiative, which contacts reported will start in PGE territory.

Regarding another facet of program marketing, PDCs are specifically charged to "integrate program marketing efforts with the Northwest Energy Efficiency Alliance (NEEA) when applicable."[9] Yet, according to one contact, "The interface with NEEA has been difficult and perplexing. Communication with program contractors and NEEA has been sub-optimal." The contact was expressing frustration with confusion generated by contacts from different organizations to a prospective program participant regarding a substantial project. The NEEA representative had spoken with a PDC before contacting the customer, but apparently did not receive appropriate guidance regarding, or did not follow, customer contact protocols. While coordination with NEEA could perhaps be better, such coordination is occurring and has helped to bring projects into the program.

In theory, ATACs also have a role in program marketing. As stated in the first evaluation of this program, "ATACs are a critical component of the program's marketing structure. Whether an ATAC is a vendor or an engineering firm, they use their longstanding relationships with customers to bring projects to the program."[10] However, during the course of this evaluation, it became apparent that the number of firms serving as ATACs has diminished, from fourteen at

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[8] It should be noted there are other factors contributing to this perceived imbalance. For example, all three PDCs work with customers of PacifiCorp, the electric utility that has fewer Oregon customers, while only one PDC works with customers of PGE. In addition, the Oregon industries that had some of the largest energy savings potentials – wood products and pulp and paper – are predominantly customers of PacifiCorp.

[9] *Request for Proposals for a Program Management Contractor for an Industrial Process Efficiency Initiative Program,* March 18, 2003.

[10] Research Into Action, *Production Efficiency Program: End-of-First-Year Progress Evaluation,* p 28, June 22, 2004.

the time of the first evaluation to eight currently. Three of those eight are the PDCs, and a fourth is the ATAC (referred to as a de facto PDC) who serves only governmental entities. Furthermore, one of the remaining ATACs interviewed for this study had been transferred out of state. Thus, there are only three ATACs available to augment PDC marketing. And, in fact, as was found during the second process evaluation, among ATACs, only the ATAC who is also a vendor actually markets the program to customers.

One reason ATACs are not marketing the program may be the risk of losing their customers to another ATAC (likely, a PDC) after bringing those customers to the program. This complaint surfaced during these interviews, as well as during the interviews for the previous evaluation. Specifically, one of the three remaining firms that do only ATAC work for the program reported a PDC told his firm there were "no savings" at the site of a customer who had asked that ATAC for help. According to that contact, the PDC "circled around and took the project." The precise number of such incidences that have occurred is not as important to the functioning of the program as is the general perception among ATACs that program processes are not fair.

Contacts also suggested another reason there are fewer ATACs working with the program. Referring to the program-funding bottleneck that occurred in 2006, a contact commented, "When the funding dried up, ATACs went to other pastures." Another contact echoed this observation, saying, "There is a diminished pool of ATACs serving the program over the last couple of years because of the program funding limitation and project hiatus."[11]

Thus, in practice, program marketing is almost exclusively done by PDCs, and by some equipment vendors and installers, with PDCs focused on larger projects for larger customers and vendors focused on their particular customer base.

Finally, one PDC suggested another limitation on program marketing activities. He said, "Our budget is smaller than it was in 2004, even though we now have a larger territory."

Although the program generated sufficient projects to utilize almost all of the funds allocated for incentives during 2005 and 2006, the preceding discussion paints a challenging picture for program marketing. To provide the greatest opportunities to obtain program savings, program staff should review the marketing role of the PDCs and the ATACs, and consider ways to enhance and augment that role through funding for additional PDC staff, by providing additional information and training to PDCs, and by recruiting additional ATACs.

[11] These factors of the 2006 funding limitation and ATAC perceptions of unfair program processes have reduced the number of ATACs serving the program in recent years. In addition, in prior years the number of ATACs had decreased from those initially signing program contracts due to staff concerns about the quality of some ATACs' program studies.

DATA TRACKING

In the course of obtaining project and contact information for this evaluation, the evaluation team encountered a variety of inconsistencies in program data. None of the inconsistencies, either individually or cumulatively, are program critical. However, data collection, data entry, and list creation protocols that would result in consistent program data would improve reporting accuracy and would benefit program marketing efforts.

Inconsistencies noted by the evaluation team included customer names and addresses entered differently on different lists, multiple project sites entered under a single address, and multiple addresses entered for a single project.[12] Perhaps as a result of these discrepancies, a list obtained by the evaluation team from Energy Trust that identified names of industrial customers who had not participated in any Energy Trust programs included customers who reported, when contacted for an interview, that they have been program participants.

Other program data discrepancies, for all program years, include reports of different numbers of projects, different numbers of sites, different amounts of energy savings, and different amounts of incentives paid, depending upon the data source. For example, for the number of projects completed in 2004, we found three different totals, ranging from 112 to 228 (Table 3.1).

Table 3.1: Production Efficiency Program History – Numbers of Projects and Sites

DESCRIPTION	2003	2004	2005	2006	TOTAL
Number of Sites [1]	45	205	236	207	**693**
Completed Projects [2]	4	112	242	240	**598**
Installed Projects [3]	4	228	207	229	**668**
Number of Sites [4]	—	—	—	239	**NA**

[1] From Energy Trust Program Manager, September 17, 2007.

[2] From P156 PE ETO/Data/PE.Commitments.07.07.26.xls, received from the PMC.

[3] From 2003, 2004, 2005, and 2006 Annual Reports to the Oregon Public Utility Commission, http://www.energytrust.org/library/reports/db/report_list.php?s_report_type_description=ANNUAL.

[4] From RFP for Impact and Process Evaluation, 2006.

For 2005, the number for project sites reported by the program manager (236) is, implausibly, greater than the number of projects reported by Energy Trust to the PUC (207). In a further wrinkle, the number of project sites received from the Energy Trust by the evaluation team as the population for the impact evaluation of 2006 projects was 157, a substantially different number than reported by any other source for that year.

[12] In some cases, different projects at different sites do share the same street address. For these situations, a method of identifying specific project sites needs to be developed.

Some of these discrepancies may have arisen because Energy Trust and the PMC separately tracked program data, apparently without common definitions of basic terminology, such as *project* and *site*. With program management moving in-house, this will no longer be a problem. In addition, the apparent discrepancies may not reflect inconsistencies in data so much as they reflect different criteria used to obtain information from a necessarily highly detailed database. For example, entries for a given project contain many different dates, from the date of application through the various dates for each stage of project activity. Additional specificity about the significance of reported dates may obviate some of the apparent discrepancies.

QUALITY CONTROL FOR PROGRAM STUDIES

Quality control for studies of customers' facilities has been within the purview of the PMC. The PMC has reviewed ATAC studies done by PDCs, and the PDCs have been delegated the responsibility of reviewing the work of the ATACs. As part of this function, PDCs review their own ATAC studies. While all three PDCs reported this in-house review is done by a different person than the study's author, as one of the PDCs observed, "When the primary source of review is a PDC, and the PDC is also the ATAC, there is not any independence." At the very least, in-house review of studies creates the appearance of a conflict-of-interest.

Another issue regarding study review, mentioned in the previous evaluation, continues to be an issue for the program. The earlier study found a "lack of a standardized process or a uniform toolkit for developing the [ATAC] studies."[13] That study recommended "the adoption of procedures, formats, or standards that will improve the quality of project analyses and documentation, and facilitate impact evaluation."[14] However, standardization has not occurred. One contact during the interviews for this evaluation reported, "There is nothing procedurally to say there has been an improvement. There is nothing written down in terms of standards or guidelines." Another contact commented, "Review formats differ from PDC to PDC. They are parallel worlds." An ATAC confirmed these observations, saying, "I have never had a template from the program. I use my own."

In spite of the continued absence of written standards, guidelines, or a template for ATAC studies, the evaluation team's lead impact engineer noted the quality of those studies has improved greatly, compared to the studies reviewed for the previous evaluation. We believe the more recent studies are less problematic for two reasons. Fewer studies are being done by contractors and vendors (reducing the divergence seen across reports), and, generally speaking, those doing the studies have raised the quality of their work. Nonetheless, the implementation of uniform procedures and standards – both for ATAC studies and for the review of those studies – would simplify the PMC's job and enhance quality control of the technical studies.

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13 Research Into Action, *Production Efficiency Program: Process Evaluation and Impact Evaluability Assessment,* p 57, January 10, 2006.

14 Ibid., p V.

2006 FUNDING LIMITATION

At the end of 2005, it became apparent that funds for Production Efficiency incentives had been overcommitted. The over-commitment of funds resulted from the use of differing accounting approaches by the PMC and Energy Trust, with the PMC accounting for incentive commitments on an accrual basis and Energy Trust accounting for incentive commitments on a cash basis.

For several years Production Efficiency had benefitted by tapping funds available from the time that Energy Trust was ramping up and revenues exceeded expenditures. But by the end of 2005, agency-wide there was no longer an excess of funds and annual expenditures could no longer exceed revenues.

"Responding to the funding shortfall, the Energy Trust directed [the PMC] to curtail the outreach activities of the PDCs and to pursue only projects that were already under way." Notice of the funding constraints and the need to diminish activity was, according to these contacts, "abrupt." However, one contact indicated there were warning signs in advance of the funding limitation. He said, "It became clear in the PDC meetings that there was a disconnect between the PMC and Energy Trust over budget cycles, so it wasn't a complete surprise when the budget problems happened."

In any case, the results of the funding shortfall were described by all but one of the PDCs and ATACs in near cataclysmic terms. The one contact who did not describe the event in such dire terms reported there was no effect on his, relatively few, program participants, although he added, "2005 was bigger than 2006." Comments by the other PDCs and ATACs included:

- *"This was devastating to the marketing and the momentum of the program."*
- *"It was a major crisis. It was damaging to vendors' trust in the Energy Trust."*
- *"When the money ran out it was sort of a tragedy."*
- *"This event emptied the pipeline."*
- *"Some larger customers had heartburn. It cooled off all of our projects."*
- *"When the notion the Trust was out of money hit the papers, [a large customer] lost interest in the program."*

Another program impact of the funding shortfall was a reduction in the number of ATACs working with the program, as mentioned in the *Program Marketing* section, above. Contacts commented:

- *"I lost one of my employees and had to scramble to find work for the others. It created instability in my firm and in the marketplace."*
- *"The effect on me was pretty bad. There were some lean months."*
- *"It was damaging to our relationships with our vendors."*

- *"We were working on many projects in the pipeline and had staffed up appropriately for them. Suddenly, we had no projects. For the rest of the year we had very little work."*

The funding shortfall thus created a setback for the program and required some time from which to recover, yet most contacts perceived the program was back on track or approaching recovery at the time of the evaluation interviews in late 2007.

- *"It's hard to stop and start. The industrial market doesn't stop and start on a dime. It took effort and still is taking effort to get that back."*
- *"It's taken the intervening time to fully restore that trust."*
- *"The activity level has returned to before the shortfall."*
- *"It's a little slower getting things going again and re-establishing those relationships, but we haven't had customers give us the cold shoulder."*

To deal with the funding shortfall, a reservation system was introduced, through which Energy Trust reviews and prioritizes projects based on their merits, rather than committing to funding every project as it comes in. However, the PDCs and ATACs were unclear about how that system works. One PDC commented, "I know of the reservation system. It's out of my control. I don't see it. It's between [the PMC] and Energy Trust." And an ATAC reported, "I've had no experience with the reservation system."

A lack of clarity among other contacts was revealed by their differing experiences with the reservation system, as revealed in the following comments:

- *"For the reservation system, you get on a list when you sign on to do a project, and are paid off in the order you got on the list."*
- *"At first [our high-tech client] was down the list. But it got right through."*
- *"It was developed in a vacuum. After it was developed, I had to figure out how it worked."*

In spite of this uncertainty, the reservation system seems to have been an effective response to the funding shortfall. Even though one PDC commented, "Some projects didn't get done," and one participant reported discontinuing program participation due to the shortfall (see Chapter 5). Another PDC reported, "None of the projects became a disaster." Indeed, every project for which the customer pursued its application was funded in 2006. A positive aspect of the reservation system reported by one contact is that vendors like it "because it conveys to their customers that funds are limited, putting pressure on them to act."

Key contacts described the funding over-commitment, the resulting incentive-level changes, and other effects as a setback for the program. Regarding these events, a passage from the previous process evaluation still resonates:

> "The Energy Trust should avoid frequent changes to the incentive level…, and program starts and stops as a means of managing annual program expenditures. Decision-making for complex industrial projects can be protracted and sometimes span several years; when project incentives change part-way through firms' internal deliberations, efficiency projects often get scuttled."[15]

To reduce the likelihood of misconceptions and speculation about the reservation system that was developed in response to the funding shortfall, it would be helpful to communicate the specifics of the reservation system comprehensively and uniformly to PDCs, ATACs, and vendors.

PROGRAM COMMUNICATIONS

According to one contact, a positive effect of the funding limitation has been enhanced communication between Energy Trust, the PMC, and the PDCs. Quarterly meetings of the PDCs have been implemented "at the insistence of Energy Trust," and these have improved program operations, according to the PDCs. One PDC commented, "Communication has improved a lot over the last couple of years. Energy Trust has taken an active role in this. The trend has been in the right direction." Another PDC simply described communications as "good."

There is at least one aspect of program communications, however, that may be worth reviewing by program staff: communications with ATACs. One ATAC, in response to a request for his thoughts about the reservation system, demurred by saying, "ATACs aren't really in the community." Another non-PDC contact also expressed a sense of being left out, saying he "was not included in the PDC meetings."

REMAINING PROGRAM OPPORTUNITIES

There was a consensus among the PDCs and ATACs that most of the projects in Oregon with large savings have been done, leaving mostly smaller, more difficult projects for future program activity. For example, one contact reported, "It's going to be harder. Some customers are jaded and the low-hanging fruit is gone," while another said, "The program has hit most of the facilities that have a large number of fixtures." The contacts agreed that there are many projects remaining, yet they assume these projects may offer smaller savings.

The analysis presented in Chapter 8, *Market Penetration*, suggests otherwise. Cumulatively, Production Efficiency has saved an estimated 2% of Oregon's total industrial electricity consumption. The program has engaged about 10% of industrial customers responsible for about 20% of industrial electricity consumption. While it may well be that the low-hanging fruit are gone, as one contact put it, the data suggest the program has just begun to transform industrial energy use.

[15] Peters, et al., 2005. *www.energytrust.org/library/reports/051230_2003_2004_PE_Evalution.pdf*, p. 53.

Repeat business is one indication of the extent to which customers feel they have an ongoing relationship with the Production Efficiency program and with Energy Trust. While repeat business represented a large portion of some of the contacts' program projects, this was not true for all of the contacts. For example, a contact who works with compressed air said, "There is very little repeat business." Another contact reported, "A small percentage of the larger customers has repeat business. The lion's share of projects are one-off projects." This difference in contacts' experiences with repeat business was mirrored by a split in contacts' explicit views of the extent to which customers see themselves as having an ongoing relationship with the program or Energy Trust. The two following comments illustrate the contacts' contrasting views:

- *"Customers tend to see their projects as one-off projects, rather than as having an ongoing relationship with the Trust or the program."*
- *"Yes, all of them feel they have an ongoing relationship with Energy Trust and the Production Efficiency program."*

However, as described in Chapter 5, program participants reported they expect to participate in the program again when they make other production or equipment upgrades or replacements, and they would consider contacting their program representative when contemplating such changes. Thus, even though contractors were split in their views of customers' perceptions of an ongoing relationship with the program and with Energy Trust, the findings from participant interviews suggest customers do expect to continue working with both. Equipment vendors' experiences supported this finding about program participants, with more than one-half (53%) of the vendors reporting repeat business from a program participant that resulted in additional program participation (see Chapter 4).[16]

Contacts are pleased with Energy Trust's new Small Industrial Initiative, as they believe it will target customers they feel are currently underserved. The contacts mentioned two reasons for their belief smaller customers have been underserved. One of these has been the time spent on additional projects for the same customers. One contact said, "Sometimes I feel there is a disproportionate amount of attention on certain customers. You do want customers to transform everything about their energy use, but sometimes it's at the expense of finding new customers." Similarly, another contact commented, "Most of my projects – I'd say 75% – are from existing customers, but the growth will come from new customers."

[16] An analysis of the Production Efficiency program database suggests that under 10% of participants have participated more than once. Considered from a project perspective, under 15% of projects are conducted by firms that have participated more than once. These numbers are imprecise because of the difficulty of: (1) matching records electronically when there are variations in the way a firm's name or address is recorded; and (2) ascertaining whether a firm for which two different locations participated counts as repeat participation (under the assumption of influence across the corporation) or not (under the assumption that each location makes its own decisions). Note that among participants surveyed for this research, just over half said their firm had previously participated in the Energy Trust's Production Efficiency program. Further research would be necessary to better understand this discrepancy.

A second reason small industrial projects have been underserved, according to contacts, is economic. One said, "I can't afford to go out and talk to those customers. You can't take a $95-an-hour engineer to data-log small motors and make any money. To be cost-effective, the incentives need to be prescriptive for small industrial." Another contact made the same observation saying, "It's tough to do an energy study on a small plant. It's hard to spend a lot of money on such an analysis. The savings are smaller. It would be nice if there were more prescriptive things that could be done."

PROGRAM CHANGES

2005 to 2007

Many program changes since 2004 were noted during these interviews. Changes occurred in the roles and numbers of program players, in the amounts of the incentives paid for industrial projects, and in program administration and management.

Regarding role changes, in early 2007, one PDC relinquished that role, but retained its role as an ATAC. The departure of that PDC affected the remaining PDCs (except for the narrowly-focused de facto PDC), expanding their responsibilities and territories to absorb the customers of the former PDC. Additionally, the only PDC who was not an ATAC in 2004 became an ATAC.

The role of the lighting trade ally coordinator also changed. That role was shifted to the PMC at the end of 2005, where it remained through 2006. However, it was reported that approach "did not work well," because it created confusion among lighting trade allies by having multiple points-of-contact for them across Energy Trust programs. In 2007, the program reverted to its original configuration, with the lighting trade-ally coordinator having sole responsibility for representing the program to lighting vendors.

Another change, mentioned previously, was a decline in the number of ATACs from the 2004 level. This has reduced the number of individuals available to market and to conduct technical studies for the program. One contact, expressing concern that the amount of time required for program participation is a drawback, commented, "Having more ATAC's would help. Projects get stretched out, which must be frustrating for industrial customers."

Project incentive amounts also changed since 2004. For projects other than those for water treatment, the incentive was diminished to 20¢ per kWh in 2005. To stretch the available funding during 2006, the incentive was reduced further to 12¢ per kWh. Since then, the incentive has been raised to its current 15¢ per kWh for projects other than municipal water and wastewater treatment projects, which are eligible for an incentive of 26¢ per kWh. However, contacts expressed concern that current incentives are insufficient. One remarked, "Fifteen cents doesn't buy a lot of great projects." Other comments about that incentive amount included:

- *"Dust collection projects with the new incentive level are barely cost-effective, so we don't touch them anymore."*

➡ *"An irrigation project we did wouldn't be done with the incentives available today."*

This latter comment is of interest in regard to the proposed Small Industrial Initiative's proposed focus on agricultural projects, described below.

The concerns about incentive levels expressed in the preceding paragraphs are, however, inconsistent with the program's achievement of its goals each year, including the expenditure of almost all incentive funds. Furthermore, the number of projects in line for participation remains robust. Looking at those concerns in conjunction with the issue expressed about the smaller size of remaining program opportunities, one possible inference is that some contacts would simply like their jobs made easier for them.

An enhancement to program communication through the initiation of quarterly PDC meetings was described above in the section *Program Communications*. According to program contacts, greater communication between the PMC and Energy Trust has also occurred. As part of this greater communication, Energy Trust began reviewing the PMC's project files in-person, on a quarterly basis, established criteria to standardize and upgrade project files, and implemented a file audit and database management process using *FastTrack* software.

Finally, Energy Trust changed and increased its staff who work with the Production Efficiency program. In 2006, a new program manager was installed and, in anticipation of program changes to occur in 2008, two additional staff were hired in late 2007 to work with the program.

2008

Forward-looking changes were also mentioned by the contacts. Two of these changes are substantial: one regarding program management and the other regarding program marketing. Responding in part to recommendations from an earlier evaluation, program management was taken in-house by Energy Trust. As of January 1, 2008, Energy Trust will manage the program with a staff of three, including two new staff members who were hired for this purpose.

A program change that will occur with the moving of program management in-house is that responsibility for meeting the program's energy goals will devolve onto the PDCs. Previously, the PMC had assumed this responsibility, leaving the PDCs free to "treat every participant equally and not cherry-pick projects." According to program staff, "In 2008, PDCs will have their own goals and will be more engaged." At least one PDC had reservations about this change, saying, "Energy goals at the PDC level can be problematic because of the limited span of control."

Representing a major change in program marketing, a new Small Industrial Initiative, seeking to reach certain underserved industrial customers, will be introduced in 2008. This initiative will add to current marketing efforts and, tentatively, will focus on irrigation equipment, dairy projects, compressed air, variable frequency drives (VFDs), and refrigeration, among other types of projects. It is anticipated the initiative may employ prescriptive rebates. Delivery of the initiative will be the responsibility of a subcontractor to an existing PDC. Even though this

delivery model removes the PDCs from direct responsibility for the success of the Small Industrial Initiative, we anticipate there may be tension between the new initiative and the program's overall shift of responsibility for meeting energy savings targets to the PDCs. It is easier to meet a target with fewer large projects than with many small ones.

As an approach to reach other underserved industrial customers, a renewed emphasis on the high-tech and electronics industry is planned for 2008 as well.

Finally, program staff mentioned a legislative change that will have an impact on the program in 2008 and beyond. The *Oregon Renewable Energy Act* (SB 838), passed in 2007, allows the Public Utility Commission to "authorize an electric company to include in its rates the costs of funding or implementing cost-effective energy conservation measures implemented on or after the effective date of this 2007 Act."[17] While rate increases pursuant to this legislation will provide additional program opportunities through additional funding, program staff expressed concern that the additional funding could exacerbate the imbalance in incentives paid to customers of the two utilities who are served by Energy Trust.

Making these changes in 2008, while maintaining and increasing program momentum, will be challenging. As one contact said, "Changes are dangerous opportunities."

FURTHER CHANGES DESIRED BY PROGRAM CONTRACTORS

Three contacts, two of them PDCs, suggested the program's cost-effectiveness criteria be changed to allow incentives for projects with paybacks in excess of ten years. Said one contact:

- *"The more efficient dust collection equipment has more than a ten-year payback because of high equipment cost and our low energy cost. There needs to be a vehicle for the Trust to cap the project costs in the case of a long payback, instead of disqualifying the project altogether."*

Their comments suggest an incomplete understanding of Energy Trust's societal test for project cost-effectiveness. By taking into account the value of a project's non-energy benefits, the societal test could allow some or all of the projects referred to in those comments to qualify for incentives. The rationale for this approach is implicit in the comments of one of the contacts who did not realize this approach was available for project proposals: "If a customer is willing to do the project, it must be cost-effective for them."

In spite of the program's challenges and changes since 2004, Production Efficiency and Energy Trust program staff were viewed in positive terms by the contacts interviewed for this evaluation. Their summary comments included:

- *"The program is very good. I am proud to be associated with it."*

[17] See: *www.oregon.gov/ENERGY/RENEW/docs/sb0838.a.pdf*, section 46, p. 28.

- *"It's a simple system to understand and convey to customers."*
- *"[Energy Trust staff] have been very open and solicitous of PDC input."*
- *"They're going in the right direction."*
- *"I wish there was a program like Production Efficiency in Washington."*

SUMMARY

Based on the reduction of the number of PDCs, the contraction of the pool of ATACs, and the program's success in obtaining projects with large energy savings by many large industrial customers, some key staff see a more challenging marketing environment as the program seeks to reach remaining opportunities.

Non-critical inconsistencies still exist in program data and lists. Taking steps to correct these inconsistencies will enhance program reporting and marketing efforts.

The program still lacks formal guidelines for ATAC studies and for their review. Nonetheless, these studies are much less problematic than at the time of the previous process evaluation.

Contacts perceive the over-commitment of program funds in 2005 dealt a serious blow to the program's credibility; they believe the program has largely recovered or continues in the process of recovery from that setback. The reservation system will need to remain in place to allocate funds when demand for incentives exceed available funding. Contacts said they lacked a good understanding of how the reservation system works.

Internal program communications among program staff and contractors has been improved, in part, through the initiation of quarterly PDC meetings.

Contacts see many remaining program opportunities, however the PDCs and ATACs generally held the view that most remaining opportunities have smaller energy savings potential than past projects. This view is not supported by an analysis of program savings to date in comparison with Oregon industrial electricity consumption.

Program changes since the last process evaluation have occurred in the roles and numbers of program players, in the amounts of the incentives paid for industrial projects, and in program administration and management. As of this writing, even greater additional changes are underway in the program's management structure, through incorporation of the PMC's role into Energy Trust and in program marketing approaches through the launching of a Small Industrial Initiative. The desired program change most often mentioned by program contractors is a modification or elimination of the program's cost-effectiveness criteria for projects.

4 EQUIPMENT VENDORS' AND INSTALLERS' FEEDBACK

To understand the program from the perspective of industrial equipment vendors and installers, the evaluation team obtained from Energy Trust a list of 119 industrial equipment vendors and contractors with customers who participated in the Production Efficiency program since its inception. Focusing upon those businesses for which the most project activity was shown, we spoke with 19 individuals, referred to herein as vendors (Table 4.1). Seven of these 19 vendors were lighting contractors. The others sold or installed motors, compressed air equipment, dust collectors, fans and blowers, heat exchangers, refrigeration systems, and other industrial equipment. The experiences of lighting vendors were analyzed separately from, as well as combined with, the experiences of the other vendors and, on the infrequent occasions differences were noted, these differences are reported.

Table 4.1: Disposition of Vendor Interviews

DISPOSITION		TOTAL
Surveyed (Three Partial)		19
Refused		2
List Errors	**Left Company**	7
	Duplicate Contact	2
	Not Qualified (Not a Vendor)	1
No Contact Made	**Attempts Failed**	13
	No Attempt (Quota Reached)	75
TOTAL		**119**

Interviews with three of these contacts were discontinued before they were completed. One of these three was found to work almost exclusively with the Oregon Military Department, which, according to that vendor, has an accounting system that precludes participation in the Production Efficiency program. Another vendor ran out of time to complete the interview and the third abruptly terminated the interview saying, "We don't deal with Energy Trust and we don't want to. We discontinued participation in the program when they changed their incentives." Because of the three partial interviews, the number of contacts asked any given question varied from 16 to 19.

This chapter describes the results of these interviews and is organized into the following sections:

- *Program Awareness*

- *Vendor and Customer Program Experiences*
- *Desired Changes*
- *2006 Funding Limitation*
- *Spillover*
- *Firmographics*
- *Summary*

PROGRAM AWARENESS

Most (11 of 19, or 58%) of these contacts reported they had been aware of the Production Efficiency program for two to four years. Three said they had been aware of the program for five years or more, indicating awareness of a preceding utility program, and the remaining three vendors reported they had been aware of the program for less than two years. The most common way in which the vendors became aware of the program was through a program contact. Five of the nineteen vendors learned of the program this way. Four contacts learned of the program from other vendors or contractors, three learned from their customers, and three learned from a seminar or tradeshow.

For the most part, these vendors reported an understanding of the program's incentive requirements. Fourteen of eighteen (78%) reported they generally know whether a customer's project is likely to qualify for incentives at the time the customer first presents the project idea to them. Of the remaining four vendors, one was an installer who works through a vendor, rather than directly with customers, and another works almost exclusively with the Oregon Military Department. One of the two remaining vendors (both of whom specialize in lighting) said he generally does not know initially whether a customer's project will qualify for incentives because "there are too many variables." The other lighting vendor had nothing substantive to say on this topic.

VENDOR AND CUSTOMER PROGRAM EXPERIENCES

Vendors' estimates of the percent of all of the equipment they supply to their customers that qualifies for a rebate from the Production Efficiency program ran from 5% (two vendors) to 100% (two vendors). The average percentage estimate of the 16 vendors who responded was 48% and the median percentage was 43%. Although both of the vendors who reported all of the equipment they supply qualifies for a program rebate were lighting vendors, there was no statistically significant difference between the percentages of qualifying equipment supplied by lighting and non-lighting vendors.

Most of the vendors (15 of 19, or 79%) reported they typically initiate the possibility of participating in the program with their industrial customers. This compares to three vendors

whose customers typically initiate the idea of program participation, and one vendor who reported he and his customers each initiate the idea of program participation on an equal basis.

Twelve of the 19 vendors (63%) reported they had repeat business from a customer who participated in the program (Table 4.2). Ten of these 12 (83%) said the repeat business resulted in additional program participation. Of the 10 vendors with repeat program participants, one-half (5 vendors) reported their repeat business included sales or installation of equipment that qualified for, but did not receive, a Production Efficiency incentive. However, roughly one-half (9 of 19, or 47%) of the vendors had customers who chose not to install available energy-efficient equipment that could have qualified for Energy Trust incentives.

Table 4.2: Installation Events and Repeat Business

EVENT	FREQUENCY	PERCENT
Repeat Business from Participant (n=19)	12	63%
Repeat Business Included Program Participation (n=12)	10	83%
Repeat Program Participation Included Qualifying but Nonparticipating Equipment (n=10)	5	50%
Customers Chose to Install Non-Efficient Equipment (n=19)	9	47%
Customers Modified Projects to Qualify (n=19)	7	37%
Vendor Pre-Screens Customers for Qualification (n=19)	4	21%

About one-third (7 of 19, or 37%) of the vendors reported they had customers who modified projects in order to qualify for an incentive. Six vendors reported none of their customers had ever chosen to modify one of their projects in order to meet program incentive requirements. Four other vendors also reported this, but qualified their responses by saying they pre-screen their customers for program qualification. Two vendors did not know whether their customers had made project modifications to qualify for the program.

Seven of 17 (41%) of the vendors reported at least twelve instances of their customers starting, but discontinuing, program participation. These vendors reported three such occurrences in 2004, five or more occurrences in 2005, one occurrence in 2006, and three occurrences in 2007. In roughly chronological order, the customers' reasons for dropping out of the program included:

- The incentive was too small (small lighting project, 2004)
- Reasons internal to the company unrelated to the program (2004)
- Program participation would have resulted in an unacceptable delay (2004, 2005, 2006, and 2007)
- Program funding limitations (may have been more than one occurrence, 2005)

- The incentive was not sufficient to allow the project to meet the firm's investment criteria (2005)
- The PDC disagreed with the vendor's engineering calculations (2005)
- The equipment had been purchased before program participation began (mentioned twice, 2005 and 2007)
- The customer forgot to do the paperwork (2007)

As an indication of overall participant satisfaction with the program (described in greater detail in Chapter 5), none of the vendors reported customers, other than those who had discontinued projects, who had expressed concerns about program participation. However, two vendors (12%) reported experiencing sufficient confusion about the program for it to have been a "small problem" (Table 4.3). One of these two vendors elaborated, "During the funding crisis, there were more forms required for rebates." The other vendor's confusion was "about whether a project would qualify for an incentive." This was the vendor who had reported having customers discontinue program participation as a result of having purchased their equipment before they began participation, and also because of a disagreement between the vendor and the PDC over engineering calculations.

Table 4.3: Program Problems

IMPROVEMENT	FREQUENCY	PERCENT N=17
Too Much Paperwork	7	41%
Incentive Approval Process Too Long	5	29%
Wait for Incentive Payment Too Long	3	18%
Confusion About Program Participation	2	12%
TOTAL	**17**	**100%**

Three other problems with the program were mentioned by ten (59%) of the vendors. Seven vendors (41%) reported "too much paperwork" had been a problem for them or for their customers. Five (29%) reported the incentive approval process had taken too long, and three (18%) reported the wait for the incentive payment was too long. Regarding the issue of paperwork, one contact commented, "When Energy Trust says things like they 'may withdraw funding at their sole discretion,' it is a deal-breaker…. Forms were initially quite simple, but as Energy Trust tried to limit risk, the forms grew, requiring hours and hours of time to be spent with…attorneys."

Regarding problems with the length of the incentive approval process, one vendor elaborated, saying "only in 2006, in response to funding limitations," was the incentive approval process too long. However, another vendor commented, "The window of opportunity is the first week of the

month; then there is a wait – seven or eight weeks sometimes." Roughly one-half (8 of 17, or 47%) of the vendors reported a customer's time constraints sometimes keep them from considering applying for an incentive through the program.

Program participation seems generally to have been good for the businesses of the seventeen vendors who responded to a related series of questions. Ten (59%) of the vendors reported their participation in the program had increased the number of their projects (Table 4.4). Nine vendors (53%) reported participation had increased the size of their projects, and eight (47%) reported participation in the program had increased the number of their customers. Nine (53%) vendors also reported program participation had increased their sales in other areas. Only three (18%) of the vendors reported their business was not improved in any way by program participation.

Table 4.4: Business Improvements from Program Participation (Multiple Responses Allowed)

IMPROVEMENT	FREQUENCY	PERCENT N=17
Increased Number of Projects	10	59%
Increased Size of Projects	9	53%
Increased Other Sales	9	53%
Increased Number of Customers	8	47%
No Improvement	3	18%

While 12 of 17 vendors (71%) reported awareness of Energy Trust's incentives for renewable energy projects, only four (24%) of them reported their firms are interested in participating in the Renewables Program (Table 4.5). Nonetheless, eight (47%) of the vendors said their customers are interested in participating in the Renewables Program. Although the vendors have an awareness of the program's existence, they seem not to be familiar with its specifics. Of the eight vendors who described the information and support they and their customers need concerning the Renewables Program, one responded, "How to qualify," and the others gave responses that can be summarized as "any and all information."

Table 4.5: Awareness of Other Programs (Multiple Responses Allowed)

OTHER PROGRAM	FREQUENCY	PERCENT N=17
Aware of Renewables Incentives	12	71%
Firm's Customers Interested in Renewables Program	8	47%
Firms Interested in Renewables Program	4	24%
Vendor Promotes BETC to Customers	10	59%

Ten of 17 vendors (59%) reported they promote the BETC to their industrial customers, and ten reported their industrial customers tend to take advantage of the BETC, including one vendor who reported he does not promote the BETC, but that his customers "do that on their own now." This leaves a surprisingly large portion (roughly two-fifths) of the vendors who do not take advantage of the marketing or promotional value of the BETC in their sales approaches.

DESIRED CHANGES

Three vendors (18%) said they would like to change something about the types of projects that qualify for incentives. Two of these three vendors would like to see changes that would benefit small industrial customers. Specifically, one of the vendors would like "more standardization," by which he meant, "prescriptive rebates especially for smaller horsepower equipment." The other vendor's suggestion to benefit small customers was to change the payback requirements. Echoing concerns mentioned by some of the program contractors regarding the program's cost-effectiveness criteria (Chapter 3), he said, "The ten-year payback is too limiting. Small customers can't meet this. An eight-to-five customer won't have enough savings to qualify." He suggested a better standard would be "the 10% improvement required for BETC." The program change suggested by the third vendor was the already-implemented inclusion of natural gas savings.

Ten of sixteen vendors (63%) reported they would like Energy Trust to provide them with training or tools for estimating the energy savings of efficient equipment. Half of these ten vendors elaborated about specific tools or training they would like, often suggesting some program aspects remain mysterious to them. One vendor commented, "I would like a copy of the equation that helps things qualify. That's a secret. The equation has been changed to include some societal advantages, which vendors would like to know." Another vendor replied, "I always like to know how they come up with their magic numbers." And a third vendor said, "It would be useful to know the Energy Trust's interpretation of things." Other comments by these and other vendors included:

- *"Anything that would bring my savings calculating tools in alignment with the Energy Trust's tools would be very beneficial."*
- *"If there is an easier way to evaluate and compare the different systems we sell, it would help."*

2006 FUNDING LIMITATION

The incentive shortfall in 2006, resulting from the over-commitment of funds in 2005, created concern among these market actors. One-quarter (4 of 16) of the vendors thought the program was going to be discontinued in 2006, when the budget was limited and incentive amounts were varying. And one of the eight vendors who did not think the program would be discontinued (four vendors were unable to express an opinion) reported, however, that both of his partners thought it would be terminated.

SPILLOVER

The following data provide an indication of the Production Efficiency program's continuing influence and effect upon the marketplace.

Two of six lighting vendors (33%) agreed their experience specifying or installing lighting through the program has convinced them that energy-efficient lighting equipment is cost-effective or beneficial, even without a program incentive (Table 4.6).[18] However, this may be a misleadingly low response rate. For example, another lighting vendor made a qualified response, observing, "It depends on a customer's hours of operation." Furthermore, those who did not agree with the statement may already have been convinced of the cost-effectiveness or benefits of energy-efficient lighting before they became involved with the Production Efficiency program.

Table 4.6: Spillover Indicators

INDICATOR	FREQUENCY	PERCENT
Experience Installing Qualifying Lighting Equipment Convinced them It Is Cost Effective without Incentive (n=6)	2	33%
Experience Installing Qualifying Equipment Has Improved Ability to Identify Energy Efficiency Opportunities (n=15)	10	67%
Performance of Program-Qualifying Equipment Has Increased Likelihood of Discussing Energy Efficiency when Developing Customers' Project Plans (n=15)	12	80%

Ten of 15 vendors (67%) reported lessons learned from installing energy-efficient equipment through the program have enhanced their ability to identify opportunities to improve the energy efficiency of equipment systems.[19] And 12 of 15 vendors (80%) reported their experiences with the performance of energy-efficient equipment installed through the program have made them more likely to discuss energy-efficient options with all of their customers when developing project plans.[20]

Additionally, as described earlier, of the ten vendors who reported repeat-customer business that resulted in additional program participation, one-half (5 vendors) reported some of those repeat customers' participating projects included equipment that qualified for the program but was installed without an incentive.

To gain greater understanding of the program's enduring effects, all of the vendors were asked whether they work with energy-efficient projects that do not receive a program incentive. Eleven vendors reported they have done such projects. However, subsequent comments by two of these

18 The interview with the seventh lighting vendor was discontinued before this series of questions.

19 One vendor had no experience installing equipment.

20 One vendor reported he does not help develop customers' project plans.

eleven vendors revealed they actually had not worked on such projects, leaving over one-half (9 of 16, or 56%) of the vendors who had installed energy-efficient equipment without a program incentive. Six of these nine vendors reported doing "a few" (five or fewer) such projects, while two vendors reported doing "many" (more than 10) energy-efficient projects that did not receive a program incentive (Table 4.7).

Table 4.7: Vendors' Energy Efficiency Projects Installed without Incentives

PROJECTS	FREQUENCY	PERCENT* N=16
None	5	31%
A few (1 to 5)	6	38%
Some (6 to 10)	1	6%
Many (More than 10)	2	13%
Don't Know	2	13%
TOTAL	**16**	**101%**

* Self-reporting initially showed 11 respondents with projects installed without incentives, but subsequent comments reduced this to 9 actual respondents. Totals may not equal 100% due to rounding.

The most commonly given reason, mentioned by nine vendors, for doing energy-efficient projects that did not receive a program incentive was project timing (Table 4.8). Five vendors mentioned they have done energy-efficient projects without a program incentive because the projects were outside of Energy Trust territory. These five vendors included both of the vendors who reported doing "many" energy-efficient projects without an incentive. Vendors gave four other reasons, mentioned once each, their projects did not receive an incentive: "group relamping," "replacing rather than adding lighting," "the incentive was too small," and "the customer was unaware of the program."

Disregarding vendors whose customers' projects were outside of Energy Trust territory and those whose customers' projects would not have qualified for a program incentive for other reasons, we are left with four vendors with "a few" nonparticipating energy-efficient projects, the vendor with "some" nonparticipating projects, and a vendor who could not estimate the number of his nonparticipating projects. Thus, collectively, the 16 vendors shown in Table 4.7 appear to have done very few energy-efficient projects for which a Production Efficiency incentive was available that did not receive an incentive from the program.

Table 4.8: Reasons Energy Efficiency Projects Were Installed without Incentives (Multiple Responses Allowed)

REASON	FREQUENCY	PERCENT N=12*
Project Timing	9	75%
Not In Energy Trust Territory	5	42%
Otherwise Not Qualified for an Incentive (Lighting Projects)	2	17%
Incentive Too Small	1	8%
Customer Unaware of Program	1	8%

* A vendor who reported he did not know how many of his energy efficiency projects had not received an incentive gave reasons for those projects' nonparticipation in the program.

Four-fifths (80%) of the vendors reported the program influenced them to include energy efficiency in their sales approach, with roughly three-quarters (73%) of these vendors reporting the program was "very influential" in this way (Table 4.9). More than four-fifths (86%) reported the program influenced them to include energy efficiency in their bids, with roughly four-fifths (79%) of these vendors reporting the program was "very influential" on them. Although the program had a lesser impact on the inclusion of BETC information by these vendors in their bids, almost two-thirds (64%) reported the program influenced them in that regard.

Table 4.9: Influence of Program on Vendor Sales Activities (Multiple Responses Allowed)

INFLUENCE	FREQUENCY	PERCENT
INCLUDING ENERGY EFFICIENCY IN SALES APPROACH (N=15)[1]		
Not at All Influential	3	20%
Somewhat Influential	1	7%
Very Influential	11	73%
INCLUDING ENERGY EFFICIENCY OPTIONS IN BIDS (N=14)[2]		
Not at All Influential	2	14%
Somewhat Influential	1	7%
Very Influential	11	79%
INCLUDING BETC IN BIDS (N=14)[2]		
Not at All Influential	5	36%
Somewhat Influential	3	21%
Very Influential	6	43%

[1] One vendor reported he does not work directly with customers.

[2] A second vendor reported he never prepares customer bids.

One-quarter (4 of 16) of the vendors reported they have concerns about the market for their products. All four of those vendors reported, individually or alone, that wood products and pulp-and-paper customers comprise 75% to 100% of their business. Their expressed concerns included:

- The housing market downturn (two mentions)
- The decline in the value of the dollar
- Inflation ("the cost of motors has increased four times in the past year")
- Industry consolidations and closures
- The bad economy

These four vendors sell or install fans, blowers, motors, or compressed air systems. None of the lighting vendors reported marketplace concerns.

FIRMOGRAPHICS

Job titles of those with management roles included business manager, supervisor/field representative, operations manager, division manager, and energy conservation manager (Table 4.10).

Table 4.10: Vendors' Roles in Their Firms

ROLE	FREQUENCY	PERCENT N=16
Owner	6	38%
Management	5	31%
Sales	5	31%
TOTAL	**16**	**100%**

Estimates of the number of employees in the vendors' firms ranged from 2 to 400. The portion of the firms' employees who spend any of their time working on Energy Trust projects was estimated to be from 5% for a firm of 300, to 100% for a firm of 2 people.

The percent of total business for a firm represented by Energy Trust projects ranged from less than 25% for 10 of the 16 respondents (63%), to over 75% for one (Table 4.11).

Table 4.11: Percent of Total Business Represented by Energy Trust Projects

PERCENT OF BUSINESS	COUNT	PERCENT* N=16
0% to 25%	10	63%
26% to 50%	3	19%
51% to 75%	0	0%
76% to 100%	1	6%
Don't Know	2	13%
TOTAL	**16**	**101.00%**

* Totals may not equal 100% due to rounding.

SUMMARY

Most of the interviewed vendors initiate the possibility of program participation with their industrial customers, but only about half of the vendors promote the BETC to their customers. About half of the vendors had repeat-customer program participation, and one-quarter of the vendors had repeat program participants who also installed equipment that qualified for, but did not receive, a Production Efficiency incentive. Most of the other energy-efficient projects done by these vendors that did not receive incentives were outside of Energy Trust's territory or were relamping projects that did not qualify for incentives. Customers' program participation generally has been good for the businesses of the vendors.

About half of the vendors expressed a desire for more training or tools from Energy Trust, particularly in regard to information about the societal test as a measure of project cost-effectiveness.

The vendors reported at least 12 occasions when their customers started, but for a variety of reasons, discontinued participation in the Production Efficiency program. Program process problems experienced by these vendors' customers were modest, even though there were still some complaints of too much paperwork, too much time for project approval, and too much time for receipt of program incentives.

Vendors' experiences with the installation and performance of equipment through the program have enhanced their ability to identify energy efficiency opportunities and have made them more likely to discuss energy-efficient options with their customers. However, roughly half of the vendors had customers who chose not to install available energy-efficient equipment that could have qualified for Energy Trust incentives.

5 PARTICIPANTS' FEEDBACK

The Production Efficiency program participant population was created from a list of 157 customers, provided by Energy Trust, whose projects were installed in 2005 or 2006, and whose savings were credited to the 2006 program year. To ensure representation in the evaluation sample of the firms comprising the majority program energy savings during that time period, a population was drawn from the projects with the largest kWh savings. On-site visits for the impact evaluation were conducted with customers from that group during October 10 to November 1, 2007. Typically, on-site contacts were the staff member most familiar with the project, usually an engineer or facility manager. During the on-site visits, 60 contacts were interviewed for the process evaluation, using the same survey instrument as was used for a telephone survey of other program participants.

For the telephone interview population, 70 of the remaining projects with the next largest kWh savings were selected. To this population, we added two of the on-site contacts who were unavailable to be interviewed during the visits to their sites. Thirty-seven telephone interviews were conducted from October 17 to November 14, 2007. When combined with the interviews conducted during the on-site visits, the total participant sample is 97.

Of the 29 sites in this population that were not contacted, most (25) were not interviewed because repeated calls to them were not returned (Table 5.1).

Table 5.1: Disposition of Participant Interviews

DISPOSITION		TOTAL
Surveyed		37
Refused		1
List Errors	**Not Qualified**	2
	No Longer in Business	2
	Duplicate Project	1
	Wrong Number	1
No Contact Made	**Attempt Failed**	24
	Quota Met Before Calling	4
TOTAL		**72**

The remainder of this chapter presents the findings of the on-site and telephone interviews. Site-visit data and telephone data were analyzed, both as a whole and separately, to explore possible differences between participants with smaller projects (between 11,904 kWh and 158,625 kWh

in savings) and participants with larger projects (between 384,320 kWh and 7,953,674 kWh in savings).[21] In-person interview data refers to data from project respondents with program savings more than 375,000 kWh[22] and telephone data refers to data from respondents with program savings less than 160,000 kWh. When differences between in-person interview respondents and telephone interview respondents are notable, they are called out.[23]

Participants' responses were also analyzed by the utility providing their electric service. PacifiCorp customers comprised a little over half of the sample (55%, Table 5.2). Significant differences between contacts served by the different utilities are also reported when found. In all other cases, the aggregate data is reported.

Table 5.2: Interviewed Firms by Electric Provider

UTILITY	TOTAL (N=97)
PGE	45%
PacifiCorp	55%
TOTAL	100%

This chapter is organized according into the following sections:

- *Program Awareness*
- *Relationship with Energy Trust and the Production Efficiency Program*
- *Program Satisfaction*
- *Clarity and Consistency of Program Information*
- *Equipment Purchasing Practices*
- *Firms' Energy Policies and Concerns*
- *Summary*

21 Differences between respondents with larger projects and respondents with smaller projects could also be attributed to the different interview methods (in-person versus telephonic) used for the different project sizes.

22 In two cases, the contact was not available during the site visit and was later interviewed by phone. These cases are nonetheless included in the in-person interview data, as it was deemed that program savings should trump interview style.

23 When such differences are best further illustrated in a table, they are displayed as such.

PROGRAM AWARENESS

In-person-interview respondents were significantly more likely to have been aware of the Production Efficiency program longer than telephone-interview respondents (χ^2, $p < 0.05$). Specifically, while 48% of in-person interview respondents said they had been aware of the program five years or longer, 32% of telephone-interview respondents reported awareness of the program for that amount of time, and 50% of telephone-interview respondents said they had been aware of it for two years or less (Table 5.3).

Table 5.3: Length of Program Awareness

LENGTH OF AWARENESS	IN-PERSON INTERVIEW RESPONDENTS (N=62)	TELEPHONE INTERVIEW RESPONDENTS (N=35)	TOTAL (N=97)
Two Years or Less	21%	51%	32%
Two to Four Years	31%	17%	26%
Five Years or More*	48%	32%	42%
TOTAL	**100%**	**100%**	**100%**

* A report of five years or more indicates awareness of a utility predecessor to the Production Efficiency program.

The majority of respondents (54%) indicated they had previously participated in the program.[24]

As shown in Table 5.4, respondents most commonly learned about the program from their vendor or contractor (37%). Only 11% of contacts learned of the program from a program representative, bringing into question the effectiveness of the program's marketing strategy described in Chapter 3.

[24] An analysis of the Production Efficiency program database suggests that under 10% of participants have participated more than once. Considered from a project perspective, under 15% of projects are conducted by firms that have participated more than once. Further research would be necessary to understand the discrepancy between these statistics as obtained from participant self-reports and the program database.

Table 5.4: Source of Program Awareness

SOURCE	TOTAL (N=97)
Vendor/Contractor	37%
Word-of-Mouth	19%
Utility	20%
Program Representative	11%
League of Oregon Cities	3%
Previous Employer	3%
Don't Know	7%
TOTAL	**100%**

Most respondents (80%) indicated their equipment vendor or installation contractor was at least somewhat familiar with the Production Efficiency program, saying specifically their vendor was "somewhat" familiar, "mostly" familiar, or "familiar" with the program (Table 5.5).

Table 5.5: Vendor Familiarity with Program

VENDOR FAMILIARITY	TOTAL (N=97)
Familiar	7%
Mostly Familiar	2%
Somewhat Familiar	71%
Not Familiar	3%
Don't Know	17%
TOTAL	**100%**

Respondents whose vendor or contractor was unfamiliar with the program had no difficulty introducing the program to those vendors, nor did those or any of the other respondents' vendors discourage program participation, although vendors of 7% of the respondents identified both pros and cons to program participation.[25] For the majority of respondents (54%), vendors encouraged program participation (Table 5.6). This majority includes vendors who had just learned about the program from the respondent and then encouraged participation.

[25] One respondent did remark his vendor was unfamiliar with the new technology they were implementing (irrigation pump) and that the vendor had some "catching up to do," but added the project had no problems.

Table 5.6: Vendor Encouragement of Program Participation

VENDOR ACTION	TOTAL (N=97)
Encouraged Participation	54%
Neither Encouraged nor Discouraged Participation	17%
Identified Both Pros and Cons of Participation	7%
Discouraged Participation	0%
No Opinion	22%
TOTAL	**100%**

The majority of respondents (78%) sought additional project funding through Oregon Business Energy Tax Credits (BETC). The 21 respondents who had not applied for BETC were asked why they had not applied, as this information can be used to understand the motivation towards seeking monetary project assistance. As shown in Table 5.7, the most commonly cited reason for not applying for BETC was the belief it was not available for municipalities (24%). Forty-three percent of respondents who did not apply for the tax credit did not know why their firm had not applied. One contact was unaware of BETC.

Table 5.7: Reasons Respondent Did Not Apply for BETC (Multiple Responses Allowed)

REASONS	TOTAL (N=21)
Thought BETC Was Not Available for Municipalities or Nonprofits	24%
Application Seemed Too Difficult or Time Consuming	10%
Unaware of BETC	5%
Knew Equipment Didn't Qualify	5%
Reasons Internal to Company	5%
Thought It Was Too Late to Apply	14%
Don't Know	43%
Other	10%

A difference between PGE and PacifiCorp customers in their reasons for not applying for BETC assistance was noted. Namely, while three of the seven PGE respondents who did not apply for

BETC said that they did not do so because "it was too late to apply," no PacifiCorp respondents gave such an answer (χ^2, $p < 0.05$).[26]

The data suggest respondents' awareness of the availability of BETC was higher for electric projects than for non-electric efficiency projects. This is not surprising, in that these contacts were being interviewed regarding projects they did that saved utility-provided electricity and may not use natural gas or renewable energy. In fact, two respondents volunteered their firms did not qualify for natural gas BETC because they did not use natural gas. The high percentage (78%) of BETC applications for respondent projects indicates a high level of awareness of BETC for electric efficiency projects. By comparison, 62% of the respondents were aware of tax credits for renewables, while about one-third (35%) were aware of tax credits for natural gas. In-person interview respondents were significantly more likely to have heard of BETC for natural gas (45%) than were telephone-interview respondents (17%, χ^2, $p < 0.05$).

To understand the influence of incentives versus tax credits on the decision to install energy-efficient equipment, respondents who applied for both BETC and PE incentives were asked which form of assistance had a greater influence on their decision to install equipment. Over half (57%) of the respondents said the Energy Trust incentive and BETC had equal importance, or it was a combination that had an influence on their decision to install the energy-efficient equipment. Among those respondents who said either the tax credit or the Energy Trust incentive had a greater influence on their decision, the Energy Trust incentive was more often cited as a greater influence (Table 5.8).

Table 5.8: Influence of the Energy Trust versus the BETC Incentive Among Contacts Aware of BETC

INFLUENCE ON DECISION	TOTAL (N=75)
Combination of Energy Trust Incentives and BETC	44%
Energy Trust Incentive Had More Influence	28%
Energy Trust Incentive and BETC Had Equal Influence	12%
BETC Had More Influence	7%
Don't Know	9%
TOTAL	**100%**

[26] Reasons for not applying for BETC assistance given by PacifiCorp respondents were not concentrated in any particular category.

RELATIONSHIP WITH ENERGY TRUST AND THE PRODUCTION EFFICIENCY PROGRAM

To determine program participants' relationships with Energy Trust and the Production Efficiency program, respondents were asked a series of questions related to their satisfaction with and willingness to seek the expertise of program representatives. The respondents generally felt their program representatives understood the challenges respondents face in operating their facilities. Nearly two-thirds of respondents (71%) said either their program contact had an "excellent" understanding of the challenges they face in operating their facility, or that their program contact "understands quite a lot" (Table 5.9). Eight percent of respondents said they did not know or that their vendor was their program contact, and one respondent said he did not have a program contact. Respondents seem to have a relationship of convenience with the program. If they know whom to call, they will call them. Those who did not know who their program contact was did not seem to care.

Table 5.9: Program Representatives' Understanding of Respondents' Challenges

UNDERSTANDING OF PROGRAM REPRESENTATIVE	TOTAL (N=94)*
Excellent Understanding	48%
Understands Quite a Lot	23%
Moderate Understanding	14%
Understands a Little	3%
Not Very Well, but Over Time They Will Likely Come to Understand	2%
Not Very Well and I Don't Expect Them to Understand	1%
Don't have a Program Contact	1%
Don't Know / Vendor is Program Contact	8%
TOTAL	**100%**

* Three respondents were not asked the question; one due to a time constraint of the respondent and the other two because of differences between in-person and telephone interview methodology.

Further indicating satisfaction with program representatives, nearly all respondents reported their program representatives were always serving their companies' best interests. Specifically, 88% of respondents said their program representatives were always serving their companies' best interests. Eight percent of respondents said they did not know or that their vendor was their program contact. One respondent said they did not have a program contact. Three respondents said they felt their program contact was not always serving their best interests. When asked why, one respondent said it was their vendor that understood their needs, one said the program has other "best interests" to serve, and one came to that conclusion after being dissatisfied with the project cost.

To assess the extent to which program representatives are being utilized as a resource by program participants, respondents who had purchased equipment in the past year were asked whether they first discussed the equipment's incentive eligibility with their program representative. Just over half (51%) of all respondents had made an equipment purchase since participating in the program. Forty-three percent of the respondents said they discussed the purchase with their program representative.

As shown in Table 5.10, the most common reasons respondents did not discuss their recent equipment purchases with their program representatives was they did not think their equipment would qualify for an incentive (32%) and they simply did not think of discussing it with a program representative (25%).

Table 5.10: Reasons Equipment Purchase Not Discussed with Program Representative (Multiple Responses Allowed)

REASON	TOTAL (N=28)
Didn't Think Equipment Would Qualify for an Incentive	32%
Didn't Think of Discussing It With Program Representative	25%
Reasons Internal to Company	7%
Not Enough Time to Participate	5%
Thought Financial Incentive Was Too Little to Bother With	4%
Did Not Think Energy Efficiency Would Work for Application	4%
Don't Know	7%

As a further indication of customers' relationships with their program representatives, over half of respondents (53%) said they had either called their program representative when considering an equipment purchase, or they planned to call them soon. Another quarter of respondents (26%) said they had thought of calling their program representative when considering an equipment purchase. Only 8% of the respondents said they would not consider or saw no reason to consider calling their program representative before making an equipment purchase (Table 5.11).

It was noted that in-person interview respondents were more likely to have called their program representative, or to indicate they were "about to call" (59%), as compared to telephone interview respondents (41%; χ^2, $p < 0.05$). Conversely, while 47% of telephone interview respondents said they were willing to contact their program representative, but had not yet done so, just 13% of in-person interview respondents gave the same answer (χ^2, $p < 0.05$).

Table 5.11: Willingness to Consider Calling Program Representative when Contemplating an Equipment Purchase

WILLINGNESS TO CONSIDER CALLING	IN-PERSON INTERVIEW RESPONDENTS (N=61)	TELEPHONE INTERVIEW RESPONDENTS (N=34)	TOTAL (N=95)*
Yes, Have Called Them / About to Call Them	59%	41%	53%
Yes, But Have Not Called Them	13%	47%	26%
Never Thought of It, But Might Do So	7%	3%	5%
No, See No Reason to Call / Would not Want to Call	10%	6%	8%
Other	6%	3%	5%
Don't Know	5%	0%	3%
TOTAL	**100%**	**100%**	**100%**

* Two respondents were not asked the question.

Regarding participants' willingness to consider contacting their program representative when contemplating an equipment purchase, differences were noted between customers' responses based upon their utility. Customers of PacifiCorp (62%) were significantly more likely than were customers of PGE (42%) to report they had either called their program representative, or they were about to call them (χ^2, $p < 0.05$).

PROGRAM SATISFACTION

Contacts' responses regarding their satisfaction with various aspects of the program were based on a five-point scale, with one being "not at all satisfied" and five being "very satisfied." Respondents ratings of satisfaction (responses of "four" and "five") were combined in Table 5.12, showing large majorities (three-quarters or more) of respondents were satisfied with all aspects of the program that were rated.

As another indicator of program satisfaction, all but one participant (99%) reported they would participate in the program again if they were to install equipment that qualifies for an incentive. Most (64%) of the respondents reported they would want nothing to happen differently if they were to participate again, further indicating satisfaction with the program. However, 14% would like the program to move faster the next time and five respondents (6%) would want a greater incentive.

Table 5.12: Percent of Respondents Satisfied with Program Aspect

PROGRAM ASPECT	PERCENT SATISFIED
Performance of Equipment Installed (n=95)	92%
Program Staff's Knowledge (n=84)	92%
Quality of Work Conducted by Contractor/Vendor (n=91)	92%
Overall Program Experience (n=89)	94%
Electricity Savings (n=66)	91%
Incentive Amount (n=85)	87%
Application Process (n=80)	84%
Resolution of Any Problems that Arose (n=23)	74%

Note: The Ns for the table show the number of respondents who provided ratings. Responses of *Don't Know* or *NA* account for the difference between these Ns and the total sample.

Respondents' attitudes toward the Production Efficiency program can also be inferred from an analysis of their reasons for not following through with program participation. As shown in Table 5.13, 30% of the respondents described instances when their firm did not complete Production Efficiency participation.

Table 5.13: Reasons for Not Completing Program (Multiple Responses Allowed)

REASON	TOTAL (N=29)
Incentive Not Sufficient	24%
Equipment Did Not Qualify	17%
Participation Would Take Too Long	21%
Unspecified Internal Reasons	45%
Incentives Were Not Available (2006)	3%

Three of the reasons given involve program satisfaction issues. Those reasons are: insufficient incentives, a too lengthy participation process, and the unavailability of program incentives. Except for the unavailability of incentives – that was specific to late 2005 and 2006, and resulted in program discontinuation by one respondent[27] – program discontinuation was fairly evenly scattered over all program years, suggesting no particular problem for any particular time period.

[27] This experience adds a qualification to the statement by program staff (Chapter 3) that there were no projects that were not funded as a result of the 2006 budget shortfall.

In-person interview respondents were significantly more likely than were telephone interview respondents to have discontinued program participation (χ^2, $p < 0.05$).

CLARITY AND CONSISTENCY OF PROGRAM INFORMATION

The interviews attempted to provide insight into the kinds and sources of any program confusion experienced by the respondents. Program confusion great enough to have been a problem among those sampled was infrequent. More than four-fifths (83%) of the respondents said they experienced "no confusion" or the confusion they did experience "was not at all a problem" (Table 5.14).

Table 5.14: Overall Confusion about the Program

AMOUNT OF CONFUSION	TOTAL (N=91)*
No Confusion	61%
Some Confusion, Not at All a Problem	22%
A Small Problem	13%
A Medium Problem	2%
A Significant Problem	1%
Problem So Significant It Nearly Stopped the Project	1%
TOTAL	**100%**

* *Don't Know* responses were excluded from analysis.

Among those who reported confusion, telephone respondents were significantly more likely than in-person interview respondents to have experienced uncertainty about one of the surveyed areas of confusion (χ^2, $p < 0.05$). More specifically, one-half (50%) of participants interviewed in-person reported no confusion regarding any of the surveyed items, while only about one-tenth (9%) of those interviewed by telephone experienced no confusion about any of the surveyed topics (Table 5.15).

The most common area of confusion was uncertainty about whether Energy Trust had run out of incentives for the year. About one-third (31%) of respondents expressed this uncertainty. Participants' comments elaborating their funding uncertainty or related to the 2006 funding shortfall included:

- *"The uncertainty over funding was traumatic."*
- *"When we were applying…there was some confusion about availability of funds."*
- *"I was not at all happy when the Trust ran out of money. To me, that was not acceptable."*

Table 5.15: Confusion/Uncertainty Experienced During Program Participation (Multiple Responses Allowed)

AREA OF UNCERTAINTY	IN-PERSON INTERVIEW RESPONDENTS (N=62)	TELEPHONE INTERVIEW RESPONDENTS (N=35)	TOTAL (N=97)
Energy Trust Had Run Out of Incentives	32%	29%	31%
Whom To Call	5%	26%	12%
Areas of Expertise of Program Contacts	3%	20%	9%
Incentive Amount	7%	14%	9%
Different Information Received from Different Program Representatives	10%	11%	10%
Who Makes Program Decisions	0%	6%	2%
Self-Direct Policies and Procedures	7%	0%	4%
Accuracy of Information from Program Contact	0%	3%	1%
Feel Vendor Gave Incorrect Information	2%	0%	1%
None of the Above	50%	9%	35%

Regarding the second most frequently mentioned area of confusion – uncertainty about whom to call – respondents' comments included:

- *"We were not sure whether to call the Trust or [the PDC] at first."*
- *"If I were to jump into something new, I don't have a contact at Energy Trust."*

Along with their overall higher frequency of confusion, telephone interview respondents had significantly more confusion than in-person respondents about certain aspects of program participation. Specifically, 26% percent of telephone interview respondents said they had some uncertainty about whom to call, while only 5% of in-person interview respondents reported the same uncertainty (χ^2, $p < 0.05$). Additionally, while 20% of telephone interview respondents had uncertainty about the areas of expertise of different program contacts, just 3% of in-person interview respondents reported such confusion (χ^2, $p < 0.05$). Customers of PGE (21%) were significantly more likely than customers of PacifiCorp (6%) to say they had experienced uncertainty about whom to call with program questions or for program information (χ^2, $p < 0.05$). The utility effect persists when the size of the project is taken into account; 40% of the 18 telephone interview respondents in PGE territory reported uncertainty about whom to call, compared with 12% of the 17 telephone interview respondents in PacifiCorp territory (χ^2, $p < 0.07$).

EQUIPMENT PURCHASING PRACTICES

Most respondents (52%) first thought about doing their project two-to-four years previous to the survey (Table 5.16). About one-quarter (28%) first considered their project within the past two years, and 15% reported their projects were in the works for five years or more. In-person interview respondents were significantly more likely than telephone interview to respondents have been considering their projects for a longer time (χ^2, $p < 0.05$). Specifically, while 47% of telephone interview respondents said they first considered the project sometime in the past two years, only 18% of in-person interview respondents gave the same answer.

Table 5.16: When Was Project First Considered

PROJECT FIRST CONSIDERED	TOTAL (N=96)*
Sometime in the Past Two Years	28%
Two to Four Years Ago	52%
Five Years Ago or More	15%
Don't Know	5%
TOTAL	**100%**

* This question was skipped for one respondent due to his time constraint.

To understand respondents' motivations for undertaking projects, they were asked to choose their top three reasons for making their equipment purchases from a provided list of 15 reasons. To facilitate analysis of the responses, we grouped the chosen reasons under broader categories. Specifically, "energy savings" and "other cost savings" were grouped under the category *Cost Savings*. "Production Improvements," "reliability," "increase production level," and "improve product quality" were grouped under the category *Production Improvements*. "Vendor or contractor recommended," "technical study recommended," and "program representative recommended" were grouped under the category *Recommended*. "Corporate policy to choose energy-efficient equipment" and "Energy efficiency features are common practice for this application" form the group *Policy/Practice*. "Failed equipment," "to meet code/regulations," and "safety" were grouped under the category *Required*.

As shown in Table 5.17, the vast majority (90%) of respondents gave cost-saving reasons for their equipment purchases. Production improvements were also a common reason for purchasing equipment, with in-person interview respondents offering those reasons significantly more often (86%) than telephone interview respondents (57%; χ^2, $p < 0.05$). Recommendations, policy and common practices, and requirements each were endorsed by about one out of six respondents.

Table 5.17: Top Three Reasons for Installing Equipment – By Category (Multiple Responses Allowed)

CATEGORY	TOTAL (N=97)
Cost Savings	90%
Production Improvements	75%
Recommended	17%
Policy/ Practice	17%
Required	15%

Deconstructing the categories in Table 5.17, within the category of cost savings, energy-cost savings was given as a reason by most respondents (89%), while other cost savings were given by 26% of the respondents (Table 5.18).

Table 5.18: Top Three Reasons for Installing Equipment – Cost Savings (Multiple Responses Allowed)

REASON FOR INSTALLING	TOTAL (N=97)
Energy Cost Savings	89%
Other Cost Savings (Labor, O&M, Improved Scheduling)	26%

"Improving production efficiency" and "reliability" were the two most common reasons cited related to production improvements, given by 50% and 29% of respondents, respectively (Table 5.19). Improving product quality (10%) and increasing production levels (8%) were cited less often.

Table 5.19: Top Three Reasons for Installing Equipment – Production Improvements (Multiple Responses Allowed)

REASON FOR INSTALLING	TOTAL (N=97)
Improve Production Efficiency	50%
Reliability	29%
Improve Product Quality	10%
Increase Production Level	8%

A vendor or contractor was the most commonly cited source for recommended equipment purchases (10%). A recommendation from a technical study (5%) and the recommendation of a program representative (3%) were less frequently given as a reason (Table 5.20).

Table 5.20: Top Three Reasons for Installing Equipment – Recommended (Multiple Responses Allowed)

REASON FOR INSTALLING	TOTAL (N=97)
Vendor or Contractor Recommended	10%
Technical Study Recommended	5%
Program Representative Recommended	3%

Unavoidable (required) reasons for equipment installation were rarely among the top three responses given. Nine percent of respondents said failed equipment was among their top three reasons (Table 5.21).

Table 5.21 Top Three Reasons for Installing Equipment – Required (Multiple Responses Allowed)

REASON FOR INSTALLING	TOTAL (N=97)
Failed Equipment	9%
Safety	7%
To Meet Code/Regulations	2%

Other reasons for equipment installation, not belonging in any other category, are shown in Table 5.22, and were roughly similar in the percentages of respondents naming each of them as one of their top three. An addition reason for undertaking projects was "the equipment was necessary to complete a larger project," mentioned by three respondents.

Table 5.22: Top Three Reasons for Installing Equipment – Policy/Practice (Multiple Responses Allowed)

REASON FOR INSTALLING	TOTAL (N=97)
Corporate Policy to Choose Energy-Efficient Equipment	7%
Energy Efficiency Features are Common Practice for the Application	6%

FIRMS' ENERGY POLICIES AND CONCERNS

Regarding corporate energy policies, several respondents indicated their firms had energy efficiency goals or purchasing policies, though further probing sometimes revealed these to be informal practices rather than written requirements (Table 5.23). The most commonly reported energy policy or practice was having a staff member responsible for energy and energy

efficiency (50%). Inclusion of energy efficiency in operations and procurement existed at one-quarter (25%) of the interviewed firms. Numerical energy savings targets (for example, "five percent energy savings for 2007") were the next most common policy, with 16% of respondents reporting them. Few respondents (5%) said their firm had a written energy management plan.

Table 5.23: Energy Policies in Place at Respondents' Firm (Multiple Responses Allowed)

ENERGY POLICY	IN-PERSON INTERVIEW RESPONDENTS (N=62)	TELEPHONE INTERVIEW RESPONDENTS (N=35)	TOTAL (N=97)
Staff Member Responsible for Energy and Energy Efficiency	58%	34%	50%
Operations and Procurement Policies that Incorporate Energy Efficiency	24%	26%	25%
Numerical Energy Savings Goals	15%	17%	16%
Training	23%	0%	14%
Written Energy Management Plan	5%	6%	5%
Informal	7%	0%	4%

Two significant differences between in-person and telephone respondents were noted. Specifically, 23% of in-person interview respondents volunteered their firm provided energy-related training, but no telephone interview respondents reported such training (χ^2, $p < 0.05$).[28] Fifty-eight percent of in-person interview respondents reported they had a staff member responsible for energy and energy efficiency, compared to 34% of telephone-interview respondents reporting this (χ^2, $p < 0.05$). In-person interview respondents were also significantly more likely to have at least one energy policy in place (69%), compared to telephone interview respondents (46%; χ^2, $p < 0.05$).

To gain an understanding of other matters competing for the attention and budgets of those working in production facilities, respondents were asked what concerns they have regarding their industry. The most common areas of concern, mentioned by 26% of respondents, were energy cost and availability (Table 5.24). Other areas of concern mentioned included meeting production demand (11%) and compliance with regulations (9%).

[28] Respondents were not asked if they provided training related to energy efficiency. All mentions of training were recorded during in-person interviews. Thus, this finding could be attributed to different interview methods.

Table 5.24: Concerns about Industry (Multiple Responses Allowed)

TOPIC ADDRESSED IN COMMENTARY	TOTAL (N=97)
Energy (Cost, Availability)	26%
Meeting Product Demand	11%
Regulations (Safety, Environmental)	9%
Labor	8%
Equipment Maintenance	7%
Maintaining Efficiency of Production	7%
Other Industry Specific Concerns (Agriculture, Water Treatment)	7%
Safety	5%
Health of the Market	4%
Supply Costs	2%
Keeping Costs Down	2%

SUMMARY

Fewer than one-half of the participant respondents learned of the Production Efficiency program from its marketing intermediaries – namely, equipment dealers or contractors – and program representatives. The respondents reported their program representatives understand the challenges respondents face in operating their facilities, and nearly all respondents reported their program representatives were always serving their companies' best interests. Roughly eight-tenths of the respondents reported they would consider calling their program representative when contemplating an equipment purchase.

But for some, barriers to further participation still exist. These include not knowing whom to call, lack of time to "spec" the equipment to ensure it will qualify for an incentive, inability to wait for the program paperwork (customers and projects have their own timelines), and uncertainty the incentive amount will justify the effort required to obtain it.

Most respondents experienced no confusion about the program. However, among those who did, uncertainty about whether Energy Trust had run out of incentives for the year was the most common area of confusion. And among those who experienced confusion, PGE customers were significantly more likely than PacifiCorp customers to be uncertain about whom to call with questions about Production Efficiency. This may be the reason PGE customers were also significantly less likely than PacifiCorp customers to have called, or to contemplate calling, their program representative when considering an additional equipment purchase.

Respondents were generally satisfied with all aspects of the program and all but one contact reported they would participate in the program again if they were to install equipment that qualifies for an incentive. Most of the respondents were sufficiently satisfied with their program experience that they would want nothing to happen differently if they were to participate again. However, respondents have a relationship of convenience with the program. If they know whom to call, they will call them. Those who did not know who their program contact was did not seem to care.

The vast majority of respondents gave cost-saving reasons for their equipment purchases. Production improvements were also a common reason for purchasing equipment. However, sometimes equipment is installed merely as a required piece of a larger project. In those cases, program incentives may not be as compelling. The majority of respondents sought additional project funding through Oregon Business Energy Tax Credits.

6 NONPARTICIPANTS' FEEDBACK

This evaluation of the Production Efficiency program included telephone surveys of industrial customers in Energy Trust territory who have not participated in any Energy Trust programs. The database of these industrial customers was purchased from Dun and Bradstreet; that list was reviewed and Energy Trust program participants were deleted from it. This provided a nonparticipant population of 1,548 unduplicated contacts. It was estimated a population of just over 400 would be required to complete interviews with a sample of 70 nonparticipants, so a population of 413 nonparticipants was randomly drawn from the larger list. Telephone interviews were conducted from December 17, 2007, to February 13, 2008, and 410 customers were contacted. Seventy-three interviews were completed (Table 6.1). Four names were not called because the quota was met before calls to them were made. The overall response rate of this survey was 28%.[29]

Table 6.1: Disposition of Nonparticipant Surveys

DISPOSITION		TOTAL
Surveyed		73
Refused		48
List Errors	**Not Eligible (Participated In Energy Trust Programs)**	125
	Bad or Wrong Number	12
	Duplicate	6
	Business or Contact No Longer There	2
No Contact Made	**Attempts Failed**	143
	No Attempt (Quota Reached)	4
TOTAL		**413**

Although we did not employ stringent quotas for this study, we purposefully oversampled the large industrial customers. Large customers typically consume significantly more electricity than smaller customers; therefore, the opportunities for savings are much greater for this segment. To understand this important group better, we sampled a larger portion of these customers. The number of employees in the organization was used as a determinant of customer size; customers

[29] The response rate equals the sample size, over the population size, reduced by the population categorized as *List Errors* (74/268).

with fewer than 100 employees were considered small, while those with 100 or more were categorized as large (Table 6.2).

Table 6.2: Segmentation by Customer Size

GROUP	SMALL (<100 EMPLOYEES)		LARGE (=>100 EMPLOYEES)		TOTAL	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Population	1,267	82%	281	18%	**1,548**	**100%**
Sample	39	53%	34	47%	**73**	**100%**

In addition to the number of employees, nonparticipants' responses were analyzed by their electric utility and their annual electricity (kWh) consumption. Sixty-six percent of the interviewed nonparticipants purchase electricity from PGE, while PacifiCorp provides electricity to 34% of the interviewed customers (Table 6.3). The population list we received did not clearly identify utility providers; therefore, a breakdown of the total nonparticipant population is unknown.

Table 6.3: Nonparticipant Sample Utility Provider

UTILITY	FREQUENCY	PERCENT (N=73)
PGE	48	66%
PacifiCorp	25	34%
TOTAL	**73**	**100%**

The size of customers' estimated annual energy consumption was expressed in kWh for most of the entries in the Dun and Bradstreet database. Those entries for which kWh consumption was shown were divided into three groups – small, medium, and large consumers – that as closely as possible were equal in size. The sample of those interviewed was also divided into three groups using the same kWh (equivalently, MWh) cutoff points used for the overall population (Table 6.4). However, the amount of energy used by these businesses varies so greatly, the percentage of total annual MWh consumption represented by each group is disproportionate. Specifically, the small MWh group uses only 6%, while the medium and large groups use 15% and 79%, respectively, of the total MWh consumed by all the nonparticipants in the sample.

Table 6.4: Segmentation by Annual Electricity Consumption

GROUP WITH KNOWN KWH CONSUMPTION	SMALL (<1,500 MWH)		MEDIUM (1,500 – 6,000 MWH)		LARGE (>6,000 MWH)		TOTAL	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Population	598	50%	404	33%	207	17%	**1,209**	**100%**
Sample	23	39%	22	37%	14	24%	**59**	**100%**

Note: Annual kWh consumption data was missing for 22% of the population (n=339) and for 19% of the sample (n=14). Analyses that involve this segmentation excluded those cases.

Whenever appropriate, data were analyzed to examine whether there are statistical differences between the three groups. All significant differences are reported. In all other cases, aggregate data is reported.

Given the type of data, Chi Square was most frequently employed for the statistical tests. Since the sample size is fairly small (n=73), some analyses using the standard asymptotic method may violate underlying assumptions of Chi Square necessary for reliable results. Therefore, all the Chi Square tests employed the Exact Tests method, which provides a means for obtaining accurate results, even when the data fail to meet any of the assumptions.

RESPONDENTS' ROLES

When the first contact of each dialed number was reached, we requested to speak with the person who "knows the most about energy at this facility," in order to conduct the survey with the most appropriate person. In addition, we determined the role of the respondent in their organization by asking for the title that best described their job. Table 6.5 shows the summary of the respondents' roles.

Table 6.5: Roles of Respondents

TITLE	FREQUENCY	PERCENT (N=73)
General Manager	27	37%
Owner, President, CEO, COO	18	25%
Facility Manager, Environmental Manager	14	19%
Plant/Corporate Engineer	2	3%
Other	12	16%
TOTAL	**73**	**100%**

The remainder of the chapter is organized as follows:

- *Belief in Energy Reduction Opportunity*

- *Corporate Energy Management*
- *Training*
- *Barriers*
- *Awareness of Oregon Business Tax Credits (BETC)*
- *Awareness of Energy Trust and Production Efficiency Program*
- *Partial Participants*
- *Potential for Program Participation*
- *Program and Industrial Market Questions and Concerns*
- *Summary*

BELIEF IN ENERGY REDUCTION OPPORTUNITY

We first asked nonparticipants about their perception of energy-saving opportunities at their facilities. As shown in Table 6.6, the respondents generally were optimistic about the opportunities to reduce energy usage at their facilities. Twenty-eight percent of the respondents thought they had a "significant opportunity" and 48% said they had "some opportunity" to reduce energy use. However, 20% believe their facilities have "little" or "no opportunity" for future energy savings.

Table 6.6: Perceptions of Energy-Reduction Opportunities

OPPORTUNITY	FREQUENCY	PERCENT (N=73)
Significant Opportunity	20	28%
Some Opportunity	35	48%
Little Opportunity	12	16%
No Opportunity	3	4%
Don't Know	3	4%
TOTAL	**73**	**100%**

Generally speaking, there is widespread perception of energy-reduction opportunities, but these perceptions differ significantly depending on the size of the facilities. Customers with more than 100 employees were more likely to perceive energy-saving opportunities than customers with fewer than 100 employees (χ^2, $p<.05$). As Table 6.7 shows, 91% of the large customers had a positive perception, reporting there are "some" or "significant" opportunities for energy

reduction at their facilities, while 67% of the small customers had a positive perception of energy-reduction opportunities.

Table 6.7: Perceptions of Energy-Reduction Opportunities by Number of Employees

PERCEIVED OPPORTUNITY	SMALL (<100 EMPLOYEES)		LARGE (=>100 EMPLOYEES)		TOTAL* (N=70)	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Significant Opportunity	7	20%	13	38%	**20**	**29%**
Some Opportunity	17	47%	18	53%	**35**	**50%**
Little Opportunity	9	25%	3	9%	**12**	**17%**
No Opportunity	3	8%	0	0%	**3**	**4%**
TOTAL	**36**	**100%**	**34**	**100%**	**70**	**100%**

* *Don't Know* responses (n=3) were treated as a missing value.

Medium and large kWh consumers – and particularly the large kWh consumers – perceive more significant energy-savings opportunities than small kWh consumers (χ^2, $p<.05$). Almost half (46%) of the small customers said they foresee "little" or "no opportunity," whereas only a few medium (14%) and large (8%) kWh consumers perceive the opportunity this way (Table 6.8).

Table 6.8: Perceptions of Energy Reduction Opportunities by Electricity Consumption Segment

PERCEIVED OPPORTUNITY	SMALL (<1,500 MWH)		MEDIUM (1,500 – 6,000 MWH)		LARGE (>6,000 MWH)		TOTAL* (N=56)	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Significant Opportunity	2	9%	7	33%	6	46%	**15**	**27%**
Some Opportunity	10	45%	11	53%	6	46%	**27**	**48%**
Little Opportunity	7	32%	3	14%	1	8%	**11**	**20%**
No Opportunity	3	14%	0	0%	0	0%	**3**	**5%**
TOTAL	**22**	**100%**	**21**	**100%**	**13**	**100%**	**56**	**100%**

* There were 17 contacts whose kWh consumption values were missing or who provided *Don't Know* responses. These cases were treated as missing, therefore, n=56.

CORPORATE ENERGY MANAGEMENT

To assess the level of engagement in energy management at the corporate level, respondents were asked a series of questions related to activities to control energy use at their facilities. First, they were asked the extent to which electricity costs are controlled at their facilities. More than

half (54%) of the customers were engaged in some level of control activities; 40% said "actively engaged in controlling costs" and 14% said they were "planning to implement" energy-cost controls (Table 6.9). However, 39% of the customers reported their facilities had not taken any action to control energy costs and 35% had not even addressed the issue internally.

Table 6.9: Level of Activities to Control Electricity Costs

LEVEL OF ACTIVITY	FREQUENCY	PERCENT (N=73)
Actively Engage in Controlling Costs	29	40%
Planning to Implement Cost Controls	10	14%
Talk About It, But Haven't Taken Action to Control Costs	3	4%
Haven't Addressed	26	35%
Don't Use Enough Electricity to Warrant Controlling Costs	3	4%
Don't Know	2	3%
TOTAL	**73**	**100%**

When these responses were collapsed into two categories – *engaged in controlling costs* ("actively engaged" and "planning to implement") and *not engaged in controlling costs* ("talked about it, but haven't taken action" and "haven't addressed") – we found a significant difference in the level of engagement in electricity cost-control activities between small and large customers by employee size (χ^2, $p<.05$). As illustrated in Table 6.10, large customers are significantly more likely to be engaged in electricity-saving activities than small customers. More than half (57%) of the small customers have not yet done anything to reduce electricity costs.

Table 6.10: Level of Activities to Control Electricity Costs by Number of Employees

LEVEL OF ACTIVITY	SMALL (<100 EMPLOYEES)		LARGE (=>100 EMPLOYEES)		TOTAL (N=68)	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Engaged in Controlling Electricity Costs	15	43%	24	73%	**39**	**57%**
Not Engaged in Controlling Electricity Costs	20	57%	9	27%	**29**	**43%**
TOTAL	**35**	**100%**	**33**	**100%**	**68**	**100%**

Note: Do not use enough electricity to warrant controlling costs and Don't Know responses were treated as missing values.

Respondents were also asked the extent to which they engage in activities to control natural gas costs. Thirty-three percent of the respondents indicated they are "actively engaged" or "planning to implement natural-gas-cost control" (Table 6.11). Twenty-seven percent said they have not

taken specific actions or "haven't addressed" reducing gas costs. These findings are not statistically significant.

Table 6.11: Level of Activities to Control Natural Gas Costs

LEVEL OF ACTIVITY	FREQUENCY	PERCENT (N=73)
Actively Engage in Controlling Costs	21	29%
Planning to Implement Cost Controls	3	4%
Talk About It, But Haven't Taken Action to Control Costs	6	8%
Haven't Addressed	14	19%
Don't Use	5	7%
Don't Use Enough Natural Gas to Warrant Controlling Costs	20	27%
Don't Know	4	6%
TOTAL	**73**	**100%**

Overall, roughly two-thirds (70%) of the nonparticipants reported activities at their firms to control energy consumption. Among those, purchasing energy-efficient equipment was the activity most commonly undertaken; 57% of the customers who attempted to control energy use reported such purchases within the last two years (Table 6.12). The number of respondents with medium-to-large annual kWh consumption who have made energy-efficient equipment purchases statistically outnumber respondents with small kWh consumption who had made such purchases (χ^2, $p<.05$). For customer segmentation by number of employees, a similar significant finding was observed – customers with large numbers of employees have made significantly more energy-efficient equipment purchases than firms with few employees (χ^2, $p<.05$).

Tracking energy use was the next most frequently reported activity, done by 47% of the customers who attempted to control energy use. Most (92%) of those customers reported their energy tracking is carried out monthly, while 4% said daily, and 4% conduct energy tracking randomly. Other activities to control energy use are: developing an asset management system (31%), assigning a staff member who is responsible for energy use (29%), and conducting plant-wide energy audits (24%). Less commonly implemented approaches are behavior changes, such as turning lights off (18%), energy assessments of specific equipment systems (16%), developing corporate policies for energy efficiency (12%), creating a committee that addresses energy use (10%), developing an energy plan (8%),[30] and using a scorecard to track key energy performance indicators (6%). Other reported activities included weatherization (three mentions) and

[30] Three of the four who said they have an energy plan told us their plans include numerical goals. Two of the three reported respective goals of a 5% reduction from the previous year and a 14% reduction over three years.

(mentioned once each): heat collection, leak detection for compressed air, rewiring old wiring, installing self-closing doors, and photovoltaic installation.

Table 6.12: Specific Activities Undertaken to Control Energy Consumption (Multiple Responses Allowed)

ACTIVITY	FREQUENCY	PERCENT (N=51)*
Purchased Energy-Efficient Equipment	29	57%
Track Energy Use	24	47%
Developed an Asset Management System	16	31%
Have a Staff Member Responsible for Energy Use and Efficiency	15	29%
Conducted a Plant-Wide Energy Assessment (Audit, Engineering Review)	12	24%
Behavior Changes	9	18%
Conducted an Energy Assessment of Specific Equipment Systems	8	16%
Have Corporate Policies for Energy Efficiency Regarding Procurement or Operations	6	12%
Have a Committee or Team that Addresses Energy	5	10%
Have an Energy Plan	4	8%
Have an Energy Scorecard to Track Key Performance Indicators for Energy	3	6%
Other	8	16%

* This was asked only if the respondents said "actively engaged" or "planning to implement" regarding their efforts to control electricity or natural gas costs, therefore, n=51.

Note that, while the proportion is smaller among nonparticipants than participants of having an assigned staff member responsible for energy use (29% versus 50%), the proportion is large enough to warrant a marketing policy directed to forming relationships with energy managers.

Findings of significance between segments were observed in several energy-control activities – energy-efficient equipment purchase, development of an energy plan, corporate policies for procurement and operations, and an asset management system. In all of these areas, large facilities with many employees that use greater kWh are more likely to have adopted such methods as compared with smaller facilities (χ^2, $p<.05$).

In addition, we assessed the extent to which the respondents utilize other methods frequently applied at industrial facilities for continuous facility improvements, such as ISO protocols, Six Sigma, and Total Quality Management (TQM). Awareness levels of all three methods are similar, ranging from 64% to 70% of the respondents (Table 6.13), but ISO protocols (19%) and Six Sigma (16%) are slightly more widely implemented than TQM (10%). A Chi Square test

found significant differences in all three methods by size of the respondents' facilities, both by employee size and by kWh consumption. Awareness of and implementation rates for these methods are significantly lower among the small organizations, measured both by employee size and kWh consumption (χ^2, $p<.05$).

Table 6.13: Awareness and Use of Facility Improvement Methods

AWARENESS OR USE	ISO (9000/14000) PROTOCOLS		SIX SIGMA		TOTAL QUALITY MANAGEMENT (N=73)	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Heard of It	29	40%	27	37%	**37**	**51%**
Tried It	1	1%	1	1%	**0**	**0%**
Doing It	14	19%	12	16%	**7**	**10%**
Planning on Doing It	1	1%	1	1%	**0**	**0%**
Not Considering It	6	8%	6	8%	**4**	**5%**
Never Heard of the Method	22	30%	26	36%	**25**	**34%**
TOTAL	**73**	**100%**	**73**	**100%**	**73**	**100%**

Respondents also shared other facility improvement methods their firms have or were engaged in. Twenty percent mentioned Lean Manufacturing, 5s, or Kaizen (Table 6.14). Nine percent mentioned their facility had developed its own facility improvement method, often based on common facility improvement methods, such as the ISO Protocols, TQM, or Lean Manufacturing. Continuous Improvement, Just in Time, Theory of Constraint, and an unspecified EMS were also mentioned once each.

Energy management initiatives, as well as other facility improvement practices, are more widely adopted by customers with large facilities. Yet, these practices have penetrated only half of the industrial sector overall. Rigorous control methods that address specific reduction goals have not gained wide acceptance.

Table 6.14: Other Facility Improvement Methods (Multiple Responses Allowed)

FACILITY IMPROVEMENT METHOD	FREQUENCY	PERCENT (N=73)
Lean Manufacturing, 5s, or Kaizen	15	20%
Personalized Program	7	9%
Continuous Improvement	1	1%
EMS	1	1%
Just in Time	1	1%
Theory of Constraint	1	1%

TRAINING

The survey attempted to determine the extent to which interest in energy efficiency in the industrial sector is integrated into corporate policy through training. We asked the respondents whether formal training is offered to their staff in specific areas that relate to energy-using equipment and processes.

Few respondents reported providing such training for specific equipment or processes. Eleven respondents reported seven different types of training provided to their staff. These were training in heating, compressed air systems, electrical generation, fan systems, motor management, and pumps. Safety and emergency preparedness trainings were mentioned most often. Seven of the eleven who said they provide some types of training reported that it is "somewhat" or "very" important the trainings they offer to their employees address energy use and efficiency.

A majority of the respondents (86%) reported no formal training about energy-using equipment or energy-related processes is provided to their employees. These types of training are provided significantly less at small organizations (both by employee size and kWh consumption; χ^2, $p<.05$).

BARRIERS

Commonly reported barriers to the adoption of energy management practices were identified as unawareness of energy efficiency issues and incentive programs, capital constraints, and a perception of already doing enough to control energy use (Table 6.15). About two-fifths (39%) of respondents mentioned lack of awareness of energy efficiency issues and of incentive programs. This included responses such as, "Nobody has stepped up to take charge of energy reduction," insufficient "knowledge of programs available to give incentives for energy-efficient equipment purchases," and "staff not taking actions to reduce energy use (turning off lights, etc.)." Other barriers mentioned frequently were capital constraints which prohibit energy-

efficient equipment purchases (28%) and respondents' perception they already were doing all that could reasonably be done to control energy costs (25%).

Table 6.15: Primary Barriers to Improving Energy Management Practices (Multiple Responses Allowed)

BARRIER	FREQUENCY	PERCENT (N=71)
Unaware of Energy Efficiency Issue and Incentive Programs	28	39%
Capital Constraints	20	28%
Already Taking Action	18	25%
Time Constraints	8	11%
Unattractive Payback for Energy-Efficient Equipment	8	11%
Management and Corporate Policy Issues	7	10%
Don't Use Much Energy	6	8%
Energy-Efficient Equipment Not Available	5	7%
Understaffed	4	6%
Building Issues	3	4%
Old Equipment Still Functioning Fine	3	4%
Small Business Concerns	3	4%

Note: The frequencies result from coding of open-ended questions. *Nothing* or *None* answers were excluded.

The two most popular types of external support respondents would find most valuable to improve energy efficiency at their facilities are types of incentives. Forty-five percent of those reporting said incentives for energy-efficient equipment would be valuable, and 42% said incentives for process/plant improvements or upgrades for efficiency would be valuable (Table 6.16). Receiving information on energy management best practices (39%) and other new energy efficiency information at industry events (27%) are also perceived as highly valuable. Assistance to help conduct technical studies of equipment or processes was considered valuable, mainly by organizations with a large number of employees (χ^2, $p<.05$). Provision of specialized technical training (10%) and forums on energy efficiency at industrial events (3%) were the least favored types of support.

The reports of trainings offered indicate energy efficiency generally has not become urgent enough for these industrial customers to incorporate training in their corporate policies. Many said their biggest obstacles to pushing an energy efficiency agenda are the lack of awareness of the issue and the lack of availability of subsidies, which may constrain their capital ability even more. On the other hand, incentive programs are the most valued external support and this can fill the gap between the respondents' barriers and their pursuit of energy efficiency activities.

Table 6.16: Most Valuable External Support to Improve Energy Efficiency Features (Multiple Responses Allowed)

EXTERNAL SUPPORT	FREQUENCY	PERCENT* (N=68)
Incentives for Energy-Efficient Equipment	30	45%
Incentives for Efficient Process Improvements or Plant Upgrades	28	42%
Information on Energy Management Best Practices in Industry	26	39%
New Information on Energy Efficiency at Industry Events	18	27%
Technical Studies of Equipment or Processes	16	24%
Specialized Technical Training in System or Facility Operations	7	10%
Forums on Energy Efficiency at Industry Events	1	2%

* Respondents were asked to choose the two options they find most valuable. We created a multiple response set in order to include only those who reported their preferences. Of the 73 respondents, 68 provided at least one option they feel is valuable.

AWARENESS OF OREGON BUSINESS ENERGY TAX CREDITS (BETC)

Oregon Business Energy Tax Credits (BETC) are provided by the Oregon Department of Energy to businesses that invest in energy conservation, recycling, renewable energy resources, and less-polluting transportation fuels.

Overall, 70% of the respondents were aware of BETC (Table 6.17). Further questions were asked as to whether they were aware that BETC is applicable for natural gas efficiency, as well as for renewable energy projects. Only 22% of the respondents knew BETC addresses natural gas efficiency and 32% knew renewable energy projects are eligible for the program. The responses to the question about the renewable energy tax credits varied considerably between PGE and PacifiCorp customers (χ^2, $p<.05$). PacifiCorp customers are significantly less aware of this component of the BETC program than are PGE customers.

Table 6.17: Awareness of Oregon Business Energy Tax Credits (BETC)

AWARENESS OF BETC	FREQUENCY	PERCENT (N=73)
Overall Awareness of BETC	51	70%
Aware BETC Is Applicable for Natural Gas Efficiency (n=51)	16	22%
Aware BETC Is Applicable for Renewable Energy Project (Combined Heat and Power, Solar Electric, and Bio Power) (n=51)	23	32%

Note: Only those who were aware of BETC were asked the two follow-up questions regarding its applicability (n=51).

AWARENESS OF ENERGY TRUST AND THE PRODUCTION EFFICIENCY PROGRAM

Sixty-seven percent of the nonparticipant respondents knew about Energy Trust (Table 6.18). Customers whose kWh consumption was small were least aware of Energy Trust and customers with medium consumption of kWh were most aware of it (χ^2, $p<.05$). However, regarding awareness of Energy Trust, the high number of refusals (48) and the low response rate (28%) suggest the sample differed from the remainder of the nonparticipant population. That is, the percentage of interviewed nonparticipants who reported awareness of Energy Trust may be higher than is true for the general population of nonparticipants due to a self-selection bias. Those who agreed to be interviewed may have been more likely to do so because they recognized the name Energy Trust or because they have an interest in the services it offers.

Table 6.18: Awareness of Energy Trust and Production Efficiency Program (Multiple Responses Allowed)

AWARENESS	FREQUENCY	PERCENT (N=73)
Energy Trust of Oregon	49	67%
Production Efficiency Program	6	8%

Even so, only 8% (six) of all of the respondents reported they had heard about the Production Efficiency program. Of the six respondents who had heard of the program, half of them learned about it in the last two years, while the other half had known about it for more than two years. The respondents who knew about the Production Efficiency program said they first learned about the program through program representatives (two), their vendors (two), a utility representative (one), and in an unspecified other way (one).

PARTIAL PARTICIPANTS

Only three respondents said they started to participate in the Production Efficiency program but did not continue for some reason.[31] Two of them said they did not continue because the incentive amount was not sufficient to meet their firms' investment criteria and one respondent withdrew due to a concern about insufficient payback. All of them began their participation after 2005.

POTENTIAL FOR PROGRAM PARTICIPATION

This section examines the potential for participation in the Production Efficiency program by customers who have not participated in any Energy Trust programs.

[31] Participation was defined as anything from seeking out information about the program to planning an equipment purchase.

About one-third (34%) of the nonparticipant respondents had applied for or received an incentive or tax credit for energy efficiency improvements at their facilities (Table 6.19). Of these, 56% whose electricity provider is PGE said they had applied for or received incentives from their utility. Forty-three percent of the customers who receive electricity from PacifiCorp had applied for or received incentives from their utility. More than half of the respondents (56%) who had experience with incentive programs said they had applied for or received tax credits from BETC. Most commonly, these respondents had applied for such incentive programs more than two years ago (64%).

Table 6.19: Company Applied for or Received an Energy-Efficiency Incentive or Tax Credit

	FREQUENCY	PERCENT (N=73)
Yes	25	34%
No	42	58%
Don't Know	6	8%
TOTAL	**73**	**100%**

We also asked the respondents whether they had purchased energy-efficient equipment within the past two years. Respondents who had applied for or received the BETC for energy efficiency improvements in the past two years were included in this analysis, since it is reasonable to assume they also have made such a purchase. When these respondents are included, 42% of the respondents have made energy-efficient equipment purchases in the past two years (Table 6.20).[32]

Seven respondents described instances in which they had applied for BETC within the past two years, providing us with information about the types of projects they have done since the Production Efficiency program came into existence. Projects included three lighting projects, two boilers, a compressor project, and a piece of equipment to assist with recycling. Four other respondents described projects they had done in which they applied for BETC funding more than two years ago; therefore, the projects might have been done before the Production Efficiency program came into existence. Those projects included four lighting projects, two air compressors, and a wastewater treatment project (some respondents had more than one project).

[32] The survey inadvertently included a duplication: in both questions Q10 and Q40 respondents were asked if they had purchased energy-efficient equipment in the last two years. We note the answers are inconsistent, with 57% responding "yes" to Q10 and 42% responding "yes" to Q40. Cross-tabulation of these answers gives 46% responding "yes" to both questions, 40% responding "no" to both questions, and 14% giving contradictory responses to the two questions.

Table 6.20: Recently Purchased Energy-Efficient Equipment

INDICATOR	FREQUENCY	PERCENT (N=73)
Applied or Received BETC in the Last Two Years	9	12%
Purchased Energy-Efficient Equipment During Past Two Years	22	30%
Neither of the Above	42	58%
TOTAL	**73**	**100.00%**

Among those who explicitly reported they had not made recent energy-efficient equipment purchases, the most common reason (50%) for not doing so was simply no equipment of any kind was purchased during the past two years (Table 6.21). Twenty-nine percent of those who responded said they were not aware of energy-efficient options for the equipment. Four (17%) respondents said they were not thinking about energy efficiency when the purchase was made or energy efficiency has not been a business priority. Some notable "other" responses were that equipment was purchased through a contractor, only used equipment is purchased, and performance and functionality override energy efficiency.

Table 6.21: Reasons for No Energy-Efficient Equipment Purchases in the Past Two Years (Multiple Responses Allowed)

REASON	FREQUENCY	PERCENT (N=24)
No Equipment Purchases	12	50%
Not Aware of Energy-Efficient Options for Equipment Purchased	7	29%
Not Thinking of Energy Efficiency / Energy Efficiency Not a Priority	4	17%
Other	5	21%

Among the respondents who recently purchased energy-efficient equipment, only 28% have applied for or received any type of incentive or tax credit for their new equipment. This means more than 70% of the respondents purchased new energy-efficient equipment without external capital subsidies. When asked why they did not utilize financial incentives, 29% reported they were not aware of the availability of incentive programs for energy-efficient equipment, 24% thought their equipment did not qualify for incentives, and others said they thought the incentive amount would be too little or their equipment cost too small to seek external financial supports (12%).[33]

[33] The comments of those who did not apply for financial incentives for "other" reasons were coded, and added to this analysis, bringing the number of respondents who reported a reason to 17.

PROGRAM AND INDUSTRIAL MARKET QUESTIONS AND CONCERNS

After having been read a description of the Production Efficiency program, respondents were asked if they had questions or concerns about potential participation. About two-fifths (30 of 73, or 41%) of the nonparticipant sample expressed a question or concern. The greatest percentage of respondents (11%) said that they did not have any specific questions or concerns about program participation – they simply needed all the details on the program (Table 6.22). Other questions included whether there was a charge to participate in the program (8%) and wondering what the benefits of participation were (8%). Twelve respondents explicitly said they were interested in participating in the program, while five said they were not at all interested in participating.

Table 6.22: Most Frequent Questions About Participating in the Production Efficiency Program (Multiple Responses Allowed)

QUESTION	FREQUENCY	PERCENT (N=73)
None, but I would like program details.	8	11%
Do you charge for participation?	6	8%
What are the benefits to participation?	6	8%
Can I get an audit?	5	7%
Can I get someone to talk to me?	3	4%
If purchasing equipment, when do I call?	2	3%

As shown in Table 6.23, the primary concern raised by participants regarding program participation was the workload required to apply or participate in the program (15%). The next most frequently mentioned concern was the cost of incented equipment (8%).

Table 6.23: Most Common Concerns about Participating in Production Efficiency Program (Multiple Responses Allowed)

CONCERN	FREQUENCY	PERCENT (N=73)
Workload Required to Apply or Participate	11	15%
Cost of Equipment	6	8%
Management Approval	3	4%
Energy Trust Will Be Too Involved with Project Management	3	4%
Need Industry-Specific Information	2	3%

More than four-fifths (61 of 73, or 84%) of the nonparticipants expressed some concern about their business or industry (Table 6.24). The greatest percentage of respondents (25%) cited the

health of the market. Most respondents who expressed concerns about the market were simply concerned about having enough business to stay viable. The second most frequently mentioned concerns were about the cost or availability of energy (19%). Most of these were concerns about the increasing costs of energy and finding ways to mitigate that cost. Labor also was a concern mentioned by 15% of respondents, with healthcare costs, and finding and retaining a qualified work force identified as specific sub-concerns.

Table 6.24: Concerns about Respondent's Industry (Multiple Responses Allowed)

TOPIC ADDRESSED IN COMMENTARY	FREQUENCY	PERCENT (N=73)
Health of the Market	18	25%
Energy (Cost, Availability)	14	19%
Labor	11	15%
Supply Costs	9	12%
Keeping Costs Down	8	11%
Foreign Competition	7	10%
Maintaining Efficiency of Production	7	10%
Meeting Product Demand	4	5%
Regulations (Safety, Environmental)	4	5%
Maintaining Customer Satisfaction	3	4%
Equipment Maintenance	2	3%
Safety	2	3%

SUMMARY

Among industrial customers who have not participated in Energy Trust programs, there is a widespread perception of energy-reduction opportunities. Roughly two-thirds of the nonparticipants reported some level of activity at their firms to control energy consumption, most commonly by installing more energy-efficient equipment and by tracking energy use. However, the penetration rate of corporate-level active engagement is about half that of the industrial sector and rigorous control methods have not yet gained much acceptance. Low involvement in training activities also manifests low interest in energy management at the corporate level.

Most frequently reported obstacles to an energy efficiency agenda at nonparticipants' firms are lack of awareness of the issue, lack of availability of subsidies, and capital constraints. On the other hand, incentive programs are by far the most valued external support, which may provide a vital opportunity to overcome the barriers to greater energy efficiency activities.

A moderately high percentage of the respondents had heard of BETC or Energy Trust. However, awareness of specific program offerings is low. Only about a third of the nonparticipant respondents had applied for or received an incentive or tax credit for energy efficiency improvements at their facilities in the last two years. Furthermore, although about half of the respondents reported having purchased energy-efficient equipment in the last two years, most of it was bought without external capital subsidies. It seems these unsubsidized purchases result from a lack of awareness and knowledge of incentive programs and specific program offerings.

The greatest area of concern expressed about prospective program participation was the workload required to apply or participate. Few respondents seem to have confusion about the program, but many wished to know more about the program details.

In addition, customers with larger-scale operations are more likely to pursue an energy efficiency agenda. Their energy usage and costs are usually much larger; thus, energy efficiency seems more urgent to them. They are more aware of energy efficiency issues, more knowledgeable about available external capital supports, and more likely to engage in control activities.

It appears the Production Efficiency program is well-designed to meet the needs expressed by interviewed nonparticipants. They are concerned about energy, believe there are opportunities at their facilities for saving energy, and are taking some efficiency actions. Some firms have assigned to a staff member responsibility for energy management. Some firms are involved in continuous improvement programs. They would appreciate information on how to save energy and incentives to facilitate efficiency projects.

7 IMPACT ANALYSIS

This chapter describes the approach to and results of the impact evaluation. It includes a description of savings adjustments made to account for operational changes to the uses of some installed measures, and a discussion of the program's free-ridership and spillover effects.

IMPACT SUMMARY: PROGRAM REALIZATION AND NET-TO-GROSS RATIO

The 157 project sites comprising the population from which the on-site visit sample was drawn had a combined recorded savings of 71,984,735 kWh (Table 7.1). The measured and deemed savings for these projects totaled 73,136,251 kWh, for a realization rate of 101.6%. The analysis found a free-ridership rate of 20.1%, for a net-to-gross ratio of 79.9%. Participants reported taking actions that constitute program spillover, generating both electricity and natural gas savings, but the current research was not able to estimate the magnitude of the savings. (Appendix A provides the details of the methods and a listing of spillover equipment installed.)

Table 7.1: Gross and Net Electricity Savings from the 2006 Production Efficiency Program

INDICES OF PROGRAM SAVINGS	VALUE
Working Estimate of 2006 Savings	71,984,735 kWh
Realization Rate	101.6%
Gross Savings Estimate	73,136,251 kWh
Free-Ridership Estimate*	17.6%
Net Savings Estimate	60,242,106 kWh
Net-to-Gross Ratio	82.4%
Net Savings as a Percent of Working Savings	83.7%

* This estimate is the mid-point of a free-ridership range estimated for the program.

IMPACT EVALUATION METHODOLOGY

As for the previous impact evaluation, a relatively small number of customer sites realized the majority of the energy savings. Therefore, to include projects representing the bulk of the savings, sites at which projects were recognized in 2006 were stratified by their savings. The 70 largest projects – representing 92% (65,882,380 kWh) of 2006 savings – comprised the "certainty sample" and were slated for site visits, with the intention of completing about 60 visits.

Four sites declined visits and five other sites were not included due to their geographic remoteness. The remaining 61 records represented 65 projects because in four cases there were two separate physical sites with different projects for measures entered in Energy Trust's *FastTrack* database as the same location. For example, a wastewater treatment and a fresh-water plant were entered as the same site. In October 2007, the team made site visits to the 65 industrial sites; projects included compressed air, refrigeration, motor systems, pumps, fans, and process modifications. The 65 site visits were conducted by Strategic Energy Group (47 site visits), assisted by WTR Consulting Engineers (18 site visits).

An additional customer targeted for a site visit had completed projects in both 2005 and 2006, and had received a site visit in 2005. We conducted a phone survey with this customer as part of the impact study of 2006 projects, and have included it in the site-visit group. Thus, the impact sample size is 66. The reported energy savings for the site-visit group totaled 63,963,306 kWh, or 89% of total 2006 program savings.

On-site data collection activities included a walk-through to make a visual assessment of the installed measures and to obtain relevant data from single measurements by the installation of data-loggers or from the participants' monitoring systems. Site visits also included interviews to understand project decision-making and participant program experiences.

From the next largest group in terms of energy savings, the two largest projects were selected for site visits to replace two projects in the first group that were unavailable to study. Telephone surveys of most of the remaining contacts in the second, mid-sized, group asked the same interview questions that were posed during site visits. These interview and telephone survey data provided the basis for project-specific free-ridership estimates.

The remaining group of projects – the smallest projects in terms of number and energy savings, consisting mostly of prescriptive lighting and motor projects – was not formally analyzed.

EVALUATION SITE VISITS

The preparation and procedure for gathering project data and verifying operating conditions through the site visits involved several steps. Before conducting each site visit, evaluators examined available project reports, including the original energy study and any available follow-up documents verifying savings. Prior to a visit, the engineer leading the impact work also met with the appropriate Program Delivery Contractor (PDC) to discuss the project. Then, after scheduling an appointment, the field evaluator met with a facility staff person familiar with the efficiency project under review.

Each site visit typically included:

- A walk-through of the facility, focusing on the installed energy efficiency measures;
- An interview with the staff person to complete a survey focused on the company's decision-making and planning related to the installed energy efficiency measure;

- Where possible, collection of data from the participants' own process monitoring systems; and
- Where appropriate and practical, installation of short-term metering by the evaluator.

The following types of data were gathered through the site visits:

- Presence or absence of the installed measures and components;
- Any differences between the documented energy efficiency measures and those observed on-site;
- Any modifications to the production process or changes in the production schedule that might affect the efficiency measures;
- Any differences between the documented operating parameters for the energy efficiency measures and those observed; and
- Evidence of free-ridership. (As part of the site visit, a survey was administered, asking customers a series of questions about the likelihood that they would have installed the efficiency measures in the absence of the program's incentives and services.)

The field engineers used the gathered information to make adjustments to the reported energy savings and to calculate the project's realization rate and free-ridership score. The methodologies employed to make these adjustments varied from site to site and depended upon the particular production process, the types of energy efficiency measures, and other site-specific circumstances.

Motor projects and some of the lighting efficiency projects were not formally evaluated. For these measures, imputed realization rates of 77.4% and 93.2%, respectively, were applied.[34]

It was not possible to calculate energy savings for every project, most often due to the lack of performance or energy-use data for a project. For example, for measures with seasonal variation (such as refrigeration system upgrades), energy use can only be determined from a full year of performance data. The needed data are occasionally, but not always, available from refrigeration control systems. Without long-term performance or energy-use data, energy savings could not be estimated. In this evaluation, there were eleven sites that had either very limited or no long-term performance data available.

Energy savings for the projects at the sites visited ranged from 246,460 kWh to 3,432,306 kWh (the team was not able to visit the two largest sites). To confirm the reliability of the kWh savings data, it was noted in all cases that the incentivized equipment was currently operational

[34] Imputed realization rates for motors and lighting are from *Building Efficiency Program: Process & Impact Evaluation,* for Energy Trust by Research Into Action, Inc., December 30, 2005.

and in use. Likewise, production levels and shift schedules were noted. If the project was in place and operating as expected, the savings were deemed to be as estimated in the energy study.

ENGINEERING ESTIMATES

The primary intention of gathering on-site data was to make a reliable estimate of the annual energy use of individual efficiency projects. The difference between measured annual energy use and annual baseline energy use (provided in the energy study) was calculated as annual energy savings.

Data Gathering/Metering

Five data-gathering/data-logging approaches were used:

1. Gathering information on measure parameters (particularly operating hours)
2. One-time measurements for projects with small variations
3. Single-phase, current-only data-logging, typically for two weeks
4. True-power data-logging, usually for two weeks
5. Calculations based on customer-provided data from their SCADA system or internal records

The most important measure parameter collected was operating hours. We made inquiries about typical weekly schedules and the annual operating schedule, noting where operating hours were substantially different from baseline assumptions. For example, many wood product plants have had market shutdowns and reduced their shifts. We made savings calculations based on the efficiency of the measure installed (see the subsequent discussion of efficiency versus conservation).

We used one-time measurements on several occasions where the load and schedule did not vary, or where the load was small (for example, less than 30 HP).

Single-phase, current-only data-logging was used where loads and schedules varied, and for linear loads (typically not variable frequency drives – VFDs). This logging equipment was easy and relatively safe to install and remove, and it fit inside all but the smallest disconnect.

True-power data-logging was used for VFD and other projects needing accuracy beyond that provided by single-phase equipment. We did not insist on using true-power equipment if the customer was not comfortable doing the installation or if it was unsafe. In some cases, the site, the electrical panels, or the site staff may not have been able to handle the use of the multiple-current transformers and voltage probes used for true-power data-logging. We used single-phase current data-logging if there was any doubt or issue.

Customers sometimes provided time-series data on motor power, current, or operating hours from their internal records. We obtained this information from paper logs, SCADA systems, and sometimes from a third-party vendor if the customer did not know how to access their own data.

Lighting Efficiency

We formally evaluated a small number of lighting efficiency projects when the savings were over about 250,000 kWh/year or when we were already at the site for evaluation of other measures. Typically, verification and assessment of energy-efficient lighting projects simply involved gathering information on operating hours and confirming the count of new fixtures. However, in some cases, we installed lighting data-loggers that recorded light levels to confirm the operating schedule or to understand the dynamics of occupancy sensors.

Engineering Estimates

All engineering estimates of energy savings were made using calculations embedded in *Excel* worksheets. A standard template enabled the use of uniform assumptions and calculation methods across the field engineering team, especially for the majority of sites where data-logging was conducted. We applied consistent assumptions for power factor when single-phase current measurements were used. In the majority of cases, actual voltage was measured to avoid making assumptions about plant service voltage. In situations where customer data was provided, we tracked over time either hours of operation, motor current, or actual energy use. We summarized these data into annual energy use for the equipment or system. For all calculations, annualized energy use was compared to the baseline and predicted usage for the equipment or system under investigation, as described in the original energy studies.

IMPACT EVALUATION RESULTS

The 157 project sites comprising the population from which the on-site visit sample was drawn had a combined recorded savings of 71,984,735 kWh. The measured and deemed savings for these projects totaled 73,136,251 kWh, for a realization rate of 101.6%.

We reviewed and revised the end-use codes used for all 2006 projects. Based on work for the previous 2003-2005 evaluation, we prepared the following formal end-use descriptions that may be considered for use by program staff. Except for lighting and motors, efficiency projects for any of the end-uses below could also include upgrades to efficient electric motors.

- **HVAC** – Heating, ventilation and air conditioning equipment and controls for people-occupied spaces, including cleanrooms
- **Hydraulics** – Hydraulic pumping, systems, and controls
- **Wastewater** – Wastewater treatment plants, including controls, pumping stations, and bio-solids

- **Irrigation** – Water pumping and controls for crop irrigation
- **Fresh Water** – Fresh water treatment plants, including pumping stations
- **Refrigeration** – Cold storage, product cooling, and controlled-atmosphere storage, not including direct process chilling and people-occupied space cooling
- **Motors** – Electric motors (motor only, not related systems)
- **Lighting** – General interior and task lighting
- **Compressed Air** – Compressed air systems, including compressors, air treatment, distribution systems, controls, and compressed air end-use modification
- **Process Pumping** – Pumping for industrial process, not including irrigation, wastewater, and fresh water
- **Process Modification** – Direct process modification, particularly those not covered by other end-use descriptions
- **Process Fans** – Fans for process, not including pneumatic conveyance and HVAC
- **Pneumatic Conveyance** – Dust collection, product transportation (grain, chips, etc.); includes discharge treatment (bag houses and precipitators); projects that convert to conveyors from pneumatic systems would be included here also

Using these descriptions, the breakdown of savings for the 2006 projects by end-use is shown in (Table 7.2). The end use with the greatest savings was compressed air with 18,699,718 kWh in gross savings. Realization rates for 2006 end-uses ranged from 136.8% for compressed air projects to 77.4% for motors and 77.3% for process pumping projects, with an overall realization rate of 101.6%, as previously mentioned.

Table 7.2: Savings from 2006 Production Efficiency Projects by End-Use

END-USE CATEGORY	WORKING SAVINGS, KWH	REALIZATION RATE	GROSS SAVINGS, KWH	NUMBER OF PROJECTS	PERCENT OF TOTAL PROGRAM SAVINGS
Compressed Air	13,673,151	136.8%	18,699,718	49	18.99%
Fresh Water	2,903,039	119.1%	3,457,957	9	4.03%
HVAC	4,511,715	93.8%	4,231,703	17	6.27%
Hydraulics	166,917	100.0%	166,917	1	0.23%
Lighting	10,304,646	94.6%	9,752,027	313	14.32%
Motors	1,281,655	77.4%	992,001	152	1.78%

Continued

END-USE CATEGORY	WORKING SAVINGS, KWH	REALIZATION RATE	GROSS SAVINGS, KWH	NUMBER OF PROJECTS	PERCENT OF TOTAL PROGRAM SAVINGS
Pneumatic Conveyance	4,732,126	110.3%	5,221,219	13	6.57%
Process Fans	310,078	85.1%	263,898	1	0.43%
Process Modification	11,190,777	88.5%	9,907,803	9	15.55%
Process Pumping	9,951,954	77.3%	7,690,012	18	13.83%
Refrigeration	3,488,624	96.8%	3,375,527	14	4.85%
Waste Water	9,470,053	99.0%	9,377,714	13	13.16%
TOTAL PROGRAM	**71,984,735**	**101.6%**	**73,136,496**	**609**	**100.00%**

Municipal projects, comprised predominantly of fresh and wastewater treatment facility upgrades, had the largest savings by industry type in 2006, with gross savings of 12,955,206 kWh (Table 7.3). Viewing 2006 realization rates by industry reveals rates ranging from 124% for wood products to 81% for pulp and paper industry projects.

Table 7.3: Savings from 2006 Production Efficiency Projects by Industry

END-USE CATEGORY	WORKING SAVINGS, KWH	REALIZATION RATE	GROSS SAVINGS, KWH	NUMBER OF PROJECTS	PERCENT OF TOTAL PROGRAM SAVINGS
Agricultural	1,168,958	100%	1,168,958	16	1.62%
Distribution	1,155,362	97%	1,115,939	13	1.61%
Electrical Generation	7,953,674	72%	5,725,728	2	11.05%
Food Processing	4,026,962	99%	3,977,288	53	5.59%
General Manufacturing	12,560,765	95%	11,965,539	194	17.45%
High Tech	5,178,101	89%	4,605,707	16	7.19%
Metals	275,238	100%	275,238	3	0.38%
Municipal	12,527,530	103%	12,955,206	31	17.40%
Printing	11,274	93%	10,507	7	0.02%
Pulp & Paper	5,537,544	81%	4,505,269	27	7.69%
Wood Products	21,589,327	124%	26,831,117	247	29.99%
TOTAL PROGRAM	**71,984,735**		**73,136,496**	**609**	**100.00%**

We also analyzed the realization rates for projects by size, as measured by project kWh savings. We looked at three size groups (small, medium, and large), generated by two approaches: the same number of firms in each group and the same quantity of savings in each group. Neither of these two approaches showed significant differences by size of project among project realization rates.

Deferred Visits

As occurred during the previous evaluation, some customers indefinitely deferred cooperation with this evaluation. These sites included a microelectronics facility, a wood products plant, and two machinery plants. The first would not take time for the evaluation and the second was undergoing a major plant expansion and also would not take the time; for the last two, staff turnover had occurred and the current managers did not know the projects (lighting upgrades) had taken place. Deemed energy savings for these four sites represent 2.7% (1,972,301 kWh) of the total 2006 program savings.

Conservation versus Efficiency

The Production Efficiency program focuses on projects that improve the overall efficiency of delivered services – for example, reduced kWh per cubic foot of compressed air or kWh per gallon of water pumped. Conservation – that is, operational changes that do not reduce facility output – can also be considered. However, conservation must be distinguished from operational changes made to modify production output. For a number of projects in this evaluation, the latter kind of operational change contributed to apparent savings. For example, plants previously operating two shifts had experienced decreased demand for their products and were operating just one shift when studied.

We differentiated projects with changes in operating hours, identifying the energy savings as resulting from conservation or from market forces, rather than from efficiency. Adjustments were made for those few situations where customers reported changes in shifts or hours of operation that changed savings estimates. Savings on eight projects were adjusted (seven downward and one upward) due to changes in production hours.

Besides their presentation in Table 7.4, no other changes were made to the savings or realization rates in the evaluation database. To recalculate the current savings, the baseline and savings estimates were redone. However, for the working kWh (a given from the Energy Trust *FastTrack* database), we did not include these changes in the program results summary. The total savings adjustment is about 3.4% of the total program savings.

Table 7.4: Conservation versus Efficiency Adjustments

PROJECT NUMBER	SITE ID	INDUSTRY	MEASURE DESCRIPTION	RR CHANGE	KWH SAVINGS CHANGE
PE0238	Not assigned	Fresh Water Treatment	Pumping hours adjusted for 10% increase in production	168% → 81%	-14,158
PE0781	S00001214769	Parts Manufacturer	Production hours reduced due to market conditions	141% → 124%	-44,512
PE1011	S00001288757	Electronics	Third shift is running more often than during the study period	80% → 100%	+101,900
PE0719	S00001213075	Transportation Manufacturer	Baseline adjusted as half of production has moved offshore	162% → 100%	-350,619
PE0677	S00000116018	Wood Products	Baseline adjusted for 20% decrease in production	136% → 112%	-250,895
PE0569	S00001125167	Wood Products	Baseline adjusted as three shifts reduced to one	178% → 120%	-738,940
PE0516	S00000115435	Wood Products	Seven-day per week operation reduced to five due to market conditions	144% → 102%	-778,203
PE0229	S00000116067	Wood Products	Baseline adjusted for 15% decrease in production	200% → 138%	-401,795
TOTAL CHANGE INDICATED					**-2,477,222**

Negative Savings

It is possible that the energy use of an installed energy efficiency measure would be equal to or greater than the baseline energy use for that project. Typically, this is because the baseline is inappropriate or because the measure operating parameters (for example, hours of operation) were misjudged in the original analysis, or because operations are different than assumed.

For situations where current energy use is greater than predicted energy use, the value of zero savings was assigned, even though energy use may have increased. However, in some cases, the specified measure may actually increase energy use, although that would never have been the original intention. The clearest example of this would be a VFD where it is operated at full speed, either by design, necessity, or by operating decision. Because a VFD has internal losses, the energy use for driving a motor at full speed is about 5% higher, depending on the drive size.

Negative savings would only appear in situations where overall measure efficiency has decreased for delivery of the same services. Thus negative savings are appropriate to describe the misapplication of technology and should not be used for misuse of technology. Although there were three projects identified where VFD were operating at or near full speed, the energy savings analysis approach used (and/or the operating evidence available) did not indicate that there would be an increase in energy use. Thus, there are no projects that show negative energy savings in this evaluation.

Baseline Adjustments

There were nine instances where evaluation staff judged that the baseline used in the original energy analysis may not be appropriate. In four instances, this was because of reductions in shifts and plant operations, often due to reductions in market demands. In another five instances, the baseline appeared to be inconsistent with the installed equipment or described operations.

Impact evaluation for this effort compares measured energy savings to the energy savings that are documented in Energy Trust records. Because energy savings are part of formal program documentation, no modification of energy savings or, in turn, baseline energy use can be made. However, in order to help explain the (high or low) realization rates for these nine situations, evaluation staff developed alternative baseline energy use and used the resulting alternative realization rate to describe possible reasons for savings variance. If included in program results, these baseline alternatives would not affect total program savings, since energy savings were not adjusted. However, the alternative baselines could be viewed as potentially reducing the overall program realization rate by 0.04 – a small impact on program results, corresponding to a change in the realization rate from 1.02 to 0.98.

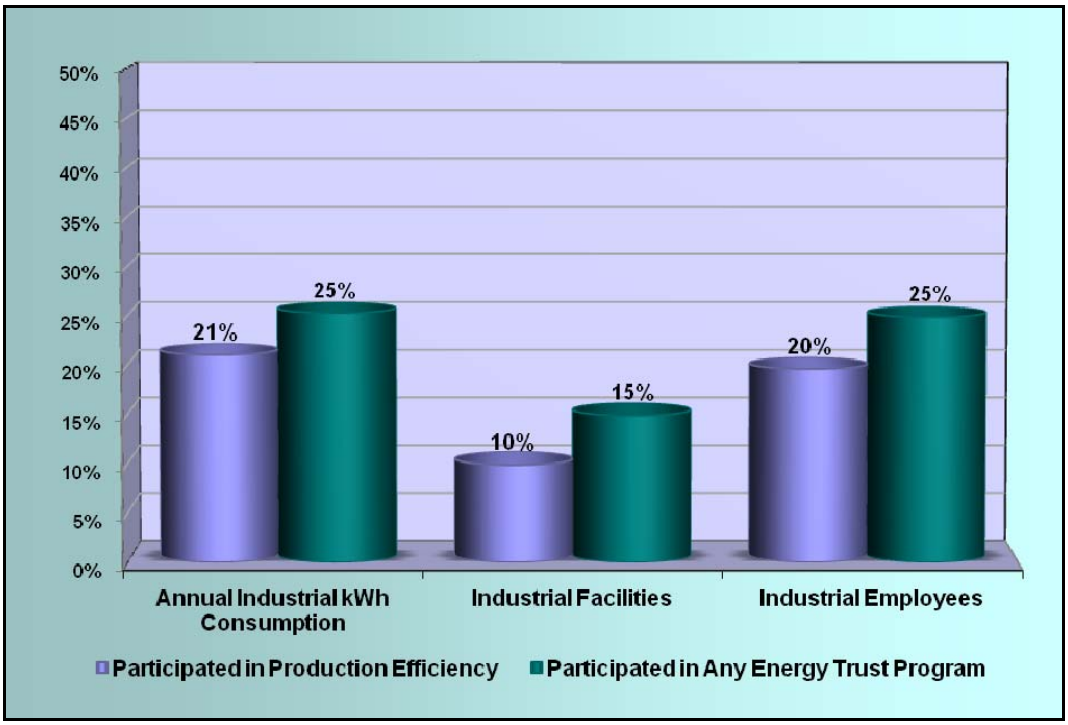
8 MARKET PENETRATION

INDICATORS OF MARKET PENETRATION

Energy Trust Service Territory as a Whole

In 2006 alone, Production Efficiency has saved an estimated 0.5% of Oregon's total industrial electricity consumption. Since its inception through 2007, Production Efficiency has saved an estimated 2% of Oregon's total industrial electricity consumption. The program has engaged about 10% of industrial customers, responsible for about 20% of industrial electricity consumption (see Figure 8.1). Participating facilities comprise about 20% of estimated industrial employment, indicating the program has reached the larger industrial customers. Since its inception through 2007, Energy Trust has installed efficiency measures through its three programs for which industrial customers are eligible (Production Efficiency, Building Efficiency, and New Building Efficiency) in facilities comprising 25% of industrial electricity consumption, 15% of industrial sites, and 25% of industrial employment.

Figure 8.1: Market Penetration of Energy Trust Programs by Percent of Annual Electricity Consumption, Industrial Facilities, and Industrial Employees



Industrial Subsectors

Figure 8.2 through Figure 8.4 show PE market penetration (again using the three metrics of penetration as measured by electricity consumption, number of sites, and number of employees) by industrial subsector. Figure 8.2 provides subsector penetration rates for the eight largest Oregon industries, as measured by electricity consumption (representing 85% of total consumption, 51% of total industrial sites, and 64% of industrial employees statewide). Within the graph, the subsectors are ordered from smallest to largest, reading left to right. As shown, paper manufacturing (coded as Sector 322 according to the North American Industrial Classification System – NAICS) is the largest electricity consuming subsector in Oregon.

Figure 8.3 provides comparables for the seven medium-size subsectors, again ordered smallest to largest from left to right (representing 12% of total consumption, 39% of total industrial sites, and 31% of industrial employees statewide). Note that the third subsector from the left, labeled *Other*, is not an industry type per se, but rather is the set of all subsectors not included in the other 21 subsectors shown in Figure 8.2 through Figure 8.4.

Finally, Figure 8.4 provides comparable information for the seven smallest subsectors (representing 3% of total consumption, 9% of total industrial sites, and 5% of industrial employees statewide).

For the largest subsectors, shown in Figure 8.2, the PE Program penetration, as measured by annual electricity consumption, varies from a low of 8% of consumption for chemical manufacturing to a high of 42% for machinery manufacturing. Looking across the three figures, the PE program has penetrated the eight largest subsectors a little more deeply than the next seven subsectors, and substantially more than the smallest seven subsectors. This finding is consistent with an allocation of scarce program resources to the greatest savings opportunities, as the largest savings potentials are assumed to be with the largest electricity consumers.

Figure 8.2: Market Penetration of the Eight Largest Oregon Industries by Percent of Annual Electricity Consumption, Industrial Facilities, and Industrial Employees

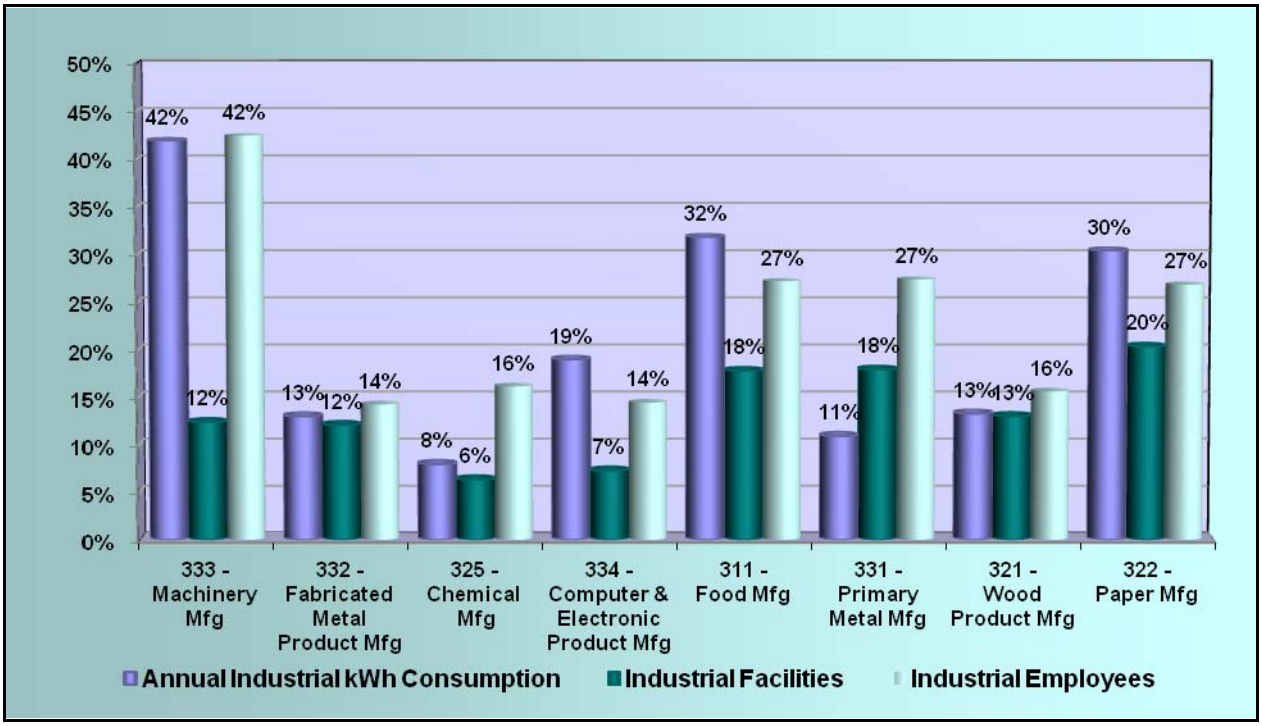


Figure 8.3: Market Penetration of the Seven Medium-Sized Oregon Industries by Percent of Annual Electricity Consumption, Industrial Facilities, and Industrial Employees

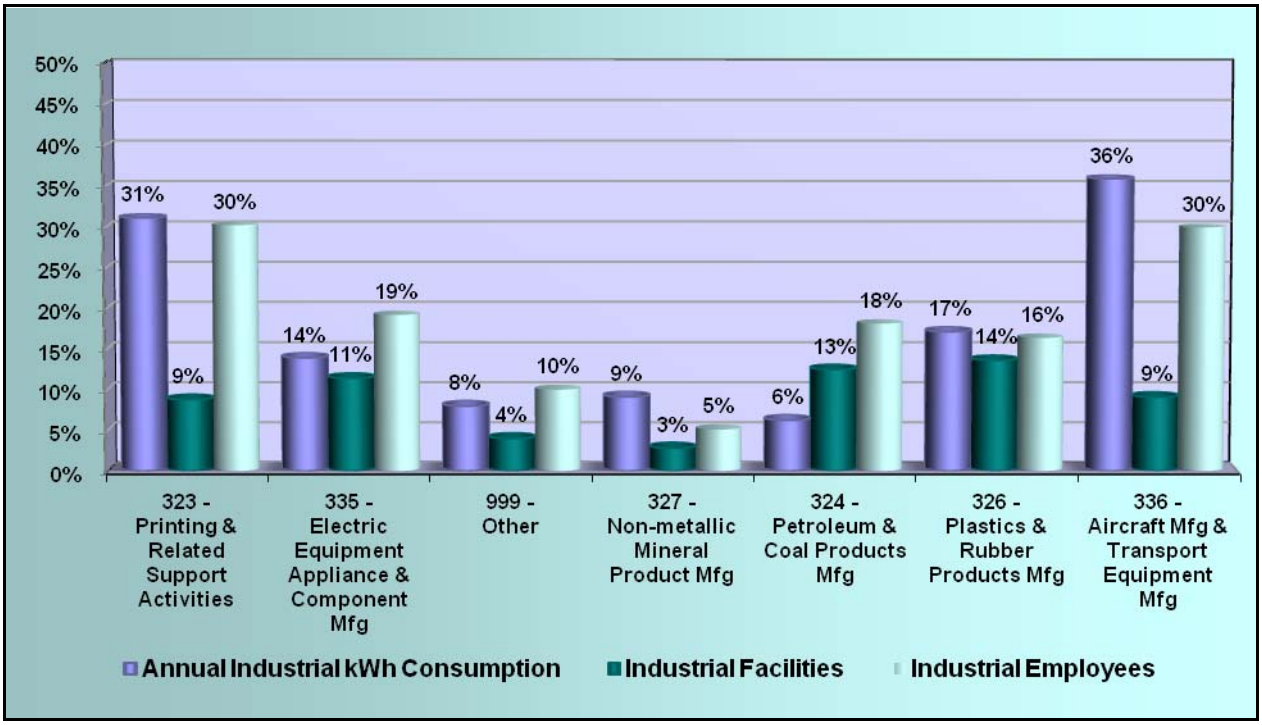


Figure 8.4: Market Penetration of the Seven Smallest Oregon Industries by Percent of Annual Electricity Consumption, Industrial Facilities, and Industrial Employees

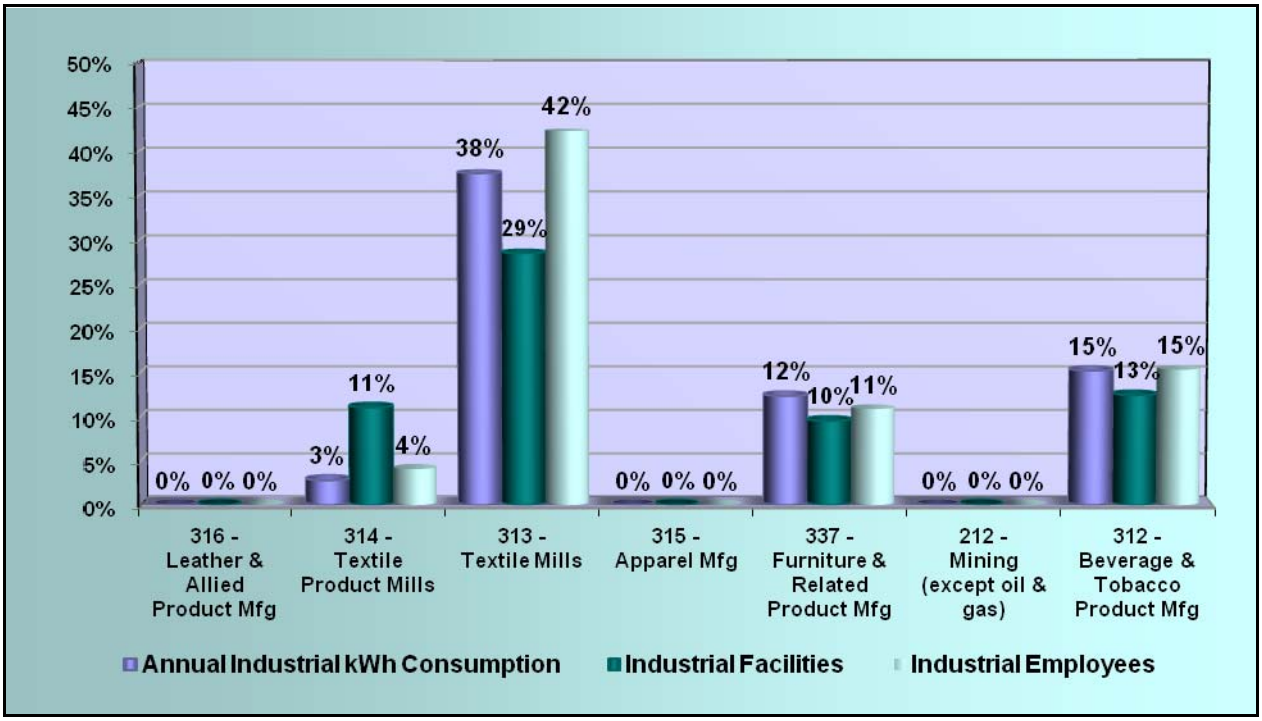


Table 8.1 provides additional context for Figure 8.2 through Figure 8.4, giving for each industry, the electricity consumption, number of sites, and number of employees, and these variables as a proportion of total Oregon industrial population.

Table 8.1: Market Penetration of All Oregon Industries by Percent of Annual Electricity Consumption, Industrial Facilities, and Industrial Employees

NAICS – INDUSTRY	ANNUAL INDUSTRIAL MWH CONSUMPTION	INDUSTRIAL FACILITIES (SITES)	INDUSTRIAL EMPLOYEES
322 - Paper Manufacturing	27%	3%	4%
321 - Wood Product Manufacturing	15%	12%	15%
331 - Primary Metal Manufacturing	11%	2%	3%
311 - Food Manufacturing	10%	8%	11%
334 - Computer & Electronic Product Manufacturing	8%	7%	11%
325 - Chemical Manufacturing	6%	3%	2%
332 - Fabricated Metal Product Manufacturing	5%	10%	11%

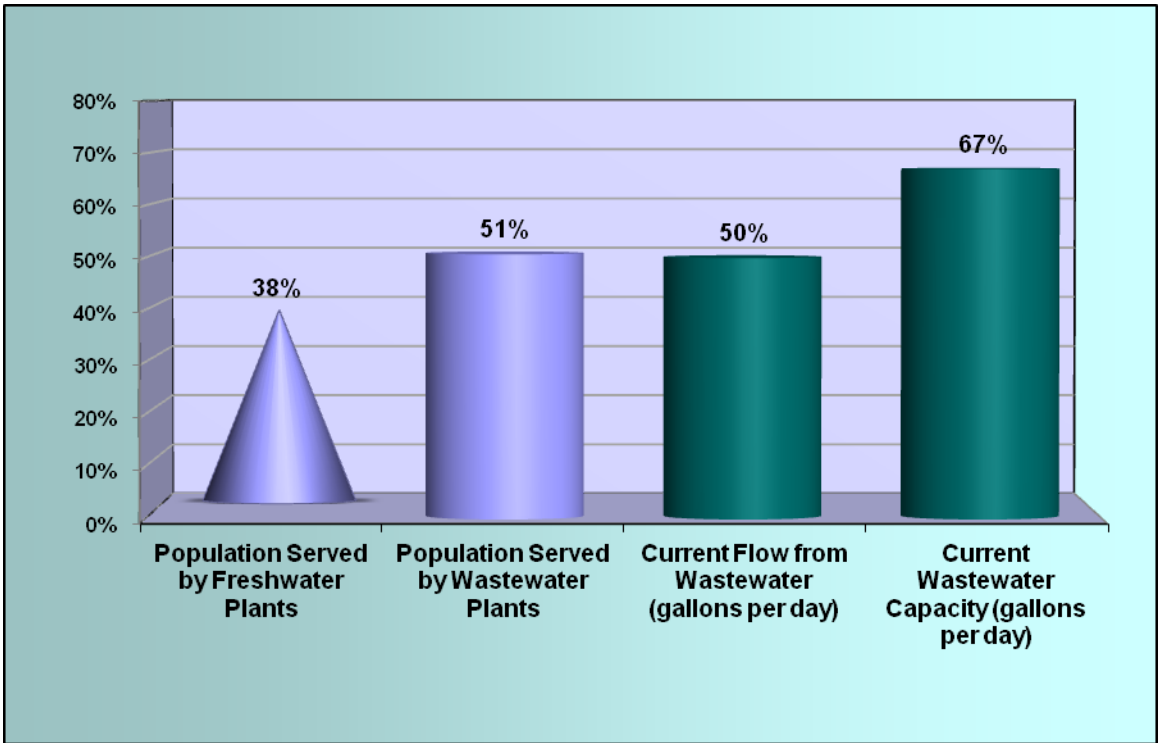
Continued

NAICS – INDUSTRY	ANNUAL INDUSTRIAL MWH CONSUMPTION	INDUSTRIAL FACILITIES (SITES)	INDUSTRIAL EMPLOYEES
333 - Machinery Manufacturing	3%	7%	8%
336 - Aircraft Manufacturing, Transportation Equipment Manufacturing	3%	5%	8%
326 - Plastics & Rubber Products Manufacturing	2%	3%	2%
324 - Petroleum & Coal Products Manufacturing	2%	1%	1%
327 - Nonmetallic Mineral Product Manufacturing	2%	3%	2%
999 – Other	1%	22%	14%
335 - Electrical Equipment, Appliance, & Component Manufacturing	1%	2%	2%
323 - Printing & Related Support Activities	1%	4%	3%
312 - Beverage & Tobacco Product Manufacturing	1%	2%	1%
212 - Mining (Except Oil & Gas)	1%	1%	0%
337 - Furniture & Related Product Manufacturing	1%	4%	3%
315 - Apparel Manufacturing	0%	1%	1%
313 - Textile Mills	0%	0%	0%
314 - Textile Product Mills	0%	0%	0%
316 - Leather & Allied Product Manufacturing	0%	0%	0%
TOTAL PERCENT	**100%**	**100%**	**100%**
TOTAL	**16,062,086**	**2,150**	**223,783**

Municipal Water Treatment Plants

PE program penetration of the industrial subsector municipal wastewater and freshwater treatment plants are shown separately in Figure 8.5, as it was appropriate to illustrate market penetration using different metrics than used for the other sectors. For wastewater, Figure 8.5 shows the percentage of the Oregon population served by wastewater treatment plants that have participated in PE since its inception, the percentage of the current plant flow in gallons per day, and the percentage of the current plant capacity in gallons per day. (Note that plant flow is its current utilization rate, which is less than or equal to its capacity.) As illustrated, the PE program has served between one-half and two-thirds of the wastewater treatment plant population, depending on the metric used to measure penetration. For freshwater, Figure 8.5 shows the PE program reaches plants serving over one-third of the total population receiving freshwater from municipal plants serving populations greater than 1,000 people.

Figure 8.5: Market Penetration In Municipal Freshwater and Wastewater Treatment Plants in Oregon as Measured by Population Served, Current Flow, and Current Capacity



Note the analysis excludes privately-owned wastewater and freshwater treatment plants, although some of these plants have also been served by the PE program. In the case of wastewater plants, we lacked data on the total population of such plants and on the plant flow and capacity. The decision for freshwater plants was made to be consistent with that of wastewater plants.

Methodology

To conduct this analysis, we worked from a dataset compiled by the Energy Trust's planning and evaluation staff. The backbone of the data is a list of Oregon industrial facilities purchased from Dun & Bradstreet, a retailer of customer data. The purchased list included such information as business name, location, contact information, and the four-digit Standard Industrial Classification (SIC) code designating industry type and number of employees. The staff assigned three-digit NAICs codes based on the 4-digit SIC codes.

The staff merged into this list information on participating industrial customers, including program and year of participation (Production Efficiency, Building Efficiency, or New Building Efficiency), site ID assigned by Energy Trust, and the utility serving the fuel targeted by program participation (i.e., PGE, PacifiCorp, or Northwest Natural). In addition, staff added variables to flag whether the customer is self-directing use of their public benefits charges and

whether they are members of the advocacy group Industrial Customers of Northwest Utilities (ICNU). From a federal database reporting statistics on industrial employment and annual electricity consumption by subsector (at the four-digit industrial classification level), the staff calculated annual electricity consumption (kWh) per employee for each four-digit subsector and merged that into the dataset. From this variable, the staff calculated estimated annual electricity consumption for the firm in the dataset.

The staff also merged in data based on customer ZIP code, indicating the electric utility that serves the facility. The identification of the utility was based on an examination of which utility serves the residential customers in a particular ZIP code. Approximately 90% of the entries were PGE or PacifiCorp.

The Energy Trust dataset lacked wastewater and freshwater treatment plants, and refrigerated storage. We added to the dataset information on municipal wastewater and freshwater treatment plants obtained from Energy Trust; staff there had obtained it from the State of Oregon's Clean Water Survey 2000 (for wastewater) and 2004 (for freshwater). For wastewater, these data included facility name, county and city names, present and projected population receiving collection, existing flow in millions of gallons per day (mgpd), and present and future design flows, also measured in mgpd. For freshwater, these data included facility name and contact information, county, and population served, among other variables. For freshwater, we limited the population to municipal plants serving populations of 1,000 people or more (a total of 200 plants). We accessed a list of PE participants we had obtained from Energy Trust to note in the industrial dataset the participating municipal wastewater and freshwater treatment plants.

Our review of the data provided by Energy Trust staff suggests it's credible and useful. However, our comparison of the PE participant dataset with the Oregon Industrial dataset prepared by the staff identified some industrial facilities that had not been flagged as program participants and some participating industrial facilities that were not in the dataset at all. Both of these omissions mean that the data presented in Figure 8.1 through Figure 8.4 understate PE penetration into the market.

Further, the information in the dataset on the utility serving the facility was not useful and seemed to us suspect in many cases. We attempted to analyze program market penetration within each utility's service territory, but we deemed the results unreliable due to the uncertainty regarding the assignment of nonparticipants to utilities.

OREGON INDUSTRY EMPLOYMENT PROJECTIONS

The Oregon Employment Department provides ten-year employment projections by industry. The department makes new projections every two years. These long-term employment projections are based primarily on projections of population growth and past long-term trends in employment. The projections do not attempt to forecast changes in employment due to business cycles – recessions and expansions. It is best to interpret them as indicative of overall trends for the industries and use them to answer such questions as whether an industry is growing or

declining, whether an industry is growing faster than the population, and whether one industry is growing faster than another.[35]

Table 8.2 shows the state's 2004-2014 projections for manufacturing employment, with durable goods manufacturing and nondurable goods manufacturing broken out separately. Durables include wood products, primary and fabricated metals manufacturing, computer and electronic product manufacturing, boatbuilding, and transportation equipment manufacturing (e.g., RV manufacturing). Nondurables captures industries such as paper manufacturing, food processing, high-tech, pharmaceuticals, plastics and chemicals, and aerospace. For purposes of comparison with two of the fastest growing employment sectors, the projections for the trade, transportation, and utilities sector, and the education and healthcare sector are also shown.

Table 8.2: Change in Employment 2004-2014

COUNTIES	MANUFACT-URING	DURABLES MANUFACT-URING	NON-DURABLES MANUFACT-URING	TRADE, TRANSPOR-TATION, & UTILITIES	EDUCATION & HEALTH CARE
ENERGY TRUST TERRITORY					
Multnomah, Washington	5.1%	7.0%	-1.1%	14.1%	NA
Clackamas	3.7%	5.1%	-2.8%	17.6%	26.3%
Marion, Polk, Yamhill	-0.5%	-0.9%	0.0%	15.4%	26.2%
Benton, Lincoln, Linn*	-4.0%	-4.0%	-3.0%	14.0%	26.0%
Douglas	3.0%	2.5%	12.1%	15.4%	23.3%
Coos, Curry**	-2.2%	NA	NA	9.4%	21.6%
Jackson, Josephine	8.6%	6.8%	NA	18.5%	32.7%
Crook, Deschutes, Jefferson*	4.0%	2.0%	22.0%	24.0%	33.0%
Klamath, Lake*	3.0%	2.0%	10.0%	9.0%	18.0%

Continued

[35] Oregon Employment Department, *Employment Projections by Industry 2004-2014, Oregon and Regional Summary*, July 2005.

COUNTIES	MANUFACT-URING	DURABLES MANUFACT-URING	NON-DURABLES MANUFACT-URING	TRADE, TRANSPOR-TATION, & UTILITIES	EDUCATION & HEALTH CARE
LITTLE OR NO ENERGY TRUST ELIGIBILITY					
Clatsop, Columbia, Tillamook	4.9%	7.9%	3.0%	15.3%	28.3%
Lane	5.7%	6.5%	2.4%	12.7%	26.9%
Gilliam, Hood River, Sherman, Wasco, Wheeler	11.2%	NA	NA	18.1%	26.3%
Morrow, Umatilla	-7.8%	23.0%	-22.3%	16.8%	26.0%
Baker, Union, Wallowa	3.0%	NA	NA	12.4%	22.0%
Grant, Harney, Malheur	-12.8%	NA	NA	13.0%	21.8%

* Projections for these counties are for 2006-2016.

** Curry County is entirely outside of Energy Trust territory, but its employment projection is combined with that for Coos County.

For Multnomah and Washington Counties, the durables and nondurables categories contain additional interesting industry employment projections. For example, the projected 5.1% increase in employment for durables manufacturers includes an 11.4% increase in fabricated metal product manufacturing, a 9.1% increase in computer and electronic product manufacturing, and a 7.4% increase in machinery manufacturing, offset by a 13.0% decrease in wood product manufacturing. Among nondurables manufacturers, paper manufacturers are projected to have a 12.5% decrease in employment by 2014.

9 CONCLUSIONS AND RECOMMENDATIONS

The Production Efficiency program continues to be successful from a number of perspectives. Industrial participants are happy with the program, especially with the services they receive from program representatives (principally, the PDCs). Through the end of 2006, the program had completed about 600 projects, estimated to have saved 250,000,000 first-year kilowatt hours of electricity, equivalent to about 2% of Oregon's total industrial electricity consumption. The completed projects were attained by providing total participant incentives (direct incentives plus study costs) averaging 14¢ per first-year kWh, the same average cost per kWh as was found during the previous evaluation.

We offer specific conclusions on the following research issues raised by Energy Trust staff concerning the Production Efficiency program:

- Program Impacts, Free-Ridership, and Spillover Effects
- Program Marketing and Outreach Strategies
- Program Communications
- Program Data Collection, Tracking, and Processing Activities
- The 2006 Funding Limitation
- Customers' Relationships with Energy Trust and the Production Efficiency Program
- Technical Studies
- Market Characterization Findings, including:
    - Penetration of Energy Trust Efforts in Oregon's Industrial Sector
    - Role of Energy Trust
    - Baseline Efficiency Practices
    - Influence of Industrial Regulations
    - Customer Involvement with Utility Programs
    - Frequency of Energy Management Training
    - Continuous Energy Improvements

The chapter concludes with recommendations.

CONCLUSIONS

Program Impacts, Free-Ridership, and Spillover Effects

For all projects visited on-site or surveyed by telephone, the incentivized equipment was currently operational and in use. Estimated gross savings totaled 73,136,251 kWh. Further, the 2006 projects were sound, having a savings realization rate of 101.6%. These indices of program savings, along with free-ridership, are given in Table 9.1. Interviews with participants, nonparticipants, and trade allies suggest these documented savings are augmented by electricity and natural gas savings from program spillover, the magnitude of which could not be estimated by the current study.

Table 9.1: Gross and Net Electricity Savings from the 2006 Production Efficiency Program

INDICES OF PROGRAM SAVINGS	VALUE
Working Estimate of 2006 Savings	71,984,735 kWh
Realization Rate	101.6%
Gross Savings Estimate	73,136,251 kWh
Free-Ridership Estimate*	17.6%
Net Savings Estimate	60,242,106 kWh
Net-to-Gross Ratio	82.4%
Net Savings as a Percent of Working Savings	83.7%

* This estimate is the mid-point of a free-ridership range estimated for the program.

Program Marketing and Outreach Strategies

To further its secondary goal of market transformation – increasing the energy efficiency of industrial firms by increasing the energy efficiency of the solutions offered to them by their consulting engineers and equipment vendors – the Production Efficiency program relies on those market actors for program marketing and delivery. These marketing efforts are in addition to marketing by the program's PDCs and ATACs.

In the program's early stages, interviews conducted by an evaluation team confirmed ATACs were marketing the program. However, the ATACs reported losing customers they had brought to the program. A year later, a second evaluation found very little marketing by ATACs. That low level of ATAC marketing was confirmed during the current evaluation. In addition, the numbers of PDCs and ATACs have decreased, and funding for individual PDCs has decreased, while their territories have expanded. At the same time, the success of the program's marketing strategy has made that strategy more challenging, as the program has already gained entry in the more easily targeted or more welcoming facilities, and has identified the most pressing or cost-effective projects for those facilities.

PGE customers were significantly more likely than were PacifiCorp customers to be uncertain about whom to call with questions about the program, and PGE customers were also significantly less likely than were PacifiCorp customers to have called, or to contemplate calling, their program representative when considering an additional equipment purchase, suggesting a need for more aggressive marketing in PGE territory.

The assignment of multiple program functions (for example, PDC and ATAC, or ATAC and vendor) to single program contractors creates, at a minimum, the appearance of conflicts-of-interest and continues to dampen ATAC marketing efforts.

Looking forward, Energy Trust is developing plans to deliver the program to many more smaller industrial firms. To do this cost-effectively will require even greater dependence on market actors for program marketing, especially equipment vendors and contractors. The Production Efficiency program appears to be successful in appealing to equipment vendors and contractors: most equipment vendors and contractors interviewed for this evaluation initiate conversations about program participation with their customers. However, less than one-half of 2006 participants learned of the program from these market actors, suggesting this component of program marketing should continue to be strengthened.

Program Communications

The previous evaluation noted improvements could be made in program communications between Energy Trust staff and PDCs, and between Energy Trust staff and program participants. In accordance with a recommendation from that evaluation for more frequent meetings, regular quarterly meetings of program managers and PDCs now occur. All parties interviewed viewed this as "moving in the right direction" and an improvement in communications. Nonetheless, gaps in communications with PDCs remain. For example, the reservation system (implemented to prioritize projects in response to the 2006 funding shortfall) remains "a mystery" to program implementation contractors, according to their reports. They did not participate in its development and do not know exactly what it is or how it works.

There was no evidence of implementation of the other part of that earlier recommendation – to meet more frequently with program participants in order to strengthen relationships and obtain participant feedback unmediated by program contractors.

Key contacts' and vendors' comments suggested an incomplete understanding of Energy Trust's societal test for project cost-effectiveness and the role non-energy benefits can play, especially when assessing projects whose energy savings yield long paybacks.

In the current evaluation, we noted an additional facet of program communication that could be improved. Specifically, other than occasional assignments of technical studies by a PDC to an ATAC, or the infrequent occurrence of an ATAC approaching a PDC with a project, program communications with ATACs are almost nonexistent. A result is that ATACs do not see themselves as "part of the community" of other program contractors.

Program Data Collection, Tracking, and Processing Activities

In the course of this evaluation, inconsistencies between data obtained by the evaluation team from different sources, and even from the same source (Energy Trust), were noted. Inconsistencies included: customer names and addresses entered differently on separate lists; multiple project sites entered under a single address; multiple addresses entered for a single project; Energy Trust program participants included in a list of program nonparticipants; and, for all program years, reports of different numbers of projects, different numbers of sites, different amounts of energy savings, and different amounts of incentives paid, depending upon the data source. The evaluation team does not believe these inconsistencies are program critical. However, improvements in data collection, data tracking, and data processing activities will add credibility to program reporting and enhance program-marketing efforts.

2006 Funding Limitation

Key contacts described the funding over-commitment, the resulting incentive-level changes, and other effects – including diminution of the pool ATACs – as a setback for the program. The incentive shortfall in 2006, resulting from the over-commitment of funds in 2005, created concern among vendors as well. And the most common area of program confusion among interviewed participants was uncertainty about whether Energy Trust had run out of incentives in 2006, with roughly one-third of them expressing this uncertainty.

The reservation system, implemented to prioritize projects in response to the 2006 funding shortfall, seems to have been an effective response to the limitation, even though PDCs and other program contractors did not understand it. The reservation system was apparently all but invisible to program participants, none of whom mentioned it when asked about any confusion they experienced.

Customers' Relationships with Energy Trust and the Production Efficiency Program

Participants are pleased with the Production Efficiency program and with its representatives. They expect to participate in the program again when they make other production or equipment upgrades or replacements, and they would consider contacting their program representative when contemplating such changes. Equipment vendors' experiences supported this finding about program participants, with more than one-half of the vendors reporting repeat business from a program participant that resulted in additional program participation. Thus, even though contractors were split in their views of customers' perceptions of an ongoing relationship with the program and with Energy Trust, the findings from participant and vendor interviews suggest customers do expect to continue working with both.

Technical Studies

Regarding the ATACs' technical studies, the previous evaluation recommended "the adoption of procedures, formats, or standards that will improve the quality of project analyses and documentation and facilitate impact evaluation." While the current research found an improvement in the quality of technical studies, nonetheless no written standards or guidelines have been produced. The evaluation team believes such guidelines are still warranted.

Market Characterization

Penetration of Energy Trust Efforts in Oregon's Industrial Sector

Since its inception, the Production Efficiency program has worked with industrial sites corresponding to 20% of estimated total industrial electricity consumption. Energy Trust, as a whole, has worked with industrial sites corresponding to 25% of estimated total industrial electricity consumption through the Production Efficiency, Building Efficiency, and New Building Efficiency programs.

Within the industrial sector, Production Efficiency, since its inception, has worked with facilities corresponding to over 30% of total electricity consumption in three high-use manufacturing subsectors: paper, food, and machinery.

Nearly two-thirds (68%) of nonparticipant respondents indicated they had heard of the Energy Trust of Oregon. [36]

Role of Energy Trust

The Production Efficiency program is well positioned to serve many of the needs of nonparticipants. When nonparticipants were asked about the types of external support they would find most valuable, incentives for energy-efficient equipment (41%) and efficient process improvements or plant upgrades (39%) topped the list. Following closely was information on energy management best practices in their industry (35%).

The role of Energy Trust as a provider of financial incentives for energy-efficient equipment purchases among the Oregon industrial sector is a role it shares with Oregon Business Energy Tax Credits. For example, 78% of interviewed PE program participants said they applied for the tax credit in addition to receiving a program incentive. However, the availability of BETC does not appear to diminish the role of Energy Trust in the Oregon industrial sector. When participants were asked about the influence of the Energy Trust incentive relative to the BETC on their decision to install energy-efficient equipment, more than half (55%) said either it was a

[36] This percentage may overestimate the awareness of Energy Trust among nonparticipants because it is likely that nonparticipants who recognized the name *Energy Trust of Oregon* as the sponsor of the survey may have been more likely to agree to be interviewed.

combination of the two that influenced their decision, or both forms of assistance had equal influence. Nearly one-third of respondents (28%) said the Energy Trust incentive had more influence and just 7% said BETC had more influence.

Baseline Efficiency Practices

Indicating energy-efficient equipment is desirable, 52% of program participants said one of the reasons they made their equipment purchase was because efficiency features are part of common practice for that application. However, only 6% of participants included this motivation among their top three reasons for their equipment purchases, suggesting that efficient equipment is the standard equipment in a very small proportion of applications.

Nearly one-quarter (24%) of interviewed participants said one of the reasons they made an energy-efficient equipment purchase was because of a corporate policy, but only 7% of them reported this as one of their top three reasons for buying their equipment. These proportions compare to 13% of nonparticipant respondents who said their firms had energy efficiency policies for procurement or operations.

Influence of Industrial Regulations

Building and industrial codes did not exert much influence on the decisions of program participants to install energy-efficient equipment. Just 2% mentioned code requirements as one of their top three reasons for installation.[37] Safety was more often cited as a top reason for equipment installation, with 11% of program participants mentioning it.

When asked what concerns they had regarding their business, 9% of program participants mentioned safety or environmental regulation-related concerns. A similar number of nonparticipants (7%) reported the same concerns in response to the question.

Interaction with Oregon Business Energy Tax Credits

Only one program participant respondent had never heard of Oregon Business Energy Tax Credits and 78% of program participant respondents had applied for BETC. Seventy percent of surveyed program nonparticipants had heard of BETC and 19% had applied for BETC.[38]

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37 Respondents were also allowed to cite an unlimited number of reasons for equipment purchase before indicating their top three reasons. Seven percent of respondents cited code or regulations as a reason for equipment installation.

38 Again, this percentage aware of BETC may be an overestimate for the nonparticipant population as a whole, given the assumption that customers unaware of Energy Trust were less likely to agree to be interviewed than those that were aware of Energy Trust.

Customer Involvement with Utility Programs

The majority of participants (54%) indicated they had previously participated in the Energy Efficiency program. Only 19% of surveyed nonparticipants reported having participated in a utility program.

Frequency of Energy Management Training

Just 15% of nonparticipant respondents were offering training to their employees. The most common type of training was OSHA/safety, which is not directly related to energy. Only five respondents (7%) mentioned training that related to equipment or processes, and therefore might be related to energy. Furthermore, when asked to pick two types of external support they would find most valuable, just 10% mentioned specialized technical training in system or facility operations.

Continuous Energy Improvements

Program data from 2003 through 2006 was examined to determine instances of multiple participation. An estimate of repeat participation was calculated using data supplied by Energy Trust, which counted among participants those for whom studies only had occurred. To obtain an estimate of participants who had received multiple program incentives, rather than those who merely had studies conducted, only sites with multiple participation dates more than one year apart were counted.[39] Using this method, we found thirty-eight participants (4% of all program participants) participated twice, sixteen (2%) participated three times, and another fifteen (2%) participated at least four times.

RECOMMENDATIONS

Marketing

For maximum effectiveness of program marketing, program staff should take steps to increase program understanding and augment the skills of those expected to market the program, including PDCs, ATACs, and vendors. To provide the greatest opportunities to obtain program savings, program staff should review the allocation of PDC resources, and the marketing roles of PDCs and ATACs.

Staff might consider such options as funding for additional PDC staff, providing additional information and training to PDCs, eliminating multiple roles for program contractors, or eliminating ATACs altogether.

[39] Using this count, 38 sites have done two projects, 16 have done three projects, and another 9 did four projects.

Communications

To minimize uninformed speculation among program contractors about PE activities and procedures, program staff should continue and expand its ongoing communications with them. Specifically, the details of the reservation system should be explained to those contractors and to the other market actors expected to market the program. ATACs should be given the opportunity to attend PDC meetings by receiving notice of and agendas for those meetings. To address key contacts' and vendors' incomplete understanding of Energy Trust's societal test, it would be helpful to provide them with additional information and details about that test and the opportunity to incorporate non-energy benefits in the cost-effectiveness calculation.

Ensure PDCs convey to their not-for-profit and municipal clients that they can benefit from the BETC tax credits using the pass-through mechanism.

Increase communication with and program-related training of vendors and pursue ways to make program eligibility requirements and incentive calculations more transparent. Encourage vendors to promote BETC tax credits to their customers.

Program Data Collection, Tracking, and Processing Activities

To address data and list discrepancies, we recommend a review of program data collection and entry procedures internal to Energy Trust and with program contractors. In particular, specific and consistent definitions of data-entry categories (such as *project* and *site*) should be developed and used. Energy Trust should identify one of the several date variables, which reflect different steps in the conclusion of a project, as the default date to be consistently used to report program activity by year, with any exceptions to this selection carefully identified and justified. Further, Energy Trust needs to clarify that some reported numbers will differ due to the factors used.

2006 Funding Limitation

Program funds should be managed and accounted for in a way that provides steady, dependable funding for projects. Frequent changes to the incentive level and program starts and stops as a means of managing annual program expenditures should be avoided. Decision-making for complex industrial projects can be protracted and sometimes span several years; when project incentives change partway through firms' internal deliberations, efficiency projects can be scuttled. Any changes in funding and funding allocation procedures need to be clearly communicated to all parties several months in advance of the change.

Technical Studies

To simplify the program review and oversight function, and to enhance quality control of technical studies, program staff should promulgate and implement uniform procedures and standards or guidelines for both the technical studies and the review of those studies.

APPENDICES

APPENDICES

A FREE-RIDERSHIP AND SPILLOVER

FREE-RIDERSHIP

Overview

For evaluation of the Energy Trust Production Efficiency program, Research Into Action worked with the Energy Trust evaluation staff to develop a set of survey questions and a model for estimating free-ridership at the program level, based on:

- **Budget:** Whether participants' budgets could accommodate the project;
- **Influence:** How influential participants believe the program and its services were in the decision to install the project; and
- **Intention:** Their (retrospectively) stated intentions in the absence of the program.

The free-ridership estimation method used for Production Efficiency is detailed in this appendix. This appendix incorporates a memo prepared by Phil Degens and Sarah Castor of Energy Trust, dated June 4, 2008, entitled *Energy Trust Free-Ridership Methodology*.

Background

The California Evaluation Framework states:

> "Free-riders are project participants who would have installed the same energy efficiency measures if there had been no program. How free-ridership is handled is a critical component of making the evaluations cost effective and accurate. Uncertainty surrounding free-ridership is a significant component of net energy and demand savings uncertainty."

Free-rider rates are also important inputs in program planning and redesign. Free-rider rates provide important information that signals when program changes should be made in such aspects as incentive levels, target markets, efficiency levels, eligibility requirements, or when the program should be terminated. This information helps programs evolve, retain their impacts, and remain relevant in the market.

Methods for calculating and adjusting for free-ridership have changed over time. Estimation techniques vary from simple self reports to elaborate econometric decision models, as well as the use of comparison groups to adjust for, but not directly estimate, free-ridership. With self-reports, the initial, simple yes /no question of *Would you have done it without the program?* has evolved into a battery of questions that attempt to model the nuances of the decision-making process and extract the influence of the program. Multiple questions with a range of answers for each question require methods for weighting and scoring, as well as an algorithm to arrive at a final estimate of free-ridership.

Energy Trust has utilized an assortment of different methods to estimate free-ridership using participant self-reports. These methods have been shown to have a various weaknesses and biases. Suggested approaches developed in other parts of the country to address these shortcomings have tended to increase data collection requirements.

To address both shortcomings and increased data requirements, Energy Trust staff has developed a method for calculating free-ridership that is simple, transparent, and unbiased. A goal in developing this method was the ability to apply it to all programs and their markets. An added goal was the ability to obtain the self-reported results through a reduced set of survey questions. These questions can be incorporated in a short program feedback survey administered online or on paper at the time of participation. The timing of the survey, as well as its brevity, should increase participant response rates. In addition, having the survey administered at the time of participation may yield more accurate information, since the program is still fresh in the respondent's mind and the chances are greater that the person most directly involved in the project is the survey respondent.

Survey Questions

Table A.1 presents the survey questions used and the abbreviated label for the question shown in subsequent tables.

Table A.1: Survey Questions Related to Free-Ridership and Corresponding Chart Abbreviations

QUESTION ASKED	CHART ABBREVIATION
How influential was the technical study in planning for this equipment installation? *(5-point scale)*	Influence: Study
How influential was the Production Efficiency Incentive in planning for this equipment installation? *(5-point scale)*	Influence: Incentive
If the program contact had not facilitated participation in the program, how likely is it that you would have installed the efficient equipment anyway? *(5-point scale; reversed for comparability with other influence questions)*	Influence: Assistance
Had your firm not been able to get an Energy Trust incentive for the installation, how would your plans have changed, if at all? *(Specific alternatives queried, plus "anything else?")*	Intention
At that time, could your budget have accommodated the full cost of the equipment installation without the incentive? *(Yes/No/Don't Know)*	Budget

METHODOLOGY

As a starting point for developing the methodology, Energy Trust evaluation staff has used the belief that the key question to be answered is whether the participant was influenced by the program. This is relatively easy to determine if only a few yes/no questions are asked and

answers are consistent (e.g., "The program had no influence" and "I would have taken the action if the program had not existed," or "The program had a critical influence on my decision" and "The action would not have taken place without the program"). If a more nuanced approach is used, such as allowing for degrees of influence, providing a "don't know" option or increasing the number and scope of the questions, the calculation becomes more difficult and requires a set of rules and algorithm.

The set of rules and algorithm that Energy Trust has developed use as their basis the *Laplace Criterion*. The *Laplace Criterion* states that "in the absence of any prior knowledge, we must assume that the events have equal probability," assuming, of course, that the events are mutually exclusive and collectively exhaustive.[40] This means that if it is not absolutely clear if the program had an influence on the participant's action/decision, equal odds are given to the outcome that the program had an influence and the outcome that the program did not have an influence. In these cases, the probability of the program having influence is 50% and the probability of it NOT having an influence is 50%. In other words, the participant has a 50% chance of being a free-rider.

The 50% free-rider outcome is only an outcome in a subset of the cases, as both influence and participant intent in the absence of the program might have a range of possible answers. To address all possible outcomes, a set of assumptions was developed that create the framework for calculating unbiased free-rider scores.

➡ **Assumption 1:** ***Respondent is truthful.***

- **Implication 1:** Consistent responses have easily calculated free-rider rates of 0% and 100%.
- **Implication 2:** Participants that provide inconsistent or contradictory responses (e.g., participant answers, "Program was critical to the project moving forward" and, "Project would have moved forward exactly the same in absence of the program") are viewed as having answered questions truthfully. With no additional information,[41] both answers are given equal validity.

➡ **Assumption 2:** ***It is inconsistencies between stated program influence and stated intentions of what would have happened in absence of the program that need to be resolved.***

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40 The *Laplace Criterion* is based on *Bernoulli's Principle of Insufficient Reason* which states that if we are ignorant of the ways an event can occur (and therefore have no reason to believe that one way will occur preferentially compared to another), the event will occur equally likely in any way. Keynes referred to the principle as the principle of indifference, formulating it as follows: "If there is no known reason for predicating of our subject one rather than another of several alternatives, then relatively to such knowledge the assertions of each of these alternatives have an equal probability."

41 Future evaluations will ask participants follow-up clarifying questions when contradictory answers are given.

- **Implication:** Only data that clearly provides information on either program influence or the participant's intent in absence of the program will be used in the free-rider calculation.
- **Example 1:** Respondent states, "Program was critical in bringing the project about," and also states, "Program had no influence."
- **Example 2:** Respondent states, "Project would not have changed in absence of the program," and states, "Program had critical influence."

➡ **Assumption 3:** ***Equal probabilities are given to inconsistent answers.***

- **Implication:** Event probabilities are additive, since the two possible events being considered are "project went through with program influence" and "project went through without program influence."
- **Example 1:** Respondent states, "Program was critical in bringing the project about," and also states, "Program had no influence." The first statement implies that the program had significant influence and the second implies that it did not; therefore, "program had no influence" has a 50% chance of being true and "program had influence" has a 50% chance of being true. Therefore, without additional information, the FR probability is 50%.

➡ **Assumption 4:** ***Questions with a range of qualitative answers will have free-rider scores distributed equally across the range.*** Questions with a range of quantitative values for answers will use actual values – or if the answer is a range, the midpoint – to calculate the free-rider score.

➡ **Assumption 5:** ***In cases where the answer is "don't know," all of the possible answers have equal probabilities of being true.***

- **Implication 1:** This will create a range of possible free-rider estimates for all participants that answer "don't know."
- **Implication 2:** To obtain the range, only scenarios involving the maximum and minimum values need to be run.
- **Implication 3:** If no information is available to any of the questions, the observation is not included in the analysis, as it is deemed equivalent to a participant that was not interviewed and thus not included in the analysis.

Assumption 2 might be considered by some as limiting in that it only focuses on the inconsistencies around the influence of the program and the sated intentions of how, if at all, the project would have changed in the absence of the program. Factors such as experience with the program, length of time the project was planned, or experience with energy efficiency are often factored into the free-rider estimation. However, they are not used to resolve inconsistent answers, as their relationship to the project in question is not clear and their inclusion in any weighting scheme or use in adjusting probabilities is not straightforward.

Participation in the program in the past is not sufficient to determine that the project under consideration would have gone through without the program's help, incentives, or studies. Past participation may have involved an end-use technology that has little relevance to the current project. On the other hand, past participation may have involved incentives and other program assistances that were needed to move the current project forward. Therefore, past program participation might be a good predictor of future participation, but cannot be considered a clear indicator of free-ridership. Even past experience with the same technology for which no incentive was received may not be a clear indicator that the participant is a free-rider. To make this assumption, the participant's economic conditions and investment criteria would need to remain unchanged, a reasonable assumption for only a short period of time. Over longer periods, economic conditions and investment criteria both change. Also, "comparable" equipment and technologies might not, in fact, be comparable and past experience with the program may not have been positive. For example, installation of additional VSDs through the program would be a sign of program success if the customer had poor experiences with VSDs in the past. Since past participation and past experience do not have a straightforward interpretation without further investigation, their use in calculating free-ridership is inappropriate.

Application

As stated above, the question that is being answered is whether the program had an influence on the project. The algorithm is quite flexible and can include multiple program influences and allow for a range of answers for the participant's intent in absence of the program.

The 2006 PE Impact Evaluation provides an example of how the scoring algorithm is used. This is a very simple case that asked participants about the influence of three program factors and allowed for three outcomes in the area of participant intent in absence of the program.

Program Influence

Participants rated program influence for three major factors:

1. Incentive
2. Technical Study
3. Program Assistance In General

Participants rated each influence on a 5-point scale, from "critical influence" to "no influence." The maximum value given for any of these program factors is used as the indicator of program influence. This results in five scores that are equally distributed across a potential range from 0 to 1. Table A.2 provides the schema for scoring program influence.

Table A.2: Free-Rider Scoring of Program Influence

PROGRAM INFLUENCE	FREE-RIDER SCORE	PROBABILITY ASSOCIATED WITH PROGRAM INFLUENCE	FREE-RIDER RATE ASSOCIATED WITH PROGRAM INFLUENCE
Critical Influence	0.00	50%	0.0%
Very Influential	0.25	50%	12.5%
Some Influence	0.50	50%	25.0%
Little Influence	0.75	50%	37.5%
No Influence	1.00	50%	50.0%

Participant Intention in Absence of the Program

For stated changes in the project in absence of the program, there are three different levels of change:

1. No change in the project – would have installed exactly like actual project
2. Project would have changed, but retained some energy efficiency features
3. Project would have made other changes with no significant energy-efficient component

To determine the level of change, participants were asked how the project would have changed in absence of the program. A variety of answers could be given, from "No change," to "Change in scope," to "Postponing the project more than a year." These answers were then allocated to one of the three options above. Changes that might have retained some of the energy-efficient features of the project were scored at the midpoint, as no reliable information on the efficiency level was available. **Error! Reference source not found.** provides the schema for scoring intent.

Table A.3: Free-Rider Scoring of Stated Intent in Absence of Program

STATED INTENT IN ABSENCE OF PROGRAM	FREE-RIDER SCORE	PROBABILITY ASSOCIATED WITH STATED INTENT	FREE-RIDER RATE ASSOCIATED WITH STATED INTENT
No Change in Project	1.00	50%	50%
Change with Some Energy Efficiency Retained	0.50	50%	25%
Significant Change with Virtually No Program Energy Efficiency Retained	0.00	50%	0%

With the outcomes of being influenced or not being influenced by the program having equal probabilities, the free-rider rates associated with each outcome are additive. The equation below can be used to calculate the free-rider rate given participant responses and scores:

Free-rider rate =0.5*(program influence FR score) + 0.5*(stated intent FR score)

In cases where information is lacking (e.g., participant stated that they did not know if they were influenced), all of the outcomes associated with that question have equal probability of being true. This will result in the participant having a range for the free-rider rate. The range is estimated for all respondents with indeterminate answers by calculating the maximum and minimum values for each participant. The resulting high and low estimates will then delineate the range of free-ridership.

Table A.4 shows the different permutations of the free-rider rates that are calculated using the above algorithm. This will result in a range of potential free-rider rates. With a high and a low estimated for the participants answering "don't know." To obtain a single value estimate, the mid-point of the range was used.

Table A.4: Weights and Free-Rider Rates

PROGRAM INFLUENCE	FREE-RIDER RATE PROGRAM INFLUENCE	STATED INTENT	FREE-RIDER RATE STATED INTENT	FREE-RIDER RATE
5	0	Change	0	0
4	0.125	Change	0	12.5%
3	0.25	Change	0	25%
2	0.375	Change	0	37.5%
1	0.50	Change	0	50%
5	0	Partial	0.25	25%
4	0.125	Partial	0.25	37.5%
3	0.25	Partial	0.25	50%
2	0.375	Partial	0.25	62.5%
1	0.50	Partial	0.25	75%
5	0	No Change	0.50	50%
4	0.125	No Change	0.50	62.5%
3	0.25	No Change	0.50	75%
2	0.375	No Change	0.50	87.5%
1	0.50	No Change	0.50	100%
5	0	Don't Know	0 to 0.50	0% to 50%

Continued

PROGRAM INFLUENCE	FREE-RIDER RATE PROGRAM INFLUENCE	STATED INTENT	FREE-RIDER RATE STATED INTENT	FREE-RIDER RATE
4	0.125	Don't Know	0 to 0.50	12.5% to 62.5%
3	0.25	Don't Know	0 to 0.50	25% to 75%
2	0.375	Don't Know	0 to 0.50	37.5% to 87.5%
1	0.50	Don't Know	0 to 0.50	50% to 100%
Don't Know	0 to 0.50	Change	0	0% to 50%
Don't Know	0 to 0.50	Partial	25	25% to 75%
Don't Know	0 to 0.50	No Change	0.50	50% to 100%
Don't Know	NA	Don't Know	NA	NA

Budget

Participants that reported having had a sufficient budget to undertake the project without an incentive would have been able to do the project in the absence of the program, but may or may not have chosen to spend the available money on that specific project. No adjustment is made to the above free-rider rates for participants that had sufficient budget.

Participants that reported not having sufficient budget to undertake the specific project would not have been able to undertake the exact project with "no change." They perhaps would be able to undertake the project "partially" or not at all ("change"). Thus, participants that reported both "no change" and "no budget" were treated for the free-rider calculation as if they had reported "partial" change. So, in Table A.4 above, instead of a free-rider stated intent score of 0.50 (corresponding to "no change"), they were assigned a free-rider stated intent score of 0.25 (corresponding to "partial"). These adjustments are shown in the next section for the Production Efficiency participants.

Production Efficiency Free-Rider Results

Table A.5 presents the results on a case-by-case basis for the surveyed Production Efficiency participants.

Table A.5: Free-Rider Case Assignment for Production Efficiency

PROGRAM INFLUENCE	STATED INTENT	BUDGET	FREE-RIDER RATE	NUMBER OF SURVEYED PARTICIPANTS
5	Change	(not applicable to FR scoring)	0	26
4	Change		12.5%	26
3	Change		25%	5
2	Change		37.5%	0
1	Change		50%	0
Don't Know	Change		0% to 50%	3
5	Partial	(not applicable to FR scoring)	25%	4
4	Partial		37.5%	9
3	Partial		50%	2
2	Partial		62.5%	0
1	Partial		75%	0
Don't Know	Partial		25% to 75%	0
5	No Change	1 said no budget	50% (25% if no budget)	4
4	No Change	1 said no budget	62.5% (37.5% if no budget)	5
3	No Change	All had budget	75%	3
2	No Change	All had budget	87.5%	3
1	No Change	(no respondents)	100%	0
Don't Know	No Change	(no respondents)	50% to 100%	0
5	Don't Know	1 said no budget	0% to 50% (0% to 25% if no budget)	3
4	Don't Know	All had budget	12.5% to 62.5%	1
3	Don't Know	1 said no budget	25% to 75% (25% to 50% if no budget)	1
2	Don't Know	(no respondents)	50% to 100%	0
1	Don't Know	(no respondents)	50% to 100%	0
Don't Know	Don't Know	NA	NA	3

The free-rider simple average across these surveyed Production Efficiency participants ranges from 20.8% to 24.5%.

To determine the estimated free-rider rate range for the Production Efficiency program as a whole, the gross savings of each participant was multiplied by the participant-specific free-rider

value (or by the simple average value for participants that were not surveyed). The Production Efficiency estimated free-rider rate ranges from a low of 16.1% to a high of 19.1%, with a mid-point of 17.6%. The Production Efficiency estimated net savings (net of free-riders) ranges from a low of 80.9% to a high of 83.9%, with a mid-point of 82.4%.

Next Steps

The methods that are described above are viewed by Energy Trust as providing the framework for arriving at free-rider rates that are not biased in any direction and for providing a guide to a consistent scoring algorithm. The method also provides a general solution that can be applied to participants in the residential, commercial, or industrial sectors. However, there is still work to be done and improvements to be made. In particular, Energy Trust plans to pursue the following in subsequent research.

Wording of Free-Rider Questions

Care must still be taken in developing appropriate questions that are clear in their meaning and for which answers also have a clear interpretation. The current wording of many of the surveys that have been fielded still have room for improvement. Energy Trust anticipates that its evaluation contractors will still have much input into the appropriate wording of survey questions.

Inconsistent Answers

Asking clarifying questions when inconsistent answers are given to free-rider questions has also been suggested as a way to arrive at a consistent result. Incorporating these consistency checks will be considered in the next evaluation survey design. Surveys that are fielded via the telephone or web can probably easily incorporate this type of consistency check, while including such a check effectively in a paper/mail survey may be more difficult.

Greater Range of Answers

The ranges of possible answers for program influence and efficiency level of a project in absence of the program are quite small in many of Energy Trust's evaluation surveys. Providing a greater range of possible answers, such as an 11-point influence scale or a percent efficiency reduction might provide a more realistic, continuous range of free-rider estimates, rather than the step-like distribution found in Table A.3. A greater range might also provide less bias to answers that are provided. These greater ranges will provide more nuance, but care needs to be taken so that the range of possible answers are meaningful to the respondent (e.g., some projects cannot be reduced by a percentage level).

Measure-Specific Free-Rider Rate Estimation

A variety of strategies can be used to estimate measure-specific free-rider rates. Energy Trust's approach has typically been to survey a sufficient number of participants that have installed each of the measures of interest. Instead of repeating the same questions for each type of equipment installed, the free-rider questions are asked once. Reducing the number and frequency of questions will increase the response rate and improve the survey results. In the future, Energy Trust anticipates that we will experiment with a variety of approaches to test what methods best capture measure-specific data.

Surveying Closer to the Date of Project Completion

Energy Trust is planning on surveying participants closer to the time of participation. What that will entail has not yet been determined. A participant satisfaction/feedback survey instrument is being designed that could gather timely data and possibly serve multiple purposes. How surveys would be fielded has yet to be determined and if they can effectively serve multiple purposes needs to be thought through and tested.

Effective Survey Design

Energy Trust anticipates developing surveys with effective designs that can obtain the information needed to estimate free-ridership using a reduced set of free-rider questions. This will help us implement many of the steps mentioned above that will increase survey response rates, improve the reliability of survey responses, allow surveys to serve multiple needs, and provide more timely results.

SPILLOVER

Spillover Method

We asked participants if they had installed any energy-efficient equipment for which they did not apply for an incentive. Just over one-half of the participants (52%) reported they had done so.

We asked these participants to rate the influence of the program on their decision to install the equipment, using a five-point scale ranging from, "Our PE experiences had no influence on our purchase of this equipment," to "Critical influence – we would not have purchased this equipment if we had not participated in the PE program."

We also asked these participants what equipment they had installed; however, we did not visit their facilities and verify the purchase, its efficiency, and its scope (i.e., sizes and quantities).

Spillover Results

Table A.6 identifies the efficient equipment participants reported installing without an incentive. Thirteen participants indicated they had installed efficient motors, 14 reported efficient lighting or lighting controls, 8 reported VFDs, and 17 reported other types of efficient equipment, including process equipment. Note that efficient motors and "other" equipment were most commonly installed by participants claiming the program had substantial influence on their decision to install additional equipment, while lighting equipment was most commonly installed by participants claiming the program had moderate or little influence on their decision. It would appear that the more expensive the additional efficient equipment, the more likely the participant had been influenced by the program to undertake the additional investment.

Table A.6: Spillover Equipment Installations

STATED EQUIPMENT INSTALLED WITHOUT AN INCENTIVE	MOTORS	LIGHTING	VFD	OTHER
PROGRAM WAS CRITICALLY INFLUENTIAL				
"Exhaust fans with VFD"			1	
PROGRAM WAS SIGNIFICANT INFLUENCE				
"Motors, lighting, VFD"	1	1	1	
"Motors, lighting"	1	1		
"Motors"	1			
"A big hog motor and a 50-hp motor"	1			
"Low pressure nesting system (irrigation)"				1
"Irrigation and a lot of different things"				1
"Pump lift station controls and networking"				1
"Recovery boiler, two pressure steam lances for de-sooting, input to stock chest, insulate steam and process piping"				1
"Heat exchanger on dryer (natural gas)"				1
PROGRAM WAS MODERATE INFLUENCE				
"Motors, lighting occupancy sensors, T5HO lamps, VFD"	1	1	1	
"Some motors; lighting"	1	1		
"Motors"	1			
"Air handler w VFD, 2 scrubbers w VFDs, occupancy sensors"		1	1	
"HVAC (minor) and lighting – both for new addition"		1		1

Continued

STATED EQUIPMENT INSTALLED WITHOUT AN INCENTIVE	MOTORS	LIGHTING	VFD	OTHER
PROGRAM WAS MODERATE INFLUENCE (CONTINUED)				
"VFD"				
"VFD evaporators"				
"$16 million dryer replacement"				1
"Natural gas boiler equipment for evaporation of waste water"				1
PROGRAM WAS A LITTLE INFLUENCE				
"Motors; lighting for shipping shed"	1	1		
"Motors, switched to CFLs, occupancy sensors"	1	1		
"Many premium efficiency motors; 150 hp VFD, 50 hp VFD"	1		1	
"Project to eliminate pumping and use gravity; purchase of motors, pumps, vehicles, water and wastewater equipment is to be efficient"	1			1
"We tested 15 items to see if they qualified for PE incentives; 8 did; we did the other 7 on our own"				1
"Lighting, lighting controls –occupancy sensors, HVAC controls, system reprogramming"		1		1
"T5s in a remodel; a few fixtures of T8s"		1		
"T5s"		1		
"Lighting"		1		
"Lighting"		1		
"Efficient injection molding machines"				1
"Point-of-use hot water heaters, new water chiller"				1
"Piping change, heat exchangers, air filters; all were intended to be part of the project, but someone didn't get paperwork"				1

Efficient Equipment Installations Among Nonparticipants

We asked nonparticipants whether they had applied for incentives for energy-efficient equipment in the last two years from organizations other than Energy Trust (and we confirmed none had applied for Energy Trust incentives). Nine percent reported having applied for BETC tax credits, and an additional 8% reported have applied for incentives from PGE, PacifiCorp (one mention each) or an "other" unspecified organization (4 mentions). In addition to these customers that reported having applied for efficiency incentives, 31% reported having purchased energy-efficient equipment in the last two years without applying for incentives. Larger nonparticipants

were more likely than smaller nonparticipants to report such purchases. Taken together, 49% of nonparticipants reported installing efficient equipment in the last two years.

As with the participants, we have no way of estimating the energy savings from these installations. In addition, we did not ask nonparticipants the extent to which the Production Efficiency program may have influenced their decisions, as most likely any influence is indirect, such as through vendors.

However, the nonparticipant findings provide corroboration of the participant findings: one-half of both groups reported installing energy-efficient equipment in the absence of Energy Trust incentives.

Vendors' comments also provide some corroboration of spillover. Recall that the sample surveyed are vendors who have had at least one project that participated in the PE program at any point in time. When asked to estimate the total proportion of their equipment sales that qualify for incentives, the average percentage estimate of the 16 vendors who responded was 48% and the median percentage was 43%. There was no statistically significant difference between the percentages of qualifying equipment supplied by lighting and non-lighting vendors. It seems unlikely to the evaluators that indeed one-half of all equipment sales are energy efficient! However, it seems quite plausible that about half of their customers have purchased efficient equipment. And of the 10 vendors with repeat program participants, one-half (5 vendors) reported their repeat business included sales or installation of equipment that qualified for, but did not receive, a Production Efficiency incentive.

Thus, all three sources of data – participant, nonparticipant, and vendor – suggest about one-half of customers have purchased energy-efficient equipment without receiving incentives. However, verifying that the equipment was indeed efficient, quantifying its energy savings (including the size or scope of the installation), and assessing the degree to which these purchases have been influenced by the activities of the Production Efficiency program is beyond the scope of this project.

B PROJECT SAVINGS EVALUATION SUMMARIES

As follows.

Master Site ID: S00001157113
Industrial Process: Electrical Generation
NAICS Code: 335

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0601	2006	Process Pumping	7,869,638	5,678,739	No	72%

Measure Description:
Installed VFD for 2300HP pumps

Factors Contributing to Variance:
Analysis used affinity laws rather than detailed pump and system curve analysis

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0728	2006	Process Pumping	84,036	46,989	No	56%

Measure Description:
Installed heat exchanger and VFD for 60HP pump

Factors Contributing to Variance:
Hours of operation were underestimated in the energy study

Master Site ID: S00000116042
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0626	2006	Process Modification	3,028,717	3,028,717	Yes	100%

Measure Description:
For this Greenfield project, added silos to store hog fuel to reduce moisture and thus decrease loads on boiler system components - connected HP reduced from 1781.5 to 1418.5 and precipitator reduced from 311 to 214 kW.

Factors Contributing to Variance:
No performance data was available/provided - savings were deemed

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE1061	2006	Pneumatic Conveyance	344,865	181,583	No	53%

Measure Description:
Installed efficient baghouse and fan.

Factors Contributing to Variance:
Originally specified 150HP motor was changed out to 250HP after as-built metering was performed.

Master Site ID: S00000115949
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0716	2006	Compressed Air	385,857	0	No	0%

Measure Description:
Installed 300hp VFD air compressor

Factors Contributing to Variance:
300hp VFD compressor operates at full load nearly all the time - a full range of variable operation is not evidenced

Master Site ID: S00000116096
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0308	2006	Compressed Air	911,493	5,488,993	No	602%

Measure Description:
Installed one new 350 HP air compressor w/ VFD controls and added a load/unload kit to the existing 300 HP air compressor.

Factors Contributing to Variance:
Baseline appears inapproriate - report is unclear on number of operating compressors. A revised baseline would give a RR of 457%.

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0694	2006	Pneumatic Conveyance	895,158	1,291,875	No	144%

Measure Description:
Installed one new 125 HP airfoil fan. Data logger was installed on unit.

Factors Contributing to Variance:
A smaller fan of 125hp was used instead of the original 150hp unit specified in the energy analysis.

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0469	2006	Process Modification	649,878	533,140	No	82%

Measure Description:
Lumber presort using LDS200 moisture sensor allowing them to send wet lumber to one kiln and dry lumber to another kiln, reducing drying times.

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: SEG2
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0643	2006	Waste Water	2,071,582	2,103,595	No	102%

Measure Description:
Re-engineered biosolids drying facility to eliminate more than 300HP of blowers

Factors Contributing to Variance:
None

Master Site ID: S00001206637
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0748	2006	Process Modification	1,898,949	1,763,004	No	93%

Measure Description:
Install a new water density separator plant in lieu of mechanical screening process with 3 efficient pumps and motors.

Factors Contributing to Variance:
None

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0818	2006	Process Pumping	66,284	76,724	No	116%

Measure Description:
Install gravity feed water supply to eliminate use of 50HP pump

Factors Contributing to Variance:
None

Master Site ID: S00000115435
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0516	2006	Pneumatic Conveyance	1,851,183	1,887,501	No	102%

Measure Description:
Installed efficient dust collection fans

Factors Contributing to Variance:
Market conditions have resulted in fewer days per week operation Without adjustment of operating hours RR would be 144%.

Master Site ID: S00000116040
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0267	2006	Compressed Air	579,088	0	No	0%

Measure Description:
Installed two VFD compressors

Factors Contributing to Variance:
VFD compressors are not operating in variable speed mode. Actual RR is -81% rather than zero as reported.

Master Site ID: S00001203268
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0730	2006	Waste Water	1,445,407	1,318,702	No	91%

Measure Description:
Blower operation and control modifications; channel aeration modifications

Factors Contributing to Variance:
None

Master Site ID: S00001171993
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0710	2006	Waste Water	837,159	837,159	Yes	100%

Measure Description:
Reduce circulation pump use, cease aeration in small digester and decommission large digester

Factors Contributing to Variance:
No measurement performed, savings were deemed

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0634	2006	Waste Water	568,522	568,522	Yes	100%

Measure Description:
Shut down one aeration basic, lower applied aeration motor power, optimized controls based on DO level

Factors Contributing to Variance:
No measurement performed, savings were deemed

Master Site ID: S00001237487
Industrial Process: Food Processing
NAICS Code: 311

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0891	2006	Refrigeration	1,251,499	1,251,499	No	100%

Measure Description:
Installed efficient refrigeration components including compressor, condenser and evaporator VFD, oversized condenser and evaporators, and computerized controls

Factors Contributing to Variance:
No data provided by customer on this Greenfield project - savings were deemed

Master Site ID: S00001156977
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0556	2006	Waste Water	1,060,720	1,478,960	No	139%

Measure Description:
Installed efficient pump and motor

Factors Contributing to Variance:
Provided billing data suggest that the energy study baseline is not realistic. Adjustment based on actual bills results in RR of 41%.

Master Site ID: S00000116021
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0844	2006	Compressed Air	1,051,700	1,268,997	No	121%

Measure Description:
Installed efficient sander dust collection system

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00001285712
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Waste Water	1,027,793	913,879	No	89%

Measure Description:
Installed high efficient 75 HP positive displacement aeration blower and also automated DO controls in aeration basin

Factors Contributing to Variance:
None

Master Site ID: S00001151067
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0672	2006	Compressed Air	986,868	205,502	No	21%

Measure Description:
Installed lead/lag controller and load/unload controls on two 250 HP air compressors

Factors Contributing to Variance:
As indicated by the datalogging, both compressors spent very little time unloaded, suggesting that controls are not working properly

Master Site ID: S00001204004
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0936	2006	Compressed Air	887,794	702,149	No	79%

Measure Description:
- Installed high efficient 350 HP air compressor w/ VFD

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00001179309
Industrial Process: High Tech
NAICS Code: 334

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0537	2006	HVAC	280,032	0	No	0%

Factors Contributing to Variance:
Appears that this was only a study and not an installed measure. Savings were incorrectly entered into FastTrack.

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0675	2006	HVAC	266,757	266,757	Yes	100%

Measure Description:
Install High Efficiency Fan Filter Units

Factors Contributing to Variance:
None - overall billing analysis provides close results - savings were deemed

Master Site ID: S00001179309
Industrial Process: High Tech
NAICS Code: 334

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0676	2006	HVAC	260,247	260,247	Yes	100%

Measure Description:
Install improvements to chilled water loop

Factors Contributing to Variance:
None - overall billing analysis provides close results - savings were deemed

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0674	2006	HVAC	119,481	119,481	Yes	100%

Measure Description:
Install improvements to chilled water loop

Factors Contributing to Variance:
None - overall billing analysis provides close results - savings were deemed

Master Site ID: S00000116063
Industrial Process: Food Processing
NAICS Code: 311

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Refrigeration	556,127	556,127	Yes	100%

Measure Description:
Greenfield project with thermosyphon oil cooling, efficient doors and underfloor heating, computer control, condenser fan, evaporator fan, and compressor VFD, oversized condenser

Factors Contributing to Variance:
No data provided by customer on this Greenfield project - savings were deemed

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Refrigeration	82,014	82,014	Yes	100%

Factors Contributing to Variance:
No data provided by customer on this Greenfield project - savings were deemed

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Refrigeration	78,840	78,840	Yes	100%

Factors Contributing to Variance:
No data provided by customer on this Greenfield project - savings were deemed

Master Site ID: S00000116063
Industrial Process: Food Processing
NAICS Code: 311

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Refrigeration	64,235	64,235	Yes	100%

Factors Contributing to Variance:
No data provided by customer on this Greenfield project - savings were deemed

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Refrigeration	40,817	40,817	Yes	100%

Factors Contributing to Variance:
No data provided by customer on this Greenfield project - savings were deemed

Master Site ID: S00001125167
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0569	2006	Compressed Air	750,965	1,334,546	No	178%

Measure Description:
Installed 250HP VFD air compressor

Factors Contributing to Variance:
Plant has gone from three shifts down to one - baseline was not adjusted. RR with baseline adjustment is 120%.

Master Site ID: S00001126433
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0457	2006	Waste Water	721,766	604,050	No	84%

Measure Description:
Replace ASR recharge pump and motor, replace ASR 1 pump motor, replace Bonita #1 pump and motor

Factors Contributing to Variance:
VFD on ASR 1 was not installed as described in report but savings were never adjusted

Master Site ID: S00000116067
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0229	2006	Compressed Air	650,356	898,917	No	138%

Measure Description:
Installed 300HP VFD air compressor

Factors Contributing to Variance:
Baseline was adjusted to account for 15% decrease in production. RR without adjustment is 200%.

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0817	2006	HVAC	53,838	53,858	No	100%

Measure Description:
Replaced failed chiller unit with energy efficiency chiller

Factors Contributing to Variance:
No customer data available - savings deemed

Master Site ID: S00001153047
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0508	2006	Fresh Water	690,837	608,129	No	88%

Measure Description:
Pump upgrades, VFD, and pumping operation and control changes

Factors Contributing to Variance:
None

Master Site ID: S00001153057
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0512	2006	Waste Water	671,996	671,996	Yes	100%

Measure Description:
DO Control, controlled aspiration, UV system control

Factors Contributing to Variance:
No performance data was available/provided - savings were deemed

Master Site ID: S00001163891
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0598	2006	Process Modification	666,810	675,372	No	101%

Measure Description:
Installed VFD for kiln fans and controls

Factors Contributing to Variance:
None

Master Site ID: S00001207775
Industrial Process: Distribution
NAICS Code: 493

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0772	2006	Refrigeration	633,985	633,985	Yes	100%

Measure Description:
Greenfield project with thermosyphon oil cooling, computer control, condenser fan and compressor VFD, oversized condenser

Factors Contributing to Variance:
No data provided by customer on this Greenfield project - savings were deemed

Master Site ID: S00000115676
Industrial Process: High Tech
NAICS Code: 334

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0352	2006	HVAC	608,369	608,369	Yes	100%

Measure Description:
Installed efficient air handler equipment with VFD and implemented night setback/up

Factors Contributing to Variance:
No performance data was available/provided - savings were deemed

Master Site ID: S00000116018
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0677	2006	Pneumatic Conveyance	570,347	772,993	No	136%

Measure Description:
Installed efficient fan on Sander Line

Factors Contributing to Variance:
Production is down due to market conditions - savings have been adjusted

Master Site ID: S00001168477
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0617	2006	Compressed Air	553,397	610,741	No	110%

Measure Description:
Installed a 200hp VFD Compressor

Factors Contributing to Variance:
None

Master Site ID: S00001288757
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	197,747	158,528	No	80%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	151,128	121,155	No	80%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	59,115	47,391	No	80%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	36,558	29,308	No	80%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	24,926	19,983	No	80%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	23,795	19,076	No	80%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	10,929	8,761	No	80%

Master Site ID: S00001288757
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	5,887	4,719	No	80%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	3,770	3,022	No	80%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	1,127	903	No	80%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	-293	-293	Yes	100%

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Lighting	-878	-878	Yes	100%

Master Site ID: S00000115978
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0318	2006	Compressed Air	503,416	1,154,228	No	229%

Measure Description:
Installed 150HP VFD compressor

Factors Contributing to Variance:
Possibly due to conservative analysis approach

Master Site ID: S00001206237
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0744	2006	Fresh Water	455,556	1,144,136	No	251%

Measure Description:
Installed efficient 75 HP pump motor w/ VFD on intake pump #2 and 300 HP pump motor w/ VFD on the high service pump #2

Factors Contributing to Variance:
Datalogging indicates that 300HP pump is very lightly loaded. Baseline may have been overestimated.

Master Site ID: SEG1
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0749	2006	Pneumatic Conveyance	286,900	365,567	No	127%

Measure Description:
Installed VFD for 200hp RCO (Regenerative Catalytic Oxidizer)

Factors Contributing to Variance:
Actual VFD speed is less than assumed

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0915	2006	Hydraulics	166,917	166,917	Yes	100%

Measure Description:
Use idling hydraulic pumps instead of four pumps totaling 110hp

Factors Contributing to Variance:
Motors removed - savings deemed

Master Site ID: S00001222585
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0870	2006	Lighting	372,735	372,735	Yes	100%

Measure Description:
Installed efficient lighting

Factors Contributing to Variance:
None

Master Site ID: S00001222585
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0808	2006	Compressed Air	62,284	123,085	No	198%

Measure Description:
Installed VFD compressor

Factors Contributing to Variance:
Possibly due to conservative analysis approach

Master Site ID: S00000116009
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0334	2006	Waste Water	427,425	346,113	No	81%

Measure Description:
Blower control modifications

Factors Contributing to Variance:
None

Master Site ID: S00001178398
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0663	2006	Fresh Water	421,104	484,203	No	115%

Measure Description:
Installed efficient pumps and VFD for intake and effluent

Factors Contributing to Variance:
None

Master Site ID: S00000116083
Industrial Process: High Tech
NAICS Code: 334

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0849	2006	Compressed Air	407,614	141,618	No	35%

Measure Description:
Installed 350hp efficient air compressor in lieu of three rotary screw machines

Factors Contributing to Variance:
The baseline used in the energy report appears low, although it is based on datalogging measurements. An alternative estimated energy use for the baseline compressors provides an RR of 79%.

Master Site ID: S00000115989
Industrial Process: Food Processing
NAICS Code: 311

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0349	2006	Refrigeration	395,797	282,700	No	71%

Measure Description:
Installed a 125hp VFD Ammonia compressor

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00000116086
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0171	2006	Process Modification	384,320	442,767	No	115%

Measure Description:
Installed four high efficient 25 HP internal gear pump motors. One motor (DR 3-1) has a higher gear ratio than the other three motors (DR 1-1, 1-2, 2-1).

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00001118335
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0723	2006	Compressed Air	324,889	352,910	No	109%

Measure Description:
Installed compressed air controls

Factors Contributing to Variance:
None

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0597	2006	Process Pumping	44,436	0	No	0%

Measure Description:
Installed VFD for 30hp boiler feedwater pump

Factors Contributing to Variance:
Boiler is no longer used and there are no current plans for restarting it.

Master Site ID: S00001300315
Industrial Process: Food Processing
NAICS Code: 311

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0931	2006	Compressed Air	342,251	488,831	No	143%

Measure Description:
Installed a 150hp VFD Compressor

Factors Contributing to Variance:
The compressor appears to be running as expected, and demand has not increased. It is likely that the baseline was conservative in this case, resulting in a high realization rate.

Master Site ID: S00001214769
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0781	2006	Compressed Air	328,520	462,430	No	141%

Measure Description:
Installed high efficient 150 HP air compressor w/ VFD

Factors Contributing to Variance:
Production is reduced due to market conditions. When baseline is adjusted to account for this, RR is 124%.

Master Site ID: S00001163895
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0226	2006	Waste Water	250,413	267,060	No	107%

Measure Description:
Operate existing aeration system at low speed, new sludge press compressor, and improved mixing/aeration unit for sludge tank

Factors Contributing to Variance:
None

Master Site ID: S00000115894
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0623	2006	Process Fans	310,078	263,898	No	85%

Measure Description:
VFD for two 60hp cooling fans, a 75hp scrubber fan, and five 15hp stacker fans.

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00001235614
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0872	2006	Lighting	309,786	336,177	No	109%

Measure Description:
Installed efficient lighting

Factors Contributing to Variance:
None

Master Site ID: S00000116079
Industrial Process: Distribution
NAICS Code: 493

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0671	2006	Pneumatic Conveyance	155,108	120,343	No	78%

Measure Description:
Installed efficient baghouse and fan

Factors Contributing to Variance:
No explanation for variance in savings was apparent

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0670	2006	Pneumatic Conveyance	150,087	150,683	No	100%

Measure Description:
Installed efficient baghouse and fan

Factors Contributing to Variance:
None

Master Site ID: S00001120279
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0018	2006	Fresh Water	302,117	232,825	No	77%

Measure Description:
Installed VFD's on 250 HP high service pump motors #2, #3, and #4.

Factors Contributing to Variance:
VFD operation is not evident in 4 weeks logged data

Master Site ID: S00001165925
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0600	2006	Compressed Air	301,717	380,569	No	126%

Measure Description:
Installed 100hp VFD air compressor

Factors Contributing to Variance:
Conservative analysis

Master Site ID: SEG4
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0635	2006	Fresh Water	301,400	213,925	No	71%

Measure Description:
Installed two premium efficient 100 HP motors for finish water pumps and VFD's.

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00000115966
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0931	2006	Compressed Air	293,075	556,646	No	190%

Measure Description:
Installed a 150hp VFD Compressor

Factors Contributing to Variance:
Compressor appears to be operating as expected. Measured Average KW is lower by about 7KW than predicted. In addition, ATAC study incorporated a 10% downward adjustment in savings to be conservative. These factors likely contribute to the high realization rate.

Master Site ID: S00001166725
Industrial Process: High Tech
NAICS Code: 334

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0847	2006	HVAC	265,700	265,700	Yes	100%

Measure Description:
Cooling tower VFD retrofit for Building E.

Factors Contributing to Variance:
No performance data was available/provided - savings were deemed

Master Site ID: S00001153049
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0509	2006	Fresh Water	260,770	215,805	No	83%

Measure Description:
Installed efficient pump and motor

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00001203278
Industrial Process: Food Processing
NAICS Code: 311

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0733	2006	Compressed Air	246,394	200,808	No	81%

Measure Description:
Install proper size suction line for using a production room as an off-season freezer

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00001293175
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE1018	2006	Lighting	176,560	134,844	No	76%

Measure Description:
Installed efficient T5HO fixtures with individual fixture occupancy controls

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00000116015
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0338	2006	Fresh Water	222,039	222,039	Yes	100%

Measure Description:
Efficient motors for one 75HP well and one 300HP effluent pump

Factors Contributing to Variance:
None - inadequate performance data was provided by customer. Savings were deemed

Master Site ID: S00000115947
Industrial Process: General Mfg.
NAICS Code: 339

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0654	2006	Compressed Air	219,361	214,334	No	98%

Measure Description:
Installed 60HP VFD air compressor

Factors Contributing to Variance:
None

Master Site ID: S00001122949
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0431	2006	Waste Water	210,494	90,902	No	43%

Measure Description:
Installed DO blower control and UV disinfecting control

Factors Contributing to Variance:
UV control system has never been used - zero savings assigned

Master Site ID: SEG3
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0238	2006	Fresh Water	187,768	275,447	No	147%

Measure Description:
Installed high efficient 20 HP motors #1, #2 and #3 and eliminate raw water pumping with gravity feed system.

Factors Contributing to Variance:
No explanation for variance in savings was apparent

Master Site ID: S00000115996
Industrial Process: Wood Products
NAICS Code: 321

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
	2006	Compressed Air	98,913	121,228	No	123%

Measure Description:
Install 50HP VFD air compressor

Factors Contributing to Variance:
Baseline and savings were for two shift operation while current activity is one shift. With adjustments for shift change, RR would be 96%.

Master Site ID: S00000116104
Industrial Process: Municipal
NAICS Code: 924

PE #	Year	Measure Category	Working KWH	Deemed/ Measured KWH	Deemed	Realization Rate
PE0239	2006	Waste Water	58,692	58,692	Yes	100%

Measure Description:
Install smaller blower and smaller inlet station pump

Factors Contributing to Variance:
Datalogging not possible - savings deemed. (Energy analysis report had savings incorrect.)

C INTERVIEW GUIDES AND SURVEY INSTRUMENTS

PRODUCTION EFFICIENCY PROGRAM: PROCESS AND IMPACT EVALUATION INTERVIEW GUIDE – ETO, PMC, PDCS

The questions we have for you cover two time frames. First we'll ask about the PE program's history and evolution since the last process evaluation, which covered 2003 and 2004. Then we want to explore your perceptions of the effects of the program changes that will occur January 1. [Unless otherwise indicated, ask each question of all respondents.]

Program Role

1. How do you see your program role, and in what ways, if any, has that changed from before 2005?

2. Please describe the activities you engage in that occupy the majority of your time?

3. **[**SKIP IF PDC**]** Do you interact directly with any customers? [If yes] What types of interactions do you have and in why types of circumstances?

2006 Funding Limitations

I understand the 2006 program had funding limitations.

4. **[**SKIP IF PDC**]** What were incentives in 2005 and how did they change in 2006? When did the changes go into effect?

5. How were these changes in incentives communicated to customers? Did the changes occur immediately when announced, or did customers have advanced warning?

6. How were these changes communicated to [the PDCs/ you]? How much advance warning of an incentive change did [the PDCs/ you] have?

7. How did customers respond to the incentive decreases? How did [the PDCs/ you] respond? What effect did you see on projects proposed?

8. Were other steps taken to ensure customer commitments for 2006 did not exceed funding availability? For example, if projects were deferred into 2007, how did this happen?

9. How did customers respond to these steps to limit program commitments? How did [the PDCs/ you] respond? How did the ATACs and vendors respond to those steps?

10. Was there a rebound in 2007? Did the proposals go through then? Have you taken [are you taking] additional steps to regain any ground lost—to get these postponed projects in the door? What steps?

11. What circumstances led to the incentive reductions and other "slow down" activities? How did it become apparent these changes were needed? When did it become apparent?

12. In retrospect, what do you think created to the need to reduce customer commitments in 2006? What steps have been taken, if any, to ensure this situation doesn't arise in the future? [If not addressed] How did the reservation system work? Do you think this will be effective in matching the flow of projects to available funding?

Program Evolution

13. What changes/evolution [other than incentives] have occurred in program design and implementation since 2004 [the 2003-2004 period was covered by a prior process evaluation]? What were the reasons for the changes?

14. Have you seen any changes in the numbers, sizes or types of projects or in the companies (by sector, by size) participating in the program since 2004? If so, what changes?

15. Has the number of projects you've worked on met your expectations?

16. How does the program work when an industrial customer has projects that qualify for BE? Do [PDCs/ you] give the customer the same amount of help as for PE? Is the customer aware of the two different programs?

17. Do you work with participants who are interested in renewable energy projects (e.g., biomass, hog fuel boilers, solar)? [If so] What types of projects? Do you know whether they completed the projects? Do you know whether they applied for ETO incentives for the projects?

18. Do [PDCs/ you] help participants with BETC applications? How?

19. When you work with gas customers, do you tell them of the BETC for gas efficiency? Do you talk with customers about the BETC for renewable energy?

Program Marketing

20. How is the program marketed to customers? How are projects assigned to ATACs?
    - How do customers come into the program and come to work with you?
    - Do you typically initiate with your customers the possibility of participating in the program, or does the customer or someone else typically approach you with program opportunities, or does the possibility of installing qualifying equipment arise as you and your customer are discussing their equipment needs?

21. Are you satisfied with this process? Explain.

22. What efforts are made to reach underserved segments? [strategic approach, outreach activities, messaging]

Serving Oregon Industry

23. What review is undertaken to determine whether any business, equipment, or process types involved in Oregon industrial activities are still underserved by the program? [probe for both industrial sectors and cross-cutting technologies such as compressed air]

24. Are you aware of any measures that are missing form the program? Are there measures you believe should have prescriptive rather than custom incentives? Are there lessons from measure or process changes in one industry that can benefit other industries?

25. Are there ways to increase program savings by increasing the level of project efficiency? By increasing the scope of efficiency of customers' projects? By improving the project implementation rate (rate at which studies become projects)?

26. How much repeat business are you seeing? That is, how many projects are occurring at locations where previous program projects were done? How do repeat customers' projects compare with their previous projects?

27. How would you describe the market, or remaining opportunities, for projects that are eligible for this program?

28. What is your vision of the program potential for serving Oregon industry? What might be an "ideal" scenario for how the program and Oregon industrial customers interact? Do you think all the program players (i.e., ETO, PMC, PDC, ATACs) hold a consistent vision or ideal scenario?

29. What is your sense of the extent to which participating customers perceive they have an ongoing relationship with Energy Trust and the Production Efficiency Program? What is data or anecdotes do you base your impressions on?

30. What do [PDCs and ATACs/ you] do with respect to forging this relationship with customers? What might [they/ you] do differently?

31. [If not addressed through prior questions] What conversations have occurred between ETO or the PMC and PDCs or ATACs about becoming involved with customers' capital planning processes and projects? How have [the PDCs/ you] responded? What follow-up has occurred?

32. Is there a potential for stronger relationships between ETO and the utilities, DOE, EIA, or other entities, and the potential that strengthened relationships would strengthen industrial energy efficiency efforts in Oregon?

Quality Control

33. What quality control activities occur and by whom? How have these activities changed over time, if at all?

34. Are there written guidelines for the reports/studies prepared by PDCs? ATACs? Vendors?

35. Are there requirements for minimum information to be presented? For presenting savings calculations and justifying savings estimations?

36. Are customers' projects varying from the recommendations in your studies? If so, in what ways?

37. Have participants ever called you with comments or concerns about their program participation? [If so] What comments or concerns?

38. Are there any quality control issues you are actively addressing at the moment? Any issues you are keeping tabs on, to see how things progress?

39. [SKIP IF ETO] How would you assess the quality of the studies since 2004 compared to those done before that time?

40. Have any misunderstandings occurred for customers regarding the separate roles of PDCs and ATACs?

41. How about any confusion or problems for the PDCs and ATACs themselves?

Communication

42. What regular forms of communication occur among two or more of the different program players (ETO, PMC, PDC, ATACs)?

43. [IF NOT ADDRESSED] Are there regular meetings between various parties? Describe.

44. Is this enough communication? Too little? Too much? Do you have suggestions for improving program communication?

45. What progress reporting occurs? From whom and to whom? How often? Has a progress reporting format been specified?

46. How would you characterize communications with and between the various program players (ETO, PMC, PDCs, ATACs)?

47. Are there any communication issues you haven't mentioned?

48. [IF NOT ADDRESSED:] Have you experienced any difficulties working with any of the other parties? [If so] What difficulties?

49. I know that some vendors develop project proposals. What ongoing communication do you have with vendors? Have any issues come up regarding the quality of those applications?

50. Have any [other] program contractors made comments or expressed concerns about the program? [If so] What comments or concerns?

Summary Remarks

51. What has worked best about the program during the past two years?

52. What program opportunities do you see? How can they be taken advantage of?

53. What are the greatest challenges now facing the program? How can they be overcome?

54. What changes would you most like to see?

Any final comments?

PRODUCTION EFFICIENCY PROGRAM: PROCESS AND IMPACT EVALUATION SURVEY INSTRUMENT – PARTICIPANTS (PHONE)

Is this phone survey or done by field staff?

- ❍ Phone survey
- ❍ Field staff

Contact Information

Interviewer (Phone survey only) _____

Field staff name (Field survey only) _____

Date _____

Firm _____

Contact _____

Master Site ID _____

PE Project Number _____

Logger Numbers (Field survey only) _____

Logger Contact Person & Contact Info (Field survey only) _____

Introductory Statement [Phone Interviewer]

Hi, my name is _____. I am calling on behalf of Energy Trust of Oregon. In 2006 your firm received an incentive through its Production Efficiency Program. As part of its commitment to continuous improvement and providing value to Oregon ratepayers, Energy Trust is evaluating the program and has hired my firm to conduct a survey of selected participants. Is now a good time to discuss your equipment and your satisfaction with the program?

Awareness

My first set of questions concern program awareness.

1. About how long have you been aware of the Production Efficiency Program? Would you say…?
   - ❍ sometime in the past 2 years or so [2006-2007]
   - ❍ 2-4 years [2004-2005]
   - ❍ 5 years or more, or answer refers to a 'utility program' [before 2004]
   - ❍ don't know

   Additional comments:

   _____

2. Do you recall how you *first* heard of the Production Efficiency Program? [DO NOT READ, BUT PROBE TO CODE]
   - ❍ Program Representative
   - ❍ Vendor/Contractor
   - ❍ Utility (PGE, Pacific Corp)
   - ❍ DON'T KNOW
   - ❍ Other (please specify)

   If you selected other please specify:

   _____

   Additional comments:

   _____

3. Did it seem to you that the vendor who provided the equipment for which you got an incentive was also familiar with the Production Efficiency Program?
   - ❍ Yes
   - ❍ No
   - ❍ Mostly
   - ❍ Somewhat
   - ❍ DON'T KNOW

   Additional comments:

   _____

4. Did it seem to you that the vendor who provided the equipment...?
   - ❍ DIDN'T WORK WITH A VENDOR OR CONTRACTOR
   - ❍ identified both pros and cons to participating
   - ❍ encouraged participation
   - ❍ neither encouraged nor discouraged participation
   - ❍ discouraged participation
   - ❍ NO OPINION

   Additional comments:

   _____

5. Did you apply for an Oregon Business Energy Tax Credit (BETC—"betsy") on the equipment you installed through the Production Efficiency Program?

❍ Yes
❍ No

5a. Why didn't you apply? [DO NOT READ, BUT PROBE TO CODE]

❑ didn't know about BETC
❑ didn't think of applying
❑ didn't know my equipment might qualify
❑ knew equipment didn't qualify
❑ thought BETC not available for municipalities, nonprofits
❑ BETC application seemed too difficult or time consuming
❑ was too late to apply
❑ for reasons internal to your company that don't pertain to the program
❑ DON'T KNOW
❑ Other (please specify)

If you selected other please specify:

_____

Additional comments:

_____

6. Are you aware that your firm can get BETC tax credits for natural gas efficiency?

❍ Yes
❍ No

Additional comments:

_____

7. Are you aware that your firm can get BETC tax credits for renewable energy projects, such as CHP—combined heat and power, solar electric, and bio-power?

❍ Yes
❍ No

Additional comments:

_____

8. When considering the influence of the BETC and the Energy Trust incentive on your decision to install the energy efficient equipment, would you say…?

- ❍ BETC had the most influence
- ❍ Energy Trust incentive had the most influence
- ❍ BETC and Energy Trust incentive had equal importance
- ❍ it was the combination of BETC and Energy Trust incentive that was so influential
- ❍ DON'T KNOW

Additional comments:

Past and Ongoing Program Interactions

The next set of questions concern interactions you've had with the Production Efficiency Program.

9. Had your firm participated in the Energy Trust's Production Efficiency Program prior to this equipment installation?

- ❍ Yes
- ❍ No, or participated prior to 2004, or Utility Program
- ❍ DON'T KNOW

Additional comments:

---

10. Has your firm ever started to participate in the Production Efficiency Program but did not continue for some reason?

- ❍ No
- ❍ DON'T KNOW
- ❍ Yes

10a. When was it that you tried to participate but did not? [DO NOT READ, BUT PROBE TO CODE] [IF A RANGE IS GIVEN, CODE MOST RECENT DATE]

- ❑ Prior to 2004, UTILITY PROGRAM
- ❑ 2004
- ❑ 2005
- ❑ 2006
- ❑ 2007
- ❑ DON'T KNOW

Additional comments:

10b. Why did you not continue? Would you say…? [CHECK ALL THAT APPLY]

- ❑ equipment didn't qualify
- ❑ incentive wasn't sufficient for project to meet your firm's investment criteria
- ❑ incentives were not available at that time
- ❑ participating in the program would take too long
- ❑ participating was too much of a hassle
- ❑ reasons internal to your company that don't pertain to the program
- ❑ DON'T KNOW
- ❑ Other (please specify)

If you selected other please specify:

_____

Additional comments:

_____

10c. You said, 'participating was too much of a hassle'. Could you describe why you said so?

_____

_____

_____

11. Since learning about the program, has your organization purchased *any* equipment (such as air compressors, motors, refrigeration components) *other* than the equipment for which you sought an Energy Trust incentive?

- ❍ No
- ❍ DON'T KNOW
- ❍ Yes

11a. Did you discuss with your program contact whether you would be eligible for an incentive if you specified the equipment be energy efficient?

- ❑ Yes
- ❑ No

11b. Why not? [DO NOT READ, BUT PROBE TO CODE] [CHECK ALL THAT APPLY]

- ❑ didn't think about it
- ❑ not aware energy efficient options were available for the equipment
- ❑ didn't think energy efficient options would work for the application
- ❑ thought financial incentive likely was too little to bother with
- ❑ thought incentives were not available at that time
- ❑ not enough time to participate
- ❑ reasons internal to your company that don't pertain to the program
- ❑ DON'T KNOW
- ❑ Other (please specify)

If you selected other please specify:

_____

Additional comments:

_____

12. Since participating in the program, is your program contact someone you would consider calling when you are contemplating an equipment purchase or facility change? [DO NOT READ, BUT PROBE TO CODE]

- ❍ yes, and have called them/about to call them
- ❍ yes, but have not called them
- ❍ never thought of it, but might do so
- ❍ would rather they contacted me periodically
- ❍ no, see no reason to call/wouldn't want to call
- ❍ Other (please specify)

If you selected other please specify:

_____

Additional comments:

_____

12a. Please describe why you think 'there is no reason to call or wouldn't want to call'?

_____

_____

_____

12b. Can you identify any changes that would increase your willingness to discuss with them equipment purchases or facility changes you are considering?

_____

_____

_____

13. Please rate how well you think your program contact understands the challenges you face in operating your specific facility? [READ LIST]

- ❍ excellent understanding
- ❍ understands quite a lot
- ❍ moderate understanding
- ❍ a little understanding
- ❍ not very well, but over time they likely will come to understand better
- ❍ not very well and I don't expect them to understand

Additional comments:

_____

14. Do you feel your program contact was always serving your company's best interests?

- ❍ Yes
- ❍ No
- ❍ DON'T KNOW

Additional comments:

_____

14a. Please explain why you feel so.

_____

_____

_____

Decision-Making

The next set of questions addresses the decisions your firm made regarding the equipment installation.

15. What reasons did you have for installing the equipment for which you received an incentive? [READ LIST] [CHECK ALL THAT APPLY]

15a. You said, [READ CHECKED LIST BELOW]. Among them, could you tell me the 3 most important reasons?

Reasons for installing the equipment	15. Reasons	15a. Top 3 Reasons
Code or regulations	❑	❑
Safety	❑	❑
Improved reliability	❑	❑
Replace failed equipment	❑	❑
Support a change in production level	❑	❑
Improve production/process efficiency	❑	❑
Product quality	❑	❑
Energy cost savings	❑	❑
Other cost savings (labor, O&M, improved scheduling)	❑	❑
Vendor/contractor recommended	❑	❑
Program representative recommended	❑	❑
Technical study recommended	❑	❑
Efficiency features are part of common practice for this application	❑	❑
Corporate policy	❑	❑
Other	❑	❑
DON'T KNOW	❑	❑

15b. You mentioned 'corporate policy' as one of the reasons. Could you explain what kind of corporate policy you are referring to?

_____

_____

_____

16. About when did you first consider a project that would address these circumstances you just described? Would you say…?

- ❍ sometime in the past 2 years or so [2006-2007]
- ❍ 2-4 years [2004-2005]
- ❍ 5 years or more [BEFORE 2004] [UTILITY PROGRAM]
- ❍ DON'T KNOW

Additional comments:

_____

17. Had your firm not been able to get an Energy Trust incentive for the installation, how would your plans have changed, if at all? I will read several phrases, each starting with "We probably would have...". For each phrase, please tell me if the statement is true or false to your firm. So, for the first one, would you say "We probably would have...

- ❍ made no changes; would have installed the identical equipment within that same year
- ❍ postponed the project to another year
- ❍ installed standard efficiency equipment
- ❍ scaled back the project in scope
- ❍ changed the project design
- ❍ used less expensive equipment
- ❍ reduced the energy efficiency features
- ❍ Other (please specify)

If you selected other please specify:

_____

Additional comments:

_____

17a. You said, 'you would have postponed the project to another year'. How long would you say you would have postponed?

_____
_____
_____

17b. You said, 'you would have scaled back the project in scope'. How much scale back would you have made?

_____
_____
_____

17c. You said, 'you would have changed the project design'. How would you have changed it?

_____
_____
_____

18. If the program contact had not facilitated participation in the program, how likely is it that you would have installed the *efficient* equipment anyway? [DO NOT READ, BUT PROBE TO CODE]

- ❍ DIDN'T WORK WITH PROGRAM REP
- ❍ definitely would
- ❍ probably would
- ❍ not sure
- ❍ probably would not
- ❍ definitely would not
- ❍ DON'T KNOW

Additional comments:

---

19. How influential was the technical study in planning for this equipment installation? Would you say…?

- ❍ DID NOT HAVE A TECHNICAL STUDY
- ❍ the technical study had no influence on our plans
- ❍ the technical study had a little influence on our plans
- ❍ the technical study had a moderate influence on our plans
- ❍ the technical study had a significant influence on our plans
- ❍ critical influence--the installation would not have happened without the technical study
- ❍ DON'T KNOW

Additional comments:

---

20. How influential was the Production Efficiency incentive in planning for this equipment installation? Would you say…?

- ❍ INSTALLATION WAS PLANNED BEFORE WE CONSIDERED THE INCENTIVE
- ❍ the incentive had no influence on our plans
- ❍ the incentive had a little influence on our plans
- ❍ the incentive had a moderate influence on our plans
- ❍ the incentive had a significant influence on our plans
- ❍ critical influence—the installation would not have happened without the incentive
- ❍ DON'T KNOW

Additional comments:

---

21. At that time, could your budget have accommodated the full cost of the equipment installation without the incentives?

- ❍ Yes
- ❍ No
- ❍ DON'T KNOW

Additional comments:

_____

22. Has your firm installed any *energy efficient* equipment for which it did *not* receive an incentive from Energy Trust?

- ❍ No
- ❍ DON'T KNOW
- ❍ Yes

Additional comments:

_____

22a. What equipment?

_____

_____

_____

22b. Please rate how influential your experience participating in the Production Efficiency (PE) Program was on your decision to install this *energy efficient* equipment (that you did not receive an incentive for). Would you say…?

- ❍ THE EQUIPMENT WAS PLANNED BEFORE OUR LAST PARTICIPATION
- ❍ our PE experiences had no influence on our purchase of this equipment
- ❍ our PE experiences had a a little influence on our purchase of this equipment
- ❍ our PE experiences had a moderate influence on our purchase of this equipment
- ❍ our PE experiences had a significant influence on our purchase of this equipment
- ❍ critical influence—we would not have purchased this equipment if we had not participated in the PE program

Additional comments:

_____

Program Experiences

We're about three-quarters of the way done. The next set of questions focuses on your experiences as a program participant.

23. If you were to install equipment that qualifies for an incentive, would you choose to participate in the program again?

- ❍ Yes
- ❍ No

23a. If anything, what would you want to have happen differently?

_____
_____
_____

23b. Why not?

_____
_____
_____

24. Can you think of any information or assistance that your program contact might have provided that would made it easier to obtain your management's approval for the project?

- ❍ no, can't think of anything
- ❍ no, not really relevant as I was the final decision-maker
- ❍ yes, they could have

Additional comments:

_____

24a. Could you describe what they are?

_____
_____
_____

25. Please rate your satisfaction with the following items, where a rating of "1" =very unsatisfied, "3" =neither unsatisfied nor satisfied, and a rating of "5"=very satisfied.

	1 = Very Unsatisfied	2	3 = Neither Unsatisfied Nor Satisfied	4	5 = Very Satisfied	Don't Know/ No Answer/ Na
Performance of equipment installed	❑	❑	❑	❑	❑	❑
Electricity Savings	❑	❑	❑	❑	❑	❑
Incentive amount	❑	❑	❑	❑	❑	❑
Application process	❑	❑	❑	❑	❑	❑
Quality of the work conducted by contractor/vendor	❑	❑	❑	❑	❑	❑
Overall program experience	❑	❑	❑	❑	❑	❑
Program staff's knowledge	❑	❑	❑	❑	❑	❑
With any program issue that needed resolution	❑	❑	❑	❑	❑	❑

26. [IF UNSATISFIED WITH ANY ITEM--RATING OF 1 OR 2] Please describe

_____

_____

_____

27. Did you ever experience any of the following situations? [READ LIST] [CHECK ALL THAT APPLY]

- ❍ uncertainty about who to call
- ❍ uncertainty about the areas of expertise of different program contacts
- ❍ uncertainty about the program (e.g., policies, procedures) as a result of different program contacts telling you different things
- ❍ feeling that a program contact gave you incorrect information about the program
- ❍ feeling that a vendor gave you incorrect information about the program
- ❍ confusion when you thought you were dealing with someone capable of making application decisions and yet it turned out the decision was made by someone else
- ❍ confusion about what incentive amount Energy Trust was paying for estimated electricity savings (price per kWh)
- ❍ uncertainty about whether Energy Trust had run out of incentives for the year and you would have to wait until the next year
- ❍ uncertainty about policies and procedures for self-direct customers
- ❍ NONE OF THE ABOVE

Additional comments:

_____

28. Please rate the extent to which you had any confusion about the program. Would you say…?
- ❍ no confusion
- ❍ some confusion, not at all a problem
- ❍ a small problem
- ❍ a medium problem
- ❍ a significant problem
- ❍ problem so significant it nearly stopped the project from going forward

Additional comments:

_____

Conclusion

I have just a few concluding questions.

29. Which of the following policies or procedures does your organization have in place regarding energy efficiency improvements at this facility? [READ LIST] [CHECK ALL THAT APPLY]
- ❍ staff member responsible for energy and energy efficiency
- ❍ corporate policies that incorporate energy efficiency in operations and procurement
- ❍ a written energy management plan
- ❍ numerical energy savings goals
- ❍ Other (please specify)

If you selected other please specify:

_____

Additional comments:

_____

29a. Can you explain the energy savings goals your organization have?

_____

_____

_____

30. Do you have any final comments on the Production Efficiency Program that might be useful to Energy Trust?

_____

_____

_____

31. Over the years, industrial customers have told us about many of their concerns, such as increasingly being called on to do more work with less resources. What are some of the concerns that are on your mind currently?

_____

_____

_____

That's all of my structured questions. Thank you very much!

PRODUCTION EFFICIENCY PROGRAM: PROCESS AND IMPACT EVALUATION SURVEY INSTRUMENT – NONPARTICIPANTS

Contact Information

ID _____

Name of Contact _____

Name of Organization _____

Phone Number _____

Interviewer _____

Introduction

Hello, my name is _____. I'm calling on behalf of Energy Trust of Oregon. I work for an independent consulting firm that the Energy Trust has hired to assist in its continuous improvement efforts. Your responses to a short survey will enable Energy Trust to better serve Oregon's industrial customers through its Production Efficiency program, which offers customers technical assistance and incentives. Can I speak with someone who knows the most about energy at this facility?

[IF THIS IS THE PERSON] I need about 12 minutes of your time. Is now a good time?

[WHEN THE PERSON IS REACHED] [RESTATE THE INTRO STATEMENT] I need about 12 minutes of your time. Is now a good time?

Screener Questions

1. Has your facility received incentives for energy efficient equipment from the Energy Trust of Oregon anytime in the last five years?
   - ❍ Yes [TERMINATE]
   - ❍ No
   - ❍ Don't know

2. Who do you purchase electricity from?
   - ❍ PGE
   - ❍ Pacific Power/PacifiCorp
   - ❍ Other [TERMINATE]

3. Has your company ever participated in an energy efficiency program of the Energy Trust of Oregon?
   - ❍ Yes [TERMINATE]
   - ❍ No
   - ❍ Don't know

4. Please indicate which of the following best describes your role in your organization.
   - ❍ Plant or corporate engineer
   - ❍ Plant manager
   - ❍ Facilities manager
   - ❍ Owner/President
   - ❍ CEO, COO
   - ❍ CFO, other financial executive
   - ❍ Other (please specify)

   If you selected other please specify:

   _____

5. Does your company have facilities in more than one location in Oregon?
   - ❍ Yes
   - ❍ No [SKIP TO Q7]
   - ❍ DON'T KNOW [SKIP TO Q7]

6. Approximately how many locations are there?

   _____

   _____

   _____

Corporate Energy Management

7. How much opportunity do you believe there is to reduce energy usage at your facility in the coming years? Would you say…
   - ❍ Significant opportunity
   - ❍ Some opportunity
   - ❍ Little opportunity
   - ❍ No opportunity
   - ❍ DON'T KNOW

8. Which of the following best describes your company's approach to controlling electricity costs? Would you describe your organization as…
- ❍ Actively engage in controlling costs
- ❍ Planning to implement cost controls
- ❍ Talk about it, but have not taken action to control costs
- ❍ Haven't addressed
- ❍ Do not use enough electricity to warrant controlling costs
- ❍ Don't know

Dummy 8. [RECORD Q7 RESPONSE BASED ON THE FOLLOWING CATEGORIES]
- ❍ "Actively engage..." or "Planning to implement..."
- ❍ Other responses

9. And which of those response options best describes your company's approach to controlling natural gas costs? [IF NECESSARY, READ LIST WITH PREFACE:] Would you describe your organization as…
- ❍ Actively engage in controlling costs
- ❍ Planning to implement cost controls
- ❍ Talk about it, but have not taken action to control costs
- ❍ Haven't addressed
- ❍ Do not use
- ❍ Do not use enough natural gas to warrant controlling costs
- ❍ DON'T KNOW

Dummy 9. [RECORD Q8 RESPONSE BASED ON THE FOLLOWING CATEGORIES]
- ❍ "Actively engage..." or "Planning to implement..."
- ❍ Other responses

[IF DUMMY 8 = 1 AND DUMMY 9= 1, SKIP TO Q15]

10. Which of the following has your organization engaged in during the past two years to control energy consumption? [READ EACH ONE]
- ❍ Purchased energy efficient equipment
- ❍ Have a staff member responsible for energy use and efficiency
- ❍ Have a committee or team that addresses energy
- ❍ Have an energy plan
- ❍ Have an energy scorecard to track key performance indicators for energy
- ❍ Have corporate policies for energy efficiency regarding procurement or operations
- ❍ Track energy use
- ❍ Conducted a plant-wide energy assessment (audit, engineering review)
- ❍ Conducted an energy assessment of specific equipment systems
- ❍ Manage motors through procedures to repair or replace critical motors when they fail
- ❍ Developed an Asset Management system

[IF 'HAVE AN ENERGY PLAN' NOT CHECKED, SKIP TO Q13]

[IF 'HAVE AN ENERGY PLAN' NOT CHECKED and 'TRACK ENERGY USE' CHECKED, SKIP TO Q13]

[IF 'HAVE AN ENERGY PLAN' and 'TRACK ENERGY USE' NOT CHECKED, SKIP TO Q14]

11. You said your organization has energy plan. Does your energy plan include numerical goals for its energy savings objectives?
    - ❍ Yes
    - ❍ No [SKIP TO Q13]
    - ❍ DON'T KNOW [SKIP TO Q13]

12. What are the goals?

_____

_____

_____

[IF 'TRACK ENERGY USE' NOT CHECKED, SKIP TO Q14]

13. You said your organization has engaged in "tracking energy use". How often do you track energy use?
    - ❍ Yearly
    - ❍ Bi annually
    - ❍ Monthly
    - ❍ Daily
    - ❍ Hourly
    - ❍ DON'T KNOW
    - ❍ Other (please specify)

    If you selected other please specify:

_____

14. Are there any other activities I didn't mention that your organization has engaged in to control energy consumption during the past two years?

_____

_____

_____

15. Have you ever heard of methods some industrial organizations use for continuous improvement such as the ISO protocols, Six Sigma, or TQM—Total quality management?
    - ❍ Yes
    - ❍ No [SKIP TO Q17]
    - ❍ DON'T KNOW [SKIP TO Q17]

16. For each of these methods, please let me know if you have heard of it, tried it, are doing it, are planning on doing it, or are not considering it. How about...

	Heard Of It	Tried It	Are Doing It	Are Planning On Doing It	Are Not Considering It
a. ISO (9,000, 14,000 and 14,001 etc)	❑	❑	❑	❑	❑
b. Six Sigma	❑	❑	❑	❑	❑
c. TQM (Total Quality management)	❑	❑	❑	❑	❑

17. Are there any other facility improvement methods your organization has or is engaged in?

- ❍ Yes
- ❍ No [SKIP TO Q19]
- ❍ DON'T KNOW [SKIP TO Q19]

18. What are they?

_____

_____

_____

Training

19. What types of formal training does your company offer staff related to energy using equipment and processes? [DO NOT READ: PROBE TO CODE]

- ❍ None [PRESS "NEXT PAGE"] [SKIP TO Q21]
- ❍ Compressed air systems
- ❍ Controls
- ❍ Electrical generation (e.g., turbines, generators)
- ❍ Fan systems
- ❍ Heating (process heating, e.g., kilns)
- ❍ Motor management
- ❍ Pump
- ❍ Refrigeration
- ❍ Steam systems practices
- ❍ Energy accounting
- ❍ Energy simulation
- ❍ OSHA/safety
- ❍ Emergency preparedness
- ❍ DON'T KNOW
- ❍ Other (please specify)

If you selected other please specify:

_____

20. How important is it that training provided to your employees on facility and equipment operations include an energy use and efficiency component? Would you say…
- ❍ Very important
- ❍ Somewhat important
- ❍ Not very important
- ❍ Not at all important
- ❍ Don't know

21. In general, what do you see as the primary barriers to improving energy management practices in your firm?

_____
_____
_____

22. To improve your firm's energy efficiency, which two of the following types of external support would you find most valuable?
- ❍ Specialized technical training in system or facility operations
- ❍ Technical studies of equipment or processes
- ❍ Information on energy management best practices in your industry
- ❍ Incentives for energy efficient equipment
- ❍ Incentives for efficient process improvements or plant upgrades
- ❍ New information on energy efficient technologies
- ❍ Forums on energy efficiency at industry events

23. Is there any external support I did not mention that you would find valuable?

_____
_____
_____

Heard of BETC

24. Have you heard of Oregon Business Energy Tax Credits?
- ❍ Yes
- ❍ No [SKIP TO Q27]
- ❍ DON'T KNOW [SKIP TO Q27]

25. Are you aware that your firm can get Oregon BETC tax credits for natural gas efficiency?
- ❍ Yes
- ❍ No
- ❍ DON'T KNOW

26. Are you aware that your firm can get Oregon BETC tax credits for renewable energy projects, such as CHP—combined heat and power, solar electric, and bio-power?
- ❍ Yes
- ❍ No
- ❍ DON'T KNOW

Heard of ETO and PE

27. Prior to today, have you heard of Energy Trust of Oregon?
- ❍ Yes
- ❍ No
- ❍ DON'T KNOW

28. Have you heard of the Production Efficiency Program, the Energy Trust's incentive program for industrial process improvements?
- ❍ Yes
- ❍ No [SKIP TO Q36]
- ❍ DON'T KNOW [SKIP TO Q36]

29. About how long have you been aware of the Production Efficiency Program? [PROBE TO CODE]
- ❍ in the past two years or so [2006-2007]
- ❍ two to four years [2004-2005]
- ❍ five years or more, or answer refers to "a utility program" [Before 2004]
- ❍ DON'T KNOW

30. Do you recall how you *first* heard of the Production Efficiency Program? [DO NOT READ, BUT PROBE TO CODE]
- ❍ Program representative
- ❍ Utility company representative
- ❍ Equipment vendor or contractor
- ❍ Architect, engineer or energy consultant
- ❍ Firms that had participated in the program
- ❍ Professional association, friend or colleague, word of mouth
- ❍ Other (please specify)

If you selected other please specify:

_____

Partial Participants

31. Has your firm ever started to participate in the Production Efficiency Program but did not continue for some reason? And by "starting to participate", I am thinking about anything from seeking out information about the program to planning an equipment purchase.
    - ❍ No [SKIP TO Q36]
    - ❍ DON'T KNOW [SKIP TO Q36]
    - ❍ Yes

32. Why did you not continue? Would you say…
    - ❍ equipment didn't qualify
    - ❍ incentive wasn't sufficient to meet your firm's investment criteria
    - ❍ incentives were not available at that time
    - ❍ participating in the program would have resulted in an unacceptable delay
    - ❍ participating was too much of a hassle
    - ❍ reasons internal to your company that don't pertain to the program
    - ❍ DON'T KNOW
    - ❍ Other (please specify)

    If you selected other please specify:

    _____

[IF 'PARTICIPATING WAS TOO MUCH OF A HASSLE' CHECKED, SKIP TO Q34]

33. You said you didn't continue because "participation was a hassle". Could you explain specifically which element was a hassle to you?

    _____
    _____
    _____

34. When was it that you tried to participate but did not? [PROBE TO CODE]
    - ❍ sometime in the past 2 years or so [2006-2007]
    - ❍ 2-4 years [2004-2005]
    - ❍ 5 years or more
    - ❍ DON'T KNOW

35. [IF THE RESPONDENT APPEARS TO HAVE EXPERIENCE, ASK ANY ADDITIONAL DETAIL REGARDING THEIR EXPERIENCE WITH THE PROGRAM OR ETO]

    _____
    _____
    _____

Potential for Program Participation

36. Has your company applied for or received any incentives or tax credits for energy efficiency improvements?
- ❍ Yes
- ❍ No [SKIP TO Q40]
- ❍ DON'T KNOW [SKIP TO Q40]

37. What incentives or tax credits has your company applied for? [OPEN-ENDED: PROBE TO CODE]
- ❍ Energy Trust of Oregon's Production Efficiency Program
- ❍ Portland General Electric programs
- ❍ Pacific Power programs
- ❍ BETC
- ❍ Northwest Energy Efficiency Alliance
- ❍ Other (please specify)

If you selected other please specify:

_____

[IF 'ENERGY TRUST OF OREGON'S PE' CHECKED, TERMINATE]

38. Did your company apply for incentives or tax credits in the last two years, before that time, or both in the past two years and prior to that?
- ❍ past two years
- ❍ longer than two years ago
- ❍ both recently (past two years) and prior to that

39. Can you describe the most recent time you participated? [PROBE: DID THEY RECEIVE $$, PROJECT TYPE, YEAR]

_____

_____

_____

[IF Q36= YES OR Q36= DON'T KNOW, SKIP TO Q43]

40. Have you purchased any energy efficient equipment in the past two years?
- ❍ Yes [SKIP TO Q42]
- ❍ No
- ❍ DON'T KNOW [SKIP TO Q43]

41. Why not? [DO NOT READ LIST. PROMPT IF NECESSARY]

- ❍ haven't made any equipment purchases
- ❍ I wasn't thinking of energy efficiency
- ❍ not aware that energy efficient options were available for the equipment
- ❍ didn't think energy efficient options would work for the application
- ❍ DON'T KNOW
- ❍ Other (please specify)

If you selected other please specify:

_____

[IF Q40=NO or Q40=DK, SKIP TO Q43]

42. Why didn't you apply for a financial incentive on that equipment? [DO NOT READ LIST. PROMPT IF NECESSARY]

- ❍ thought financial incentive likely was too little to bother with
- ❍ thought incentives were not available at that time
- ❍ participating in the program would have resulted in an unacceptable delay
- ❍ reasons internal to your company that don't pertain to the program
- ❍ DON'T KNOW
- ❍ Other (please specify)

If you selected other please specify:

_____

Questions and Concerns about Program

[IF Q28=YES, SKIP TO Q44]

43. The Energy Trust's Production Efficiency Program offers technical assistance, incentives for energy efficiency, installation and project management, and post-installation inspections. Based on what you have heard of the Production Efficiency Program, what questions or concerns come to mind regarding potential participation?

_____

_____

_____

[IF Q28~=YES, SKIP TO Q45]

44. You mentioned you were aware of the Energy Trust's Production Efficiency Program. You may not know that it offers technical assistance, incentives for energy efficiency, installation and project management, and post-installation inspections. Based on what you have heard of the Production Efficiency Program, what questions or concerns come to mind regarding potential participation?

_____

_____

_____

Conclusion

45. Over the years, industrial customers have told us about many of their concerns, such as increasingly being called on to do more work with less resources. What are some of the concerns that are on your mind currently?

_____

_____

_____

We are talking only with non-participating organization in the Energy Trust's program. Thank you for your time.

We'd like to talk only with organizations that purchase electricity from PGE or Pacific Power. Thank you for your time.

Thank you very much for your time!!

Enter "0" for uneligible respondents.

Enter "1" for eligible and completed respondents

PRODUCTION EFFICIENCY PROGRAM: PROCESS AND IMPACT EVALUATION SURVEY INSTRUMENT – ATACS

Program Role

1. Please briefly describe your activities for the program.

2. About how many studies have you conducted for the PE program? What industries and end uses have been involved in your work with the program? About how much of your time did studies occupy in 2006?

3. Has the number of projects you've worked on met your expectations?

4. How do your activities for the PE program mesh with the rest of your professional work? [PROBES: complements/competes, similar/different]

5. Have you had any disappointing experiences with your involvement in PE or your customers' involvement?

Program Evolution

6. How has your program role changed during the last two years since 2004? [the 2003-2004 period was covered by a prior process evaluation]

7. Have you seen any changes in the numbers, sizes or types of projects participating in the program since 2004? If so, what changes?

8. What, if any, concerns do you have about the program transition that will occur in January 2008?

Program Marketing

9. What is your understanding of how the program is marketed to customers?

10. [IF NOT ADDRESSED] Do you typically initiate with your customers the possibility of participating in the program, or does the customer or someone else typically approach you with program opportunities, or does the possibility of installing qualifying equipment arise as you and your customer are discussing their equipment needs?

11. How are projects assigned to you?

12. Are you satisfied with this process? Explain.

13. What do you think the potential is for energy efficient products and optimized solutions among your customers? Would you say it is:
- ❍ None
- ❍ Minimal
- ❍ Moderate
- ❍ Great

14. [IF NONE OR MINIMAL] Why do you think there is so little potential? [DO NOT READ]
- ❍ Energy costs are unimportant
- ❍ Customers are already quite efficient
- ❍ Customers have little interest
- ❍ Customers will not pay the added up-front costs
- ❍ Other [specify]: _____

15. In general, how important are energy costs to your customers? [DO NOT READ]
- ❍ Not at all important
- ❍ Not very important
- ❍ Somewhat important
- ❍ Very important
- ❍ Don't know/not sure

16. To what extent do you promote energy efficiency in your customer transactions? Would you say it is:
- ❍ Always a part of my presentation
- ❍ Sometimes a part of my presentation
- ❍ Rarely a part of my presentation
- ❍ Never a part of my presentation

17. [IF "NEVER"] Why are you not promoting energy efficiency? _____

18. Do you typically give customers a range of choices based on energy efficiency? [DO NOT READ]
- ❍ Always
- ❍ Sometimes
- ❍ Seldom
- ❍ Never
- ❍ Don't know

Quality Control

19. What guidelines have you been given for the reports/studies you prepare as an ATAC?

20. Are there requirements for presenting savings calculations and justifying savings estimations?

21. What feedback have you received on your study reports?

22. Have quality control activities changed over time?

23. Have you heard of any participant dissatisfaction with the program? [If so] What comments or concerns?

24. Do you see any quality control issues for the program?

25. Have any misunderstandings occurred for customers regarding the separate roles of PDCs and ATACs?

26. How about any confusion or problems for the PDCs and ATACs themselves?

27. Some vendors develop project proposals. Are you aware of any issues that have come up regarding the quality of those proposals?

Communication

28. What regular forms of communication occur between you and the other program players (ETO, PMC, PDC)?

29. How would you characterize communications between you and the other program players?

30. [IF NOT ADDRESSED] Have you experienced any difficulties working with any of the other parties? [If so] What difficulties?

2006 Funding Limitations

I understand the 2006 program had funding limitations.

31. Were you aware of the funding limitations?

32. [IF NOT AWARE, SKIP TO NEXT SECTION, *Serving Oregon Industry,* BELOW] How and when were the changes in funding communicated to you?

33. From your experience, what were the consequences, if any, of the funding limitations for your customers?

34. Was the reservation system ever applied to any projects you were working with? [IF SO,] How did that work?

Serving Oregon Industry

35. How much repeat business are you seeing? That is, how many projects are occurring at locations where previous program projects were done?

36. How do repeat customers' projects compare with their previous projects?

37. What is your sense of the remaining opportunities in Oregon for program eligible projects?

38. What is your sense of the extent to which participating customers perceive they have an ongoing relationship with Energy Trust and the Production Efficiency Program?

39. What data or anecdotes do you base your impressions on?

40. What do you do with respect to forging this relationship with customers?

41. What might you do differently if you could?

42. [IF NOT ADDRESSED BY PRIOR RESPONSES] What conversations have occurred between you and ETO or the PMC and PDCs about becoming involved with customers' capital planning processes and projects?

43. What follow-up has occurred?

44. Do you work with participants who are interested in renewable energy projects (e.g., biomass, hog fuel boilers, solar)? [IF SO] What types of projects?

45. Do you know whether they completed the projects?

46. Do you know whether they applied for ETO incentives for the projects?

47. Thinking of all of your work (with and without the ETO) over the last two years, when your budget proposals or bids include energy efficiency options, how often did your customers select those options?

- ❍ Never (0%)
- ❍ Infrequently(1-10%)
- ❍ Sometimes (11-25%)
- ❍ Often 25-%-50%)
- ❍ Very often (over 50%)
- ❍ Always (100%)

48. Has this increased, decreased, or stayed the same in the past two years?

- ❍ Increased
- ❍ Decreased stayed the same
- ❍ Don't know

Spillover

Please indicate whether you agree or disagree with the following statements.

49. Our past experience specifying or installing lighting through the program has convinced us this equipment is cost effective or beneficial even without a program incentive.

- ❍ Agree
- ❍ Disagree
- ❍ Don't Know

50. Because of what we have learned by installing energy efficient equipment through the program, we are better able to identify opportunities to improve the energy efficiency of equipment systems.

- ❍ Agree
- ❍ Disagree
- ❍ Don't Know

51. Because of our experience with the performance of energy efficient equipment installed through the program, we are more likely to discuss energy efficient options with all of our customers when developing project plans for equipment.

- ❍ Agree
- ❍ Disagree
- ❍ Don't Know

52. How many energy efficient projects that you do don't get an incentive?
- ❍ None
- ❍ A few (1 to 5)
- ❍ Some (6 to 10)
- ❍ Many (More than 10)
- ❍ Don't know

53. What are the reasons those projects didn't receive an incentive? [All that apply]
- ❍ Not in trust territory
- ❍ Gas projects
- ❍ Would not be covered by incentive
- ❍ Too much hassle
- ❍ Incentive too small
- ❍ Timing
- ❍ EE option was part of the specification
- ❍ EE bid was already accepted without incentive
- ❍ Other [Specify]: _____
- ❍ Don't know

How influential has the Production Efficiency program been on:

54. Including energy efficiency in your sales approach/pitch?
- ❍ 1-Not at all influential
- ❍ 2-Somewhat influential
- ❍ 3-Very influential

55. Including energy efficiency options in your bids?
- ❍ 1-Not at all influential
- ❍ 2-Somewhat influential
- ❍ 3-Very influential

56. Including the BETC in your bids?
- ❍ 1-Not at all influential
- ❍ 2-Somewhat influential
- ❍ 3-Very influential

57. Thinking about your projects that did not get an incentive, what were the top three types of projects?

- ❍ Process improvements
- ❍ Gas process
- ❍ Steam/boiler
- ❍ Refrigeration
- ❍ Motors
- ❍ VFDs
- ❍ HVAC
- ❍ Lighting
- ❍ Compressed air
- ❍ Pumps
- ❍ Fans/blowers
- ❍ Other [Specify]: _____

Firmographics:

58. Please indicate which of the following best describes your role:

- ❍ Owner
- ❍ Business Manager
- ❍ Engineer
- ❍ Contractor
- ❍ Sales Manager/Business Development
- ❍ Other [Specify]: _____

59. How many people are employed by firm? _____

60. How many people work on ETO projects? _____

61. What percent of your total business do ETO projects represent?

- ❍ 0-25%
- ❍ 26-50%
- ❍ 51-75%
- ❍ 75-100%

62. What types of industries do you serve?

63. What proportions of your business do each of those industry types represent?

64. What are the end uses of the equipment you most frequently install?

Summary Remarks

65. What has worked best about the program during the past two years?

66. What are the greatest challenges now facing the program?

67. What changes would you most like to see?

68. Any final comments?

PRODUCTION EFFICIENCY PROGRAM: PROCESS AND IMPACT EVALUATION SURVEY INSTRUMENT – PARTICIPATING VENDOR

How Heard about the Program

1. About how long have you been aware of the Production Efficiency Program? (Probe to code):
   - ❍ two years or so (2006-07)
   - ❍ two to four years (2005-04)
   - ❍ five years or more (or utility program)
   - ❍ don't know

2. Do you recall how you *first* heard of the Production Efficiency Program?
   - ❍ program contact
   - ❍ program website
   - ❍ another vendor/contractor
   - ❍ other (describe)
   - ❍ Don't know

Decision to Participate

3. Do you typically initiate with your industrial customers the possibility of participating in the program, or does the customer or a program representative (PDC or ATAC) typically approach you with program opportunities, or does the possibility of installing qualifying equipment arise as you and your customer are discussing their equipment needs?
   - ❍ 1= you initiate
   - ❍ 2= customer initiates
   - ❍ 3= program representative initiated
   - ❍ 4= arose in discussion
   - ❍ 7= Other (specify)

4. Have your customers ever chosen to modify one of their projects so that it qualifies for an incentive?

5. Have your customers ever chosen against installing an available energy-efficient alternative that could have qualified for Energy Trust incentives?

6. Have you ever lost a project because you were not able to deliver an Energy Trust incentive?

7. Have you had repeat business from a customer who participated in the program?

8. Did the repeat business result in additional program participation?

9. Did the repeat business include the installation of equipment that qualified for the program but was installed without an incentive?

10. Can you estimate what percent of all the equipment you supply to your customers qualifies for a rebate through the Production Efficiency Program?

11. What kinds of equipment is this?

12. When a customer first presents you with a project idea, do you generally know whether it is likely to qualify for incentives?

13. Would you like for Energy Trust to provide you with training or tools for estimating the energy savings of efficient equipment?

14. Would you change anything about the types of projects that qualify for incentives?
    - ❍ Yes: What would you change?
    - ❍ No
    - ❍ DK

15. Has your participation in the program improved your business in any of the following ways?
    - ❍ increased size of projects
    - ❍ increased number of projects
    - ❍ increased number of customers
    - ❍ increased sales in other areas
    - ❍ other (specify)

16. Are you aware that Energy Trust also provides incentives for renewables such as biogas projects, PV, and wind?

17. Is your firm interested in participating in the renewables program?

18. Are your customers interested in participating in the renewables program?

19. What information/support regarding the renewables program do you and your customers need from the Energy Trust?

BETC

20. Do you promote the Oregon Business Efficiency Tax Credit (BETC) to your industrial customers?

21. Do your industrial customers tend to take advantage of BETC?

Questions/Concerns/Confusion/Problems

22. Have you ever had a customer who started to participate in the program and then did not continue for some reason?

23. [IF YES] Roughly what year was that?
- ❍ 2004
- ❍ 2005
- ❍ 2006
- ❍ 2007
- ❍ don't know

24. Why did they not continue? Would you say: [CHECK ALL THAT APPLY]
- ❍ equipment didn't qualify
- ❍ incentive wasn't sufficient to meet their firm's investment criteria
- ❍ incentives were not available at that time
- ❍ participating in the program would have resulted in an unacceptable delay
- ❍ participating was too much of a hassle because (describe)
- ❍ reasons internal to their company that don't pertain to the program
- ❍ other (describe
- ❍ don't know

Comments: _____

25. Other than customers who discontinued participation, have any customers called you with comments or concerns about their program participation? ELABORATE: _____

26. Did you feel that you were supplied with adequate and accurate program information to deliver to your customers? ELABORATE: _____

27. Please rate the extent to which you have had any confusion about the program. Would you say:
- ❍ no confusion
- ❍ some confusion, not at all a problem
- ❍ a small problem
- ❍ a medium problem
- ❍ a significant problem
- ❍ problem so significant it nearly stopped the project from going forward

28. [IF PROBLEM] Have you ever experienced any of the following situations regarding the Production Efficiency Program? [PLEASE CHECK ALL THAT APPLY]
- ❍ uncertainty about who to call
- ❍ difficulty reaching a program representative
- ❍ difficulty getting a sufficient answer to a question
- ❍ confusion about whether a project would qualify for an incentive
- ❍ uncertainty about the program (e.g., policies, procedures) as a result of different program contacts telling you different things
- ❍ confusion when you thought you were dealing with someone capable of making application decisions and yet it turned out the decision was made by someone else
- ❍ confusion about what incentive amount Energy Trust was paying for estimated electricity savings (price per kWh)
- ❍ uncertainty about whether Energy Trust had run out of incentives for the year and your customer would have to wait until the next year

29. Have any of the following things been a problem for either you, your customers, or for you and your customers?
- ❍ too much paperwork
- ❍ incentive approval process is too long
- ❍ wait for incentive payment is too long

30. How often do time constraints ever keep a customer from considering applying for an incentive? Would you say…
- ❍ Always
- ❍ Sometimes
- ❍ Never

31. When the budget was limited and incentive amounts were varying, did you ever think the program was going to be discontinued?

Spillover

32. Would you agree or disagree that…Your past experience specifying or installing lighting through the program has convinced you that equipment is cost effective or beneficial even without a program incentive.
- ❍ Agree
- ❍ Disagree
- ❍ Don't Know

33. Would you agree or disagree that…Because of what you have learned by installing energy efficient equipment through the program, you are better able to identify opportunities to improve the energy efficiency of equipment systems.
- ❍ Agree
- ❍ Disagree
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Conclusion

48. Over the years, vendors have told us about many of their concerns, such as decreased equipment budgets among their customers. What are some of the concerns that are on your mind currently?

49. Do you have any final comments relating to the Production Efficiency Program you would like to add?