Final Report

Impact and Process Evaluation of the 2006-2007 Building Efficiency Program

Funded By:

Prepared By:

research/into/action inc

Jane S. Peters, Ph.D.
Marjorie McRae, Ph.D.
Research Into Action, Inc.

August 3, 2009

EXECUTIVE SUMMARY

Energy Trust of Oregon, Inc. (Energy Trust) was incorporated as an Oregon nonprofit public benefit corporation in March 2001 and began operation in March 2002, to fulfill a mandate to invest "public purposes funding" for new energy conservation, the above-market costs of new renewable energy resources, and new market transformation in Oregon. It receives funding from a 3% public purposes charge to the rates of the two largest investor-owned electric utilities in the state: PacifiCorp and Portland General Electric (PGE). Additionally, under separate agreements with NW Natural, Cascade Natural Gas Corporation, and Avista Corporation, Energy Trust administers funding for gas efficiency. Energy Trust has responsibility to communicate with the Oregon Public Utilities Commission (OPUC) on how it is spending its funding and what it achieves.

Energy Trust began operating the Existing Buildings (EB, formerly Building Efficiency or BE) program in early 2003. The program seeks to acquire large volumes of electric and gas savings at modest cost from a wide variety of efficiency strategies by providing positive financial, energy, and related benefits for participating businesses and institutions. The program design is market-driven and builds on existing market relationships, which is consistent with best practices among resource acquisition and market transformation efforts.

Energy Trust follows a continuous improvement approach to its operations and relies on timely evaluations of its activities. This report describes an impact evaluation and a process evaluation of the 2006-2007 program years, completed in 2008.

PROGRAM DESCRIPTION

Lockheed Martin Corporation has acted as the Program Management Contractor (PMC) for this program since January 2006, when it acquired Aspen Systems Corporation (Aspen), which had run the program since December 2002. The most recent contract started in January 2008 and runs through December 2010, with two one-year options to extend the contract.

The Existing Buildings program provides a range of electric and gas energy-saving services and incentives for existing Oregon commercial and institutional facilities. Services include energy surveys and technical analysis (studies), contractor referrals, project facilitation, and post-installation assistance.

The program works through a network of trade allies (vendors and contractors) to identify and deliver energy-saving lighting and mechanical projects for their customers. Projects may involve combinations of measures, but those involving extensive work on two building systems would be referred to the New Building Efficiency program for new construction.

The EB program provides for both standard (prescriptive) and custom incentives for lighting retrofit projects, electrically-powered mechanical projects, and projects that upgrade gas-fired equipment. All measures must meet the cost-effectiveness criteria established by Energy Trust.

Estimates of expected measure savings and paybacks, required for custom incentives, must be either reviewed by the PMC or determined by a technical study. The latter is performed by Allied Technical Analysis Contractors (ATACs), who also identify potential participants.

For all EB projects, the facility representative must sign an *Energy Release Form*, *Incentive Application Form*, and *Completion Certification Form*. In addition, the facility's selected contractor must complete an *Information Form* to convey basic information describing the facility and its energy use. The contractor or PMC staff complete the *Project Detail Form* to verify and document all the details of a project.

EVALUATION GOALS AND METHODS

The previous combined process and impact evaluation of the program, conducted in 2005, offered six recommendations, five of which have been addressed. The one recommendation that was not addressed was to develop a summary sheet to be included in the project file of each mechanical project. In addition, based on results of the previous evaluation, the current evaluation included more detailed building characteristic data to attempt to provide better billing analysis results and more detailed spillover analysis.

The impact and process evaluation of the 2006 and 2007 EB Program has the following objectives:

- To develop reliable estimates of program, site, and measure-specific electric (kWh and kW) and gas (therms) savings for 2006 and 2007
- To estimate the extent of free-ridership and spillover effects, and the associated net realization rate
- To document the history of the program, provide a market characterization, and yield recommendations for program enhancements

The data sources for this process evaluation were: in-depth interviews with Energy Trust and PMC staff members involved in implementing and managing the program, and with ATACs; telephone surveys of trade allies and nonparticipating vendors, program participants, and program nonparticipants; and on-site examinations of projects performed for the impact analysis. Table ES.1 shows the size of each data source.

Table ES.1: Data Sources

SOURCE	SAMPLE SIZE
In-Depth Interviews with Energy Trust and PMC Staff	9
In-Depth Interviews with ATACs	13
Survey of Most Active Trade Allies	20
Survey of Least Active Trade Allies	34
Survey of Nonparticipant Vendors	59
Survey of Program Participants	212
Survey of Program Nonparticipants	130
On-Site Inspections of Program Participants	145
Billing Analyses – Participants	358
Billing Analyses – Nonparticipants	1,386

EVALUATION RESULTS

Participants are happy with the program, especially with the services they receive from program representatives. During 2006 and 2007, the program completed about 3,074 projects, saving over 57 million first-year kilowatt-hours of electricity and 1.5 million therms of gas. Excluding food service locations where free pre-rinse sprayers were installed, the program reached about 10% to 11% of the total square footage of nonresidential building in Oregon (12% to 13% when those projects are included).

Results are summarized in terms of: program impacts; marketing and outreach strategies; program communication; data collection, processing, and tracking; customers' relationships with Energy Trust and the program; the role of technical studies; and characterization of the existing building market.

Program Impacts, Free-Ridership, and Spillover Effects

Table ES.2 shows preliminary estimates of the gross and net electricity savings from the 2006 and 2007 Existing Buildings Program. Gross realization rates ranged from 90% to nearly 103%. Savings-weighted mean free-ridership levels were about 30% for both gas and electric projects in 2006; in 2007, they were about 36% for gas projects and 35% for electric ones. Across the two project years, they averaged about 32% for both fuel types. When free-ridership was taken into account, net realization rates ranged from about 64% to about 70%.

Table ES.2: Gross and Net Energy Savings from the 2006-2007 Existing Buildings Program

TYPE	NUMBER OF SITES	ESTIMATED THERMS	REALIZATION RATE	ADJUSTED GROSS	NET FACTOR	NET SAVINGS
2006						
Gas (Therms)	1611	985,727	98.4%	970,117	70.1%	679,713
Electric (kWh)	1611	31,326,511	90.0%	28,182,099	70.0%	19,740,016
2007						
Gas (Therms)	1463	526,998	102.6%	540,940	63.6%	343,819
Electric (kWh)	1463	26,531,894	94.1%	24,959,443	65.3%	16,298,977
2006-2007 TOTAL						
Gas (Therms)	3074	1,512,725	99.9%	1,511,057	67.7%	1,023,532
Electric (kWh)	3074	57,858,405	91.8%	53,141,542	67.8%	36,038,993

Free-ridership (unweighted) was relatively higher for self-reported prior participants, companies with an energy-efficiency purchasing policy, those who replaced failed equipment, and those who bought HVAC, motors, and boilers, compared to respondents who did not share those characteristics. It was lower for those who bought lighting and those who bought the efficient equipment to save energy costs or because efficiency features were common for the equipment's application. However, the range of free-ridership estimates remained below 50% in almost all subgroups examined and below 40% in most subgroups.

The current free-ridership estimates are higher than those found in the previous evaluation, but some of that difference may be due to a change in the method of calculating free-ridership since the last evaluation. Moreover, the rates are within the wide range of estimates that other evaluations have found (see Chapters 7 and 9 for more detail). There are several reasons to be cautious about making any revisions to the program based on these findings, including the controversial nature of the meaning of free-ridership estimates, the potential adverse impact of making frequent or significant changes to the program on the program's relationship with trade allies, insufficient reliability of free-ridership estimates for specific measure types to decide what aspects of the program to change, and climate considerations that continue to make it essential to acquire all the savings possible.

On average, the program had a moderate influence on the purchase of non-incented energy-efficient equipment purchased in the past two years. One-sixth of participants had planned or purchased non-incented energy-efficient equipment during or after program participation. Of those, six (3% of all participants) bought equipment that they indicated was highly influenced by the program: two bought HVAC equipment and one each bought equipment of a variety of other types.

Program Marketing and Outreach Strategies

The PMC continues to work largely through contractors and vendors, and to work effectively with them. Contractors continued to be participants' primary source of program awareness and the main *person* influencing the decision to undertake the project. The program contributes substantially to trade allies' business and their effectiveness at selling energy efficiency. However, brand-name awareness is low and there is room for additional program reach into the vendor market.

The PMC began to work directly with end-users in certain sectors during the 2006-2007 program years, resulting in a decrease in the contractors' role as the source of awareness and an increase in that of program staff. Whether the main contact was a contractor or program staff member had little effect on satisfaction, although program staff were perceived as more knowledgeable about the program than were contractors.

A program of free direct installation of energy-efficient pre-rinse sprayers in food service establishments, implemented in 2005 through 2007, had some effect in developing interest in energy efficiency, but it is not clear how much effect it had. Most surveyed sprayer recipients said that it had increased their likelihood of undertaking future energy efficiency improvements. Analysis of Energy Trust's *FastTrack* database showed that only about 11% of sprayer recipients later installed other energy efficient measures through the program, but that analysis did not account for business chains that received a sprayer at one location and then installed other measures at different locations (that were recorded in the database under different site identification numbers). It would be valuable to contact participants who received free sprayers to determine whether they purchased additional energy efficiency equipment without an incentive.

Overall, nonparticipant feedback indicates a high level of program interest and suggests that participation in this group was limited largely by lack of program awareness. Greater program awareness likely would induce more energy efficiency investment, which will be important in helping Energy Trust achieve increased savings goals.

Program Communication

The program and PMC staff reported frequent and effective communication within the PMC and between the PMC and other groups. However, about half of ATACs indicated a need to improve the amount or quality of PMC communication or program information. Trade allies reported no communication challenges, but encouraged continued communication of program information. Nonparticipant vendors would like more printed program information to share with customers. A significant subset of both nonparticipant vendors and trade allies frequently use the program website.

Program Data Collection, Tracking, and Processing Activities

No significant issues were uncovered relating to incentive processing. The only significant change to forms was the development of an alternative Form W-9, to facilitate its completion by customers. The only new tool completed was a spreadsheet tool for managing data from incentive application forms.

Some data-related issues were identified. Challenges were reported with the use of Energy Trust's data tracking systems, which Energy Trust was addressing, but had not yet completely resolved. Also, documentation errors were uncovered in a large number of 2006 projects. The PMC identified and addressed the cause, and documentation appeared to improve for 2007 projects. Finally, the trade ally list may not be up to date and shows duplication and inconsistency.

Customers' Relationships with Energy Trust and the Existing Buildings Program

The overall quality of program experience was good. A generally high level of program satisfaction was reported, particularly with program staff and contractors, and little uncertainty or confusion about the program was reported. Nearly all respondents said that they would participate in the program again if they were to install qualified equipment.

Technical Studies and ATACs

Technical studies appear to be a valuable program component, although it is difficult to assess exactly how valuable. Analysis of Energy Trust's *FastTrack* database revealed that projects followed about 30% of technical studies (with a mean lag of about a year and two months). However, while one-third of the respondents to the participant survey said that technical studies were influential in their project decision, the database analysis showed that studies were performed for only about 3% of the participants who had projects. The difference between one-third and 3% must result from some combination of program participants with technical studies performed outside of the program and those with technical studies performed through the program that did not get recorded in the database.

The ATACs who carried out the technical studies reported no specific customer questions or concerns about them or the projects that might result. The ATACs generally were quite satisfied with the program, but most would like more training on the program, particularly on analysis tools. Most were unaware either of the number of walk-throughs converted to projects or of the PMC's plans to increase the conversion rate.

Market Characterization

Penetration into the Vendor and Building Owner/Occupant Markets

The 459 Existing Buildings trade allies listed at the time of the evaluation represent approximately 11% of the Oregon market, as defined by the services they most frequently offer.

Awareness of the program has penetrated to about 59% of the vendor market. Completed 2006 and 2007 projects likely represent approximately 12% to 13% of the Oregon nonresidential building owner/occupant market (10% to 11% when only projects with measures other than free pre-rinse sprayers are considered) and awareness has penetrated to about 31% of the market.

Energy Trust's Role in the Market

The Existing Buildings program is well positioned to serve the market. Nonparticipants were interested in a variety of program services, and most said that they would participate in the Existing Buildings program if they were to install qualifying equipment. Vendors are actively marketing the program, more actively and thoroughly than we observed in the previous process evaluation.

Evidence suggests that the number of projects done in the existing building market that received Energy Trust incentives in 2006-2007 was about equal to the number that received a BETC. The Existing Buildings participants who had applied for a BETC generally indicated that the Existing Buildings incentive had more influence than the BETC, although this could change if the BETC were increased.

Corporate Energy Policies and Decision-Making

Consistent with other recent research[1], most surveyed companies were engaged in or planning energy cost controls, and corporate policy contributed to about a quarter of projects. Saving energy costs was the most frequently identified reason for the purchase of efficient equipment. The percentage of respondents reporting a company policy to purchase energy efficiency equipment (30%) was half again higher than that reported in the previous process evaluation.

Other than energy savings or program influence, other common influences were reliability, improved comfort or work environment, non-energy savings, improved work efficiency, and safety. Four in 10 program participants said that they bought energy-efficient equipment partly because efficiency features were a common practice for that application, indicating transformation of the market. Codes or regulations did not exert much influence on the decisions to install energy-efficient equipment – it will be worth revisiting this question after updated codes go into effect in 2010.

While most respondents accept the reality of global climate change, the level of acceptance was not related to what their companies were actually doing to reduce energy costs or to their history of energy-efficient investment.

---

[1] "How Companies Think About Climate Change: A McKinsey Global Survey." The McKinsey Quarterly. Accessed by Internet March 26, 2009, *URL: http://www.mckinsey.com/clientservice/ccsi/pdf/climate_change_survey.pdf.*

Building tenancy is a barrier to making energy efficiency investments, although it does not necessarily impede energy management through other means, such as through changing operations and management practices.

Repeat Participation

Repeat participants were more likely to have large projects than first-time participants. To see whether repeat participation leads to larger projects, we examined data from the Energy Trust *FastTrack* database on project size of repeat participants over the program's five years from 2003 to 2007. Examining the total annual savings for participants who had projects in consecutive years from 2003 through 2007, we found varying results, with increases between some pairs of years and decreases between others; large variances in all year pairs indicated large increases as well as large decreases from year to year. However, ignoring year of participation, we found a mean increase of 8.1% from the first year's savings to the mean savings for all subsequent years. Thus, generally, repeat participation is associated with larger projects.

CONCLUSIONS AND RECOMMENDATIONS

Program Marketing and Outreach Strategies

1. ***Conclusion:*** Program awareness was low among nonparticipants, and results suggest that greater program awareness would induce more energy efficiency investment.

   Recommendation: The program should increase the amount of general program marketing directed toward the vendor and nonresidential building owner/occupant market. It also should increase the production of marketing collateral to distribute to vendors.

2. ***Conclusion:*** It is difficult to evaluate the effectiveness of the free pre-rinse sprayer distribution program, although there is some evidence that it increased awareness of and intention to pursue energy efficiency.

   Recommendation: The pre-rinse spray valve is now required by state and federal standards. However, similar activities should be carefully considered.

3. ***Conclusion:*** The increased direct involvement of PMC staff in outreach to end-users has had little if any adverse impact and participants rated the program staff as more knowledgeable than contractors about the program.

   Recommendation: The current approach of having PMC staff carry out direct outreach to end-users in certain sectors should continue.

Communication with ATACs

4. ***Conclusion:*** ATACs indicated a need for more frequent, consistent, and detailed communication with program staff, contrasting with what the PMC contact said on the subject.

   Recommendation: The PMC should review its procedures for communicating with ATACs and establish guidelines to ensure more frequent, consistent, and detailed communication.

5. ***Conclusion:*** ATACs would benefit from training on a variety of topics.

   Recommendation: The PMC should schedule more regular ATAC training sessions to cover a variety of topics and should develop a program handbook for use by ATACs.

Program Data Collection, Tracking, and Processing Activities

6. ***Conclusion:*** While data tracking challenges are being addressed, the system is still described as difficult to use.

   Recommendation: Discussion between Energy Trust and the PMC to identify ways to improve the efficiency of data entry and tracking should continue.

7. ***Conclusion:*** While documentation problems identified in project records from the 2006 program year appear to have been addressed, additional quality control review will help prevent future problems.

   Recommendation: The PMC should carry out an additional quality control review of project documentation for a random sample of records from 2007 and 2008.

8. ***Conclusion:*** The evaluation team found that the list of trade allies may not be up to date and found multiple instances of trade ally firm names being represented inconsistently in the file.

   Recommendation: The PMC should carry out a thorough review of the trade ally list to ensure that it is up to date, that it is consistent with the trade ally information listed on the Energy Trust website, and that redundancies are minimized.

9. ***Conclusion:*** The percentage of records in the program database that had building size data (8%) did not permit a reliable estimate of market penetration.

   Recommendation: The PMC should record building size for all incentive applications.

10. ***Conclusion:*** It was difficult to use the Energy Trust database to analyze the number of free pre-rinse sprayers that resulted in other energy efficient measure installations. There were many cases in the Energy Trust database in which a given business had different identification numbers for multiple locations and no easy and consistent way to match the multiple locations up.

Recommendation: Add a higher-level identification code field to the Energy Trust database to allow multiple locations of single business to be identified with a single code and establish conventions for assigning a single higher-level code to entities with separate site identifiers. Build the capability into the database to identify likely matches to the name entered for a new record and establish naming conventions to increase the likelihood that a new record will be name-matched to an existing one.

11. ***Conclusion:*** The evaluation's analysis of the result of technical studies could not take the studies' recommendations into account as they are not recorded in the Energy Trust database.

    Recommendation: The Energy Trust database should include fields for recording technical studies' recommendations.

Program Impact

12. ***Conclusion:*** Cohort variation still produces surprises. There are clear differences in the performance of the 2006 participants and the 2007 participants, particularly in the lighting group.

    Recommendation: In the future, include a small sample of lighting-only participants in the site-visit sample and develop a correction factor for lighting for the billing analysis.

13. ***Conclusion:*** Free-ridership ratios are within the normal range for similar commercial retrofit programs.

    Recommendation: Do not make any changes to the program based on free-ridership rates.

14. ***Conclusion:*** Hard refusals compromise the integrity of the site-visit approach, especially with the largest participants. Efforts by Energy Trust and PMC staff to intervene did not change the outcome.

    Recommendation: In the future, initiate interventions with program participants at the start of the project, rather than after the site engineers attempt to schedule visits.

15. ***Conclusion:*** Realization rates for the site-visit group were generally close to 100%. Where they were less, the decrement was usually a function of problems at a small number of sites, but no systematic engineering issues were found.

    Recommendation: Re-examine the program quality control procedures to ensure that more complex sites have inspections and that program behavioral recommendations are implemented. (See also Conclusion 7, above.)

16. ***Conclusion:*** Billing analysis results produced large relative precision bands around the point estimates. The 2007 lighting-only sample was the only estimate with a less than 10% precision.

Recommendation: Implement surveys at nonparticipant sites to better account for changes in operation and behavior.

Future Evaluations

17. ***Conclusion:*** Most ATACs were unaware either of the number of walk-throughs converted to projects or of the PMC's plans to increase the conversion rate.

    Recommendation: The next evaluation should examine the PMC's reported plan to increase the effort to convert studies to projects.

18. ***Conclusion:*** There appears to be a trend for an increase in corporate policies related to energy management.

    Recommendation: Future evaluations should continue to track corporate energy management policies.