Industrial Process and Equipment Efficiency in Oregon: An Evaluation of the Energy Trust's Production Efficiency Program

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ABSTRACT

In mid-2003, the newly created Energy Trust of Oregon, Inc. launched the Production Efficiency Program to acquire large volumes of energy savings from industrial facilities. Consistent with best practices, the program design builds on existing market relationships and offers both technical and financial support for efficiency. The paper presents the findings from a process evaluation addressing the program's first two years and assessment of the program's impact evaluability.

The Production Efficiency (PE) Program appears to be effective in engaging a wide variety of facilities in generating efficiency savings. Projects committed to or completed in 2003-2004 are estimated to have first-year energy savings of over 150 million kWh. Efficiency projects include those substantially changing the participants' production processes, as evidenced by the 28 projects underway or completed that each had estimated savings in excess of one million first-year kilowatt hours (kWh). Process improvement projects save more energy and cost less than equipment projects, from both the program's and the participants' perspectives.

By all accounts, the program's success owes to its simplicity, its effective use of technical analysis, and to the relationships formed between program implementers and facility staff. The evaluation team also found areas of program weakness that it posited as resulting from the contractual relationships among the Energy Trust, the program management contractor, and the program delivery contractors. The team concluded that the terms and/or structure of the implementation contract complicates the attainment of program objectives. It also concluded the project documentation is sufficient to support an impact evaluation and yet warrants improvement.

Introduction

In mid-2003, the newly created Energy Trust of Oregon, Inc. (Energy Trust) launched the Production Efficiency Program to obtain energy savings from the industrial customers served by the state's investor-owned electric utilities. The program design and implementation makes it possible to acquire energy savings from fundamental changes to industrial processes, not simply through the equipment change-outs that dominate many industrial programs. Indeed, 48% of projects completed by the end of 2004 increased industrial process efficiency, including water treatment. By the end of 2004, all projects underway or completed were estimated to save over 150,000,000 kWh, including 28 projects—each with estimated savings in excess of one million first-year kilowatt hours (kWh).

This paper describes the Production Efficiency Program and the findings from a recent evaluation (McRae et al. 2005)—so recent, in fact, that the reader should consider the results preliminary and subject to change with the finalization of the report, expected to occur by summer 2005. The evaluation focused on program processes and an assessment of the adequacy of project documentation to support an impact evaluation. On-site investigations of completed projects contributed to the latter objective.

The paper is organized into five sections in addition to the introduction and summary. The first two sections provide brief descriptions of the program and of the evaluation methods used to assess the effectiveness of its processes and its impact evaluability. The third section provides a synopsis of the program's accomplishments. The next two sections present our evaluation findings, organized into the team's assessment of program strengths, weaknesses, and challenges.

Description of the Program

The Production Efficiency Program is a resource acquisition program offered by the Energy Trust of Oregon, Inc., which incorporated as an Oregon nonprofit public benefit corporation to fulfill a mandate to invest "public purposes funding" for new energy conservation and related, specified activities. The Energy Trust receives funding from a three-percent public purpose charge added to the rates of customers of the two investor-owned electric utilities in the state. It reports its spending and achievements to the Oregon Public Utilities Commission (PUC).

The Production Efficiency Program encourages projects involving substantial changes to the production process itself. 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 relatively greater non-energy benefits as well. For example, projects may reduce facility down-time and substandard output, or improve labor utilization. And process improvement projects can set the stage for the transformation and revitalization of aging, unprofitable facilities that may have otherwise faced closure. Thus, the program is capable of serving as an economic development tool. (Of course, facilities close for a combination of factors and thus investment in aging facilities is not without risk. To date, one facility has closed after receiving program incentives.)

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 participant, capped at 50% of measure cost. The Production Efficiency Program launched with a per-customer incentive cap of $500,000 per calendar year. 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 extraordinarily cost-effective projects, limited to one per facility.

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

The Energy Trust hired a program management contractor (PMC) to implement the program through September 2005. The PMC is responsible for delivering energy savings commensurate with the goal set for the program. To deliver these savings, the PMC directs marketing efforts, assigns, directs, and approves all project technical studies, and authorizes and tracks program activity.

Included among the PMC's responsibilities is directing the work of four program delivery contractors (PDCs), who bear primary responsibility for marketing the program and working with program participants. The responsibilities of three of the PDCs are defined by geographic area. The fourth PDC is responsible for all pulp and paper facilities in the state.

The PMC also manages a network of "allied technical analysis contractors" (ATACs) who conduct technical analysis studies of potential projects. The ATACs are diverse in size and type and include engineering firms, equipment vendors, and three of the four PDCs.

The PMC provides overall management of the process of project identification and completion. The PDCs—and to a much lesser extent, the ATACs—market the program to industrial facilities. They assess the interest of prospective participants in efficiency programs, the facilities' ability to undertake efficiency measures, and the best direction for further activities. For facilities identified as having the interest and ability to pursue an efficiency project, this initial assessment produces a scoping study that identifies a recommended list of measures, either for immediate action or warranting further study.

When further study is necessary to adequately describe an efficiency project and determine its estimated cost and energy savings, the PMC assigns an ATAC to conduct a technical analysis study. The program makes use of three alternative levels of study so that the depth of technical/engineering review can be tailored to each project.

The completed studies provide information needed by the Technical Manager (on the PMC's staff) to determine whether or not the identified projects meet the Energy Trust's cost-effectiveness criteria, as indicated by a Trust-designed Excel spreadsheet tool. The criteria accept quantified non-energy benefits; however, in practice, these are routinely quantified and considered in project cost-effectiveness for only water treatment projects.[1]

The PMC commits the Energy Trust to providing incentives for all identified cost-effective projects. The PDC presents the incentive offer to the participant, who commits to installing the project by signing the incentive offer letter. The PDC offers to assist the participant as needed throughout the project, such as by helping to coordinate project implementation and resolve problems that threaten to derail or delay the project. 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 an authorizing signature and processing.

The program does not require project commissioning. Currently, incentives are paid for all measures the PDCs verify are installed and operating. The verification report is informal. Energy Trust staff are considering evaluation findings relating to the need for a final savings verification audit. In addition, Energy Trust staff asked the evaluators to explore in interviews with the PMC, the PDCs, and ATACs the need for a project document equivalent to a statement of Functional Design Intent or a Minimum Requirements Document. Such approaches are used in the Northeast prior to project installation to specify the how the project is anticipated to achieve energy savings (the design intent), or the levels of equipment efficiency, controls, and modes of operation required (the requirements document). Interview respondents had somewhat mixed views on the need for such documents, but tended to think the existing technical study reports provide sufficient assurance of expected savings.

The Energy Trust selected the PMC based on the proposal it submitted in response to a Request for Proposals (RFP), which included a broad-brush sketch of the program design, as well as a sketch of the PDC's role. The PMC's proposal further developed the program design,

[1] See Epstein et al. (2003) for discussion of industrial energy efficiency programs that have as an explicit goal the investigation and consideration of non-energy benefits.

as the PMC continues to do in collaboration with the Energy Trust. The PMC works for the Energy Trust on a time and materials contract with a not-to-exceed cap.

The PMC in turn issued RFPs for the roles of PDC and ATAC, and it holds the contracts with the selected firms. The PDC contracts reimburse time and materials subject to a cost cap, while the ATAC contracts specify payment for each study conducted, with study costs negotiated in advance. The PMC establishes the contract cap for each PDC commensurate with its judgment of the program potential represented by the facilities served by each PDC.

The Energy Trust conducted a cost-benefit analysis of the program at its outset and has not yet revised the analysis based on program performance. The planning analysis for the program's first two years (2003-2004) specified a total program cost of $46 million, estimated to save about 282 million first-year kWh, with savings expected to extend for ten years. The Energy Trust estimated the levelized cost to society to be $0.030 per kWh, with a societal benefit cost ratio of 1.7 and a utility system benefit cost ratio of 2.4. The Energy Trust estimated customer paybacks with incentives to be 1.9 years, and payback without incentives to be 4.2 years.

The Energy Trust estimated the 2003-2004 program would provide $32.8 million in incentives. The program included $7.9 million to support Energy Trust program activities (including evaluation, planning, communication, tracking, quality assurance, management, and administration) and $5.3 million for program contractor activities (PMC, PDC, and ATAC activities, including technical studies, marketing, tracking, quality control, management, and administration).

Evaluation Methods

To assess program strengths and weaknesses, the evaluation team conducted in-depth interviews spanning one to three hours in length with the two Energy Trust program staff, three PMC staff, staff of the four PDCs, staff of ten of twelve ATACs, and the executive director of Industrial Customers of Northwest Utilities (ICNU), a lobbying organization representing large industrial customers. In addition to these interviews, the evaluation team conducted on-site investigations of the 30 larger projects out of the 53 projects completed by September 20, 2004. These larger projects comprised nearly 90% of completed program savings. Participant contacts for all the completed projects, both larger and smaller, were interviewed. The evaluation team also reviewed the files of completed projects, as well as the program tracking database.

The on-site investigations employed short-term metering (typically for one week) for 22 of the 30 larger projects to develop adjusted savings estimates. For another two projects, adjusted savings estimates were derived by analyzing customer-provided data or other observations made on site. Due to limitations pertaining either to the project documentation or to the conditions on site, the evaluation team was unable to derive adjustments to the projected savings of six projects.

Program Accomplishments

As of December 31, 2004—approximately 18 months after program launch—the Production Efficiency Program had 252 committed or finished projects, of which 132 had been completed (more than twice the number of completed projects as of mid-September, when the on-site investigations got underway). In addition, another 267 projects were in the analysis stage prior to participant commitment.

Industrial firms participated in large numbers and participants span all ten of the industry-type categories tracked by the program.[2] The smallest Production Efficiency project is estimated to annually save 7,000 kWh, while the largest project is estimated to save 24,694,000 kWh. To identify these projects, the Energy Trust paid $840,522 in study costs. Average study costs ranged from a low of 0.2 cents per first-year kWh for eleven primary process projects specified by one ATAC, to a high of 7.6 cents per first-year kWh for twelve fresh water and pumping projects specified by another ATAC.

Tables 1 through 4 provide energy and cost savings information on projects committed or completed in 2003-2004. Tables 1 and 2 summarize information for the program as a whole, while Tables 3 and 4 summarize information for the average project by group. The tables present information for three groupings of projects: Process Improvements—primary process (87 projects) and secondary process (70); Equipment—air abatement (45), compressed air (157), HVAC (39), hydraulics (12), pumping (23), and refrigeration (37); and Water Treatment—fresh water (24) and wastewater (25).

The tables use the following terms and assumptions: *Energy cost savings* are estimated at the 2004 average cost of $0.05 per kWh. *Project costs* indicate total project costs before incentives. *Participant costs* indicate project costs less incentives. *Participant lifetime total cost savings* indicates the value of energy savings in excess of participants' share of project costs.

Table 1. Annual Energy and Cost Savings

Project Type	2003-2004 Program Totals, Committed and Completed Projects				
	Number of Projects	Project Costs	Incentives	Annual Energy Savings (kWh)	Annual Energy Cost Savings
Process Improvements	81	$14,929,000	$8,975,356	83,946,353	$4,197,318
Equipment	145	$12,355,663	$7,662,894	57,108,568	$2,855,428
Water Treatment	26	$9,511,855	$5,104,160	9,714,057	$485,703
Total	252	$36,796,518	$21,742,410	150,768,978	$7,538,449

Table 2. Lifetime Energy and Cost Savings

Project Type	2003-2004 Program Totals, Committed and Completed Projects				
	Average Measure Life	Lifetime Energy Savings (kWh)	Lifetime Energy Cost Savings	Participant Costs	Participant Lifetime Total Cost Savings
Process Improvements	15 years	1,259,195,295	$62,959,765	$5,953,644	$57,006,121
Equipment	12.9 years	737,783,090	$36,889,155	$4,692,769	$32,196,386
Water Treatment	20 years	194,281,140	$9,714,057	$4,407,695	$5,306,362
Total	14.5 years	2,191,259,525	$109,562,977	$15,054,108	$94,508,869

Although the cost-effectiveness assessment uses the measure lives indicated in Table 2, for program planning purposes the Energy Trust assumes that the average industrial measure life is no longer than ten years. Ten years is a simplistic assumption made to reflect the fact that there is significant turnover in industrial process lines, as well as plant closures. While the incidences of turnovers and closures are difficult to reliably forecast, the Energy Trust expects them to occur, especially among sawmills and the pulp and paper industry, both of which have been active in the program.

[2] Industrial categories tracked in the program database are: Agricultural (23 projects), Municipal (51), Distribution (9), Electrical (2), Food Processing (59), General Manufacturing (83), High Tech (44), Metals (26), Pulp and Paper (75), and Wood Processing (147).

Table 3. Per-Project Average Energy and Cost Savings

Project Type	2003-2004 Program Totals, Committed and Completed Projects				
	Participant Costs	Annual Energy Savings	Annual Energy Cost Savings (kWh)	Lifetime Energy Savings (kWh)	Participant Lifetime Total Cost Savings
Process Improvements	$73,502	1,036,375	$51,819	15,545,621	$703,779
Equipment	$32,364	393,852	$19,693	5,088,159	$222,044
Water Treatment	$169,527	373,618	$18,681	7,472,352	$204,091
Overall	$59,739	598,290	$29,914	8,695,474	$375,035

Table 4. Per-Project Average Cost per kWh Savings and Paybacks

Project Type	2003-2004 Program Totals, Committed and Completed Projects				
	Study + Incentive Cost per First-Year kWh	Payback with Incentive	Payback without Incentive	Reduction in Payback as Result of Incentive	Annual Energy Cost Savings
Process Improvements	$0.11	1.4 years	3.6 years	60%	$4,197,318
Equipment	$0.14	1.6 years	4.3 years	62%	$2,855,428
Water Treatment	$0.57	9.1 years	19.6 years	54%	$485,703
Overall	$0.15	2.3 years	5.7 years	59%	$7,538,449

The committed and completed projects are estimated to have first-year energy savings of over 150 million kWh. Industrial process improvements save the most energy and generate the most cost savings, both for the program overall and for projects on average, and are the most cost-effective from both the Energy Trust's and the participants' perspectives (as suggested by the information in Table 4). From the participants' perspective, average energy cost savings from process improvements are roughly ten times their share of project cost, compared to roughly seven times their share of costs for equipment projects. Energy savings from program efficiency improvements to the processing of fresh and waste water generate the lowest proportions of lifetime energy cost savings compared to expenditures; however, these projects provide large non-energy benefits that the program quantifies and considers in its measure cost-effectiveness screening

The evaluation team asked participants with completed projects to identify any non-energy benefits they were experiencing as a result of their efficiency projects. The named benefits can be grouped into those that increase positive conditions or otherwise improve them, and those that decrease or eliminate negative conditions. Participants described non-energy benefits that increased or improved: output, quality, system performance, precision, reliability, plant utilization, labor utilization, system management, flexibility, ease of use, equipment start-up, pressures, and air distribution. They described non-energy benefits that decreased or eliminated: production downtime, swings in production levels, problems, chemical costs (estimated for one project to be $96,000 annually), waste, emissions, discharge, vibration, wear and tear, maintenance, and oil temperatures.

Program Strengths

The large quantity of cost-effective savings attained by the Production Efficiency Program in its first 18 months, the variety of industries participating, and the variety of projects in terms of size and process affected are all evidence that the program design and implementation has a number of strengths.

Foremost among the program strengths is its simplicity from the perspective of the participant. The incentive is fixed at that which reduces project payback to 18 months (capped at 50% of project cost). Project deliberations internal to the company are simplified when technical staff can approach facility executives knowing the program sponsor (in this case, the Energy Trust) has made a commitment to provide a specified incentive.

This approach contrasts favorably with those taken by programs that negotiate with participants to determine project-specific incentives or tie project incentives to savings measured after installation. Facility staff describe that in programs without fixed incentives, it was not unusual to have secured management approval for a project only to have the incentive change, necessitating re-approaching management for project approval at the revised costs.[3] Such changes can kill projects; in addition, the potential for a change in the incentive can make facility staff hesitant to even propose a project to management.

The program is also simple from the participant's perspective because the administrative burden of participation falls on the PDC. The prospective participant need only agree to having a free technical study conducted for an efficiency improvement of interest to the facility,[4] commit to installing the identified cost-effective project, and verify the project has been installed at a specified cost. The participant conducts each of the three steps by signing a project form. The PDC handles all other administrative aspects of program implementation. This approach enables participant facility staff to focus on the project and not on the program.

Previous research on industrial efficiency programs (Peters, Seratt & Way 1996) has found that opportunities to save energy seldom reach the point of implementation without a project champion, someone who advocates for the project and continues to pursue it regardless of challenges or setbacks. In the Production Efficiency Program, the PDC often serves as the project advocate, or shares the role with facility staff. The PDC can assist facility staff in effectively presenting the project to management. And the PDC continues to work with the participant throughout the implementation period to coordinate, problem-solve, negotiate, and so on; in other words, the PDC continues to pursue the project regardless of challenges or setbacks encountered.

A second program strength is its use of established market actors for delivery. The term "established market actors" here denotes engineering consulting firms and vendors that have served the state's industrial firms prior to the creation of the Production Efficiency Program and potentially will continue to offer their products and services to industrial firms long after the program is terminated. Two of the PDCs are engineering consulting firms, and all but one of the ATACs are engineering consulting firms and/or vendors.

Following best practices for resource acquisition programs, the Energy Trust designed the Production Efficiency Program to use established market actors to acquire energy savings. The premise is that firms involved in the program—directly, as a PDC or ATAC, or indirectly as hired by the industrial participant to install the efficiency project—will gain additional expertise and confidence in energy-efficient solutions, and will increasingly discuss energy-efficient solutions with their customers. Because these firms will continue to act in the market beyond the termination of the program, any positive influence the program has on these firms has the potential to bear fruit indefinitely.

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[3] As reported to program evaluators during their interview with the executive director of ICNU.

[4] As part of agreeing to a technical study, the facility commits to paying a portion of study costs if it decides not to proceed with any recommendations within six months.

In addition to using established market actor firms, firms that function as extensions of the Energy Trust staff are involved in program delivery. Included in this designation are the PMC and two of the PDCs. These three firms do not offer products or services to industrial firms independent of program implementation; their market niche is to implement energy efficiency programs. Even so, the staff of these three firms that work on the Production Efficiency Program have, through previous work, established relationships with industrial facilities in Oregon. The PMC's technical manager is an engineer that previously provided consulting services to industrial facilities, and the two PDCs are led by staff who previously served the utilities' industrial customers.

Thus, the PMC, PDCs, and ATACs that deliver the Production Efficiency Program are either established market actors or firms whose key staff have established relationships with staff of Oregon's industrial facilities. Program contacts interviewed for the evaluation credited these established relationships with much of the program's success.

Not only do the implementation staff of Production Efficiency make good use of these established relationships, they actively seek to strengthen them. The Energy Trust was formed with a ten-year mandate, and one of its objectives is to steadily offer incentives to potential participants, rather than turn the incentive spigot on and off as a means of controlling program expenditures. The PDCs are pursuing a strategy of getting to know the facility and management staff of the firms assigned to them and to work with those staff over time to increase the energy efficiency of the facility.

The strategy appears to be working. Staff of several PDCs reported that some participants have asked them to participate in meetings addressing future plans for the production line or the facility, so that energy efficiency can be part of facility decision-making from the outset.[5]

Program Challenges and Weaknesses

The evaluation team found two areas of program weakness that the team posited as resulting from the contractual relationships among the Energy Trust, the PMC, and the PDCs.

First, the evaluation concluded improvement was needed in the technical analysis study reports. The reports lack a standard format or, in lieu of that, a standard summary sheet that organizes and presents key project characteristics and assumptions. The absence of any standardization of report content greatly increased the difficulty of determining, through an impact evaluation, adjusted savings estimates for the projects investigated on site. Increased difficulty translates into increased cost for, and potentially decreased reliability of any impact evaluation. The evaluation team concluded the documentation provided sufficient, but less than optimal, support for an impact evaluation.

Absent standardization of study content, the reports varied widely regarding the information they presented. Nearly half of the studies lacked an estimate of energy consumption of the affected equipment before or after the efficiency project. Some studies reported baseline data that was poorly estimated, resulting in an apparent increase in electricity use due to the efficiency measure (electricity consumption of the affected equipment exceeded the reported consumption estimates prior to the efficiency installations). Equipment operating hours were

[5] Baker, Gaherty & Howell (2005) report similar strong working relationships have evolved between representatives of Efficiency Vermont's industrial program and its program participants. Both programs offer participants technical and financial support for energy efficiency.

missing in a number of studies. Some studies lacked any discussion of the method whereby expected efficiency savings were estimated.

These irregularities among the studies for the 30 projects investigated on site resulted in total adjusted savings falling short of total expected savings. The realization rate for the 30 projects—that is, the ratio of total adjusted savings to total expected savings—was less than one.

The evaluation team suspects this situation arose, or was exacerbated by, the structure of the contract between the Energy Trust and the PMC. The PMC has contracted to deliver cost-effective energy savings—about as much savings as it possibly can. The Energy Trust has responsibility for determining which projects are cost-effective. The PMC determines how to get the most energy savings for its efforts; conversely stated, the PMC determines how to use the least effort to get a given amount of savings.

Yet the PMC is also responsible for directing and approving the technical studies on which cost-effectiveness judgments hinge. Therein lies the difficulty.

Interviewed contacts agree that there is no upper limit to what a study of efficiency opportunities might cost. Projects can easily be "studied to death" and yet produce no installations. All contacts agree a balance must be struck between study cost and study rigor.

The Energy Trust's contract with the PMC rewards the PMC based on the amount of energy savings it generates from its total contract dollar amount. Study costs are one of many administrative costs the PMC controls in its attempt to attain the performance bonus or to simply satisfy the contract terms. The evaluators found the studies, considered as a group, incompletely documented savings. The evaluators surmised the terms and structure of the Energy Trust's contract with the PMC does not include sufficient standards or safeguards to prevent the PMC from economizing on study costs to the detriment of program evaluability and verified savings.

The evaluation found a second area of program weakness that it also attributed to contractual relationships. The PMC is responsible for total program implementation using the Energy Trust's program design. Consequently, the PMC (rather than the Energy Trust) contracts with the PDCs and the ATACs. Through this contracting structure, the PMC is the manager of firms that in other circumstances it might compete with. The evaluation found a number of difficulties that the team hypothesizes results from this contracting structure.

The evaluation found four problems comprising this second area of program weakness. One, the team found evidence of communication difficulties between the PMC, the PDCs, and the ATACs.

Two, the contract structure sets up PDCs and ATACs to have divergent competitive interests within the program, rather than to have complementary objectives. As stated in the discussion of program strengths, the program design seeks to use established market actors to deliver the program; this is happening, yet on a more limited scale than need be. In the first six months of program launch, the ATACs reported actively marketing the program. However, they experienced losing potential jobs they had brought to the program when the PDCs recommended the PMC assign the technical analysis studies to other ATACs or to themselves, as three of the PDCs also serve as ATACs. After 18 months of program operations, few ATACs reported conducting any marketing. Were the PDC contracts to include responsibility for delivering program savings instead of the PMC contract, the PDCs would have an incentive to expand their marketing capability by enlisting ATACs to aggressively pursue this activity.

Three, the system of having the PMC contract with the PDCs and ATACs also complicates the contracting process. The Energy Trust required that the Request for Proposals (RFPs) for PDCs and ATACs, as well as all contracts with the selected firms, be approved by the

Energy Trust. Contract negotiations included the Energy Trust as well as the two parties to the contract (the PMC and the particular PDC or ATAC). All parties described the contracting process as protracted and problematic.

Finally, and perhaps most significantly, the current system where the PMC contracts with the PDCs and ATACs puts the Energy Trust twice removed from the industrial firms it serves. The Energy Trust interacts with the PMC, which interacts with the PDCs and ATACs that have relationships with potential and actual participants. The PMC operates the program in a turn-key manner for the Energy Trust: the Energy Trust pays the bill and the contractor delivers the energy savings. Although the Energy Trust is informed about PMC decisions and in some cases collaborates in making these decisions, it does so relying on information the PMC presents. This information is augmented by the Energy Trust's quality assurance and independent evaluation processes, yet these provide periodic, as opposed to ongoing, input. The Energy Trust lacks an ongoing, independent source of information about the market and about the performance of the PDCs and ATACs. Consequently, the Energy Trust's evolution of the program and its oversight of the PMC primarily rest on information the PMC has provided it.

The use of a PMC to implement programs is considered by Energy Trust staff to be an evolving experiment and the Energy Trust could address the issues raised by the evaluation in a number of ways. The evaluation team suggested two alternative approaches.

One approach would be for the Energy Trust to restructure its program contracting and contract independently with the PMC, each PDC, and each ATAC. With this approach, the Energy Trust would contract with the PDCs to deliver energy savings and with the PMC to provide program support services to the Trust and to the PDCs and ATACs. These activities include at a minimum, developing marketing strategies and approaches, assisting the PDCs in marketing, and program tracking.

The PMC's role could continue to include reviewing technical studies to a level of quality defined by the Energy Trust, as study review no longer poses a potential conflict once the PMC is no longer responsible for cost-effectively meeting an energy savings goal. Alternatively, the Energy Trust could contract with a firm other than the PMC to review all ATAC studies; or the Trust could establish a process whereby the ATAC firms review each other's studies. And, regardless of which approach to study review the Energy Trust chooses to take, the evaluation team also suggested the Trust take steps to standardize the quality of the technical analysis studies.

An alternative approach would be for the Energy Trust to continue with the current contractual relationships—whereby the Energy Trust contracts with the PMC for energy savings, and the PMC contracts with the PDCs and ATACs to deliver the program—yet add to the contract performance requirements to address some of the current shortcomings in program implementation.

At the time this article was written (spring 2005), the Energy Trust was considering the suggestions of the evaluation team. The Energy Trust is likely to continue to contract only with the PMC and to revise the terms of the contract to better achieve its objectives and to address some of the issues found by the evaluation team. For example, the new contract terms will directly encourage consistently high-quality technical analysis studies. The Energy Trust currently plans to institute quarterly meetings with the PDCs to create an additional avenue whereby it obtains market feedback. The Energy Trust will be entering into a new contract for program management services in the fall of 2005.

Summary

The Energy Trust's Production Efficiency Program is proving effective in cutting the high cost of energy for participating facilities. Within 18 months of launch, the program has involved industrial facilities in over 500 projects in some phase of participation. The committed and completed projects are estimated to have first-year energy savings of over 150 million kWh. Efficiency projects include those substantially changing the participants' production processes, as evidenced by the 28 projects underway or completed that each had estimated savings in excess of one million first-year kilowatt hours (kWh).

Process improvement projects save more energy and cost less than equipment projects, from both the program's and the participants' perspectives. The savings from process improvement projects cost the program $0.11 per kWh in incentives plus study costs, compared with $0.14 per kWh for equipment projects. Average energy cost savings from process improvements are roughly ten times participants' share of project cost, compared to roughly seven times participants' share of costs for equipment projects.

The program's success owes in large part to its simplicity from the participants' perspective. Incentives are predictable, program forms are simple, and the program provides support to participants throughout the process. The use of the established market actors and program contractors with existing market relationships has enabled the program to quickly reach a large number of firms and persuasively present the benefits of program participation. In addition, the use of established market actors has the potential to contribute in lasting ways to the transformation of industry's use of energy in Oregon to the extent the program changes the standard practice of these market actors toward greater efficiency.

Yet the evaluators believe the program is weakened by the contracting structure—or, alternatively, the contracting terms—currently used by the Energy Trust. As of the writing of this article, the Energy Trust is considering the evaluators' suggestions. The Energy Trust currently plans to structure its next program contracts (to be signed in fall 2005) using the same structure as previously, but to revise the contracting terms. Anticipated revisions will address project study quality, communication between the PMC and PDCs, and direct market feedback provided by the PDCs to the Energy Trust.

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