Chasing O&M Savings: Process Lessons from Two Pilot Programs in the Northwest

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Abstract

This paper compares two programs that were designed to convince building owners and service providers to implement energy saving operations and maintenance (O&M) improvements in existing commercial buildings. Using information collected in two process evaluations conducted over several years, we highlight the differences in the approaches uses and describe which components worked well and which were less successful. We explore how each program developed and introduced a new program to utilities, service providers, and owners and the challenges they encountered. We also discuss the challenges involved in evaluating these pilot programs, including evaluating a pilot program when market transformation is a key goal.

Key lessons learned from evaluating these two programs include:

1. Clear and agreed upon goals, outcomes, and delivery processes move projects more smoothly through the process and produce more predictable and consistent results.
2. The experience and approach of service providers greatly affects the recommended measures.
3. Documenting and verifying measures is especially challenging due to the nature of many O&M measures.
4. The time and commitment needed to develop and deliver new O&M service offerings are likely to exceed even the most generous expectations of program planners and implementers.
5. Evaluations of O&M programs, especially within a market transformation context, pose significant challenges.

Introduction

Despite the importance of capturing energy savings of up to 15% from improved operations and maintenance in existing commercial buildings, efficiency programs have found it difficult to snare them. Over the past five years, however, a number of utilities and systems benefits charge agencies have been piloting programs – variously called building tune-ups, retrocommissioning, enhanced O&M services, and energy management -- designed to corral these elusive savings.[1]

The authors have evaluated two pilot programs in the northwest focusing on O&M energy savings: Building Performance Services(BPS) at the Northwest Energy Efficiency Alliance and the Building Tune-up and Operations (BTO) program at Energy Trust of Oregon.[2] We commend the sponsoring agencies for launching these innovative efforts and for evaluating them. The experience gained from these pilot programs

[1] Programs in California include the 2002-2003 Oakland Energy Partners Large Commercial Building Tune-Up Program, the 2004-2005 Building Tune-Up Program (Quest), the 2004-2005 Monitoring-Based Commissioning element of the UC/CSU/IOU Statewide Energy Efficiency Partnership, and the Southern California Edison and San Diego Gas and Electric Retrocommissioning Program (PECI). Other Retrocommissioning programs include Xcel Energy's programs in Colorado and Minnesota, Rocky Mountain Power, CenterPoint Energy, Long Island Power Authority, and NYSERDA (New York: through Flex Tech and Technical Assistance)

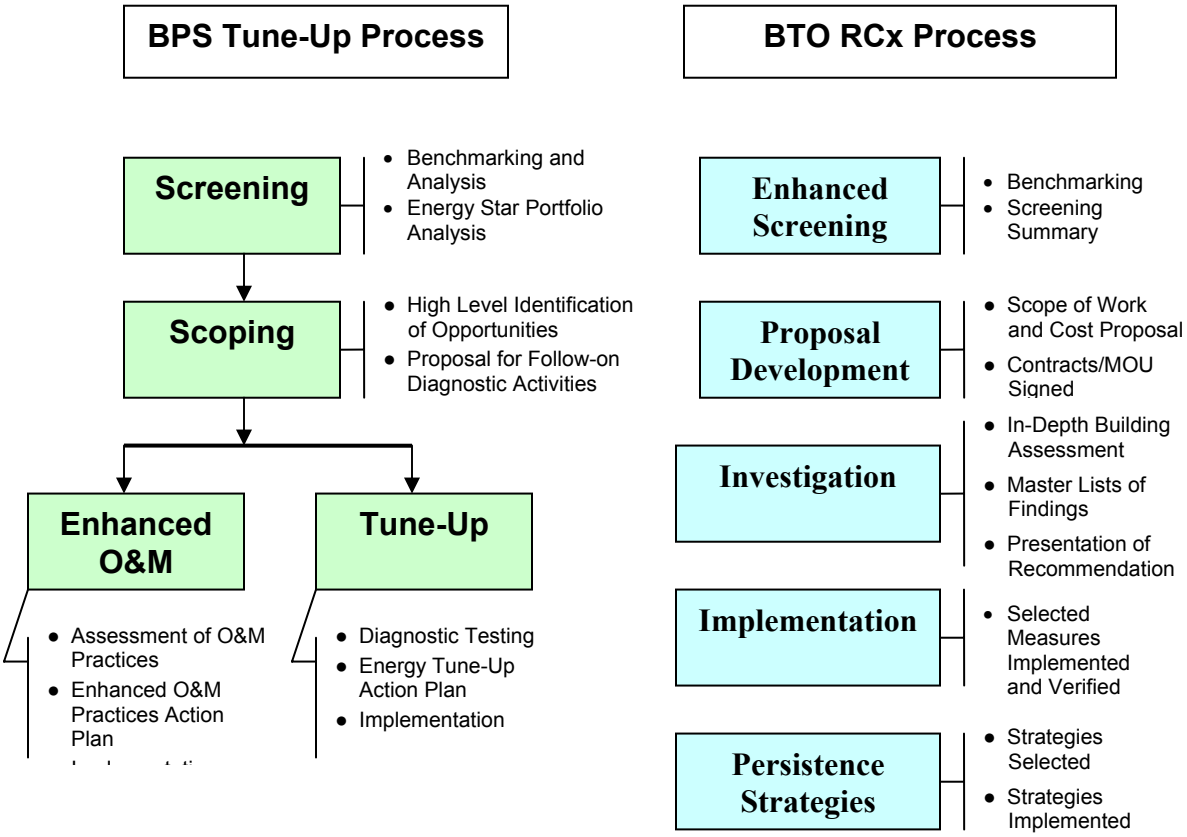
[2] Please see report references at the end of this paper.

provides valuable insights and raises important questions that should be considered if future programs are to be successful. In the remainder of this paper we describe the two programs, implementation experience, lessons learned, and issues to consider.

Program Descriptions

The steps for of the two O&M savings programs – BPS and BTO – are shown in Figure 1 below. The programs have many similar facets but the specific steps differ. Each program employs screening and initial on-site scoping activities, followed by more in-depth investigation and implementation. Overall, the BTO retrocommissioning service follows a more systematic and rigorous process than the BPS tune-up service, which was intended to allow a more flexible and quicker process than a traditional retrocommissioning approach. Still, both programs employ a thorough approach to identifying and implementing O&M improvements. Each program also includes efforts to ensure that O&M efforts persist over time. The paragraphs following the figure briefly describe the steps in each program's process.

Figure 1 Process Diagrams for BPS and BTO



The BPS Screening step identifies if buildings are likely to benefit from O&M improvements. This step leads to Scoping, which includes an on-site review and a scoping report that describes energy efficiency opportunities and proposes follow-on activities, including diagnostic tests. The focus of the Enhanced

O&M Step is to review and revise current O&M practices with an eye to persistence, such as implementing in-house staff training or adjusting outside service contracts. The Tune-Up step identifies and implements low-cost operational changes to reduce energy costs, such as reprogramming existing building controls and equipment.

The BTO retrocommissioning process combines the screening and scoping steps into an Enhanced Screening step. This step feeds into Proposal Development, where a scope of work, cost proposal, and a contract or memorandum of agreement are developed using a standard template. The BTO Investigation and Implementation steps are similar to the BPS Tune-Up step. The BTO process concludes with the development of Persistence Strategies to ensure savings over time, such as education and training, development of O&M procedures, and trending or testing (similar to the Enhanced O&M step in BPS).

Program Implementation and Outcomes

Although the programs have similar elements, they have been operated quite differently. To manage the BPS pilot, the Northwest Energy Efficiency Alliance (NEEA), worked hand-in-hand with a expert contractor that had strong experience motivating northwest decision-makers to implement O&M energy efficiency opportunities. Three utilities and Energy Trust of Oregon, a systems benefit charge administrator, also sponsored the effort. Four service providers were recruited to deliver the actual tune-up services; NEEA and its expert contractor provided training and, where needed, "mentoring" for these service providers. The sponsors helped define the BPS steps, identified worthy projects (along with the service providers), oversaw the BPS process for projects in their service territories, and relied on the service providers to carry out the tune-up process. To encourage buy-in from the sponsors, and to allow flexibility, the BPS pilot did not require the sponsors to adhere to the BPS tune-up steps.

When Energy Trust decided to create the Building Tune-Up and Operations program after being a sponsor of BPS, they assumed they would use a similar approach to BPS. As with their other programs, Energy Trust hired a program management contractor (PMC) to administer the program. After program initiation, however, the PMC proposed that the program focus on providing the retrocommissioning process shown in Figure 1. The PMC recommended this approach based on their experience running similar programs elsewhere and because they thought this approach would better meet program goals. Energy Trust accepted this alternative focus for BTO, although they still offered the tune-up approach as an option and continued to shepherd a set of projects that they began when they were BPS sponsors.

In the BTO retrocommissioning process, the PMC has strong control over the process. They handle the initial project recruiting and enhanced screening to determine if there are sufficient opportunities for retrocommissioning. They then support and facilitate the RCx process, using tools and guidelines they developed to streamline and improve the quality of services delivered. Once a project passes enhanced screening, a service provider (from a pool of providers) conducts the building investigation to identify opportunities for improving building performance. The owner reviews the recommendations, selects measures to implement, and chooses who will implement the measures. In the final step of the process, the RCx service provider works with the owner to implement a persistence strategy to help maintain the energy savings.

Table 1 summarizes the approaches, timelines, and results of the BPS and BTO projects examined during our evaluations. The table reflects how the flexibility allowed in the BPS process led to each sponsor adapting BPS to its existing program approaches or needs and providing widely varying tune-up-type services to 18 test projects. The varying approaches, listed by sponsor in the table, also produced differences in the time it took to complete projects and in the types of outcomes achieved. On the other hand, the single contractor for BTO, who both developed and implemented the program, was able to more uniformly apply its retrocommissioning process and to obtain more consistent results.

For BPS, only one sponsor closely followed the specified approach, largely because NEEA's expert contractor, who also was involved in developing the BPS approach, managed these projects (Sponsor 4). The approaches for the other sponsors ranged from energy audits or facility assessments with fairly detailed reporting and analysis and an emphasis on higher cost efficiency recommendations (Sponsor 1) to simple walk-through site visits that reported low-cost savings opportunities in a brief memo (Sponsor 2). Participants or service providers implemented the recommendations, in some cases with assistance from the utility.

The BPS process envisioned projects moving through the scoping phase fairly quickly, with more emphasis on the diagnostics, action plan, and implementation steps. However, many projects were delayed in the scoping process, primarily because screening and scoping reports ended up being more detailed and labor intensive than originally intended. The time it took for BPS projects to progress from initial contact with participants to final scoping reports varied widely, from a month and a half to 15 months, reflecting the diversity of approaches.

As of April 2005, when the evaluation of BPS was conducted, delivery of BPS was largely complete for 11 buildings, scoping reports were complete for six other projects, and scoping was underway at one BPS
building. It took 9 to 18 months for projects to reach completion[3] and some projects were still underway. The primary outcomes for these projects were:

- Information and recommendations were provided to owners in the scoping and diagnostic reports
- Minor adjustments or fixes were made to some buildings during the scoping or diagnostic process
- Tune-up activities, enhanced operation actions, and energy efficiency retrofit measures were implemented or were in the process of being implemented in 9 projects, but the number and types of measures varied widely. Some participants indicated the BPS recommendations would be implemented in the future depending on available budgets. The process evaluation did not attempt to quantify energy savings.

The seven new projects recruited for the RCx portion of BTO successfully progressed through the investigation phase in six to twelve months[4]. As of May 2007 implementation of recommendations was complete for two projects and was underway at four others. Implementation is expected to be completed for these projects by summer 2007. Implementation of measures for one project has been delayed because of a change in building ownership. The final step in the RCx process is implementation of persistence strategies, such as education and training and documentation of O&M procedures; this step is currently underway at two sites.

The retrocommissioning projects will deliver energy savings and help BTO meet its goals, although preliminary estimates show the levelized cost of the savings[5] are above Energy Trust's benchmark. The PMC was successful recruiting participants from the target population of downtown Portland property owners, its enhanced screening worked well, and projects started in a timely fashion. Service providers have shown they can deliver the RCx services defined by the program.

Table 1 Summary of BPS and BTO Implementation Experience

[3] Defining completion is difficult because in some cases implementation of measures can extend into the future, but delivery of program services are complete.
[4] An eighth project began the RCx process, but dropped out when it was learned that a major building renovation was planned.
[5] Savings are based on estimates made by the RCx service providers.

Sponsor	Approach	Time to Complete Scoping Report/ Investigation	Scoping/ Investigation Reports	Time to Project Completion	Outcomes
BPS Tune-up Sponsor 1	Facility assessment /energy audit	7-15 months to complete scoping reports	Detailed reports recommending a mix of capital and O&M-type measures.	Project end points not clear; BPS ended with scoping report	BPS services ended with the report. Some owners implemented O&M type measures recommended in the scoping reports. Capital measures may be implemented in the future.
BPS Tune-up Sponsor 2	Simple Tune-Up, Operations & Maintenance Model	1-2 months	Simple Memo reports; some emphasized capital measures and others O&M-type measures.	9-18 months	BPS services continued through implementation. All projects implemented some measures
BPS Tune-up Sponsor 3	Modified BPS Approach emphasizing the scoping report	5-11 months	Detailed reports recommending some low cost and some relatively high cost O&M measures along with a few capital measures	Projects still underway when the evaluation ended	Some minor measures implemented by owners. Owners may implement more expensive measures as budgets allow
BPS/BTO Tune-up Sponsor 4	BPS Model or Modified BPS Approach	4-7+ months	Mix of simple scoping reports and more detailed reports depending on service provider	12-18 months	Two projects successfully implemented measures and achieved significant benefits, one is still underway, and three were terminated
BTO RCx Sponsor 4	RCx	6-12 months	Mostly O&M, tune-up, and control type measures, often with short payback	13-18+ months	Implementation of measures complete for 2 projects, underway on 4 more, and under negotiation for one

Lessons Learned

We have summarized the lessons learned from the successes and challenges experienced in these two pioneering programs into five areas:

1. Defining clear goals, outcomes, and delivery processes
2. Addressing differences in the measures recommended by service providers
3. Documenting and verifying measures implemented
4. Recognizing the time and commitment needed to develop and deliver O&M service offerings
5. Allowing for the challenges of evaluating these types of programs.

1. Clear and agreed upon goals, outcomes, and delivery processes move projects more smoothly through the process and produce more predictable and consistent results.

NEEA, BPS program sponsors, service providers and building owners all brought different perspectives and needs to BPS. These differences in goals, motivations, and expectations created challenges for program implementation. In addition, NEEA allowed sponsors and service providers "the flexibility to deliver services as they see fit, with the BPS Implementation Toolkit[6] serving as guidance to the extent useful." However, the Toolkit did not provide an easily usable framework for implementing BPS and received limited use despite compliments about it being a great resource.

The different implementation approaches used to deliver BPS highlight the differences of opinion between NEEA, sponsors, and service providers about core concepts and delivery elements of the BPS approach. For example, differences included the amount of effort to be put into the scoping report, the tendency to favor more traditional capital intensive energy efficiency improvements over low-cost O&M-type measures, the degree of detail in follow-on diagnostics, and at what point in the BPS process follow-on diagnostics should be conducted.

In contrast, the PMC had complete responsibility for recruiting participants and managing implementation of BTO RCx projects and created spreadsheet workbooks, guidelines, and quality assurance review processes to support service providers in delivering consistent, high quality RCx services. The delivery process for RCx was clearer than the tune-up process and combining the screening and scoping tune-up steps into an enhanced screening step conducted by the PMC worked well and helped move projects more quickly into the investigation phase.

2. The experience and approach of service providers greatly affects the recommended measures.

The success of a RCx or tune-up project depends on the experience and expertise of the service provider. The evaluation results show a significant variation in the nature of measures recommended by different service providers. For the three RCx service providers, the average payback of recommended measures was 0.27, 2.36, and 2.77 years. One averaged almost 40 mostly low-cost O&M-type measures per building, while the others recommended fewer measures and more than 20 percent had greater than five year paybacks. While some of this variation could be attributed to differences in the buildings and how the service providers grouped their recommendations, a lot is likely due to their approach and focus, how comprehensive their investigation was, and to their experience and expertise.

There was a similar mix of more expensive capital-type recommendations and low-cost O&M-type recommendations for the tune-up projects. This reflected the different approaches used by each sponsor and service provider. In addition, in the tune-up process the service providers made proposals to the owners to implement the measures recommended in the scoping study. Some service providers were putting a greater level of effort into the scoping study than the program paid for with the hope of conducting the follow-up implementation work. While this did not matter to some owners, others saw a conflict of interest. This was not an issue for the RCx process because the RCx providers typically did not implement the recommendations (although they were sometimes involved).

Programs can compensate for this variation by specifying what is to be included in investigations and by providing guidelines and documentation tools. However, the experience and expertise of the service provider is critical to addressing the unique issues that occur in each building. This is a longer-term market transformation challenge that requires training, field experience, and market demand for these services.

[6] The BPS Toolkit was a comprehensive set of technical resources developed for those implementing the program.

3. Documenting and verifying measures is especially challenging due to the nature of many O&M measures.

One of the challenges emerging for the RCx projects is documenting and verifying the implementation of the measures[7]. The BTO program requires installation of all measures with less than a one-year payback in return for covering the cost of the RCx investigation. Building owners are required to provide documentation this has occurred. This is turning out to be an iterative process between owners and the PMC that is delaying the completion of some projects. The evaluation has not yet fully explored this issue because most projects are still underway, but this appears to be an important issue.

The RCx service providers have not tended to be involved in the implementation or documentation process. The service provider needs to provide a complete description of what is required for implementation and documentation, but even if this occurs the owner may not fully understand what is needed. If the owner finds they cannot implement the measures as described, then the description and documentation of the measure changes. The RCx service providers have suggested in evaluation interviews that they should be used to document implementation and perhaps even to conduct follow-up testing.

4. The time and commitment needed to develop and deliver new O&M service offerings are likely to exceed even the most generous expectations of program planners and implementers.

It took substantially more time than originally anticipated for delivery of the tune-up and RCx projects. This extended timing reflects the steep learning curve for all market actors to understand the tune-up or RCx process and to embrace its benefits, the time needed for owners to decide what services they wanted and could afford, and the time needed to deliver projects from screening through completion.

Most of the projects took (or will take) more than a year from initial participant contact to completion. Managing and delivering O&M projects is complicated. Recruiting participants, building relationships, and selling the concept to building owners may take months. Projects have multiple steps and it takes time to move through each step with lots of places for projects to be derailed or delayed. Matching budget cycles for owners so dollars are available to implement recommended measures can also delay project completion.

Programs need to be flexible to adapt to the changing needs of clients. While program managers should aim to keep projects moving forward, they should also recognize delays will occur and results may take longer than expected to materialize. It is important not to set unrealistic timelines that do not account for the time and commitment needed to develop and deliver O&M service offerings.

5. Evaluations of O&M programs, especially within a market transformation context, pose significant challenges.

One of the goals of the BPS evaluation was to assess or validate the BPS tune-up approach. The evaluators' ability to do this was hampered for several reasons: The combination of the small number of projects and the variation in approaches, the lack of a clear implementation guide defining approach, deliverables, options, incentives, and benefits, and differences of opinion among the NEEA, sponsors, and service providers on core concepts, goals, and outcomes. As a result, the evaluators were able to say very little about the BPS approach.

The programs also set unrealistic timelines that were not met. This led to delays in conducting the evaluation and required a great deal of flexibility to adapt to program changes and to schedule evaluation activities. The evaluation of BPS took more than two years to complete. The BTO evaluation was extended six months to allow the RCx projects to be completed.

[7] This was not an issue for many of the BPS tune-up projects because they were pilot projects that either did not get to the implementation phase or there was no obligation for owners to implement recommendations.

The evaluations of these pilot programs focused on program processes and delivery approaches. However, market transformation is the primary goal for NEEA and the program theory for both programs defines market transformation goals. Addressing these market issues can be difficult in a small pilot project evaluation and there can be a tendency for program staff to ignore them and focus on processes and approaches. This can result in ignoring key market issues that may have more to do with success and failure than the processes and approaches. In the BPS evaluation, the evaluators used information from interviews and review of project results to develop some market insights to help explain the underlying factors for each stakeholder in terms of the strengths and challenges they bring to a BPS-type project.

Issues

In addition to the key lessons learned from these pilot programs noted above, we identified some issues that need to be addressed for future O&M programs to succeed. We hope these issues will stimulate further dialogue that supports the creative approaches needed for effective O&M programs.

- **The attributes and appropriate use of pilot programs need to be better defined.**

NEEA called BPS a "test" and program staff described BTO as a pilot. However, NEEA did not structure BPS to test program approaches and BTO had resource acquisition targets and a 2-year performance-based program management contract like other Energy Trust programs. A pilot or test program should be designed to assess specific delivery alternatives, especially when new concepts are being introduced into the market or when aspects of the market being served are uncertain. If possible, an evaluation team should work with program developers to specify clear research questions and methods. Still, given the added costs in time and budget to conduct pilot programs, when are they justified? Since tune-up and RCx programs are relatively new, at a minimum, program staff and evaluators clearly need to specify the issues they want to learn about from the evaluation.

- **Simple tune-up approaches were not tested.**

The tune-up and RCx approaches are both in-depth and complex strategies for obtaining O&M-related energy savings. Most of the building tune-up projects took a couple of years to complete and experienced delays. The steps in the tune-up are similar to those used in the RCx process, but with somewhat less rigor. Defining and testing a tune-up approach that has the potential for quickly and cost-effectively delivering energy savings from O&M measures is clearly needed. Is there a way to significantly shorten the tune-up process and still identify the key energy savings opportunities? Can a viable option be developed for buildings that do not need a more comprehensive RCx process?

- **O&M-type energy savings measures are different from traditional energy efficiency measures.**

RCx and tune-up programs tend to treat measure recommendations similarly to traditional energy efficiency measures. Measures are described, savings and costs estimated, and documentation and verification requirements specified. This provides value in helping owners decide what to do, but a lot of effort can go into meeting the program requirements for achieving savings that does not provide benefits to participants. The nature of O&M-type measures, their costs, and their risks are quite different from traditional, more capital-intensive energy efficiency measures. Program approaches need to reflect this rather than impose traditional approaches. This might involve a more holistic approach that looks at overall building performance rather than individual measures and applies verification approaches that are consistent with the investment that has been made.

- **O&M programs/services are one time interventions, yet building O&M is ongoing.**

The tune-up and RCx approaches are one-time interventions like most existing building energy efficiency programs. However, building O&M is an ongoing process. To address this, the programs offer enhanced O&M and persistence strategies. While it is too early to access the success of these approaches, we believe there is a need for organizations like NEEA and Energy Trust to look beyond one-time interventions to achieve energy savings in existing buildings. To fully ensure long-term success programs need to consider ways to maintain long term relationships with participants and to support and reinforce ongoing O&M efforts. This might include things like training, building operator certification[8], energy accounting and benchmarking, and circuit riders to support facility staff.

- **RCx and tune-up services are a tough sell.**

While the awareness of RCx-type services among building owners is growing, many are still very uncertain about the benefits. There are a relatively small number of service providers. The market for O&M services is quite fragmented and services are not well-defined or differentiated. There is still a great deal of work needed to create demand for RCx, tune-up, and enhanced O&M services and to develop the expertise among service providers to deliver these services.

The PMC for the RCx program successfully marketed retrocommissioning to large building owners in Portland because they had credibility as an expert in this area and they were independent from the service providers that would be conducting the investigations. In some cases, the tune-up program relied on service providers to make the sale and this tended not to work as well.

Given the immaturity of the market, incentives are necessary to motivate owners to tune-up or retrocommission their buildings. Participants in these programs favored incentives to pay for the RCx investigations or tune-up scoping studies. They often do not have budgets to pay for 'studies.' Incentives for implementing measures were less important, particularly if the recommendations were low cost measures. In addition to incentives, programs need to consider training and other methods to develop expertise in the marketplace and to encourage changes in business practices both for owners and service providers.

- **O&M programs can be expensive and difficult to manage.**

Delivery of O&M energy efficiency programs is hard. If it were easy, more organizations would be delivering these programs. These services are difficult to sell to building owners, there are limited numbers of qualified service providers, the multi-step processes are difficult to manage and can seem complicated, projects are prone to delay, and savings are difficult to measure and appear to be less certain than more traditional energy efficiency measures. Energy Trust estimates show that RCx will have a levelized cost of four cents/kWh, twice their benchmark. To address these challenges we believe program sponsors need to keep looking at ways to streamline and simplify processes, provide flexibility and options to match services to owner needs, reduce delivery costs and risk, and consider ways to integrate O&M programs into existing building programs. By leveraging the infrastructure of existing building programs, some of the cost of developing and operating stand-alone programs can be avoided. O&M services should be a natural compliment to more traditional existing building energy efficiency programs.

Conclusions

Organizations involved with energy efficiency have pointed to the large energy savings potential from O&M improvements in existing buildings, but have had mixed success tapping this potential. Any existing buildings energy efficiency program that strives to significantly improve the performance of

[8] Energy Trust has found that scholarships for Builder Operator Certifications are one of their most cost effective initiatives.

existing buildings will need to address building O&M. However, programs focused on O&M have tended to be expensive and difficult to manage. The results for BPS and BTO are consistent with this experience.

To address this, we believe organizations wishing to operate O&M based energy efficiency programs should more fully explore how to leverage existing program infrastructure to obtain energy savings from O&M services, asking questions such as:

- To what extent can O&M services be integrated with existing building efficiency and training programs?
- Like new construction programs, can there be a "whole buildings" approach for existing buildings that offers a comprehensive range of integrated services that aim to produce a high performance building?

O&M services often have difficulty standing on their own because the energy savings are not large enough to justify the investment in the project. To survive, either the investment needs to be reduced, or the services need to be included in a more comprehensive package.

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