A Compelling Combination: ISO 50001 and Resource Acquisition

J.P. Batmale, Energy Trust of Oregon
Chad Gilless and Richard Hart, EnerNOC, Inc.

ABSTRACT

The ISO 50001 standard has enormous potential to accelerate the market adoption of transformative energy management practices. The standard unites organizational business practices and a management system to drive persistent results, and since its release in 2011, over 1000 companies around the world have deployed it at 1500 sites. At the same time, leading utilities have implemented resource acquisition programs that target business practices and management systems, but none have included ISO 50001 … until now.

In 2012, the Energy Trust of Oregon (Energy Trust) initiated a test offering under the Production Efficiency program, with three objectives: (a) Deploy energy management practices to the ISO 50001 level to establish a system that could be externally certified; (b) Determine if energy savings resulted; and (c) Return findings to Energy Trust on how ISO 50001 could potentially influence Energy Trust's other Strategic Energy Management (SEM) offerings. Two initial customers completed the offering in spring 2013. This paper describes the customers' experience with the offering, the results against Energy Trust's three objectives for its ISO 50001 test offerings, and lessons learned that will influence Energy Trust's future customer offerings.

Introduction to ISO 50001

Strategic Energy Management

In the past ten years, utilities and their customers have recognized that there is a significant opportunity to gain savings by integrating energy management practices into the every aspect of a customer's business. Broadly speaking, this approach, called Strategic Energy Management (SEM) has two components: (i) a deep review of energy usage to find savings from changes in operations and maintenance and in behavior, on top of equipment upgrades; and (ii) a continuous improvement approach to energy performance, using classic Plan-Do-Check-Act methodologies. However, historically there were no standards for implementing SEM.

Origin of the Standard

In June 2011, the International Organization for Standards (ISO) launched ISO 50001, after a multi-year development effort (that included one of the paper authors, Chad Gilless, on the US team). ISO 50001 aims to deliver continual improvement in energy efficiency through the use of management systems, in the same way that the well-known ISO 9001 standard aims at continual improvement in quality.

Requirements for Customers

The heart of ISO 50001 is a comprehensive energy management system (EnMS). This is not an IT system; instead it is a management approach for energy, similar to a Quality Management System. An ISO-compliant EnMS includes an energy policy, energy teams, clear management involvement, energy-related purchasing procedures, energy goals, employee engagement, training, and numerous other structures and processes.

ISO-compliant companies also have Energy Performance Indicators (EnPIs), which are the metrics that they use to drive improvement and meet goals. The standard does not define which EnPIs to adopt; it leaves that flexibility to each company (e.g. kWh/widget, therms/square foot, BTUs/month). Those companies which seek to be ISO certified also commit to an initial third party certification of their management system, annual surveillance audits, and a thorough recertification every three years. Third party certifiers can often provide additional expert advice on optimizing facility efforts.

These three elements (a management system, performance indicators, and external certification) have been proven to drive results in quality, environmental impact, safety, and most recently in energy management. ISO 50001 certification complements other approaches to Strategic Energy Management.

Current Status of Implementation of the Standard

Organizations typically launch the standard at a facility level, so they can learn and expand. As of April 9, 2013, more than 1100 companies worldwide had completed certification at 2453 sites in 58 countries[1]. Eighteen firms in the US are fully certified in at least one location, including 3M, Bridgestone, Cooper Tire & Rubber, Nissan, Schneider, and Volvo. While manufacturers are the typical adopters, we have also seen certification by retailers, public facilities, and office facilities. The US Department of Energy (DOE) has provided early results from 7 facilities who have implemented ISO in the last year and a half; one key finding was that 6 out of 7 facilities saw ROI in 2 years or less.

Energy Trust and Strategic Energy Management

About Energy Trust

Energy Trust of Oregon is an independent nonprofit organization, overseen by the Oregon Public Utility Commission (OPUC). Energy Trust provides solutions and cash incentives that help customers to save energy, use renewable energy and lower costs in homes and businesses. Energy Trust serves the customers of Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas. Since 2002, Energy Trust programs have directly saved customers over $1 billion on their energy bills. Annually, Energy Trust consistently meets or beats savings and renewable generation targets set by the OPUC. Energy Trust's cumulative impact has been to help keep energy costs as low as possible for customers and the region.

[1] Worldwide ISO 50001 deployments are tracked on a monthly basis by Reinhard Peglau, Senior Scientific Officer on Environmental Management, at Germany's Federal Environment Agency (Umweltbundesamt).

Strategic Energy Management Offerings

Energy Trust's industrial and agricultural customers are served by the Production Efficiency (PE) Program. This program includes a mix of service and incentive offerings that range from prescriptive lighting to custom capital studies and incentives. In 2012 alone the PE Program helped industrial and agriculture customers save over 127 million kWh and 879,000 therms.

Beginning in 2008 the PE Program began acquiring energy efficiency resources from SEM offerings. Energy Trust was influenced to adopt SEM offerings by the success of the Northwest Energy Efficiency Alliance's Continuous Energy Improvement efforts. SEM offerings have played a pivotal role in Energy Trust's diversification strategy to engage more customers and acquire more savings per customer.[2]

Since 2008 Energy Trust's SEM offerings have served over 70 customers and collectively saved over 93 million kWh in total. These savings are independent of capital investments, custom or prescriptive, that may occur during the SEM engagement.

Energy Trust currently has five distinct SEM offerings:

- Industrial Energy Improvement (IEI) - An interactive, year-long engagement that brings together manufacturers in a workshop setting to learn and then share their experiences putting strategic energy management principles, tools, and practices in place at their businesses.
- Corporate SEM - An interactive, year-long engagement for individual manufacturers that utilizes workshops and on-site activities to learn and then put into practice strategic energy management principles and practices at their business.
- SEM-Maintenance - Helps former IEI and cSEM participants maintain, deepen, and continue the integration of strategic energy management practices, processes, and tools into their business's operations.
- CORE Improvement – Nearly identical IEI in focus and structure but services and instructions are tailored to small- to medium- manufacturers.
- ISO 50001

Most of these offerings are aimed at Medium- to Large- industrial clients. The exception is CORE Improvement, which offers SEM services and incentives to Small- to Medium- sized industrial clients. Incentives are generally $0.02/kWh saved and $0.40/therm saved. Engagements can last from six months to more than one-year, depending on the customer and offering. Energy Trust's SEM engagements utilize statistical models to establish energy savings. The final savings from an SEM engagement are net of the verified savings from all capital projects completed during the engagement.

Energy Trust's longest running SEM offering is Industrial Energy Improvement (IEI). The IEI primarily targets manufacturers utilizing more than 8 million kWh/year who also have some level of understanding or application of Lean manufacturing principles or Continuous Improvement. Since 2008, the IEI has served nearly 50 of Oregon's leading manufacturers

[2] 2012 Program Efficiency Trends report to the Energy Trust Conservation Advisory Council, May 1 2013, http://energytrust.org/library/meetings/cac/130501_CAC_Package.pdf

Adding ISO 50001 to the SEM Offerings

After administering two SEM offerings for two years, in 2010 Energy Trust sought to expand its provider pool and to test SEM-related offerings that could lead to new, novel, and complementary SEM approaches. Through an RFQ process, Energy Trust chose several vendors with which to test certain offerings. EnerNOC's ISO 50001 offering was selected as it provided a compelling solution for Energy Trust customers.

Energy Trust chose the ISO 50001 offering for a few reasons: First, ISO 50001 was emerging as a possible next step for many manufacturers involved in SEM. Energy Trust wanted to share in the accreditation experience with its customers, to better understand the ISO 50001 benefits and costs and its potential for broader applicability to other Energy Trust offerings and clients. Second, EnerNOC brought a wealth of immediately applicable ISO expertise. EnerNOC staff were heavily involved in creating the ISO 50001 standard, experienced in deploying ISO 50001 and the Superior Energy Performance standard (as part of a US DOE-sponsored pilot), and had experience auditing other ISO management system standards.

Design of the ISO 50001 Test Offering

Goals of the Offering

The Energy Trust ISO 50001 test offering had three goals:

1. Deploy energy management practices to the ISO 50001 level that could be externally certified. The customers would attempt to achieve ISO 50001 certification, with their management systems standing up to the scrutiny of a third party certification body audit.
2. Determine if energy savings from non-capital equipment measures occurred at a level that meets robust resource acquisition requirements. The energy savings would be determined using approaches and tools common to SEM deployments.
3. Return findings to Energy Trust on best practices that could be used to refine existing SEM offerings and how to best deploy an ISO 50001 offering in the marketplace, if at all. For example, Energy Trust would understand if the customer services were sufficient, and if the Energy Trust incentives provide adequate motivation.

Target Market

The ISO 50001 test offering focused on customers who had previously participated in Energy Trust's IEI offering.

Offering Description

The offering was designed to assist the customer in three key ways:

- Consulting services to prepare for certification. These services included the creation of detailed savings models. Customers also need assistance with change management, internal marketing of the effort, and continued executive engagement.

- Coaching services to achieve certification. Once ready, customers needed coaching to prepare necessary materials, interact with the certification body, and respond to issues raised during the certification process. Energy Trust offered to cover some of the cost of certification, but only if the customer was certified by a specific expiration date.
- Incentives for energy savings. Incentives were available for savings from capital equipment measures as well as from operation and maintenance changes (these latter incentives were already available from existing Energy Trust programs). Financial incentives were also available for achieving certification within 6 months of completing the statistical energy savings model.

Duration of the Test Offering

The ISO 50001 test offering lasted approximately one year from April, 2012 to July, 2013. This included 6-8 months to implement the standard to the ISO-compliant level, moving from gap analysis to coaching to mock audits. During this period, the team established savings models to be used for three purposes:

- To meet the standard's technical requirements
- To create a baseline of energy consumption
- To estimate energy savings for Energy Trust program incentives.

In addition, the offering continued while the customers gained third-party certification; this process is managed on a distinct timeline beyond that managed by Energy Trust, with an expectation that each customer would be certified within one year, but with a desire that each customer be certified within six months after completing implementation.

Energy Trust and Implementer Resources

To support the test offering, Energy Trust applied a mix of resources. From the Energy Trust itself, a program manager focused on the SEM offerings would dedicate time to ensure appropriate direction. On Energy Trust's behalf, EnerNOC would apply a combination of resources as the Project Team: a project director to provide vision, oversee efforts, and to engage with customer executives as needed; a project manager to manage the numerous implementation activities; a management systems expert to coach the customers on methods to improve their energy management efforts to the ISO level; and a technical expert to review, refine, and develop statistically-based savings models, to identify savings opportunities, and to estimate energy savings.

Customer Resources

Each customer provided a combination of resources:

- an executive sponsor to adequately resource the project, to hold the energy team accountable, and to deliver on the top management requirements of ISO 50001;
- a project manager to maintain project momentum through coordination and communication;

- a person experienced with their organization's other management systems, such as ISO 14001, as this person could help the energy team leverage existing processes;
- a technical resource who could implement the standard's technical components; and
- staff who joined the energy team in order to deploy and maintain the energy management system (for example, one person may create documents to meet the ISO requirements, while another person may spearhead internal employee marketing around ISO).

Recruitment of Participants

In December 2011, EnerNOC and Energy Trust presented the ISO 50001 offering at a networking event of former IEI participants. Then, beginning in spring of 2012, Energy Trust Production Efficiency Program Delivery Contractors (PDCs) began screening customers who were interested in the test offering. Potential participants were screened using the following 5 questions:

1. Are your company executives on-board with ISO certification?
2. Does your facility/company have familiarity with third-party auditing?
3. Does your company use documentation to standardize and improve your processes?
4. Does your company have an active training focus that understands competencies required for certain positions and then utilizes training to meet those position requirements?
5. Why are you interested in certifying your company's energy management program to the ISO standard?

After several meetings four customers expressed interest in the ISO 50001 offering. Energy Trust PDCs produced scoping reports for each interested participant that detailed, among other things, the answers to the five questions above. EnerNOC then completed a further in-person screening to assess the fit of the offering to the participant. Based on EnerNOC's ISO experience, it was clear that a combination of participant commitment, previous ISO certifications, and previously trained resources would be critical for the offering to be a success. By the end of this screening process, two customers had committed to move forward and Energy Trust issued formal offers to each customer to participate.

Both of the participants were multi-national companies, one being a biotech manufacturer and the other being a clean energy manufacturer. Both had completed participation in Energy Trust's IEI offering only a few months before with very positive experiences. Culturally, both had commitments to being "World Class" (i.e., excellence in operations, including energy management). Financially, both companies had to position their products and services as competitively as possible in international markets (i.e., both companies view certifications as a means to distinguish themselves against competitors worldwide). Related to that point, both companies had undergone certification for other standards before attempting ISO 50001.

Delivery of the Offering

Kick-off Meeting and Gap Analysis

In the kick-off meeting, EnerNOC set expectations for the effort as well cemented agreement from the customer energy team and executives on moving forward. The Energy Trust

PDC attended this and subsequent meetings, providing account management consistency as well as knowledge about capital equipment measures completed or on the radar.

During the first meeting EnerNOC conducted an ISO 50001 gap analysis to identify the tasks facing each customer to fulfill all of the requirements of the standard. Based on their SEM efforts within the IEI offering, as well as the fact that they had existing ISO certification in other standards, the two customers met several of the ISO requirements, with a range of effort required to meet the complete standard. In the rest of this document, we refer to the customers as Customer A and Customer B.

Table 1. Initial Gap Analysis

ISO 50001 Elements	Customer A	Customer B
4.1 – General Requirements	Pass	Pass
4.2 – Management	Pass	Error
4.3 – Energy Policy	Pass	Pass
4.4 – General Energy Baseline, Objectives, Performance Indicators	Pass	Pass
4.5 – Implementation & Operation	Pass	Pass
4.6 – Checking	Error	Error
4.7 – Management Review	Error	Error

Implementing the Standard: Management Systems

After the gap analysis, EnerNOC began working with each customer energy team to implement the standard (i.e. complete the tasks required to get certification). Implementation begins with the results of the gap analysis and ends with the customer having an ISO compliant management system that can be certified.

The Project Team met with the customer teams at least monthly, reviewing progress on the actions identified in the gap analysis and coaching the customers on how to address ISO 50001 requirements. This implementation was not simple, due to the implications of the standard.

For example, ISO 50001 requires that persons who impact significant energy uses systems be competent ("significant energy use" or SEU is an ISO term for any system or process that has a measurable impact on facility energy consumption). This requirement means that the customers first understand and delineate their SEUs, that they define what operational competency means with respect to those SEUs, that they train those persons if necessary, and that they ensure that competency will be maintained over time. These actions can require involving energy engineers and statisticians for the SEU delineation, process managers for the operational competency definition, supervisors or trainers for the actual training, and human resources for the maintenance of training records.

This implementation process took over six months, longer than EnerNOC and Energy Trust would have preferred, but not surprising given competing priorities. For both customers, EnerNOC conducted a mid-project review with energy teams and executives to confirm expectations and maintain agreement on timelines. EnerNOC also coached the energy teams on how to internally market ISO 50001 to improve employee buy-in to the new management system.

Implementing the Standard: Technical Activities

In parallel to implementing the organizational components of ISO 50001, EnerNOC worked with the customers on the standard's technical components. From their IEI experience, both customers had existing energy savings models, one for electricity and one for gas. EnerNOC applied engineering and statistical expertise to ensure that the models were still valid for current operating conditions.

This technical analysis helped the customers establish fundamental ISO concepts such as Energy Performance Indicators (EnPIs), Baselines, and Significant Energy Users (SEUs) at a defensible level for third party certification. In addition, the technical analysis helped the customers focus on energy performance improvement opportunities, a key component of the offering since Energy Trust expected energy savings to meet the test offering's second goal. At the end of the effort, around late summer 2013, EnerNOC will estimate the total project savings and report these to Energy Trust.

Opportunity Register

Through the engagement, the customers were driven to use their management systems to drive savings-producing measures. From their experience in the IEI, each customer had an Opportunity Register to track and manage their measures. Preparation for ISO 50001 certification drove both customers to increase general employee awareness, to increase the competency of the employees who impacted the SEUs, and to identify operations and maintenance improvement opportunities (see the Results section for examples).

Mock Audits

EnerNOC conducted a final mock audit as a capstone to note what had been achieved over the past six months and to clarify any improvement areas prior to the actual audit.

After each customer finished filling the gaps within their EnMS (on both the organizational and technical tracks), they were able to put their management systems into practice, gaining experience and identifying improvement opportunities prior to certification. This timeframe was 3-5 months, a sufficient time to lock in the EnMS organizational practices.

Certification

ISO certification is completed with two rounds of audits by an authorized, third-party Certification Body (CB). EnerNOC supported them as an extension of their energy teams through this process.

The first audit round, Stage 1, was focused on EnMS documentation review, where the CB checked to see that all of the system elements existed and that no major gaps were evident. EnerNOC monitored communication between the CB and each customer to facilitate responses to questions.

The second audit round, Stage 2, was focused on onsite EnMS verification, where the CB walked the facility and interviewed personnel to ensure that organizational reality matched the management system documentation. EnerNOC supported the customers by joining them onsite for the first day of each Stage 2 audit, and supporting customers to answer questions as

appropriate. The CBs served important roles as knowledgeable third parties with respect to management systems, and were able to pinpoint gap areas where each customer's EnMS might falter and not produce the intended results. The amount of time spent by CBs on the Stage 1 and Stage 2 audits was preset based on established CB guidelines. It is an interesting point that both customers used existing CBs from their other ISO certified management systems.

As of June 2013, both customers have completed their Stage 1 and Stage 2 audits. One customer has been recommended for certification by the CB, while the other is in negotiations with its CB to address two identified non-conformances.

At completion of the certification efforts, approximately 6 months after both companies have fulfilled all of the ISO requirements and are thus ISO-compliant, EnerNOC will estimate the accumulated savings and report these to Energy Trust.

Results

Energy Trust had three goals with this test offering:

1. Helping customers achieve ISO 50001 certification
2. Determine if the ISO 50001 certification process could lead to energy savings and at what cost
3. Transfer any lessons-learned or best-practices from the ISO 50001 engagement to Energy Trust's other SEM offerings

With these results, Energy Trust and EnerNOC are optimistic that the offering will meet Energy Trust's goals[3]. First, both customers are poised to achieve ISO 50001 certification. In both cases the design of the offering:

- Motivated participants to move through their ISO 50001 certification more quickly than if they had not been enrolled.
- Prepared the participants better for final certification than if they had done it on their own, saving time and money.

Second, for both participants, ISO 50001 activities led to the identification and, in some cases, the implementation of low-cost, no-cost O&M measures. These included replacing cooling tower water filters, optimizing or removing pumps, optimizing HVAC controls, and reducing hours of operation for lighting. In addition, ISO 50001 activities at both sites identified capital projects like lighting. These lighting projects were implemented independently of the ISO 50001 efforts once they had been identified, using the regular Energy Trust trade ally lighting program.

Third, both customers went through major business changes during the program period. One significantly ramped-up production, while the other shifted production focus from one set of products to another. While events like these typically stall energy efficiency efforts at a customer, the reverse was true in this case. Both customers persisted with the ISO 50001 engagement, and in fact, they have baked ISO 50001 into their standard business practices

[3] Note that this paper is delivered to ACEEE in May 2013 before the final results have been tabulated for the offering. The presentation at the ACEEE conference in July 2013 provides more current results.

coming out of the restructuring. One customer is applying the standard as they build out a second facility in Oregon,

Unfortunately, due to these major business changes, the statistical models that EnerNOC initially built for both clients were no longer valid at the end of the program. However, models are being rebuilt using interval data from the post-changes period to provide each customer the ability to monitor, track, and report on energy usage as each company puts their energy management systems into practice.

Lastly, there have been significant lessons learned; they are covered in the next section. From a customer perspective, with each customer nearing the end of their participation in the offering, and with both proceeding to external certification, they have expressed full satisfaction with the process. From Energy Trust's perspective, along with customer satisfaction surveys, continuing the ISO 50001 offering will be contingent upon a review by Energy Trust's evaluation and measurement team.

Table 2. Results for each participant

	Customer A	**Customer B**
Employee Count	Over 1,000	Over 1,000
Energy Usage Annually	10 to 20 million kWh	150 to 180 million kWh
Facility size	75 acres	97 acres
Existing management systems	LEAN, Six-Sigma, principles OSHAS 18001, FDA BMP certified , Corporate energy directive, Global Reporting Initiative (GRI) *Sustainability Reporting*	ISO 9001, ISO 14001
Key Findings	ISO process drove focus on crosswalk of management systems; communication regarding energy directive is weaved throughout organizational documents and systems, top management support is key driver to timely implementation (provides staff resources to complete crosswalk and implementation of ISO elements)	ISO process drove focus on SEU improvements e.g. site has multiple machinery doing the same function but site was reluctant to list them as one SEU. Even though site has previous ISO certifications they saw the need to provide training to staff to ensure persistence of systems.
Energy Model Traits	Cooling Degree Days (CDD)	Cooling Degree Days (CDD), Production throughput, also an indicator for a short operating month
Time to implement ISO	14 months	15 months

Insights for Program Managers

For utility resource acquisition program managers interested in implementing an ISO 50001 offering, there are some key criteria that would make the offering more successful:

- **Timing.** While the ISO offering did drive significant changes in the two participants' energy management systems, certification is clearly a long-term initiative. It can be difficult to simultaneously achieve certification and embark on major energy savings activities. Energy Trust feels that the investment in ISO 50001 certification and the resulting energy management systems have created fertile ground on which it can work with its customers to continually harvest savings for years to come. With this in mind, ISO 50001 does not appear to be an appropriate resource acquisition offering for industrial energy efficiency programs in need of savings in less than 8 months.
- **Program Design.** The expiration date for the certification incentive was a key element in good program design. As the date approached, participants saw the possible loss of the incentive as a significant motivator.
- **Resources.** EnerNOC utilized individuals with key experience areas: deploying ISO 50001 with other customers elsewhere; establishing facility-wide savings models and determining savings from these; managing SEM implementations; and directly contributing to the writing of the standard itself. While relatively new personnel certifications may add value (e.g. the ANSI program for ISO 50001 Auditors, and the Institute for Energy Management Professionals program for Certified Practitioner for Energy Management Systems), it is not clear if these can replace actual experience. Program managers will benefit from putting a high priority on finding the right organization to support their ISO offering.
- **Recruiting.** For an ISO offering to be successful, the right customers must be recruited to participate. First, if a program manager is looking for any savings within a program year, then recruiting stable customers is critical. Second, participants should have been through a standards certification before, so that they see 50001 as an extension and can therefore implement with existing resources. Third, a strong relationship with the customer allows the utility to ask for more from the customer. Energy Trust had years-long relationships with both customers, and they had recently deepened this relationship via participation in Energy Trust's IEI offering. Building on the strong relationship, Energy Trust and EnerNOC required that potential participants possess a compelling combination of traits, including explicit executive buy-in, experience with other management systems, and a clear understanding of what work lay ahead as the customers embarked on ISO implementation.
- **Relationship building.** Energy Trust's existing relationships with participants are now much deeper. The ISO 50001 offering forced the Energy Trust team to work with a much broader reaching out and engaging across multiple departments at each facility to help ensure certification. The Energy Trust team now has more reach into the customer, to operations managers and executives, which leads to more conversations about EE.
- **Interventions.** EnerNOC used proven interventions to implement ISO 50001 and to drive energy savings from the EnMS. These interventions included walking the facilities to determine energy usage as well as data collection points for energy and production. This exercise helped each customer to refine their Key Characteristics and SEUs, while also facilitating the questioning of why energy is used the way it is. Program managers should consider applying similar deeper dive, facilitated walkthroughs to their ISO 50001 offering.

- **Tools.** Through experience with other SEM and ISO 50001 deployments, EnerNOC brought EnMS templates and other tools that greatly simplified and eased the customers' ISO implementations. Program managers will benefit by leveraging existing tools, including some freely available on the US Department of Energy ISO 50001 website (see External References at the end of this paper).

There are a few challenges that a Program Manager would likely face in rolling out an ISO 50001 offering:

- **Maintaining momentum**. The organizational complexity of an ISO 50001-grade EnMS requires involvement from numerous customer departments such as Training/Human Resources, Engineering, Procurement, Marketing/Communication, and Operations. It can be challenging to gain these groups' buy-in and to then keep the ISO 50001 implementation moving forward in the face of competing priorities. The project really benefits from a customer kickoff meeting at the implementation outset, with mandatory attendance and participation from those departments; this would be enhanced by similarly attended project milestone meetings.
- Working with challenging energy consumption models. Sound and predictive energy consumption models require that the right energy and production data be available. While most Program Managers are familiar with the challenges of getting energy data, appropriate production data can also be difficult to obtain. It is helpful to recruit customers who have existing systems for tracking and storing production data. In addition, program managers can look for an implementation team that is able to apply alternative statistical models to demonstrate energy performance and to estimate savings.

Remaining Questions

At the end of the test offering, the Project Team still has some outstanding questions. We look forward to further work in Oregon and to discussions within the SEM community on the following issues:

- Could ISO increase the measure life for behavioral (and even equipment) measures due to the persistent attention paid to energy consumption?
- Could ISO provide a fundamentally different type of program option, wherein third-party Certification Bodies provide data that speed the verification of energy savings?
- How could utilities use the ISO standard for their energy management programs, even if certification is not the goal?

Acknowledgements

The authors wish to recognize the helpful contributions from the following colleagues: Kim Crossman of Energy Trust; Kim Brown, Richard Milward and Patricia Hurtado of EnerNOC.

External References

Here are a few links to useful ISO 50001 related websites:

- http://www.iso.org/iso/home/standards/management-standards/iso50001.htm
- http://www1.eere.energy.gov/energymanagement/index.html
- http://oee.nrcan.gc.ca/industrial/financial-assistance/8280