Leveraging ISO 50001 for Utility and Government Program Effectiveness

Chad Gilless, Patricia Hurtado, Kim Brown, and Kelly Parmenter, Global Energy Partners
David Goldstein, Natural Resources Defense Council

ABSTRACT

For years, energy efficiency program administrators have run industrial programs, and these efforts have raised foundational program questions regarding the longevity of energy conservation measures (ECMs) and the confounding influence of short-lived workarounds that undermine actual energy savings. In addition, a significant program expense is the industrial management engagement to make energy productivity a top priority. This challenge exists in the initial engagement, as well as in the ongoing relationships and in maintaining focus on energy productivity beyond the first project. Finally, there has been no methodology to connect expenses with measurable improvements in long-term performance.

Global Energy Partners and the Natural Resources Defense Council (NRDC) have worked on the creation of the ISO 50001-energy management systems standard for the past several years, focusing on making and then demonstrating measurable improvements in industrial facility energy productivity. The draft standard, which was published in July 2010, requires that these measurements are continuing activities, and that the demonstration of continual improvement meets a target.

In addition to benefiting the facilities, this systematic approach to energy improvement can also provide assurance to program administrators and their regulators that the ECMs they promote are maintained over time. Industrial facilities that implement ECMs will understand the true potential for energy productivity improvements and thus proactively and repeatedly engage with efficiency programs. Furthermore, the standard can be integrated into evaluation, measurement, and verification protocols that utility regulatory commissions use to evaluate utility-sponsored industrial energy efficiency programs, opening up new opportunities for program designs that have not been judged effective when evaluated by existing protocols.

Introduction

This paper presents the potential of the ISO 50001 Standard for Energy Management Systems to support energy efficiency program goals. Organizational behavior is a component of every energy measure, and having a management system in place that supports energy-efficient behavior will increase the confidence around energy savings attainment and persistence, increasing savings reliability over time. Additionally, due to an organization-wide energy efficiency approach being broader in scope than a traditional measure, it can enable measurement that supports and aligns to improvements in energy productivity. Indeed, a common example of energy performance indicators used in management system approaches is energy consumed per unit of output. This type of emphasis will drive the organization to make improvements that increase productivity for each unit of energy used.

The paper begins with background information on standards, including how energy efficiency program administrators use product standards to support their efforts. Next, energy management systems and their standards are discussed, and the background is completed with the development and status of ISO 50001. The link between ISO 50001 and the efforts and challenges of energy efficiency program administrators is presented. The paper concludes with specific next steps energy efficiency program administrators can take to leverage ISO 50001.

Background on Standards and Program Use

According to the National Institute of Standards and Technology, 80% of world merchandise trade is estimated to be affected by standards or regulations that reference or incorporate standards. In the United States alone, there are approximately 50,000 private sector voluntary standards developed by more than 600 organizations. This number does not include the more than 44,000 distinct statutes, technical regulations, or purchasing specifications developed and used by federal regulatory and procurement authorities (Breitenburg 2009).

Use of Standards by Energy Efficiency Program Administrators

Several types of organizations serve as energy efficiency program administrators, including traditional utilities (e.g., Puget Sound Energy, NorthWestern Energy), state agencies (e.g., Maine, New Jersey), efficiency utilities (e.g., Efficiency Vermont), and regional/national coordinators (e.g., Northeast Energy Efficiency Partnerships, Southwest Energy Efficiency Project). Most of these organizations energy efficiency programs center on specific end uses, such as light bulbs or other equipment and devices, wherein the program administrator encourages the adoption of more efficient end-use technologies, possibly via some type of financial incentive or educational program. Along with the design and implementation of energy efficiency programs, an equally important component of the effort is evaluation of program results to ensure that energy savings did, in fact, occur. Where utilities use the energy efficiency programs as an energy resource, that evaluation takes on an additional level of importance.

Program administrators have seen standards as a valuable resource and cornerstone of their efforts. From a program design perspective, the administrator can know what the standard requires and then build a program that leverages that standard. For example, if a standard such as ENERGY STAR mandates a specific energy efficiency level for a product, then the administrator can use that standard as a reference point for their work, either directly or by requiring products to exceed the standard. From a program implementation perspective, the administrator can take advantage of the marketing aspects of the standard, using the brand or label that can come with the standard, such as the blue ENERGY STAR label, to provide consumers a way to understand if products are efficient. Finally, from a program evaluation perspective, the administrator can know that the standard requires thorough development and/or testing to ensure standard compliance, and thus count on a certain degree of reliability and predictability around the actual performance.

Increasingly, program administrators have begun to pay attention to more holistic standards that apply to more than a single product. One example of this is the ENERGY STAR New Homes certification, which is based on the energy efficiency of the entire house as a system. This program has gained acceptance in the residential building market. Program

administrators can use ENERGY STAR's New Homes program requirements, certification process, and overall structure as a basis for their current and new energy programs.

Energy Management System Standards

Organizations seeking a more strategic approach will invest time in systematic solutions to their issues and goals. For example, with regard to safety issues, a non-strategic organization will take a reactive approach and resolve safety issues as they produce injuries, whereas a strategic organization will proactively establish a team and culture that encourages identifying and fixing hazards before they produce injuries. This type of approach is deployed in a continuous improvement model, popularized by the phrase Plan-Do-Check-Act (PDCA), where teams methodically work to plan, execute and refine their approaches. Management systems can be established to improve product quality, environmental impact, safety, and social accountability.

A relatively recent entry into the management systems space is energy. Although management system approaches have been applied to energy since at least the late 1980s, over the past ten years there has been increased emphasis by numerous groups:

- US Department of Energy Federal Energy Management Program – Resource Energy Manager (REM) Program
- Puget Sound Energy – Resource Conservation Manager (RCM) Program
- Northwest Energy Efficiency Alliance (NEEA) – Strategic Energy Management efforts
- California Public Utilities Commission – statewide initiative for Continuous Energy Improvement, based on work done by NEEA

In 2000, the United States established the first national standard to codify the management system approach toward energy. This was done with the American National Standards Institute (ANSI), resulting in the ANSI Management Systems for Energy (MSE) 2000 standard, last revised in 2008. Also in 2000, Denmark created the first national standard in Europe, and over the next decade other countries joined in the creation of standards, including Ireland, Sweden, and China. In 2009 the European Union standards bodies — European Committee for Standardization (CEN) and European Committee for Electrotechnical Standardization (CENELEC) — jointly created a regional energy management systems standard EN 16001.

In 2007, the United Nations Industrial Development Organization (UNIDO) conducted a stakeholders meeting that determined the need for an international standard. ISO created a Task Force on Energy Efficiency and Renewable Energy Sources, and this group stated, "National energy management standards have been developed and are in use in various countries, resulting already in significant savings in energy consumption and reductions in greenhouse gas emissions. Regional and national standards development is underway in Europe, China, USA and other countries. The increasing interest in this field, and the explicit requests received by ISO, has led the Technical Management Board to already address the matter and the Task Force recommends that ISO moves forward expeditiously." From this international discussion, ANSI and Brazil's national standards organization Associação Brasileira de Normas Técnicas (ABNT)

jointly proposed to lead the effort to create an international standard for energy management systems. ISO accepted the proposal and initiated Project Committee 242 to create the ISO 50001 Energy Management Systems Standard. (Pinero 2009)

ISO 50001 Standard

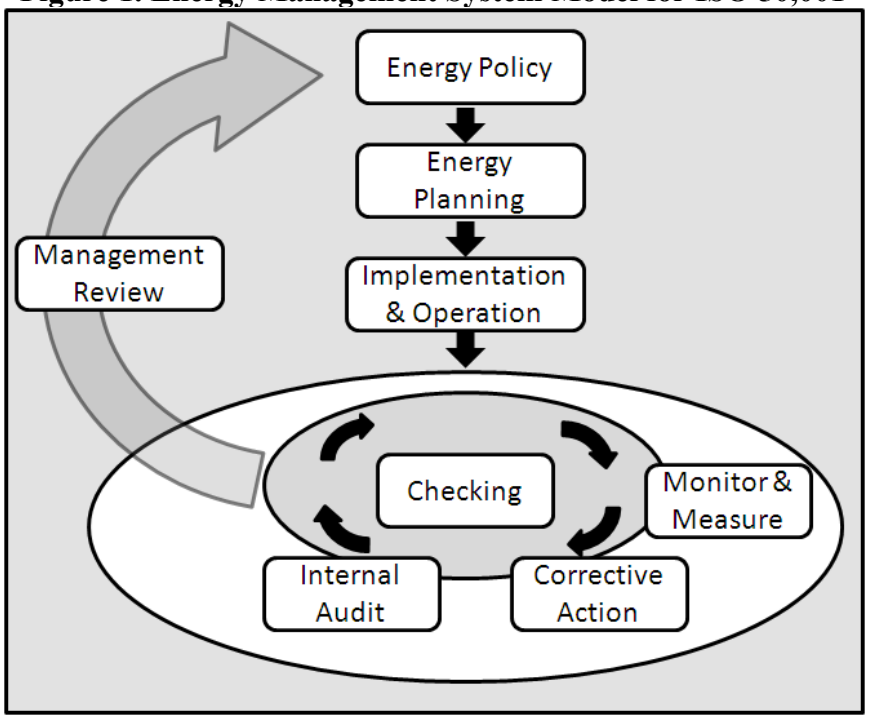
ISO estimates that the standard will affect up to 60% of the world's energy use. This will come from companies that directly certify to the standard, as well as those that push the usage of the standard through their supply chain to control costs, reduce energy price risks, and manage environmental impact. (Pinero 2008)

Similar to the ISO 9001 and 14001 standards for Quality Management Systems and Environmental Management Systems, respectively, ISO 50001 will have core management system elements that will drive continuous improvement. These elements include:

- Formal energy management planning process
- Management commitment and involvement
- Organization policy that commits to the process as well as to improving energy performance
- Energy team establishment and leadership
- Organization awareness and training
- Addressing of business areas that influence energy performance, such as procurement, training
- Energy performance indicators, baselines, and goals

These elements are encapsulated within an Energy Management System Model that is implemented along a PDCA cycle similar to other management systems. The specifics of the model are shown graphically in Figure 1. (ISO 2010)

Figure 1. Energy Management System Model for ISO 50,001



After publication of the standard in June 2011, two activities will occur. The group of authors of the initial standard will continue writing and refining the adjacent subjects that support the core management system standard, with advanced technical topics such as metering and monitoring, guidelines for implementation by users and agencies, and specific focus area development in areas such as application of the standard for Small to Medium Enterprises (SMEs). The second activity will be the implementation and certification of the standard itself. Consultants and other groups will work with organizations to apply the management systems approach to energy, specifically to the levels required for ISO certification; certification bodies (CBs) will come behind the implementation efforts, validating the management systems and providing the certification. These CBs will also conduct formal audits every three years as well as impromptu spot-audits in the timeframe between for the organizations to maintain their certification. Closing the loop in the whole effort, both the implementation and certification groups will provide feedback to the authors so that the standard can be refined and augmented as necessary.

How ISO 50001 Can Be Leveraged

As the ISO 50001 standard moves closer to publication, energy efficiency program administrators are planning, or already implementing, efforts to leverage the standard. These can provide a number of benefits depending on the administrator's priorities, the maturity of energy management within their programs, the depth of their customer relationships to deploy deeper programs, and their proximity toward embracing the standard. The standard can be leveraged in three ways: increasing traditional energy measure reliability, improving the organization's energy efficiency culture, and ensuring that organizational improvements themselves are reliable.

Increasing Reliability of Energy Savings from Traditional Measures

Estimates of the energy saved from energy efficiency programs have a range of confidence regarding the reliability of savings based on the type of program and its ECMs. These measures can be deemed, wherein the approach to calculating the savings is pre-determined; deemed savings approaches are prevalent for common measures such as lighting. For measures that are more variable, a custom approach with some type of pre- and post-metering is used to validate the energy savings. In either case, the program administrator may discount the total program savings based on degree of certainty. The adjustment may consider the level of confidence that the customer's organization will maintain the measure in a way that preserves the savings. For example, if a facility manager installs a high efficiency fluorescent light system, the program administrator assumes that the facility manager will not go back to using less efficient lamps in the system; however, if the facility is not supported by procurement policies that support energy efficiency, a facility purchasing agent may buy the less efficient lamp to save upfront purchasing costs. Another example is in the emerging area of Operations and Maintenance (O&M) measures, where equipment is operated or maintained in a different way to produce energy savings. If the facility is not supported by operating procedures that support energy efficiency, a facility operations manager may make decisions that undo the savings improvement. For this reason, program administrators typically do not rely on savings from improved O&M, thereby missing some substantial efficiency opportunities.

Within the energy efficiency program evaluation area, this topic is described as the behavioral aspect of Technical Degradation Factors (TDF). To date there is a shortage of primary research on this topic. Program administrators are becoming aware of the challenge and are adding concepts such as periodic problem checking to look for early measure removals or new technology failures so that these measures can be corrected and appropriate accounting of savings can occur. Customer management support of energy efficient operations can reduce these challenges. (Skumatz 2009)

Creating Cultures of Energy Improvement

With energy efficiency programs widespread, it is increasingly common to see energy efficiency measures deployed at facilities. The initially deployed measures are typically the ones that offer short payback or small upfront costs, such as lighting. In subsequent years, as additional measures are targeted by program administrators, they find that organizations can push back, because they feel they are already efficiently operating their facilities. Even when supported by solid technical information on the economic case for the measures, the program administrator must market the business case for the subsequent projects. Essentially, the initial effort does not reduce the time the administrator must spend on the successive engagements (see Figure 2). In contrast, organizations with a systematic culture of continuous energy performance improvement will frequently have a more proactive relationship with program administrators and will reach out to them with ideas for new and creative energy efficiency solutions (see Figure 3). They will become partners who look to the program administrator for resources, and will often engage in a mutually beneficial attitude, participating in program pilots or focus groups.

Figure 2. Traditional EE Project Effort

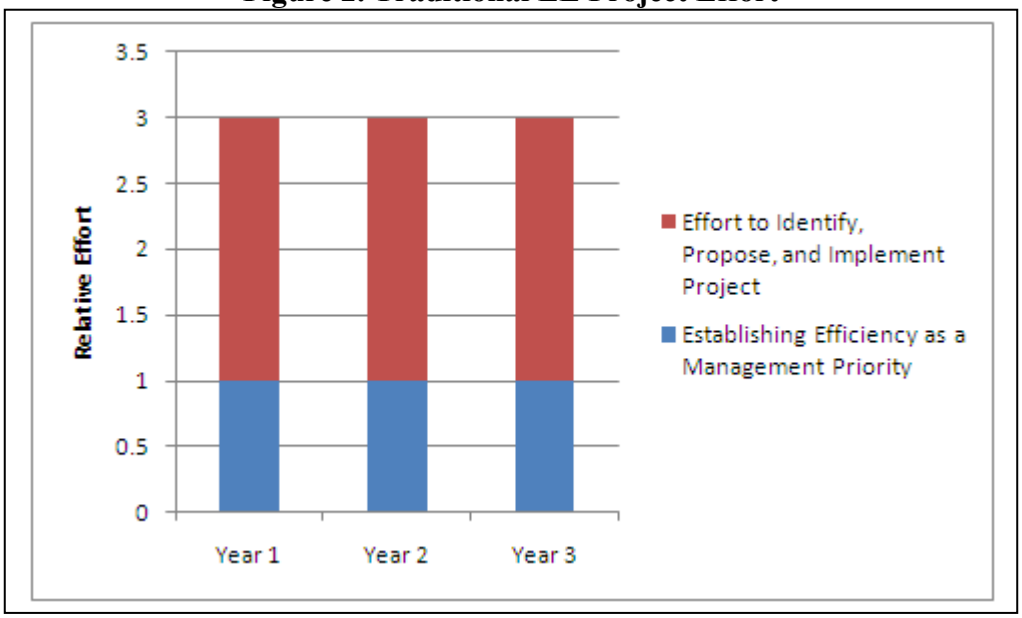
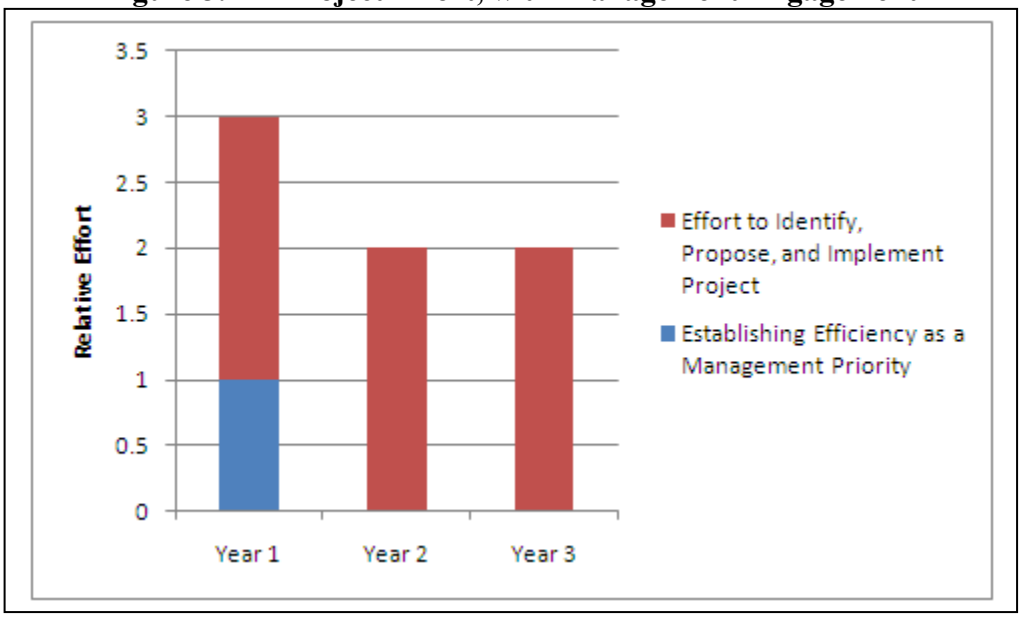


Figure 3. EE Project Effort, with Management Engagement



Establishing Reliability of Energy Management

The previous two methods make it important for program administrators to add management system elements to their energy efficiency programs. However, the organizational changes that support energy efficiency can require some additional structure to ensure that the resulting energy savings are delivered. For example, a company may deploy a management system approach in one year, maintain that approach for a second year, but then, in year three, other operational priorities may override some of the decisions made previously to support

efficiency. To avoid this kind of backsliding and ensure savings reliability, program administrators may find that the ISO 50001 standard, with its built-in processes for certification and re-certification every three years, can be a viable method to ensure that the organizational improvements are occurring and being independently verified. In addition, the standard can enable comparisons between energy management efforts; the elements codified within the standard will be the same from organization to organization, so that program administrators can have confidence that the practices are implemented in a consistent and reliable fashion. Emerging efforts will be able to use the standard as a basis from which incentives can be paid for energy savings demonstrated by the organization as a result of its ISO standard energy management system implementation and subsequent certification.

As a reference point, quality management systems have existed for decades, and the ISO 9001 Standard for Quality Management Systems has seen widespread adoption in the past fifteen years. In that time, organizations that have chosen to go beyond implementation of their quality management system and actually pursue certification have seen benefits including:

- Fixed date review of the management system — rather than having a management system that merely has expectations on revising the plan, presenting to management, and improving the system, certified companies also have a fixed year, three years after the initial certification, in which they must re-certify. This presents a goal that can be placed on the organization calendar and which management can drive toward.
- Greater executive commitment to the management system —internal audits required by the system can drive management to maintain focus on the management system and ensure that performance is sustained.

In organizations that have adopted ISO 50001, executives may also pay attention to the public benefits of being certified. Organizations can claim that they are efficient with energy or that they responsibly manage energy use, but if they can point to an external certification such as ISO they then are at a different level with stakeholders and customers, a level which executives seek to maintain.

What Utilities and Governmental Agencies Can Do

Energy efficiency program administrators may have interest in the ISO 50001 standard. This could stem from ever-increasing program goals that require innovative approaches, or strategic directions to move into longer planning cycles, or even interest in leveraging the standard as a marketing piece from which to engage in substantive discussions with key customers regarding their business objectives. For any of these or other reasons, program administrators have numerous options available as they consider management system approaches in line with and including the ISO 50001 standard:

- Review existing efficiency programs — program administrators can review their initiatives and look for areas in which increased savings reliability may come from paying attention to the organizational aspects of measures.
- Review existing customer relationships — engaging organizations in a management system approach requires deep relationships. Integrating energy into existing

management systems is a strategic activity and one in which a degree of trust is necessary to support the needed executive commitment and the ultimate changes required.

- Become familiar with ISO 50001 — the Draft International Standard is currently available for download at the ISO website (www.iso.org) for a nominal fee. Program administrators can access this document to understand the standard's concepts and plan for ways that the standard's elements can support their initiatives. At the minimum, being familiar with the standard will provide knowledge that administrators can leverage in their core efforts.

These activities and others can help program administrators as they plan around ISO 50001. Reaching out to market transformation entities such as NEEA and SWEEP can be productive to formulate program strategies.

With an understanding of the standard, program administrators can apply it as a reference, thereby gaining greater assurance that an ECM will have persistent savings, that ECMs with O&M components will be supported to a greater extent by customers' organizations, and that management system approaches found in their programs and services can leverage the standard as a reference point and possibly use ISO 50001 as a core program.

These steps will work best if agencies with oversight of efficiency program administrators, such as public utilities commissions, also begin to review ISO 50001 and evaluate how or whether compliance with such a standard can allow them to feel confident about the reality and sustainability of energy savings estimated on a whole-facility basis, rather than on a device-by-device basis. If the measurement requirements in ISO 50001 are deemed sufficient for evaluating realized savings, the standard can open up new potentials for savings based on operational improvements in addition to capital improvements. If there are concerns over the adequacy of the Standard's requirements for this sort of evaluation, these issues can be raised not only within the utility regulatory forums but also in the context of the regular updating of ISO 50001.

Conclusion

At the minimum, the upcoming ISO 50001 Energy Management Systems Standard should be a resource for energy efficiency program administrators from utilities, government agencies, and other organizations. Whether it is used as reference point to align programs, or used as a core part of the energy efficiency program, the standard should be highly supportive of energy efficiency. It is a valuable exercise to gain familiarity with the currently available draft version and share information with program leaders in such groups as NEEA. Deploying the management system approach combined with the certification elements of the standard will create more reliable energy savings, both in the near- and long-term, and will support the mission of program administrators as they seek to improve the energy performance of their customers.

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