An 'Ecosystem' Approach to Drive Adoption of Strategic Energy Management

Paul Birkeland, Global Strategic Energy
John Wallner, Northwest Energy Efficiency Alliance
Jim West, Snohomish County PUD

ABSTRACT

Past energy conservation success in the Pacific Northwest is making it increasingly challenging for utility conservation programs to achieve their goals. There is a sense among conservation program managers that the 'low hanging fruit' has, at the very least, been seriously thinned. Discussions with energy conservation managers reveal increasing interest in the possibility of motivating non-capital energy savings that come from behavior changes or process changes through the implementation of Energy Management Systems (EnMS). But there are real questions about how to accurately determine the energy savings from such programs.

Energy conservation programs are faced with the question of how to support – and, more importantly, drive - the adoption of EnMS by small and medium sized firms. These firms represent the majority of US industry in terms of the number of firms. Yet reaching out to them with customized solutions is expensive and time-consuming due to the size and diversity of the market. It is also difficult to convince utilities to offer incentives for EnMS despite the now proven benefits because of the uncertainty about measuring the achieved savings.

This paper describes one approach to drive the adoption of EnMS by creating an 'ecosystem' of market players in a flexible, but well-defined, environment. Several existing programs can be used to support a simple, performance-based enrollment program, and ensure accurate accounting of energy savings. This paper is an attempt to open a broader conversation among utility industry and power providers on the best approach to implementing Energy Management Systems as an Energy Conservation Measure (ECM).

Introduction: The Case for Utility-deployed EnMS at Medium Sized Operations

The publication of ISO 50001 Energy Management Systems in June 2011 initiated the global adoption of disciplined EnMS by industry. The adopters have mostly been large corporations however, despite the fact that the majority of US industry consists of medium sized operations. From an energy conservation point of view, this is a missed opportunity. In the Pacific Northwest, here are approximately 18000 industrial sites. Of those approximately 235 or 2 % are large energy consumers using more than 10 million kwh per year. Approximately 1700 (9.4%) are medium, using between 1 million and 9,999,999 kwh per year. And the rest are small, about 16000 using less than 1 million kwh per year.[1]

Adopters are seeing energy savings on the order of but it is even more so from the utilities' point of view.

[1] Northwest Energy Efficiency Alliance internal report "Final Northwest Industrial Database by NAICS," 2012.

When a customer adopts an EnMS, the utility sees the following benefits:

- Self-motivated and self-directed energy savings programs at the customer's location(s);
- Virtual 'recruitment' of the customer's workforce into the utility's energy conservation program;
- A mechanism for identifying and taking advantage of non-capital intensive energy savings projects (simple process changes and behavior changes);
- The chance to engage in a long-term working relationship with a customer;
- The opportunity to become a value-added partner to the customer, not just an energy vendor.

It behooves utilities to encourage and support their customers in adopting an EnMS. But a new paradigm is needed to do this since EnMS does not fit well into existing conservation program structures. This is largely because an EnMS, if properly implemented and maintained, produces energy savings for the life of the organization. It has in essence an 'infinite' measure life. EnMS does not lend itself to a discrete 'project support' effort that is 'closed out' once any new equipment is commissioned. EnMS is transformative, and existing conservation program structures do not easily assimilate it.

EnMS is an opportunity for ongoing engagement with the customer. And it is clear that supporting a customer's EnMS effort requires a paradigm shift away from the way utilities currently motivate and incentivize ECMs.

ISO 50001 as a Paradigm, Not as an Answer

ISO 50001 was developed with the intention that any size organization could implement an ISO 50001 Energy Management System (EnMS). The reality is, however, that many medium sized organizations cannot afford the overhead in resources and audit fees that come along with the Standard. (Implementation can cost on the order of $50,000.00 to $150,000.00 in consulting and staff time, and annual audits can run $12,000.00 to $20,000.00 not counting staff support time.) ISO 50001 can, however, serve as a model for a utility-driven EnMS program.

An ISO management system is generally developed and maintained by three parties.

Certified Party

This is the organization receiving the certification. The organization is motivated by an Executive Sponsorship commitment to energy savings and seeking certification either locally or on a corporate level. The management system requires that an individual, the "Management Representative," be assigned responsibility for all management system related tasks.

Certifying Party

This is the organization that does the audit, recommends improvements to the management system, and provides the ISO certification. The Certifying Party is motivated by the revenue received for auditing the Certified Party and the registration of that party.

Among ISO certified companies and certification bodies, anecdotal evidence indicates that it is the periodic audit that most ensures the persistence of an ISO management system.

Knowing that a third party will be returning each year to assess your management system integrity seems to ensure that it receives attention from participants amidst their other responsibilities.

The Certifying Party is driven by two goals. First, to be as cost effective as possible so they can be competitive in the market. Second, to be 'value-added' to their client so as to ensure repeat business.

ISO Consultant

An ISO Consultant is not part of every management system implementation. But they play a critical role in those situations where the organization that desires to be certified does not have the expertise, the resources, or either one, to develop and implement their system. ISO Consultants also serve the Certifying Party as Contract Auditors. So, ISO Consultants have critical roles in the ISO ecosystem. The ISO consultant is motivated by the revenue received for the consulting service.

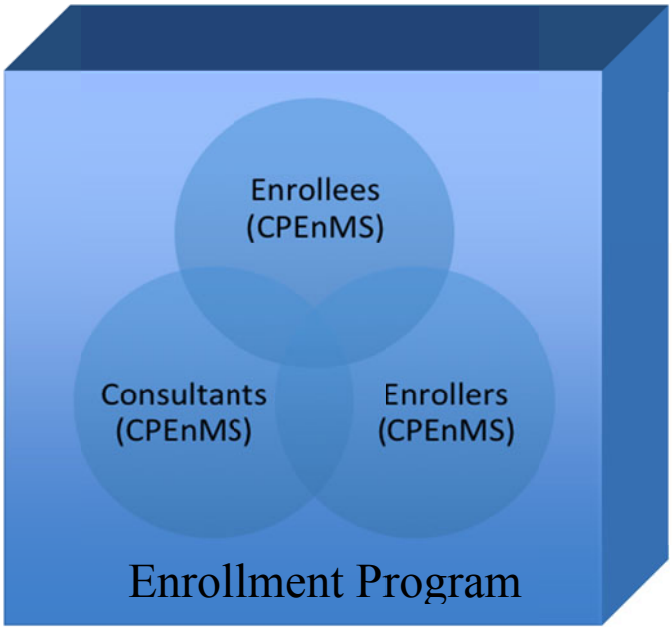
These three parties can be effective because they work in the same "ecosystem," the ISO Standard. ***It is the ISO Standard that gives them a common language, common definitions, and harmonized expectations of what an acceptable EnMS looks like. It is the ISO Standard that enables them to work toward a common goal.***

In summary, the ISO ecosystem consists of a programmatic backdrop (the ISO standards), and three fundamental roles, each of which has ISO expertise either within the organization or through a contractual arrangement.

A Proposed EnMS 'Ecosystem' for Medium Size Organizations

It is not unreasonable to assume that a non-ISO EnMS Ecosystem might flourish under a similar arrangement. In our vision, this arrangement consists of the following four (4) elements:

1. Parties that are motivated to implement an EnMS (Enrollees/Customers)
2. Parties that are motivated to ensure that the EnMS is persistent and effective (Enrollers/Utilities);
3. A pool of outside consultants who can fill in the expertise gaps when they appear (Consultants).
4. And an "Enrollment Program" to serve as a backdrop. The "Enrollment Program" is complementary to the ISO and SEP programs in that it is specifically targeted at small to medium sized operations that might not show an interest in those other programs. (Note that one purpose of this paper is to open discussion regarding who precisely is the appropriate administrator for this new program.)



The Secret Sauce: Energy Management System Practitioner Certification

The US DOE sponsored the development and implementation of a professional certification regime known as the Certified Practitioner in Energy Management Systems (CP EnMS). The intent was to ensure a cadre of energy professionals with a common and comprehensive understanding of what makes an EnMS effective and persistent. Certification consists of passing a four hour Core Exam on energy and energy management topics, along with a four hour Specialty Exam for specific types of industry, for example Transportation Systems, Industrial Systems, or Power Generators. The DOE has authorized two organizations to provide CP EnMS training in preparation for the exam.

CP EnMS certification provides all parties in the EnMS Ecosystem with a common language, common definitions, and harmonized expectations of what an acceptable EnMS looks like. We propose that all parties in the ecosystem each retain CP EnMS expertise, either through direct employment or through contract, with a CP EnMS-certified professional to ensure that each party is capable of fulfilling its role in the Ecosystem.

Enrollees: The Customers

- Enrollees are any parties interested in implementing an EnMS.
- Enrollees will be required to conform *a priori* to Programmatic requirements (such as an Energy Policy statement and resource allocation) to ensure management commitment to a 'necessary and sufficient' complement of organizational elements and activities to make EnMS success likely.
- Enrollees must commit to a periodic Performance Evaluation and Tune Up by their Enroller to ensure that the EnMS remains effective and persistent.

- *Enrollees require CP EnMS expertise in order to have an individual inside the organization with the knowledge and insight to maintain the EnMS and tend to all its functions.*

Enrollers: The Utilities

- Enrollers are responsible for ensuring that Enrollee EnMS's are effective and persistent.
- *Enrollers require CP EnMS expertise to properly conduct Performance Evaluations and advise their clients/customers regarding their EnMS.*

Consultants: Filling the Gaps

- Consultants fill several roles in the Enrollment Program. The most critical role we envision for Consultants is as EnMS Development Support.
- Among the other roles we envision being filled by Consultants to varying degrees over time are EnMS trainers, Utility Personnel Trainers, Energy Modeling Trainers, Specialty Support in Energy Modeling for Enrollees and Contract Performance Evaluations for Enrollers
- *A cadre of CP EnMS Consultants provides the 'cushion' within the Enrollment Program to provide sufficient expertise as required in the region. The Consultants' role will evolve over time in a manner that is not entirely predictable.*

Enrollment Program

- The Enrollment Program should be performance-based, and not prescriptive. Successful Enrollment should entail, not meeting a specific set of outside requirements, but that the Enrollee show persistent progress toward reaching agreed upon EnMS goals.
- The Enrollment Program must be driven by genuine incentives. For example, the Enroller Utility may offer a financial incentive for demonstration that the EnMS is yielding results. The Enroller Utility may have a "Preferential Tariff" for Enrollees. Or the Enroller Utility may offer an end-of-year rebate based on EnMS performance.

Enrollment Program: Setting Up the Ecosystem

In determining what the Enrollment Program consists of, it is useful to first agree upon the goals. In general, an EnMS has three goals:

1. ***Credible*** energy savings – that take all relevant variables into account
2. ***Continuous*** EnMS improvement
3. ***Persistence -*** over personnel and management changes.

Achievement in the Enrollment Program (and any utility incentives provided), would likewise consist of three components – 1) the magnitude of energy savings achieved as verified through a sophisticated energy baseline model, 2) evidence of continuous EnMS improvement based upon the presence and effectiveness of a minimum set of EnMS elements, and 3) evidence of EnMS persistence based upon an EnMS *Persistence Scorecard*.

We believe that this multi-faceted approach, coupled with the engagement of CP EnMS professionals, greatly increases confidence that the achieved energy savings are real, and that the EnMS will remain effective and persistent over time.

Enrollment Program Components

As mentioned in the Abstract, this paper is an attempt to open a broader conversation among utility industry and power providers on the best approach to implementing Energy Management Systems as an Energy Conservation Measure (ECM). The outline of Enrollment Program components is intentionally skeletal, and is intended to prod that conversation.

As stated above, the Enrollment Program would have three components to address the three fundamental EnMS goals:

1. Facility-wide Baseline energy model (e.g., linear regression) to provide credible energy savings estimates – *Enforce Credibility*

   The purpose of this component is to quantify the energy savings in an efficiency manner, and obviate the need intensive Measurement & Verification (M&V) on each project. IN the process, it also captures behavior-based energy efficiency gains that might otherwise be unquantifiable and, hence, cannot be acquired by the utility.

   The customer would develop their model in consultation with utility, or the model would be approved by the utility. It may be based upon the Department of Energy's EnPI v3.0 model (https://ecenter.ee.doe.gov/EM/tools/Pages/EnPI.aspx).

   A credible model is critical to the integrity of the savings estimate, and properly trained individuals are critical to building a credible model. Thus the need for CP EnMSs on both the Customer and the Utility sides.

2. Minimum EnMS Element Set that *Drives Continuous Improvement*, and includes:

   - Energy Policy and Energy Goals
   - Documented Action Plans
   - Regular Management Reviews
   - Employee engagement program to solicit energy saving ideas
   - Regular data measurement, collection, and recording
   - CP EnMS individual(s) assigned as Energy Leader with clear resource allocations, authorities, and responsibilities.

   Our experience has shown that these EnMS Elements embed the EnMS in the Customer's management procedures and motivate regular attention and progress from involved personnel.

3. EnMS Persistence Scorecard that *Ensures Energy Efficiency Survives Employee, Management, and Ownership Turnover,* and includes point scores for:

- Job descriptions that include energy responsibilities
- Performance evaluations that include energy considerations
- Department budgets for energy expenses (rather than overhead)
- Energy goals allocated to each department
- Procurement specifications that include energy expenses in a Life Cycle Costing model

Enrollment Program Mechanisms

The Enrollment Program would not be static. As the customer's EnMS matures, and as the engagement between the customer and the utility deepens, the participants' roles should change. We envision two ways that these changes can be used to drive greater energy savings.

Phasing out of the persistence scorecard. As discussed earlier, an EnMS has an infinite measure life. We can use that to our advantage. Initially, a company can gain significant credit through implementing items called out on the Persistence Scorecard. This will help them qualify for the program and receive any incentives the utility offers participating customers. We envision, however, a schedule by which credits gained on the Persistence Scorecard phase out. For example, a company may receive 5 points for having departmental energy budgets in their first year in the program. In the second year, however, that item may be worth only 3 points. And in the third year, only 1. This drives the customer to qualify for incentives based more and more on actual energy savings rather than getting credit for specific actions as their EnMS matures and becomes more institutionalized. The utility is then not paying repeatedly for an action that has become a standard part of the customer's business.

Utility personnel shifts roles. Likewise, as the customer's EnMS matures and the engagement between the customer and the utility deepens, the role of the utility representative changes. At first, the utility representative is concerned that sufficient EnMS elements are present and active so as to produce energy savings. As the EnMS matures, however, this becomes less of a concern. The EnMS, if implemented properly, should take root and become part of the customer's standard operating procedures. At that point, the utility representative can shift focus to becoming more of an energy advisor, supporting new explorations at the company's facility, pointing out opportunities, pushing the EnMS further out into the organization.

Incentivizing EnMS

To date, many utilities have been hesitant to incentivize EnMS, and rightfully so. It is often difficult to determine precisely how much energy savings came out of an EnMS implementation.

One can calculate estimated savings from a proposed capital project, and one can measure the actual savings once the project is in place. But how does one get a credible measure of energy savings from, say, some kind of process change that touched a hot water system, a

soup kettle, an oven, and a wastewater system? Everyone would agree there were savings. But how would one measure them with sufficient credibility to justify an incentive payment without investing a small fortune in meters? And even then, given the vagaries of production, weather, raw materials, and all the other variables that impact a facility's energy performance, how can one determine that the savings can be credited to the EnMS and not simply the result of decreased production or a warmer winter?

Add to this the complication that the measure life is infinite, and the ROI could also be considered infinite (the capital investment in EnMS is zero), and it is difficult to see how an EnMS fits into the typical incentive structure. However, its poor fit should not be reason to ignore it. Challenges such as these are often seen in hindsight as closed doors that must be opened to step through to the future. The opportunity here is too great to ignore, and we must solve this problem.

Our proposed strategy outlined above in Section 4.1, and in more detail below, centers on a facility-level energy baseline model from which to measure changes. In general, we recognize the uncertainties inherent in such a model, and address that issue in three ways. First is a well-disciplined approach to the modeling itself, with utility expertise either reviewing or participating directly. Second, by setting a high standard for professional expertise at the involved parties (CP EnMS certificate required). Finally, with regular Performance Evaluations that confirm the robustness of the EnMS' organizational components.

We believe that a facility-wide energy model alone is insufficient to provide confidence in an EnMS energy savings estimate, but that when bolstered by a detailed assessment of other EnMS components, regular performance evaluations by the utility, and the recruitment of professionally accredited personnel, incentive payments for EnMS-derived energy savings are justified.

First prong: Disciplined, facility-wide energy baseline modeling. We propose that each participant in the program be required to develop, with utility concurrence and support, a facility-wide linear regression energy model. The US Department of Energy has one available at no cost at its web site (**https://ecenter.ee.doe.gov/EM/tools/Pages/EnPI.aspx**), and implementing it is relatively straightforward. This model can be made to take into account all the variables that impact a facility's energy performance, including, but not limited to:

- Production volumes
- Production mix
- Heating Degree Days (HDD)
- Cooling Degree Days (CDD)
- Relative humidity
- Raw material quality
- Hours of daylight
- Shift arrangements.

The application of such a model vastly increases confidence in facility-wide estimates of energy performance, and the overhead is within the capabilities of small to medium sized operations.

Utilities can support their customers by delivering the model, providing technical support if required, and acting as the model reviewer.

Second prong: High standard of professional expertise. We already discussed the US DOE developed professional certification program that leads to becoming a Certified Practitioner in Energy Management Systems (CP EnMS). CP EnMS is the energy management counterpart to the well -known Certified Energy Manager (CEM) program.

A CEM receives training that includes discussion of utility incentives, regulatory issues, and tariffs. But the majority of the CEM training is the analysis and understanding of industrial systems such as pumps, fans, HVAC, and the like. *In short, a CEM is trained to look from the utility bills "downward" into a more detailed level of a facility's operations*.

A CP EnMS receives similar training in utility incentives, regulatory issues, and tariffs. But the majority of CP EnMS training is in EnMS dynamics within an organization's daily functions - the responsible individuals, the reporting mechanisms, employee engagement, training provided, baseline selection, preventative and corrective action mechanisms, etc. *In this sense, the CP EnMS is trained to look from the utility bills "upward" at how well energy considerations are integrated into an organization's operations.*

Explicitly requiring CP EnMS professional expertise at both the utility and at the customer as a condition for receiving an incentive ensures that energy modeling, EnMS implementation, and EnMS Performance Evaluations are held to a high standard of competence. This further ensures that energy savings estimated from the baseline model are in fact real and as accurate as possible.

Third prong: Performance evaluations by the utility. For conventional Energy Conservation Measures, utilities often get involved in verifying the energy savings. For an EnMS-based program, the utility should participate in an analogous way. We envision a utility representative conducting a Performance Evaluation on an annual basis. (This would be in addition to the more frequent contacts as part of the customer's Energy Team.)

This Performance Evaluation would confirm 1) that modeling, measurement, and other technical aspects of the EnMS are being properly executed, 2) that the organizational elements of the EnMS are more broadly permeating the organization, and 3) that EnMS elements remain active and are producing results.

As mentioned earlier, we envision that as the customer's EnMS matures and its persistence is no longer in doubt, the utility representative's role would shift from confirming EnMS activity and savings to providing advice and insight to the customer on energy strategies and projects. Explicitly requiring that the utility representative filling this role be a CP EnMS ensures that the Performance Evaluation is consistent with high EnMS standards.

Summary Conclusions, Next Steps, and Invitation to Discussion

In summary then, we have determined the following:

- The strategic training of individuals as CP EnMS' will allow placement of expertise to ensure successful and persistent adoption of energy management amongst medium sized firms. Such expertise should be embedded in three places: Industry, Utilities, and Consultants.

- A flexible, performance-based Enrollment Program is necessary to provide the framework in which these parties interact.
- To be effective, the Enrollment Program must provide real (financial) motivation to the parties involved. This cannot be a 'feel good' program.
- A three-pronged approach to overseeing EnMS performance ensures that uncertainties in the facility-wide model are minimized, and that the estimated energy savings are real and accurate.

Further work is required to fully characterize the EnMS 'ecosystem,' and enable the incentivization of EnMS. The further work includes, but is obviously not limited to:

- Finalization of the minimum EnMS elements list;
- Finalization of the Persistence Scorecard elements;
- Finalization of the Persistence Scorecard point distribution;
- Development of a Utility-deployed EnMS Program Guide;
- Development of a Utility Representative Manual.

Ensuring broad applicability of this program requires broad participation in its formulation and development. The authors welcome any and all comments, suggestions, insights, and recommendations for taking this discussion forward.