When Does Energy Management Become Strategic?

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ABSTRACT

Every organization stands to benefit from improving how it manages energy, either with a piecemeal or comprehensive approach. But where is the tipping point at which sufficient elements are in place to constitute a self-sustaining system? Are all management system elements of equal importance? This paper addresses these questions, which are integral to successful implementation of utility Strategic Energy Management (SEM) programs.

The practice of SEM continues to gain wide market traction both as independently adopted by organizations and through the support of utility programs. By fostering a proactive problem-solving approach to controlling energy cost, SEM promises to drive continuous measurement and improvement of energy performance within an organization. This fundamentally shifts the dynamic of energy efficiency initiatives—from utilities promoting measures to companies actively seeking further savings opportunities.

Great strides have been made both in identifying the facets of energy management systems and in creating a common language of assessment of management practices, notably by the Consortium for Energy Efficiency. This shared vocabulary provides a context for evaluating the progress of an organization in developing an SEM system. But questions arise when the theoretical framework meets the unique environment of an actual organization. This paper examines critical success factors and measurement indicators for energy users, utilities and regulators.

Tactical vs. Strategic

The term energy management encompasses a range of practices that contribute to energy savings. These practices are generally considered separately from large-scale equipment upgrades by both utilities and participants due to the differing magnitudes of savings achieved and investment required. The field of energy management also includes steps organizations may take to reduce energy costs beyond energy efficiency, such as load management, distributed energy resources and storage. Taken on an ad hoc basis, energy management practices constitute what might be considered to be the tactical approach to pursuing energy savings. Perhaps the most thorough overview of the breadth of energy management activities is provided by the Association of Energy Engineers (AEE) in its updated Certified Energy Manager (CEM) Body of Knowledge, shown in Table 1. This information is particularly insightful, as the CEM accreditation is widely recognized as a comprehensive and respected indicator of expertise in the field.

Addressing energy-consuming systems to ensure efficient operation makes sense both as an opportunity for significant energy savings and as a business best practice. A range of utility programs has sought to drive savings through system-focused retro-commissioning, leak maintenance and allied programs. These programs have consistently identified actionable measures yielding cost effective savings, despite ever heightening productivity gains and increased operational sophistication among manufacturers. Some jurisdictions have called into

question whether the cost of maintaining equipment at intended performance levels should fall solely on system owners rather than on ratepayers through utility programs.

Table 1. CEM Body of Knowledge

Content
CODES AND STANDARDS
ENERGY ACCOUNTING AND ECONOMICS
ENERGY AUDITS AND INSTRUMENTATION
ELECTRICAL SYSTEMS
HVAC SYSTEMS
MOTORS AND DRIVES
INDUSTRIAL SYSTEMS
BUILDING ENVELOPE
CHP SYSTEMS and RENEWABLE ENERGY
FUEL SUPPLY AND PRICING
BUILDING AUTOMATION AND CONTROL SYSTEMS
HIGH PERFORMANCE BUILDINGS
THERMAL ENERGY STORAGE SYSTEMS
LIGHTING SYSTEMS
BOILER AND STEAM SYSTEMS
MAINTENANCE AND COMMISSIONING
ENERGY SAVINGS PERFORMANCE CONTRACTING and MEASUREMENT AND VERIFICATION

Source: **AEE, 2015**

Information systems that offer insight and control into energy consumption are increasingly common. A recent nationwide survey of over 500 multi-site businesses indicated that nearly half (48%) had Building Management System/Energy Management Systems (BMS/EMS) installed in at least some of their facilities. Another 5% have allocated budget to install these systems within the next year (Ecova, 2014). BMS/EMS can serve as powerful tools, but to have maximum effect must be utilized as tools by individuals charged with driving improvement. Too often, the installation of a user interface is mistaken for an action that directly results in energy savings.

Over-reliance on either information systems or well intentioned, stand-alone tactical approaches allows energy performance to be subject to disruptions that can derail efforts temporarily or permanently. Without processes in place to ensure that information is acted upon, or that performance gains are monitored, energy efficiency gains are all too often lost.

Strategic Energy Management

Properly implemented, SEM is a self-perpetuating management system. Beyond being merely a comprehensive suite of energy-management tactics, SEM defines a holistic approach in which elements interact with, support and reinforce each other. The result is a whole greater than the sum of its parts.

This methodology is then applied across myriad organizations, each its own multifaceted system comprising equipment, materials, knowledge and, most importantly, people. SEM effectively spurs cultural change within the organization. Communication efforts increase awareness of energy management across whole organizations. Teams collaborate and cooperate to reduce energy use.

Moving beyond broad awareness to widespread employee engagement presents a constant challenge. However, ultimately SEM shifts the burden of change away from individuals to processes that can withstand business or personnel disruptions.

An increasing number of organizations seek to make permanent the gains realized through SEM by implementing robust, documented systems. Since the initial release of the ISO 50001 standard on energy management systems, thousands of organizations worldwide have gone through the process of third-party verification to ensure that their energy management systems will last.

Utility SEM Programs

Utility energy-efficiency programs have entered a new, more challenging phase. Quick-payback, easy-to-implement measures are increasingly difficult to find. More mature, pervasive energy-efficiency measures are becoming industry standard practice. Utilities thus increasingly look for deeper savings from their customers in order to meet their resource acquisition mandates. It is in this context that utility-supported SEM programs continue to evolve.

Implementation of SEM programs across diverse utilities in multiple states offers insight into the factors with the greatest impact as well as those that serve as the best indicators of program success.

Three basic SEM formats have gained widespread acceptance (Kolwey, 2013):

- Support of Operations and Maintenance (O&M) improvements with a heavy focus on savings measurement. This approach builds on the concept that O&M projects will offer quick wins to "prime the savings pump." The focus on quantifying savings serves as the foundation for a data-driven approach to energy management.
- Training and/or support of SEM capability in participants, either in a one-on-one or cohort format. These programs seek to establish the capabilities and practices of SEM within the organization by providing teams with the foundational knowledge needed to succeed. Additionally, many programs utilize advisors or coaches to supplement technical or organizational requirements in establishing an energy management system.
- Cost sharing of onsite dedicated resources. The utility funds part or all of a dedicated energy manager for a limited time to establish an energy management

system within a customer organization. This approach is best suited for very large, energy-intensive organizations.

Successful deployment of utility SEM programs requires identification, alignment and prioritization of key factors for all stakeholders. Participating organizations must receive benefits outweighing the investment of employee time and project cost. Utilities must cost-effectively generate energy savings. Finally, regulators must be able to see measurable savings and a clear path of attribution.

Stakeholder Considerations

Utility Customers

It may seem self-evident that reducing energy costs benefits organizations. However, the capital outlay and opportunity costs of those investments can make in-depth, extended programs such as SEM a difficult proposition for many businesses. Managers often embrace more tangible efforts around increased production or yield improvement. What's more, past experiences with energy-efficiency efforts may have failed to provide promised monetary savings or reliability improvements. These can lead businesses to discount the promised returns of future efforts.

In practice, SEM makes the case for improved energy performance a compelling financial case. SEM does more than allow an organization to monetize the impact of energy-saving measures and track cost savings, by changing how the resource of energy is viewed, tracked and managed within the organization. This focus on measurement and tracking, combined with an established cadence and long range planning allows participants to factor savings in to their operations and capital investment decisions to a far greater extent. Businesses that consistently address energy improvement navigate capital planning cycles with greater ease than those chasing targets of opportunity. Furthermore, price volatility of energy can be a significant variable in production cost. Improved energy management capability reduces the margin risk associated with increased costs for energy.

Non-energy benefits, such as lowered maintenance costs or market appeal, can also play a key role in influencing the decision to participate in utility SEM programs. Some of these non-energy benefits provide continued support of work teams for successful implementation by developing new skills and outlets for positive employee engagement. Preventive and predictive maintenance efforts initiated through SEM programs provide both savings and further the objectives of key stakeholders in energy programs. These proactive approaches cost less than emergency repairs in the long run by avoiding equipment failure and resulting down time. Well-maintained equipment lasts longer and uses less energy, resulting in fewer repairs, fewer replacements and lowered replacement cost. Reduced maintenance costs are one of the most-cited unexpected benefits of SEM by program participants.

Non-energy benefits of SEM extend into soft areas of the enterprise such as culture. SEM lubricates interdepartmental cooperation and a greater understanding of how independent functions within an organization interact through the medium of energy. Many organizations, and certainly mature manufacturers, have deeply ingrained ways of working and unwritten rules of relationships between functional groups. By serving as a novel channel for collaboration, SEM efforts have been reported by participants to improve communication and spur innovative solutions to business issues beyond the scope of the energy program.

It's a win-win for individuals and the organization. Working within cross-functional teams to solve energy management problems requires employees to demonstrate abilities and initiative that may fall outside the bounds of standard duties. By providing greater insight into operations and organizational goals and priorities, this experience can build leadership and managerial skills. The complexity of some energy management issues alone can provide the impetus for an organization to address and fill knowledge, training and skill gaps. In the end, top-to-bottom organizational participation leads to a more integrated, engaged workforce.

Utilities

The primary goal of most SEM programs is to produce measurable, verified savings. Managers may design metrics to gauge the results of discrete measures initiated as a result of the SEM implementation or they may count energy improvements for the whole organization. In the former, savings from SEM participation are treated as the accumulation of distinct measures using evaluation methodologies already in place. This approach offers the added benefit of leveraging established protocols in measuring savings. However, the large O&M improvements, positive interaction effects and behavioral savings can be very difficult to quantify. Additionally, opportunity for confusion between program offerings or perceived conflict with objectives for traditional program performance lessens with this approach. In the latter, across-the-organization approach, existing program savings are subtracted from facility-wide results, preventing or at least mitigating double-counting of savings.

Part of the allure of SEM programs is their ability to produce savings greater than simply the sum of the activities implemented, tracked and measured. To capture these results, metrics must utilize whole building/whole organization savings calculations. This approach presents a few drawbacks. Adequate baselines may not be found for a range of factors. Or baselines may be skewed by production or facility changes occurring shortly before the intervention period. Manufacturing facilities vary widely in the nature of the production, which can impact the ability to tie production to energy use. Facilities that produce a number of markedly differing products, or produce very few units pose challenges in establishing consumption models. Often, these characteristics go hand in hand, creating the dreaded high mix/low volume scenario.

SEM programs offer a unique suite of opportunities for strengthening relationships between utilities and their customers. Utilities offer often underutilized opportunities to assist their customers. Understanding of the role of the energy in their value chain challenges even the most sophisticated businesses. The constant evolution of the utility marketplace, at a pace unseen since electrification, makes the need for active collaboration even greater. An increased understanding of the partnership between utilities and their customers leads to greater insight into less-publicized incentives and fosters increased dialogue on topics beyond rates and outages. SEM team meetings provide a natural opportunity for utility account executives to interact with customers in a time dedicated to focusing on positive business issues. This produces an opportunity both to support SEM efforts and to educate customers on broader utility program offerings.

Regulatory Bodies

Measurable, verified savings are goals shared by utilities and their regulators. In addition to capital projects, SEM programs focus on converting O&M efforts into verifiable savings. SEM offers the added benefit of developing central contact points for energy projects, rather than

having this function reside in disparate groups within an organization, such as maintenance and engineering. This allows for streamlined evaluation efforts and assessments of project persistence.

Energy savings in and of themselves do not guarantee a successful demand-side management program. The savings must demonstrably result from the program intervention. This can be a particularly difficult proposition for a class of programs whose stated approach is for participants to manage energy in the same manner as other aspects of their business. To ensure that savings link directly to an SEM intervention requires meticulous and detailed recordkeeping of outcomes tied to the implementation and any impetus provided through the program. This degree of recordkeeping is needed for proper attribution of savings. But it can often be problematic for the participants, for whom the need for documentation may not readily equate with the benefits of pursuing SEM. Successful programs balance the considerations around recordkeeping by encouraging recordkeeping appropriate to SEM implementation among the participants while incorporating and building upon those records to support program evaluation.

Critical Success Factors

With success both dependent on and ultimately assessed by disparate parties, SEM programs must align with the interests of stakeholders and allow for course adjustment as needed. Three critical areas center around sharing data, communicating with stakeholders and employing energy management assessment methods.

Open Sharing of Data

Data is the lifeblood of an SEM program for all stakeholders. Thus, understanding key energy drivers is critical to determining the impact of the intervention. While each case can be treated on an individual basis, all parties must enter an engagement acknowledging the state of the data. Commitments to keep and share should be strictly followed and enforced.

To ensure that SEM meets the goals of the utility and regulator, stakeholders must openly share information on energy drivers throughout the engagement lifecycle. This begins with establishing clear expectations from the outset. In some instances, participants may be unable or unwilling to share the production information needed to establish a clear link between energy use and the core business of the prospective participant. Some businesses do not track production information with sufficient granularity to support correlation of energy to production with any degree of certainty. Other participants may perceive a business threat should competitors become privy to energy intensity information. These obstacles must be openly discussed and resolved.

SEM programs can succeed in raising energy management within a participant organization to a level on par with other critical strategic aspects of the business. In rare instances SEM implementation may elevate a business's general management practices.

Stakeholder Communication

Communication ranks on equal footing with data sharing. Decisions around implementation tradeoffs, evaluation methods and participant circumstances that could impact the ability of the program to meet its objectives must be communicated between sponsoring

utilities, implementers and, ideally the parties responsible for evaluating the program. The NW SEM Collaborative – a working group comprising Pacific Northwest utilities and the Northwest Energy Efficiency Alliance – has hosted a series of meetings between SEM implementers and evaluators to establish common report language and accurate program evaluation methods (MetaResources Group, 2014). Information included in these sessions included:

- Establishing defensible baselines
- Documenting key behaviors
- Recordkeeping

Energy Management Assessment

To ensure that SEM programs are effective and prudent investments of ratepayer dollars, the SEM system requires both quantitative and qualitative measurements. This corollary to the energy baseline is generally formed through the use of Energy Management Assessments (EMA).

A wide range of tools is available for EMA, from freely available mechanisms such as the EPA Energy Star Energy Management Assessment Matrix (Figure 1) to proprietary tools costing thousands of dollars. Properly administered, these tools are effective in assessing longitudinal performance of subjects, in addition to their common use in identifying areas lagging and thus requiring particular attention in the SEM implementation.

ENERGY STAR® Energy Management Assessment Matrix

	Little or no evidence	Some elements	Fully implemented	Next Steps
Make Commitment to Continuous Improvement				
Energy Director	No central or organizational resource Decentralized management	Central or organizational resource not empowered	Empowered central or organizational leader with senior management support	
Energy Team	No company energy network	Informal organization	Active cross-functional team guiding energy program	
Energy Policy	No formal policy	Referenced in environmental or other policies	Formal stand-alone EE policy endorsed by senior mgmt.	
Assess Performance and Opportunities				
Gather and Track Data	Little metering/no tracking	Local or partial metering/tracking/reporting	All facilities report for central consolidation/analysis	
Normalize	Not addressed	Some unit measures or weather adjustments	All meaningful adjustments for organizational analysis	
Establish baselines	No baselines	Various facility-established	Standardized organizational base year and metric established	
Benchmark	Not addressed or only same site	Some internal comparisons among	Regular internal & external	

Figure 1 : ENERGY STAR Energy Management Assessment Matrix. *Source: EPA*

As deployment of SEM programs has become widespread, so has the need for a common reporting language to exchange ideas and best practices. This need has led to the advent of shared frameworks for describing SEM implementation, notably the CEE Minimum Elements and NEEA Maturity Model. The Minimum Elements serve as a series of wayposts to allow program designers and administrators to ensure efforts are fundamentally aligned with accepted SEM practice, while fostering innovation and dissemination of practices (CEE, 2014). The Maturity Model approach dives into a greater level of granularity of practices, and offers the potential to more closely link savings outcomes with both overall adoption and specific aspects of SEM implementation (Leritz, 2014).

All of these means of assessing the level of energy management look through a shared lens – the perspective of the end user. However, the system under scrutiny is crucial to a range of stakeholders, and the perspective of the entity viewing the organization does matter. Thus it remains important to address the needs of end users, utilities and regulators when assessing the energy management implementation.

Key Indicators of Program Success

Involvement of Leadership

Corporate sponsorship of SEM is demonstrated in a wide range of forms, the most important being the allocation of human and capital resources. But signing on to policies, plans and memoranda do not guarantee success. While crucial to efficiency programs in practice, these actions may, in effect, remain invisible to much of the workforce.

Feedback from program participants, in fact, indicates that executive commitment may not be conveyed in demonstrable ways to SEM teams. Professing support at the outset of a program, and allocating resources to implement SEM are necessary functions, but may not be sufficient to sustain an effort over the full time needed to develop mature systems. Perception matters. The commitment to address organizational structure and to apply change management requires a particularly clear and high-level executive involvement. Executives must visibly support SEM efforts, see and be seen by SEM teams. Finding ways to demonstrate commitment within the culture of an organization does not require great effort. Spare words of senior leadership, used consistently, ensure that SEM maintains the profile needed to succeed.

Getting to "Act"

A number of approaches seek to embed SEM into organizations by leveraging continuous improvement methodologies. This effectively applies proven approaches from Total Quality Management (TQM) into energy management. A clear example of this is the evolution of the Deming Cycle, or PDCA Loop (Figure **1**) into the "fish-hook" diagram commonly seen in energy management programs (Figure 3).

Figure 1: PDCA Loop (ASQ). *Source*: ASQ

There may be no stronger marker of long-term success of a SEM engagement than the organization "Acting" or "Adjusting" program activities based upon "Checking" progress toward goals. A participant moves through the process of implementing SEM with support, sometimes substantially so. An organization can leverage existing frameworks with a minimal amount of effort and even execute a plan to manage energy. This is invariably a positive outcome, but in and of itself may not indicate a lasting SEM implementation. Even monitoring progress and

reporting on performance to goals does not indicate lasting success. When an organization resets its energy management plan, based on the information gathered through the execution of its initial plan, SEM has truly taken hold in such a way that continued gains will be realized.

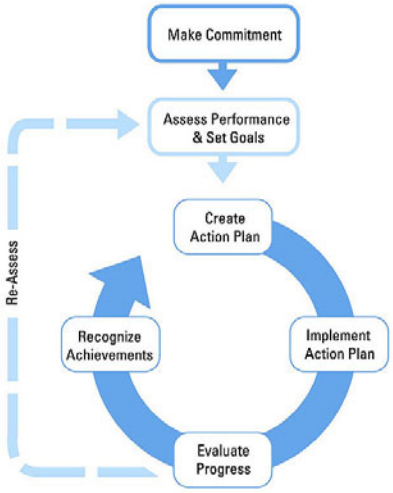

Figure 3: ENERGY STAR Energy Management Process. *Source:* EPA

Conclusion

It's easy to assume that SEM makes common sense. In this view, using energy more efficiently and effectively, and saving money, should be standard business practice. Yet this point of view, while understandable, misses the mark. The vast majorities of businesses are either doing nothing to lower their energy bills or are just scratching the surface of what could be done. Properly framing energy in the context of business allows for the full benefits of positive actions to be realized.

Therein lies the opportunity. The time is ripe for utilities to push the market in the direction of more widespread adoption of SEM with the attendant benefits of deep energy savings, strengthened customer partnerships, and improved customer relations. Utilities are uniquely positioned to facilitate the transformation of the industrial market, having both the energy expertise and the customer relationships necessary to make this happen.

Open data sharing, clear communication and proper assessment tools ensure that all parties recognize the intended outcomes and working together to allow SEM programs to realize their full savings potential.

SEM represents a comprehensive, holistic approach to a complex set of problems. The multi-faceted dimension of these programs, with the need to address technical, behavioral and organizational aspects of energy use, makes the collaboration of all stakeholders critical, from organizational leadership through operations, from utility staff to regulators.

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