

# Strategic Energy Management for Small to Medium Industrial Sites: A Case Study with 12 Industrial Plants

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## ABSTRACT

Building on previous ACEEE papers focused on efforts to serve small industrial customers, Energy Trust of Oregon has identified a market need for, and opportunity to provide, Strategic Energy Management (SEM) to highly motivated small to medium sized industrial firms. This pilot is focused on workforce development to overcome the barriers that historically have hindered small-medium sized facilities from implementing energy management and strategically driving energy savings. The pilot leverages Energy Trust's past success with large industrial firms in implementing SEM systems to provide staff of companies participating in the pilot guidance and support to identify, cultivate and train an energy champion and energy team, conduct an onsite energy assessment to identify energy saving opportunities (capital and behavioral), lay out an energy action plan, and engage employees in energy awareness.

The paper will summarize Energy Trust's pre-evaluation findings from the year-long pilot, which began in July 2012 with 12 companies. The paper will also explore and attempt to answer the following programmatic questions:

- Can this approach to energy management be adopted by small industrial sites?
- What characteristics make small companies more or less successful with SEM?
- What is the subset of SEM activities that provide the greatest benefit to small companies?
- Is it possible to train and engage employees of small companies in energy efficiency?
- Can programs provide custom services to smaller industries cost-effectively?

## Introduction

Energy Trust of Oregon (Energy Trust) and Northwest Energy Efficiency Alliance (NEEA) are leaders in developing and implementing Strategic Energy Management (SEM) offerings as a comprehensive way to engage industrial customers in energy efficiency. Until recently, SEM in the industrial sector has been focused on sites with an annual consumption greater than 8 MWh, where vast savings opportunities and significant employee resources to dedicate to the efforts exist. SEM programs have been delivered in a cohort-based peer network model that has been proven effective for large industry through Industrial Energy Improvement (IEI). With this model in mind, Energy Trust and NEEA identified a market need for SEM designed for companies whose annual consumption is less than 8 MWh and were previously thought to be unfit for traditional SEM offerings due to the cost of services relative to potential savings. In addition, cultural differences in smaller industry, such as lack of internal capacity to monitor energy and sustain savings and the inexperience of staff regarding managing change initiatives, were thought to pose obstacles to success. Despite those perceived barriers, through engagement with NW High Performance Enterprise Consortium, NW Food Processors

Association, Oregon Workforce Investment Board and Oregon Manufacturing Extension Partnership, Energy Trust and NEEA learned that there were leaders of small firms in Oregon clamoring for assistance in training their employees to manage energy as a controllable cost through SEM.

In addition, industrial market research completed in 2012 by Energy Trust identified many small industrial customers wanting to do more related to energy efficiency but not knowing what the next steps were towards that goal. It was with all these considerations in mind that Energy Trust pursued approval for a pilot project of SEM for small to medium industrial customers delivered to 12-20 sites. Once approval for the pilot was secured, Energy Trust issued a request for proposals from firms currently implementing SEM through other methods and selected Triple Point Energy (Triple Point) as the implementation contractor. Not only has Triple Point been a key partner in implementing SEM to industrial firms across North America, Energy Trust gains an additional benefit in that Triple Point implements IEI and therefore the pilot can base its learning on a consistent implementation and modeling methodology that has proven effective with large industry.

For the purposes of this pilot, Energy Trust defined small to medium industrial customers as spending \$50,000-\$500,000, which in Oregon equates to roughly 750,000 kWh – 7,500,000 kWh or 50,000-1,000,000 Therms, or any combination of the two, annually on electricity and natural gas. Energy Trust titled the offering CORE (Continuous ORganizational Energy) Improvement and began recruiting interested firms in April 2012.

## **Recruiting and Enrollment**

Energy Trust needed to think differently when recruiting for CORE Improvement than it previously had for IEI, where it held relationships with most large and many medium sized industrial sites, making personal recruiting conversations the primary method of enrollment. Without the luxury of those personal relationships at the customers being targeted for CORE Improvement, Energy Trust decided to tackle the recruiting effort through three different methods.

First, Energy Trust leveraged industry groups that had existing relationships with the size of customer targeted. Key organizations that communicated the offering to their membership were NW High Performance Enterprise Consortium, NW Food Processors Association, Oregon Workforce Investment Board and the northern Oregon chapter of the Society of Manufacturing Engineers. There were varying degrees of success in leveraging the memberships of each organization. Second, Energy Trust leveraged its energy efficiency account managers, who generally work directly with larger industrial customers but had knowledge of some smaller sites in their territories, to populate a targeted list of potential sites. Account managers then reached out to those targeted sites via email to inform them of the offering. Finally, Energy Trust reviewed projects that were completed in the last three years through its Small Industrial Initiative and targeted companies that appeared to fit the criteria for enrollment. Those companies were contacted directly by Energy Trust staff via phone and email. After initial contact was made, companies who responded with interest in the SEM services were contacted by Energy Trust staff to further discuss the offering. During that conversation a meeting was set-up for Energy Trust and/or Triple Point staff, often times together, to meet with relevant staff at the interested sites to further explain the offering and answer any additional outstanding questions. Many questions and concerns regarding enrollment were related to staff time needed

to successfully complete the year-long engagement, which had previously been hypothesized as a barrier.

In the end, Energy Trust enrolled 12 companies to participate in the CORE Improvement pilot with annual energy spend ranging from \$85,000 to \$560,000 annually, and an average of \$250,000. The number of employees ranged from 24 to almost 300, so the diversity in company size within the group was significant even without taking into account the variety of industries represented. Table 1 outlines the types of businesses that enrolled and includes annual energy usage and employee count. In addition, 17 other companies indicated the timing wasn't right for them at that point, but they would like to be contacted if the opportunity came up again.

**Table 1. CORE Improvement Participants**

Type of Business	Number of Employees	Annual kWh	Annual Therms
Knife Manufacturer	193	1,768,800	6,131
Bicycle Components	98	1,186,250	2,081
Meat Processor	76	2,106,200	38,857
Nutritional Supplements	100	2,057,000	35,000
Electrical Connectors	175	6,850,200	25,159
Waste Water Treatment*	24	2,500,000	21,500
Industrial Laundry	134	2,211,900	526,231
Painting Equipment	286	2,598,400	36,155
Laboratory Equipment	108	962,636	58,040
Winches	129	4,383,779	86,653
4WD Hubs	96	4,861,770	22,221
Frozen Yogurt	104	5,756,062	208,434
<b>Total</b>	<b>1,523</b>	<b>37,242,997</b>	<b>1,066,461</b>

\*Did not complete SEM engagement

There were several key lessons learned from the recruiting effort that Energy Trust plans to use to improve the effort if another cohort of SEM for this class of customer is offered again. First, Energy Trust should recruit for this effort early and often, meaning that having conversations throughout the year when the opportunity arises, and keeping a list of companies to contact when actual enrollment time comes around will help streamline the process and reduce the amount of work during the actual enrollment period. Next, ensuring the marketing collateral communicates the offer and expected commitment is very important because it may be the first real experience a company has directly with Energy Trust. Finally, leveraging different associations was beneficial, but not as effective as originally expected. Most of the final enrollees actually came from Energy Trust's direct outreach as opposed to the association outreach. Because of this, it will be important to include associations in future recruiting efforts, and include additional associations if possible, but to continue with the other methods of recruitment with the most vigor.

## CORE Improvement Overview

The CORE Improvement offering was designed to implement Strategic Energy Management (SEM) for highly motivated small and medium-sized industrial firms. In planning implementation of the offering, Energy Trust and Triple Point focused on overcoming the barriers that historically hindered small to medium industrial facilities from implementing energy management, including limited time availability and lack of staffing skills redundancy. These barriers result in difficulty dedicating resources such as spending time away from the facility and other necessary activities related to successfully participating in the offering. Given the challenges faced by this customer class, this offering emphasized learning that leads to action, which in turn leads to organizational change. Understanding that the limited staff in these plants are required to wear many hats and the culture tends to be close-knit, the offering aimed to reduce the participant's time out of the plant, provide tools and templates to quickly implement SEM, and maximize one-on-one coaching.

**Table 2. CORE Improvement Workshops and Meetings**

<b>Kick-Off Workshop</b>	Participants start to develop their strategic energy management practices during our Kick-Off workshop where they meet the other participants in the cohort and start planning for the future.
<b>Energy Inventory</b>	SEM coaches walk through the facilities to help identify how and where energy is being consumed. A comprehensive Energy Inventory is created after the walk through.
<b>Energy Scan</b>	Four-hour on-site walk through with energy team to discover quick and easy system and process improvements to save energy at your facility. Capital projects are also identified.
<b>MT&amp;R Workshop</b>	The Monitoring, Targeting & Reporting workshop will teach participants to monitor and analyze their energy use in order to target optimal energy performance.
<b>Onsite MT&amp;R</b>	SEM coaches help with the MT&R model at each facility to begin tracking progress towards energy goals.
<b>Energy Scan Implementation</b>	Energy Scan Implementation is another on-site opportunity to implement low/no cost projects with assistance from CORE Improvement coaches.
<b>Organizational Engagement Workshop</b>	Participants learn about and plan employee engagement activities to create awareness and desire for energy savings among all facility personnel.
<b>Organizational Engagement Activities</b>	SEM coaches help implement employee engagement plans to promote best practices and energy awareness.
<b>Wrap-Up Meeting</b>	SEM coaches help finalize your data and activities as well as creating a plan for persistence of energy savings and activities.
<b>Report Out and Celebration</b>	Participants get together to present their activities over the last year. Companies learn from each other to help generate new ideas.

The CORE Improvement offering included a combination of training workshops and one-on-one coaching with specific assignments. The offering also leveraged specific tools and resources through the process which were designed to create a culture of energy efficiency within the organization. Throughout the year-long involvement, the plants participated in four peer-to-peer cohort training workshops, which were each offered twice to accommodate schedules. In between these workshops SEM coaches met with participants individually. These monthly meetings used a combination of forms and tools to ensure that assignments were applicable to the site, thoughtfully completed, and effective for that facility. Table 2 outlines CORE Improvement workshops and meetings.

To guide participants through the process of implementing SEM at their facility, a workbook was created. This workbook, to be filled out during CORE Improvement activities throughout the offering, included a combination of worksheets and electronic tools, and was designed so that at the end of the year each company would have both a record of their achievements and a roadmap for future activities. In the workbook, each company recorded important information about their energy team, such as team member contacts, individual roles and responsibilities, meeting agendas, and the company energy policy. In addition, information about the facility, such as size, annual energy consumption, lists of major energy using equipment, and process flow, was captured. Worksheets to guide the energy team through engaging all employees at the site and planning future energy team activities were included to ensure the sustainability of SEM efforts. An energy model allowing participating companies to track their energy usage and compare current usage to the baseline period was provided as one of the electronic tools in the workbook. This model acted as both a discovery tool to help participants understand their energy use as well as a communication tool to illustrate changes accomplished by their energy savings efforts. The other key electronic tool provided is an opportunity register to help track and prioritize all energy opportunities at the facilities.

Energy modeling of each company participating in the program was the backbone of this CORE Improvement and any SEM offering. The ability to measure and understand energy consumption was considered essential to success. The SEM coaches used statistical tools to model the electrical and natural gas consumption of each of the twelve companies participating in the offering. Training was provided on how to evaluate and use the model, including a peer-to-peer workshop dedicated to energy modeling. In addition to the four-hour workshop, the SEM coaches provided one-on-one support to help all the participating companies use their model as a predictive tool to understand changes in their energy use. A significant milestone in the offering was met when the energy team was able to update and communicate the model without help from SEM coaches. Each model included a savings chart which tracked the percent savings at the facility, allowing the team to communicate success both to upper management and facility-wide.

The CORE Improvement offering was designed to ensure that each energy team would gain a better understanding of energy use in their facility. In order to achieve this objective, in addition to the energy modeling, a tool kit was provided to each facility which included data loggers, AC current transducers, plug load meters, and light meters. These tools were presented to each participating company along with training on how to use the equipment. Software was provided to utilize the loggers and analyze the data recorded. This proved to be a useful way for the energy team to start the dialog on ways energy could be saved at their facility. The tools provided will also be useful in ensuring operational changes are fully understood and maintained over time.

In order for the offering to be considered successful it was necessary for participating companies to make meaningful changes that resulted in energy savings. Many of the participating companies were highly motivated to make changes but first needed to know what changes to make. In order to address that need, the SEM coaches helped each site conduct a four-hour energy scan. During these scans, members of the energy team, SEM coaches, and technical experts walked through the facility and focused on finding possible projects or activities that would save energy. These scans were very successful, often finding more than 30 projects for the energy team to focus on. The ideas generated on these scans tended to be mostly projects or activities that required little or no capital and could be implemented in six months or less. Long-term projects and those requiring capital investments were also recorded on the opportunity register to be tracked by the energy team as part of the overall SEM efforts. Finally, the goal of the energy scans was to give each energy team the tools and knowledge necessary to implement future energy scans of their facility on a semi regular basis in order to keep the pipeline of projects full.

## **Questions Answered by the CORE Improvement Pilot**

### **Can This Approach to Energy Management Be Adopted by Small Industrial Sites?**

Prior to the implementation of CORE, small and medium-sized industrial facilities were largely served by Energy Trust with vendor driven offerings that utilize excel based calculator tools to model baseline system and upgrade system energy use. Examples of tools using this methodology are Compressed Air, Lighting, Welders, and Pumps. Prescriptive incentives were also available to these customers for common HVAC, water heating and other measures.

A number of risks were identified and addressed in the design of this offering. The main risk was the time commitment both from the participating companies and from the SEM coaches. In order to make the offering both cost effective and worthwhile, it was necessary to minimize the amount of time and staff resources required. To address this, CORE Improvement was streamlined to limit time away from the facility for participants, which included four peer-to-peer workshops and monthly one-on-one meetings between the SEM coaches and each company. Additionally, the workbook allowed the participating companies to efficiently work through the main elements of SEM. One key finding was that as the CORE Improvement pilot progressed, it was clear that these companies tended to be both highly motivated and quick adopters of SEM. In a majority of the companies the executive management was very involved with the energy team, often attending every CORE Improvement meeting and many of the energy team meetings. With that level of executive involvement, changes identified by the energy team were investigated and implemented quickly.

### **What Characteristics Make Small Companies More or Less Successful With SEM?**

Given the diversity of the group enrolled, it is difficult to draw broad conclusions about the potential for SEM success in small and medium-sized companies. It was clear, however, that the challenges faced by these companies tended to be very similar to the challenges faced by larger companies during a SEM engagement, specifically the time and effort necessary to implement an energy efficiency culture. Where smaller companies are at an advantage is their access to upper management. In a larger company an energy champion may have difficulty

getting the attention of the owner or CEO, but in a smaller company the owner may sit just a few offices away. Another key finding was that we found when the executive management was engaged and enthusiastic about the energy efficiency effort, the rest of the workforce was engaged as well. This was evident at many of the facilities in the CORE Improvement pilot where the executive management routinely attended workshops, energy scans, and energy team meetings. This involvement ensured the success of the teams.

The area where these companies appear to be most vulnerable to failure is limited workforce. The only company that dropped out of the offering did so because of unexpected personnel changes, which resulted in an inability to dedicate resources for the meetings and workshops. There is little staff skills redundancy in small companies and as a result a loss of even one employee may derail efficiency efforts. In addition, if a company lost a key member of the energy team, such as the energy champion, it may be difficult for that company to continue with the SEM program implemented at their facility because the role of the energy champion is to coordinate SEM efforts and ensure that the projects identified are being continuously pursued. CORE Improvement attempts to mitigate that risk by ensuring all activities and efforts are documented by the energy team through the engagement. That way a new energy champion would ideally be able to step in to the existing SEM program and continue the efforts with minimal rework.

### **What is the Subset of SEM Activities That Provide the Greatest Benefit to Small Companies?**

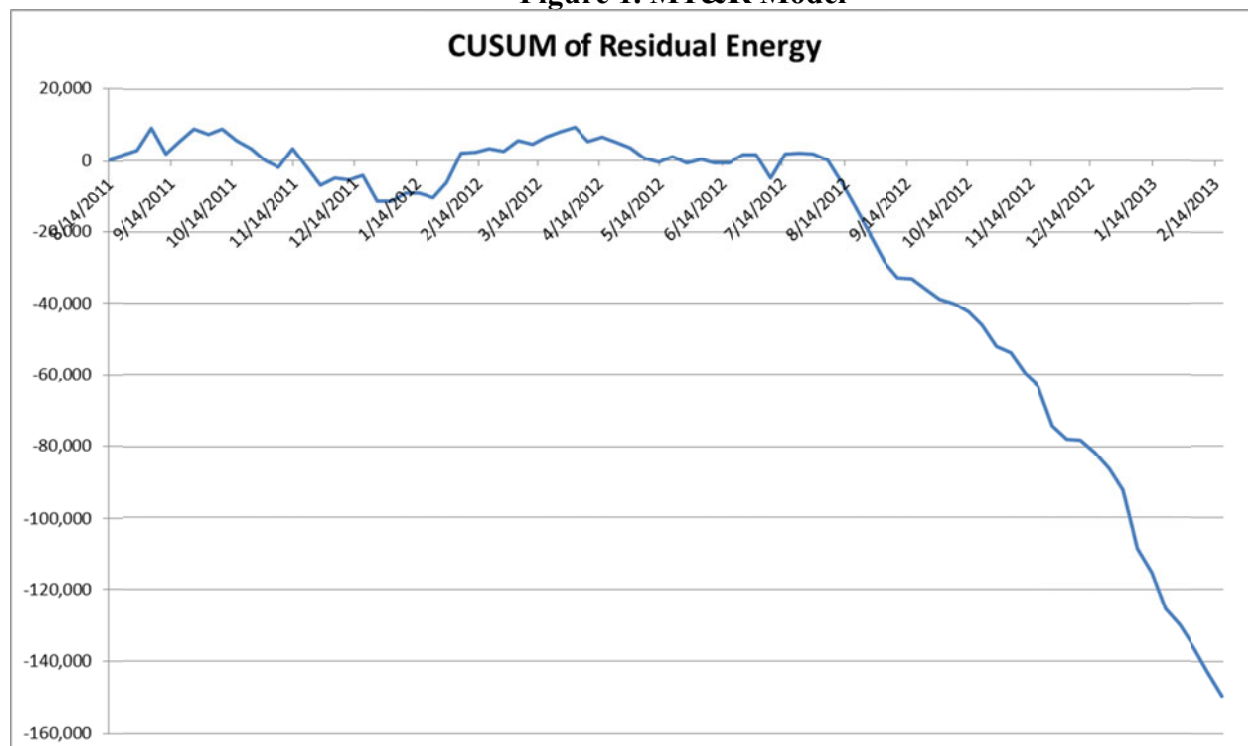
Early in the CORE Improvement pilot it was clear that the most important aspects of SEM for small and medium-sized companies were understanding their energy use, tracking energy performance, and identification of possible projects or activities. To better understand the energy usage at each facility, the SEM coaches helped each company log their main energy-using equipment. In addition, the data logging equipment that was given to each participating company along with training on the use and potential benefit of the equipment was found to be very effective. Most energy teams started investigating their energy use right away, installing logging equipment the day it was received. In subsequent visits, the teams shared their results with the SEM coaches asking for analysis support where necessary. The knowledge gained from equipment logging created more understanding of their energy use and generated energy savings ideas. After projects and activities were implemented or initiated many of the teams logged the equipment after the change to either verify the effort was saving energy or to estimate if they could continue to tune the system settings. In addition, some companies even began estimating the energy savings from the changes they were making using the information they were getting from the data loggers.

While some of the companies were already concerned with conservation and sustainability, none of the companies had looked at their energy consumption using energy modeling, and only a few were using energy performance indicators (i.e. kWh per unit production). Without the capability to monitor energy usage, they didn't know how their energy use had changed over time. Once the models were created for each site, the energy team could use the information to communicate successes and investigate increases in energy use. A number of the participating companies were growing their business so they saw their energy usage grow as well. The energy models accounted for the change in energy use by reporting usage based on energy intensity tied to production and/or other energy drivers such as weather,

and provided each site a way to see the savings achieved through both behavioral and capital energy efficiency measures. Figure 1 shows an example of an energy model as a cumulative sum of the differences between predicted and actual energy use.

Finally, identifying energy savings projects and activities through the energy scans proved to be very important to the success of the program. The energy scans that were completed at the beginning of the program for each company provided a long list of project and activity ideas for the energy teams to implement throughout the year. This list became the basis for the energy savings achieved by each site. In addition to the energy scans, the SEM coaches followed up monthly with each site to provide support on the implementation. Support included technical assessments, additional research, and connecting the site with industry resources to help them with their projects.

**Figure 1. MT&R Model**



### **Is It Possible to Train and Engage Employees of Small Companies in Energy Efficiency?**

Not only is it possible to train and engage employees in a small company, in many cases small companies can be at an advantage over large companies where employee engagement and awareness is concerned. This advantage stems from a smaller workforce with more direct communication and greater executive level engagement as well as the close-knit feeling in many of these facilities. The CORE Improvement pilot participating companies' training and awareness efforts were both simple and effective, utilizing informal and formal communication to educate employees.

One example of a successful employee engagement activity implemented during the engagement was a facility that created an energy board right next to where plant personnel entered and exited the facility to start their shifts and during breaks. The board highlighted



energy intensity per unit produced and also collected all of the compressed air leak tags that had been removed after a repair was made. Because of the commitment to communicate back to the employees on the efforts they had been making the company was encouraging the energy saving culture and cultivating additional actions. Another example of a successful employee engagement activity is an energy fair hosted by the facilities. All plant personnel attend the fair during a specific day and learn about what the facility has been doing related to energy efficiency efforts. In addition, Energy Trust provides the facilities with collateral and information related to residential energy usage so the facilities can help provide resources for their employees to use in their homes. Yet another successful example of an employee engagement activity is regularly adding an energy moment to the end of shift or safety meetings. By addressing energy issues regularly with plant personnel it tends to improve awareness and reinforces the desire to make changes related to energy consumption organization wide.

While most facilities have shown significant success in their efforts, Energy Trust has learned that not all companies are able to dedicate the resources needed to be successful. One facility, a wastewater treatment plant, had to pull out of the offering due to two plant operators coming down with serious illness. In losing those two operators, the facility need all staff time dedicated to making sure the facility was operating effectively and was complying with its environmental effluent standards. Another facility, a knife manufacturer, has had a difficult time dedicating staff to the effort. Due to this, they have still been unable to make much change at their facility.

### **Can Programs Provide These Types of Custom Services to Smaller Industries Cost-effectively?**

Energy Trust provides three types of incentives to the facilities through the CORE Improvement engagement. First, it provides technical services in the form of the SEM coaches, which cost around \$25,000-\$40,000 per facility of this size over the 15 month engagement. Without the dedicated efforts of the SEM coaches helping to guide them through the process and assisting in working through the workbook and tools, these facilities would not be able to undertake such dramatic changes at their facilities related to managing their energy. The second type of incentive is per unit of energy saved, \$0.02/kWh and \$0.20/therm. These incentives are key to the success any SEM engagement used as resource acquisition because the time-bound nature of the incentive and a commitment of a larger check at the end with more savings usually elevates the importance of taking action throughout the facilities. The last type of incentive is a milestone incentive, where Energy Trust commits to paying the companies a small incentive for reaching certain milestones related to the uptake and adoption of their energy models during the SEM effort. The milestone incentive is a new idea for Energy Trust, and thus far, has been vital in getting the facilities to more quickly adopt their energy models. Each incentive serves a unique purpose and is important to the success of the SEM engagement.

Energy Trust's budget and forecasted electric and natural gas savings for CORE Improvement will put this pilot on the edge of its organizational cost-effectiveness requirements. However, a relatively conservative estimate of savings of 5% was used in the budget and forecasting process. Currently, statistical modeling is showing that participants in CORE Improvement are saving from 1-7% entering the final months of the engagement when energy savings have traditionally taken hold and rapidly increased in other SEM engagements. Energy Trust hopes to see this savings trend continue to grow as each company's SEM practices flourish

through the end of the engagement. Also, past cohorts of IEI have averaged 8% savings as a whole, further indicating that this pilot will prove to be cost effective.

In addition, most companies have identified at least one capital project they can pursue through the standard Energy Trust energy efficiency offerings. Many have even begun pursuing those projects while engage in CORE Improvement, further indicating the value of a comprehensive SEM engagement as both a resource acquisition offering and a customer service effort.

## **Conclusion**

Energy Trust has been pleased with the pre-evaluation results of the CORE Improvement pilot as most participants in the offering have been deeply engaged from the top of the organization through the energy team to the plant floor. Participating companies have proved that energy can be managed strategically as a controllable cost by smaller industrial companies despite perceived barriers to success. They have also shown that the most successful small to medium industrial companies in implementing SEM have the same characteristics as successful large industrial facilities, yet the smaller companies may even have an advantage when it comes to getting executive level buy-in. The pilot has also identified what appear to be the most important aspects of the SEM engagement for this size of customer: tracking energy use, performing energy scans, using energy models based on energy intensity of the facility, and engaging employees in energy efficiency.

Energy Trust has found through the CORE Improvement pilot that SEM for small to medium industrial customers can make up a significant cost-effective resource to include in its portfolio of offerings for industry by scaling the SEM engagement to the needs of those customers.