Energy Trust Production Efficiency Strategic Energy Management Evaluation Final Report

February 28, 2019

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Glossary

Table 1 provides a glossary of terms used in our evaluation of Energy Trust's Strategic Energy Management (SEM) program.

Table 1. Energy Trust SEM Evaluation Glossary

Term	Definition
2012 Production Efficiency (PE) Impact Evaluation	As part of the 2012 PE Impact Evaluation, Cadmus estimated changes in facility energy consumption using data collected on site, program tracking data, regression analysis, and engineering calculation models to verify reported program participation and to estimate facility energy savings
2012 SEM evaluation	Cadmus performed interviews, SEM adoption assessments, and SEM savings analysis to identify SEM activity prevalence; estimate SEM energy savings rates and data requirements and availability; and identify characteristics about Monitoring, Targeting, and Reporting (MT&R) models for 2009 through 2013 SEM participants
Baseline period	The 12 months before SEM engagement; energy consumption in the baseline is free of any influences from the engagement
Capital savings	Estimated savings that resulted from capital projects
Consortium for Energy Efficiency (CEE)	A consortium primarily of efficiency program administrators from across the United States and Canada, where members leverage individual efforts by working together to accelerate energy-efficient products and services in targeted markets (https://www.cee1.org/content/who-we-are)
Facility	Building or structure within a site; each site has one or more facilities
Facility savings	Savings that occurred during the performance period as the result of capital projects, the SEM engagement, and other unobserved factors
Implementation period	Time period during the SEM engagement where the participant is implementing projects prior to the reporting period
Independent variable	One or more factors aside from the SEM engagement that influence energy consumption at a facility or site
Measurement period	The range of dates that the implementer used to estimate savings
Model	Linear regression model used to estimate energy usage while controlling for the influence of independent variables on energy use
Modeled savings	Estimated facility savings resulting from regression modeling
MT&R models	Statistical regression model used to estimate reported SEM savings
MT&R reports	Documents used by the implementer to document the SEM engagement and results
MT&R workbook	Workbook used to collect energy consumption data, estimate savings using site-specific statistical analysis, document non-routine adjustments, and report savings estimates
Multi-engagement participant	Participant participated in multiple SEM engagements at the time of the SEM evaluation
Participant	Firm or company enrolled in SEM
201 PE Impact Evaluation sample	Sites that had previously been sampled as part of the 2012 PE Impact Evaluation and had participated in SEM in any year
Performance period	The 12 months of SEM engagement (including the engagement and time afterward) in which energy consumption could be affected by the engagement
PE program	Energy Trust's PE program provides incentives for agricultural and industrial energy efficiency measures

Term	Definition
SEM activities	Activities listed in the opportunity register; these can include behavioral, capital, and operations and maintenance activities
SEM adoption	Includes participant commitment, planning and implementation, and systems for measuring and reporting
SEM engagement	The period of time in which the program is actively engaging with SEM participants; typically, one year
SEM population	All 2009 through 2013 SEM participants except Kaizen Blitz, ISO 50001, eVSM, or CORE participants
SEM program	Track of Energy Trust's PE program focused on SEM
SEM sample	Sites that were sampled as part of the SEM evaluation (but not the 2012 PE Impact Evaluation)
SEM savings	Savings that resulted from the SEM engagement, equal to the modeled savings minus the capital savings
Single-engagement participant	Participant participated in one SEM engagement at the time of the SEM evaluation
Strategic energy management (SEM)	Collection of holistic strategies and energy management consulting services that educate and train industrial energy users to develop and execute an energy planning strategy and integrate energy management into their business planning

Executive Summary

Through the Production Efficiency (PE) program, Energy Trust of Oregon (Energy Trust) offers strategic energy management (SEM) training and support to industrial participants, providing energy management consulting services that educate and train industrial energy users to: (1) develop and execute an energy planning strategy and (2) integrate energy management into their business planning and practices. Participants work with Energy Trust for about one year and then can choose to participate in subsequent years.[1]

Overview

Cadmus evaluated Energy Trust's SEM offerings from 2010 through 2013. The overarching objectives of this evaluation were to determine the prevalence of SEM activities, data requirements and availability, and properties of monitoring, targeting, and reporting (MT&R) tools. Energy Trust was interested in the distribution of SEM activities across all participants and if activities differed depending on whether participants participated in a single SEM engagement (single-engagement participants) or multiple SEM engagements (multi-engagement participants). Energy Trust wanted to catalogue the type of data available for each participant, typical energy use frequency, and the completeness and accuracy of the data. Energy Trust was interested in regression model specifications and how similar or different they were across participants.

Energy Trust was also interested in determining savings rates and, particularly, changes in savings rates over time after program participation. However, savings rates could only be evaluated for a small subset of the participants and no time trends (savings rate trajectories) could be evaluated due to the quality of required data, reported models, and inconsistencies between monitoring, target, and reporting (MT&R) tools and reports. The specific research questions that we answered in this evaluation are listed in Table 2.

Table 2. Evaluation Research Questions

Research Question
SEM Activity Prevalence
What is the distribution of SEM activities across program participants (how many program participants implemented the minimum SEM activities as defined by the Consortium for Energy Efficiency and, where applicable, to what extent)?
Does the prevalence of SEM activities differ between single-engagement and multi-engagement participants?

[1] This was the design of Energy Trust's SEM program from 2009 through 2013. In 2016, Energy Trust developed Continuous SEM to deliver ongoing support to industrial customers who want to continue to expand their capabilities and capacity to manage energy through SEM.

Research Question
Data Requirements and Availability
What types of data are available for each participant and facility in years during and after their participation (such as consumption data and production data)?
At what frequency are data available?
Are the program data and project files available, complete, reliable, and consistent for each site?
How do energy savings estimates differ between data-rich and data-poor participants (that is, what effect does missing or less frequent data have on the accuracy and precision of estimated savings)?
To what degree does the data collected through site visits improve regression modeling results and savings trajectory estimates? Which data from the site visits are most useful?
What is the minimum level of data required for evaluation?
Monitoring, Targeting, and Reporting (MT&R) Models
What are the most common model specifications used by the SEM implementation team in their MT&R models?
What are the most common adjustments Cadmus makes to the implementer models for evaluation purposes?
Are there opportunities for the SEM implementation team to adjust MT&R models that would result in better savings estimates and efficiency gains in evaluation activities?

Methodology

Between 2009 and 2013, 121 customers participated in one, two, or three SEM engagements with Energy Trust. The population of participants was too large to cost-effectively evaluate savings for the census, so we sampled 45 participants for the evaluation—due to overlap with the 2012 PE impact evaluation, we evaluated 46 participants in total.

This evaluation included reviewing SEM activities captured in participant opportunity registers, interviewing participants, conducting site visits, and estimating energy savings using regression analysis. We collected data from Energy Trust via a data request and from participants through interviews and site visits to assess SEM adoption, SEM activity prevalence, capital project savings, and energy savings.

Key Findings and Recommendations

Conclusion 1: The evaluation of energy savings was inconclusive because, although data were available, they were inconsistent and incomplete. Because the analysis sample included only eight participants with electric savings and six with natural gas savings, these results (see Appendix I. Participant-Specific Reports (Confidential)) could not be generalized to the population.

Recommendation 1: Cadmus recommends that Energy Trust require participants to deliver final versions of the MT&R workbooks with the MT&R reports and that the models in the MT&R reports can be replicated using the data in the MT&R workbooks. Cadmus recommends that Energy Trust verify this upon receiving the data and documentation from implementers.

Conclusion 2: SEM activities persisted among interviewed participants. Many participants continued to use the MT&R workbook (or another tool) to track energy used, most of the activities we asked about remained in place or were continued, and many respondents had added projects to their list of potential

opportunities since they participated in SEM. Most respondents indicated that participating in SEM made identifying future energy efficiency projects easier and that they were more likely to conduct energy efficiency projects following their SEM engagement.

Recommendation 2: Cadmus recommends that Energy Trust approach recent SEM participants with program offerings specific to the activities that were listed in opportunity registers to make implementing those activities easier for the participants. Energy Trust should also consider requiring updated energy usage and production data from participants in the years following their SEM engagements. Because many are already tracking it, the burden to the participants would be small and the value would be high because the data could be used in regression analysis to quantify the persistence of savings.

Conclusion 3: There was continuity within the role of energy champion or manager and institutional knowledge about SEM activities remained in place after the SEM engagements. Many energy management coordinators were the same people who coordinated energy management during SEM engagement.

Recommendation 3: Cadmus recommends that Energy Trust emphasize to participant facilities that continuity in the energy manager role has the potential to lead to continued energy savings due to lessons learned while implementing SEM. It should provide guidelines for internal knowledge transfer when there is staff turnover.

Conclusion 4: Facility changes, when not tracked and recorded over time, likely confound energy savings estimates. Most interviewed participants reported that changes in their facilities had occurred between the time of SEM engagement and the interview. This puts into question model development for persistence studies, i.e., if changes in product lines, production levels, hours and the facility occur at nearly every plant but limited data about these changes exist, there will be limits on how well models can adjust to detect savings that occurred and that persisted over time.

Recommendation 4: Cadmus recommends that Energy Trust work with participants to develop robust data tracking tools—not only for energy consumption but non-routine events and changes to production or the facility over time. These could include customized MT&R workbooks and periodic check-ins after SEM engagements have been completed.

Memo

To: Board of Directors

From: Erika Kociolek, Evaluation Sr. Project Manager
Kati Harper, Sr. Project Manager – Industry and Agriculture

Date: February 28, 2019

Re: Staff Response to SEM Evaluation

Energy Trust's industrial strategic energy management (SEM) offering began in 2010 and has since grown significantly. Between 2010 and 2013, the program experienced significant growth, which was the impetus for Energy Trust to hold two workshops in 2014, which gathered program staff, implementers, and evaluators to discuss how to best evaluate SEM. One of the key workshop outcomes was a set of SEM evaluation guidelines[1] . To test these guidelines, in late 2014, Energy Trust decided to undertake an evaluation of the industrial SEM program. For a variety of reasons, finalizing the results from this evaluation took some time.

The goals of the evaluation were to:

- Understand the prevalence of SEM activities
- Assess available data for completeness, and the impact of different levels of data (e.g., daily, weekly, monthly) on estimated energy savings
- Review and provide feedback on regression models used by the program to estimate energy savings
- Estimate energy savings rates over time (in particular, any changes to energy savings rates post-SEM engagement)

The evaluator, Cadmus, drew a sample of 46 participants from 2010-2013 SEM participants. In reviewing the program documentation and data for each engagement, the evaluator found that only 18 percent of the models had the data necessary to estimate energy savings rates over time. This was because: (1) the evaluator was not able to replicate the reported energy savings in the final reports using the data and models provided (perhaps because the data and models were not the final versions), and (2) the evaluator was only able to obtain data post-SEM engagement for nine participants (out of 36 interviewed participants).

Two of the evaluator's recommendations related to the issue described above:

- The evaluator recommended that Energy Trust require, and verify, that the final versions of the data and models be used to estimate the energy savings in the final reports. Starting in 2016, the program adopted a checklist for closing out all SEM engagements. The checklist requires implementers to provide final versions of the report, models (including data), opportunity register, energy map, and energy management assessment to Energy Trust program staff. In addition, Energy Trust program staff verify that the savings in the final model match the savings in the final report and in in Energy Trust's Project Tracking database.

[1] 2014 Energy Trust Workshops on Strategic Energy Management Impact Evaluation: Report on Key Outcomes. https://www.energytrust.org/wp-content/uploads/2016/12/SEM_Evaluation_Workshop_Report.pdf.

- Another set of recommendations were for Energy Trust to (1) check-in with participants post-SEM engagement to document non-routine events, such as facility changes (given that 80 percent of interviewed participants reported changes to their facilities), and (2) require participants to provide data post-SEM engagement (given that only 30 percent of interviewed participants were able to provide updated data). Energy Trust program and evaluation staff understand the value of post-SEM engagement data and are discussing options for how to engage customers after an SEM engagement.

While the evaluator was not able to use the models to estimate energy savings rates over time for the reasons described above, the evaluator reviewed participants' opportunity registers and interviewed 36 of the 46 participants to determine which activities were still in place, to identify any activities that had been added to their opportunity registers since the SEM engagement, and to gather feedback on participants' experiences with SEM. Of the 80 activities the evaluator asked about, 89 percent were still in place at the time of the interview (which took place between two and six years after participants' SEM engagements).

- The evaluator recommended that Energy Trust proactively follow-up with SEM participants regarding activities listed in their opportunity registers to facilitate implementation. Starting in 2015, Energy Trust program staff have emphasized in custom program delivery contractor account manager trainings that the opportunity registers should be leveraged when working with sites.

Based in part on the finding that of the 80 activities the evaluator asked about, 89 percent were still in place, the evaluator concluded that SEM activities persisted, at least among interviewed participants. Energy Trust evaluation staff feel that this finding lends support to the three-year measure life used for SEM, and are planning to conduct a more comprehensive study to estimate the measure life for industrial operations and maintenance measures; this study is slated to be complete later in 2019.

In addition to the measure life research described above, additional research is being performed as part of the 2018 Production Efficiency process evaluation. In the SEM evaluation, 89 percent of interviewed participants said they were more likely to conduct energy efficiency projects following their SEM engagement; the research will quantitatively assess the extent to which SEM is related to increased numbers of capital projects or increased savings.

Overall, although data issues limited the evaluator's ability to achieve the original goals of the evaluation, the evaluation findings have resulted in changes to program processes regarding documentation (which will be helpful in future evaluations) and gathered useful information about SEM participants' energy and energy efficiency policies and practices.

Introduction

Background

Through the Production Efficiency (PE) program, Energy Trust of Oregon (Energy Trust) offers strategic energy management (SEM) training and support to industrial utility customers. The facilities where SEM engagements occur include buildings with refrigerated storage and processing, product, equipment, and medicine manufacturing, and lumber product production operations. They are facilities that require large amounts of energy to operate, with energy and facility managers overseeing equipment and systems operations. Identifying opportunities for energy savings in these facilities is not only an important part of energy efficiency in the region, it is also important to the companies that operate them as a means for cost savings.

SEM differs from traditional energy efficiency programs by focusing on holistic strategies that extend beyond replacing or upgrading inefficient equipment. Energy Trust provides program energy management consulting services that educate and train industrial energy users to: (1) develop and execute an energy planning strategy; and (2) integrate energy management into their business planning and practices. Participants must work with Energy Trust for one year and have commitment from top management as well as staff resources to implement the opportunities identified. After the first engagement, participants can renew their participation for another engagement.[2]

Energy Trust started offering SEM through the PE program in 2009. Since its inception, SEM participation grew from five participants in the first year to 121 participants by 2013, and customers participated for between one and three years. Energy Trust has offered various types of energy management engagements:[3]

- Industrial Energy Improvement (IEI): cohort approach to deliver training on continuous improvement to energy management with monthly trainings and individual on-site instruction
- Industrial Energy Improvement Maintenance (IEI-m): one-on-one engagement focused on one or more elements of IEI that was not successfully integrated during the initial IEI engagement
- CORE Improvement: similar to IEI but focused on small and medium industrial firms[4]

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[2] This was the design of Energy Trust's SEM program from 2009 through 2012 and beyond. In 2016, Energy Trust developed Continuous SEM to deliver ongoing support to industrial customers who want to continue to expand their capabilities and capacity to manage energy through SEM.

[3] McRae, Marjorie and Gardels, A. (2013) "Final Report Production Efficiency Evaluation." https://www.energytrust.org/wp-content/uploads/2016/12/PE_ProcessEvalReport_042213.pdf

[4] We excluded CORE engagements from this evaluation due to an extensive, separate evaluation effort of the CORE pilot.

- Corporate Strategic Energy Management (cSEM): one-on-one on-site approach to continuous energy improvement trainings to executives and energy champions
- Kaizen Blitz: multi-day, team-based intensive on-site effort to identify issues and develop recommendations for either immediate or near future implementation[5]
- ISO 50001: incentives and technical support to pursue training and accreditation for internationally recognized ISO 50001 accreditation—requirements include establishing, implementing, maintaining, and improving an energy management system, in order to follow systematic approaches to continual improvement of energy performance
- Refrigeration Operator Coaching (ROC): cohort approach that combines workshops with on-site technical support and coaching to implement system retro-commissioning, strategic energy management inspired reporting, policies, and procedure improvements[6]
- Strategic Energy Management Maintenance (SEM-m): one-on-one engagement focused on one or more element of SEM that was not fully integrated during initial SEM (any type) engagement

Energy Trust's focus was on participants that completed IEI, IEI-m, SEM-m, cSEM, and ROC engagements between 2009 and 2013, so we omitted participants that had only completed Kaizen Blitz, CORE, and ISO 50001 engagements from the study population. The Population and Sample Overview section of this report provides a summary of SEM participation with details on the distribution of projects according to the type of SEM and length of engagement.

Evaluation Goals and Objectives

The overarching objectives of this evaluation were to determine the prevalence of SEM activities, data requirements and availability for evaluation, and properties of monitoring, targeting, and reporting (MT&R) tools used between 2009 and 2013. Energy Trust was interested in the distribution of SEM activities across all participants and whether they differed between single and multi-engagement participants. It wanted to catalogue the type of data available for each participant, typical energy use frequency, and how complete and correct the data were. Energy Trust was interested in regression model specifications and how similar or different they were across participants. It was also interested in determining savings rates and, particularly, changes in savings rates over time after program participation. However, savings rates could only be evaluated for a small subset of the participants and no time trends could be evaluated due to the quality of data, reporting, and inconsistencies between monitoring, target, and reporting (MT&R) tools and MT&R reports. The research questions are listed

[5] Crossman, Kim and Brown, D. (2009) "Energy Trust of Oregon Kaizen Blitz Pilot Program." ACEEE conference abstract. https://aceee.org/files/proceedings/2009/data/papers/3_84.pdf

[6] Batmale, JP, Crumrine, B., and Huth, K. (2013) "Energy Trust of Oregon's Refrigeration Operator Coaching: Harvesting Energy Savings from Peer-based Learning and Technical Support" ACEEE conference paper. https://aceee.org/files/proceedings/2013/data/papers/4_084.pdf

Table 3. We note specific reasons why some research questions could not be addressed in this evaluation.

Table 3. Research Questions

Research Question	Evaluated?	Reason Not Evaluated
SEM Activity Prevalence		
What is the distribution of SEM activities across program participants? (How many program participants implemented the minimum SEM activities as defined by the CEE and, where applicable, to what extent?)	Yes	--
Does the prevalence of SEM activities differ between single-engagement and multi-engagement participants?	Yes	
SEM Annual Energy Savings Rates and Savings Trajectories		
What is the average annual energy savings rate at participant sites in a single program engagement?	No	There were not enough evaluable regression models and data for participants in the sample to evaluate savings trajectories or to generalize results to the population.
What are the savings trajectories (annual savings rates as a function of time) in the engagements following initial program participation?	No	
Do the savings trajectories differ between single-engagement participants and multi-engagement participants?	No	
Are there correlations between savings rates or savings trajectories and the prevalence of certain types of SEM activities? (Are higher savings trajectories correlated with the prevalence of certain SEM activities other than those that directly produce savings, such as regular energy team meetings?)	No	
Are there correlations between savings rates or savings trajectories and other participant characteristics? (Are savings trajectories higher in facilities with energy management information systems?)	No	
Can savings rates and savings trajectories be estimated using a single regression model with predictor variables generalized across sites? What are the limitations and requirements of this type of meta-analysis?	No	
Data Requirements and Availability		
What types of data are available for each participant and facility during and after their participation (such as consumption data and production data)?	Yes	--
At what frequency are data available?	Yes	
Are the program data and project files available, complete, reliable, and consistent for each site?	Yes	
How do energy savings estimates differ between data-rich and data-poor participants? (What effect does missing or less frequent data have on the accuracy and precision of estimated savings?)	Limited	There were not enough evaluable participant regression models in the sample to generalize results to the population.
To what degree does the data collected through site visits improve regression modeling results and savings trajectory estimates? Which data from the site visits are most useful?	Limited	
What is the minimum level of data required for evaluation?	Yes	--
Monitoring, Targeting, and Reporting Models		
What are the most common model specifications used by the SEM implementation team in their MT&R models?	Yes	--
What are the most common adjustments Cadmus makes to the implementer models for evaluation purposes?	Limited	

Research Question	Evaluated?	Reason Not Evaluated
Are there opportunities for the SEM implementation team to adjust MT&R models that would result in better savings estimates and efficiency gains in evaluation activities?	Limited	There were not enough evaluable participant regression models in the sample to generalize results to the population.

Evaluation Methodology

Cadmus developed the methodology for evaluating SEM engagements as part of the 2012 2012 PE impact evaluation. The 2012 PE Impact Evaluation was focused on evaluating projects implemented in 2012, which included SEM projects. After sampling 2012 projects for the 2012 PE impact evaluation, Energy Trust decided to focus on SEM projects more broadly, including engagements in all years of the program. Cadmus built from the PE evaluation methodology to include additional program years for this evaluation. The expanded scope of work included:

- Developing a sampling plan for the population of SEM engagements
- Assessing SEM activities captured in sampled participants' opportunity registers
- Evaluating energy savings at sampled participant facilities
- Interviewing sampled participants
- Assessing SEM adoption

Sampling

Cadmus sampled participants from the population of participants for this evaluation. We focused on participants with IEI, IEI-m, SEM-m, cSEM, and ROC engagements between 2009 and 2013. None of these types of engagements occurred during 2009, so the population included projects in 2010 through 2013 only. Also, due to multi-engagement participation, the final evaluation sample included one CORE, one Kaizen Blitz, and one ISO 50001 engagement as well. We stratified the population according to SEM type and year of engagement.

Data Review

Cadmus requested data from Energy Trust's project tracking database that included the population of 2009 to 2014 SEM participants. We used addresses to identify unique population units, or participants, and a variable labeled "year concluded" to determine which year the participant participated in. Cadmus removed participants who had only completed Kaizen Blitz, ISO 50001, eVSM, and CORE projects and participants who had only participated in 2014 from the population for this evaluation because these engagements were not a priority for Energy Trust. We reviewed the population data, then developed a sample design.

Cadmus examined the distribution of projects to determine the prevalence of each type of SEM engagement and in which years the engagements occurred; these were key variables of interest because we intended to examine savings rates by type of engagements over time. We also examined the number of engagements for each participant and the number of projects that reported natural gas and electric savings. We got information about project status, year concluded, and SEM type from Energy Trust's project tracking database.

Table 4 summarizes the number of unique participants in the final population. The final population, excluding the SEM types listed above, included 73 unique participants (some of these participants had

multiple engagements). All 2009 SEM projects were removed from the population as a result of removing the SEM types listed above.

Table 4. Sample Frame

Filter	Number of Unique Participants
Original Energy Trust project tracking	121
Removed because year concluded was 2014 or blank	27
Removed because SEM engagement type was Kaizen Blitz, ISO 50001, eVSM, or CORE	29
Final population size*	**73**

*Total row is not the sum of rows above because one participant could be removed due to both filters.

Sample Design

Cadmus determined the total sample size and allocated it to SEM type and year strata proportionally to the number of projects that occurred in each stratum in the population. Prior to determining the sample sizes for this evaluation, Cadmus considered the types of SEM projects previously sampled as part of the 2012 2012 PE impact evaluation. Cadmus compared the distribution of projects across strata in the PE sample to the population. When the PE sample provided sufficient coverage of SEM types and years, then we did not allocate additional sample points to those strata. The final sample size was 46 participants.[7] Cadmus sample size calculations are detailed in a memo submitted to Energy Trust.[8]

SEM Activity Assessment

Energy Trust provided participants' opportunity registers to assess SEM activities. We assigned the activities listed in each participant's opportunity register to one of the following categories:

- Behavioral
- Blowers
- Boilers
- Compressed Air
- HVAC
- Lighting
- Miscellaneous
- Ovens
- Plug load
- Process
- Pumps
- Refrigeration
- Could not be identified

We selected a subset of activities to verify during the interview and also verified activities based on completion status or dates included in the opportunity register. Some participants verified additional activities during the interview and some provided updated opportunity registers after the interview—we used both to update the completion status and verification. Cadmus used these activities,

[7] The original target sample size was 45 participants. However, one participant was added to the 2012 PE Impact Evaluation that had participated in SEM, and so was included in the SEM evaluation, resulting in a total sample size of 46 participants.

[8] Ochsner, Heidi and Huckett, J. (2015) "Energy Trust SEM Impact Evaluation Tasks 1 and 2: Population Characterization and Sampling." Memo delivered to Energy Trust.

summarized in the SEM Activity Assessment section, to answer the research questions about the distribution of SEM activities and whether the prevalence of SEM activities differs between single-engagement and multi-engagement participants.

Energy Savings Evaluation

The typical timeline of an SEM engagement starts with a baseline period, defined as the 12 months prior to the SEM engagement, which should be free of SEM activities. It is followed by the performance period, defined as the 12 months following the start of SEM engagement and including SEM activities. Implementers tend to estimate the reported savings based on a measurement period; that is, a period of time at the end of the performance period.

Evaluability Assessment

Energy Trust provided MT&R workbooks and final MT&R reports for the energy savings evaluation. The workbooks contain energy consumption and facility production data, implementer models, and estimated savings. The MT&R reports contain the implementer's description of the SEM engagement, regression models, and reported savings estimates.

We reviewed the MT&R workbooks and reports to assess data quality, completeness, and adequacy for evaluating savings. We developed a set of criteria to determine whether the data and regression model, and hence energy savings, were evaluable for each participant. We frequently found that data and regression models in the MT&R workbooks did not match the reported models and savings estimates in the MT&R reports. We found out that, as of 2013, Energy Trust did not require implementers to submit final MT&R workbooks, although it did require them to submit final MT&R reports. In cases where the data in the workbooks could not be used to replicate the model and results in the reports, we concluded that we had not received the most up to date data and that important information could be missing—i.e., that if we used the data in the workbook to evaluate savings, we would not be confident that the results would be accurate. Further, any realization rate calculation would be suspect because we would not be certain that we were comparing two values derived from the same (or at least similar) data sets.

Table 5 shows the criteria that must be met for participant's regression models and data to be considered evaluable. Participants had to have remained engaged in the program throughout the expected engagement period. We did initial data checks to confirm that the MT&R report included the baseline regression model specification, and that the MT&R workbook included data for all variables in the reported baseline regression model as well as data for at least 12 months in the baseline period and at least 12 months in the performance period. We reviewed the dates reported for the baseline and performance periods to confirm that they did not overlap.

Table 5. Evaluability Criteria

Regression Model and Data Requirements
Participants remained engaged in the program throughout the expected engagement period
The MT&R report included the baseline regression model
The MT&R workbook included data for all variables in the baseline regression model
The MT&R workbook included data for 12 months in the baseline period
The MT&R workbook included data for 12 months in the performance period
The baseline period and performance period did not overlap
Calculated facility energy savings (using data in the MT&R workbook and the model specified in the MT&R report) were equal to reported facility energy savings

Cadmus assessed the evaluability of each site's MT&R workbook and model based on the data provided in the MT&R workbook and the MT&R regression model specification (as reported in the MT&R report). We used the MT&R model specification (independent variables and reported regression estimates) and measurement period data to calculate expected energy use absent SEM during the measurement period and then extrapolated it to the entire performance period to estimate facility energy savings. In this step, we did not verify the MT&R model coefficients by re-fitting the regression, but only verified that the reported model and measurement period data produced savings estimates that were the same as in the MT&R report. If they were different, and we could not identify or reconcile the differences, we concluded that data in the workbook not the final version used to estimate reported savings and categorized the data and model as not evaluable.

If the reported and calculated savings estimates matched, we went on to verify the model specification itself, by re-fitting the baseline model using baseline data in the MT&R workbook (where we used the same independent variables as in the reported model). We compared the resulting regression coefficients to the reported coefficients and categorized the data and model as evaluable if reported and calculated regression coefficients were the same or not evaluable if different. Using these criteria, we found that the regression model(s) and data were evaluable for eight participants with electric savings and six participants with gas savings, for a total of 12 unique participants (26% of the 46 sampled participants)—some participants had multiple regression models and both electric and gas savings).

The Evaluability Assessment Results section provides a comprehensive summary of results of the evaluability assessment. Appendix I. Participant-Specific Reports (Confidential) provides participant-specific evaluability details. We used the evaluability assessment to answer research questions on data requirements and availability.

Regression Analysis

The analysis sample included very few participants with evaluable data and models—eight participants with evaluable electric savings and six with evaluable natural gas savings. Therefore, the regression and savings results could not be generalized to the population and we provide the regression methodology and results in Appendix G. Regression Analysis and Evaluated Savings.

Site Visits

Cadmus conducted site visits with 20 participants to understand how they manage energy and to verify strategic energy management practices including operations and maintenance (O&M) and behavioral activities. During the site visits, we conducted walkthroughs of the facilities to acquire contextual information (nameplate information, operating hours, operating temperature, production data, etc.) to verify savings calculations for capital measures.

Cadmus used the data we collected during site visits primarily to verify 2012 and 2013 capital projects as part of the 2012 PE impact evaluation—we focused on projects implemented in 2012 and 2013 to maximize the overlap of efforts between evaluations. After verifying the capital project savings, we subtracted the verified capital savings from the facility savings to estimate evaluated SEM savings. Cadmus used the methodology described in the Interviews and SEM Adoption Assessment section to recruit participants for site visits and interviews. We used the methodology described in the 2012 PE Impact Evaluation report for on-site data collection and capital measure engineering analyses.[9] The confidential site report appendix of that report includes the details of each site visit and subsequent analysis. When applicable, we included the capital measure savings in Appendix I. Participant-Specific Reports (Confidential). Otherwise, they are included in a confidential appendix to the 2012 PE Impact Evaluation report.

During some site visits, Cadmus verified SEM activities in participants' opportunity registers. We included these results, along with the interview results, as part of the SEM activity assessment.

Interviews and SEM Adoption Assessment

Cadmus conducted interviews with staff from 36 of the 46 sampled participants, including facility operators, members of the Energy Team, and Energy Champions, between June and October 2015. A primary goal of the interviews was to assess persistence of energy management activities since the SEM engagements. We also asked about the timing and nature of any substantial changes to systems or practices over time, to understand what equipment was impacted, how it was impacted, whether the changes are still in effect, or if not, how long they lasted. The interviews involved discussing and updating the participants' opportunity registers.

The primary objectives of the interviews were to schedule site visits as necessary and collect data on the following topics:

- SEM adoption
- Distribution of SEM activity types
- Persistence of energy management activities

[9] Cropp, Jeff and J. Huckett. 2018. *2012 Energy Trust of Oregon Production Efficiency Impact Evaluation Report*. https://www.energytrust.org/wp-content/uploads/2018/02/2012-Energy-Trust-PE-Impact-EvaluationSR.pdf

- Successes and challenges with SEM
- Facility energy consumption and production

Data Review

Cadmus developed the interview guide in coordination with the Energy Trust evaluation team and program staff. To prepare the interview guide, we reviewed and incorporated questions about the CEE SEM minimum elements[10] to help assess the level of SEM adoption among the SEM participant population. We also collected information about each participant's energy savings activities as reported in the MT&R reports and opportunity registers. We catalogued SEM activities that were reported as having been completed during the SEM engagement and attempted to verify their completion by including interview questions about specific activities. We reviewed the opportunity registers and MT&R reports to collect this information, but ultimately compiled the list of completed activities based on information in the MT&R reports. In many opportunity registers, the status of individual activities (such as planned, in progress, or complete) was unclear due to missing data or discrepancies between recorded completion dates and completion status fields. The opportunity registers also included activities that were recorded as having been completed prior to the SEM engagement—asking about these activities was outside of the scope of this study.[11]

Because the list of activities was extensive for most participants, including all activities in the interview was not feasible due to time constraints. Additionally, participants had been engaged in SEM anywhere from two to six years prior to the interview, and we were concerned that interview respondents would not remember all the SEM activities. We selected activities that participants would most likely recall, including those with large savings or ongoing behavioral activities that might have been continued since the SEM engagement. We did not select activities that we knew would be included in the SEM adoption portion of the interview, such as establishing an energy team, and also excluded one-time events that happened several years prior, such as various employee awareness campaigns. We identified a maximum of five activities to ask participants about during the interviews. Although this non-random selection of activities could introduce bias, we recommended it in place of random sampling to ensure that the participant conversations were productive.

Interviews

The interviews took place in 2015, two to six years after participants had been engaged in the program. Cadmus attempted to reach every sampled program participant for an interview. We relied on contact information in the MT&R reports and program tracking data, as well as from program delivery contractors and Energy Trust program staff. Cadmus called or emailed customers to schedule the interviews and site visits (for participants who had also been selected for a site visit as part of the PE

[10] Consortium for Energy Efficiency. February 11, 2014. "CEE Strategic Energy Management Minimum Elements." http://library.cee1.org/sites/default/files/library/11283/SEM_Minimum_Elements.pdf

[11] Energy Trust's program manager indicated that it is not uncommon for participants to get excited at the recruitment and enrollment stage and start making changes prior to engagement start.

evaluation). We attempted to interview the energy champion or someone familiar with the SEM program or with energy management efforts.

Cadmus conducted most interviews over the phone but performed two on-site interviews during site visits. Cadmus used the interview guide, included in Appendix H. Interview Guide during the conversation but encouraged participants to discuss open-ended questions to the extent that they were willing and able. We used an Excel version of the interview guide for data collection.

SEM Adoption Assessment

We defined SEM adoption in accordance with the CEE minimum element definitions:

- ***Customer commitment:*** requires that senior management at participant sites develop and communicate energy reduction goals and allocate resources for goal attainment
- ***Planning and implementation:*** requires that an energy champion or team assess energy management, develop an energy map, establish metrics and goals, track planned and completed energy savings actions, engage employees, implement planned actions, and periodically review goals, metrics, planning, and progress
- ***Systems for measuring and reporting:*** requires regular data collection of energy consumption and other relevant variables, analysis, and reporting

Each of these elements is comprised of one or more sub-elements.

Cadmus assigned SEM adoption scores to each element and its sub-elements based on data collected during interviews. We developed an algorithm to map interview questions and responses to CEE minimum element requirements for each element and its sub-elements. Using this algorithm, we characterized each participant's SEM adoption level of each sub-element as either *full*, *some*, or *none* then aggregated these to the element level. Participants who implemented all the sub-elements received a SEM adoption score of *full* in the element category, while participants who implemented a subset of sub-elements received a score of *some* and participants who did not implement any sub-elements received a score of *none*. This algorithm is detailed in Appendix C. SEM Adoption Scoring Algorithm. We aggregated scores across participants to assess SEM adoption for the program.

It is important to note that the CEE minimum elements were published in 2014, after the SEM engagements assessed in this evaluation. These Energy Trust SEM engagements were not designed under the guidance of the CEE minimum elements and there were no requirements for participants to meet a defined version of SEM. The program provided milestone incentives to encourage that participants complete certain SEM activities during the engagement period. However, there were no metrics in place to measure the extent to which participants implemented SEM activities, beyond measuring savings.

Results

The results are organized into the following sections:

- Population and Sample Overview: contains a summary of the population of SEM participants, as well as the sample of SEM participants selected for this evaluation
- Interviews: contains key findings from the interviews conducted with SEM participants
- SEM Adoption: contains a summary of the analysis of SEM adoption
- SEM Savings: contains a summary of the evaluability assessment, and findings from the energy savings analysis (for the subset of SEM participants determined to be "evaluable")

In the next section, we use these results to answer the research questions outlined in the Introduction section.

Population and Sample Overview

SEM Engagements

Table 6 provides an overview of the population of participants by SEM type and year. Table 7 provides the same summary for sampled participants. IEI and ROC engagement types were the most frequent in the population and in the sample. Maintenance engagements (IEI-m or SEM-m) made up almost 15% of the population, suggesting 15% of participants found prioritized completing projects and activities that remained after their original engagement and determined that program engagement was the best way to accomplish that.

Table 6. Number of Participants in Population

SEM Type*	2010	2011	2012	2013	Total**
cSEM	0	0	1	7	8
IEI/SEM	19	10	6	12	47
IEI-m/SEM-m	0	0	6	2	8
ROC	0	5	4	7	16
Total**	**19**	**15**	**15**	**28**	**73**

* Although participants who only engaged in SEM through ISO 50001 and Kaizen Blitz were removed from the population, one participant that was sampled based on their IEI engagement also participated in ISO 50001 and one participant sampled based on their ROC engagement also participated in Kaizen Blitz. These participants are represented in this table as IEI and ROC participants.

** The column and row totals are the number of unique participants and do not sum to the overall total because some were multi-engagement participants (participated in more than one year and more than one SEM type).

Table 7. Number of Participants in Sample

SEM Type	2010	2011	2012	2013	Total**
cSEM	0	0	1	4	5
IEI/SEM	14	8	6	7	34
IEI-m/SEM-m	0	0	6	2	8
ROC	1	2	2	3	6
ISO 50001*	0	0	0	1	1
Kaizen Blitz*	1	0	0	0	1
Total**	**16**	**10**	**15**	**17**	**46**

* One participant was selected as a 2011 IEI participant who also participated in ISO 50001 in 2013; one participant was selected as a 2013 ROC participant who also participated in Kaizen Blitz in 2010. These participants are represented in this table as participants of all four engagement types.

** The column and row totals are the number of unique participants and do not sum to the overall total because some were multi-engagement participants (participated in more than one year and more than one SEM type).

Data Availability

Based on our review of the project files for each of the sampled participants, we compiled a participant data summary to determine if there were trends in participant data availability depending on the SEM engagement type and SEM year. Table 8 and Table 9 provide a summary of data availability. We provide the participant sample sizes in each SEM year and SEM type and the percent of participants in each category with whom we conducted an interview and/or site visit with. We provide the percent of customers with opportunity registers, MT&R reports, and MT&R workbooks—the percentages in these three columns do not reflect the quality of that data but only that the data were available.

These summaries show that there were no correlations between SEM year and the percentage of participants that completed an interview or site visit or for whom MT&R reports and workbooks were available. Opportunity registers were available for higher proportions of participants with recent engagements (2012 and 2013) than less recent engagements (2010 and 2011). Evaluability of data and regression models was correlated with SEM year—participants with more recent engagements tended to have evaluable data and models more often than those with less recent engagements. This also implies that the data quality in the MT&R reports and workbooks was higher for participants with more recent engagements. Evaluability was not correlated with SEM type (sample sizes were less than ten within each SEM type, so even though some categories had high evaluability percentages, we determined that the results were inconclusive). Requirements that participants deliver final versions of MT&R workbooks with MT&R reports and that models in the MT&R reports can be replicated using the data in the MT&R workbooks would likely increase the evaluability of savings and persistence in future evaluations.

Table 8. Participant Data Summary by SEM Year

SEM Year	Participant Sample Size*	Interview	Site Visit	Opportunity Register	MT&R Report	MT&R Workbook	Evaluable
2010	16	88%	38%	88%	94%	88%	6%
2011	10	70%	20%	60%	100%	100%	10%
2012	15	73%	67%	93%	100%	93%	20%
2013	15	80%	47%	93%	100%	100%	67%
Overall	**46**	**76%**	**43%**	**83%**	**98%**	**96%**	**26%**

*Sample sizes do not sum to total row because some participants were multi-engagement participants (participated in more than one year and more than one SEM type).

Table 9. Participant Data Summary by SEM Type

SEM Type	Participant Sample Size*	Interview	Site Visit	Opportunity Register	MT&R Report	MT&R Workbook	Evaluable
cSEM	5	100%	40%	100%	100%	100%	80%
IEI/SEM	34	79%	47%	76%	97%	94%	21%
IEI-m/SEM-m	6	83%	50%	100%	100%	83%	17%
ROC	6	57%	29%	100%	100%	100%	14%
ISO 50001**	1	100%	0%	100%	100%	100%	100%
Kaizen Blitz**	1	100%	0%	100%	100%	100%	0%
Overall	**46**	**76%**	**43%**	**83%**	**98%**	**96%**	**26%**

*Sample sizes do not sum to total row because some participants were multi-engagement participants (participated in more than one year and more than one SEM type).

** One participant was selected as a 2011 IEI participant who also participated in ISO 50001 in 2013; one participant was selected as a 2013 ROC participant who also participated in Kaizen Blitz in 2010. Multi-engagement participants are included multiple times in the table—once for each engagement.

Interview Results

Cadmus interviewed 36 of the 46 sampled participants, resulting in a 78% response rate. We were unable to reach nine after 10 or more attempts; one company was no longer a company at the time of the interviews. Two companies had multiple facilities with the same contact, so we interviewed one representative and asked about each facility. Table 10 shows the sample frame and interview disposition after this effort. None of the participants that we were able to reach refused to participate in an interview.

Table 10. Interview Disposition

Description	Total	2012 PE Impact Evaluation Sample	SEM Evaluation Sample
Completed interview	36	19	17
No longer a company	1	1	0
No answer, answering machine, or not available	9	6	3
Evaluation Sample	**46**	**26**	**20**

Cadmus prepared detailed results for every interview question, shown in Appendix D. SEM Adoption and Interview Analysis. In addition, we used these interviews to support the impact analysis in several ways:

- Provide context for results obtained via regression analysis
- Make adjustments for regression analysis
- If regression analysis was not feasible, used information from interviews and site visits to qualitatively assess savings

We reviewed the length of participation and type of engagement for the interview respondents and non-respondents to look for any significant differences between the two groups. Table 11 shows the length of participation and type of SEM engagement for the overall population, the sample, the interview respondents, and non-respondents. There are no significant differences in length of participation or type of engagement between the respondents and non-respondents. The respondents are representative of the population, which included a larger proportion of multi-engagement participants than the population because one objective was to compare multi-engagement participants to single-engagement participants. Lastly, IEI participants made up the largest percentage of the population, the sample, and the interview respondents.

Table 11. Interview Respondent Characteristics

SEM Type	Overall Population (n=73)	Sample (n=46)	Respondents (n=36)	Non-respondents (n=10)
Length of Participation				
Multi-engagement participant	7%	28%	31%	22%
Single-engagement participant	93%	72%	69%	78%
SEM Engagement Type				
IEI	57%	72%	72%	67%
ROC	19%	17%	14%	33%
IEI-m	7%	15%	14%	22%
Other	17%	25%	33%	0%

Respondent Profile

Cadmus interviewed 36 participants and spoke with the person most familiar with their SEM engagements. Over half of respondents (58%; 21 of 36) described their role in their company's SEM program as energy champion or energy manager, 22% described themselves as an energy team

member, 6% said they were the sponsor, and 14% said they currently have no role because their company is not currently implementing SEM at the facility. Most respondents (58%) have had their current role for five years or less.

Energy Plans and Savings

A large majority of respondents (89%; 32 of 36) said they have a policy or plan that incorporates energy efficiency, while 69% said they have set goals related to energy or energy efficiency. Two-thirds of respondents (67%; 24 of 36) said they have maintained the energy savings they achieved during their participation in SEM.

Resources

Over two-thirds of the participants (69%; 25 of 36) reported having a staff member who was in charge of coordinating energy management. Sixty percent of current energy management coordinators (15 of 25) coordinated energy management during SEM engagement. This suggests some continuity within the role of energy champion/manager and that institutional knowledge about SEM activities will remain and possibly lead to continued energy savings due to lessons learned in implementing SEM.

Over half the respondents had an energy team, but of those, 21% (5 of 24) said the team consisted of one person. For the purposes of this analysis, Cadmus did not consider participants with a single member "team" as having an energy management team.

Most respondents said their management was supportive of energy management practices (67%; 24 of 36) and said that the top five influencers[12] are cost savings (67%; 24 of 36), followed by environmental responsibility (11%), public opinion (8%), business culture (8%), and process improvements (6%).

A large majority of respondents (81%; 29 of 36) said they conducted employee engagement activities as part of SEM engagement and 72% of these facilities (21 of 29) plan to continue conducting employee engagement activities.

Energy Management Tools

Cadmus asked respondents to answer several questions about the current use of tools to manage energy use at their organizations. Eighty-six percent of participants (31 of 36) said they use the opportunity register or some other tool to identify and track potential projects. Sixty-seven percent (24 of 36) use the MT&R workbook or some other tool to track energy use. Sixty-one percent (22 of 36) continue to use the energy map, compared to only 19% (seven of 36) who had used the energy management assessment since their SEM engagement.

Respondents said the most common reason they had not used the energy management assessment is because they were not aware of it (31%; nine of 29). Ten of the 29 respondents who had not used the

[12] Respondents provided multiple responses to this question.

energy management assessment since their SEM engagement did not currently have an energy manager or champion, and 10 had a different energy manager or champion since their SEM engagement.

Facility Changes

Cadmus asked whether there had been any changes to the facility, operating hours or schedules, production levels, or product lines since the participants' SEM engagements. Almost 80% (22 of 28) of participants reported at least one change to their facility. The results are summarized in Table 12, below. The vast majority of participants reported changes to their facility since the SEM engagements.

Table 12. Facility Change Summary

Change	Multi-engagement	Single-engagement	Total
Change to facility	75%	80%	79%
Change to operating hours or schedules	17%	67%	54%
Change to production levels	89%	71%	77%
Change to product line	57%	40%	44%

Source: Interview questions I3a, I4, I5, and I6. "Since participating in SEM in [year], have there been any changes to the facility?" (n=28), "Since participating in SEM in [year], has there been any change in operating hours/schedules?" (n=24), "Has there been any change in production levels since implementing SEM in [year]?" (n=26), and "Since participating in SEM in [year], have you changed the product line or added any different products to your production facility?" (n=27)
Don't know, refused, and not applicable responses were removed.

Persistence

The interview findings suggest that SEM leads to persistence of energy management activities. Cadmus asked about a selection of implemented or completed activities included in the opportunity register, and MT&R reports. Because we interviewed participants several years after these activities were completed and to improve the likelihood they would remember them, we selected activities that would be easily recognizable or may have had a large impact on the savings (see the Evaluation Methodology section for more information). Of the 116 activities Cadmus identified for verification, we were able to ask about 80 activities during the interviews. Of those, respondents indicated that 71 remained in place or were continued (89%), three had been removed, and two had not been completed but were still planned. The respondents did not know the status of two activities. The most common types of activities we asked about were shutting down equipment (21%; 17 of 80 activities), detecting and repairing air leaks (16%; 13 of 80 activities), and adding or modifying controls, sensors, or timers (11%; nine of 80 activities).

We asked 29 participants about activities in their opportunity registers—these results represent activities where we were able to speak directly with the participant about the status during the interview. Six of the remaining seven participants did not have activities listed in their opportunity registers or did not have opportunity registers at all; one of the participants declined to answer. We provide a detailed list of the activities selected to be verified in Appendix E. SEM Activities Verified During Interviews. These results represent a subset of the results summarized in the SEM Activity Assessment below.

We also asked if respondents had added new projects to their opportunity registers. Two-thirds of respondents (67%; 24 of 36) reported that they had added projects to their list of potential opportunities since they participated in SEM.

Challenges to Participating in SEM

Respondents indicated that the most common challenges to participating in SEM were time constraints, commitment from staff or management, and budgetary issues. Respondents who indicated that time was a challenge said that finding the time to get the energy team together was a concern, finding time to implement new projects was challenging, and finding time for staff to focus on energy management was difficult (since it was not a primary part of their job).

Although time constraints and commitment were top challenges, most participants received a SEM adoption score of "*full*" in the customer commitment element (92%; 33 of 36), suggesting that although there are challenges, participants have been able to mitigate these challenges.

Over one-quarter of respondents (27%; nine of 33) said that Energy Trust could continue to provide information about the program and how to continue implementing it. One respondent indicated that they "… do better with a push, so during ETO's [sic] involvement … we have done better." Other companies said it was helpful for Energy Trust to continually stay in contact with them and provide updates about possible opportunities. Another respondent suggested that Energy Trust provide a refresher course targeted at companies who have participated in the past to discuss new ideas and ways to stay focused on energy management.

Future Engagement

Most respondents (89%; 31 of 35) said they were more likely to conduct energy efficiency projects following their SEM engagement, while 11% said the SEM engagement made no difference. This finding is supported by a separate study conducted by Energy Trust and summarized in a paper that was presented at the ACEEE Industrial Summer Study.[13]

Most respondents said that participating in SEM made identifying future energy efficiency projects easier (88%; 28 of 32), while only half (50%; 16 of 32) said that participating in SEM made implementing future energy efficiency projects easier. Respondents said SEM made it easier to identify future projects because it increased awareness, ideas, and creativity.

SEM Adoption Results

Cadmus analyzed the interview responses to understand each participant's level of SEM adoption, as well as SEM adoption across all participants. The findings from this analysis are below. Appendix D. SEM

[13] Harper, Kati. 2015. *The Impact of SEM Programs on Customer Participation.* ACEEE Industrial Summer Study, Buffalo, New York, August 4-6.

Adoption and Interview Analysis contains information about how Cadmus translated interview responses into scores of participants' level of SEM adoption.

Overall SEM Adoption Results

Most interviewed participants had implemented and completed *some* of the three key CEE SEM minimum elements (Customer Commitment, Planning and Implementation, and Monitoring and Reporting) and corresponding sub-elements. Planning and Implementation had no *full* adoption, indicating that Energy Trust could increase encouragement and support of participants in this key element.

Most participants received a score of *full* adoption for Customer Commitment (61%; 22 of 36) and Monitoring and Reporting (64%; 23 of 36), but none received a score of *full* adoption for Planning and Implementation. All Energy Trust SEM participants received an overall SEM adoption score of *some* adoption. These results are summarized in Figure 1. In Figure 2, we provide results separately for single-engagement and multi-engagement participants. More single-engagement participants received a score of *full* adoption in the customer commitment element while more multi-engagement participants received a score of *full* adoption in the monitoring and reporting element. Neither SEM type nor the length of time between participants' engagements and the interview was correlated with SEM adoption score.

Figure 1. Overall SEM Adoption Scores

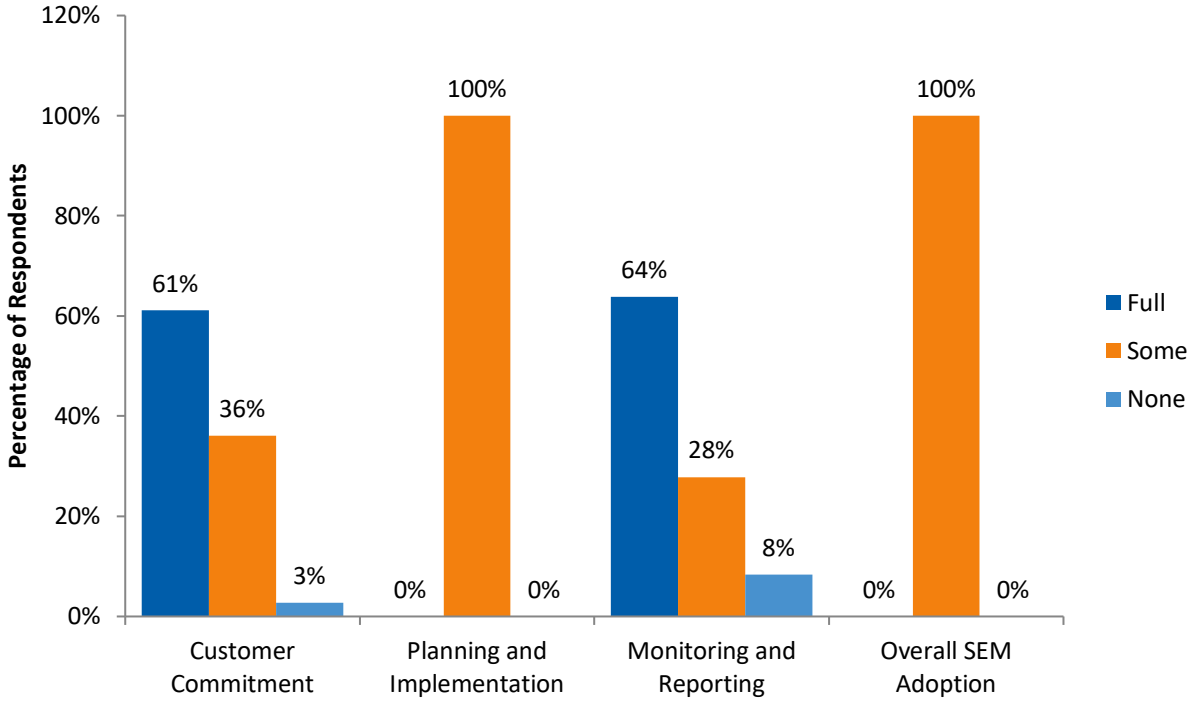
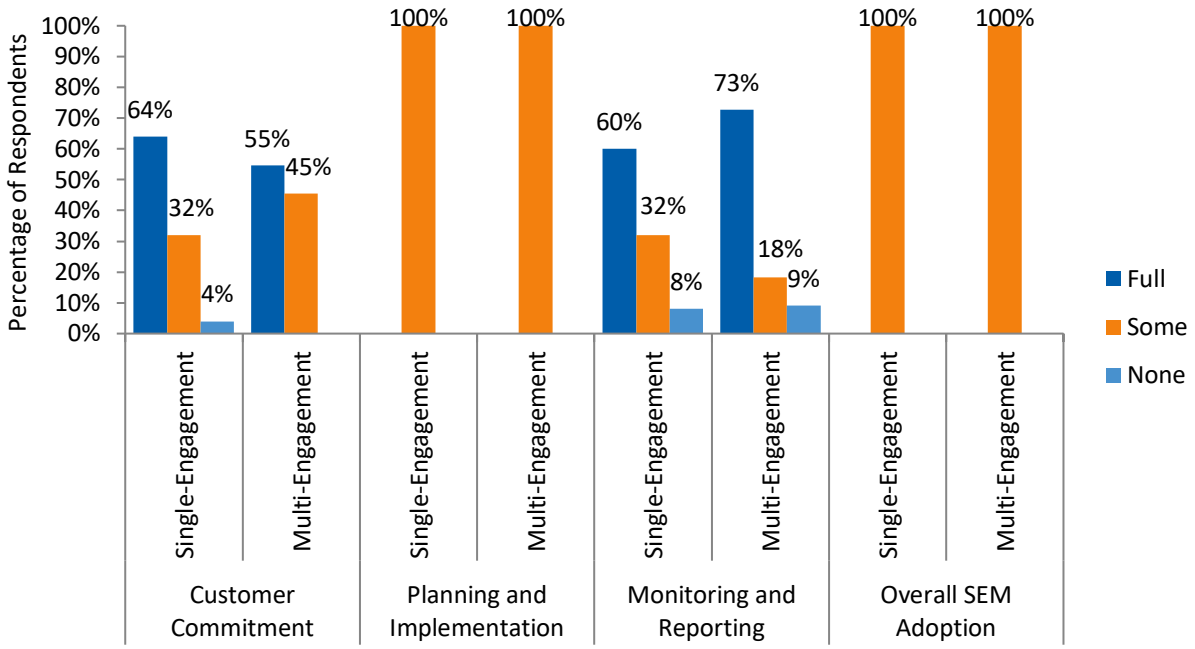


Figure 2. Single and Multi-Engagement SEM Adoption Scores



Participant-Level Summary of SEM Adoption

Table 13 provides SEM adoption results for each participant included in this study. Additional details on regression evaluability are provided in the Evaluability Assessment Results section.

Table 13. Participant Results

ID	SEM Type	SEM Engagement Year(s)	Participant Type	Overall SEM Adoption Level	Customer Commitment	Planning and Implementation	Monitoring and Reporting	Savings and Regression Evaluable
1	IEI, SEM-m	2012, 2013	Multi-engagement	*Some*	*Full*	*Some*	*Some*	No (Electric)
2	cSEM	2012	Single-engagement	*Some*	*Some*	*Some*	*Full*	Yes (Electric and Gas)
3	IEI, IEI-m, SEM-m	2010, 2012, 2013	Multi-engagement	*Some*	*Some*	*Some*	*Full*	No (Electric) Yes (Gas)
4	cSEM	2012	Single-engagement	*Some*	*Full*	*Some*	*Full*	No (Electric and Gas)
5	IEI	2010	Single-engagement	*Some*	*Full*	*Some*	*Some*	No (Electric)
6	IEI	2011	Single-engagement	*Some*	*None*	*Some*	*Some*	No (Electric)
7	IEI	2013	Single-engagement	*Some*	*Full*	*Some*	*Some*	No (Electric) Yes (Gas)
8	ROC	2011	Single-engagement	*Some*	*Full*	*Some*	*Full*	No

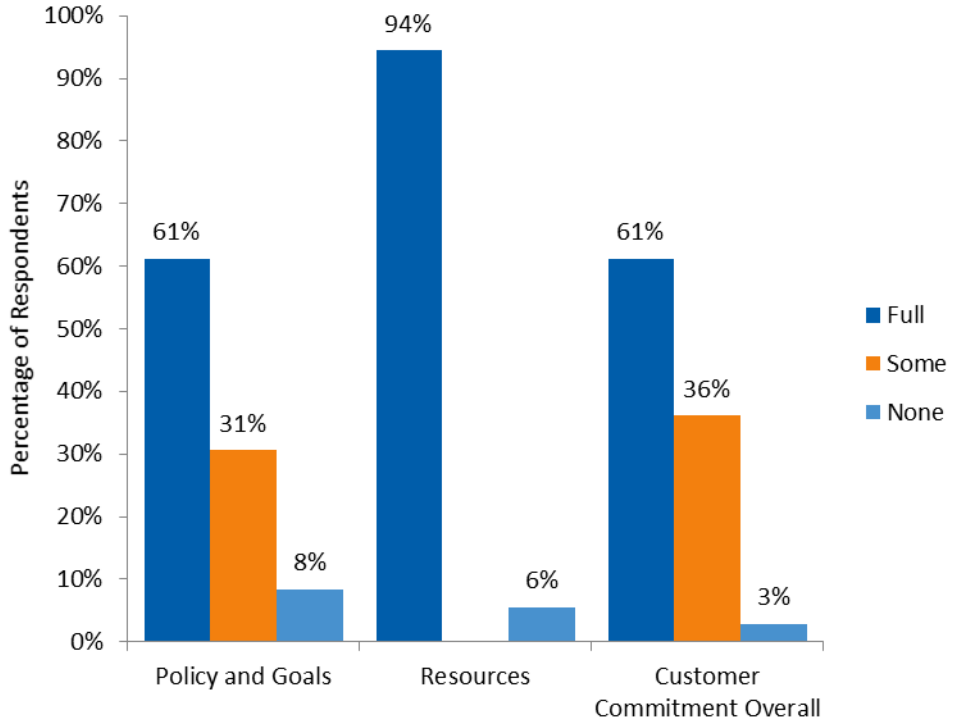
ID	SEM Type	SEM Engagement Year(s)	Participant Type	Overall SEM Adoption Level	Customer Commitment	Planning and Implementation	Monitoring and Reporting	Savings and Regression Evaluable
9	IEI	2010	Single-engagement	*Some*	*Full*	*Some*	*Full*	No
10	IEI	2011	Single-engagement	*Some*	*Full*	*Some*	*Full*	No
11	IEI, ISO 50001	2011, 2012	Multi-engagement	*Some*	*Full*	*Some*	*Full*	Yes (Electric and Gas)
12	IEI	2013	Single-engagement	*Some*	*Full*	*Some*	*Some*	No (Electric) Yes (Gas)
13	c-SEM	2013	Single-engagement	*Some*	*Full*	*Some*	*Full*	Yes (Electric)
14	c-SEM	2013	Single-engagement	*Some*	*Full*	*Some*	*Full*	Yes (Electric)
15	c-SEM	2013	Single-engagement	*Some*	*Full*	*Some*	*Full*	Yes (Electric)
16	IEI	2011	Single-engagement	*Some*	*Some*	*Some*	*None*	No (Electric)
17	IEI	2013, 2014*	Multi-engagement*	*Some*	*Full*	*Some*	*Full*	Yes (Electric) No (Gas)
18	IEI, ISO 50001	2011, 2012	Multi-engagement	*Some*	*Full*	*Some*	*Full*	No (Electric and Gas)
19	IEI	2009	Single-engagement	*Some*	*Full*	*Some*	*Full*	No (Electric)
20	IEI, IEI-m	2010, 2012	Multi-engagement	*Some*	*Full*	*Some*	*Full*	No (Electric and Gas)
21	IEI	2010	Single-engagement	*Some*	*Full*	*Some*	*Full*	No (Electric)
22	IEI	2012	Single-engagement	*Some*	*Some*	*Some*	*Some*	No (Electric and Gas)
23	ROC, Kaizen Blitz	2012, 2013	Multi-engagement	*Some*	*Some*	*Some*	*None*	Yes (Electric)
24	IEI	2012	Single-engagement	*Some*	*Full*	*Some*	*Full*	No (Electric)
25	IEI	2013	Single-engagement	*Some*	*Full*	*Some*	*Some*	No (Electric) Yes (Gas)
26	Kaizen Blitz, ROC	2011, 2012, 2013	Multi-engagement	*Some*	*Some*	*Some*	*Full*	No (Electric)
27	IEI, IEI-m	2010, 2012	Multi-engagement	*Some*	*Some*	*Some*	*Full*	No (Electric)
28	IEI	2010	Single-engagement	*Some*	*Full*	*Some*	*Some*	No (Electric)
29	IEI, IEI-m	2010, 2011	Multi-engagement	*Some*	*Some*	*Some*	*Full*	No (Electric)
30	ROC, Kaizen Blitz	2009, 2012	Multi-engagement	*Some*	*Full*	*Some*	*Full*	No (Electric)

ID	SEM Type	SEM Engagement Year(s)	Participant Type	Overall SEM Adoption Level	Customer Commitment	Planning and Implementation	Monitoring and Reporting	Savings and Regression Evaluable
31	IEI	2010	Single-engagement	*Some*	*Some*	*Some*	*Full*	No (Electric)
32	IEI, IEI-m	2010, 2012	Multi-engagement	*Some*	*Full*	*Some*	*Some*	No (Electric)
33	IEI	2012	Single-engagement	*Some*	*Some*	*Some*	*None*	No (Electric)
34	IEI	2009	Single-engagement	*Some*	*Some*	*Some*	*Some*	No (Electric)
35	IEI	2011	Single-engagement	*Some*	*Some*	*Some*	*Full*	No (Electric)
36	ROC	2012	Single-engagement	*Some*	*Some*	*Some*	*Full*	No (Electric)

Customer Commitment

Cadmus scored Customer Commitment based on two sub-elements: (1) Policy and Goals and (2) Resources. The sub-elements refer to SEM policies or plans, goals, and staff communications the participant had in place at the time of the interview. Depending on which sub-elements had been implemented, we assigned adoption scores of *full*, *some*, or *none* to each participant for this key element. We summarized the scores for each sub-element and the aggregate score for Customer Commitment in Figure 3.

Figure 3. Customer Commitment Adoption Results



A *full* score for Customer Commitment indicates that participants have energy efficiency policy or goals and staff communications in place. Single-engagement and multi-engagement participants scored similarly across the two sub-elements, with 16 of 25 single-engagement and six of 11 of multi-engagement participants confirming *full* adoption of these activities.

About two-thirds of participants (22 of 36) received a *full* score for the Policy and Goals sub-element. Eleven facilities reported not having goals related to energy efficiency. Nearly all participants (34 of 36) received a *full* score for the Resources sub-element, which is met by (1) having an energy manager, (2) having an energy team that meets regularly, or (3) conducting employee engagement activities. Most participants (29 of 36) did employee engagement activities as part of SEM, but 12 participants reported not having an energy team, and 11 reported that either their facility did not have an energy manager (10 of 11) or they did not know if their facility has an energy manager (one of 11).

Planning and Implementation

Planning and Implementation is the CEE minimum element with the most sub-elements: these seven sub-elements focus on usage of the tools developed during the SEM engagement (energy management assessment, energy map, and tracking of energy use and opportunities to reduce energy use), projects implemented, and employee engagement. Details on each of the seven sub-element are shown in Table 14.

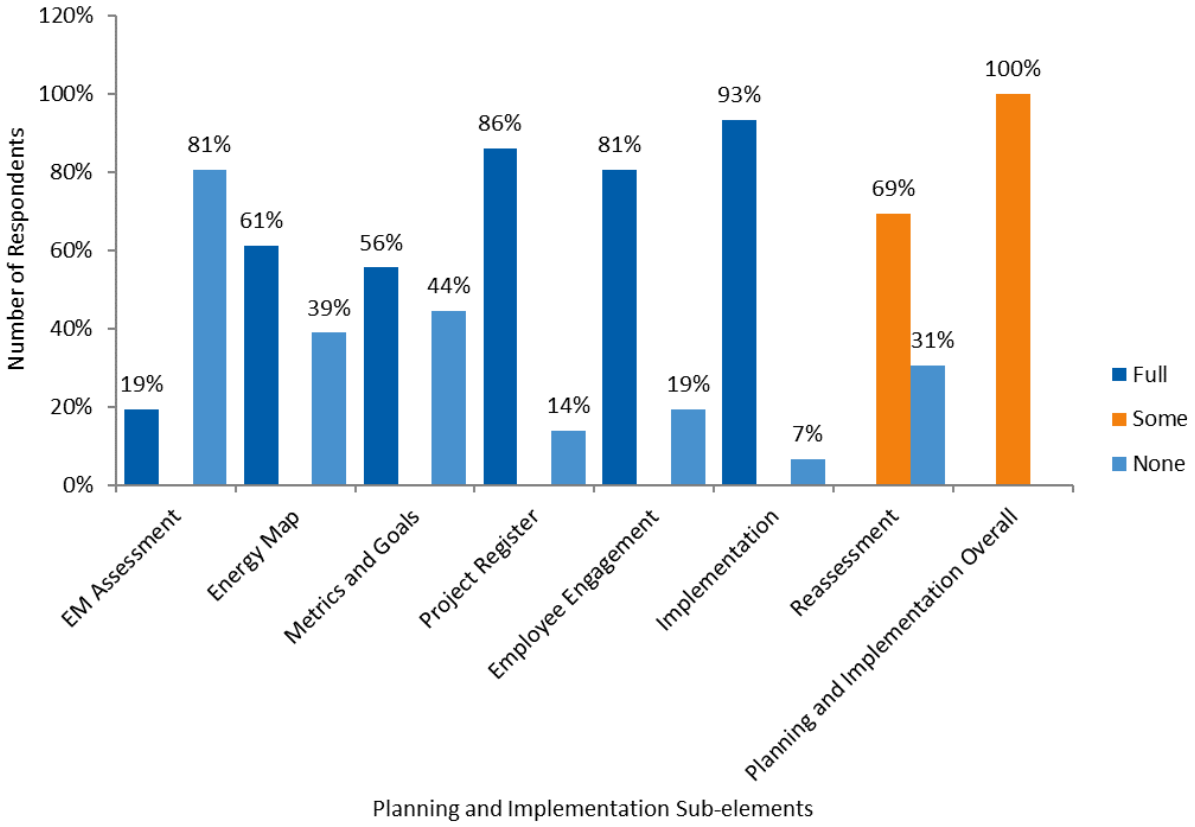
Table 14. Planning and Implementation Measurement

Sub-Element	Sub-Element Definition
Energy Management (EM) Assessment	Revisited or updated the energy management assessment since engagement
Energy Map	Uses or references the energy map developed through SEM
Metrics and Goals	Has defined and clear goals
Project Register	Continues to use the opportunity register, or if not, is tracking potential opportunities using a different system
Employee Engagement	Conducted specific employee engagement activities as part of participation in SEM
Implementation*	Implemented some activities from the opportunity register that remain in place
Reassessment	Periodically updates goals
	Frequency of updating goals
	Updates opportunity register
	Added energy efficiency projects to opportunity register since involvement
	Uses information from MT&R and model

* To ensure the interviews were not prohibitively long, Cadmus selected up to five activities based on the likelihood of the respondent to remember and recognize the activity. In some cases, we did not verify any activities during the interview because the activities were not detailed enough to ensure that the respondent would recognize the exact activity included. See the Evaluation Methodology section for more information.

Single-engagement and multi-engagement participants scored similarly across the sub-elements but no participants achieved *full* adoption. The Energy Management Assessment sub-element had the lowest adoption of the seven Planning and Assessment sub-elements, with only seven of 36 participants achieving *full* adoption. Figure 4 shows all the Planning and Implementation adoption scores for all participants.

Figure 4. Planning and Implementation Adoption Results



The most common Planning and Implementation sub-element with *full* adoption scores was Implementation (28 of 30), which involved asking participants about the status of specific SEM activities in the opportunity register. Six respondents did not provide any data for this sub-element.

Participants were less likely to get a *full* score for the Energy Management (EM) Assessment (seven of 36) and Reassessment (0 of 36) sub-elements. Only seven participants had revisited or updated the energy management assessment since their SEM engagement. To achieve a *full* score for the Reassessment sub-element, participants needed to meet the adoption criteria for five questions. These questions and the number of participants who met and did not meet each criterion necessary for *full* adoption are shown in Table 15.

Table 15. Reassessment Sub-Element

Reassessment	Met Criterion	Did Not Meet Criterion	Total*
Added energy efficiency projects to opportunity register since SEM engagement	15	21	36
Periodically updated goals since SEM engagement	14	11	25
Updated opportunity register since SEM engagement	14	7	21
Updated goals at least yearly since SEM engagement	7	9	16
Used the MT&R and model to reassess goals or projects since SEM engagement (or gave another qualifying answer)	2	10	12

* Questions only asked of participants who previously stated they used the tool in question (varies by question)

All the questions for the Reassessment sub-element focus on current behavior, post-SEM engagement. For this sub-element, no participants received a score of *full*, 25 of 36 participants received a score of *some*, and 11 of 36 received a score of *none*.

- Of the 21 participants who are still using their opportunity register, 14 have updated it since engagement, with slightly more participants (15 of 36) having added energy efficiency projects to their opportunity register since SEM engagement. Adding projects to the register could have happened at any point post-SEM engagement, whereas updating the register was focused on current practices.
- Of the 25 participants who had goals, 14 would periodically update their goals, seven of which would do so at least yearly.
- Of the 12 participants who were still using the MT&R workbook(s) developed during their SEM participation, only two were using the MT&R to reassess their goals, metrics, or planned projects to ensure that they align with business and energy performance priorities. Of the other 10, three use the MT&R to track annual energy savings, two use it to provide monthly reports to staff or management about energy savings, one uses it to track annual energy savings and report to management, one uses it to review trends, one uses it to review energy spikes and dips, one uses it to see how set points are affecting energy use, and one does not know how it is used.

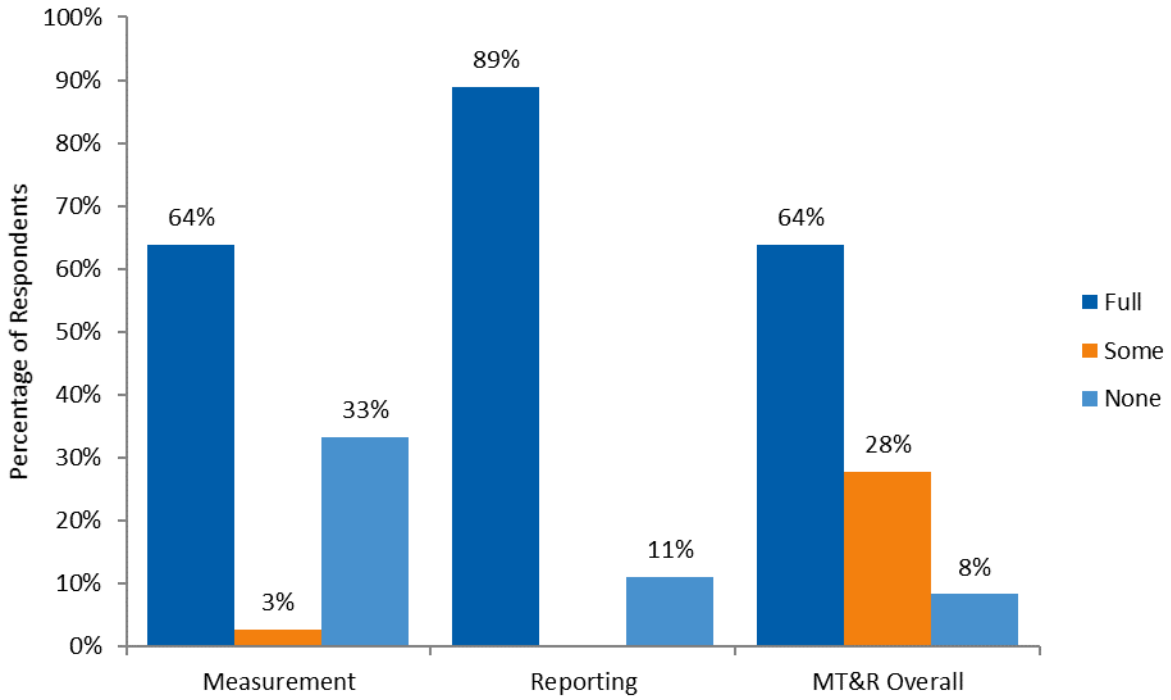
MT&R

The MT&R element is focused on tracking energy usage, on using the MT&R model and workbook developed by Energy Trust's implementation contractors during SEM participation (or using a different type of tracking system),[14] and on the frequency of communication about energy use with the organization. If participants tracked their energy usage and they reported their data with others in their organization at least annually, they received a score of *full* adoption.

[14] Six participants referenced using an energy tracking software from the following companies: PGE (3), JLL (1), Pacific Power (1), and SENSEI (1)

Single-engagement and multi-engagement participants scored similarly across the sub-elements, with 15 of 25 single-engagement and eight of 11 multi-engagement participants confirming *full* adoption of these activities. Overall, the participants all scored high on this element, with 23 of 36 respondents getting a score of *full*, 10 of 36 getting a score of *some*, and only three getting a score of *none*.

Figure 5. Monitoring and Reporting Key Element Results



For the Measurement sub-element, 12 of 36 participants use the MT&R model and workbook or another similar tool to track their energy use.

For the Reporting sub-element, Cadmus asked about the following types of communication:

- Whether the management team requires regular reports from the energy team
- How the MT&R model data are being used (for example, for monthly reports on energy savings, for tracking toward savings goals, for tracking costs)
- If and how often energy use data are shared with others in the organization

Many participants reported that their management team requires regular updates from the energy team (21 of 36) and that energy use data are shared with others in the organization (24 of 36). Of the 12 participants who currently use the MT&R, three use it to make monthly or annual reports to staff or management on their energy savings. Other participants use it on an as needed basis to track energy usage, confirm isolated projects are savings energy as expected, and to communicate results to plant staff using the graphs.

SEM Activity Assessment Results

The participants' activities, as described in the opportunity registers and MT&R reports, are summarized below. Cadmus assessed the SEM activities in opportunity registers, regardless of whether or not participants completed an interview with Cadmus or their data and models were evaluable. Opportunity registers were available and completed for 42 participants; three participants did not have an opportunity register; and one participant had an opportunity register with no activities listed.

In Table 16, we show the number of SEM activities, the number verified, and the percent verified by the number of years since participants last engaged with the SEM program. Verified means that the activities were verified as complete, based on their completion status in the opportunity registers, MT&R reports, or verification during the interview. Opportunity registers for participants with more recent engagements tended to include more activities but the percent verified varied. Overall, there were 1,647 activities in the opportunity registers and Cadmus verified 34% of them had been completed.

Table 16. SEM Activities by Years Since Engagement

Years Since Last Engagement	Number SEM Activities in Opportunity Registers*	Percent Verified**	Number Selected to be Verified During Interviews	Number Possible to be Verified During Interview***	Number Verified During Interview ****	Percent Verified During Interview ****
2	605	40%	31	17	15	88%
3	699	26%	41	23	22	96%
4	186	37%	19	15	12	80%
5	157	46%	25	25	22	88%
Total	**1,647**	**34%**	**116**	**80**	**71**	**89%**

*These numbers represent activities in the opportunity registers available for 42 participants.

**The number verified represents the total number of verified activities, verified based on the completion status in the documents and/or via the interviews.

***Number possible to be verified during interview represents activities that could be verified because the participant participated in an interview.

****Number verified during interview represent the total number of activities that were verified during the interview as having been completed.

Cadmus determined the distribution of SEM activities among all sampled participants, shown in Table 17, which includes the number of participants with activities in each category, activities in each category, and the number verified (based on the completion status in the documents and/or via the interviews), selected to be verified, and verified during interviews.

- Participant frequencies
  - Compressed air, HVAC, and lighting were listed in over 80% of the opportunity registers—these categories correspond to systems that are present at most facilities with a variety of possible activities.
  - Blowers and ovens listed in less than 25% of the opportunity registers—these categories correspond to activities associated with specialized systems that are not present at all facilities.
- Activity frequencies
  - HVAC and lighting activities were the most prevalent, accounting for 31% of all activities, with the highest number of activities listed in opportunity registers.
  - Refrigeration activities were also prevalent, accounting for 15% of all activities—even though only six of the sampled participants had participated in ROC SEM, the number of activities listed in each of their corresponding opportunity registers were much higher than the others.
  - Blowers, boilers, and ovens were the least prevalent, accounting for less than 5% of all activities.
- Average number of activities
  - Refrigeration had the highest number of activities per participant listed and verified.
  - HVAC and lighting and categories had the next highest number of activities per participant, both listed and verified.
  - Blowers, boilers, and ovens had the lowest number of activities per participant listed and verified.

Table 17. SEM Activity Summary from Opportunity Register Review and Interviews

Category	Participants		Activities									
	Number of Participants	Percent of Participants	Number of Activities	Percent of Activities	Number of Activities Verified **	Percent Verified **	Number Selected to be Verified During Interviews	Number Possible to be Verified During Interview ***	Number Verified During Interview ****	Percent Verified During Interview ****	Average Number Activities per Participant **	Average Number Verified per Participant **
Behavioral	24	57%	115	7%	38	33%	8	7	7	100%	2.4	0.8
Blowers	10	24%	35	2%	9	26%	3	2	2	100%	0.7	0.2
Boilers	16	38%	34	2%	10	29%	2	2	1	50%	0.7	0.2
Compressed Air	34	81%	195	12%	61	31%	24	19	19	100%	4.1	1.3
HVAC	36	86%	249	15%	58	23%	12	12	11	92%	5.3	1.2
Lighting	34	81%	256	16%	99	39%	13	11	11	100%	5.4	2.1
Miscellaneous	32	76%	169	10%	54	32%	10	7	4	57%	3.6	1.1
Ovens	5	12%	12	1%	5	42%	3	3	2	67%	0.3	0.1
Plug Load	25	60%	115	7%	45	39%	8	7	6	86%	2.4	1.0
Pumps	15	36%	106	6%	35	33%	3	1	1	100%	2.3	0.7
Refrigeration	14	33%	244	15%	110	45%	25	6	5	83%	5.2	2.3
Unsure	23	55%	117	7%	39	33%	5	3	2	67%	2.5	0.8
Subtotal	**42**	**91%**	**1,647**	**100%**	**563**	**34%**	**116**	**80**	**71**	**89%**	**35.0**	**12.0**
No Opportunity Register*	4	9%	-	-	-	-	-	-	-		-	-
Total	**46**	**100%**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**	**-**

*Three participants had no opportunity register and one participant had an opportunity register that did not include any activities.
**Number of activities verified represents activities verified as complete, based on the completion status in the documents and/or via the interviews.
***Number possible to be verified during interview represents activities that could be verified because the participant participated in an interview.
****Number verified during interview represent the total number of activities that were verified during the interview as having been completed.

Table 18 provides the percentages of SEM activities in each category in single-engagement and multi-engagement opportunity registers. Based on these results, Cadmus determined that the distribution of SEM activities does not differ between single-engagement and multi-engagement participants.

Table 18. SEM Activity Summary by Length of Engagement

Category	Single-Engagement Participants				Multi-Engagement Participants			
	Number Participants	% Participants	Number Activities	% Activities	Number Participants	% Participants	Number Activities	% Activities
Behavioral	18	53%	93	8%	6	75%	22	5%
Blowers	9	26%	34	3%	1	13%	1	0%
Boilers	10	29%	20	2%	6	75%	14	3%
Compressed Air	27	79%	147	12%	7	88%	48	11%
HVAC	28	82%	184	15%	8	100%	65	15%
Lighting	26	76%	181	15%	8	100%	75	17%
Miscellaneous	25	74%	125	10%	7	88%	44	10%
Ovens	4	12%	11	1%	1	13%	1	0%
Plug Load	20	59%	82	7%	5	63%	33	7%
Pumps	11	32%	75	6%	4	50%	31	7%
Refrigeration	11	32%	177	15%	3	38%	67	15%
Unsure	19	56%	73	6%	4	50%	44	10%
Total	**34**	**100%**	**1,202**	**100%**	**8**	**100%**	**445**	**100%**

SEM Savings

This section presents results of the evaluability assessment.

Evaluability Assessment Results

Table 19 provides the results of the evaluability assessment for the participant sample in terms of the number of participants and the total number of regression models. Less than half of the participants with natural gas models had evaluable data and models and less than 20% of the participants with electricity models had evaluable data and models.

Table 19. Evaluability Assessment Summary

Model Type	Number Participants			Number Models		
	Total	Evaluable	% Evaluable	Total	Evaluable	% Evaluable
Electric	46	8	17%	103	12	12%
Natural Gas	13	6	46%	24	11	46%
Total	**46**	**12**	**26%**	**127**	**23**	**18%**

Table 20 provides details on the number of models that met each evaluability criterion. Cadmus evaluated each model using all criteria, so there is overlap in the number of models listed in each category. Based on these results, we answered the research questions about data requirements and

availability, including the types of data available during and after participation; whether program data and project files were available, complete, reliable, and consistent for each participant and facility; and whether the minimum level of data required to evaluate participant data and models were met:

- Data were available for most participants.
  - Most MT&R reports included the baseline regression model.
  - Most MT&R workbooks included 12 months of baseline and performance period data.
  - Baseline and performance periods did not overlap for most models.
  - MT&R workbooks contained data for all variables in baseline natural gas models.
- Data quality was not good.
  - Nearly half of MT&R workbooks did not contain data for all baseline electric model variables.
  - The most widespread issue was that facility energy savings calculated using model specifications in the MT&R reports and measurement period data in MT&R workbooks were not equal to reported facility energy savings—this led Cadmus to conclude that the MT&R workbooks did not include the final data sets and thus should not be used for evaluation.

Table 20. Evaluability Criteria Summary

Assessment*	Electric Models		Natural Gas Models		Total Models	
	Count	%	Count	%	Count	%
Sampled participants	103	100%	24	100%	126	100%
Remained engaged with the program	101	98%	24	100%	125	99%
MT&R report included baseline regression model	82	80%	22	92%	104	83%
MT&R workbook included data for all variables in baseline regression model	57	55%	23	96%	80	63%
MT&R workbook included data for 12 months in baseline period	71	69%	15	63%	86	68%
MT&R workbook included data for 12 months in performance period	83	81%	22	92%	105	83%
Baseline and performance periods did not overlap	80	78%	21	88%	101	80%
Calculated facility energy savings (using MT&R workbook and model specified in MT&R report) were equal to reported facility energy savings	28	27%	11	46%	39	31%
Total Evaluable	**12**	**12%**	**11**	**46%**	**23**	**18%**

*Multiple rows may apply to a single model

In the end, only 12% of electric models and 46% of natural gas models were deemed evaluable. The regression analysis and estimated savings can be found in Appendix G. Regression Analysis and Evaluated Savings.

Cadmus asked all interviewed participants to provide updated MT&R workbooks or data from other energy usage tracking tools. Only half of the respondents answered this question (18 of 36) and 15 respondents indicated they would provide updated energy usage data. We received data from 13 of the 15 participants, but files from only nine of the participants included billing data that had been updated

compared to the original data. Many of these participants continued to have limitations with regression models and data evaluability, despite receiving the updated data. None of these were used in the regression analysis to estimate savings.

Answers to Research Questions

This section outlines findings for each research question, as outlined in Table 3. Not all research questions could be answered due to challenges with executing this evaluation. We outline those in Appendix A. Evaluation Challenges.

SEM Activity Prevalence

Question 1: What is the distribution of SEM activities across program participants? (How many program participants implemented the minimum SEM activities as defined by the CEE and, where applicable, to what extent?)

Answer: We considered the distribution of activities in terms of participant frequencies and activity frequencies.

- Participant frequencies
  - Compressed air, HVAC, lighting, and miscellaneous were listed in over 70% of the participants' opportunity registers because these categories correspond to systems that are present at most facilities and have a large variety of possible activities.
  - Behavioral, boilers, plug load, pumps, and refrigeration were listed in 30-60% of participants' opportunity registers.
  - Blowers and refrigeration were listed in the less than 25% of participants' opportunity registers—these categories correspond to activities associated with specialized systems that are not present at all facilities.
- Activity frequencies
  - Activities in refrigeration, HVAC, and lighting categories were the most prevalent. The activities in each of these categories made up 15-16% of all activities in the reviewed opportunity registers. Each ROC participant had a high number of refrigeration activities listed.
  - Blowers, boilers, and ovens were the least prevalent, with activities in each category accounting for only 1-2% of the total activities.

Most interviewed participants had implemented and completed *some* of the three key CEE SEM minimum elements (Customer Commitment, Planning and Implementation, and Monitoring and Reporting) and corresponding sub-elements. Most participants received a score of *full* adoption for Customer Commitment and Monitoring and Reporting), but none received a score of *full* adoption for Planning and Implementation.

Question 2: Does the prevalence of SEM activities differ between single-engagement and multi-engagement participants?

Answer: Almost 75% of all interviewed participants reported that a staff member is in charge of coordinating energy management and 60% of energy management coordinators are the same person who coordinated energy management during SEM engagement. These findings suggest there is widespread continuity within the role of energy champion/manager and that institutional knowledge about SEM activities remained within many participants.

Also, based on our SEM activity assessment, most multi-engagement participants listed activities in almost all categories and this group listed and completed more activities than single-engagement participants in most categories. The largest differences were that higher percentages of multi-engagement participants listed behavioral, boilers, and pumps than single-engagement participants. The average number of activities listed among multi-engagement participants were substantially higher in all categories and the average number verified were especially larger in lighting and pumps categories among multi-engagement participants.

Higher portions of participants with recent engagements (2012 and 2013) had opportunity registers than participants with historical engagements (2010 and 2011). A higher proportion of multi-engagement participants listed activities in almost all categories (10 of 12). Multi-engagement participants listed and completed more activities than single-engagement participants in most categories (8 of 12).

SEM Annual Energy Savings Rates and Savings Trajectories

These research questions could not be answered. There were not enough evaluable regression models and data for single or multi-engagement participants in the sample to generalize results to the population.

Data Requirements and Availability

Question 3: What types of data are available for each participant and facility in years during and after their participation (such as consumption data and production data)? At what frequency are data available?

Answers: The available and evaluable participant models and data included the following variables at monthly, weekly, and daily intervals:

- Electric and natural gas energy consumption
- Temperature
- Single or multiple production variables
- Season or month indicators
- Nonroutine event indicators

Most electricity usage data were recorded weekly and most natural gas usage data were recorded monthly. Overall, monthly data were most prevalent among evaluable data and models, although note that evaluable models represent a very small fraction of sampled models.

Question 4: Are the program data and project files available, complete, reliable, and consistent for each site?

Answers: Data including participant MT&R reports and MT&R workbooks for each SEM engagement were available for most participants (but data quality varied).

- Most MT&R reports included the baseline regression model
- Most MT&R workbooks included 12 months of baseline and performance period data
- Most MT&R workbooks contained data for all variables in baseline natural gas models
- Nearly half the MT&R workbooks did not contain data for all variables in baseline electric models
- Calculated facility energy savings were not equal to reported facility energy savings in almost 75% of electric models and in over 50% of natural gas models

The evaluability of data and regression models was correlated with recency of SEM participation, where participants with more recent engagements tended to have evaluable data and models more often than those with historical engagements.

Question 5: How do energy savings estimates differ between data-rich and data-poor participants? (What effect do missing or less frequent data have on the accuracy and precision of estimated savings?)

Answers: In this evaluation, data-poor sites had unevaluable models and data and thus have no evaluated savings. The precision of estimated savings among the evaluable models improved as the data frequency increased from monthly to weekly and from weekly to daily. Details on the regression analyses are provided in Appendix G. Regression Analysis and Evaluated Savings.

Question 6: To what degree does the data collected through site visits improve regression modeling results and savings trajectory estimates? Which data from the site visits are most useful?

Answers: The data collected from site visits that we used to verify capital project savings were integral for accurately estimating the SEM savings for participants and facilities with evaluable data and regression models. This type of data should be collected in future evaluations. Details on the regression analyses are provided in Appendix G. Regression Analysis and Evaluated Savings.

Question 7: What is the minimum level of data required for evaluation?

Answers: The criteria for evaluating data and models are listed in Table 5. In general, many participants' data and model were unevaluable due to missing the final MT&R workbooks with data used to estimate models and savings in the MT&R report.

Monitoring, Targeting, & Reporting Models

Question 8: What are the most common model specifications used by the SEM implementation team in their MT&R models?

Answers: Most implementer models included temperature and temperature squared or inverse temperature and single or multiple production variables. They rarely included seasonal indicators.

Question 9: What are the most common adjustments Cadmus makes to the implementer models for evaluation purposes?

Answers: Cadmus most often recommended replacing temperature, temperature squared, and inverse temperature with CDD and HDD variables and including seasonal indicators in the models. Including these variables increased the adjusted R^2 in all cases, improving the accuracy of the overall savings estimates.

Question 10: Are there opportunities for the SEM implementation team to adjust MT&R models that would result in better savings estimates and efficiency gains in evaluation activities?

Answers: In all evaluable models, Cadmus recommended including CDD and HDD variables, seasonal indicators, production variables, and indicators of nonroutine events. We agree with Degens and Kelly (2017)[15] that analysts should test for correlations between production and non-routine event variables and that the final regression model should not necessarily include all available variables, but only those that improve the fit of the model and its precision substantially. Analysts should consider adjusted R^2 and Aikake's information criterion (AIC) regression fit statistics when determining which variables to include in each model.

[15] Degens, Phil and Kelly, A. (2017) "Strategic Energy Management Modeling: What's good enough?" ACEEE International Energy Program Evaluation Conference, Baltimore, MD.

Conclusions and Recommendations

Cadmus has several conclusions and recommendations for Energy Trust based on the results of the SEM program evaluation.

Conclusion 1: The evaluation of energy savings was inconclusive because, although data were available, they were inconsistent and incomplete. Participants with more recent engagements tended to have evaluable data and models more often than those with less recent engagements. However, in many cases the MT&R workbooks that Energy Trust received from the implementers were not the final versions used to produce the estimates in the MT&R reports.

The evaluated participant SEM savings were 3.2% electricity savings and 3.5% natural gas savings but because the analysis sample included only eight participants with electric savings and six with natural gas savings, these results were difficult to generalize to the population.

Recommendation 1: Energy Trust should enforce the requirement that implementers deliver final versions of the MT&R workbooks with the MT&R reports and that the models in the MT&R reports can be replicated using the data in the MT&R workbooks. It should verify this upon receiving the data and documentation. The Energy Trust program manager notes that this requirement has been in place since 2016.

Conclusion 2: SEM activity persisted among interviewed participants. Many participants continued to use the MT&R workbook (or another tool) to track energy used, 91% of activities we asked about remained in place or were continued, and nearly 70% of respondents had added projects to their list of potential opportunities since they participated in SEM.

Most respondents said that participating in SEM made identifying future energy efficiency projects easier, although only half said it made it easier to implement the projects. Most respondents said they were more likely to conduct energy efficiency projects following their SEM engagement.

Recommendation 2: Energy Trust should approach recent SEM participants with program offerings specific to the activities that were listed in opportunity registers to make implementing those activities easier for the participants.

Energy Trust should consider requiring updated energy usage and production data from participants in years after their SEM engagements. Because many are already tracking it, the burden to the participants would be small and the value would be high because the data could be used in regression analysis to quantify the persistence of savings.

Conclusion 3: There was continuity within the role of energy champion or manager and institutional knowledge about SEM activities remained in place after the SEM engagements. Many energy

management coordinators were the same people who coordinated energy management during SEM engagement.

Recommendation 3: Energy Trust should emphasize to participant facilities that continuity in the energy manager role has the potential to lead to continued energy savings due to lessons learned while implementing SEM. It should provide a guideline for internal knowledge transfer when there is staff turnover.

Conclusion 4: Facility changes, when not tracked and recorded over time likely confound energy savings estimates. Most interviewed participants reported that changes in their facilities had occurred between the time of SEM engagement and the interview. This response puts into question model development for persistence studies, i.e., if changes in product lines, production levels, hours and the facility occur at nearly every plant but limited data exist about these changes, there will be limits on how well models can adjust to detect savings that occurred and that persisted over time.

Recommendation 4: Energy Trust should work with participants to develop robust data tracking tools—not only for energy consumption but non-routine events and changes to production or the facility over time. These could include customized MT&R workbooks and periodic check-ins after SEM engagements have been completed.

Appendix A. Evaluation Challenges

Interviews

Cadmus faced two main challenges to completing the interviews: the length of time between when participants were engaged with the SEM program and the interview and resulting loss of historical knowledge. It required multiple contacts (phone and email) over a five-month period (June through October 2015) to engage participants. Cadmus completed interviews with 36 of 46 sampled participants, resulting in a 78% response rate.

Of the ten participants we could not engage, one was associated with a company that had been sold and no employee of the new company remained involved in the original company's SEM engagement. We attempted to contact each of the remaining nine participants 10 or more times, and while we were able to make contact, we could not find a time when a participant representative was available to complete the interview (despite trying to reach the participants over four months).

SEM Adoption Scoring

There were two main challenges to scoring SEM adoption. First and foremost, Energy Trust began their SEM program five years prior to CEE defining the SEM minimum elements, and the program offering was not guided by the definition of SEM. Therefore, the SEM that was implemented by participants in Energy Trust's program may not encompass all elements in the CEE's definition. Cadmus used the interviews to assess the persistence of the SEM activities based on a new and consistent SEM definition, and the results should not be interpreted as a measure of a participant's success with SEM during the engagement. Second, the time between SEM participation and the interviews decreased the likelihood that we could verify the SEM activities—this could be due to recall or due to the activities no longer being place over time.

Savings Evaluation

Cadmus faced several challenges related to the savings evaluation. One recurring issue was the lack of information in MT&R reports. In several reports it was unclear what date ranges corresponded to the baseline, performance, and measurement periods. Even when the MT&R reports clearly defined these periods, Cadmus sometimes needed to use MT&R workbook data corresponding to different date ranges to replicate the MT&R reported baseline model. This was especially evident when we tried to replicate the MT&R estimated site savings using the measurement period stated in the MT&R report, and we were therefore not always confident in the information provided by the MT&R report. The participant-specific reports provide more detailed information for sites where this was an issue.

There were other inconsistencies between the MT&R report and MT&R workbook data as well. Cadmus could not replicate the MT&R-reported baseline model for several sites, leading us to question whether the data were reliable. The participant-specific reports provide more detailed information for sites where this was an issue.

Another challenge was that the MT&R workbooks did not contain all the data needed for evaluation. Many of the natural gas models did not contain any production data because it was not significant in the MT&R baseline model; however, these data are needed to build a truly independent baseline model. Cadmus also found that sometimes when the implementer removed an observation from the baseline data, they removed the observation from the MT&R workbook entirely, forcing Cadmus to remove it from the independent baseline model as well. All baseline and performance period data are needed to build an independent baseline model. The participant-specific reports provide more detailed information for sites where this was an issue.

Appendix B. Sample Design Details

In this appendix, we provide an overview of the details in our sample design. We started with the 2012 PE Impact Evaluation sample, examined the distribution of participants in the sample compared to the population, and then added sample size where necessary to ensure sufficient coverage of each SEM type and SEM year stratum in the SEM evaluation sample.

2012 PE Impact Evaluation Sample

Tables 21 through Table 24 provide the number of participants by SEM engagement year, SEM type, number of engagements, and savings fuel type in the SEM population and the 2012 PE Impact Evaluation sample.

- Most SEM engagements in the SEM population occurred in 2013 but the majority in the 2012 PE Impact Evaluation sample occurred in 2012, by design.
- Most participants in the population and sample engaged in IEI.
- Similar portions of IEI-m and SEM-m participants were included in the 2012 PE Impact Evaluation sample as occurred in the population.
- There were proportionately fewer cSEM and ROC engagements in the sample than population compared to other SEM types.
- Most participants engaged in the SEM program for a single year, with less than 10% engaging in multiple years. The 2012 PE Impact Evaluation sample included almost all of the six multi-engagement participants and provided good coverage of both types of participants.
- The 2012 PE Impact Evaluation sample provided good coverage of the population with respect to savings fuel type.

Based on this assessment, we concluded that the 2012 PE Impact Evaluation sample was sufficiently representative of the population with respect to the number of SEM engagements, savings fuel type, 2012 projects, and of IEI, IEI-m, and SEM-m projects but that it did not sufficiently represent cSEM or ROC projects and under-represented 2010, 2011, and 2013 engagements. Therefore, we increased the sample sizes of those years, as well as cSEM and ROC participants.

Table 21. SEM Participants by SEM Engagement Year

SEM Year	Number of Unique Participants		
	Population	2012 PE Impact Evaluation Sample (2012 SEM)	2012 PE Impact Evaluation Sample (2010–2013 SEM)*
2010	19	0	4
2011	15	0	1
2012	17	13	13
2013	28	0	3
**Total ** **	**72**	**13**	**16**

* These counts include the 2012 SEM participants.

** The total number of unique participants is not equal to the sum of participants across years because some participants engaged in more than one program year

Table 22. SEM Participants by SEM Engagement Type

SEM Type	Number of Unique Participants		
	Population	2012 PE Impact Evaluation Sample (2012 SEM)	2012 PE Impact Evaluation Sample (2010–2013 SEM)*
cSEM	8	1	1
IEI	47	5	12
IEI-m	6	5	5
ROC	16	2	2
SEM-m	2	0	1
Total **	**72**	**13**	**16**

* These counts include the 2012 SEM participants.

** The total number of unique participants is not equal to the sum of participants across SEM types because each participant could engage in the program in more than one type.

Table 23. SEM Participants by Number of SEM Engagements

Participant Type	Number of Unique Sites		
	Population	2012 PE Impact Evaluation Sample (2012 SEM)	2012 PE Impact Evaluation Sample (2010–2013 SEM)*
Single-engagement	65	8	11
Multi-engagement	7	5	5
Total	**72**	**13**	**16**

Table 24. SEM Participants by Savings Fuel Type

Savings Fuel Type	Number of Unique Sites		
	Population	2012 PE Impact Evaluation Sample (2012 SEM)	2012 PE Impact Evaluation Sample (2010–2013 SEM)*
Electric only (kWh)	61	11	13
Natural gas only (therms)	1	0	1
Electric and natural gas (kWh and therms)	7	2	2
No reported savings	3	0	0
Total	**72**	**13**	**16**

Additional Sample

Cadmus determined that additional sampling should be performed to increase coverage of 2010, 2011, and 2013 SEM year and cSEM and ROC SEM types. We calculated target sample sizes within each year, compared those to the sample sizes already selected for the 2012 PE program evaluation, and sampled additional participants required to reach the target sample sizes. Cadmus calculated sample sizes based on several assumptions and targets related to savings estimates and trajectories:

- Coefficient of variation of 0.55
- Finite population correction applicable to small population sizes
- Confidence and precision targets of 80% confidence and ±15% precision for population estimates

Table 25 and Table 26 provide the final sample sizes. The additional sample sizes for the SEM evaluation are the difference between the sample sizes that were already included in the PE sample and the target sample sizes we calculated.

Table 25. SEM Evaluation Sample by Engagement Type

SEM Type	Number Unique Participants			
	Population	2012 PE Impact Evaluation Sample Size	Additional Sample Size	Final Sample Size
cSEM	8	1	4	5
IEI	47	12	21	33
IEI-M (Maintenance)	6	5	1	6
ROC	16	2	5	7
SEM-M (Maintenance)	2	1	1	2
Total*	**72**	**16**	**30**	**46**

* The total number of unique participants is not equal to the sum of participants across SEM types because each participant could engage in more than one SEM type.

Table 26. SEM Evaluation Sample by Engagement Year

SEM Year	Number Unique Participants			
	Population	2012 PE Impact Evaluation Sample Size	Additional Sample Size	Final Sample Size
2010	19	4	12	16
2011	15	1	9	10
2012	17	13	2	15
2013	28	3	12	15
Total*	**72**	**16**	**30**	**46**

* The total number of unique participants is not equal to the sum of participants across SEM types because each participant could engage in more than one SEM type.

Appendix C. SEM Adoption Scoring Algorithm

One purpose of the interview guide was to gather data to determine the level of SEM adoption. For each SEM element, Table 27 lists the interview question(s) used to evaluate the level of adoption and the responses that indicate each level of adoption.

Table 27. SEM Adoption Scoring Algorithm

SEM Element	Interview Question(s)	Level of SEM Adoption		
		Full	*Some*	*None**
1. Customer Commitment				
1a. Policy and Goals	• Does your company or facility have any policies or plans in place that incorporate energy efficiency? • Does your company or facility currently have goals related to energy or energy efficiency? • Have these goals been communicated to staff?	Have a policy/plan or goals that have been communicated to staff	Any other response combination	No policy/plan (or DK) and no goals (or DK) to communicate to staff (or DK)
1b. Resources	• Do you have an energy manager or someone in charge of energy efficiency at this location? • Do you have an energy management team [dedicated staff for energy and energy efficiency]? • Is your energy team still meeting [regularly]? • Did you conduct any specific employee engagement activities as part of your participation in SEM? If so, please describe.	Have an energy manager or a team that meets regularly or conducted employee engagement activities as part of SEM	Any other response combination	No energy manager (or DK), no energy management team (or DK), and did not conduct employee engagement activities as part of SEM (or DK)
2. Planning and Implementation				
2a. Energy Management Assessment	• Have you revisited or updated the energy management assessment since your SEM engagement?	Have revisited or updated assessment	Any other response combination	Did not revisit or update assessment (or DK)
2b. Energy Map	• Do you still use or reference the energy map developed through SEM?	Use/reference energy map	Any other response combination	Did not use or reference energy map
2c. Metrics and Goals	• Does your company or facility currently have goals related to energy or energy efficiency? • How are the goals defined, and what are they (for example, a 5% reduction in energy use in three years)?	Have and can articulate goal(s) for energy performance improvement	Any other response combination	No goals for energy performance (or DK)
2d. Project Register	• Are you still using the opportunity register? • If not, do you track potential opportunities using a different system? If so, please describe. • [Ask if removed] Are you planning to implement them [remaining items on the opportunity register]?	Using/developing opportunity register, tracking opportunities using different system, or planning to implement items on opportunities register	Any other response combination	Not using opportunity register (or DK), not tracking opportunities using different system (or DK), and not planning to implement items on opportunity register (or DK)

SEM Element	Interview Question(s)	Level of SEM Adoption		
		Full	*Some*	*None**
2e. Employee Engagement	• Did you conduct any specific employee engagement activities as part of your participation in SEM? If so, please describe.	Have conducted specific employee engagement opportunities	Any other response combination	Did not conduct specific employee engagement opportunities (or DK)
2f. Implementation	• I have some questions about the status of the projects included in your opportunity register at the time you participated in SEM. Can you describe the projects and tell me whether they were completed? [Record for each project/SEM activity]	Completed one or more projects in opportunity register	Any other response combination	Did not complete any projects in opportunity register
2g. Reassessment	• Do you periodically update the goals? • If so, how often? • Do you regularly update your opportunity register? • Have you added any energy efficiency projects to the opportunity register since your SEM engagement? • In what ways are you currently using information from the MT&R model and workbook? [Probe about monthly reports to staff/management on energy savings, tracking toward annual savings goals, and cost tracking (the cost per unit of production)]	Have updated goals and updated opportunity register or added projects to opportunity register and is using MT&R model and workbook to reassess goals, metrics, or planned projects	Any other response combination	Did not update goals (or DK), did not update or add projects to opportunity register, and did not use MT&R model to reassess goals, metrics, or planned projects
3. Monitoring, Tracking, and Reporting (MT&R)				
3a. Measurement 3b. Data Collection and Availability 3c. Analysis	• Are you currently using the Monitoring, Targeting and Reporting (MT&R) model and workbook developed during SEM to track your energy use? If not, are you using another type of electronic system to track your energy use over time? • If using another type of electronic system to track energy use, please describe how the system or tool works	Using MT&R, EMIS, or something else to track energy use	Any other response combination	Not using MT&R, EMIS, or something else to track energy use
3d. Reporting	• Does your management team require regular updates from the team? • In what ways are you currently using information from the MT&R model and workbook after SEM? • How often is energy use data shared with others in your organization?	Management requires regular updates or using MT&R model for monthly reporting to staff/management, or energy use data shared with others in organization	Any other response combination	Management does not require regular updates (or DK), not using MT&R model for monthly reporting to staff/ management, and energy use data not shared with others in organization (or DK)

*DK = don't know.

Appendix D. SEM Adoption and Interview Analysis

Cadmus performed data reviews to gather information on SEM activities recorded by implementers and participants, then between June and October 2015, we conducted interviews to verify recorded SEM activities, energy management structures, and the level of SEM adoption at the time of each participant's SEM engagement and in the years following their engagement. In combination with the other data sources, including opportunity registers, MT&R reports and workbooks, and site visits, the interviews were designed to provide additional context for evaluated energy savings. The interviews also enabled us to gather details about successes and challenges of implementing SEM activities and about the influence of the program on future energy efficiency activities and projects.

The interviews ranged in length from 25 to 60 minutes, depending on the knowledge level and interest of the respondent. The average interview lasted 40 minutes. We interviewed 36 of 46 participants, resulting in a response rate of 78%.

This appendix provides an overview of the interview guide and presents detailed results on all topics covered with the interview respondents. The actual interview guide is provided as Appendix H. Interview Guide. We present additional details on the methodology, including the CEE minimum elements and scoring, in the main body of the report and our algorithm for mapping interview responses to key and sub-elements is provided in Appendix C. SEM Adoption Scoring Algorithm.

Interview Guide

Cadmus designed the interview guide to be administered using an in-depth interview format, allowing for additional probing of responses. Details on our methodology to design the interview guide are provided in the Interview Results section of the main report, including specifics of how we incorporated the CEE minimum elements into the interview questions. Although the interview guide included many open-ended questions and opportunities for participants to elaborate, we structured the questions used to evaluate SEM adoption so that we could record exact responses for consistent assessment across all respondents.

Some respondents did not answer every question, either because the question was not applicable to their engagement or because they were not able to or did not want to provide a response. In some cases, Cadmus removed "don't know," "refused," and "not applicable" responses from the total number of respondents when calculating percentages or response totals. Therefore, the total number of responses for each topic is not always equal the total number of respondents. We have documented this where applicable and also noted the number of responses for each topic and result.

Interview Findings

For many of the findings below, Cadmus summarized the results by single-engagement participants (those who engaged in one SEM program) versus multi-engagement participants (those who engaged in more than one SEM program) to determine if differences exist between the groups.

Respondent Profile

Cadmus attempted to interview the person most familiar with SEM in each participant organization. The professional titles of interview respondents are shown in Table 28. Overall, 67% of respondents (24 of 36) indicated being *very familiar* with the activities implemented as part of SEM, while 14% were *somewhat familiar* and 19% were *not too familiar*.

Table 28. Respondent Professional Titles

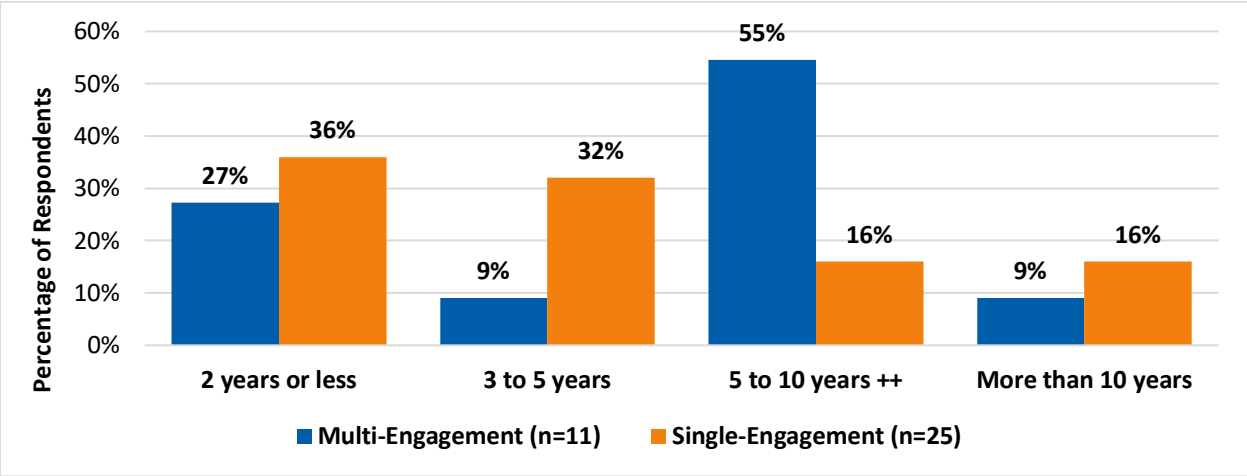
Title	Count	Percentage
Engineer	9	25%
Facilities manager	9	25%
Maintenance personnel	4	11%
Electrical supervisor	3	8%
Energy team/coordinator	3	8%
Process specialist	3	8%
Environmental or conservation technician/specialist	2	6%
Other (new product developer and financial analyst)	2	6%
No answer	1	3%
Total	**36**	**100%**

Source: Interview question A3. "What is your job title?" (n=36)

Among all the respondents, 58% (21 of 36) described their role in their organization's SEM program as energy champion or energy manager, 22% described their role as an energy team member, 6% described themselves as a program sponsor, and 14% said they currently had no role in their organization's SEM program because the organization was not implementing SEM at the facility.

All respondents provided information on the length of time they had been in their current role: 58% had been in their role for five or fewer years. The *full* results are shown in Figure 6 by single-engagement participants versus multi-engagement participants. Multi-engagement participants tended to have been in their energy management roles for longer than single-engagement participants.

Figure 6. Length of Time in Current Role

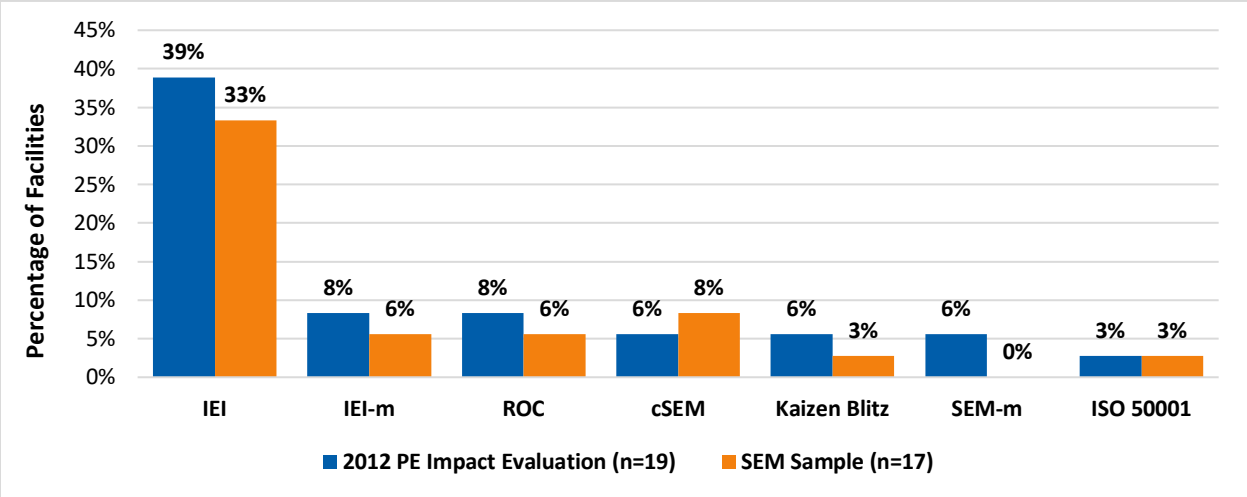


Source: Interview question A5. "How long have you had this role?" (n=36)
++ Significant difference between multi-engagement and single-engagement participants at the 0.05 level.

Company Profiles

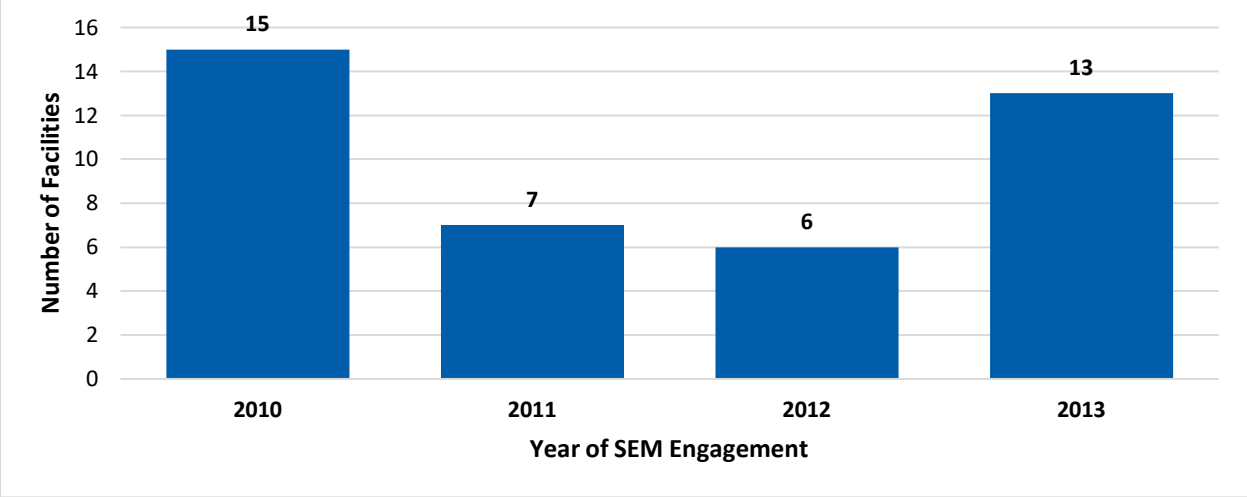
Among all interview respondents, the most common SEM engagement type was IEI. Figure 7 shows the percent of respondents by SEM type, distinguished depending on whether the participant was selected as part of the 2012 PE Impact Evaluation sample or the SEM evaluation sample. The percentages are of the total 36 interview respondents. Figure 8 shows the year of SEM engagement.

Figure 7. SEM Types



Source: Energy Trust project tracking data and MT&R reports (n=36).
Percentages exceed 100% because some respondents participated in multiple engagements and SEM types.

Figure 8. SEM Engagement Year

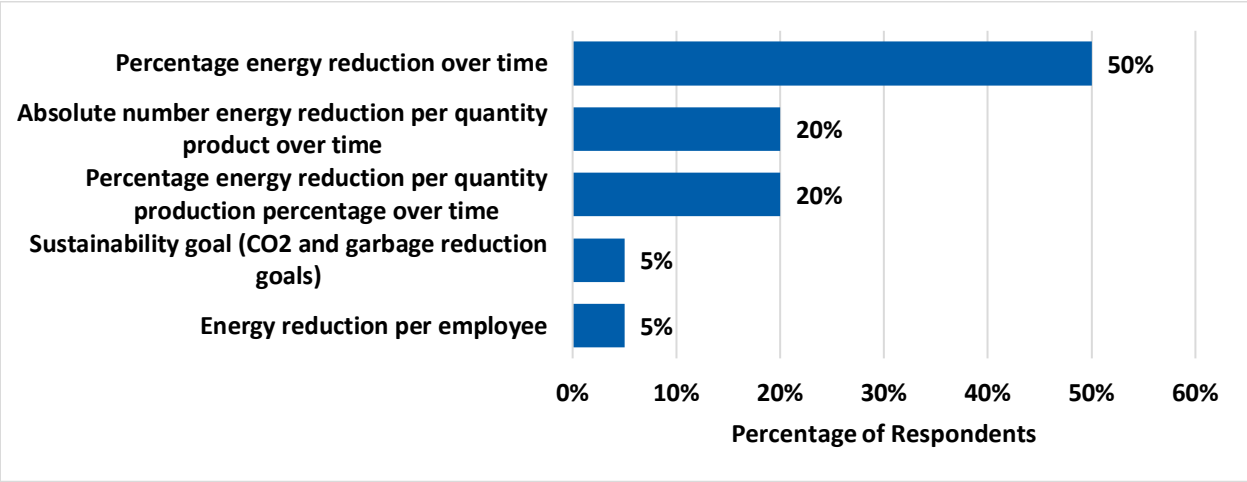


Source: Energy Trust project tracking data and MT&R reports (n=36).
Some respondents participated in multiple years, so sample sizes from each year cannot be added to equal the number of unique respondents (n=36).

Energy Performance Goals

Cadmus asked respondents several questions about their organization's energy performance goals. When asked about policies and plans, most respondents (89%; 32 of 36) indicated that their organization currently has a policy or plan in place that incorporates energy efficiency. However, only 69% (25 of 36) indicated that their organization currently has goals related to energy or energy efficiency. Figure 9 shows the types of energy or energy efficiency goals.

Figure 9. Energy Reduction Goals



Source: Interview question D2b. "How are the goals defined and what are they?" (n=24)

Table 29 summarizes the responses for all participants and for single-engagement and multi-engagement participants separately. It shows that, of the respondents who indicated that their

organization has goals related to energy or energy efficiency, 88% (22 of 25) indicated that the goals had been communicated to staff.

Table 29. Energy Performance Goals

Energy Performance Goals	Multi-engagement	Single-engagement	Overall
Policy or plan that incorporates energy efficiency (n=36)	91%	88%	89%
Goals related to energy or energy efficiency (n=36)	64%	72%	69%
Goals communicated to staff (n=25)	86%	88%	88%

Source: Interview questions D1a, D2a, and D2e. "Does your company or facility have any policies or plans in place that incorporate energy efficiency?" "Does your company or facility currently have goals related to energy or energy efficiency?" and "Have they [these goals] been communicated to staff?"

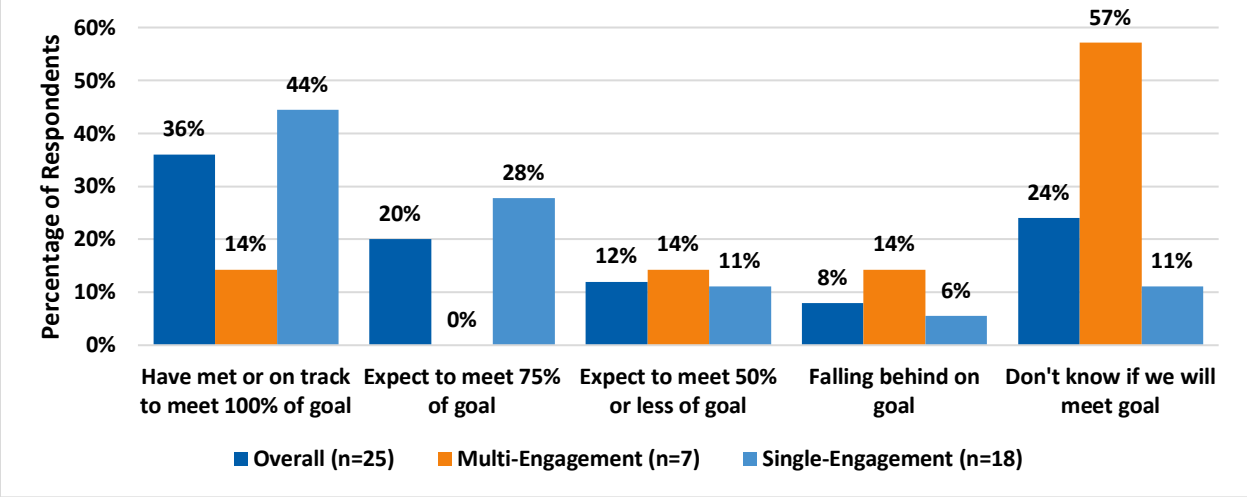
Cadmus used responses to the questions shown in Table 29 to determine SEM adoption scores for Policy and Goals and Metrics and Goals, sub-elements of the Customer Commitment and Planning and Implementation key elements. Sixty-four percent of respondents received *full* SEM adoption scores for the Policy and Goals sub-element, most of whom indicated that their organization currently has policies related to energy efficiency and have communicated energy efficiency goals to staff. Two respondents said their organization does not have a policy or goals related to energy efficiency and thus received a SEM adoption score of *none* for this sub-element. The remaining facilities received a score of *some*.

The SEM adoption scores for the Metrics and Goals sub-element were slightly lower, with 56% of participants receiving a *full* score, 8% receiving a *some* score, and 36% receiving a *none* score. We assigned a score of *none* when respondents indicated that their organization did not have goals or that they did not know if their organization had goals related to energy efficiency.

Goal Achievement

To assess the achievement of goals, Cadmus asked respondents to indicate whether their organization had or will meet 100%, 75%, or less than 75% of their energy performance goals. Of the 25 organizations with such goals, 36% of respondents (nine of 25) have met or will meet 100% of their goal, 20% expect to meet at least 75% of their goal, 20% will meet less than 75% of their goal, and 24% did not know if their organization will meet their energy performance goals. Figure 10 shows goal achievement overall and among single-engagement and multi-engagement participants. Note that only three of the seven respondents representing multi-engagement participants with energy performance goals were able to answer this question and thus the results may not be representative of the general population.

Figure 10. Goal Performance



Source: Interview question D2f. "How are you doing meeting the goals?" (n=25)

Of respondents who indicated that their organization had set goals, 56% (14 of 25) indicated that the goals are periodically updated. Of these respondents, 36% (five of 14) indicated that updates occur annually and 21% (three of 14) indicated that goals are updated as needed but did not provide a specific frequency. Twenty-one percent (three of 14) of respondents indicated that goals are updated weekly, monthly, or never, respectively, and 21% (three of 14) indicated their organization had set goals but did not know how frequently updates occurred.

Energy Savings

Cadmus asked participants to describe energy savings maintenance. Of all respondents, 67% (24 of 36) indicated that their organization has maintained the energy savings achieved during the SEM engagement(s). Energy savings maintenance occurred at higher rates among multi-engagement participants (73%; eight of 11) than amount single-engagement participants (64%; 16 of 25).

Staff Involvement

Cadmus asked a series of questions to investigate the role of the energy champion, the energy management team, management support, and the executive sponsor as well as the level of engagement in energy management activities that resulted from the SEM activities. We mapped responses to staff involvement questions to the Resources and Employee Engagement sub-elements. Most participants received *full* SEM adoption scores in these sub-elements, with 94% receiving a *full* score in Resources and 81% receiving a *full* score in Employee Engagement.

The subsections below provide additional details on the interview questions and responses that support these scores along with additional detail about how participants are engaging management and staff in energy efficiency.

Energy Champion

When asked, 69% of respondents (25 of 36) said their organization currently has an energy champion or manager (Table 30). Among these, 60% (15 of 25) said the person filling this role is the same person that filled the role during their SEM program engagement.

Further, 88% (22 of 25) said the energy champion also has a back-up, suggesting continuity within the role of energy champion or manager and that institutional knowledge related to SEM activities could remain in place, potentially leading to continued SEM activities and energy savings over time.

Table 30. Energy Champion

Response	Energy Champion or Manager (n=36)	Same Energy Champion as During SEM (n=25)	Back-Up for Energy Champion (n=25)
Yes	69%	60%	88%
No/Don't know/No answer	31%	40%	12%

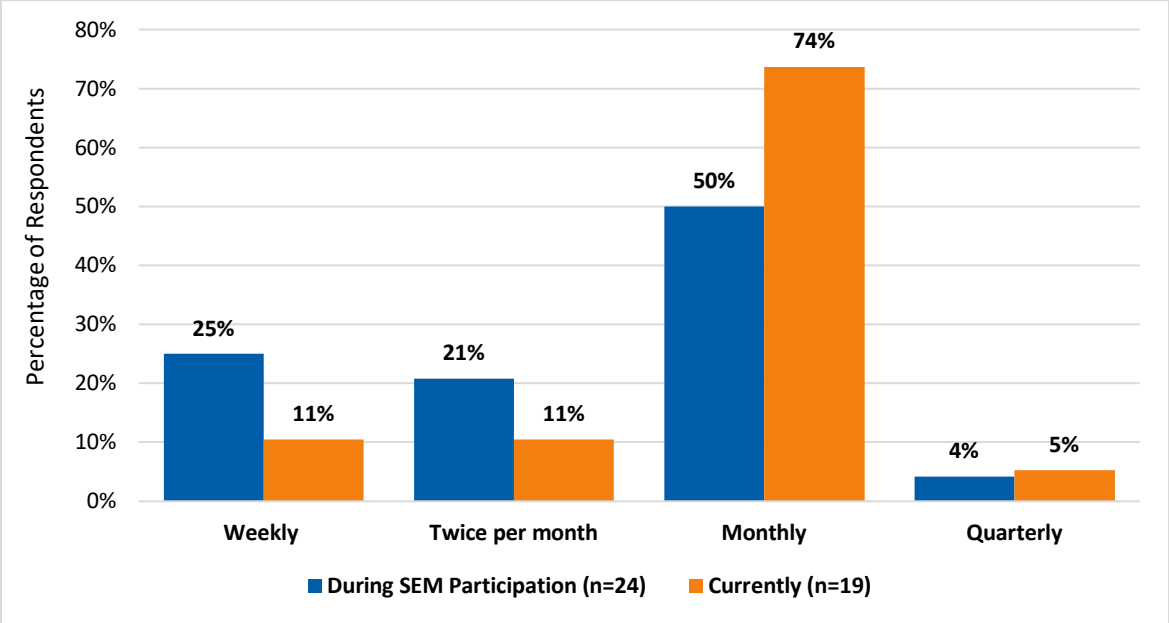
Source: Interview questions C1a, C1b, and C2. "Do you have an energy manager or someone in charge of energy efficiency at this location?" "Is it the same person as the one who worked on SEM?" and "Does this person have a back-up?"

Energy Management Team

When asked, 60% of all respondents (24 of 36) indicated that their organization has an energy management team. A larger proportion of multi-engagement participants (82%; 9 of 11) than single-engagement participants (60%; 15 of 25) have an energy management team. Among the organizations with an energy management team, 75% (18 of 24) indicated that the team was comprised of multiple people.

Cadmus asked how frequently the team met during SEM engagements and how frequently they were currently meeting and found that 92% (22 of 24) reported that the team continues to meet regularly (although two respondents didn't know how frequently). Figure 11 shows that monthly meetings were the most common frequency both during and after SEM engagements.

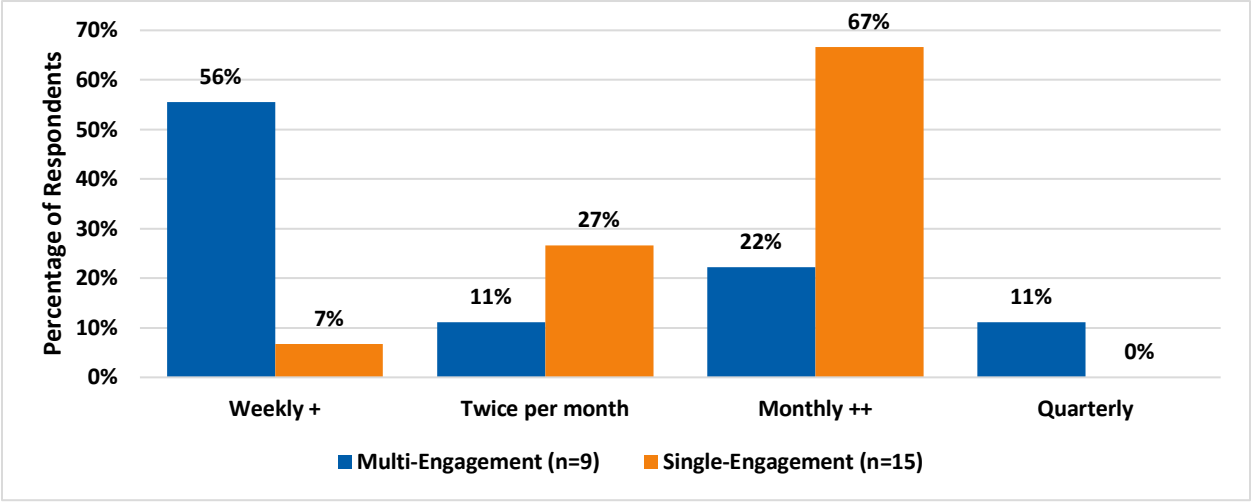
Figure 11. Frequency of Energy Team Meetings



Source: Interview questions C4a and C4c. "How frequently did the energy team meet over the course of your involvement in SEM?" and "How frequently is it currently meeting?"
Don't know and no responses were removed.

During SEM engagements, most participants were meeting monthly (and were single-engagement participants), Most multi-engagement participants met weekly as shown in Figure 12.

Figure 12. Frequency of Energy Team Meetings During SEM Engagements

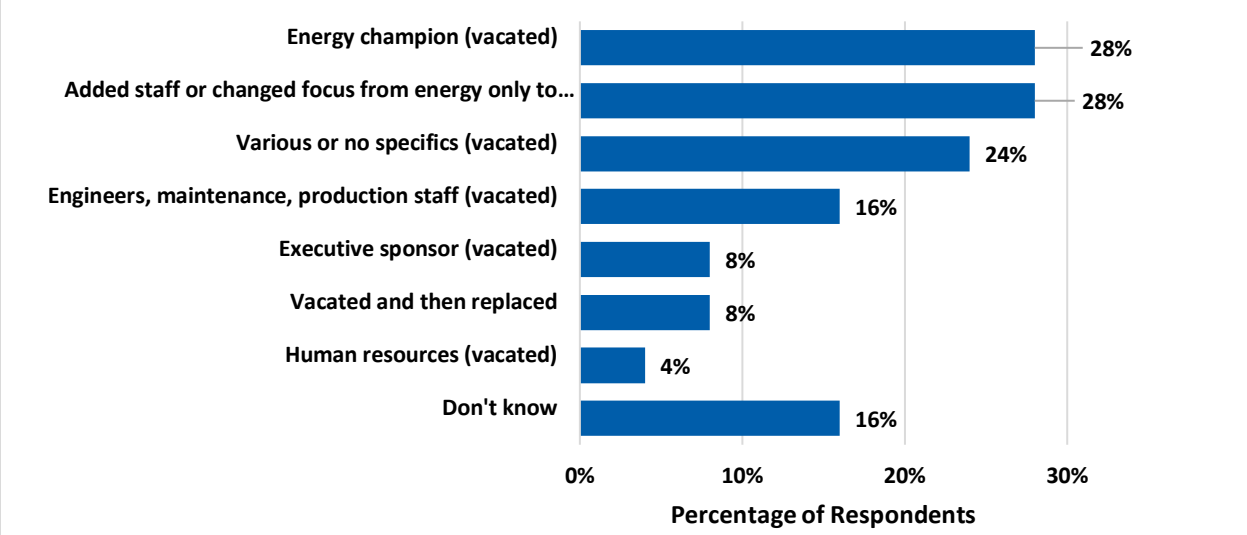


Source: Interview question C4a. "How frequently did the energy team meet over the course of your involvement in SEM?" + Significant difference between multi-engagement and single-engagement participants at the 0.10 level. ++ Significant difference between multi-engagement and single-engagement participants at the 0.05 level.
Don't know and no responses were removed.

Cadmus asked questions to determine how the composition of the energy management teams had changed over time (summarized in Figure 13). Eighty-six percent of energy management teams (25 of 29) had personnel changes since their SEM engagement—note, that although only 24 respondents answered that they had an energy management team in the previous question, 29 respondents answered the question about changes to their teams because changes to some teams included positions being vacated, resulting in those teams no longer existing. Respondents could provide responses in multiple categories. The most common change was that the role of the energy champion was vacated (28%; 7 of 25) and that staff were added or that the focus of the team changed from energy only to energy and production (28%; 7 of 25). Twenty-four percent of participants gave no specifics (6 of 25) and 16% of participants did not know if changes had occurred (4 of 25). Fifteen participants said that key positions on the energy team had been vacated (60%; 15 of 25), including energy champion; executive sponsor; engineers, maintenance, production staff; human resources; or various or no specifics. Sixteen percent of the respondents indicated they did not know (3 of 25).

About half the roles vacated were filled by other staff (52%; 12 of 23). At the time of the interview, 11 vacated roles had not been filled: three respondents had plans to fill the role, five did not, and three did not know. Paired with the previous results that just over half of participants continue to have an energy management team that meets regularly, this could suggest that maintaining the composition of energy management teams is not as high of a priority after SEM engagements as during SEM engagements.

Figure 13. Energy Team Changes



Source: Interview question C5a and C5b. "Has your energy team changed? Specify how it has changed," and "Have any staff ceased to participate in the energy team? "If so, which role was vacated?" (n=25)
Multiple responses allowed.

Cadmus asked respondents how much of their time at work they currently devoted to SEM. Of the 29 respondents who provided details, 79% spend less than one-quarter of their time on energy management, 17% spend between one-quarter and one-half their time, and one respondent (3%) said

energy management is a full-time job. About one-third of all respondents said energy management is included in their job descriptions.

Management Support

Cadmus asked respondents to describe management support for SEM. Most respondents indicated that management is very supportive of continuing SEM (67%; 24 of 36). While three indicated that management is supportive as long as it makes financial sense, three indicated that management is supportive but there is limited time to implement SEM activities, two indicated that management is supportive of energy management but not SEM in particular,[16] one indicated that management is supportive of SEM but want it structured differently, and two respondents could not provide an answer.

Among all respondents, the top five factors reported to influence management to engage in SEM included cost savings (67%; 24 of 36), environmental responsibility (11%; 4 of 36), public opinion (8%; 3 of 36), business culture (8%; 3 of 36), and process improvements (6%; 2 of 36).

Executive Sponsor

Cadmus asked respondents about the level of engagement from their organization's executive sponsors (senior management representatives supporting SEM). Thirty-seven percent of participants (10 of 27) indicated that the executive sponsor currently has limited involvement, only when needed.

Nine of 36 participants said they do not have an executive sponsor or they did not know if they have an executive sponsor: this was a more common answer for multi-engagement participants than for single-engagement participants.

In addition, 47% of single-engagement participants (9 of 19) reported that the executive sponsor is still very involved with the program. Table 31 summarizes the levels of executive sponsor engagement with SEM.

[16] These respondents did not indicate why management is supportive of energy efficiency but not SEM in particular.

Table 31. Executive Sponsor Engagement with SEM

Involvement	Overall (n=27)	Multi-engagement (n=8)	Single-engagement (n=19)
Less involved, limited involvement, hands off, answers questions when needed	37%	50%	32%
Driving force, champion of the program, fairly involved, complete involvement, priority	33%	0%	47%
Checks in periodically, attends meetings, reviews reports, monitoring role, provides information	22%	50%	11%
Makes final decisions; approves the program	7%	0%	11%

Source: Interview question C8a. "Tell me about the executive sponsor's involvement." (n=27)
Don't know responses were removed.

Forty-seven percent of all respondents (17 of 36) indicated that the executive sponsor is the same person as it was during program engagement, while 31% indicated it is a different person, 17% did not know, and 6% do not currently have an executive sponsor.

Employee Engagement

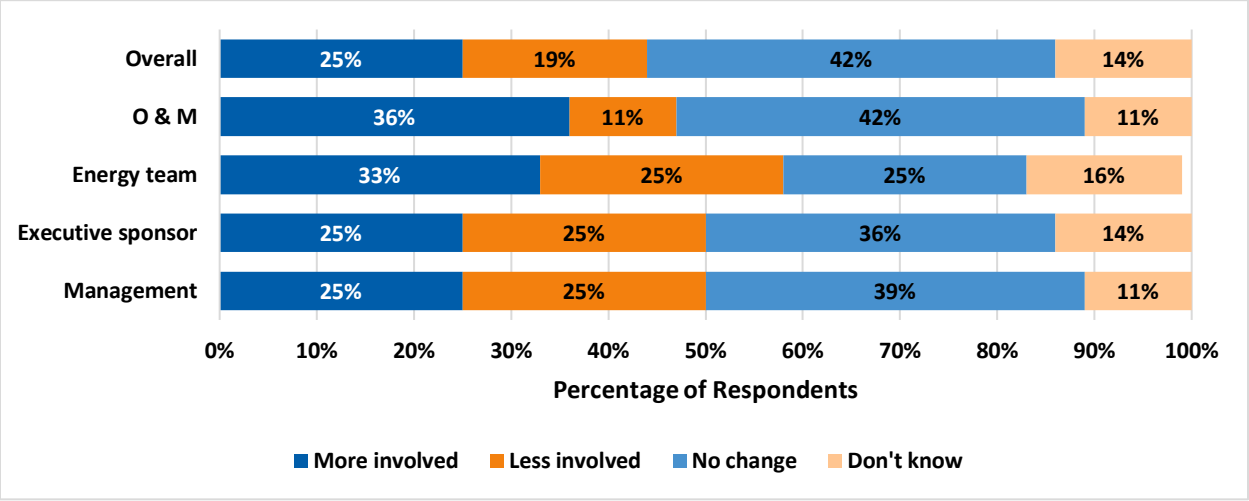
Most respondents (81%; 29 of 36) conducted employee engagement activities as part of their SEM participation and 70% of these 29 participants plan to continue these activities in the future. However, only 36% of all respondents plan to initiate new activities.

The most common employee engagement activities were training, meetings, and workshops (52%) followed by energy fairs, Kaizen events, and summer barbecues (31%); newsletters (14%); behavioral rewards (7%); and other (17%) activities like signage, using the staff to look for air leaks, and expanding the energy team.

Level of Engagement

When asked how the level of SEM engagement had changed across their organization since the SEM engagements, 25% respondents (nine of 36) indicated that overall SEM engagement has increased. Figure 14 shows the results for different categories of SEM engagement including operations and maintenance (O&M) employees, energy team, executive sponsor, and management activities. The results indicate that operations and maintenance and energy team activities have increased for a greater number of participants than executive sponsor or management activities.

Figure 14. Changes in SEM Engagement Levels since SEM Program Engagement



Source: Interview question F4. "How has the level of engagement in SEM changed since your SEM engagement, is the [insert] more involved, less involved, or has there been no change?" (n=36)

Energy Management Tools

Cadmus asked respondents a series of questions about their use of various energy management tools after SEM engagement. Table 32 shows the percentage of respondents who had used an energy management tool since participating in SEM. There is no correlation between single or multi-engagement participation and continuing to use these tools—many participants continue to use some or all of them.

The energy management assessment is the least commonly used tool (19%) and the opportunity register is the most commonly used (86%). The participants who used the energy management assessment, energy map, and opportunity register received *full* SEM adoption scores for the corresponding sub-elements.

Table 32. Usage of Energy Management Tools

Tool	Total (n=36)	Multi-engagement (n=11)	Single-engagement (n=25)
Energy management assessment	19%	27%	16%
Energy map	61%	45%	68%
MT&R or other reporting tool	67%	73%	64%
Opportunity register or other tracking system for potential projects*	86%	73%	92%

Source: Interview questions E1a, E2a, F1a, F1b, F1e and G1. "Have you revisited or updated the energy management assessment since your SEM engagement?" "Do you still use or reference the energy map developed through SEM?" "Are you still using the opportunity register?" "Do you track potential opportunities using a different system?" and "Are you currently using the Monitoring, Targeting, and Reporting model and workbook developed during SEM to track your energy use? If not, are you using another type of electronic system to track your energy use over time?"
* These percentages include respondents who used the opportunity register or a different system to track potential opportunities.

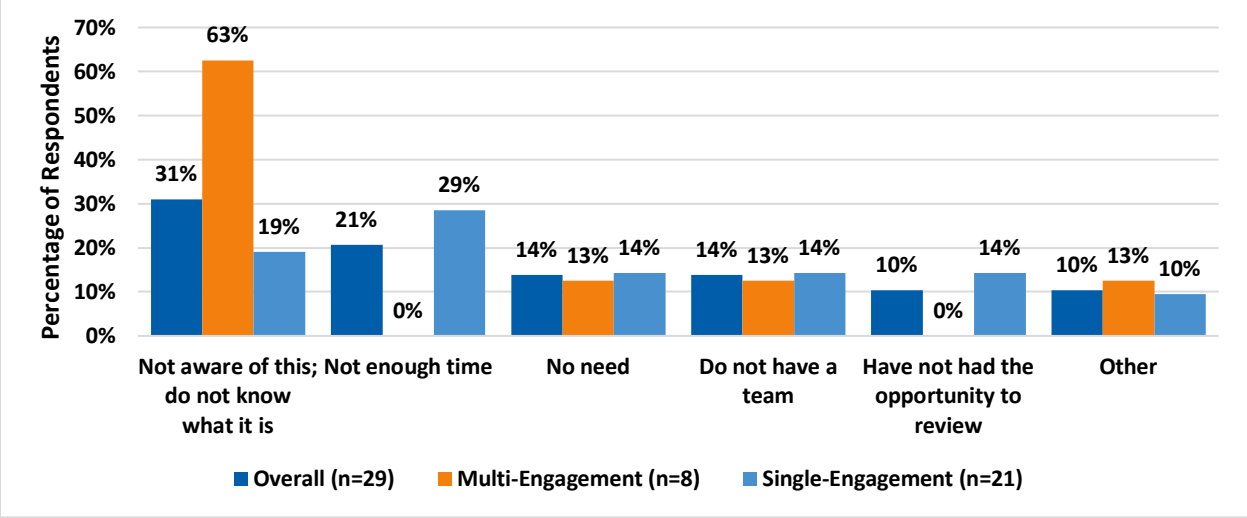
Energy Management Assessment

Most respondents had not updated the energy management assessment since their SEM engagement. All seven respondents who had used the energy management assessment since their SEM engagement said they update the assessment at least annually.

Of the 29 respondents who had not used the energy management assessment since their SEM engagements, 10 do not currently have an energy manager or champion and 10 have a different energy manager or champion since their SEM engagement; this result could be contributing to the lack of awareness about the tool.

The most common reason respondents provided for not using the energy management assessment was being unaware of it (31%; 9 of 29). This was also the most common reason among multi-engagement participants (63%; 5of 8), while the most common reason among single-engagement participants was lack of time (29%; 6 of 21). Several respondents also indicated that time constraints is one of the top challenges to energy management in general (22%; 8 of 36). Figure 15 summarizes these responses.

Figure 15. Reasons for Not Using the Energy Management Assessment since SEM Engagement



Source: Interview question E1c. "If not, why not?"

Energy Map

Cadmus asked respondents whether they currently use the energy map, how they use it, and, if they do not use it, why not. Sixty-one percent of respondents (22 of 36) still use or reference the energy map developed during their SEM engagement. The most common ways respondents use the energy map is to track energy (52%; 11 of 21) and to help them identify future energy savings opportunities (38%; eight of 21).

Over half of those who no longer use the energy map (57%; eight of 14) do not know why they have not used it. Other participants had various reasons for not using the map. One respondent said operations had changed and the energy map was no longer relevant, one said the map is just not actively in use, one said they map was "lost in the shuffle," one is no longer involved in high-level strategy documents, one has no energy team and said the energy map was never completed, and one said the map is simply not in use because it is not visible on a daily basis.

Opportunity Register

Cadmus asked respondents about current and past use of the opportunity register. Overall, 67% of respondents (24 of 36) said the opportunity register is useful in helping them prioritize and implement projects; this was reported by higher percentage of single-engagement participants (72%; 18 of 25) than multi-engagement participants (55%; six of 11). Overall, respondents indicated that the opportunity register is a useful tool, a great resource, and a good way to look for ways to save energy.

Just over half of respondents said the opportunity register is no longer being used (53%; 19 of 36); however, when asked, 74% (14 of 19) said they are tracking potential opportunities using a different system. Between the number of participants who use the opportunity register and the number who use a different system, 86% of respondents (31 of 36) are currently tracking potential opportunities.

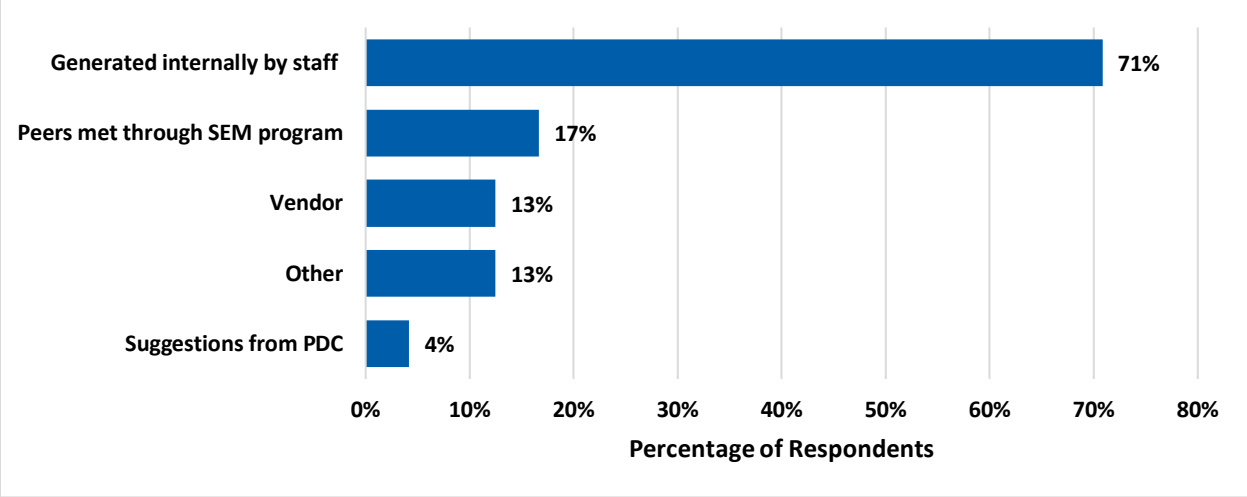
Respondents who are tracking potential opportunities but are not currently using the opportunity register most commonly use an Excel spreadsheet or have created a location on their network to track these opportunities. Some of these participants (29%; 4 of 14) do not have a specific tool to track energy efficiency projects but said opportunities are added to a list of facility-wide improvements. Of these, one respondent started using an Excel file because the opportunity register was difficult to use and to print.

A few respondents provided details about challenges they faced when using the opportunity register. One respondent said the opportunity register was difficult to maintain because staff added the same project multiple times but with slightly different details or titles, which created challenges with updating the information. One respondent said the opportunity register was not client-friendly and not easy to print out. One respondent said the opportunity register does not fit with the organization's culture and there is no need to make a list of potential opportunities, so instead the organization uses the energy scan concept to identify and fix problems.

Cadmus asked about a sample of activities included in the opportunity registers and MT&R reports produced at the time of the SEM engagements. Because we interviewed participants several years after the activities were recorded or completed and to increase the likelihood respondents would remember them, we selected activities that respondents could more likely recall, focusing on those with potentially large impacts on energy savings. Of the 116 activities we selected, we were able to ask about 80 of them during interviews. Of those, 71 had been completed or were ongoing (89%), three had been removed (4%), and two had not been completed but remained on the list of planned activities (3%). The respondents did not know the status of two activities. These results are reflected in the Implementation sub-element, where 93% of participants (28 of 30) achieved a *full* SEM adoption score.

Two-thirds of respondents (67%; 24 of 36) had added projects to their list of potential opportunities since participating in SEM. Figure 16 shows the sources of activities that had been added to opportunity registers since the engagements took place. Sixty-three percent of respondents (17 of 24) said projects are most often generated by internal staff; the other nine respondents did not provide information (didn't know or did not answer).

Figure 16. Origins of Opportunities Added to Opportunity Registers



Source: Interview question F3c. "Describe where the opportunities came from." (n=24)
Multiple responses allowed.

Nine respondents (33%) said staff generated the projects to improve energy-efficiency: this finding suggests that SEM engagement indeed leads to increased awareness of energy efficiency among staff.

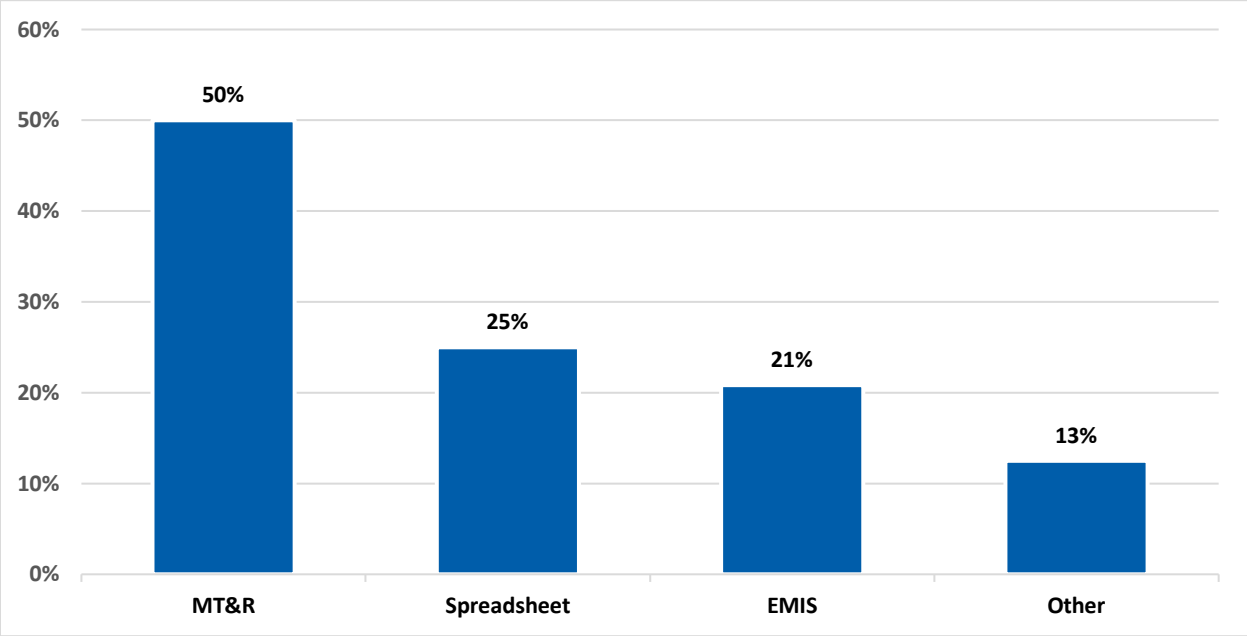
Monitoring, Targeting, and Reporting

This section provides results for one of the three key elements, Monitoring, Tracking, and Reporting. Overall, 64% of participants achieved *full* adoption scores for this key element. Sixty-four percent of participants achieved *full* SEM adoption for the Measurement sub-element and 92% achieved *full* SEM adoption for the Reporting sub-element.

Energy Use Tracking

As shown in Figure 17, of the 67% of respondents (24 of 36) who said they track energy use, 50% (12 of 24) most often use the MT&R workbook, while 25% use other spreadsheet tools (6 of 24), 21% use an energy management information system (5 of 24), and 13% use other tools (3 of 24). Multiple responses were allowed. These other tools include a proprietary software system, ENERGY STAR's Portfolio Manager, and daily email messages.

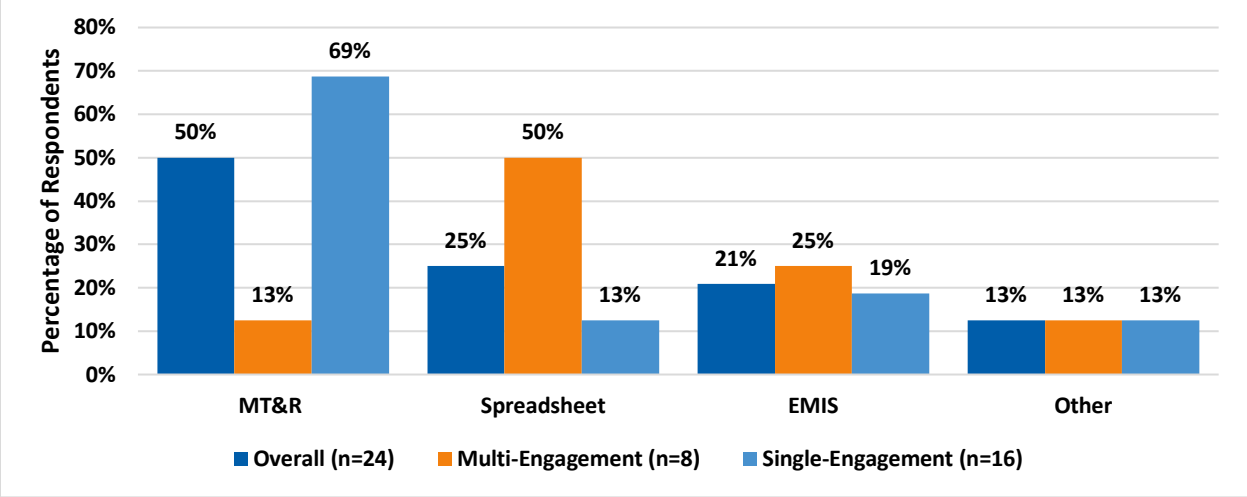
Figure 17. Reporting Tools Used to Track Energy Use



Source: Interview questions G1 and G1(4). "Are you currently using the Monitoring, Targeting, and Reporting model and workbook developed during SEM to track your energy use? If not, are you using another type of electronic system to track your energy use over time?" (n=24)
Multiple responses allowed.

Single-engagement participants (69%; 11 of 16) were more likely to use the MT&R model and workbook developed during SEM to track energy use, whereas multi-engagement participants (50%; four of eight) were more likely to use a spreadsheet, and they used other types of reporting tools including energy management information systems (Figure 18).

Figure 18. Reporting Tools Used to Track Energy Use by Duration of Engagement



Source: Interview question G1. "Are you currently using the Monitoring, Targeting, and Reporting model and workbook developed during SEM to track your energy use? If not, are you using another type of electronic system to track your energy use over time?" (n=24)
Multiple responses accepted.

One-third of respondents (33%; 12 of 36) indicated that they do not track energy at all. Respondents provided the following reasons for not tracking energy use:

- Time constraints (2 of 12)
- Forecast method not updating by season (2 of 12)
- Have not found a model that works (1 of 12)
- Difficult to maintain model without sub-metering (1 of 12)
- Difficult to maintain the model when there are production changes (1 of 12)
- No longer doing the project that required energy tracking (1 of 12)
- Team moved and they did not continue tracking energy (1 of 12)
- Do not know why no longer tracking energy (3 of 12)

Monitoring, Targeting, and Reporting Model

Cadmus asked the 12 respondents who used the MT&R model and workbook to provide additional detail about the ease of use, maintenance time, variables in the model, and current use. Most respondents indicated that the MT&R model and workbook were either *very easy* (50%; 6 of 12) or *somewhat easy* (42%; 5 of 12) to maintain; one respondent said it was not easy to maintain. Respondents said the model requires less than one hour or between one to four hours per month to maintain (or that they did not know how long it takes to maintain).

Nearly half of these respondents (42%; five of 12) said they had changed the variables in their model since SEM engagement. Of these respondents, two had changed weather variables, two had changed manufacturing and production inputs, and one had made seasonal changes but was unable to provide

additional details. Of the seven respondents who had not changed any model variables, three indicated that the model is still good at tracking energy and four did not know.

Respondents who use the MT&R model said they used it in the following ways:

- Provide monthly reports to staff and management on energy savings (25%; 3 of 12)
- Tracking toward annual savings goals (25%; 3 of 12%)
- Reassess their goals, metrics, or planned projects (17%; 2 of 12)
- Review trends (8%; 1 of 12)
- Review how set points are affecting energy use (8%; 1 of 12)
- Review spikes and dips (8%; 1 of 12)
- Don't know (8%; 1 of 12)

We asked respondents who used the MT&R model and workbook how the MT&R model and workbook could be changed to help them maintain or use these tools. Table 33 lists all the suggestions provided by respondents. The two most common suggestions were to provide more training and to automate data inputs.

Table 33. Suggestions to Improve the MT&R Model and Workbook

Summary of Comments	Number of Responses**
Provide more training or information (general training, how to correlate projects, how to update the model as company grows, and how to change the model when production changes are made)	5
Automate data input including weather	4
Have the National Oceanic and Atmospheric Administration maintain the weather data website more consistently*	1
Simplify (average production data by week or month instead of daily)	1
Set up the MT&R workbook for specific meters or on specific accounts (difficult to see savings at campus level)	1
Provide an engineer to collect information from multiple meters	1

Source: Interview questions G1(1c), G1(6), and G1(11). "If using MT&R model and workbook, what would help to maintain it?" (n=12), "If using another type of electronic system to track energy use, how could the MT&R model and workbook have been improved so that you would have continued to use it?" (n=14), and "If not using a system to track energy use, how could the MT&R model and workbook been improved so that you would have continued to use it?" (n=12) Don't know responses were removed.

* We recognize that Energy Trust cannot control the National Oceanic and Atmospheric Administration weather service, but included all responses mentioned by a respondent.

** Multiple responses allowed.

Other Tracking Systems

Two of 12 respondents who use the MT&R tools to track energy use also use other energy management information system tracking tools: one uses Sensei and the other uses Portland General Electric's Energy Expert. Over half of the respondents used tools other than the M&TR model and workbook (58%; 14 of 24), including the two that also use MT&R tools and one that didn't know what tool they were using.

Of the 13 respondents that knew what tools they were using, they used them because they had been using them prior to participating in Energy Trust's SEM program and staff were already familiar with them (29%; four of 13) or they were automated and easy to use (21%; three of 13); other participants indicated that they used the ISO 50001 modeling plan and that trying to get environmental factors into thee MT&R model was too difficult, among other reasons (31%; 4 of 13); one participant indicated they didn't use the MT&R tools because they didn't have an energy champion (8%; 1 of 13) and one participant did not know (8%; 1 of 13).

Cadmus asked respondents who use tools other than the MT&R model and workbook what type of information they collected. Respondents could provide multiple responses to this open-ended question; we did not prompt for specific types of information. All but two of these 13 respondents provided responses and all indicated that they collect energy use data, most commonly cost information, production data, and weather data. Two respondents decided which data to collect by considering how various systems use data and three others consider production and energy data, three respondents use data collected during their SEM participation, one collects additional data that was required by their corporate office, one determines what data to collect based on internal meetings, and one indicated that the data collection is automatic.

Most respondents (85%; 11 of 13) who use a different energy tracking system than MT&R reported that they will continue using that system to track energy use.

Energy Use Data

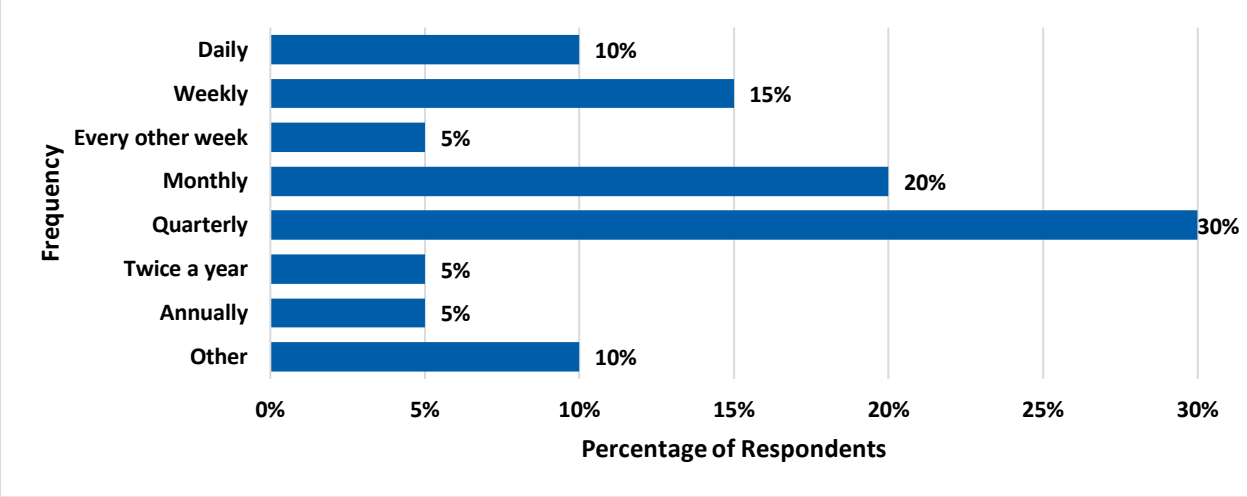
The energy champion is the person most often responsible for tracking energy use (55%; 17 of 31),[17] followed by an assigned member of the energy team (16%; five of 31). Other people who track energy include engineers, maintenance managers, purchasing directors, utility managers, and staff at the corporate office.

Reporting Updates

Many respondents (69%; 25 of 36) said their management teams require regular updates from the energy team. Although five did not know at what frequency, we summarized the frequencies for the 20 respondents that answered in Figure 19. Most required quarterly updates (30%; 6 of 20) as shown in Figure 19.

[17] The remaining respondents did not know who tracks energy use or said their company does not track energy use.

Figure 19. Frequency of Management Updates



Source: Interview question C9b. "Does your management team require regular updates from the team? How frequently?" (n=20)
Multiple responses allowed.

Energy teams provide management updates through meetings (44%; 11 of 25), spreadsheets (24%; 6 of 25), written reports (20%; 5 of 25), PowerPoint presentations (12%; 3 of 25), and email (4%; 1 of 25), 16% of respondents did not know how updates were provided (4 of 25); multiple responses were allowed. Most participants did not specify or did not know (80%; 20 of 25) who information was shared with. Of those who did, they indicated that data is shared with management (40%; 2 of 5), the energy team (20%; 1 of 5), or all staff (40%; 2 of 5).

Challenges and Successes

Cadmus asked respondents to describe challenges in implementing SEM, summarized in Table 34. All but one respondent said they faced challenges. The most common challenges included time constraints, commitment issues, and budgetary issues. Although time constraints and commitment were top challenges, most respondents (92%; 33 of 36) achieved a *full* SEM adoption score in the customer commitment key element, suggesting that although challenging, participants were able to establish protocols to mitigate these challenges. Respondents also mentioned time constraints as a reason they did not use the MT&R tool to track energy.

Table 34. Challenges Implementing SEM

Description	Count	Percentage
Time and resource constraints (getting the group together, time intensive program, time commitment from group because not primary job, understaffed)	8	22%
Commitment (getting buy-in from management and staff)	5	14%
Budget, finances, getting funding	5	14%
Staff and management changes	4	11%
Communication (many people and many shifts)	4	11%
Project-specific issue (VFD issue, balancing refrigeration compressors with seasonality, balance flow with water quality)	3	8%
Getting the right staff in the right positions	2	6%
Not quick enough payback on projects	2	6%
Enthusiasm issues (preconceived ideas about energy efficiency)	2	6%
Difficult to find small projects	1	3%
Old equipment	1	3%
Maintenance	1	3%
Operator training	1	3%
No challenges	1	3%

Source: Interview question B2a. "Have you encountered any challenges implementing SEM?" (n=36)
Multiple responses allowed.

We asked respondents to provide feedback about ways that Energy Trust could help their organization sustain SEM practices. Three respondents did not provide a response. Eight of the remaining 33 respondents said there is nothing Energy Trust can change. Over one-quarter of respondents (27%; 9 of 33) said Energy Trust could continue to provide information about the program and how to continue implementing it (Table 35).

Table 35. Suggestions for Improvement

Suggestions	Count	Percentage
Continued communication from Energy Trust (encourage continuation, provide a periodic update or plan, and provide information about upcoming opportunities; check-in with people who completed the program and talk about challenges since the program)	9	27%
More help with employee engagement activities	3	9%
Offer incentives for operations and maintenance projects and other low-cost projects	2	6%
Provide training about how to modify the energy model	2	6%
Provide bigger incentives	1	3%
Continue providing evaluation reports on specific projects	1	3%
Provide weekly reports	1	3%
Provide upgrades using direct purchasing at a discount (so that a lighting project does not all need to be completed at once)	1	3%
Continue Kaizen Blitz events	1	3%
Nothing	8	24%
Don't know	4	12%

Source: Interview question H4. "What could Energy Trust do to help your company sustain your strategic energy management practices and continue to identify and implement changes to save energy?" (n=33)
Open-ended question (each participant provided one response that was coded into a single suggestion category).

Future Engagement

Most respondents (88%; 31 of 35) said they are more likely to conduct energy efficiency projects following their SEM engagement, while 11% (four of 35) said that the SEM engagement made no difference; one respondent did not know. Of the 31 respondents that said they were more likely to conduct additional energy efficiency projects following SEM engagement, Table 36 lists the reasons they gave; one respondent did not answer.

Table 36. Reasons Participants are Likely to Conduct Energy Efficiency Projects

Response Summary	Count	Percentage of Respondents
Awareness increased; increased discussion, provided additional items to think about; shed light on opportunities, paid more attention to energy efficiency	11	37%
More information, understanding of opportunities, more education, easier to identify projects	5	17%
Program was helpful, made a difference	5	17%
Make the business case, justify the project	3	10%
More projects since SEM	3	10%
Still a priority	1	3%
Increased creativity	1	3%
Extra help from Energy Trust	1	3%

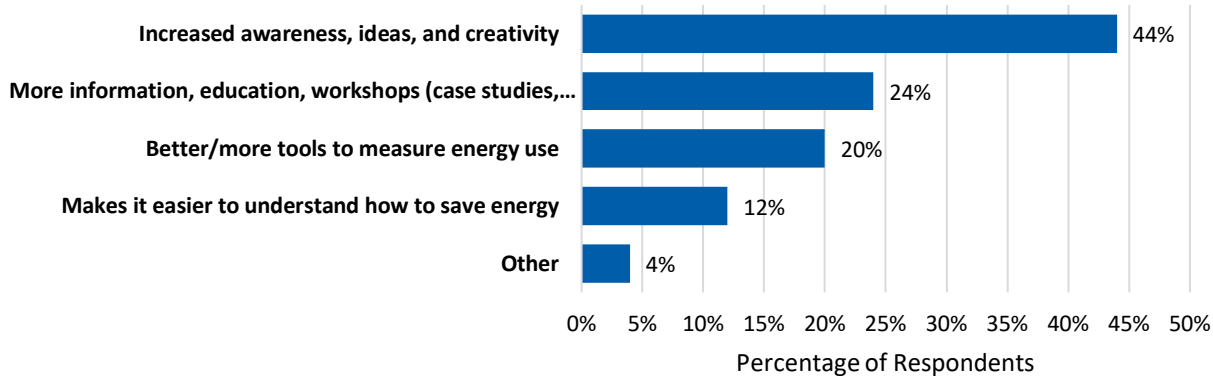
Source: Interview question H1b. "Why?" (n=30)
Multiple responses allowed.

Most respondents said that participating in SEM made identifying future energy efficiency projects easier (88%; 28 of 32) and 50% (16 of 32) said that participating in SEM made implementing future

projects easier; the remaining respondents did not know or did not provide a response. There was no significant difference between multi-engagement and single-engagement participants.

Respondents provided several reasons that the SEM engagements made identifying future energy easier, summarized in Figure 20. The four respondents who indicated that the engagement made no difference said that they had already been identifying future energy efficiency projects prior to SEM engagement.

Figure 20. Reasons that Identifying Energy Efficiency Projects is Easier Since SEM Engagement



Source: Interview question H2b. "Did participating in SEM make identifying future energy efficiency projects easier? Why do you say that? " (n=32)
Multiple responses allowed.

Fifty percent of respondents (16 of 32) indicated that the SEM engagement makes implementing future energy efficiency projects easier, while 44% (14 of 32) said it makes no difference and 6% (2 of 32) said it is not easier. The top reason respondents provided that implementing future energy efficiency projects is easier is the increased information and awareness of ways that activities and projects can affect energy use. Table 37 list respondents' feedback on why and how their SEM engagements influenced the implementation of future energy efficiency projects.

Table 37. SEM Engagement Influences on Future Implementation

Response Description	Count	Percentage of Respondents
Easier (n=16)		
Awareness, information, and more details about the impact on energy savings	6	38%
Better tools to obtain and communicate savings and organize projects	3	19%
Skills developed during SEM used to identify projects and activities, provided good structure	3	19%
Skills in return-on-investment calculations	1	6%
More management support	1	6%
Good for LEED certification	1	6%
No answer	1	6%

Response Description	Count	Percentage of Respondents
Not Easier (n=2)		
Different way of doing things	1	50%
SEM does not help with what happens after making the business case	1	50%
No Difference (n=14)		
Already doing it; did not establish a new process	8	57%
Impacted awareness but no impact on implementation	5	36%
No answer	1	7%

Source: Interview question H2d. "Did participating in SEM make implementing future energy efficiency projects easier? Why?" (n=32)
Open-ended question (each participant provided one response that was coded into a single response description category).

Respondents also identified the aspects of SEM that most contributed to their organization conducting additional energy efficiency projects. Overall, the opportunity register was the aspect that most contributed toward additional energy efficiency projects. There was a difference in responses between participants depending on the length of their engagement: the top aspect for single-engagement participants was the opportunity register, while the top aspect for multi-engagement participants was the energy team. Table 38 provides the responses to this question, with the shaded cells representing the top answer for each respondent type.

Table 38. Important Aspects

SEM Aspect	Overall (n=30)	Multi-Engagement (n=9)	Single-Engagement (n=21)
Opportunity register	40%	33%	43%
Energy scan	27%	44%	19%
Energy team	27%	56%	14%
Energy model that shows predicted versus actual energy use	17%	22%	14%
Employee engagement activities	13%	22%	10%
Other (Infra-red guns, consistent attention, communication tools)	10%	11%	10%
Energy management assessment	7%	22%	0%
Peer network	7%	22%	0%
Everything	7%	0%	10%
General awareness	7%	0%	10%
Support from Energy Trust	7%	0%	10%
Energy management plan and goals	3%	11%	0%
Reports to management	3%	11%	0%

Source: Interview question H3a. "Since your SEM experience ended, which aspect(s) of SEM do you feel has most contributed toward your facility doing additional energy efficiency projects?" (n=30 overall, n=9 multi-engagement participants, and n=21 single-engagement participants)
Multiple responses allowed.

Facility Changes

Cadmus asked whether there had been any changes to the facility, operating hours or schedules, production levels, or product lines since the participants' SEM engagements. The results are summarized in Table 39 and below the table. 22 of 36 respondents (61%) noted that there had been one or more of the following changes; 8 of 36 (22%) indicated they didn't know.

Table 39. Facility Change Summary

Change	Multi-Engagement Participants	Single-Engagement Participants	Total
Change to facility	75%	80%	79%
Change to operating hours or schedules	17%	67%	54%
Change to production levels	89%	71%	77%
Change to product line	57%	40%	44%

Source: Interview questions I3a, I4, I5, and I6. "Since participating in SEM in [year], have there been any changes to the facility?" (n=28), "Since participating in SEM in [year], has there been any change in operating hours/schedules?" (n=24), "Has there been any change in production levels since implementing SEM in [year]?" (n=26), and "Since participating in SEM in [year], have you changed the product line or added any different products to your production facility?" (n=27)
Don't know, refused, and not applicable responses were removed.

Operating Hours or Schedule

Over half of the respondents (54%; 13 of 24) said they had made changes to their operating hours or schedules since their SEM engagements; 12 respondents did not know whether or not there had been

changes and were removed from the base. The majority (77%; 10 of 13) had added shifts. One respondent said the SEM program incentive played a role in the changes.

Production Levels

Seventy-seven percent of respondents (20 of 26) said production levels had changed since implementing SEM; 10 respondents did not know whether there had been changes or did not respond and were removed from the base. Thirty percent (six of 20) expected these changes to be permanent. Two-thirds of the respondents that answered (67%; 12 of 18) indicated that production levels had changed because of changes in the market and 33% of respondents gave various reasons including costs, customer demand, moving from start-up to regular operation, new equipment, marketing, and seasonality; two did not know why and were removed from the base. None of the respondents indicated that the program had a role in the production level changes.

Product Line

Twelve respondents had changed or added product lines. Of these, four respondents said the program had a role in how production of the new lines was set up. One respondent provided details, indicating that when the new product line was added, the operating hours of the other two lines were shifted and the organization identified an energy opportunity through this process.

Appendix E. SEM Activities Verified During Interviews

Table 40 lists the 116 activities that Cadmus selected to be verified. The 71 activities highlighted in light blue were verified during the interviews as having been complete during the SEM engagement or remained ongoing. During the interviews, we verified that all activities highlighted in blue were implemented during the performance period unless denoted with a superscript. The superscripts indicate the following: [1] removed, [2] planning to implement but not yet implemented, [3] completed in post-performance period, or [4] the respondent did not know the project status. Note, these are results from the interviews only and do not include all activities verified based on the completion status and dates in the opportunity registers.

Table 40. SEM Activities Selected and Verified During Interviews

Participant	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6
1						
2	[redacted]	[redacted]	[redacted]			
3	[redacted]	[redacted]	[redacted]			
4	[redacted]	[redacted]	[redacted]	[redacted]		
5	[redacted]	[redacted]				
6	[redacted]	[redacted]				
7	[redacted]	[redacted]				

Participant	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6
8	[redacted]	[redacted]				
9	[redacted]		[redacted]			
10	[redacted]	[redacted]	[redacted]			
11	[redacted]	[redacted]	[redacted]			
12						
13	[redacted]					
14	[redacted]					
15	[redacted]					
16	[redacted]	[redacted]	[redacted]			
17						
18	[redacted]	[redacted]	[redacted]			
19	[redacted]	[redacted]				

Participant	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6
20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
22						
23	[redacted]	[redacted]				
24	[redacted]	[redacted]	[redacted]			
25						
26	[redacted]					
27	[redacted]	[redacted]	[redacted]			
28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
29	[redacted]	[redacted]	[redacted]			

Participant	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6
30	[redacted]	[redacted]				
31	[redacted]	[redacted]				
32	[redacted]	[redacted]	[redacted]			
33	[redacted]	[redacted]				
34	[redacted]	[redacted]	[redacted]			
35	[redacted]	[redacted]				
36	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
37	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Participant	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6
		[redacted]				
38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
39	[redacted]	[redacted]	[redacted]			
40	[redacted]	[redacted]	[redacted]			
41	[redacted]	[redacted]				
42	[redacted]	[redacted]				
43	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
44	[redacted]	[redacted]	[redacted]	[redacted]		
45						
46						

Appendix F. Available Data by Participant

Table 41. Participant Data Summary

Participant	Interview	Site Visit	Opportunity Register	MT&R Report	MT&R Workbook	Evaluable
Participant 1	X	X	X	X	X	No
Participant 2	X	X	X	X	X	Yes
Participant 3	X	X	X	X	X	Yes
Participant 4	X	X	X	X	X	No
Participant 5	X	X	--	X	X	No
Participant 6	X	--	--	X	X	No
Participant 7	X	--	--	X	X	Yes
Participant 8	X	--	X	X	X	No
Participant 9	X	--	X	X	X	No
Participant 10	X	--	X	X	X	No
Participant 11	X	--	X	X	X	Yes
Participant 12	X	X	X	X	X	Yes
Participant 13	X	--	X	X	X	Yes
Participant 14	X	--	X	X	X	Yes
Participant 15	X	--	X	X	X	Yes
Participant 16	X	X	X	X	X	No
Participant 17	X	X	X	X	X	Yes
Participant 18	X	X	X	X	X	No
Participant 19	X	--	X	X	X	No
Participant 20	X	X	X	X	--	No
Participant 21	X	X	X	X	X	No
Participant 22	X	X	X	X	X	No
Participant 23	X	--	X	X	X	Yes
Participant 24	X	--	X	X	X	No
Participant 25	X	--	X	X	X	Yes
Participant 26	X	--	X	X	X	No
Participant 27	X	--	X	X	X	No
Participant 28	X	X	X	X	X	No
Participant 29	X	--	X	X	X	No
Participant 30	X	--	X	X	X	No
Participant 31	X	--	X	X	X	No
Participant 32	X	--	X	X	X	No
Participant 33	X	X	X	X	X	No
Participant 34	X	--	X	X	X	No
Participant 35	X	--	--	X	X	No
Participant 36	X	--	--	--	--	No
Participant 37	--	X	X	X	X	No
Participant 38	--	X	X	X	X	No
Participant 39	--	X	X	X	X	No
Participant 40	--	X	X	X	X	No

Participant	Interview	Site Visit	Opportunity Register	MT&R Report	MT&R Workbook	Evaluable
Participant 41	--	--	--	X	X	No
Participant 42	--	--	X	X	X	No
Participant 43	--	X	X	X	X	Yes
Participant 44	--	X	X	X	X	No
Participant 45	--	--	--	X	X	No
Participant 46	--	--	--	X	X	No
Total	**36**	**20**	**38**	**45**	**44**	**12**

Appendix G. Regression Analysis and Evaluated Savings

Appendix G provides the methodology and results of the regression analyses that Cadmus performed when participant data and regression models were evaluable.

Methodology

Cadmus used the pre-post methodology to evaluate savings for each participant with evaluable data and model(s). We estimated the regression model, as specified in the MT&R report with the addition of a pre-post indicator, to estimate facility annual savings. We verified the savings associated with capital projects that occurred during the performance period and then subtracted the verified capital savings from the facility savings to estimate evaluated net SEM savings. We reported a point estimate of net SEM savings, the percent savings, and an 80% confidence interval and calculated realization rates.

Cadmus also compared methodologies and model specification between the MT&R model and other alternatives. For example, if the MT&R model included temperature, Cadmus compared it with a model that included heating and cooling degree days instead. If an alternative approach provided more accurate estimates of energy savings, we included the variables and model specification as a recommendation to update the MT&R model.

Regression Analysis

Cadmus used the model specification and variables in the MT&R report to fit pre-post regression models of energy consumption during the baseline period. The regression models (reported and evaluated) usually included weather variables such as heating and cooling degree days and other variables, including volumes of product output or schedule variables. The following equation provides the general form of each participant's facility energy consumption model:

$$e_t = \alpha + f(weather_t, \beta) + g(other_t, \gamma) + I(post, \delta) + \varepsilon_t$$

Where:

t = The t^{th}time period (day, week, or month), $t = 1, \ldots, T$. For example, $T = T_{baseline} + T_{performance} = 24$ when monthly energy-use data were available for a full year in both the baseline and performance periods.

e_t = Energy consumption of the facility during the t^{th} time period.

α = Intercept indicating the facility average base load energy use per interval.

$weather_t$ = A vector of outdoor temperature variables (such as heating degree day [HDD] and cooling degree day [CDD]) affecting energy use during the t^{th} month.

β	=	A vector of coefficients that indicates the relationship between energy use and weather. For example, the coefficient on HDD would indicate average energy use per additional heating degree day.
$other_t$	=	A vector of additional variables related to facility energy consumption during the t^{th} time period (e.g., production).
γ	=	A coefficient vector that represents the relationship between the additional variables and energy consumption.
$I(post)$	=	An indicator that represents the SEM engagement; it is set to 0 in the baseline period and 1 in the performance period.
δ	=	A coefficient that represents the change in facility average load during each performance period, i.e., the modeled facility savings.
ε_t	=	The model error term that represents unobservable influences on energy consumption in time period t.

Cadmus used the estimated effect of the SEM engagement, δ, to calculate average facility energy savings in the performance period, by multiplying the estimate by the number of time periods (days, weeks, or months) in the performance period, as shown in the following equation.

$$s = \hat{\delta} \times T_{performance}$$

Where s represents the modeled facility savings in the performance period.

Methodology Comparison

Cadmus also compared the predictive accuracy of the MT&R model and alternative model specifications. We identified the best-fitting model from among model specifications that included independent variables (e.g., HDD or CDD) in addition to those in the model reported in the MT&R report. We selected independent variables based on regression fit statistics and other regression diagnostics to identify outliers and cases where there was non-constant variance. Cadmus did not develop independent baseline models using these updates but made recommendations about MT&R model specifications and methods.

Program Savings Estimation

Implementers typically estimated savings using the forecast method to create a predictive Ordinary Least Squares (OLS) Regression energy model using baseline period data. The predictive model is then used to forecast what energy consumption would have been in the absence of the program, had the facility not implemented SEM-related improvements. Implementers tended to use measurement period data to estimate energy savings, or avoided energy use, by comparing actual energy use observed after the improvements were implemented to the forecasted energy consumption. They extrapolated the measurement period estimates to the performance period to estimate SEM savings.

They also apply adjustments for capital projects or non-routine adjustments (e.g., new loads or plant expansion) to estimate SEM-specific savings.

Regression Models

As part of this evaluation, Cadmus considered regression model specifications—those reported in the MT&R reports and our recommendations for model specifications. Table 42 provides a summary of the electric energy and natural gas usage regression model specifications for evaluable models only. In most reported models, temperature, temperature squared, and/or inverse temperature were included. Cadmus recommended including CDD and HDD and seasonal indicators in place of these variables, one or more production variables, and indicators for nonroutine events. Including these variables increased the adjusted R^2 in all cases, improving the accuracy of the overall savings estimates.

Table 42. Regression Model Summary

Independent Variables	Implementers' Models		Recommended Models	
	Electric Models	Gas Models	Electric Models	Gas Models
Temperature	4	8	0	0
Temperature squared	4	7	0	0
Inverse temperature	2	3	0	0
CDD, HDD, or both	2	0	10	11
Season or month	0	2	10	11
Weekday or holiday	2	0	1	0
Single production variable	4	2	3	0
Multiple production variables	6	2	7	4
Nonroutine event indicator	1	1	1	1

Cadmus tracked the frequency of data available for electricity and gas consumption models. Table 43 provides a summary. Most electricity usage data were recorded weekly and most gas usage data were recorded monthly. Overall, monthly data were most prevalent among evaluable data and models.

Table 43. Data Frequency Summary

Model Type	Daily	% Daily	Weekly	% Weekly	Monthly	% Monthly
Electric (n=12)	2	17%	7	58%	3	25%
Gas (n=11)	1	9%	0	0%	10	91%
Total (n=23)	**3**	**13%**	**7**	**30%**	**13**	**57%**

In Table 44, we summarize the average relative precision across evaluated savings estimates, for different data frequency categories, at 80% confidence. Precision improved with increased frequency.

Table 44. Average Precision of Evaluated SEM Savings by Data Frequency

Model Type	Daily	Weekly	Monthly
Electric	28% (n=1)	56% (n=7)	>100% (n=3)
Gas	>100% (n=1)	NA (n=0)	>100% (n=10)
All	**>100% (n=2)**	**56 (n=7)**	**>100% (n=13)**

Savings Results

Table 45 and Table 46 below present the total facility savings, capital savings deducted, and SEM electric and natural gas savings for the evaluated participants and models. Evaluated electric and natural gas SEM savings were both above 3%, with 3.2% electric savings and 3.5% natural gas savings. The total electric savings included 12 models (facilities) for eight participants and the total gas savings included 11 models for six participants. Because the analysis sample included only eight participants with electric savings and six with natural gas savings, these results could not be generalized to the population.

Table 45. Evaluated Electric Savings Summary

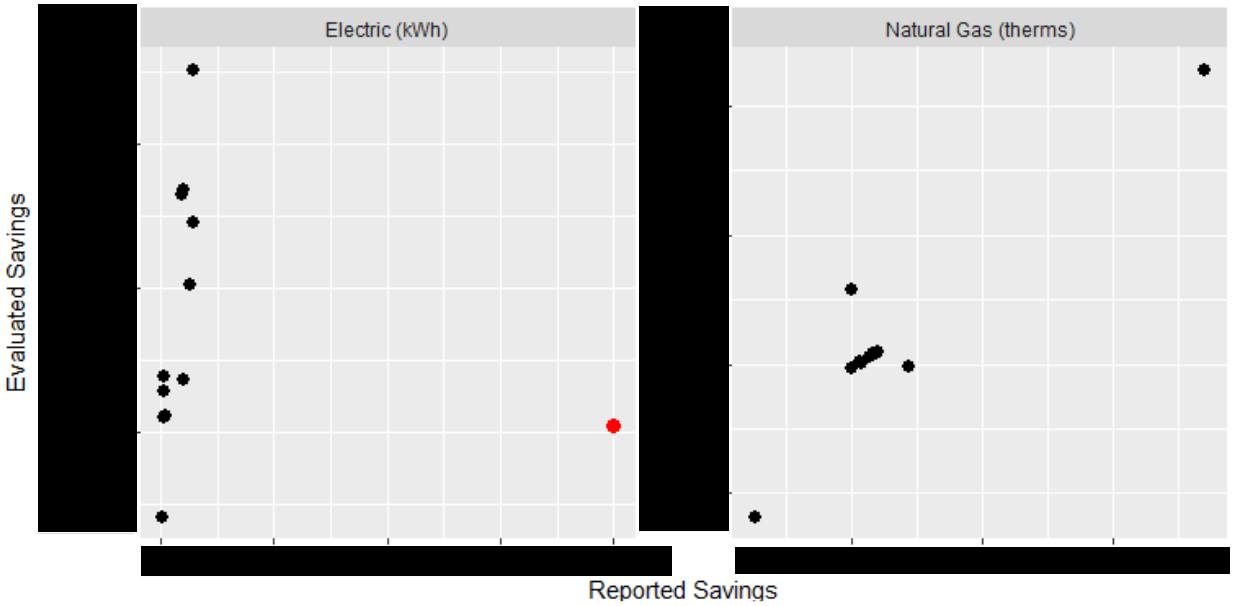
Savings	Number Participants	Number Models (Facilities)	Reported Savings (kWh)	Reported Savings %	Evaluated Savings (kWh)	Evaluated Savings %	Realization Rate
Facility savings	8	12	[redacted]	19.0%	[redacted]	3.9%	17%
Capital savings deducted	5	8	[redacted]	3.6%	[redacted]	0.9%	25%
SEM savings	**8**	**12**	[redacted]	**17.3%**	[redacted]	**3.2%**	**10%**

Table 46. Evaluated Natural Gas Savings Summary

Savings	Number Participants	Number Models (Facilities)	Reported Savings (therms)	Reported Savings %	Evaluated Savings (therms)	Evaluated Savings %	Realization Rate
Facility savings	6	11	[redacted]	10.0%	[redacted]	3.5%	62%
Capital savings deducted	0	0	[redacted]	N/A	[redacted]	N/A	N/A
SEM savings	**6**	**11**	[redacted]	**10.0%**	[redacted]	**3.5%**	**62%**

The reported savings values were considerably higher than the evaluated savings. When we compare the evaluated to the reported savings, the realization rates were 10% for SEM electric savings and 62% for SEM natural gas savings. Most evaluated savings values were less than reported savings values. Also, as shown in Figure 21, one participant is an outlier (red dot) with very high reported savings had much lower evaluated savings—it accounted for 72% of the total reported savings but had a 0.1% realization rate. The chief source of discrepancy was due a nonroutine event: the facility was shut down for nine days during the performance period which reduced energy consumption. The event was not accounted for in the reported savings but was in the evaluated savings.

Figure 21. Reported and Evaluated Electric Savings



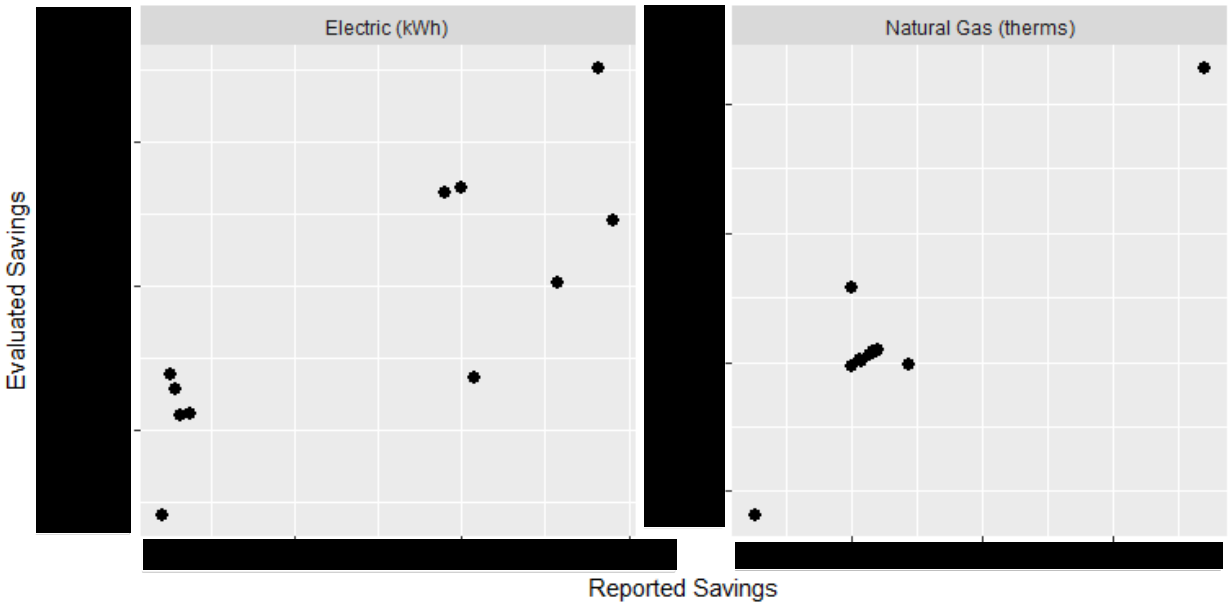
Note: the red dot in the figure represents the outlier participant with high reported savings.

Table 47 and Figure 22 show the results with the outlier omitted. The resulting electric SEM realization rate is 57%, similar to the natural gas savings realization rate. Participant-specific summaries are provided in Appendix I. Participant-Specific Reports (Confidential).

Table 47. Evaluated Electric Savings Summary, Outlier Omitted

Savings	Number Participants	Number Models (Facilities)	Reported Savings (kWh)	Reported Savings %	Evaluated Savings (kWh)	Evaluated Savings %	Realization Rate
Facility savings	7	11	[redacted]	7.0%	[redacted]	4.3%	60%
Capital savings deducted	4	7	[redacted]	1.3%	[redacted]	1.0%	87%
SEM savings	**7**	**11**	[redacted]	**6.3%**	[redacted]	**3.7%**	**57%**

Figure 22. Reported and Evaluated Electric Savings, Outlier Omitted



The reasons for discrepancies between reported and evaluated savings included differences between implementer and evaluator methods for accounting for capital savings and nonroutine events, and the implementer using a measurement period instead of the full performance period for estimating facility savings. Table 48 provides and overview of the reasons that realization rates were less than 100%.

Table 48. Reasons Realizations Rates Less than 100%

Reason	Electric Models (Facilities)	Gas Models (Facilities)	Total	Percent of All Models
Capital savings not accounted for correctly	7	0	7	30%
Nonroutine event not accounted for correctly	1	0	1	4%
Measurement period used to estimate annual savings rather than performance period	6	10	16	70%
No significant difference	2	1	3	13%
Total*	**12**	**11**	**13**	**100%**

*Total row is not the sum of previous rows—one model could have one or more reason for realization rate less than 100%.

Appendix H. Participant-Specific Reports (Confidential)

Confidential Appendix H submitted separately.

Appendix I. Participant Identification Map (Confidential)

Confidential Appendix I submitted separately.

Appendix J. Interview Guide

Appendix J includes the interview guides for ROC participants and for non-ROC participants.

Energy Trust Production Efficiency Strategic Energy Management Evaluation Interview Guide

Researchable Topics	Item
Company and contact information	Section A
SEM Background	Section B
Customer Commitment – Policy and Goals	Section D
Customer Commitment – Resources	Section C
Planning and Implementation – Energy Assessment and Energy Map	Section E
Planning and Implementation – Project Register (Opportunity Register), Employee Engagement, and Implementation	Section F
Planning and Implementation – Metrics and Goals, Measurement and Reporting	Section G
Future Engagement	Section H
Site Visit Recruit	Section I

These questions are meant to be a guide and will be modified by the interviewer as needed based on the conversation and knowledge level of the respondent.

Target Quota = 45

Variables to be pulled into interview

- Opportunity Register activities
- Contact Name
- Facility/company name
- Facility address
- Phone Number
- SEM Year (both)

A. Introduction

A1. May I speak with [CONTACT NAME]? [IF THAT PERSON IS NOT AT THIS PHONE NUMBER, ASK FOR NAME AND PHONE NUMBER AND START AGAIN]

1. (Yes)
2. (No, person is not able to come to phone) [GET NAME, PHONE NUMBER, AND SCHEDULE CALLBACK]
3. (No, person no longer works there) [ASK FOR THE CONTACT NAME AND PHONE NUMBER FOR THE PERSON MOST FAMILIAR WITH PARTICIPATING IN {SEM TYPE} IN {SEM YEAR}]

98. (Don't know) [ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]
99. (Refused) [THANK AND TERMINATE]

A2. Hello, I'm [INSERT NAME] calling from Cadmus on behalf of Energy Trust of Oregon. We are conducting an important study with current and past participants in industrial energy management programs to understand their impact and opportunities for improvement. Are you the person who is most familiar with strategic energy management or SEM at your facility?

1. (Yes)
2. (No, person is able to come to phone) [RECORD NAME AND REPEAT A2]
3. (No, person is not able to come to phone) [SCHEDULE CALLBACK]
98. (Don't know) [ASK FOR THE CONTACT NAME AND PHONE NUMBER FOR THE PERSON MOST FAMILIAR WITH PARTICIPATING IN {SEM TYPE} IN {SEM YEAR}]
99. (Refused) [THANK AND TERMINATE]

[READ DESCRIPTON IF NEEDED]
SEM provides technical support such as audits and workshops to help facilities adopt Strategic Energy Management as an important part of how they do business.

Before we get started, I'd like to note that your responses are confidential and will only be publicly reported in aggregate. Individual facility responses will not be identified in public documents, but will be made available to Energy Trust OF OREGON. [IF NEEDED: individual responses will be reported anonymously as part of a group. We will not publicly report any identifying information] Recording the responses.

A3. What is your job title?

A4. How long have you been with **[facility name]**?

A5. How long have you had this role?

[ASK DURING SCHEDULING CALL]

A6. Did your company participate in **SEM** in **[SEM YEAR OF MOST RECENT PARTICIPATION]**? [IF NEEDED: SEM was a program offered by Energy Trust of Oregon that provides training and technical assistance to facilities to track and improve their energy performance]

1. Yes
2. No [ASK TO SPEAK WITH SOMEONE WHO IS MORE FAMILIAR WITH THEIR PARTICIPATION AND BEGIN AGAIN]
98. Don't know [ASK TO SPEAK WITH SOMEONE WHO IS MORE FAMILIAR WITH THEIR PARTICIPATION AND BEGIN AGAIN]

A7. How familiar are you with the activities implemented as part of SEM?

A8. What is your role in your company's SEM program?

Some of my questions are about components of SEM. If you are not familiar enough to answer, just let me know and I'll move on to the next question. If SEM was implemented at multiple facilities, please base your answers on how SEM was implemented at the majority of your facilities.

B. Overall SEM Questions

B1. To what degree has your organization continued the energy management practices taught during your participation in the SEM program in **[SEM YEAR]**? What did it take to make this happen?

B2. Have you encountered any challenges implementing SEM? What were they and when did they occur? How did you overcome them?

B3. Have you maintained the energy savings you achieved during SEM?

[INSTRUCTION TO INTERVIEWER: USE TABLE B BELOW TO RECORD ANSWERS TO QUESTIONS IN SECTION B]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table B				
Question	**Energy Performance Goals**	**Answers to listen for**	**Check box**	**CEE Element[1]**
B1a	To what degree has your organization continued to implement the energy management practices taught during SEM?	1. Open end 2. Don't know		
B1b	What did it take to make this happen?	1. Open end 2. Don't know		
B2a	Have you encountered any challenges implementing SEM?	1. Open end 2. Don't know		
B2b	What were they and when did they occur?	1. Open end 2. None 3. Don't know		
B2c	How did you overcome them?	1. Open end 2. Don't know		
B3	Have you maintained the energy savings you achieved during SEM?	1. Yes 2. No 3. Don't know		

[1]Note that the CEE Element column is intended to track the questions associated with each element. Not all questions require a direct mapping to a CEE element, but each element requires at least on question. Having the questions marked in the tables will help to ensure that the interviewer prioritizes these questions.

C. Energy Team, Energy Champion, & Executive Sponsor

Energy Champion

C1. Do you have an "energy champion" or "energy manager," someone in charge of coordinating energy management activities and spearheading efficiency projects? Is this the same person (or people) who served as the energy champion during SEM in **[SEM YEAR]**?

C2. Does the energy champion have a back-up?

Energy Team

C3. Do you have an **energy [management] team** [dedicated staff for energy and energy efficiency]?

[ASK C4 THROUGH C6 IF C3= YES]

C4. How frequently did the energy team meet over the course of your involvement in SEM in **[SEM YEAR]**? Is your energy team still meeting [regularly]? How frequently is it currently meeting?

C5. Has your energy team changed since you first started meeting? Have any staff ceased to participate in the energy team? If so, which role was vacated? Has another staff member fill that role? If not, do you plan to fill that role? Was the staff member identified based on strategic decisions or based upon the person's personal interest?

C6. How much of each team member's time at work is devoted to the energy management team? Is energy management in their job description?

Management

C7. In general, how supportive is your company's management of continuing to work on SEM? What factors influence this position?

C8. Tell me about the Executive Sponsor's involvement. Do you have the same Executive Sponsor that you did during SEM, or a different one? [IF NEEDED: The executive sponsor is the person from management who supports SEM.]

C9. Does your management team require regular updates from the team? How frequently? In what form?

[INSTRUCTION TO INTERVIEWER: USE TABLE C BELOW TO RECORD ANSWERS TO QUESTIONS C1 - C9]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table C				
Question	**Staff**	**Answers to listen for**	**Check box**	**CEE Element[1]**
C1a.	Do you have an energy manager or someone in charge of energy efficiency at this location?	1. Yes 2. No 3. Don't know		1b
C1b	Is it the same person as the one who worked on SEM?	1. Yes 2. No 3. Don't know		
C2	Does this person have a back-up?	1. Yes 2. No 3. Don't know		
C3a	Do you have an energy management team [dedicated staff for energy and energy efficiency]?	1. Yes 2. No 3. Don't know		1b
C3b	Is it one person or multiple people?	1. One person 2. Role shared across multiple people 3. Other [SPECIFY] 4. Don't know		
C4a	How frequently did the energy team meet over the course of your involvement in SEM?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. Other [SPECIFY] 8. Don't know 9. Bi-monthly (every other week)		
C4b	Is your energy team still meeting [regularly]?	1. Yes 2. No 3. Don't know		1b
C4c	How frequently is it currently meeting?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. Other [SPECIFY] 8. Don't know 9. Bi-monthly (every other week		
C5a	Has your energy team changed? (Have any staff ceased to participate in the energy team?)	1. Yes [specify] 2. No 3. Don't know		
C5b	If so, which role was vacated?	1. Open end 2. Don't know		
C5c	Has another staff member fill that role?	1. Yes 2. No 3. Don't know		
C5d	If not, do you plan to fill that role?	1. Open end 1. Don't know		
C5e	Was the staff member identified based on strategic decisions or based upon the person's personal interest?	1. Strategic 2. Personal interest 3. Other		

		4. Don't know		
C6a	How much of each person's time at work on the energy team is devoted to SEM?	1. 0% - 24% 2. 25% - 49% 3. 50% - 74% 4. 75% - 99% 5. 100% 6. Don't know		
C6b	Is energy management in their job description?	1. Yes 2. No 3. Don't know		
C7a	In general, how supportive is the management of continuing to work on SEM?	1. Open end 2. Don't know		
C7b	What factors help influence this?	1. Open end 2. Don't know		
C8a	Tell me about the Executive Sponsor's involvement.	3. Open end 4. Don't know		
C8b	Do you have the same Executive Sponsor that you did during SEM, or a different one?	1. Same 2. Different 3. Don't know 4. No executive sponsor		
C9a	Does your management team require regular updates from the team?	1. Yes 2. No 3. Don't know		3d
C9b	How frequently?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. Other [SPECIFY] 8. Don't know 9. Bi-monthly (every other week)		
C9c	In what form?	1. Open end 2. Don't know		

[1]Note that the CEE Element column is intended to track the questions associated with each element. Not all questions require a direct mapping to a CEE element, but each element requires at least on question. Having the questions marked in the tables will help to ensure that the interviewer prioritizes these questions.

D. Energy Policies & Goals

D1. Does your company or facility have any <u>policies or plans</u> in place that incorporate energy or energy efficiency? [IF NEEDED: Does the plan include other sustainability goals such as recycling, waste reduction, water use, etc.? A simple example would be things like always buying efficient equipment or setting energy performance goals.]

D2. Does your company or facility currently have <u>goals</u> related to energy or energy efficiency? [READ IF NEEDED: This goal(s) may be expressed as a percentage or an absolute number in units of energy use intensity (EUI). The goal(s) must be stated as a comparison to a defined baseline. It could also be defined through adoption of other systems such as LEED or ENERGY STAR.] How are the goals defined and what are they (e.g. 5% reduction in energy use in 3 years)? When did you set the goals? Are they formal (i.e., approved by management) or informal? Have they been communicated to staff? How are you doing meeting the goals? Do you periodically update the goals? If so, how often?

[INSTRUCTION TO INTERVIEWER: USE TABLE D BELOW TO RECORD ANSWERS TO QUESTIONS D1 – D2]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table D				
Question	**Energy Performance Goals**	**Answers to listen for**	**Check box**	**CEE Element[1]**
D1a	Does your company or facility have any <u>policies or plans</u> in place that incorporate energy efficiency? [IF NEEDED: Does the plan include other sustainability goals such as recycling, waste reduction, water use, etc.?]	1. Yes 2. No 3. Don't know		1a
D1b	[IF NEEDED: Does the plan include other sustainability goals such as recycling, waste reduction, water use, etc.?]	1. Yes 2. No 3. Don't know		
D2a	Does your company or facility currently have <u>goals</u> related to energy or energy efficiency?	1. Yes 2. No 3. Don't know		1a
D2b	How are the goals defined and what are they (e.g. 5% reduction in energy use in 3 years)?	1. percentage energy reduction per quantity product over time 2. absolute number energy reduction per quantity product over time 3. Other [SPECIFY]		2c
D2c	When did you set the goals?	1. 2009 2. 2010 3. 2011 4. 2012 5. 2013 6. 2014 7. 2015 8. Other [SPECIFY]		
D2d	Are they formal or informal?	1. Formal 2. Informal 3. Don't know		
D2e	Have they been communicated to staff?	1. Yes [SPECIFY] 2. No 3. Don't know		1a
D2f	How are you doing meeting the goals?	1. We have met 100% of our goals 2. We are on track to meet 100% of our goals		

Table D				
Question	**Energy Performance Goals**	**Answers to listen for**	**Check box**	**CEE Element[1]**
		3. We are falling behind on our goals 4. We expect to meet 75% of our goal 5. We expect to meet 50% of our goal 6. We expect to meet 25% of our goal 7. We expect to meet 0% of our goal 8. Other [SPECIFY] 9. Don't know		
D2g	Do you periodically update the goals?	1. Yes 2. No 3. Don't know		2g
D2h	If so, how often?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. Never updated 8. Other [SPECIFY] 9. Don't know		2g

[1]Note that the CEE Element column is intended to track the questions associated with each element. Not all questions require a direct mapping to a CEE element, but each element requires at least on question. Having the questions marked in the tables will help to ensure that the interviewer prioritizes these questions.

E. Energy Management Assessment and Energy Map

E1. Have you revisited or updated the energy management assessment since your SEM engagement in **[SEM YEAR]**? If so, how often do you revisit the assessment? If not, why not? [IF NEEDED: This is an assessment of the energy management structure that identifies how management can better support energy efficiency efforts.]

E2. Do you still use or reference the energy map developed through SEM? How? If not, why not? [IF NEEDED: This is a breakdown of energy end uses broken down by facility/processes either by estimated energy use or % of facility energy use.]

[INSTRUCTION TO INTERVIEWER: USE TABLE E BELOW TO RECORD ANSWERS TO QUESTIONS E1 - E2]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table E

Question	Planning and Implementation	Answers to listen for	Check box	CEE Element
E1a	Have you revisited or updated the energy management assessment since your SEM engagement?	1. Yes 2. No 3. Don't know		2a
E1b	[IF YES] If so, how often do you revisit the assessment?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. When operations change 8. Other [SPECIFY] 9. Don't know 10. Bi-monthly (every other week)		2g
E1c	[IF NO] If not, why not?	1. Open end 2. Don't know		
E2a	Do you still use or reference the energy map developed through SEM? [IF NEEDED: This is a breakdown of energy end uses broken down by facility/processes either by estimated energy use or % of facility energy use.]	1. Yes 2. No 3. Don't know		2b
E2b	[IF YES] How?	1. Open end 2. Don't know		
E2c	[IF NO] If not, why not?	1. Open end 2. Don't know		

F. Opportunity Register & Employee Engagement

Opportunity Register

While participating in SEM in [SEM YEAR], an opportunity register was developed listing potential energy-efficiency projects and activities at your facility.

F1. Did you find the Opportunity Register useful in helping you prioritize and implement projects? Are you still using it? Do you regularly update your opportunity register? [INCLUDES ADDING NEW PROJECTS TO THE REGISTER OR UPDATING PROJECTS ALREADY ON THE REGISTER] If not, do you track potential opportunities using a different system? If so, please describe. [IF UPDATE REGISTER, ASK IF WE CAN GET A COPY OF THE REGISTER.]

F2. I have some questions about the status of the activities included in your opportunity register at the time you participated in SEM. I am going to list a few activities which were implemented during your SEM participation. Can you confirm these were implemented and tell me whether they remain in place? [INTERVIEWER: Check the Opportunity Register and ask about projects. For example, control set point projects: three were completed and two were still planned? Did the ones that were completed change and were the ones identified implemented?] Have you implemented the remaining items on the opportunity register? If not, do you have any plans to do so?

F3. Have you added any energy-efficiency projects to the opportunity register since your SEM engagement in [SEM YEAR]? Describe the projects, where they "came" from [INTERVIEWER: Look for whose idea it was – someone within the facility, a contractor, a contact from a different firm that they met through the SEM workshops, etc.], and tell me when they were implemented or when you plan to implement them. [ASK IF F1c INDICATES REGULAR UPDATE: You mentioned earlier that you update the opportunity register. Are you tracking the status of these projects in the register?] [ASK IF F1c INDICATES **NO** REGULAR UPDATE: Have you kept track of these projects? If so, how?]

Employee Engagement

F4. How has the level of engagement in SEM changed overall at your company since your SEM engagement in [SEM YEAR], is the company more involved with SEM? Less involved? How has it changed specifically among your company's: [ASK EACH ITEM SEPARATELY]

1. Management?
2. Executive Sponsor?
3. Energy Team?
4. Operations and maintenance personnel?
5. Production employees?

F5. Did you conduct any specific employee engagement activities as part of your participation in SEM in [SEM YEAR]? If so, do you plan to continue those activities in the future? Do you plan to initiate new ones? If so, please describe.

[INSTRUCTION TO INTERVIEWER: USE TABLE F BELOW TO RECORD ANSWERS TO QUESTIONS F1-F5]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table F				
Question	**Opportunity Register**	**Answers to listen for**	**Check box**	**CEE Element**
F1a	Did you find the Opportunity Register useful in helping you prioritize and implement projects?	1. Yes 2. No 3. Don't know		
F1b	Are you still using the opportunity register?	1. In place and using it 2. In place but not using it 3. In development 4. No 5. Don't know		2d
F1c	Do you regularly update your opportunity register? [ADD NEW PROJECTS TO THE LIST OR TRACK PROGRESS OF PROJECTS]	1. Update regularly 2. Update occasionally 3. Almost never update it 4. Haven't updated since SEM ended 5. Don't know		2g
F1d	Can we get a copy of the updated opportunity register?	1. Yes 2. No 3. Don't know		
F1e	If not, do you track potential opportunities using a different system? If so, please describe. [INTERVIEWER: Request the files if customer uses a different system.]	1. Yes [SPECIFY] 2. No 3. Don't know		2d
F2a	I have some questions about the status of the projects included in your opportunity register from when you participated in SEM. Can you describe them [projects included in your opportunity register] and tell me if they were complete or whether you removed them or plan to complete them? [INTERVIEWER: Check the Opportunity Register and ask about projects. For example, control set point projects: three were completed and two were still planned? Did the ones that were completed change and were the ones identified implemented?]	Record for each project / SEM activity 1. Completed 2. Planned 3. Removed		2f
F2b	If completed, did they change since they were recorded in the opportunity register during your participation in SEM?	Record for each project / SEM activity completed 1. Yes [SPECIFY] 2. No 3. Don't know		
F2c	When were they completed or when are they planned to be completed?	Record for each project / SEM activity if completed or planned 1. Open end 2. Don't know		
F2d	ASK IF REMOVED: Are you planning to implement them?	Record for each removed project. 1. Yes 2. No 3. Don't know		2f
F3a	Have you added any energy-efficiency projects added to the opportunity register since your SEM engagement?	1. Yes [SPECIFY] 2. No 3. Don't know 4. Yes, but not to official register [SPECIFY] 5. Haven't added to OR or potential project list but have done other projects		2g

Table F				
Question	**Opportunity Register**	**Answers to listen for**	**Check box**	**CEE Element**
F3b	IF YES: Describe the projects?	1. Open end 2. Don't know		
F3c	IF YES: Describe where they "came" from?	1. Staff requests for energy efficiency 2. Suggestions from PDC 3. Generating internally 4. Peers met through SEM program 5. Activities other than energy efficiency 6. Other [SPECIFY] 7. Don't know		
F3d	When were they implemented or if not implemented when do you plan to implement them?	1. Open end 2. Don't know		
F3e	[ASK IF UPDATING THE REGISTER] Are you tracking the status of these projects in the register?	1. Yes [SPECIFY what the status is] 2. No 3. Don't know		
F3f	[ASK IF NOT UPDATING IN THE REGISTER] Have you kept track of these projects? If so, how?	1. Yes [SPECIFY] 2. No 3. Don't know		
F4	How has the level of engagement in SEM changed overall at your company since your SEM engagement, is the company more involved with SEM? Less involved? 1. Company? 2. Management? 3. Executive Sponsor? 4. Energy Team? 5. Operations and maintenance personnel? 6. Production employees?	[ASK ABOUT EACH ITEM ON LIST] 1. More involved with SEM 2. Less involved with SEM 3. No change 4. Don't know		
F5a	Did you conduct any specific employee engagement activities as part of your participation in SEM? If so, please describe.	1. Yes [SPECIFY] 2. No 3. Don't know		2e
F5b	If so, do you plan to continue those activities in the future?	1. Yes [SPECIFY] 2. No 3. Don't know		
F5c	Do you plan to initiate new activities? If new, please describe.	1. Yes [SPECIFY] 2. No 3. Don't know		

G. MT&R Model

G1. Are you currently using the Monitoring, Targeting and Reporting (MT&R) model and workbook developed during SEM in **[SEM YEAR]** to track your energy use? If not, are you using another type of electronic system to track your energy use over time?

If using MT&R model and workbook:

1. How easy is it to maintain the model? How much time does it take? What would help to maintain it?
2. In what ways are you *currently* using information from the MT&R model and workbook? (Probe about: Monthly reports to staff/management on energy savings; tracking toward annual savings goals; cost tracking, e.g. cost per unit of production)
3. Have you changed the variables for your facility's MT&R model? If so, how? If not, is the current model still good at tracking energy and the impacts of energy efficiency projects?

If using another type of electronic system to track energy use:

4. Please describe how the system or tool works.
5. Why did you use this system instead of the MT&R model and workbook?
6. How could the MT&R model and workbook be improved so that you would have continued to use it?
7. What data did your company choose to collect in your monitoring and reporting model?
8. How did you decide which data to collect and record?
9. Do you plan to continue using this electronic system to track energy use?

If not using a system to track energy use:

10. What discouraged or prevented you from using your MT&R model or any other system to track energy use?
11. How could the MT&R model and workbook been improved so that you would have continued to use it?

G2. Who is responsible for tracking energy use? How frequently are energy use data reviewed? How often are energy use data shared with others in your organization? With whom are these data shared?

[ASK PAST PARTICIPANTS WHO STILL USE THE MT&R MODELS]

Part of our research with Energy Trust of Oregon is to calculate the energy savings during the years after participants finish the program. Would you be willing to provide us with your updated MT&R models (including billing and production data) through the end of 2014? [IF NEEDED: These data will be kept confidential. These data will help Energy Trust understand how savings change in years after participants finish the program, and will help Energy Trust improve their program.]

[ASK PAST PARTICIPANTS WHO DO NOT USE THE MT&R MODELS]

As part of our research with Energy Trust of Oregon, we are estimating the energy savings during the years after participants have completed the program. Would you be willing to provide us with your billing and production data since [SEM YEAR + 1] through the end of 2014? [IF NEEDED: These data will be kept confidential. These data will help Energy Trust understand how savings change in years after participants finish the program, and will help Energy Trust improve their program.]

[INSTRUCTION TO INTERVIEWER: USE TABLE G BELOW TO RECORD ANSWERS TO QUESTIONS G1 - 0]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table G				
Question	**Measuring and Reporting**	**Answers to listen for**	**Check box**	**CEE Element**
G1	Are you currently using the Monitoring, Targeting and Reporting (MT&R) model and workbook developed during SEM to track your energy use? If not, are you using another type of electronic system to track your energy use over time? [explicitly ask about MT&R and EMIS if not mentioned]	1. MT&R 2. EMIS 3. Other [SPECIFY] 4. No 5. Don't know		3a, 3b, 3c
G1(1a)	[IF G1=MT&R] How easy is it to maintain the model?	1. Very easy 2. Somewhat easy 3. Not easy 4. Don't know		
G1(1b)	[IF G1=MT&R] How much time does it take?	1. Minutes 2. Hours 3. Days 4. Weeks 5. Months 6. Don't know		
G1(1c)	[IF G1=MT&R] What would help to maintain it?	1. Open end 2. Don't know		
G1(2)	[IF G1=MT&R] In what ways are you currently using information from the MT&R model and workbook after SEM? [Probe about: Monthly reports to staff/management on energy savings; tracking toward annual savings goals; cost tracking, e.g. cost per unit of production]	1. **Monthly reports to staff/management on energy savings (CEE 3d)** 2. Tracking toward annual savings goals 3. Cost tracking, e.g. cost per unit of production 4. **Reassess goals, metrics, or planned projects to ensure they align with business and energy performance priorities (CEE 2g)** 5. Other [SPECIFY] 6. Don't know		2g, 3d
G1(3a)	[IF G1=MT&R] Have you changed the variables for your facility's MT&R model? If so, how?	1. Yes [SPECIFY] 2. No 3. Don't know		
G1(3b)	[IF G1=MT&R and G1(3a) = No] If not, is the current model still good at tracking energy and the impacts of energy efficiency projects?	1. Yes [SPECIFY] 2. No 3. Don't know		
G1(4)	[IF G1=EMIS or OTHER] If using another type of electronic system to track energy use, please describe how the system or tool works.	1. Open end 2. Don't know		3a, 3b, 3c
G1(5)	[IF G1=EMIS or OTHER] Why did you use this system instead of the MT&R model and workbook?	3. Open end 4. Don't know		
G1(6)	[IF G1=EMIS or OTHER] How could the MT&R model and workbook been improved so that you would have continued to use it?	1. Open end 2. Don't know		
G1(7a)	[IF G1=EMIS or OTHER] What data did your company choose to collect in your monitoring and reporting model?	1. Open end 2. Don't know		
G1(8)	[IF G1=EMIS or OTHER] How did you decide which data to collect and record?	1. Open end 2. Don't know		

Table G				
Question	**Measuring and Reporting**	**Answers to listen for**	**Check box**	**CEE Element**
G1(9)	[IF G1=EMIS or OTHER] Do you plan to continue using this electronic system to track energy use?	1. Yes 2. No 3. Don't know		
G1(10)	[IF G1=NO] If not using a system to track energy use: What discouraged or prevented you from using your MT&R model or any other system to track energy use?	1. Open end 2. Don't know		
G1(11)	[IF G1=NO] How could the MT&R model and workbook been improved so that you would have continued to use it?	1. Open end 2. Don't know		
G2a	Who is responsible for tracking energy use?	1. Energy champion 2. An assigned energy team member 3. Other [SPECIFY] 4. Don't know		
G2b	How frequently is energy use data reviewed?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. Continuously 8. Other [SPECIFY] 9. Don't know 10. Bi-monthly (every other week		
G2c	How often is energy use data shared with others in your organization?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. Other [SPECIFY] 8. Don't know		3d
G2d	With whom is this data shared?	1. Energy team 2. Management 3. Staff 4. Other [SPECIFY] 5. Don't know		
0	Part of our research with Energy Trust of Oregon is to calculate the energy savings during the years after participants finish the program. Would you be willing to provide us with your updated MT&R models (including billing and production data) through the end of 2014? [IF NEEDED: These data will be kept confidential.]	1. Yes 2. No [SPECIFY] 3. Don't know		
0	As part of our research with Energy Trust of Oregon, we are estimating the energy savings during the years after participants have completed the program. Would you be willing to provide us with your billing and production data since [SEM YEAR + 1] through the end of 2014? [IF NEEDED: These data will be kept confidential.]	1. Yes 2. No [SPECIFY] 3. Don't know		

H. Future Engagement

H1. After participating in SEM in **[SEM YEAR]**, would you say your facility was more likely or less likely to conduct energy efficiency projects or did it make no difference? Why do you say that?

H2. Did participating in SEM make identifying and implementing future energy efficiency projects easier? Why do you say that?

H3. Since your SEM experience ended in **[SEM YEAR]**, which aspect(s) of SEM do you feel has **most** contributed toward your facility doing additional energy efficiency projects? Why?

H4. What could Energy Trust do to help your company sustain your strategic energy management practices and continue to identify and implement changes to save energy?

[INSTRUCTION TO INTERVIEWER: USE TABLE H BELOW TO RECORD ANSWERS TO QUESTIONS H1-H4]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table H				
Question	**Measuring and Reporting**	**Answers to listen for**	**Check box**	**CEE Element**
H1a	After participating in SEM, was your facility more likely or less likely to conduct energy efficiency projects or did it make no difference	1. More likely 2. Less likely 3. No difference		
H1b	Why?	1. Open end 2. Don't know		
H2a	Did participating in SEM make identifying future energy efficiency projects easier?	1. Easier 2. Not easier 3. No difference 4. Don't know		
H2b	Why?	1. Open end 2. Don't know		
H2c	Did participating in SEM make implementing future energy efficiency projects easier?	1. Easier 2. Not easier 3. No difference 4. Don't know		
H2d	Why?	1. Open end 2. Don't know		
H3a	Since your SEM experience ended, which aspect(s) of SEM do you feel has **most** contributed toward your facility doing additional energy efficiency projects?	1. Energy scan 2. Opportunity register Energy model that shows predicted vs. actual energy use 4. Energy team 5. Energy Management Plan & Goals 6. Energy Management Assessment 7. Employee Engagement Activities 8. Reports to Management 9. Peer Network 10. Other [SPECIFY] 11. Don't know		
H3b	Why?	1. Open end 2. Don't know		
H4	What could Energy Trust do to help your company sustain your strategic energy management practices and continue to identify and implement changes to save energy?	1. Open end 2. Don't know 3. Nothing		

I. Site Visit Recruitment

As part of this study, Energy Trust of Oregon has contracted with Cadmus to review and visit a small sample of projects to verify that energy-efficiency projects were implemented and to estimate the current savings. This is an Energy Trust program evaluation solely intended to determine the impact of Energy Trust programs. It will not affect current or future participation in Energy Trust programs or energy efficiency projects.

On average the visit will last between 2 and 4 hours. It could take up to a full day if metering is involved.

I1. If possible, I would like to schedule the visit for [INSERT DATE AND TIME]. Please let me know if this day and time work for you.

1. Yes
2. No

I2. Can I verify your contact information?
Name (first and last):_____
Company name (full name): _____
Phone 1: _____
Phone 2: _____
Email: _____

Site Visit Questions (I3-I8) [ASK DURING SCHEDULING CALL]

I3. Now, I'd like to ask a few questions about your facility. Since participating in SEM in [SEM YEAR], have there been any changes to the facility? If so, please describe.

I4. Since participating in SEM in [SEM YEAR], has there been any change in operating hours/schedules? [IF THEY ARE NOT FAMILIAR ENOUGH TO ANSWER QUESTIONS SKIP TO END.] If so, please describe the operating hours/schedules before and after participating in SEM.

- I4a. Why were operating hours/schedules changed? [Please note if SEM was the cause of the change and if unclear ask, Did the SEM program have any role in this change? If yes, what was its role?]
- I4b. When did these changes occur?
- I4c. Are the changes still in place? [IF NOT: How long did they last?]
- I4d. [ASK IF YES TO I4c] Are these changes permanent? [If NO: When do you expect them to change again and to what level?]

I5. Has there been any change in production levels since implementing SEM in [SEM YEAR]? [IF THEY ARE NOT FAMILIAR ENOUGH TO ANSWER QUESTION SKIP TO END.]

- I5a. If so, would you be able to provide data showing production levels before and after [SEM YEAR]. [INTERVIEWER: AT THE END, PROVIDE AN EMAIL ADDRESS FOR THEM TO SEND US THESE DATA]
- I5b. What was the reason for these production changes? (e.g., does production vary seasonally?)
- I5c. If the program was the cause of the change or if unclear ask: Did the program have any role in this change? If yes, what was its role? Are these changes permanent? If no, when do you expect them to change again and to what level?

I6. Since participating in SEM in [SEM YEAR], have you changed the product line or added any different products to your production facility? If so, did the program have any role in how you set up production of these new products?

I7. Can you provide any additional information on operational changes that may impact the energy consumption of the facility as a whole?

[INSTRUCTION TO INTERVIEWER: USE TABLE I BELOW TO RECORD ANSWERS TO QUESTIONS I1-I7]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table I				
Question	**Measuring and Reporting**	**Answers to listen for**	**Check box**	**CEE Element**
I1	If possible, I would like to schedule the visit for [INSERT DATE AND TIME]. Please let me know if this day and time work for you.	1. Yes 2. No [SPECIFY] 3. Don't know		
I2	Can I verify your contact information?	Name (first and last):_____ Company name (full name): __ Phone 1: _____ Phone 2: _____ Email: _____		
I3	Now, I'd like to ask a few questions about your facility. Since participating in SEM in [SEM YEAR], have there been **any changes to the facility**? If so, please describe.	1. Yes [SPECIFY] 2. No 3. Don't know		
I4	Since participating in SEM in [SEM YEAR], have there been any changes **in operating hours/schedules**? [IF THEY ARE NOT FAMILIAR ENOUGH TO ANSWER QUESTIONS SKIP TO END.] If so, please describe the operating hours/schedules before and after participating in SEM.	1. Yes [SPECIFY] 2. No 3. Don't know		
I4a	Why were operating hours/schedules changed? [Please note if SEM was the cause of the change and if unclear ask: Did SEM have any role in this change? If yes, what was its role?]	1. Yes [SPECIFY] 2. No 3. Don't know		
I4b	When did these changes occur?	1. Month/Year[SPECIFY] 2. Don't know		
I4c	Are the changes still in place? [IF NOT: How long did they last?]	1. Yes 2. No [SPECIFY] 3. Don't know		
I4d	[ASK IF YES TO I4c] Are these changes permanent? If no: When do you expect them to change again and to what level?	1. Yes 2. No [SPECIFY] 3. Don't know		
I5	Has there been any **change in production levels** since implementing SEM in [SEM YEAR]? [IF THEY ARE NOT FAMILIAR ENOUGH TO ANSWER QUESTION SKIP TO END.]	1. Yes [SPECIFY] 2. No 3. Don't know		
I5a	If so, please provide data showing baseline (before) and post-measure installation production levels.	1. Yes 2. No 3. Don't know		
I5b	What was the reason for these production changes? (e.g., does production vary seasonally?)	1. Open end 2. Don't know		
I5c	[If the program was the cause of the change or if unclear ask]: Did the program have any role in this change? If yes, what was its role?	1. Yes [SPECIFY ROLE] 2. No 3. Don't know		
I5d	Are these changes permanent? If no, when do you expect them to change again and to what level?	1. Yes 2. No [SPECIFY] 3. Don't know		
I6a	Since participating in SEM in [SEM YEAR], have you **changed the product line or added any different products** to your production facility?	1. Yes 2. No 3. Don't know		
I6a	If so, did the program have any role in how you set up production of these new products?	1. Yes 2. No 3. Don't know		
I7	Can you provide **any additional information on other changes that may impact the energy consumption** of the facility as a whole?	1. Yes [SPECIFY] 2. No 3. Don't know		

J. Closing

Those are all my questions. You agreed to send us the following data [INTERVIEWER: LIST ALL THAT ARE APPLICABLE]

- Updated MT&R models [PAST PARTICIPANTS WHO USE MT&R MODELS (G1)]
- Billing and production data since [SEM YEAR + 1] through the end of 2014 [PAST PARTICIPANTS WHO TRACK BUT DON'T USE MT&R MODELS (G1)]
- Updated opportunity register
- Data showing production levels [IF CHANGED SINCE SEM [I5=YES]

We will send you an email with instructions about how to upload these items onto a secure server. It will come from Cadmus. What email address should we sent the information to? [RECORD EMAIL ADDRESS]

Can you please provide the information by [INSERT DUE DATE]?

Thank you very much for your time and participation with Energy Trust and for your support of this important study. Have a great day!

Energy Trust Production Efficiency Strategic Energy Management Evaluation Interview Guide for Refrigeration Operator Coaching Participants

Researchable Topics	Item
Company and contact information	Section A
ROC Background	Section B
Customer Commitment – Policy and Goals	Section D
Customer Commitment – Resources	Section C
Planning and Implementation – Energy Assessment and Energy Map	Section E
Planning and Implementation – Project Register (Opportunity Register), Employee Engagement, and Implementation	Section F
Planning and Implementation – Metrics and Goals, Measurement and Reporting	Section G
Future Engagement	Section H

These questions are meant to be a guide and will be modified by the interviewer as needed based on the conversation and knowledge level of the respondent.

Target Quota = 45

Variables to be pulled into interview

- Contact Name
- Facility/company name
- Facility address
- Phone Number
- ROCROC (both)

A. Introduction

A1. May I speak with [CONTACT NAME]? [IF THAT PERSON IS NOT AT THIS PHONE NUMBER, ASK FOR NAME AND PHONE NUMBER AND START AGAIN]

1. (Yes)
2. (No, person is not able to come to phone) [GET NAME, PHONE NUMBER, AND SCHEDULE CALLBACK]
3. (No, person no longer works there) [ASK FOR THE CONTACT NAME AND PHONE NUMBER FOR THE PERSON MOST FAMILIAR WITH PARTICIPATING IN {ROC TYPE} IN {ROC YEAR}]
98. (Don't know) [ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]
99. (Refused) [THANK AND TERMINATE]

A2. Hello, I'm [INSERT NAME] calling from Cadmus on behalf of Energy Trust of Oregon. We are conducting an important study with current and past participants in the Refrigeration Operator Coaching program to understand its impact and opportunities for improvement. Are you the person who is most familiar with Refrigeration Operator Coaching or ROC at your facility?

1. (Yes)
2. (No, person is able to come to phone) [RECORD NAME AND REPEAT A2]
3. (No, person is not able to come to phone) [SCHEDULE CALLBACK]
98. (Don't know) [ASK FOR THE CONTACT NAME AND PHONE NUMBER FOR THE PERSON MOST FAMILIAR WITH PARTICIPATING IN {ROC TYPE} IN {ROC YEAR}]
99. (Refused) [THANK AND TERMINATE]

[READ DESCRIPTON IF NEEDED]
ROC's energy efficiency training for large, industrial refrigeration systems combines workshops involving a cohort of peers, with on-site technical support and coaching so clients can implement system retro-commissioning, strategic energy management inspired reporting, policies, and procedures improvements to create accountability and foster communication, and web-based energy management **software energy information system** (EIS) to track energy performance.

Before we get started, I'd like to note that your responses are confidential and will only be publicly reported in aggregate. Individual facility responses will not be identified in public documents, but will be made available to Energy Trust OF OREGON. [IF NEEDED: individual responses will be reported anonymously as part of a group. We will not publicly report any identifying information] Recording the responses.

A3. What is your job title?

A4. How long have you been with **[facility name]**?

A5. How long have you had this role?

[ASK DURING SCHEDULING CALL]

A6. Did your company participate in ROC**ROC** in **[ROCROC YEAR OF MOST RECENT PARTICIPATION]**?ROC]

1. Yes
2. No [ASK TO SPEAK WITH SOMEONE WHO IS MORE FAMILIAR WITH THEIR PARTICIPATION AND BEGIN AGAIN]

98. Don't know [ASK TO SPEAK WITH SOMEONE WHO IS MORE FAMILIAR WITH THEIR PARTICIPATION AND BEGIN AGAIN]

A7. How familiar are you with the Refrigeration Operator Coaching or ROC program?

A8. What is your role in your company's ROC (Refrigeration Operator Coaching) program?

Some of my questions are about components of ROC. If you are not familiar enough to answer, just let me know and I'll move on to the next question. If ROC was implemented at multiple facilities, please base your answers on how ROC was implemented at the majority of your facilities.

B. Overall ROC Questions

B1. To what degree has your organization continued the energy management practices taught during your participation in the ROC program in [ROCYEAR]? What did it take to make this happen?

B2. Have you encountered any challenges with continuing to implement any of the energy management practices you learned during ROC? What were they and when did they occur? How did you overcome them?

B3. Have you maintained the energy savings you achieved during ROC?

[INSTRUCTION TO INTERVIEWER: USE TABLE B BELOW TO RECORD ANSWERS TO QUESTIONS IN SECTION B]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table B				
Question	**Energy Performance Goals**	**Answers to listen for**	**Check box**	**CEE Element[1]**
B1a	To what degree has your organization continued to implement the energy management practices taught during ROC?	1. Open end 2. Don't know		
B1b	What did it take to make this happen?	1. Open end 2. Don't know		
B2a	Have you encountered any challenges implementing ROC?	1. Open end 2. Don't know		
B2b	What were they and when did they occur?	1. Open end 2. Don't know		
B2c	How did you overcome them?	1. Open end 2. Don't know		
B3	Have you maintained the energy savings you achieved during ROC?	1. Yes 2. No 3. Don't know		

[1]Note that the CEE Element column is intended to track the questions associated with each element. Not all questions require a direct mapping to a CEE element, but each element requires at least on question. Having the questions marked in the tables will help to ensure that the interviewer prioritizes these questions.

C. Energy Team, Energy Champion, & Executive Sponsor

Energy Champion

C1. Do you have an "energy champion" or "energy manager," someone in charge of coordinating energy management activities and spearheading efficiency projects? Is this the same person (or people) who served as the energy champion during ROC in **[ROC YEAR]**?

C2. Does the energy champion have a back-up?

Energy Team

C3. Do you have an **energy [management] team** [dedicated staff for energy and energy efficiency]?

[ASK C4 THROUGH C6 IF C3= YES]

C4. How frequently is the team meeting?

C5. Has your energy team changed since you first started meeting? Have any staff ceased to participate in the energy team? If so, which role was vacated? Has another staff member fill that role? If not, do you plan to fill that role? Was the staff member identified based on strategic decisions or based upon the person's personal interest?

C6. How much of each team member's time at work is devoted to the energy management team? Is energy management in their job description?

Management

C7. In general, how supportive is your company's management of continuing to work on energy management? What factors influenced their support?

C8. Tell me about the Executive Sponsor's involvement. Do you have the same Executive Sponsor that you did during ROC, or a different one? [IF NEEDED: The executive sponsor is the person from management who supports ROC.]

C9. Does your management team require regular updates from the energy champion? How frequently? In what form?

[INSTRUCTION TO INTERVIEWER: USE TABLE C BELOW TO RECORD ANSWERS TO QUESTIONS C1 - C9]

[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table C				
Question	**Staff**	**Answers to listen for**	**Check box**	**CEE Element[1]**
C1a.	Do you have an energy manager or someone in charge of energy efficiency at this location?	1. Yes 2. No 3. Don't know		1b
C1b	Is it the same person as the one who worked on ROC?	1. Yes 2. No 3. Don't know		
C2	Does this person have a back-up?	1. Yes 2. No 3. Don't know		
3a	Do you have an energy management team [dedicated staff for energy and energy efficiency]?	1. Yes 2. No 3. Don't know		1b
3b	Is it one person or multiple people?	1. One person 2. Role shared across multiple people 3. Other [SPECIFY] 4. Don't know		
C4a	How frequently did the energy team meet over the course of your involvement in ROC?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. Other [SPECIFY] 8. Don't know		
C4b	Is your energy team still meeting [regularly]?	1. Yes 2. No 3. Don't know		1b
4c	How frequently is it currently meeting?	1. Daily 2. Weekly 3. Monthly		

		4. Quarterly 5. Twice a year 6. Annually 7. Other [SPECIFY] 8. Don't know		
C5a	Has your energy team changed? (Have any staff ceased to participate in the energy team?)	1. Yes [specify] 2. No 3. Don't know		
C5b	If so, which role was vacated?	1. Open end 2. Don't know		
C5c	Has another staff member fill that role?	1. Yes 2. No 3. Don't know		
C5d	If not, do you plan to fill that role?	1. Open end 1. Don't know		
C5e	Was the staff member identified based on strategic decisions or based upon the person's personal interest?	1. Strategic 2. Personal interest 3. Other 4. Don't know		
C6a	How much of each person's time at work on the energy team is devoted to ROC?	1. 0% - 24% 2. 25% - 49% 3. 50% - 74% 4. 75% - 99% 5. 100% 6. Don't know		
C6b	Is energy management in their job description?	1. Yes 2. No 3. Don't know		
C7a	In general, how supportive is the management of continuing to work on ROC?	1. Open end 2. Don't know		
C7b	What factors help influence this?	1. Open end 2. Don't know		
C8a	Tell me about the Executive Sponsor's involvement.	3. Open end 4. Don't know		
C8b	Do you have the same Executive Sponsor that you did during ROC, or a different one?	1. Same 2. Different		

		3. Don't know		
C9a	Does your management team require regular updates from the team?	1. Yes 2. No 3. Don't know		3d
C9b	How frequently?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. Other [SPECIFY] 8. Don't know		
C9c	In what form?	1. Open end 2. Don't know		

[1]Note that the CEE Element column is intended to track the questions associated with each element. Not all questions require a direct mapping to a CEE element, but each element requires at least on question. Having the questions marked in the tables will help to ensure that the interviewer prioritizes these questions.

D. Energy Policies & Goals

D1. Does your company or facility have any policies or plans in place that incorporate energy or energy efficiency? [IF NEEDED: Does the plan include other sustainability goals such as recycling, waste reduction, water use, etc.? A simple example would be things like always buying efficient equipment or setting energy performance goals.]

D2. Does your company or facility currently have goals related to energy or energy efficiency? [READ IF NEEDED: This goal(s) may be expressed as a percentage or an absolute number in units of energy use intensity (EUI). The goal(s) must be stated as a comparison to a defined baseline. It could also be defined through adoption of other systems such as LEED or ENERGY STAR.] How are the goals defined and what are they (e.g. 5% reduction in energy use in 3 years)? When did you set the goals? Are they formal (i.e., approved by management) or informal? Have they been communicated to staff? How are you doing meeting the goals? Do you periodically update the goals? If so, how often?

[INSTRUCTION TO INTERVIEWER: USE TABLE D BELOW TO RECORD ANSWERS TO QUESTIONS D1 – D2]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table D				
Question	**Energy Performance Goals**	**Answers to listen for**	**Check box**	**CEE Element[1]**
D1a	Does your company or facility have any policies or plans in place that incorporate energy efficiency? [IF NEEDED: Does the plan include other sustainability goals such as recycling, waste reduction, water use, etc.?]	1. Yes 2. No 3. Don't know		1a
D1b	[IF NEEDED: Does the plan include other sustainability goals such as recycling, waste reduction, water use, etc.?]	1. Yes 2. No 3. Don't know		
D2a	Does your company or facility currently have goals related to energy or energy efficiency?	1. Yes 2. No 3. Don't know		1a
D2b	How are the goals defined and what are they (e.g. 5% reduction in energy use in 3 years)?	1. percentage energy reduction per quantity product over time 2. absolute number energy reduction per quantity product over time 3. Other [SPECIFY]		2c
D2c	When did you set the goals?	1. 2009 2. 2010		

Table D				
Question	**Energy Performance Goals**	**Answers to listen for**	**Check box**	**CEE Element[1]**
		3. 2011 4. 2012 5. 2013 6. 2014 7. 2015 8. Other [SPECIFY]		
D2d	Are they formal or informal?	1. Formal 2. Informal 3. Don't know		
D2e	Have they been communicated to staff?	1. Yes [SPECIFY] 2. No 3. Don't know		1a
D2f	How are you doing meeting the goals?	1. We have met 100% of our goals 2. We are on track to meet 100% of our goals 3. We are falling behind on our goals 4. We expect to meet 75% of our goal 5. We expect to meet 50% of our goal 6. We expect to meet 25% of our goal 7. We expect to meet 0% of our goal 8. Other [SPECIFY] 9. Don't know		
D2g	Do you periodically update the goals?	1. Yes 2. No 3. Don't know		2g
D2h	If so, how often?	1. Daily 2. Weekly 3. Monthly 4. Quarterly		2g

Table D				
Question	**Energy Performance Goals**	**Answers to listen for**	**Check box**	**CEE Element[1]**
		5. Twice a year 6. Annually 7. Never updated 8. Other [SPECIFY] 9. Don't know		

[1]Note that the CEE Element column is intended to track the questions associated with each element. Not all questions require a direct mapping to a CEE element, but each element requires at least on question. Having the questions marked in the tables will help to ensure that the interviewer prioritizes these questions.

E. Energy Management Assessment and Energy Map

E1. Have you completed an energy management assessment [IF NEEDED: This is an assessment of the energy management structure that identifies how management can better support energy efficiency efforts.]

E2. Have you developed an energy map? How? If not, why not? [IF NEEDED: This is a breakdown of energy end uses broken down by facility/processes either by estimated energy use or % of facility energy use.]

[INSTRUCTION TO INTERVIEWER: USE TABLE E BELOW TO RECORD ANSWERS TO QUESTIONS E1 - E2]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table E				
Question	**Planning and Implementation**	**Answers to listen for**	**Check box**	**CEE Element**
E1a	Have you completed an energy management assessment?	1. Yes 2. No 3. Don't know		2a
E1b	[IF YES] If so, how often do you revisit the assessment?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. When operations change 8. Other [SPECIFY] 9. Don't know		2g
E1c	[IF NO] If not, why not?	1. Open end 2. Don't know		
E2a	Have you developed an energy map? [IF NEEDED: This is a breakdown of energy end uses broken down by facility/processes either by estimated energy use or % of facility energy use.]	1. Yes 2. No 3. Don't know		2b
E2b	[IF YES] How?	1. Open end 2. Don't know		
E2c	[IF NO] If not, why not?	1. Open end 2. Don't know		

F. Opportunity Register & Employee Engagement

Opportunity Register

While participating in ROC in [**ROC YEAR**], during each workshop a list of specific action items, or tasks, was presented and discussed in the group.

F1. Did you find this list useful in helping you reduce energy use?

F2. I have some questions about the status of the activities included in your opportunity register at the time you participated in ROC. I am going to list a few activities which were implemented during your ROC participation. Can you confirm these were implemented and tell me whether they remain in place? [INTERVIEWER: Check the Opportunity Register and ask about projects. For example, control set point projects: three were completed and two were still planned? Did the ones that were completed change and were the ones identified implemented?] Have you implemented the remaining items on the opportunity register? If not, do you have any plans to do so?

F3. Have you completed any energy efficiency projects in the past year? [IF YES, Please describe them.]

Employee Engagement

F4. OMIT

F5. Do you conduct any specific employee engagement activities? If so, please describe.

[INSTRUCTION TO INTERVIEWER: USE TABLE F BELOW TO RECORD ANSWERS TO QUESTIONS F1-F5]

[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table F				
Question	**Opportunity Register**	**Answers to listen for**	**Check box**	**CEE Element**
F1a	Did you find this list useful in helping you reduce energy use ?	1. Yes 2. No 3. Don't know		
F1b	OMIT	1. In place and using it 2. In place but not using it 3. In development 4. No 5. Don't know		2d
F1c	Do you regularly update this list?	1. Update regularly 2. Update occasionally 3. Almost never update it 4. Haven't updated since ROC ended 5. Don't know		2g
F1d	Can we get a copy of this list?	1. Yes 2. No 3. Don't know		
F1e	OMIT	1. Yes [SPECIFY] 2. No 3. Don't know 4. Not applicable		2d
F2a	I have some questions about the status of some of the projects. Can you tell me if they were complete or whether you removed them or plan to complete them? [INTERVIEWER: Check the Opportunity Register and ask about projects. For example, control set point projects: three were completed and two were still planned? Did the ones that were completed change and were the ones identified implemented?]	Record for each project / ROC activity 1. Completed 2. Planned 3. Removed		2f

Table F				
Question	**Opportunity Register**	**Answers to listen for**	**Check box**	**CEE Element**
F2b	If completed, did they change since they were first identified them?	Record for each project / ROC activity completed 1. Yes [SPECIFY] 2. No 3. Don't know		
F2c	When were they completed or when are they planned to be completed?	Record for each project / ROC activity if completed or planned 1. Open end 2. Don't know		
F2d	ASK IF REMOVED: Are you planning to implement them?	Record for each removed project. 1. Yes 2. No 3. Don't know		2f
F3a	Have you added any energy-efficiency projects to the list?	1. Yes [SPECIFY] 2. No 3. Don't know 4. Yes, but not to official register [SPECIFY]		2g
F3b	IF YES: Describe the projects?	1. Open end 2. Don't know		
F3c	IF YES: Describe where they "came" from?	1. Staff requests for energy efficiency 2. Suggestions from PDC 3. Generating internally 4. Peers met through ROC program 5. Activities other than energy efficiency 6. Other [SPECIFY] 7. Don't know		
F3d	When were they implemented or if not implemented when do you plan to implement them?	1. Open end 2. Don't know		

Table F				
Question	**Opportunity Register**	**Answers to listen for**	**Check box**	**CEE Element**
F3e	OMIT	1. Yes [SPECIFY what the status is] 2. No 3. Don't know		
F3f	OMIT	1. Yes [SPECIFY] 2. No 3. Don't know		
F4	OMIT	[ASK ABOUT EACH ITEM ON LIST] 1. More involved with ROC 2. Less involved with ROC 3. No change 4. Don't know		
F5a	Did you conduct any specific employee engagement activities as part of your participation in ROC? If so, please describe.	1. Yes [SPECIFY] 2. No 3. Don't know		2e
F5b	If so, do you plan to continue those activities in the future?	1. Yes [SPECIFY] 2. No 3. Don't know		
F5c	Do you plan to initiate new activities? If new, please describe.	1. Yes [SPECIFY] 2. No 3. Don't know		

G. Energy Information System

G1. Are you currently using the web-based energy information system (EIS) to track your energy use? If not, are you using another type of electronic system to track your energy use over time?

If using EIS:

1. How easy is it to use this system? How much time does it take? What would help to maintain it?
2. In what ways are you *currently* using information from EIS? (Probe about: Monthly reports to staff/management on energy savings; tracking toward annual savings goals; cost tracking, e.g. cost per unit of production)
3. Have you changed the variables for your facility's EIS? If so, how? If not, is the current model still good at tracking energy and the impacts of energy efficiency projects?

If using another type of electronic system to track energy use:

4. Please describe how the system or tool works.
5. Why did you use this system instead of EIS?
6. How could EIS be improved so that you would have continued to use it?
7. What data did your company choose to collect in your energy tracking system?
8. How did you decide which data to collect and record?
9. Do you plan to continue using this electronic system to track energy use?

If not using a system to track energy use:

10. What discouraged or prevented you from using EIS or any other system to track energy use?
11. How could the EIS model and workbook been improved so that you would have continued to use it?

G2. Who is responsible for tracking energy use? How frequently are energy use data reviewed? How often are energy use data shared with others in your organization? With whom are these data shared?

[ASK PAST PARTICIPANTS WHO STILL USE THE EIS MODELS]

Part of our research with Energy Trust of Oregon is to calculate the energy savings during the years after participants finish the program. Would you be willing to provide us with your updated EIS models (including billing and production data) through the end of 2014? [IF NEEDED: These data will be kept confidential. These data will help Energy Trust understand how savings change in years after participants finish the program, and will help Energy Trust improve their program.]

[ASK PAST PARTICIPANTS WHO DO NOT USE THE EIS MODELS]

As part of our research with Energy Trust of Oregon, we are estimating the energy savings during the years after participants have completed the program. Would you be willing to provide us with your billing and production data since [ROC YEAR + 1] through the end of 2014? [IF NEEDED: These data will be kept confidential. These data will help Energy Trust understand how savings change in years after participants finish the program, and will help Energy Trust improve their program.]

[INSTRUCTION TO INTERVIEWER: USE TABLE G BELOW TO RECORD ANSWERS TO QUESTIONS G1 - 0]

[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table G				
Question	**Measuring and Reporting**	**Answers to listen for**	**Check box**	**CEE Element**
G1	Are you currently using the web-based energy information system (EIS) to track your energy use? If not, are you using another type of electronic system to track your energy use over time? [explicitly ask about MT&R and EMIS if not mentioned]	1. EIS 2. EMIS 3. Other [SPECIFY] 4. No 5. Don't know		3a, 3b, 3c
G1(1a)	[IF G1=EIS] How easy is it to use?	1. Very easy 2. Somewhat easy 3. Not easy 4. Don't know		
G1(1b)	[IF G1=EIS] How much time does it take?	1. Minutes 2. Hours 3. Days 4. Weeks 5. Months 6. Don't know		
G1(1c)	[IF G1=EIS] What would help to maintain it?	1. Open end 2. Don't know		
G1(2)	[IF G1=EIS] In what ways are you currently using information from the EIS? [Probe about: Monthly reports to staff/management on energy savings; tracking toward annual savings goals; cost tracking, e.g. cost per unit of production]	1. **Monthly reports to staff/management on energy savings (CEE 3d)** 2. Tracking toward annual savings goals 3. Cost tracking, e.g. cost per unit of production 4. **Reassess goals, metrics, or planned projects to ensure they align with business and energy performance priorities (CEE 2g)** 5. Other [SPECIFY] 6. Don't know		2g, 3d

Table G				
Question	**Measuring and Reporting**	**Answers to listen for**	**Check box**	**CEE Element**
G1(3a)	[IF G1=EIS] Have you changed the variables for your facility? If so, how?	1. Yes [SPECIFY] 2. No 3. Don't know		
G1(3b)	[IF G1=EIS and G1(3a) = No] If not, is the current model still good at tracking energy and the impacts of energy efficiency projects?	1. Yes [SPECIFY] 2. No 3. Don't know		
G1(4)	[IF G1=EMIS or OTHER] If using another type of electronic system to track energy use, please describe how the system or tool works.	1. Open end 2. Don't know		3a, 3b, 3c
G1(5)	[IF G1=EMIS or OTHER] Why did you use this system instead of EIS?	3. Open end 4. Don't know		
G1(6)	[IF G1=EMIS or OTHER] How could EIS have been improved so that you would have continued to use it?	1. Open end 2. Don't know		
G1(7a)	[IF G1=EMIS or OTHER] What data did your company choose to collect in your monitoring and reporting model?	1. Open end 2. Don't know		
G1(8)	[IF G1=EMIS or OTHER] How did you decide which data to collect and record?	1. Open end 2. Don't know		
G1(9)	[IF G1=EMIS or OTHER] Do you plan to continue using this electronic system to track energy use?	1. Yes 2. No 3. Don't know		
G1(10)	[IF G1=NO] If not using a system to track energy use: What discouraged or prevented you from using EIS or any other system to track energy use?	1. Open end 2. Don't know		
G1(11)	[IF G1=NO] How could the EIS have been improved so that you would have continued to use it?	1. Open end 2. Don't know		
G2a	Who is responsible for tracking energy use?	1. Energy champion 2. An assigned energy team member 3. Other [SPECIFY] 4. Don't know		
G2b	How frequently is energy use data reviewed?	1. Daily 2. Weekly 3. Monthly		

Table G				
Question	**Measuring and Reporting**	**Answers to listen for**	**Check box**	**CEE Element**
		4. Quarterly 5. Twice a year 6. Annually 7. Continuously 8. Other [SPECIFY] 9. Don't know		
G2c	How often is energy use data shared with others in your organization?	1. Daily 2. Weekly 3. Monthly 4. Quarterly 5. Twice a year 6. Annually 7. Other [SPECIFY] 8. Don't know		3d
G2d	With whom is this data shared?	1. Energy team 2. Management 3. Staff 4. Other [SPECIFY] 5. Don't know		
0	Part of our research with Energy Trust of Oregon is to calculate the energy savings during the years after participants finish the program. Would you be willing to provide us with your billing and production data through the end of 2014? [IF NEEDED: These data will be kept confidential.]	1. Yes 2. No [SPECIFY] 3. Don't know		
0	As part of our research with Energy Trust of Oregon, we are estimating the energy savings during the years after participants have completed the program. Would you be willing to provide us with your billing and production data since [ROC YEAR + 1] through the end of 2014? [IF NEEDED: These data will be kept confidential.]	1. Yes 2. No [SPECIFY] 3. Don't know		

H. Future Engagement

H1. After participating in ROC in **[ROC YEAR]**, would you say your facility was more likely or less likely to conduct energy efficiency projects or did it make no difference? Why do you say that?

H2. Did participating in ROC make identifying and implementing future energy efficiency projects easier? Why do you say that?

H3. Since your ROC experience ended in **[ROC YEAR]**, which aspect(s) of ROC do you feel has **most** contributed toward your facility doing additional energy efficiency projects? Why?

H4. What could Energy Trust do to help your company sustain the practices you learned in ROC and continue to identify and implement changes to save energy?

[INSTRUCTION TO INTERVIEWER: USE TABLE H BELOW TO RECORD ANSWERS TO QUESTIONS H1-H4]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table H				
Question	**Measuring and Reporting**	**Answers to listen for**	**Check box**	**CEE Element**
H1a	After participating in ROC, was your facility more likely or less likely to conduct energy efficiency projects or did it make no difference	1. More likely 2. Less likely 3. No difference		
H1b	Why?	1. Open end 2. Don't know		
H2a	Did participating in ROC make identifying future energy efficiency projects easier?	1. Easier 2. Not easier 3. No difference 4. Don't know		
H2b	Why?	1. Open end 2. Don't know		
H2c	Did participating in ROC make implementing future energy efficiency projects easier?	1. Easier 2. Not easier 3. No difference 4. Don't know		
H2d	Why?	1. Open end 2. Don't know		
H3a	Since your ROC experience ended, which aspect(s) of ROC do you feel has **most** contributed toward your facility doing additional energy efficiency projects?	1. Energy scan 2. Opportunity register Energy model that shows predicted vs. actual energy use 4. Energy team 5. Energy Management Plan & Goals 6. Energy Management Assessment 7. Employee Engagement Activities 8. Reports to Management 9. Peer Network 10. Other [SPECIFY] 11. Don't know		
H3b	Why?	1. Open end 2. Don't know		
H4	What could Energy Trust do to help your company sustain the practices you learned during ROC?	1. Open end 2. Don't know		

Site Visit Questions (I3-I8) [ASK DURING SCHEDULING CALL]

H5. Now, I'd like to ask a few questions about your facility. Since participating in ROC in [ROC YEAR], have there been any changes to the facility? If so, please describe.

H6. Since participating in ROC in [ROC YEAR], has there been any change in operating hours/schedules? [IF THEY ARE NOT FAMILIAR ENOUGH TO ANSWER QUESTIONS SKIP TO END.] If so, please describe the operating hours/schedules before and after participating in ROC.

- H6a. Why were operating hours/schedules changed? [Please note if ROC was the cause of the change and if unclear ask, Did the ROC program have any role in this change? If yes, what was its role?]
- H6b. When did these changes occur?
- H6c. Are the changes still in place? [IF NOT: How long did they last?]
- H6d. [ASK IF YES TO I4c] Are these changes permanent? [If NO: When do you expect them to change again and to what level?]

H7. Has there been any change in production levels since implementing ROC in [ROC YEAR]? [IF THEY ARE NOT FAMILIAR ENOUGH TO ANSWER QUESTION SKIP TO END.]

- H7a. If so, would you be able to provide data showing production levels before and after [ROC YEAR]. [INTERVIEWER: AT THE END, PROVIDE AN EMAIL ADDRESS FOR THEM TO SEND US THESE DATA]
- H7b. What was the reason for these production changes? (e.g., does production vary seasonally?)
- H7c. If the program was the cause of the change or if unclear ask: Did the program have any role in this change? If yes, what was its role? Are these changes permanent? If no, when do you expect them to change again and to what level?

H8. Since participating in ROC in [ROC YEAR], have you changed the product line or added any different products to your production facility? If so, did the program have any role in how you set up production of these new products?

H9. Can you provide any additional information on operational changes that may impact the energy consumption of the facility as a whole?

[INSTRUCTION TO INTERVIEWER: USE TABLE I BELOW TO RECORD ANSWERS TO QUESTIONS I1-I7]
[ANSWER OPTIONS WILL NOT BE READ; THEY ARE INCLUDED HERE FOR EASE IN CODING AND TRACKING RESPONSES]

Table I				
Question	**Measuring and Reporting**	**Answers to listen for**	**Check box**	**CEE Element**
I3	Now, I'd like to ask a few questions about your facility. Since participating in ROC in [ROC YEAR], have there been **any changes to the facility**? If so, please describe.	1. Yes [SPECIFY] 2. No 3. Don't know		
I4	Since participating in ROC in [ROC YEAR], have there been any changes **in operating hours/schedules**? [IF THEY ARE NOT FAMILIAR ENOUGH TO ANSWER QUESTIONS SKIP TO END.] If so, please describe the operating hours/schedules before and after participating in ROC.	1. Yes [SPECIFY] 2. No 3. Don't know		
I4a	Why were operating hours/schedules changed? [Please note if ROC was the cause of the change and if unclear ask: Did ROC have any role in this change? If yes, what was its role?]	1. Yes [SPECIFY] 2. No 3. Don't know		
I4b	When did these changes occur?	1. Month/Year[SPECIFY] 2. Don't know		
I4c	Are the changes still in place? [IF NOT: How long did they last?]	1. Yes 2. No [SPECIFY] 3. Don't know		
I4d	[ASK IF YES TO I4c] Are these changes permanent? If no: When do you expect them to change again and to what level?	1. Yes 2. No [SPECIFY] 3. Don't know		
I5	Has there been any **change in production levels** since implementing ROC in [ROC YEAR]? [IF THEY ARE NOT FAMILIAR ENOUGH TO ANSWER QUESTION SKIP TO END.]	1. Yes [SPECIFY] 2. No 3. Don't know		
I5a	If so, please provide data showing baseline (before) and post-measure installation production levels.	1. Yes 2. No 3. Don't know		
I5b	What was the reason for these production changes? (e.g., does production vary seasonally?)	1. Open end 2. Don't know		
I5c	[If the program was the cause of the change or if unclear ask]: Did the program have any role in this change? If yes, what was its role?	1. Yes [SPECIFY ROLE] 2. No 3. Don't know		

I5d	Are these changes permanent? If no, when do you expect them to change again and to what level?	1. Yes 2. No [SPECIFY] 3. Don't know		
I6a	Since participating in ROC in [ROC YEAR], have you **changed the product line or added any different products** to your production facility?	1. Yes 2. No 3. Don't know		
I6a	If so, did the program have any role in how you set up production of these new products?	1. Yes 2. No 3. Don't know		
I7	Can you provide **any additional information on other changes that may impact the energy consumption** of the facility as a whole?	1. Yes [SPECIFY] 2. No 3. Don't know		

I. Closing

Those are all my questions. You agreed to send us the following data [INTERVIEWER: LIST ALL THAT ARE APPLICABLE]

- Updated EIS models
- Billing and production data since [ROC YEAR + 1] through the end of 2014
- Updated project list
- Data showing production levels [IF CHANGED SINCE ROC [I5=YES]

We will send you an email with instructions about how to upload these items onto a secure server. It will come from Cadmus. What email address should we sent the information to? [RECORD EMAIL ADDRESS]

Can you please provide the information by [INSERT DUE DATE]?

Thank you very much for your time and participation with Energy Trust and for your support of this important study. Have a great day!