

Evaluation of Continuous Energy Improvement Pilot

August 31, 2016

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Executive Summary

The Vermont Public Service Department (PSD) contracted with Cadmus to evaluate Efficiency Vermont's (EVT) Continuous Energy Improvement (CEI) Pilot. The Pilot launched in late 2013, targeting energy savings from large commercial and industrial (C&I) utility customers through changes in operations, maintenance, and behaviors (OM&B). CEI seeks organizational and cultural change to make reducing energy waste and improving energy intensity an ongoing objective and activity of the workplace, from the factory floor to upper levels of management. The Pilot's objective is to achieve lasting reductions in energy-use intensities (kWh/unit of output) through CEI and to increase customer engagement with EVT.

The Pilot currently has eight organizations enrolled, including seven industrial sector customers and one healthcare sector customer. EVT moved one customer from the initial participant list to the next implementation phase to provide a better fit with that organization's energy-saving objectives. EVT's account management and engineering staff implemented the program, helping participants to achieve the following: improve energy management practices; identify CEI savings opportunities; implement savings measures; and track, measure, and verify the savings. Each organization received guidance from a third-party consultant to help them implement an energy management information system to track energy use. EVT plans to add 10 customers in each of the second and third program years.

The PSD tasked Cadmus with estimating energy savings from the first cohort of CEI Pilot sites, documenting the program design and implementation, and assessing the customer experience. These organizations were recruited at the end of 2013 and initiated CEI during 2014.

Specifically, Cadmus set out to answer the following research objectives:

- Independently estimate the energy savings for each CEI participant, accounting for the impacts of any capital measures, in 2014 and 2015. Specifically, we measured the *facility savings* and *CEI savings* of electricity, fuel oil, and propane.¹ Facility savings equaled the total energy savings from both OM&B measures and any capital projects and was obtained from a regression analysis of facility energy use. CEI savings equaled the difference between facility savings and savings from any capital projects receiving incentives from other EVT energy efficiency programs.
- Verify EVT's estimates of site-specific CEI, capital measure, and total Pilot savings.
- Develop recommendations for improving the Pilot data collection, measurement and verification (M&V), and impact evaluation approaches, specifically:
 - Facility data reporting and sub-metering
 - Establishing reliable M&V baseline models

¹ Only one site had fuel oil and propane fuel sources. As Cadmus had at the time of this writing not received fuel oil and propane consumption data for this site, this draft report does not include savings estimates for these fuels.



- Collecting program-related costs and conducting cost-effectiveness testing
- Identifying potential OM&B savings for future program planning
- Assess program successes and challenges

Cadmus conducted a variety of evaluation tasks. In particular, these included:

- In-depth interviews with program stakeholders
- Surveys of Pilot participants
- Analysis of first-year Pilot outcomes as reported in annual reports
- Collection of data addressing facility or site-level energy use and the principal drivers of energy use
- Individual regression analysis of each site’s energy use and estimation of savings
- Estimation of Pilot savings for 2014 and 2015
- Cost-effectiveness analysis of the CEI Pilot

The PSD and EVT will use this evaluation’s findings to make Pilot design changes and decisions about continuing and/or expanding the Pilot.

Key Findings

Cadmus made several key evaluation findings about EVT’s CEI pilot. Before presenting these, however, we provide some context for putting the findings in perspective.

The Pilot’s implementation remained in progress when this evaluation began. Several evaluated facilities had just started to implement CEI measures, and two had not undertaken any CEI measures—only capital measures—before the end of 2015. Therefore, this evaluation provides a preliminary and incomplete assessment of CEI Pilot implementation and savings during the first program year. As CEI seeks to change an organization’s energy-use culture, it is particularly important to conduct impact and process evaluations over a time horizon when those changes can be detected.

In addition, the first CEI cohort only included eight participants, and Cadmus evaluated savings for only five of those. One participant had three facilities that were analyzed separately, and Cadmus concluded that one of these facilities was not evaluable. Therefore, Cadmus evaluated a total of six facilities. Given the small analysis sample, the evaluation results may not be indicative of savings of future participants. Future evaluation of the three planned cohorts over multiple years will provide a more complete picture of the Pilot’s savings potential.

Energy Savings

Cadmus evaluated the Pilot’s facility and CEI electricity savings in 2014 and 2015. We evaluated electricity savings for one facility in 2014 and for six facilities in 2015. In 2014, with only one facility

reporting, the CEI pilot achieved CEI electricity savings of 0.1%. In 2015, with six facilities reporting, the pilot achieved overall CEI electricity savings of 3%.

Recommendation

Given that several facilities were still in the process of implementing CEI, Cadmus recommends that EVT continue to evaluate this CEI program cohort to learn whether savings persist.

Evaluated Savings Realization Rate

The evaluated electricity savings in most cases were very similar to the reported savings. In 5 of the 6 facilities with evaluated CEI savings, the savings realization was essentially at or above what was reported by the program. However, one facility brought the overall 2015 CEI savings realization rate (i.e., the ratio of evaluated to reported CEI savings) to 91%. This was basically due to a difference in the reporting of an estimated increase in consumption for the facility. Cadmus reported this increase in energy use as negative savings, while EVT reported the estimated increase in consumption as zero savings. When Cadmus adopted the implementer's reporting convention, we estimated that the pilot achieved a 102% realization rate for 2015.

Recommendation

Cadmus recommends that EVT report negative savings estimates rather than report them as zero. In general, it is impossible to know whether negative savings estimates represent error in the baseline regression model, random error in the savings estimate, or an actual increase in facility energy-use intensity. Reporting negative savings estimates as zero biases the savings estimates upwards.

Evaluated MT&R Models

EVT constructed high-quality MT&R models to report savings. In general, the models closely predicted energy use during the baseline period; furthermore, the evaluation and reported savings estimates were close. EVT provided clear rationales for variables in the models and definitions of the baseline and reporting periods.

Recommendations

Cadmus recommends that in the future EVT continue to follow the same process for building MT&R models. We suggest testing weather variables in all models, even if the facility engineering assessments indicate that facility energy use is not sensitive to weather. We also recommend testing weekend or weekday variables to capture these variables' effects on energy consumption. Finally, we recommend providing evaluators with a single data file, containing all data required for the evaluation. This will facilitate data collection and ensure that EVT and the evaluator use the same data for measuring savings.

Pilot Cost Effectiveness

Cadmus calculated the pilot cost-effectiveness under different assumptions about CEI measure life, including one year, two years, three years, and five years. We did this because the industry is uncertain about the effective useful life of CEI and Vermont has not yet determined a CEI measure life assumption.



The 2015 CEI Pilot did not prove cost-effective for a measure life of one year or two years, with benefit-to-cost ratios of, respectively, 0.5 and 0.9. However, the CEI Pilot did prove cost-effective for a measure life greater than three years. The benefit cost ratio was 1.3 for a measure life of three years and 2.0 for a measure life of five years.

Two factors contributed negatively to the pilot's cost-effectiveness in 2015. First, EVT was still in the process of implementing the pilot at the end of 2015. As noted above, several facilities had not implemented CEI projects and therefore did not achieve savings. Also, the cost-effectiveness analysis did not account for the benefits of any fuel oil and propane savings. The pilot cost-effectiveness may increase as more participants begin to implement CEI and after the analysis accounts for any fuel oil or propane savings.

Recommendation

Cadmus recommends that EVT reassess the cost-effectiveness of the CEI Pilot at the end of 2016 to determine whether the cost-effectiveness has improved. EVT should also conduct additional research to determine an appropriate CEI measure-life assumption for future cost-effectiveness calculations.

Implementing Key CEI Elements

Based on participant surveys and staff interviews, Cadmus found that CEI participants generally implemented the Pilot in accordance with the CEE minimum element definitions,² paraphrased here for the three key minimum elements:

- **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 saving 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.

In addition, Pilot participants will likely continue to implement lessons learned through their CEI engagement and will be more likely to conduct energy efficiency projects after participating in the CEI program.

² "CEE Strategic Energy Management Minimum Elements." CEE, 11 Feb. 2014. Web. 16 June 2016. <http://library.cee1.org/sites/default/files/library/11283/SEM_Minimum_Elements.pdf>

Barriers to Implementing CEI Elements

Organizations engaged with the program. Participants reported that tools and activities introduced through their CEI engagement have increased energy efficiency awareness within the organizations, but having sufficient time to focus on CEI remains one of the biggest challenges to engagement. Two of the five participant survey respondents indicated that finding time to implement and attend workshops was a challenge.

Recommendation

EVT could help participants overcome this challenge by reducing the number of on-site workshops and meetings. To do this, EVT could consider conducting fewer full-day workshops and offering shorter, targeted telephone webinars. These webinars could be target a single component or program topic. The webinars could focus on real-world examples and solutions from others within the cohort.

Using shorter, more focused webinars would provide participants with greater flexibility in choosing webinars to attend and would allow them to send multiple people from their organizations. As attendees would not be traveling, this also would reduce the amount of time employees spend away from their on-site responsibilities. Webinars could be recorded and shared, allowing even greater flexibility to organizations unable to attend on the original webinar date.

Organizational and Cultural Change

Through Pilot components and activities, organizations have succeeded in the continuing process of shifting workplace cultures toward more efficient use of energy. Organizations have committed to energy efficiency, allocating staff resources to maintaining energy teams that continue to meet bimonthly or monthly. In some organizations, the Pilot has increased executive management involvement.

All but one organization plans continued employee engagement activities to increase employee involvement in energy efficiency strategies. One organization said focusing on employee engagement was a factor motivating their decision to participate. Despite challenges relating to initial set up and ongoing use, all participants continue to track energy use using their data analysis tools. The participants found these tools to be the most important tools provided by the Pilot because they enabled participants to see how improvements affected energy use and to identify new opportunities for energy efficiency.

Peer-to-Peer Interaction

One important CEI Pilot component is to encourage organizations to share activities and feedback through peer-to-peer communication. This communication allows organizations to learn from one another and to discuss potential challenges and successes with OM&B activities. The communication proves useful as it provides an opportunity to gain different perspectives, exchange ideas, and identify new opportunities. This Pilot aspect works very well and is highly valued by participants and in the case of one organization led to implementation of a new air-leakage detection program.



EVT Support

Participants were *very satisfied* with the support they received from EVT staff, reporting that the staff were very talented and able to provide accurate and reliable technical expertise. Staff were responsive, and participants felt as though they were EVT's top priority.

Employee Engagement

Customers were primarily motivated to participate in the program to save energy and reduce energy costs. In some cases, companies believe they have realized all the retrofit opportunities they can and are focusing on changes to operational, maintenance, and behavioral practices. Although employee awareness and engagement remains a key component of this focus, challenges exist for companies in identifying effective and interesting ways to engage and motivate employees, especially for companies with temporary staff.

Recommendation

EVT could consider developing more materials about methods for companies to increase employee engagement. They could develop a checklist of the common ways that employees become involved in saving energy. Companies could share this list with employees through company staff meetings or monthly newsletters. This list would prove helpful for companies with part-time or temporary staff as they could share the ideas multiple times over the course of a year.

EVT could gather topics and tips from workshops and Kaizen³ events, and share them through a monthly or quarterly newsletter. This newsletter could provide opportunities for companies to learn about the ways other companies have engaged employees in low- or no-cost energy efficiency activities.

Sustainability

Sustainability remains an important aspect of the program as many participants have corporate policies encouraging them to be good stewards of the environment. Although sustainability can mean many things, it serves as an indicator for companies predisposed to participate and experience success with CEI. EVT has used this indicator successfully to identify candidates for the pilot. Synergies also likely exist between sustainability and energy-saving goals.

Recommendation

EVT could consider including a sustainability assessment that identifies possible carbon emission goals and/or reporting needs (e.g., Carbon Disclosure Project, Global Reporting Initiative) with new participants. EVT also could consider customizing aspects of the annual report to provide inputs for other sustainability reporting that will help companies reduce record keeping where overlap occurs with CEI reporting requirements.

³ Kaizen is Japanese for "improvement." When applied to the CEI Pilot, kaizen refers to on-site workshops to help customers identify low- or no-cost energy efficiency opportunities while providing peer-to-peer interaction and support.

Pilot Cost Tracking

EVT's internal account management software allows for tracking program costs. However, it is difficult to differentiate between traditional Account Management tasks and CEI tasks. This presents a challenge in accurately recording time spent on the CEI program, and in turn, presents difficulties in accurately quantifying program costs.

Recommendation

EVT could evaluate the account management software to determine whether it can be adjusted or modified to make querying CEI tasks easier, compared to other account management tasks.

Program Resources

EVT staff devote a significant number of hours for CEI-related tasks and interact closely and frequently with participants. Because this high-touch program requires many interactions with participants, it may be difficult to expand the number of participating organizations without increasing program resources.

Recommendation

EVT could consider an additional study to determine which steps and customer touchpoints are critical to the program's success and continued energy savings. Such analysis might enable EVT to increase the efficiency of the program delivery and increase cost-effectiveness. It might also enable EVT to make the program more prescriptive and to expand it to other industries and types of business customers.



Introduction

This section provides a description of the Continuous Energy Improvement (CEI) Pilot's design and implementation and presents the evaluation research questions used.

Pilot Program Design

In late 2013, Efficiency Vermont (EVT) launched the CEI Pilot, targeting energy savings from large commercial and industrial (C&I) utility customers. CEI seeks organizational and cultural changes to make reducing energy waste and improving energy intensity an ongoing objective and activity of the workplace, from the factory floor to upper levels of management.⁴ The Pilot focused on achieving energy savings through changes in operations, maintenance, and behaviors (OM&B), and its objective was to achieve lasting reductions in energy-use intensities (kWh/unit of output).

Currently, the Pilot has eight organizations enrolled, including seven industrial customers and one healthcare customer. In 2015, participants were in different stages of CEI implementation, with some participants having started implementation of CEI activities and others yet to begin.

EVT's account management and engineering staff implement the Pilot, helping participants to:

- Identify CEI savings opportunities
- Implement savings measures
- Track, measure, and verify savings
- Improve organizational focus on facility energy management practices

EVT plans to add 10 customers per year for the Pilot's second and third years. The Vermont Public Service Department takes responsibility for evaluating the CEI Pilot.

Research Objectives

The evaluation's objectives included estimating energy savings from the first cohort of CEI Pilot sites, documenting the program design and implementation, and assessing the customer experience. Cadmus developed an evaluation plan to address the following research objectives regarding the CEI Pilot:

- Assessing Pilot implementation successes and challenges
- For 2014 and 2015, independently estimate the CEI energy savings at each CEI participant facility, accounting for any capital measure impacts. Cadmus estimated facility and CEI savings of

⁴ For a formal definition of CEI and CEI minimum elements see: Consortium for Energy Efficiency, 2014. CEE Strategic Energy Management Minimum Elements. Available at <https://library.cee1.org/content/cee-strategic-energy-management-minimum-elements/>

electricity, fuel oil, and propane.⁵ Facility savings equaled the total energy savings from both OM&B measures and any capital projects and was obtained from a regression analysis of facility energy use. CEI savings equaled the difference between facility savings and savings from any capital projects incentivized by other EVT efficiency programs.

- Verify EVT's estimates of site-specific CEI, capital measures, and total Pilot savings
- Develop recommendations for improving Pilot data collection, measurement and verification (M&V), and impact evaluation approaches, specifically with respect to the following:
 - Collecting facility energy use data and sub-metering facility energy end uses
 - Establishing reliable M&V baseline models
 - Collecting program-related costs, including customer costs
 - Identifying potential OM&B savings for future program planning

⁵ As Cadmus has not received fuel oil and propane consumption data to date, this draft report does not include savings estimates for these fuels.



Methodology

This section describes the research methodologies used for conducting the following evaluation tasks, as included in the research plan:

- Document review
- Staff interviews
- Customer surveys
- Energy-savings analysis
- Cost-effectiveness

To answer research questions addressing program design, processes, delivery, and performance, Cadmus conducted staff interviews and customer surveys. To estimate CEI energy savings and cost-effectiveness, Cadmus conducted individual regression analysis of each facility's energy use. Cadmus evaluated the facility and CEI energy savings for one participant in 2014 and for five participants in 2015.

Document Review

Table 1 lists documents that Cadmus reviewed.

Table 1. Documents

Document	Description
2015 MT&R (Monitoring, Targeting, and Reporting) reports	Report outlining organization's implemented actions and data collected
CEI one-pager	Description of program for potential organizations
Statistical tools	Description of benefits for using statistical tools to track energy use
Memorandum of Understanding (MOU) template	Agreement organizations signed at the beginning of their engagement with the Pilot
CEI assessment tool	Tool outlining the program milestones and EVT's scoring procedure
CEI overview PowerPoint presentation	Presentation created by EVT to introduce the program to potential Pilot participants
CEI white paper	Paper describing the benefits of CEI programs
Sample energy plan	Workbook for organizations to track energy reduction activities and ideas

Staff Interviews

Cadmus conducted telephone interviews with key EVT Pilot staff, as shown in Table 2. We completed eight interviews: two with the EVT portfolio manager, three with EVT account managers (AMs), and

three with EVT energy consultants (ECs). Energy consultants are engineers with expertise in energy-efficiency.

Table 2. Staff Interviews

Stakeholders	Number of Interviews	Number of Interviewees
EVT Pilot portfolio manager	2	3
EVT AM	3	3
EVT EC	3	3
Total	8	9

Interviews addressed the following topics:

- Pilot history
- Pilot objectives and goals
- Pilot design and implementation
- Pilot successes and challenge
- Readiness for Pilot expansion

Customer Surveys

Cadmus administered telephone surveys with five of the eight participants in May 2016. We were unable to complete surveys with three participants: one company refused to answer the survey questions; and, as two companies had not completed their performance period, we excluded them from the survey sample frame.

The surveys assessed implementation challenges and successes, sought to achieve insights into the adoption and persistence of CEI activities, assessed satisfaction with Pilot components, and identified possible implementation improvements.



Conclusions and Recommendations

This section provides a synthesis of key findings, conclusions and recommendations for the Pilot.

Energy Savings

Cadmus evaluated the Pilot's facility and CEI electricity savings in 2014 and 2015. We evaluated electricity savings for one facility in 2014 and for six facilities in 2015. In 2014, with only one facility reporting, the CEI pilot achieved CEI electricity savings of 0.1%. In 2015, with six facilities reporting, the pilot achieved overall CEI electricity savings of 3%.

Recommendation

Given that several facilities were still in the process of implementing CEI, Cadmus recommends that EVT continue to evaluate this CEI program cohort to learn whether savings persist.

Evaluated Savings Realization Rate

The evaluated electricity savings in most cases were very similar to the reported savings. In 5 of the 6 facilities with evaluated CEI savings, the savings realization was essentially at or above what was reported by the program. However, one facility brought the overall 2015 CEI savings realization rate (i.e., the ratio of evaluated to reported CEI savings) to 91%. This was basically due to a difference in the reporting of an estimated increase in consumption for the facility. Cadmus reported this increase in energy use as negative savings, while EVT reported the estimated increase in consumption as zero savings. When Cadmus adopted the implementer's reporting convention, we estimated that the pilot achieved a 102% realization rate for 2015.

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EVT constructed high-quality MT&R models to report savings. In general, the models closely predicted energy use during the baseline period; furthermore, the evaluation and reported savings estimates were close. EVT provided clear rationales for variables in the models and definitions of the baseline and reporting periods.

Recommendations

Cadmus recommends that in the future EVT continue to follow the same process for building MT&R models. We suggest testing weather variables in all models, even if the facility engineering assessments indicate that facility energy use is not sensitive to weather. We also recommend testing weekend or weekday variables to capture these variables' effects on energy consumption. Finally, we recommend providing evaluators with a single data file, containing all data required for the evaluation. This will

facilitate data collection and ensure that EVT and the evaluator use the same data for measuring savings.

Pilot Cost Effectiveness

Cadmus calculated the pilot cost-effectiveness under different assumptions about CEI measure life, including one year, two years, three years, and five years. We did this because the industry is uncertain about the effective useful life of CEI and Vermont has not yet determined a CEI measure life assumption.

The 2015 CEI Pilot did not prove cost-effective for a measure life of one year or two years, with benefit-to-cost ratios of, respectively, 0.5 and 0.9. However, the CEI Pilot did prove cost-effective for a measure life greater than three years. The benefit cost ratio was 1.3 for a measure life of three years and 2.0 for a measure life of five years.

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Implementing Key CEI Elements

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- **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 saving 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.

In addition, Pilot participants will likely continue to implement lessons learned through their CEI engagement and will be more likely to conduct energy efficiency projects after participating in the CEI program.



Barriers to Implementing CEI Elements

Organizations engaged with the program. Participants reported that tools and activities introduced through their CEI engagement have increased energy efficiency awareness within the organizations, but having sufficient time to focus on CEI remains one of the biggest challenges to engagement. Two of the five participant survey respondents indicated that finding time to implement and attend workshops was a challenge.

Recommendation

EVT could help participants overcome this challenge by reducing the number of on-site workshops and meetings. To do this, EVT could consider conducting fewer full-day workshops and offering shorter, targeted telephone webinars. These webinars could be target a single component or program topic. The webinars could focus on real-world examples and solutions from others within the cohort.

Using shorter, more focused webinars would provide participants with greater flexibility in choosing webinars to attend and would allow them to send multiple people from their organizations. As attendees would not be traveling, this also would reduce the amount of time employees spend away from their on-site responsibilities. Webinars could be recorded and shared, allowing even greater flexibility to organizations unable to attend on the original webinar date.

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Through Pilot components and activities, organizations have succeeded in the continuing process of shifting workplace cultures toward more efficient use of energy. Organizations have committed to energy efficiency, allocating staff resources to maintaining energy teams that continue to meet bimonthly or monthly. In some organizations, the Pilot has increased executive management involvement.

All but one organization plans continued employee engagement activities to increase employee involvement in energy efficiency strategies. One organization said focusing on employee engagement was a factor motivating their decision to participate. Despite challenges relating to initial set up and ongoing use, all participants continue to track energy use using their data analysis tools. The participants found these tools to be the most important tools provided by the Pilot because they enabled participants to see how improvements affected energy use and to identify new opportunities for energy efficiency.

Peer-to-Peer Interaction

One important CEI Pilot component is to encourage organizations to share activities and feedback through peer-to-peer communication. This communication allows organizations to learn from one another and to discuss potential challenges and successes with OM&B activities. The communication proves useful as it provides an opportunity to gain different perspectives, exchange ideas, and identify new opportunities. This Pilot aspect works very well and is highly valued by participants and in the case of one organization led to implementation of a new air-leakage detection program.

EVT Support

Participants were *very satisfied* with the support they received from EVT staff, reporting that the staff were very talented and able to provide accurate and reliable technical expertise. Staff were responsive, and participants felt as though they were EVT's top priority.

Employee Engagement

Customers were primarily motivated to participate in the program to save energy and reduce energy costs. In some cases, companies believe they have realized all the retrofit opportunities they can and are focusing on changes to operational, maintenance, and behavioral practices. Although employee awareness and engagement remains a key component of this focus, challenges exist for companies in identifying effective and interesting ways to engage and motivate employees, especially for companies with temporary staff.

Recommendation

EVT could consider developing more materials about methods for companies to increase employee engagement. They could develop a checklist of the common ways that employees become involved in saving energy. Companies could share this list with employees through company staff meetings or monthly newsletters. This list would prove helpful for companies with part-time or temporary staff as they could share the ideas multiple times over the course of a year.

EVT could gather topics and tips from workshops and Kaizen events, and share them through a monthly or quarterly newsletter. This newsletter could provide opportunities for companies to learn about the ways other companies have engaged employees in low- or no-cost energy efficiency activities.

Sustainability

Sustainability remains an important aspect of the program as many participants have corporate policies encouraging them to be good stewards of the environment. Although sustainability can mean many things, it serves as an indicator for companies predisposed to participate and experience success with CEI. EVT has used this indicator successfully to identify candidates for the pilot. Synergies also likely exist between sustainability and energy-saving goals.

Recommendation

EVT could consider including a sustainability assessment that identifies possible carbon emission goals and/or reporting needs (e.g., Carbon Disclosure Project, Global Reporting Initiative) with new participants. EVT also could consider customizing aspects of the annual report to provide inputs for other sustainability reporting that will help companies reduce record keeping where overlap occurs with CEI reporting requirements.

Pilot Cost Tracking

EVT's internal account management software presents a challenge to tracking program costs, making it difficult to differentiate between traditional account management tasks and CEI tasks. In turn, this presents difficulties in accurately quantifying program costs.



Recommendation

EVT could evaluate the account management software to determine whether it can be adjusted or modified to make querying CEI tasks easier, compared to other account management tasks.

Program Resources

EVT staff devote a significant number of hours for CEI-related tasks and interact closely and frequently with participants. Because this high-touch program requires many interactions with participants, it may be difficult to expand the number of participating organizations without increasing program resources.

Recommendation

EVT could consider an additional study to determine which steps and customer touchpoints are critical to the program's success and continued energy savings. Such analysis might enable EVT to increase the efficiency of the program delivery and increase cost-effectiveness. It might also enable EVT to make the program more prescriptive and to expand it to other industries and types of business customers.

Appendix A. Participant Survey provides a copy of the participant survey.

Energy Savings Analysis

Cadmus estimated the CEI electricity, for each participating facility that reported savings in 2014 or 2015.⁶ We used regression to analyze facility energy use during the baseline period, predicted what the facility's energy use would have been had the facility not implemented CEI (i.e., adjusted baseline energy use), and estimated savings as the difference between metered consumption and adjusted baseline consumption. In doing so, we followed best practices for conducting whole facility savings analysis, as outlined in the International Performance Measurement and Verification (2012) Protocol Option C, Whole Facility Guidelines and in the forthcoming U.S. Department of Energy Uniform Methods Project (UMP) Strategic Energy Management Evaluation Protocol.

Overview

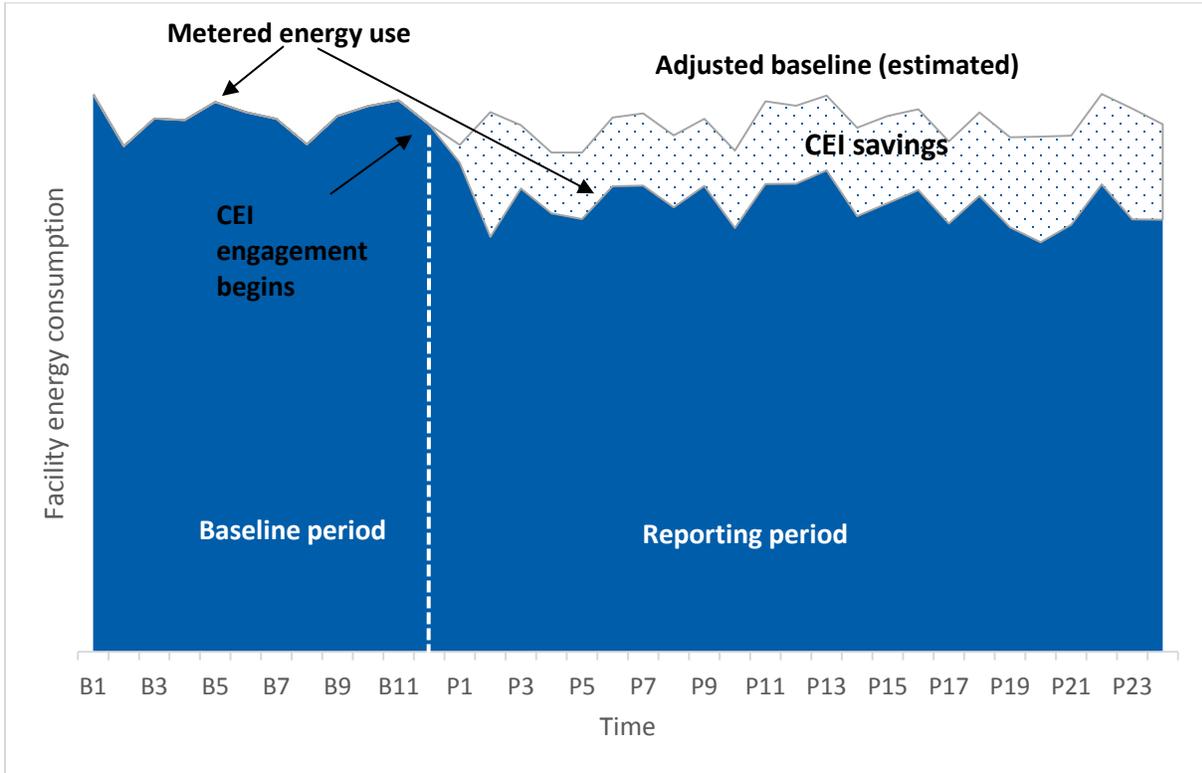
Cadmus estimated CEI savings for each facility by comparing the facility's metered energy use during *the reporting period* with the facility's adjusted baseline energy use during the same period. We calculated the adjusted baseline using a regression model of *baseline period* energy use.

- The reporting period is the time from which CEI engagement energy savings were estimated.
- The baseline period is the time over which the evaluation established the facility's baseline energy use before CEI activities took place.

⁶ Following the forthcoming UMP on SEM program evaluation, Cadmus defined the facility as the area of a site over which energy use would be measured and analyzed.

Figure 1 illustrates CEI energy savings estimation, showing metered energy use and the adjusted baseline. The dotted area represents savings (i.e., the area between the adjusted baseline and metered energy use). For simplicity, the shown example does not differentiate between CEI capital projects and CEI operations, maintenance, and behavioral measures.

Figure 1. Estimation of CEI Energy Savings



Cadmus estimated the adjusted baseline using facility energy-use data from the baseline period. Using regression analysis, we adjusted the baseline energy consumption for baseline and reporting period differences in output, weather, occupancy, or other measured variables affecting a facility’s energy consumption.

We estimated facility savings as the difference between metered energy use and adjusted baseline energy use. We estimated CEI savings by taking the difference between estimated facility savings and savings from capital projects receiving incentives through other EVT programs that the facility implemented during the reporting period. If the facility did not implement such capital projects, CEI savings equaled the estimated facility savings.



This approach for evaluating CEI Pilot facility savings yields accurate savings estimates upon meeting the following conditions:

- **No omitted variable bias (no confounding variables):** The regression must be correctly specified and does not omit key variables affecting energy use. Specifically, the model controls for all variables affecting energy use that correlate with CEI implementation.
- **No measurement error:** The model independent variables were not measured with error.

Cadmus attempted to avoid bias from omitted variables by including all relevant variables in the baseline energy-use model. A description follows of procedures used for selecting the regression model variables, as designed to minimize potential omitted variable bias. EVT and Cadmus experienced less control over measurement error of model independent variables, as the facilities and implementers collected energy-use, output, and occupancy data.

The energy savings analysis for each facility involved four main steps (listed below and followed by detailed descriptions):

1. Verify the facility boundaries and availability of energy-use data.
2. Define the baseline and reporting periods.
3. Build the baseline regression model.
4. Estimate facility and CEI savings.

Step 1. Verify the Facility Boundaries and Availability of Energy-Use Data

For each facility, Cadmus verified the following:

- Facility boundaries (i.e., the area over which energy use was measured).
- Facility energy use and other key variables at the facility were available.
- Facility energy use and other variables were measured consistently over time.

Cadmus followed up with EVT staff to resolve discrepancies or missing data for a facility. In general, EVT staff or CEI Pilot consultants were able to answer our questions or to provide the missing data.

Step 2. Define the Baseline and Reporting Period

Cadmus reviewed the implementer’s definitions of the baseline and reporting periods for each facility. We checked whether the baseline period covered a full year. If it did not, we verified enough data remained available to build a valid model of facility energy use for estimating the adjusted baseline kWh for the reporting period. For some facilities, the reporting period covered less than a full year due to data unavailability, hence we only estimated savings for the period with available data (a situation applying only for oil savings).

Step 3. Build the Baseline Energy-Use Model

Cadmus followed a multistep process in building the baseline energy-use model. The process involved applying both engineering knowledge about a facility’s energy use and automated variable selection.

Cadmus identified candidate variables for the baseline energy-use model based on engineering description of the facility in the annual participant report. We employed an automated variable selection process to select variables to be included in the final baseline model.

Step 3a. Identify a candidate set of explanatory variables. First, Cadmus constructed variables that would measure the sensitivity of the facility's energy use to outside temperatures (e.g., the facility's demand for space heating or space cooling). We collected mean daily temperatures for each facility from the closest National Oceanic and Atmospheric Administration weather station, and then computed daily heating degrees and cooling degrees for a range of base temperatures (between 45°F and 75°F) for the baseline and the reporting period. If necessary, these values were aggregated to the same frequency as the site data (i.e., weekly or monthly).

To determine optimal base temperatures for heating degree days (HDDs) and cooling degree days (CDDs), Cadmus built regression models for each facility, regressing consumption on every possible HDD and CDD combination (employing a constraint that the CDD base temperature must be greater or equal to the HDD base temperature) and facility production variables. We then defined and selected the optimal HDD/CDD base temperature combination, based on R² statistics. The optimal HDD-CDD pair became the candidate variables in the variable/model selection process (described below).⁷

Cadmus then identified other candidate explanatory variables for the baseline regression model. We determined the candidate variables by reviewing the annual participant report, which included information about relationships between a facility energy usage and output, weather, and other drivers. The baseline MT&R model always served as a starting point for identifying candidate variables. EVT's and its consultants' prior modeling significantly reduced the time required to build an energy-use model and improved the final model's quality.

Step 3b. Identify significant energy drivers. Once Cadmus identified the candidate set of explanatory variables, we identified significant energy consumption drivers at the facility using stepwise selection—an iterative variable selection technique that identifies variables highly correlated with facility energy use. A description follows of each step in the stepwise selection process:

1. *Regress energy consumption on each candidate independent variable in turn.*
2. *Choose the variable with the most explanatory power to update the model.* An F test determines a variable's explanatory power. The variable with the largest change in the F-statistic and a p-value greater than 0.2 (corresponding to an 80% confidence level) serve for inclusion in the next model iteration.
3. *Refit the model with the added variable, testing all remaining independent variables, and choosing another variable with the next-largest explanatory power.*

⁷ HDDs and/or CDDs were most commonly used when selecting weather variables for the model, though testing included other temperature variables (e.g., the average temperature in Step 4).



4. *Refit the model with the added variable.* Verify no independent variables included in the model lose significance after adding the preceding variable. If so, remove the nonsignificant variable.
5. *Repeat steps 2 through 4 until no remaining variables can be added* (i.e., when no additional variables prove statistically significant in the model).

Though an automated variable selection process can help to identify variables affecting facility energy use that an engineering analysis may not, it also can omit variables that engineering knowledge indicates should be included as regressors in the model. To avoid omitting relevant variables, Cadmus carefully reviewed the model specification selected through the automated procedure, and we added or removed variables as necessary, based on knowledge of the site type modeled and the site's production.

Step 3c. Investigate inclusion of quadratic and interactions terms among selected variables. For this step, Cadmus formed squares of the variables selected in the first stage and all pairwise interactions between the selected variables. We then selected among these variables, rerunning the stepwise selection procedure (steps 1–5), using all variables selected in the first stage, the squares, and the interaction variables. This step ensures that the final baseline model captures any interactive effects between the variables selected in Step 3b and improves the model fit.

Step 3d. Select the final baseline model. The previous variable selection steps yielded a final baseline model. We compared this model to other candidate model (including the MT&R model) to assess model performance. We assessed the selected model using several different model performance metrics, examining the individual and joint statistical significance of the independent variables (using t and F statistics), the model R2, and collinearity diagnostics. We verified that the coefficients had the expected signs and the independent variables could explain most variability of energy use. To avoid omitting relevant variables, we carefully reviewed the final model specification selected by the automated procedure and added variables that we concluded, based on knowledge of the site type modeled and the site's energy consumption, should have been included.

The final model selected to estimate a facility's adjusted baseline energy consumption took the following general form:

$$e_t = \alpha + f(\text{output}_t, \text{outside temperature}_t, \text{occupancy}_t, \beta) + g(\text{other}_t, \gamma) + \varepsilon_t$$

Equation 1

With model variables defined as follows:

- t The t^{th} time interval (day, week, or month), $t=1, 2, \dots, T$. For example, $T=365$ if daily energy use was modeled and energy-use data were available for a full year.
- e_t Energy consumption of the facility during the t^{th} time interval.
- α Intercept indicating facility average base load energy use per interval.
- output_t A vector of different outputs produced at industrial facilities during the t^{th} time interval.

$outside\ temperature_t$	A vector of different outdoor temperature variables (e.g., HDD, CDD, average daily temperature) affecting facility energy use during the t^{th} time interval.
$occupancy_t$	A vector of different occupancy variables for commercial facilities during the t^{th} time interval.
β	A vector of coefficients that indicates the relationship between energy use and key explanatory variables (e.g., outputs, outdoor temperature, and occupancy). For example, the coefficient on output would indicate average energy use per unit of output.
$other_t$	A vector of additional explanatory variables and/or indicators related to a facility's energy consumption during the t^{th} time interval. This may contain facility closures, indicators of changes to the facility, or indicators of changes in measurement.
γ	A coefficient vector that indicates the relationship between the additional explanatory variables and energy consumption.
ε_t	The model error term representing unobservable influences on energy consumption in period t .

Estimate Savings

To estimate facility savings, Cadmus first estimated Equation 1 using baseline period data. We then estimated the facility regression models by ordinary least squares.⁸

Then, for each interval of the facility's reporting period, we used the estimated Equation 1 to calculate the adjusted baseline energy use:

$$\hat{e}_t = \hat{\alpha} + f(output_t, outside\ temperature_t, occupancy_t, \hat{\beta}) + g(other_t, \hat{\gamma})$$

Equation 2

Where \hat{e}_t is the adjusted baseline energy use for time interval t and $\hat{\cdot}$ denotes the estimate of the coefficient. As noted, adjusted baseline energy use is an estimate of energy consumption had CEI not been implemented and had other facility conditions during the baseline period persisted during the reporting period.

Cadmus estimated energy savings during interval t of the reporting period, s_t as:

⁸ Cadmus conducted model diagnostic tests for autocorrelation. If autocorrelation occurred, but the model did not account for it, coefficients would remain unbiased and consistent, but the model standard errors and inferences based on the standard errors could be incorrect.



$$\hat{s}_t = \hat{e}_t - e_t$$

For energy savings during the reporting period, S equaled the sum of savings over the T^P intervals of the reporting period:⁹

$$S = \sum_{t=1}^{T^P} \hat{s}_t$$

S is an estimate of the facility savings during the reporting period. Cadmus estimated facility CEI savings by subtracting any capital projects incentivized through other EVT programs (S_k) during the reporting period from S:

$$\text{CEI Savings} = S - S_k$$

Cadmus obtained estimates of the facility’s capital project savings from the facility’s annual participant report. Savings from capital projects implemented in 2014 had already been adjusted using previous evaluation realization rates. Cadmus prorated savings from capital projects implemented in 2015 using EVT’s Custom Program realization rate for 2014.

Cost-Effectiveness

Camus conducted a cost-effectiveness analysis of the CEI Pilot using the Vermont (VT) 2016 Statewide Screening Tool, which EVT provided to Cadmus.¹⁰ EVT uses the societal cost test (SCT) to screen Vermont’s energy efficiency programs. The SCT accounts for the following benefits and costs the Pilot.

⁹ Cadmus estimated the standard error of the estimated savings as follows:

$$\text{standard error}(S) = \sqrt{\text{Var}(\sum_{t=1}^{T^P} \hat{\alpha} + f(\text{output}_t, \text{outside temperature}_t, \text{occupancy}_t, \hat{\beta}) + g(\text{other}_t, \hat{\gamma})) + T^P \hat{\sigma}^2}$$

Where $\hat{\sigma}^2$ is the regression standard error (i.e., the estimate of the error variance σ^2 from the baseline period regression model).

The first term in the formula is the adjusted baseline’s variance. The second term in the standard error formula, $T^P \hat{\sigma}^2$, is an estimate of the metered energy-use variance during the reporting period. This may be estimated using the regression standard error (i.e., the regression root mean square error) of the baseline regression, assuming the error variance during the baseline and reporting periods equal. The forthcoming UMP on SEM program evaluation will present a derivation of this formula.

¹⁰ Cadmus utilized 2015 data (included in the tool for the analysis); 2015 DRIPE values were set equal to 2016 as the tool did not include 2015 values.

Table 3. Societal Cost Test Benefits and Costs

Benefits	Costs
Electric Energy	Program Administration
Electric Capacity	
DRIPE*	
Electric Externalities	
Non-Energy Benefits	

*Demand Reduction Induced Price Effects: DRIPE is a measure of impacts from reduced electricity consumption due to energy efficiency investments on regional energy and capacity market clearing prices.



Evaluation Findings

This section describes findings drawn from the document review, staff interviews, participant surveys, energy savings analysis, and cost-effectiveness analysis.

Document Review

Marketing Materials

Cadmus reviewed a number of CEI materials. In the participant survey, Cadmus asked about respondents' use of the CEI assessment (i.e., the energy management assessment). Three respondents found the CEI assessment *very useful* in implementing the Pilot, one found it *somewhat useful*, and one found it *not too useful*. This report's survey findings portion provides additional information about the tool's usefulness.

Through the participant surveys, one participant discussed the importance of creating a culture of employee engagement—a phrase referenced in several marketing materials pieces. The participant survey included several questions about use of statistical tools to measure energy usage. While none of the survey participants referenced the document outlining the importance of the Pilot statistical tools, all participants use an energy management tool, and two of the five survey participants reported this tool as the most important aspect of the Pilot.

MT&R Workbooks

As part of the document review, Cadmus reviewed the Pilot year 2015 MT&R reports, provided by EVT. We used the annual reports to understand the data collection and pilot implementation at each facility. Specifically, we required information from the MT&R reports to undertake the following:

- Verify the baseline and performance periods
- Replicate the MT&R baseline regression model
- Build an independent evaluation regression model
- Compare reported and verified gross/CEI savings at each facility

EVT provided a separate Pilot year 2015 MT&R report for each Pilot facility. The consistent format of these reports made it easy for Cadmus to locate information quickly. The MT&R reports provided information required for evaluation and verification purposes.

Staff Interviews

Cadmus conducted eight interviews with EVT AMs and ECs. The following sections summarize results drawn from these interviews.

Overall Pilot Performance

EVT successfully reached its participation goal for the Pilot's first year. While final energy savings remained unknown when Cadmus conducted these interviews, most EVT staff considered the Pilot a

success. According to one respondent, about 75% of the organizations experienced success with the concepts and activities implemented through CEI, while about 25% struggled due to their other priorities and inadequate bandwidth to fully engage in CEI.

Organizations remain engaged in the Pilot, and the provided tools and activities have increased awareness regarding energy-efficiency.¹¹ Examined organizations have committed to energy efficiency, allocating staff resources such as creating and expanding energy teams. Executive management involvement increased at some facilities as a result of participation in the Pilot. Organizations have discovered ways to engage employees in energy efficiency strategies by holding staff meetings addressing energy saving opportunities, placing signs around the facility reminding employees to turn equipment off when not in use, or holding energy fairs teaching employees about ways to save energy in their own homes.

Regarding Pilot implementation, EVT has identified participation barriers and implementation challenges. As the first year included a diverse group of participants, EVT could identify processes and activities similar across all company types and has developed some best practices (although they recognize that each site differs and must overcome varying challenges and obstacles). EVT found some Pilot activities and tools useful in implementing other programs with customers not participating in the Pilot.

Pilot Background

The Pilot has enrolled eight organizations: seven industrial customers and one healthcare customer. Each organization works with an EVT AM, an EVT EC, and a third-party, project-level implementer to instruct participants about using SENSEI¹² or other energy management software for tracking energy use. These individuals collaborate to help participants accomplish the following:

- Identify CEI savings opportunities
- Implement savings measures
- Track, measure, and verify savings

For the second and third years, EVT is targeting up to 10 additional customers per year. The second program implementation year will include a technology focus, targeting organizations with ammonia refrigeration units.

Pilot Goals

EVT's goals for the Pilot include the following:

- Demonstrate a measurement and verification (M&V) approach to quantify savings from these behavioral changes; quantify the relative magnitude of project-based savings vs. and behavior-

¹¹ As indicated in Table 8 of this report, participants report continued engagement in CEI activities.

¹² SENSEI is an energy management information system (EMIS).



based energy savings from energy management and conservation. (Setting a participation goal of eight to ten organizations, EVT achieved eight participants for the Pilot’s first year.)

- Provide opportunities for enhanced engagement with customers looking to improve their energy management and for Efficiency Vermont staff to engage more fully with these customers.
- Test the ability for Efficiency Vermont’s Account Management staff to cost-effectively affect customers’ energy management strategies. This includes developing processes to assess and track costs related to the initiative.
- Increase the identification of additional capital projects from each customer through CEI on-site activities, workshops, and trainings; assess the incremental effect of this outreach on projects and other program participation (program lift).
- Determine the pilot’s ability to enhance customer relationships by increasing the number of company contacts Efficiency Vermont works within each customer facility.
- Inform the type and cost of system enhancements, such as improved data reporting or permanent sub-metering, required to undertake a successful CEI program with customers.
- Test the ability of Efficiency Vermont Engineering staff to collect customer energy usage data, generate reliable baseline models, track deviation of actual usage from the model, and estimate savings.
- Develop a system to capture program-related costs, including customer and program costs.
- Gain experience in applying analysis concepts outlined in the SEP M&V Protocol.
- Increase the per-customer value commensurate with the EEC investment made by this customer group.
- Establish effective metrics to deliver the CEI approach to nonindustrial C&I customers, such as large institutions or commercial buildings; share these protocols with other program administrators across the country.

The Pilot does not include overall energy-savings or demand-savings goals, although some individual organizations set specific energy-reduction goals. Other organizations set different goals (e.g., peak summer demand reduction, achieving ENERGY STAR designation). A few did not set measurable goals.

Pilot Delivery

Customer Targeting

EVT did not use traditional marketing or outreach to recruit Pilot participants. Rather, it selected organizations that were actively engaged with energy efficiency and were sustainability minded. EVT originally contacted 15 organizations about possibly participating in the Pilot; eight organizations committed. The second cohort focuses on organizations with large refrigeration loads. EVT has yet to determine strategies to recruit and select organizations for the Pilot’s third year.

Internal Training

Prior to the Pilot's start, the EVT Pilot manager introduced AM and EC staff to the Pilot, and discussed key Pilot elements and values that the program would provide customers. Following this meeting, the implementer conducted an informational meeting with EVT staff to discuss technical tools and support it would provide during the Pilot.

Process

Once organizations verbally committed to Pilot participation, they identified an executive sponsor and an energy champion at their facilities. Organizations attended a kick-off workshop to introduce them to EVT staff, the implementer, and other participants. During the workshop, they formally committed to Pilot participation by signing an MOU, outlining each organization's roles and responsibilities.

Organizations attended workshops regarding various Pilot components (e.g., customer commitment, employee engagement, data analytics, reporting). Each participant completed an energy management assessment for each level of their organization, a useful exercise allowing all employees to provide Pilot-related input. Participants began sharing data and building regression models. During their participation, each organization held meetings with EVT staff, implementers, and with other Pilot participants. Following the Pilot's conclusion, EVT prepared an annual report, summarizing each participants' energy savings and engagement levels.

Table 4 shows the results of the energy management assessment (EMA) reports prepared by EVT staff as part of each participant's annual report. The table includes organizations who completed an EMA in 2014 and 2015 and who were evaluated as part of Cadmus' energy savings evaluation. To preserve confidentiality of participating facilities, Cadmus assigned a unique ID to each evaluated facility. We use the unique IDs when making references to individual facilities in this section.

The comprehensive score shows that all organizations improved their EMA scores from 2014 to 2015 and in all but one case experienced savings in 2015. While it is difficult to measure the impact of each step on the final savings, facility F1 made the most progress in improving their EMA comprehensive score and also achieved savings.

As indicated by the EMA scores and the participant surveys, participating organizations are increasing their commitment level through the engagement of energy teams. Both the improvement of EMA scores and responses from participant surveys indicate that organizations are making progress in implementing energy efficiency activities. Of the 20 total projects Cadmus reviewed in the surveys, all but two had been implemented and remained in place.



Table 4. Energy Management Assessment Report ¹³

Facility ID		F1		F2		F3		F5	
Process Step ¹	Category ¹	2014	2015	2014	2015	2014	2015	2014	2015
Commitment	Senior Management	75%	94%	56%	63%	50%	63%	44%	44%
	Energy Policy	33%	75%	8%	42%	33%	50%	0%	0%
	Energy Champion & Energy Team	92%	100%	58%	100%	42%	67%	58%	92%
Plan	Energy Review	67%	88%	38%	46%	42%	42%	54%	75%
	Action plan	67%	75%	33%	58%	42%	67%	17%	33%
Do	Implementation	50%	100%	50%	75%	50%	100%	75%	75%
	Employee Engagement	25%	67%	42%	50%	67%	75%	58%	63%
Check	Monitoring, Measurement and Analysis	42%	67%	0%	25%	0%	42%	42%	42%
	Internal Auditing	50%	50%	0%	13%	0%	38%	0%	0%
Act	Management Review	25%	50%	0%	38%	0%	25%	0%	0%
Comprehensive Score		53%	78%	33%	52%	38%	57%	40%	49%
Cadmus Percent Savings ²		N/A	3%	N/A	-1%	N/A	11%	N/A	3%

¹ The process steps and categories are reported in EVT's annual report for each participant.
² Cadmus percent savings is reported in Table 15 of this report.

Communication

At each site, EVT staff most often coordinated and communicated with energy managers or energy champions. Occasionally, they met with executive-level staff. Some organizations maintain energy teams, comprised of different staff (e.g., facility, maintenance, engineering, human resources). Most organizations conduct formal meetings with EVT staff monthly or more frequently. EVT staff scheduled additional conference calls and site visits, as needed. Given these formal and informal communication channels, EVT staff did not report communication challenges with participants.

Internally, EVT staff coordinated plans and activities with their team of ECs and AMs, along with strategy and program managers. They held monthly meetings to discuss the Pilot and customers.

During the Pilot's first year, EVT staff conducted monthly conference calls with the implementer.

Customer Motivators

Saving energy and reducing energy costs primarily motivated customers to participate in the Pilot. Many of these organizations believed they had realized all of their retrofit opportunities and sought other

¹³ The energy management assessment identifies current energy management practices by utilizing a performance scorecard and reports the percentage of implementation for each category.

ways to reduce energy costs. Through the Pilot, they learned of employee engagement activities to help them change employee behaviors to save energy.

Companies also participated due to Pilot's focus on operational activities that could improve their processes and increase production. The Pilot's emphasis on sustainability also proved attractive as many companies maintain corporate policies encouraging them to act as good stewards of the environment. Finally, the program offered access to other companies through peer-to-peer workshops and events, which allowed organizations to learn from one another and discuss potential challenges and successes with OM&B activities.

Data Management

Organizations and EVT track events, recommendations, actions, outcomes, workshop participation, and behavior changes along with capital improvements. Though not every participant tracks all of these activities, every participant uses a data management system. Some use systems they already had in place, while others use the third-party implementer's system (Energy SENSEI).

Tracking and using energy management information systems (EMIS) can be challenging. The initial implementation of a system can be complicated, as participants establish variables to track. Organizations using the new data management system encountered problems in learning to use the new software. Once the modeling was in place, some participants found it difficult to update the model regularly (participants also encountered difficulties in finding the available resources and time to update the model—which emerged as one of the Pilot's greatest challenges). Finally, small energy savings made inflection points difficult to detect when using the model.

Internally, EVT used a database management tool to track customer interactions. The tool produced year-end reports for each participant, showing energy savings and customer touchpoints (including operation and maintenance activities).

Year-End Report

For each participant, EVT creates a year-end report, based on strategic energy management principles. The report summarizes energy savings, events, actions, outcomes, recommendations, workshop participation, behavior changes, and customer touchpoints. EVT created a template for the report and has provided administrative support to prepare the version for each participant. The detailed document provides quantitative and qualitative information.

The reporting process faces challenges in gathering information recorded in EVT's database management tool as activities and touchpoints specific to the Pilot cannot be queried. Compiling the report can be time consuming due to a great deal of detail that may not be useful to participants. Challenges can also arise in gathering consistent information across all participants and having the bandwidth for EVT staff to regularly update the information.



Working Well

Many aspects of the Pilot work well, but participants describe peer-to-peer access as the most valued program element. The Pilot’s structured encourages organizations to share their activities with one another and to receive feedback through workshops and Kaizen events. Customer commitment presents another valued aspect, motivating companies to participate and to devote resources to help their energy teams to accomplish their goals.

Most interview participants agreed communication and partnership between EVT AMs and ECs proved important to the Pilot’s success, and they reported this collaboration worked well.

Challenges

Throughout the interviews, respondents identified various customer challenges, with finding enough time to focus on CEI the most important of these. Table 5 summarizes all customer challenges, including those discussed previously in this report.

Table 5. Pilot Challenges for Customers

Challenges
Resources and Employee Engagement
<ul style="list-style-type: none"> • Creating and maintaining a cross-functional team and having the time to meet. • Time not available because energy efficiency is not part of the job description. • Energy champions have more responsibilities than energy efficiency; so finding the time to devote to CEI is difficult. • Engaging employees when there is no time for any activities. • Engaging contract staff. • Engaging staff in different departments with different roles at the company. • Generating ideas for employee engagement activities.
Commitment
<ul style="list-style-type: none"> • Gaining commitment and workshop attendance at the corporate level.
Company Organization
<ul style="list-style-type: none"> • Getting multiple departments to agree on priorities. • Organization culture (e.g., messaging coming from maintenance staff in hospitals is often ignored by doctors and nurses). • Individual policies regarding use of subcontractors.
Workshops
<ul style="list-style-type: none"> • Long distances from workshops and other events add time to commitment, and make it difficult to attend. • Full-day events are difficult to attend.
Costs/Savings
<ul style="list-style-type: none"> • Making the business case for sub-metering. • Competing priorities, especially when energy is less than 10% of total cost of business. • Accurately quantifying the savings because of small margins.

Challenges

- Complicated initial set-up.
- Identifying appropriate variables.
- Continuous updates.
- Difficult to see inflection points.
- Time needed to update the tools.

The Pilot faces some internal challenges. EVT staff mentioned the difficulty in differentiating between traditional account management tasks and CEI tasks, which makes it problematic to accurately quantify the Pilot’s cost. Due to the many activities and interactions, documenting all aspects proved to be a challenge.

Program Resources

The Pilot runs well, but, as a high-touch program, EVT may need to change the implementation method to enable expansion. Currently, the Pilot requires many levels of documentation and customer engagement, but such detail and attention may become difficult to maintain with more customers. According to one interview respondent, expansion plans remain contingent on whether the Pilot can claim savings and whether those savings persist. Until that becomes known, it will be difficult to determine whether the Pilot should be expanded.

Suggestions for Improvements

As shown in Table 6 and Table 7, respondents provided several suggestions to address challenges and to improve and expand the Pilot.

Table 6. Suggestions for Implementation Improvements

Communication and Information Sharing
<ul style="list-style-type: none"> • Provide more information about the time commitment, emphasizing the Pilot’s team aspect.
<ul style="list-style-type: none"> • Continue team meetings to maintain company focus.
<ul style="list-style-type: none"> • Reduce the number of workshops and meetings to lessen the time commitment for customers.
<ul style="list-style-type: none"> • Provide investment-grade analysis to help customers make a business case.
<ul style="list-style-type: none"> • Start gathering data earlier in the process.
Commitment
<ul style="list-style-type: none"> • Spend more time securing commitment from all company stakeholders.
<ul style="list-style-type: none"> • Customers should include Pilot implementation responsibilities in selected job descriptions within their respective organization.
Annual Report
<ul style="list-style-type: none"> • Reduce the detail level in the annual report; evaluate customer needs and revise reports to match the information most useful to the customers.
Tools
<ul style="list-style-type: none"> • Develop more employee engagement materials.
<ul style="list-style-type: none"> • Automate fuel tracking.
<ul style="list-style-type: none"> • Automate the modeling and input information.



<ul style="list-style-type: none"> • Improve consistency of Pilot milestones in reporting tools.
Events and Workshops
<ul style="list-style-type: none"> • Hold more events at customer sites.
Expansion
<ul style="list-style-type: none"> • Recruit geographically similar cohorts; so workshops and Kaizen events require less time away from the site.
<ul style="list-style-type: none"> • Create cohorts based on industry or business types; so organizations can learn from similar businesses.¹

¹EVT has done this with the second cohort.

Table 7. Suggestions for Internal Management Improvements

<ul style="list-style-type: none"> • Organize EVT staff according to their skill set to replace the outreach currently handled by the implementer.
<ul style="list-style-type: none"> • Develop a method to track how much time EVT spends on CEI and on other account management.
<ul style="list-style-type: none"> • Hold an internal EVT meeting to discuss the Pilot’s status and whether EVT should shift its focus.

Participant Surveys

This section summarizes the results from the five participant surveys.

CEI Tools

Participants continue to use many tools they employed during their CEI engagement. Table 8 shows activities respondents are implementing in 2016.

Table 8. Implementation of CEI Tools in 2016

Component	Implementing in 2016 (n=5)	Notes
Energy team	5	2 meet bimonthly with energy team 3 meet monthly with energy team
Employee engagement activities	4	1 is not planning any as they have no more low- or no-cost activities to implement
Energy action plan	5	2 review biweekly 2 review quarterly 1 reviews semiannually
Energy Management System (EMS)	5	4 use SENSEI 1 uses SkySpark
Energy tracking	5	4 review weekly 1 reviews monthly

CEI/Energy Management Assessment

Participants found the CEI assessment (i.e., the energy management assessment.)¹⁴ useful as it increased awareness about methods and processes for saving energy. It also provided a map for taking energy conservation seriously, and it offered a critical tool to prioritize projects and to determine which projects and actions had been implemented. One participant deemed it *not too useful* as CEI priorities did not always align with their company's corporate energy policies.

Management System

Four participants track energy use and CEI milestones using SENSEI; another uses SkySpark. Three customers using SENSEI found the system *very easy* to use in tracking energy usage and CEI milestones, given its user-friendly, well-organized, and easy-to-navigate features.

The tool allows staff to produce meaningful charts and graphs. One SENSEI-using participant considered it *neither easy nor difficult* as the software takes a long time to open and does not show sufficient detail to identify exactly where the company could make changes to reduce energy. The participant using SkySpark described the system as *somewhat easy* to use, given some staff (such as maintenance) found it very easy to use, while others found it difficult.

Project Implementation

Cadmus reviewed the annual reports to list activities included as part of each participant's Pilot engagement. Of 20 total projects, all but two had been implemented and remained in place.

Of the two projects not implemented, one continues to wait for funding, and one was removed from the participant list because it was postponed. Both projects will be implemented in the future.

Pilot Satisfaction

Participants answered questions about their satisfaction with various aspects regarding the workshops, the Kaizen events, and other Pilot components as well as their overall opinion of the Pilot.

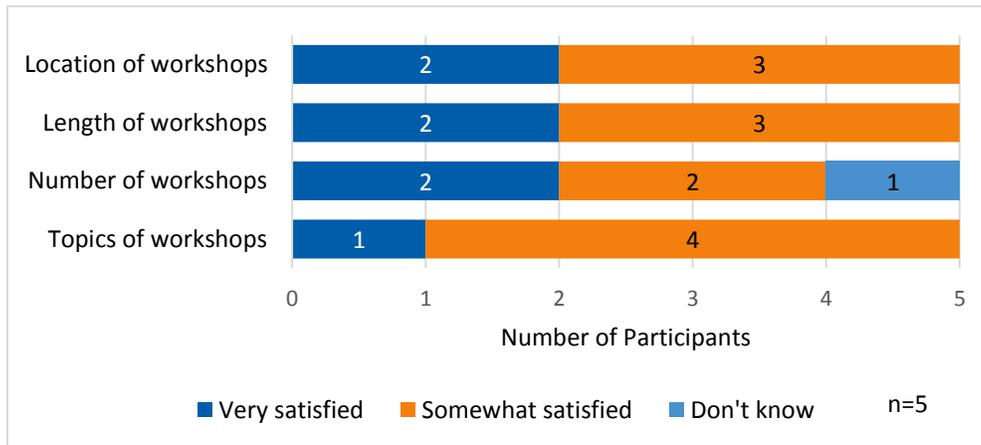
Workshops

Participants answered questions about their satisfaction with several key workshops components: workshop locations, workshop lengths, number of workshops offered, and topics addressed through each workshop. Overall, participants expressed satisfaction with all workshop components, as shown in Figure 2.

¹⁴ The energy management assessment listed program milestones used to assess organizations. The assessment categories are commitment, energy plan, implementation, employee engagement activities, monitoring and analysis, and management review.



Figure 2. Workshop Satisfaction



Source: Survey question H1a-d, “Thinking about the workshops you attended as part of your CEI engagement, please tell me how satisfied you were with the following aspects. Were you very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied with ...” (n=5)

Some participants provided additional details about why they rated their experience with workshop components as less than *very satisfied*, as shown in Table 9.

Table 9. Comments About Workshops

Workshop Component	Comments
Workshop Location	<ul style="list-style-type: none"> • Missed a day of work for a three-hour meeting. • Room was too small; participant could not remember which workshop this applied to.
Workshop Length	<ul style="list-style-type: none"> • Would be better if more time was spent identifying opportunities at the location. • Too much detail. • Too long in general; nothing specific.
Workshop Number	<ul style="list-style-type: none"> • Number was sufficient; would not have been able to attend more than three or four. • Seemed repetitive; repeated some of the same ideas at each meeting.
workshop Topics	<ul style="list-style-type: none"> • Ones not held at EVT were better. • There was always the opportunity to learn from other people in the room. • More focus on how to build momentum when staffing changes frequently. • Most useful when there were real world examples and solutions. • Did not need to attend workshop about using the system other companies were using because we used a different one. • Some of the material was repeated between meetings.

Source: Survey question H2a-d, “Why were you [INSERT ANSWER] with the [INSERT COMPONENT] of the workshops?”

Participants provided suggestions for improving the workshops. One said more communication about the agenda and timing would help in determining if their company should attend and which staff should

go. One participant suggested greater focus on ideas for changing company cultures in different types of businesses. Another said the Pilot should operate more like a prescriptive Pilot, with information and ideas. This respondent suggested EVT could provide a checklist of energy-saving actions that could be presented during employee meetings.

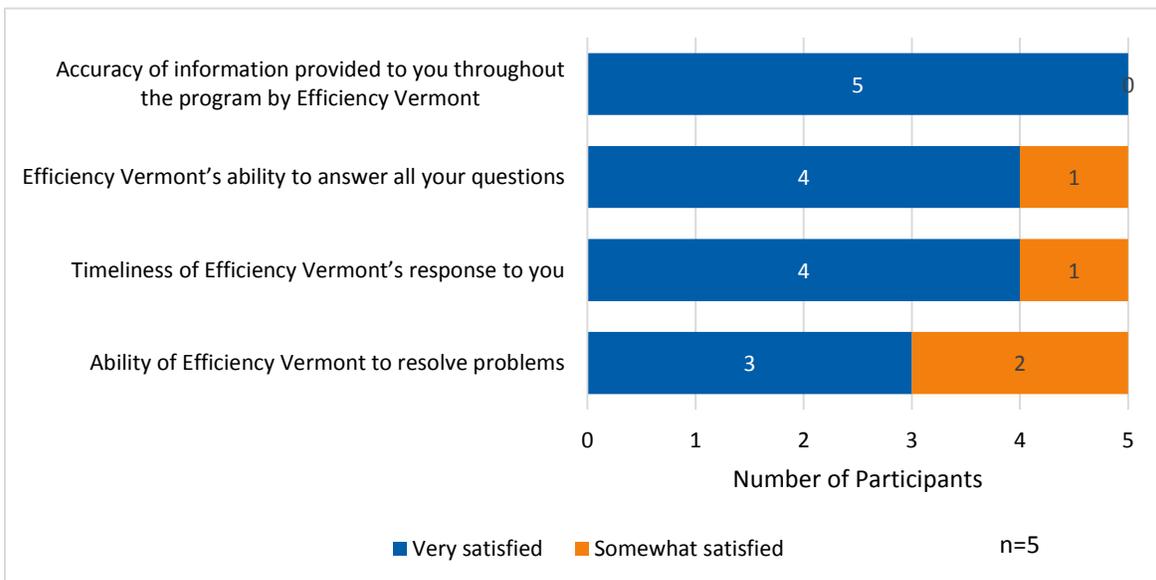
Kaizen Events

Overall, participants characterized the Kaizen events as *very* (two of five) or *somewhat useful* (two of five). One participant did not know if the events were useful as he did not attend them. Participants attending an event found them useful as they offered an opportunity to hear different perspectives, exchange ideas, and identify new opportunities. Following a Kaizen event, one participant decided to implement an air leak program in their organization.

Pilot Components

Participants answered questions about their satisfaction with various EVT components. As shown in Figure 3, all expressed satisfaction with EVT.

Figure 3. Satisfaction with EVT



Source: Survey question J1a-d, "Please answer the following questions about your satisfaction with your [INSERT STATEMENT]. Were you very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied?" (n=5)

Participants expressed their satisfaction with support they received from EVT staff, finding the staff very talented and providing "incredible" technical support. When requested, EVT staff were available to provide on-site support; participants considered the staff responsive and felt as though they were EVT's top priority. EVT staff participation in team meetings proved useful as it helped companies move forward with projects, identify risks, and discuss ideas to mitigate those risks.

One participant considered the engineering data analysis as the most useful information EVT provided as because this removed their company's burden to identify opportunities for energy savings. Another



participant said EVT taught them the importance of small changes (such as replacing light fixtures) on the overall cost of energy.

Participants answered a question about the Pilot’s most important aspect or tool in helping them improve energy performance. Though respondents offered multiple responses, SENSEI received the top response, followed by Kaizen events. Table 10 lists all the responses and the number of citations.

Table 10. Important CEI Tools

Response	Count
SENSEI EMIS	3
Kaizen events	2
EVT Energy Team	1
Peer-to-peer networking	1
Data analysis	1
Employee suggestions	1
Rebates	1

Source: Survey question K3, “What tools or aspects of the Pilot were most useful in helping your organization improve energy performance? (n=5)
Multiple responses allowed.

Using SENSEI and other data analysis tools proved important as they provided detailed information about energy use. Companies could use these tools to obtain live data and to identify how improvements affected energy use. Employees offered useful suggestions as the tools increased communication about potential opportunities. EVT staff identified certain opportunities’ costs, and respondents found this process important. Peer-to-peer networking and Kaizen events provided opportunities to discuss new ideas, offering a forum for participants to exchange ideas about successful activities.

Overall

Overall, participants expressed satisfaction with the Pilot, with three answering *very satisfied* and two answering *somewhat satisfied*.

Cadmus asked participants to elaborate on Pilot aspects that worked particularly well. One participant could not identify a single element and said all Pilot elements were successful. Another participant cited data analysis and incentive checks¹⁵. One participant said the networking provided examples of other ideas, and two participants considered EVT as the reason for the Pilot’s success.

¹⁵ This respondent did not provide additional details about incentive checks but Cadmus inferred they were referring to incentives provided for completing capital improvements since incentives are not part of CEI engagement.

Motivation

Respondents most commonly participated in the Pilot to save money and reduce energy use (four responses). Other reasons for participation included serving as a leader in sustainability and the employee engagement component. One participant said they participated because their company paid for EVT programs as part of their utility bills.

Customers remained motivated to continue implementing lessons learned during the program, with four respondents saying they were *very likely* to continue to implement lessons they learned during their CEI engagement, and one saying *somewhat likely*.

Challenges

Respondents considered the top challenge during CEI participation as finding time to implement projects and attend workshops (two responses). Other challenges included: prioritizing energy improvements, employee engagement and morale, and having sufficient budget for the staff time required to focus on CEI. One participant considered finding projects with a two-year or shorter payback challenging.

Moving forward, participants anticipated the same challenges would continue.

Suggestions for Improvements

Some participants provided suggestions for improvements:

- Fewer on-site workshops and more telephone workshops
- Provide more cost beneficial ideas
- Provide more financial support to pay for opportunities
- Provide higher incentives to encourage change
- Hire a person who works full time to reduce energy for the organization

Future Participation

Overall, four respondents said they were *very likely* to continue to implement lessons learned through their CEI engagement, and one said they were *somewhat likely*. Four respondents said they were *more likely* to conduct energy efficiency projects after participating in the CEI program, while one said the program *made no difference*.

Energy-Savings Analysis

This section provides estimates of facility and CEI savings in 2014 and 2015 for the evaluated facilities. To preserve confidentiality of participating facilities, Cadmus assigned a unique ID to each evaluated facility. We use the unique IDs when making references to individual facilities in this section of the report.



Analysis Sample

Cadmus evaluated 2014 and 2015 energy savings for participants of EVT’s CEI Pilot program. We estimated energy savings for one participating customer in 2014 and five participating customers in 2015. Overall, Cadmus evaluated energy savings for seven separate facilities in 2015, as one participant contained three facilities that were analyzed separately. We did not evaluate savings for three participants because these facilities either deferred participation to a second cohort of facilities or did not report savings in 2014 or 2015.

Cadmus determined that facility F4-E2, though eligible for 2015 electric savings, was non-evaluative using the current baseline period. In 2014 the facility undertook a major kitchen and bar expansion that included the addition of kitchen equipment. The implementer stated in MT&R report that it expected the expansion to result in an increase in energy consumption. With no way to separate the effects of the expansion from CEI engagement, Cadmus decided that we could not evaluate savings at facility F4-E2 at this time. We included six facilities in the 2015 evaluation.

Cadmus conducted a separate analysis for each facility and fuel type. We evaluated 11 models in total: seven electric models, three propane models, and one oil model. Table 11 presents the facility identification, building segment, fuel type, data frequency, and CEI beginning engagement date for each facility Cadmus evaluated as part of the 2014 and 2015 analysis.

Table 11. Facility Characteristics

Facility ID	Industry/Commercial Building Segment	Fuels	Data Frequency	CEI Beginning Engagement Date
F1	Hospital/Medical Center	Electric	Daily	02/13/2014
F2	Manufacturing	Electric	Daily	02/13/2014
F3	Manufacturing	Electric	Weekly	02/13/2014
F4-E1	Resort: Hotel/Conference Center/Dining	Electric, Propane, Oil	Electric: Daily; Propane: Monthly; Oil: Monthly	02/13/2014
F4-E2	Resort: Private club for events/Dining	Electric, Propane	Electric: Daily; Propane: Monthly; Oil: Monthly	02/13/2014
F4-E3	Resort: Fitness/Pool/Indoor Tennis	Electric, Propane	Electric: Daily; Propane: Monthly; Oil: Monthly	02/13/2014
F5	Manufacturing	Electric	Daily	02/13/2014

A detailed description follows of each facility listed in Table 11:

- Facility F1 is a hospital and medical center that provides 24-hour emergency care, along with a multitude of in-patient and out-patient services.¹⁶ This facility has been involved in a number of energy efficiency programs during the last five years, seeking to lower its high energy costs.

¹⁶ F1 MT&R report reference.

Facility F1 has been very proactive in seeking energy-savings opportunities through its participation in CEI and other programs.

- Facility F2 is the only 2014 participant in this evaluation, although incentivized capital projects from other programs accounted for the majority of 2014 savings. For this manufacturing plant, production accounts for a large portion of the facility’s energy consumption.
- Facility F3 is a manufacturing facility, with production accounting for a large portion of the facility’s energy consumption. The facility has worked extensively with EVT over the past 10 years to improve energy efficiency, although its efforts have largely focused on implementing incentivized capital projects.
- Facility F4 is a ski resort, which operates almost exclusively during the winter months. Operations at participating buildings slow significantly once the ski season closes for summer. Cadmus evaluated electric, propane, and oil savings at this facility. Facility F4 implemented several incentivized capital projects during the reporting period that affected all fuel types. Three buildings at this facility are part of the CEI Pilot program:
 - Facility F4–E1 is primarily a lodging building at the resort. Along with hotel rooms, this building provides dining and conference rooms. This is the only building in the CEI pilot with fuel oil consumption.
 - Facility F4–E2 is a private club for events and dining, which implemented a major kitchen and bar upgrade in 2014. This included addition of kitchen equipment. The facility expected higher customer activity due to the bar upgrade along with higher fuel consumption due to the additional kitchen equipment.
 - Facility F4–E3 is a fitness center that contains a fitness room, pool, and indoor tennis courts. Steam provided to the spa treatment rooms had not functioned since the beginning of the 2015 heating season, according to the MT&R report. The implementer expected this event to affect propane consumption.
- Facility F5 is a manufacturing facility, with production accounting for a large portion of the facility’s energy consumption. Both production buildings were included in the CEI Pilot. This facility focused on low- or no-cost behavioral and operational improvement measures rather than pursuing a majority of energy savings through capital projects.

Pilot Annual Savings Estimates

Table 12 and Table 13 present annual reported and evaluated electric savings for the 2014 and 2015 reporting periods, respectively: 2014 estimates were based on data from 01/01/2014 to 12/31/2014; and 2015 estimates were based on data from 01/01/2015 to 12/31/2015:

- In each table, the first column shows Cadmus’ point estimate of pilot facility savings. We obtained annual evaluated facility savings by summing the regression-based estimates of facility savings for all evaluated facilities.
- The second and third columns provide the lower and upper bounds of the 90% confidence interval of the pilot facility annual savings.



- The fourth column shows savings from all capital projects incentivized by other EVT programs during the calendar year at the evaluated facilities.
- The fifth column provides the evaluated CEI estimates, obtained by taking the difference between the pilot facility savings and the capital project savings. We did not provide confidence bounds for evaluated CEI savings as we did not have an estimate of uncertainty around evaluated capital project savings.
- The sixth column provides pilot CEI savings reported by EVT, calculated by summing the reported CEI savings of each evaluated facility. The seventh column shows the CEI savings' realization rate—the ratio of evaluated CEI savings to reported CEI savings.

The following sections describe program-level results for each fuel type in more detail.

Table 12 presents 2014 evaluation results by fuel type. Cadmus estimated positive facility electric savings of 125.7 MWh/year for the 2014 reporting period. This annual estimate is statistically different from zero with 90% confidence, and its respective lower and upper 90% confidence bounds are presented in the second and third columns of Table 12. Cadmus deducted prorated incentivized capital project savings of 113.7 MWh from facility savings to estimate CEI savings of 12.1 MWh/year. We did not apply an evaluation realization rate to 2014 capital projects as EVT had already applied a realization rate to the savings. Overall, Cadmus verified 6% of 2014 CEI electric savings.

For 2014, Cadmus only evaluated savings of one CEI pilot facility (F2). For this facility, we estimated savings that were significantly less than the implementer's estimate. After subtracting the capital project savings, we obtained a CEI savings estimate of 12 MWh. We believe that the difference between our CEI savings estimate and the implementer's CEI estimate of 206 MWh is due to a difference in baseline regression model specification. Cadmus included an indicator for weekends in the baseline model specification as it proved to be a significant energy driver. Its inclusion in the model decreased the facility savings estimate.

Cadmus did not evaluate any propane or oil savings in 2014 as none of the facilities reported these.

Table 12. 2014 Evaluated Energy Savings by Fuel Type

Fuel Type	Evaluated Facility Savings	Lower Bound 90% Confidence Interval	Upper Bound 90% Confidence Interval	Evaluated Capital Project Savings	Evaluated CEI Savings	Reported CEI Savings	Realization Rate
Electricity (MWh/year)	125.7	60.5	191.0	113.7	12.1	206.4 ¹	6%
Propane (gallons/year)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oil (gallons/year)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

¹ Cadmus estimated reported CEI savings since the 2014 MT&R report could not be considered final. We estimated this value using the 2015 MT&R reported baseline model and 2014 data.

Table 13 provides the 2015 evaluation results by fuel type. Cadmus estimated positive facility electric savings of 1,877.8 MWh/year for the 2015 reporting period. This annual estimate is statistically different from zero with 90% confidence, and its respective lower and upper 90% confidence bounds are presented in Table 13’s second and third columns. The relative precision of the 2015 Pilot facility savings estimate was +/- 9% with 90% confidence.

Cadmus deducted prorated incentivized capital project savings of 868.6 MWh from facility savings to estimate CEI savings of 1,009.2 MWh/year. We did not apply an evaluation realization rate to 2014 capital projects as they had already been evaluated. We applied 2014’s 93.7% capital project realization rate to capital projects implemented in 2015, as these projects had not been evaluated. Overall, Cadmus verified 91% of 2015 CEI electric savings. We evaluated CEI savings lower than reported savings in large part because the implementer reported zero CEI savings for facility F2. Cadmus evaluated larger capital project savings than evaluated facility savings, leading to negative CEI savings. We believe that capital project savings may be overestimated at this facility. The implementer also found capital project savings that were larger than facility savings, but they reported zero CEI savings instead of the negative estimated CEI savings.

We will evaluate 2015’s propane and oil savings when they are available.

Table 13. 2015 Evaluated Energy Savings by Fuel Type

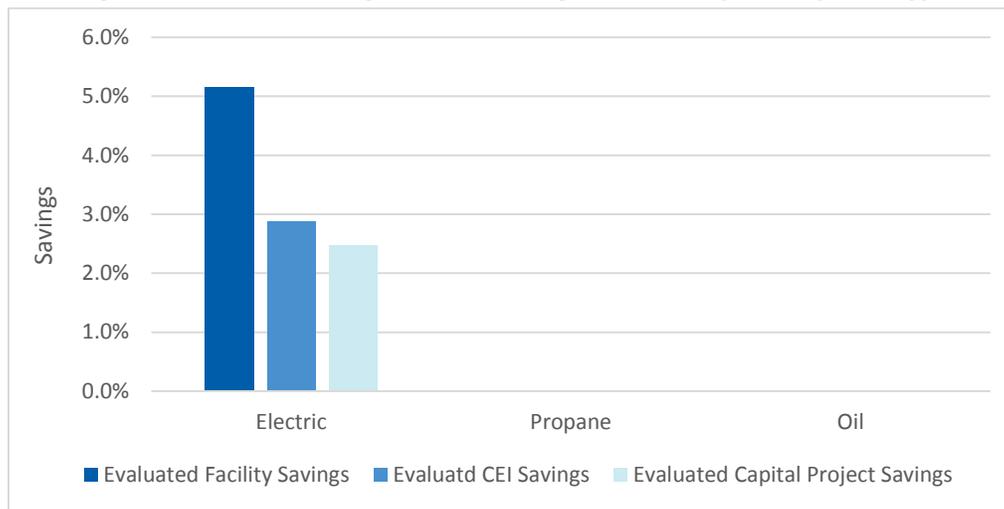
Fuel Type	Evaluated Facility Savings	Lower Bound 90% Confidence Interval	Upper Bound 90% Confidence Interval	Evaluated Capital Project Savings	Evaluated CEI Savings	Reported CEI Savings	Realization Rate
Electricity (MWh/year)	1,877.8	1,718.1	2,037.5	868.6	1,009.2	1,109.7	91%
Propane (gallons/year)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Oil (gallons/year)	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Figure 4 presents 2015 evaluated CEI savings as a percentage of total 2015 consumption of pilot participants.

We estimated facility savings as 5.4% of total facility consumption, estimated that capital projects saved 2.5% of total facility consumption, and evaluated CEI savings as 2.9% of total facility consumption. We determined savings as a percentage of consumption by summing savings across all CEI pilot facilities and dividing the result by the sum of total consumption and estimated facility savings in 2015. As shown in Figure 4, evaluated CEI savings accounted for the small majority of electric energy savings.



Figure 4. 2015 CEI Savings as a Percentage of Consumption, by Fuel Type



Individual Facility Savings Estimates

The following sections describe facility-level, energy-savings results for 2014 and 2015, by fuel type.

Electric Savings

Table 14 provides facility-level results for 2014 electric-energy savings. Only facility F2 reported electric savings in 2014. Cadmus could not verify a majority of this facility's reported electric savings, resulting in a 6% overall 2014 electric realization rate. We did not provide confidence intervals around evaluated CEI estimates as we did not have the uncertainty around evaluated capital projects savings. However, the confidence interval around evaluated facility savings suggests they are significantly different from zero with 90% confidence. As described early, low realization rate is due in part to the addition of a weekend indicator in the evaluation model.

Table 14. 2014 Reported and Evaluated Electric Energy Savings

Facility ID	Evaluated Facility Savings (MWh)	Lower Bound 90% Confidence Interval	Upper Bound 90% Confidence Interval	Evaluated Capital Project Savings (MWh)	Evaluated CEI Savings (MWh)	Reported CEI Savings (MWh)	Realization Rate	Percent Savings
F2	125.7	60.5	191.0	113.7	12.1	206.4 ¹	6%	0.13%

¹ Cadmus estimated reported CEI savings as the 2014 MT&R report could not be considered final. We estimated this value using the 2015 MT&R reported baseline model and 2014 data.

Table 15 provides facility-level results for 2015 electric energy savings. Cadmus found positive CEI electric savings in 2015 at four of the six facilities that we evaluated. Facilities F1, F3, and F5 had savings realization rates close to 100%. Facility F1 achieved CEI savings equal to 103% of the reported CEI savings. This facility reduced its energy consumption by 3% because of CEI engagement. Facility F3 achieved a realization rate of 98%. Overall, this facility reduced its energy consumption by 11%. A large

portion of F3's CEI savings may be attributed to an improvement to its molding operations by enabling either of the facility's two chillers to provide the necessary cooling to both banks of injection molding presses. Facility F5 achieved a CEI savings realization rate of 102%. Overall, this facility decreased its energy consumption by 3%.

Facility F4-E1 had a savings realization of 140%. Overall, this facility reduced its energy consumption by 13%, the most of any facility in the pilot program. F4-E1 likely achieved its savings through a number of activities such as employee engagement (closing doors and windows and turning off lights), implementation of SENSEI, and the re-invigoration of their energy team. Cadmus was unable to identify the specific activity or activities that led to such large CEI savings as it is often difficult to correlate activities with savings.

Facilities F-2 and F4-E3 had zero or negative estimated savings. Cadmus evaluated negative CEI savings at facility F2 because the capital project savings exceeded the regression-based estimate of the facility savings. For this facility, the implementer also obtained a negative estimate of CEI savings but reported zero CEI savings. Cadmus evaluated facility savings for facility F4-E3 equal to 0%.

Cadmus determined that it was not possible to estimate savings for Facility F4-2 because the baseline period consumption was not representative of post-engagement energy consumption. Facility F4-E2 expanded its kitchen and bar area during 2014. The implementer used 2013 as the baseline period for this facility; however, the implementer states in the MT&R report that it expected consumption to increase due to these expansions. Cadmus saw an increase in energy consumption during the 2015 reporting period, which we believe was related to the expansions and not a result of CEI engagement. Therefore, we did not evaluate this facility.

Table 15. 2015 Reported and Evaluated Electric Energy Savings

Facility ID	Evaluated Facility Savings (MWh)	Lower Bound 90% Confidence Interval	Upper Bound 90% Confidence Interval	Evaluated Capital Project Savings (MWh)	Evaluated CEI Savings (MWh)	Reported CEI Savings (MWh)	Realization Rate	CEI Percent Savings
F1	512.1	475.4	548.9	309.5	202.6	197.0	103%	3%
F2	430.3	366.2	494.5	557.5	-127.2	0.0	N/A	-1%
F3	426.5	325.8	527.1	0.0	426.5	436.0	98%	11%
F4 ¹	100.7	86.6	114.9	0.0	100.7	78.7	128%	13%
F4 - E1	101.1	89.0	113.1	0.0	101.1	72.4	140%	14%
F4 - E2 ²	Not Evaluable							
F4 - E3	-0.4	-7.8	7.1	0.0	-0.4	6.3	-6%	0%
F5	408.2	309.7	506.7	1.6	406.6	398.0	102%	3%
Total	1,877.8	1,718.1	2,037.5	868.6	1,009.2	1,109.7	91%	3%

¹ All estimates in this row come directly from the estimates in rows F4-E1, F4-E2, and F4-E3.

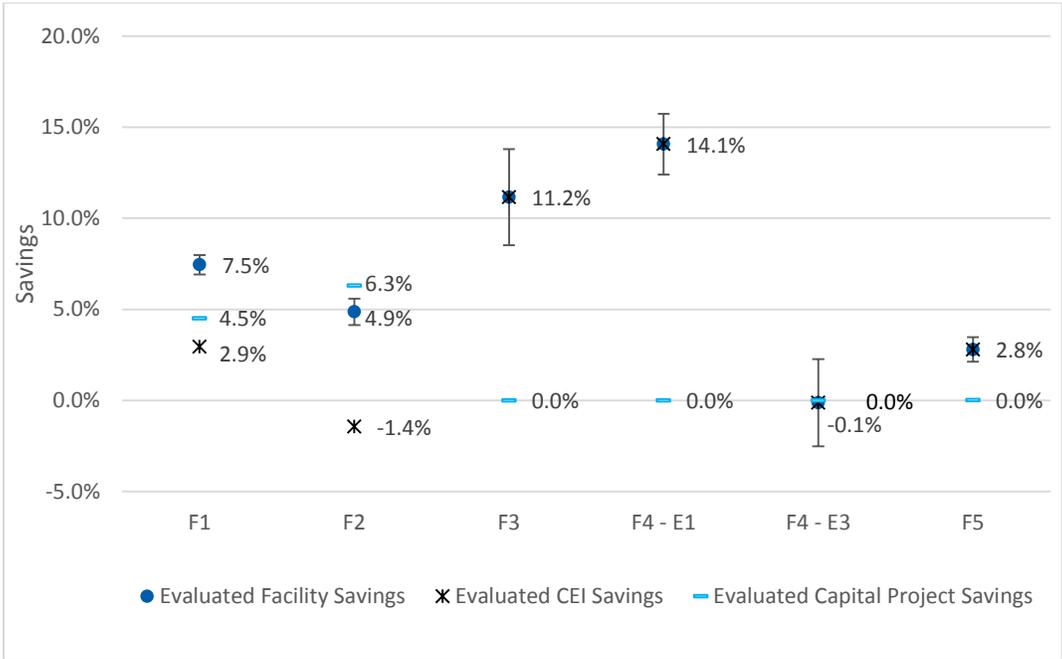
² Cadmus could not estimate savings because of a kitchen upgrade at this facility during CEI engagement.



Figure 5 presents evaluated facility savings, evaluated CEI savings, and evaluated capital project savings as a percentage of facility electricity consumption during the 2015 reporting period. Cadmus did not provide a similar figure for 2014 evaluated savings as only one facility reported electric savings. We determined savings as a percentage of consumption by summing savings across all CEI pilot facilities and dividing the result by total consumption in 2015, and adding estimated facility savings into the total to compare savings. Evaluated facility savings are well-estimated, as suggested by the small error bars in Figure 5. The largest uncertainty occurs around the evaluated facility savings for facility F3, about 2.6% of facility consumption. We see capital project savings are larger than CEI savings when a facility implemented capital projects during the 2015 reporting period.

Please note that we determined facility F4-E2 to be non-evaluable, as described earlier. We have omitted the facility from Figure 5.

Figure 5. 2015 Evaluated Savings as a Percentage of Consumption

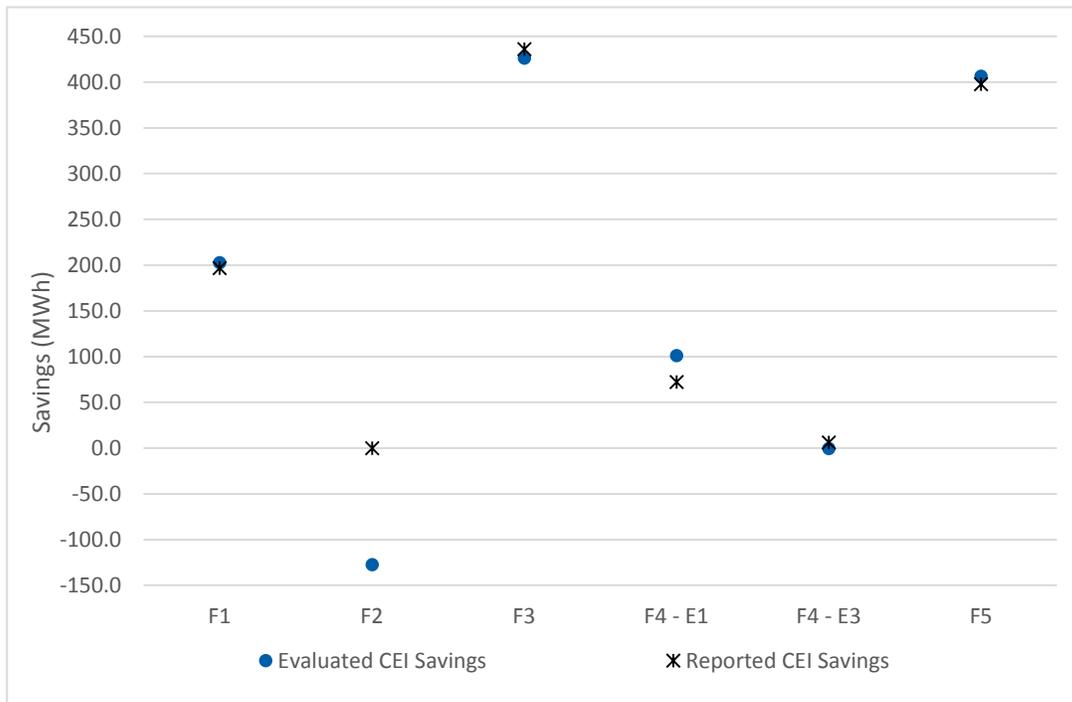


Please note that we determined facility F4-E2 to be non-evaluable, as described earlier. In **Error! Not a valid bookmark self-reference.**, we have omitted the facility.

Figure 6 compares 2015 evaluated and reported CEI electric savings. We did not provide error bars around the evaluated CEI estimates as we did not have the uncertainty around capital project savings. Overall, the evaluated CEI savings were reasonably close to the reported CEI savings. The largest difference in savings occurred at facility F2. As noted above, Cadmus reported negative savings for this facility as the evaluated capital project savings were greater than the regression-based estimate of facility savings. The implementer had also estimated negative CEI savings for this facility but reported the savings as zero.

Please note that we determined facility F4-E2 to be non-evaluable, as described earlier. In **Error! Not a valid bookmark self-reference.**, we have omitted the facility.

Figure 6. 2015 Evaluated and Reported CEI Electric Savings



Propane Savings

Cadmus did not evaluate any 2014 propane savings as EVT did not report any for this reporting period. We continue to obtain the necessary data to evaluate 2015 propane savings. Facility F4 is the only site that reported 2015 propane data, present at all three evaluated facilities.

Oil Savings

Cadmus did not evaluate any 2014 oil savings as EVT did not report such savings. We continue to obtain the necessary data to evaluate 2015 propane savings. Facility F4 is the only site that reported 2015 propane data, present at all three evaluated facilities.

Cost-Effectiveness

This section reports results of the cost-effectiveness analysis for 2015.



Cadmus conducted the cost-effectiveness analysis using the VT 2016 Statewide Screening Tool, which EVT provided.¹⁷ EVT uses the societal cost test (SCT) to screen Vermont’s energy efficiency programs. Table 16 presents the benefits and costs included in the SCT for the CEI Pilot.

Table 16. SCT Benefits and Costs

Benefits	Costs
Electric Energy	Program Administration
Electric Capacity	
DRIFE*	
Electric Externalities	
Non-Energy Benefits	

*Demand Reduction Induced Price Effects: DRIFE is a measure of impacts from reduced electricity consumption due to energy efficiency investments on regional energy and capacity market clearing prices.

Cadmus obtained the energy-savings estimate for 2015 from its analysis of facility energy use. We obtained an estimate of the capacity benefits using the energy savings estimate and an industrial processes load profile from the Vermont CE screening tool. EVT provided Pilot administrative costs. Pilot participants incurred costs to implement CEI, such as staff time spent receiving CEI training or implementing CEI, but these costs are difficult to track, and the cost-effectiveness analysis does not take these costs into account.

Table 17 shows CEI Pilot inputs for the cost-effectiveness calculation. Total administrative program costs (2014 and 2015 combined) were \$390,435 and total energy savings were 1,009 MWh in 2015. Cadmus calculated the pilot cost-effectiveness under different assumptions about CEI measure life, including one year, two years, three years, and five years. We did this because the industry is uncertain about the effective useful life of CEI and Vermont has not yet determined a CEI measure life assumption.¹⁸

Table 17. Statewide Screening Tool Inputs

Parameter	Value
Total Program Costs (2014-2015)	\$390,435
2015 Savings (kWh)	1,009,228

¹⁷ Cadmus’s analysis utilized 2015 data included in the tool: 2015 DRIFE values were set equal to 2016, as 2015 values had not been included in the tool.

¹⁸ Many utility CEI or strategic energy management (SEM) programs assume a multi-year measure life. Cadmus reviewed the Consortium for Energy Efficiency’s SEM Program tracking data base, which listed SEM programs from EVT and 14 other utilities in the United States and Canada. Excluding EVT, as of 2014, three utilities did not claim SEM savings and three utilities claimed SEM savings but did not report a measure life or had not yet determined a measure life. One utility assumed a measure life of two years. Four utilities assumed a measure life of three years. Three utilities assumed a measure life of five or more years.

EUL	Various assumptions
Load shape	Industrial Process

Table 18 shows the program cost-effectiveness results for the CEI Pilot.¹⁹ The 2015 CEI Pilot did not prove cost-effective for a measure life of one year or two years, with benefit-to-cost ratios of, respectively, 0.5 and 0.9. However, the CEI Pilot did prove cost-effective for a measure life greater than three years. The benefit cost ratio was 1.3 for a measure life of three years and 2.0 for a measure life of five years.

Table 18. CEI SCT Cost-Effectiveness Results

Parameter	EUL=1	EUL=2	EUL=3	EUL=5
Benefits	\$158,223	\$306,255	\$449,194	\$698,866
Costs	\$350,042	\$350,042	\$350,042	\$350,042
Net Benefits	(\$191,819)	(\$43,787)	\$99,151	\$348,824
Benefit / Cost Ratio	0.45	0.87	1.28	2.00
Levelized \$/kWh	\$0.347	\$0.196	\$0.133	\$0.082

Two factors contributed to reduce the pilot’s cost-effectiveness in 2015. First, EVT was still in the process of implementing the pilot at the end of 2015. As noted above, several facilities had not implemented CEI projects and therefore did not achieve savings. Also, the cost-effectiveness analysis did not account for the benefits of any fuel oil and propane savings. The pilot cost-effectiveness may increase as more participants begin to implement CEI and after the analysis accounts for any fuel oil or propane savings.

Cadmus recommends that Vermont conduct research regarding the measure life of CEI and make a determination about the appropriate measure life assumption for cost-effectiveness calculations.

¹⁹ The VT cost-effectiveness tool discounts program costs 10% for risks and values the costs as accrued midyear; hence, the program costs in Table 18 and Table 17 do not match.



Conclusions and Recommendations

This section provides a synthesis of key findings, conclusions and recommendations for the Pilot.

Energy Savings

Cadmus evaluated the Pilot’s facility and CEI electricity savings in 2014 and 2015. We evaluated electricity savings for one facility in 2014 and for six facilities in 2015. In 2014, with only one facility reporting, the CEI pilot achieved CEI electricity savings of 0.1%. In 2015, with six facilities reporting, the pilot achieved overall CEI electricity savings of 3%.

Recommendation

Given that several facilities were still in the process of implementing CEI, Cadmus recommends that EVT continue to evaluate this CEI program cohort to learn whether savings persist.

Evaluated Savings Realization Rate

The evaluated electricity savings in most cases were very similar to the reported savings. In 5 of the 6 facilities with evaluated CEI savings, the savings realization was essentially at or above what was reported by the program. However, one facility brought the overall 2015 CEI savings realization rate (i.e., the ratio of evaluated to reported CEI savings) to 91%. This was basically due to a difference in the reporting of an estimated increase in consumption for the facility. Cadmus reported this increase in energy use as negative savings, while EVT reported the estimated increase in consumption as zero savings. When Cadmus adopted the implementer’s reporting convention, we estimated that the pilot achieved a 102% realization rate for 2015.

Recommendation

Cadmus recommends that EVT report negative savings estimates rather than report them as zero. In general, it is impossible to know whether negative savings estimates represent error in the baseline regression model, random error in the savings estimate, or an actual increase in facility energy-use intensity. Reporting negative savings estimates as zero biases the savings estimates upwards.

Evaluated MT&R Models

EVT constructed high-quality MT&R models to report savings. In general, the models closely predicted energy use during the baseline period; furthermore, the evaluation and reported savings estimates were close. EVT provided clear rationales for variables in the models and definitions of the baseline and reporting periods.

Recommendations

Cadmus recommends that in the future EVT continue to follow the same process for building MT&R models. We suggest testing weather variables in all models, even if the facility engineering assessments indicate that facility energy use is not sensitive to weather. We also recommend testing weekend or weekday variables to capture these variables’ effects on energy consumption. Finally, we recommend providing evaluators with a single data file, containing all data required for the evaluation. This will

facilitate data collection and ensure that EVT and the evaluator use the same data for measuring savings.

Pilot Cost Effectiveness

Cadmus calculated the pilot cost-effectiveness under different assumptions about CEI measure life, including one year, two years, three years, and five years. We did this because the industry is uncertain about the effective useful life of CEI and Vermont has not yet determined a CEI measure life assumption.

The 2015 CEI Pilot did not prove cost-effective for a measure life of one year or two years, with benefit-to-cost ratios of, respectively, 0.5 and 0.9. However, the CEI Pilot did prove cost-effective for a measure life greater than three years. The benefit cost ratio was 1.3 for a measure life of three years and 2.0 for a measure life of five years.

Two factors contributed negatively to the pilot's cost-effectiveness in 2015. First, EVT was still in the process of implementing the pilot at the end of 2015. As noted above, several facilities had not implemented CEI projects and therefore did not achieve savings. Also, the cost-effectiveness analysis did not account for the benefits of any fuel oil and propane savings. The pilot cost-effectiveness may increase as more participants begin to implement CEI and after the analysis accounts for any fuel oil or propane savings.

Recommendation

Cadmus recommends that EVT reassess the cost-effectiveness of the CEI Pilot at the end of 2016 to determine whether the cost-effectiveness has improved. EVT should also conduct additional research to determine an appropriate CEI measure-life assumption for future cost-effectiveness calculations.

Implementing Key CEI Elements

Based on participant surveys and staff interviews, Cadmus found that CEI participants generally implementing the Pilot in accordance with the CEE minimum element definitions,²⁰ paraphrased here for the three key minimum elements:

- **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 saving 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.

²⁰ "CEE Strategic Energy Management Minimum Elements." CEE, 11 Feb. 2014. Web. 16 June 2016. <http://library.cee1.org/sites/default/files/library/11283/SEM_Minimum_Elements.pdf>



In addition, Pilot participants will likely continue to implement lessons learned through their CEI engagement and will be more likely to conduct energy efficiency projects after participating in the CEI program.

Barriers to Implementing CEI Elements

Organizations engaged with the program. Participants reported that tools and activities introduced through their CEI engagement have increased energy efficiency awareness within the organizations, but having sufficient time to focus on CEI remains one of the biggest challenges to engagement. Two of the five participant survey respondents indicated that finding time to implement and attend workshops was a challenge.

Recommendation

EVT could help participants overcome this challenge by reducing the number of on-site workshops and meetings. To do this, EVT could consider conducting fewer full-day workshops and offering shorter, targeted telephone webinars. These webinars could be target a single component or program topic. The webinars could focus on real-world examples and solutions from others within the cohort.

Using shorter, more focused webinars would provide participants with greater flexibility in choosing webinars to attend and would allow them to send multiple people from their organizations. As attendees would not be traveling, this also would reduce the amount of time employees spend away from their on-site responsibilities. Webinars could be recorded and shared, allowing even greater flexibility to organizations unable to attend on the original webinar date.

Organizational and Cultural Change

Through Pilot components and activities, organizations have succeeded in the continuing process of shifting workplace cultures toward more efficient use of energy. Organizations have committed to energy efficiency, allocating staff resources to maintaining energy teams that continue to meet bimonthly or monthly. In some organizations, the Pilot has increased executive management involvement.

All but one organization plans continued employee engagement activities to increase employee involvement in energy efficiency strategies. One organization said focusing on employee engagement was a factor motivating their decision to participate. Despite challenges relating to initial set up and ongoing use, all participants continue to track energy use using their data analysis tools. The participants found these tools to be the most important tools provided by the Pilot because they enabled participants to see how improvements affected energy use and to identify new opportunities for energy efficiency.

Peer-to-Peer Interaction

One important CEI Pilot component is to encourage organizations to share activities and feedback through peer-to-peer communication. This communication allows organizations to learn from one another and to discuss potential challenges and successes with OM&B activities. The communication

proves useful as it provides an opportunity to gain different perspectives, exchange ideas, and identify new opportunities. This Pilot aspect works very well and is highly valued by participants and in the case of one organization led to implementation of a new air-leakage detection program.

EVT Support

Participants were *very satisfied* with the support they received from EVT staff, reporting that the staff were very talented and able to provide accurate and reliable technical expertise. Staff were responsive, and participants felt as though they were EVT's top priority.

Employee Engagement

Customers were primarily motivated to participate in the program to save energy and reduce energy costs. In some cases, companies believe they have realized all the retrofit opportunities they can and are focusing on changes to operational, maintenance, and behavioral practices. Although employee awareness and engagement remains a key component of this focus, challenges exist for companies in identifying effective and interesting ways to engage and motivate employees, especially for companies with temporary staff.

Recommendation

EVT could consider developing more materials about methods for companies to increase employee engagement. They could develop a checklist of the common ways that employees become involved in saving energy. Companies could share this list with employees through company staff meetings or monthly newsletters. This list would prove helpful for companies with part-time or temporary staff as they could share the ideas multiple times over the course of a year.

EVT could gather topics and tips from workshops and Kaizen events, and share them through a monthly or quarterly newsletter. This newsletter could provide opportunities for companies to learn about the ways other companies have engaged employees in low- or no-cost energy efficiency activities.

Sustainability

Sustainability remains an important aspect of the program as many participants have corporate policies encouraging them to be good stewards of the environment. Although sustainability can mean many things, it serves as an indicator for companies predisposed to participate and experience success with CEI. EVT has used this indicator successfully to identify candidates for the pilot. Synergies also likely exist between sustainability and energy-saving goals.

Recommendation

EVT could consider including a sustainability assessment that identifies possible carbon emission goals and/or reporting needs (e.g., Carbon Disclosure Project, Global Reporting Initiative) with new participants. EVT also could consider customizing aspects of the annual report to provide inputs for other sustainability reporting that will help companies reduce record keeping where overlap occurs with CEI reporting requirements.



Pilot Cost Tracking

EVT’s internal account management software presents a challenge to tracking program costs, making it difficult to differentiate between traditional account management tasks and CEI tasks. In turn, this presents difficulties in accurately quantifying program costs.

Recommendation

EVT could evaluate the account management software to determine whether it can be adjusted or modified to make querying CEI tasks easier, compared to other account management tasks.

Program Resources

EVT staff devote a significant number of hours for CEI-related tasks and interact closely and frequently with participants. Because this high-touch program requires many interactions with participants, it may be difficult to expand the number of participating organizations without increasing program resources.

Recommendation

EVT could consider an additional study to determine which steps and customer touchpoints are critical to the program’s success and continued energy savings. Such analysis might enable EVT to increase the efficiency of the program delivery and increase cost-effectiveness. It might also enable EVT to make the program more prescriptive and to expand it to other industries and types of business customers.

Appendix A. Participant Survey

Efficiency Vermont Continuous Energy Improvement Participant Interview Guide

Researchable Questions	Item
Assess implementation challenges and barriers	L1-L2
Gain insight into adoption and persistence of CEI activities	B1-B2,D1-D2, E1, F1-F2, G1-G4,K1-K2,O1,N1
Identify improvements for implementation	C1,C2,H3,J3,M3
Assess satisfaction with Pilot components	C1,G2,G3,H1,H2,I1,I2,J1,J2,K3,K4,M2,M1
Assess implementation and persistence of capital projects	E2-E4

A. Introduction

- A1. May I speak with **[CONTACT NAME]**? OR **[IF NO NAME]** May I speak with the person who is most familiar with your facilities Continuous Energy Improvement Pilot program? **[IF THAT PERSON IS NOT AT THIS PHONE NUMBER, ASK FOR THEIR NAME AND PHONE NUMBER AND START AGAIN]**
1. Yes
 2. No or not a convenient time **[ASK IF RESPONDENT WOULD LIKE TO ARRANGE A MORE CONVENIENT TIME OR IF YOU CAN LEAVE A MESSAGE FOR A MORE APPROPRIATE PERSON]**
 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 Efficiency Vermont. We are conducting an important study about your participation in the Continuous Energy Improvement program. It is our understanding that you are the energy champion at **[FACILITY NAME]**. Is this correct? **[IF NOT, ASK FOR THE PERSON WHO IS MOST FAMILIAR WITH THE CONTINUOUS ENERGY IMPROVEMENT OR CEI PROGRAM AT YOUR FACILITY?]**
1. Yes
 2. No, person is able to come to phone **[ASK FOR PERSON WHO IS AND START AGAIN]**
 3. No, person is not able to come to phone **[GET NAME AND PHONE NUMBER, SCHEDULE CALL BACK]**
 98. (Don't know) **[ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]**
 99. (Refused) **[THANK AND TERMINATE]**



B. Energy Team

- B1. Do you have an energy management team at your facility? [IF NEEDED: This is dedicated staff for energy and energy efficiency.]
1. (Yes)
 2. (No) [SKIP TO NEXT SECTION]
- B2. How frequently does the energy team meet? [READ LIST IF NEEDED]
1. (Weekly)
 2. (Bi-weekly)
 3. (Monthly)
 4. (Quarterly)
 5. (Semi-annually)
 6. (Annually)
 7. (Other) [SPECIFY]
 98. (Don't know)
 99. (Refused)

C. Energy Management Assessment

[ASK IF THEY CONDUCTED AN EMA]

Our records show that an energy management assessment was conducted as part of your participation in the program. [IF NEEDED: This is also known as the CEI assessment. It lists process steps and milestones such as selecting an energy champion, writing an energy policy, creating an action plan, performing audits and other milestones.]

- C1. How useful was the energy management assessment in implementing the program?
1. Very useful
 2. Somewhat useful
 3. Not too useful
 4. Not at all useful

C2. Why do you say it was **[INSERT ANSWER FROM C1]**?

1. **[RECORD RESPONSE]**

D. Employee Engagement

D1. Are you planning to conduct any energy related employee engagement activities in 2016?

1. (Yes)
2. (No)

[IF D1=2]

D2. Why aren't you going to conduct any employee engagement activities in 2016?

1. **[RECORD RESPONSE]**

E. Energy Action Plan (Energy Management Plan)

E1. During the program, you developed an energy action plan **[IF NEEDED: This was also referred to as an energy management plan. It was a list of list of planned processes, programs, and projects.]** How frequently do you update this list? Would you say ... **[READ LIST]**

1. (Weekly)
2. (Bi-weekly)
3. (Monthly)
4. (Quarterly)
5. (Semi-annually)
6. (Annually)
7. (Other) **[SPECIFY]**
98. (Don't know)
99. (Refused)

E2. I have some questions about the status of some of the projects implemented during the CEI program. I'll read each one. Please tell me if the activity was implemented. If it was implemented please let me know if it is still in place? **[ASK ABOUT UP TO 6 MEASURES]**

E2a. Did you implement **[ACTIVITY]**?

1. (Yes)
2. (No)
3. (Don't know)

E2b. **[IF YES]** Is it still in place?

1. (Yes)
2. (No)
3. (Don't know)

[ASK IF E2B=NO]

E3. Why was [EACH MEASURE NOT IMPLEMENTED IN E2b] removed?

1. [RECORD RESPONSE]

99.

[ASK IF E2A=NO]

E4. Are you planning to implement it?

1. (Yes)

2. (No)

F. Energy Performance

F1. As part of the program, you tracked energy performance. Have you continued to track energy performance since January 2016?

1. (Yes)

2. (No)

[ASK IF F1=1]

F2. How frequently is energy performance reviewed? [READ LIST IF NEEDED]

1. (Daily)

2. (Weekly)

3. (Bi-weekly)

4. (Monthly)

5. (Quarterly)

6. (Semi-annually)

7. (Annually)

8. (Other) [SPECIFY]

G. Energy Management System

Now I have a few questions about how you track energy use in your organization.

G1. According to our records you used [INSERT EMS SYSTEM] to track energy usage and CEI milestones? Is this correct?

1. (Yes)

2. (No)

G1c. What system did you use? [RECORD RESPONSE]

[ASK IF G4=1]

G2. How easy or difficult is it to use this energy management system to track energy usage and CEI milestones? Would you say ... **[READ LIST]**

1. Very easy
2. Somewhat easy
3. Neither easy nor difficult
4. Somewhat difficult
5. Very difficult

G3. Why do you say it is **[INSERT ANSWER FROM G2]** to use that system to track energy usage and CEI milestones?

1. **[RECORD ANSWER]**

G4. Are you still using this system?

1. (Yes)
2. (No)

G4a. Why did you stop using this system? **[RECORD RESPONSE]**

H. Workshop Satisfaction

H1. Thinking about the workshops you attended as part of your CEI engagement, please tell me how satisfied you were with the following aspects. Were you very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied with **[STATEMENT]**? **[AFTER FIRST ONE REPEAT SCALE AS NEEDED]**
[RANDOMIZE ORDER]

H1b. Location of the workshops

H1c. Length of the workshops

H1d. Number of workshops that were part of the program

H1e. Topics of each workshop

[ASK FOR EACH STATEMENT IN H1 WHERE RESPONDENT SAID SOMEWHAT, NOT TOO, OR NOT AT ALL SATISFIED]



H2. Why were you [INSERT RESPONSE FROM H1b-H1e]?

- 1. [RECORD RESPONSE]

H3. What suggestions, if any, do you have for improving the workshops?

- 1. [RECORD RESPONSE]

I. Kaizen Events Usefulness

I1. How useful were the Kaizen events in helping you improve energy performance? Would you say ...

[READ LIST]

- 1. Very useful
- 2. Somewhat useful
- 3. Not too useful
- 4. Not at all useful

I2. Why were the Kaizen events [INSERT RESPONSE FROM I1]?

- 1. [RECORD RESPONSE]

J. Satisfaction

J1. Please answer the following questions about your satisfaction with your communication with Efficiency Vermont. Let's start with [STATEMENT]. Were you very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied with [STATEMENT]? [AFTER FIRST ONE REPEAT SCALE AS

NEEDED] [RANDOMIZE ORDER]

- J1a. Accuracy of information provided to you throughout the program by Efficiency Vermont
- J1b. Efficiency Vermont's ability to answer all your questions
- J1c. Timeliness of Efficiency Vermont's response to you
- J1d. Ability of Efficiency Vermont to resolve problems

[ASK FOR EACH STATEMENT IN J1 WHERE RESPONDENT SAID SOMEWHAT, NOT TOO, OR NOT AT ALL SATISFIED]

J2. Why were you [INSERT RESPONSE FROM J1a-J1d]?

- 1. [RECORD RESPONSE]

J3. Thinking about your CEI coach, what was the most important information he provided to you during your participation in the CEI program?

- 1. [RECORD RESPONSE]

K. Motivations and Influence

- K1. What motivated your organization to participate in the CEI program?
1. [RECORD RESPONSE]
- K2. How likely are you to continue to implement the lessons you learned during your CEI engagement?
1. Very likely
 2. Somewhat likely
 3. Not too likely
 4. Not at all likely
- K3. What tools or aspects of the program were most useful in helping your organization improve energy performance?
1. (Workshop) [ASK: Which ones?]
 2. (Kaizen events)
 3. (Energy management assessment)
 4. (Regression model)
 5. (End of program report)
 6. (Efficiency Vermont energy team)
 7. (Peer to peer networking)
 8. (Other) [SPECIFY]
- K4. Why was that useful in helping your organization improve energy performance?
1. [RECORD ANSWER]

L. Challenges

- L1. What challenges, if any, did you encounter participating in the CEI program?
1. [RECORD ANSWER]



- L2. What challenges, if any, do you think you will have continuing to implement the practices and activities you initiated during your CEI participation?
 - 1. [RECORD ANSWER]

M. Overall Satisfaction

- M1. Thinking about your overall satisfaction with the program, how satisfied were you overall with the program? Would you say ... [READ LIST]
 - 1. Very satisfied
 - 2. Somewhat satisfied
 - 3. Not too satisfied
 - 4. Not at all satisfied

- M2. Thinking about the entire program, what worked particularly well?
 - 1. [RECORD ANSWER]

- M3. Overall, what suggestions, do you have to improve the program?
 - 1. [RECORD ANSWER]

N. Future Engagement

- N1. After participating in the CEI Pilot program, would you say your facility is more likely or less likely to conduct energy efficiency projects or has it made no difference?
 - 1. (More likely)
 - 2. (Less likely)
 - 3. (No difference)

- N2. Why do you say that?
 - 1. [RECORD RESPONSE]

O. Closing

- O1. Do you have any other comments about the program or feedback for Efficiency Vermont at this time?
 - 1. [RECORD RESPONSE]

Those are all of our questions. Your responses are very important to Efficiency Vermont. We appreciate your participation and thank you for your time. Have a good day.