Sustainable Energy Management through Continuous Energy Improvement

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ABSTRACT

The traditional approach of energy efficiency programs focuses on delivering energy savings cost effectively. While this approach has been well tested and proven over the years, it tends to emphasize short-term results in the form of successful energy efficiency projects rather than how the facility performs over the long term. Furthermore, this approach often translates into a limited engagement scope between the utility program and its customer that revolves around providing financial support for the projects. As an alternative to the standard incentive program model, Southern California Edison (SCE) and Southern California Gas (SoCalGas) jointly implement the Continuous Energy Improvement (CEI) pilot program that encourages and assists participants to establish sustainable energy management policy and practices.

This paper details the experience working with SCE's and SoCalGas' commercial customers, including the lessons learned and design elements that may be useful to other energy efficiency programs interested in implementing a program that incorporates an energy management system. Some of the diverse topics covered include customer's motivation, program outcomes, and tie-in to other national and international programs and certifications such as the Environmental Protection Agency's (EPA's) Building Performance with Energy Star, and particularly ISO-50001.

Introduction

Energy efficiency programs in California have existed since the late seventies (Kavalec & Schultz 2011), and they have consistently delivered cost-effective energy savings. The design of early energy efficiency programs is typically centered on providing financial incentives for installation of energy efficient products and technologies. At the later stages of market adoption, this effort is complemented with or replaced in its entirety by inclusion of the technology into building codes and standards. One does not have to look further than the screw-in compact fluorescent lamp for a success story of how a highly effective product evolved from an emerging technology in the 80's to a market-transformed product twenty years later (Shierka et al. 2010).

While focusing energy efficiency programs on specific products and technologies carries a long track record of success, many program administrators are also becoming increasingly aware of its limitations. Due to the transactional nature of such programs, the opportunity to gain traction with a customer and the ability to influence the customer's decision-making process in the long run can be lacking. On the other hand, the relationship between the customer and program administrator can also be adversely impacted by the customer's perception that energy efficiency programs are focused solely on qualifying, rebating and validating installed technologies, rather than on building a long-term partnership. From the perspective of program

design and administration, a weakening sphere of influence is largely undesirable as it may lower a program's net-to-gross ratio (NTG)[1], and consequently, its cost-effectiveness.

California also saw numerous changes in the regulatory and technological fronts in the last ten years that impacted design and delivery of energy efficiency programs. The California Public Utilities Commission was increasingly calling for an integrated approach to energy management, which included demand response and distributed generation, as well as a clear path to market transformation. This push resulted in the creation of the California Long-Term Energy Efficiency Strategic Plan in 2008. In 2006, the state legislators also pushed forward and passed Assembly Bill 32 (AB32), the Global Warming Solutions Act, which set the 2020 greenhouse gas emissions reduction goal into law. The impact of this changing regulatory and legislative landscape has been quite profound as both the public and private sectors are increasingly compelled to adopt an energy management plan that addresses their present and future energy needs, as well as compliance with new state mandates and regulations.

Anticipating a robust demand for energy management strategies and programs, many national as well as international organizations jumped into the fray. In the last few years, national programs such as the United States Department of Energy's (USDOE's) Superior Energy Management (SEP) and the EPA's Building Performance with Energy Star (BPwES) were rolled out in several states (including California) to court early adopters. Acknowledging energy as one of the most critical challenges facing the international community, the International Standards Organization (ISO) released the ISO 50001 International Standard on June 15, 2011. Most of these efforts leveraged the well-known business philosophy of continuous improvement, or *Kaizen,* something already familiar to many businesses.

Local and regional demand-side management programs promoting energy management practices also began to emerge all across the United States and Canada. As an example, the Northwest Energy Efficiency Alliance (NEEA) developed a Continuous Energy Improvement program for the industrial sector in the Pacific Northwest (Jones et al., 2011), and conducted a survey to learn about the number of industrial facilities in the region that already had adopted energy management practices (NEEA 2012). Due to the strong relationship between energy management principles and quality manufacturing practices, industrial facilities appeared to be the natural early adopters. Efforts in the commercial sector were also underway, with the EPA coordinating with many program administrators across the country (including SCE and SoCalGas) to implement BPwES pilot programs centered on strategic planning. A number of energy management programs in the commercial sectors began employing the use of energy information systems with advanced intelligence and analytics to better manage a building's energy consumption, for example BC Hydro's Continuous Optimization (CO) Program.

It was against this backdrop that California utilities, including SCE and SoCalGas, rolled out the CEI pilot program in 2010 to start working with large businesses (>500 kW and 50,000 annual Therms) in all sectors to assist them with strategic energy management planning and implementation. Given its modest budget (approximately $3.5 million for 3 years in SCE's and SoCalGas's territories), the primary goal of this pilot effort was not necessarily to achieve the maximum energy savings, cost effectiveness or other quantifiable impacts, but to explore and identify program design elements and lessons learned for use in a full-scale program. As the program is still ongoing at the time of writing, some of the results presented here are not final,

[1] NTG is a factor representing net program load impacts divided by gross program load impacts that is applied to gross program load impacts to convert them into net program load impacts. This factor is also sometimes used to convert gross measure costs to net measure costs.

nor can they be discussed in excruciating detail to protect participant privacy and confidentiality. However, they provide sufficient qualitative findings and insights that may help shape future implementation of CEI in California and elsewhere. It should also be noted the CEI pilot is working with 17 total participants, out of which five are in the commercial sector. Unless specifically noted, the findings presented in the paper reflect results from all 17 engagements.

CEI's Objective and Process

To facilitate a holistic view of energy management, SCE (an electric-only utility) and SoCalGas (a gas-only utility) decided to combine resources and deliver CEI jointly in their overlapping territories. Program management would be handled jointly with each utility having its own program manager, and the two would collaborate closely and make key decisions together as the program management team (PMT).

The basic premise of CEI is providing consultative services to help a participating business create its own internal energy management capabilities (a good analogy would be the relationship between a personal fitness trainer and a trainee). Due to their existing relationship with customers, the utility account managers were identified early on as the potential providers of energy management coaching. However, it became obvious that such role would require technical and business management expertise that might not necessarily match their core competencies. Thus, the PMT decided to procure outside expertise and issue a competitive solicitation seeking energy management experts. The PMT received a robust response, and selected four firms[2] to provide technical and management consulting (in this paper, these four firms are referred to as "CEI advisors.").

The PMT and CEI advisors reached an understanding that there should be two key value propositions behind each CEI engagement:

1. **CEI will enable and facilitate sustainable organizational transformation.** CEI will serve as a learning platform for the participant to create sustainable practices that could stand on their own. As with most transformational endeavors, CEI will require rigorous and systematic training, which enables the participant to make permanent structural, organizational and behavioral change.
2. **CEI will assist in the achievement of significant technical and cost gains.** It is understandable that an organization will not undergo transformational efforts if these efforts do not result in benefits that are clear and tangible. On the program side, it is also obvious that the program's existence needs to be justified by being cost effective.

The CEI project management team also assigned a circular six-step process to CEI with the following highlights:

Step 1: Commitment. A potential participant is evaluated for program aptitude based on pre-established criteria that gauge readiness for organizational change. If selected, the participant signs a non-binding Memorandum of Understanding (MOU) that details the CEI process. Participant also assigns team members and an executive sponsor at this time.

[2] These four firms are Ecova, Enovity, California Manufacturing Technology Consulting and Nexant, with the first two serving the commercial sector, and the last two working with industrial customers only.

Step 2: Assessment. The CEI advisor facilitates an Envinta One-2-five[3] session to assess organization hurdles, and improvements that need to be made. The CEI advisor also begins the technical assessment by helping the facility select a boundary where CEI activities will be focused on, establish baseline (based on historical energy consumption data) and benchmark using the EPA's Portfolio Manager tool. The CEI advisor also conducts a high-level energy audit (equivalent to ASHRAE level 1 audit) to identify areas of focus. Based on the results of this audit, the CEI advisor identifies matching services and incentives that are available through utility or other programs. It should be noted that the CEI pilot does not pay implementation incentives for qualifying projects nor does it claim direct savings, and instead services and incentives are offered through other utility programs. Areas to be assessed include energy efficiency, demand response, distributed generation (which together make up Integrated Demand Side Management or IDSM) and to a lesser extent greenhouse gas emissions, water and waste. Assessments do not have to be completed all at the same time, and the participant can return to conduct more assessments at a later time.

Step 3: Planning. Upon completion of the first phase of assessments, the CEI advisor helps the participant create short- and long-term plans. Included in these plans are performance metrics and goals such as an energy policy, SMART[4] goals, targets, and Key Performance Indicators (KPIs). The CEI advisor also helps the participant develop a training program for its employees, which includes holding an energy awareness event.

Step 4: Implementation. The CEI advisor works closely with the participant to monitor implementation. This step usually involves regular meetings and interactions between the CEI advisor and the participant.

Step 5: Evaluation. The CEI advisor assists the participant in conducting evaluation of successfully implemented projects and progress towards transformation. Another Envinta session is held to determine if the barriers identified in the assessment phase have been overcome. This step also provides an opportunity for the participant to evaluate the performance of the CEI advisor and the program. Finally, the participant's accomplishments are celebrated and recognized both internally and externally, for example through press releases, utility award ceremonies, and other events.

Step 6: Modification. Based on the evaluation results, plans are updated and revised accordingly. The CEI advisor transitions the stewardship of the CEI process to the utility account managers and the participant. The participant will continue with additional assessments or planning activities on their own.

[3] Envinta One-2-five energy is a diagnostic tool that assesses the state of internal systems and procedures for managing energy costs and risks.

[4] SMART goals are those that are Specific, Measurable, Achievable, Realistic, and Time-bound. SMART is a mnemonic commonly used in business management to set objectives.

Continuous Learning and Collaboration

The PMT understood that CEI would thrive in a dynamic environment where continuous improvement would also be expected from the program itself. To assist in drafting program design elements, the PMT collaborated with other regional and national organizations to draw from the lessons learned and innovative approaches elsewhere. The collaboration included regular conference calls with other California implementers, quarterly webinars showcasing other similar programs in the country, participation in various program administration forums such as Consortium of Energy Efficiency (CEE) and Association of Energy Service Professional (AESP), and a process evaluation done by a third-party evaluator. In addition, SCE also began offering an energy management and ISO-50001 introductory course at its Energy Learning Center in 2012, one of the first such courses in the country. Through the collaborative process, the PMT arrived at a list of key design elements as outlined in Table 1. The program adoption status at the time of writing is also included.

Table 1. Summary of Key Design Elements for CEI

Recommendation	CEI Adoption Status
Involve and educate utility/customer account representatives early and frequently as they own the permanent relationship with the participant.	The CEI PMT held a focus group with utility account representatives while drafting the program implementation plan, and also held introductory/orientation events specifically designed for them at program roll-out.
Involve the company's top decision-maker from the start.	The CEI advisor will enroll a potential participant only if an executive sponsor is present in one of the introductory meetings and expresses interest in the program.
Involve a cross-functional team from different facets of operations. An engagement that is too one-dimensional may not be able to continue when the leader leaves the engagement.	The CEI advisor will make every effort to establish a working team that is comprised of staff from different areas in the company. This selection process is one of the first items to be addressed in each CEI engagement (in the Commitment phase.)
Offer bonus financial incentives for successful CEI participants to further motivate.	The current CEI design does not pay implementation incentives for projects, but this incentive structure will be seriously considered when it does in the future.
Offer salary offset for in-house energy management staff.	Due to budget limitations, the CEI program is not able to offer such salary offset at this time, but it will be considered in future programs.
Offer Energy Information System (EIS) software as a means for the participant to closely track performance.	The CEI program pays for the installation of EIS software and the fee for the duration of program participation at sites where the EIS is seen as beneficial and recommended by the CEI advisor.

Table 1. Summary of Key Design Elements for CEI (continued)

Recommendation	CEI Adoption Status
Conduct joint marketing with other similar national and regional efforts.	The CEI program is partnering up with the EPA's Building Performance with Energy Star through co-branding, and is looking for ways to partner with other national efforts such as the DOE's Manufacturing Extension Partnership (MEP) and the EPA's Economy-Energy-Environment (E3) programs.
Encourage tangible goals such as energy management certification.	The CEI program sets certification and recognition as goals in the planning phase. It encourages the participating facility to seek the Energy Star Building status, and it is currently offering financial incentives to offset the ISO-50001/SEP certification cost.
Leverage whole-building analysis approach as the basis for financial incentive to encourage holistic improvements that includes better operational and behavioral performance.	The CEI program is working with the California regulators to identify ways that a CEI participant can be paid financial incentives based on whole-building performance. The existing incentive model in California is still entirely transactional based.

Profile of the CEI Participants

As the budget is limited in 2010-12, the CEI program is working with only five commercial companies (and twelve industrial companies) in its pilot phase. By design, the five commercial participants come from very different market segments: a four-star rated hotel, a county government, a grocery chain, a K-12 private boarding school, and a national restaurant chain. The intent of working with such a diverse group is to enhance the program's learning experience, and identify the specific barriers in each market segment. As the engagements are still ongoing, to protect the participant's privacy, each participant will not be named, but instead will be referred to by its market segment.

The Hotel

Participant one is a four-star hotel belonging to an international chain. The chain's corporate management has established energy performance goals for the hotel, and in turn, it has opted to partner with the CEI program to accomplish those goals. Prior to CEI, the hotel has had some experience deploying green initiatives focused on recycling and minimizing waste, so the hotel was in a fairly good position to organize around energy management. Participation in CEI has allowed the facility to focus more on energy strategy and implement sooner. For example, CEI has identified the need for increased staff participation at all levels, including security, housekeeping and maintenance, to help identify opportunities. In addition, the facility is in the process of implementing significant energy improvement projects such installation of a new building management system, light-emitting diodes (LEDs), and energy efficient kitchen equipment, including a new main oven. The hotel is also assessing the feasibility of installing solar water heaters.

The County Government

Participant two is a county government that oversees an area with a population of approximately three million. Seven buildings, out of a very large building portfolio, are involved with CEI. While the county has implemented energy-related projects over the years, it is participating in CEI to identify additional opportunities and incorporate energy management strategies into their organizational processes. While participation in CEI has resulted in a major uptick in utility program participation (particularly in programs that offer free assessment), progress has been slow. This is primarily due to the number and complexity of facilities enrolled and a decision-making process that tends to more complex and slower than the process in the private sector. The CEI advisor has observed improved communication since CEI participation, although it is unknown whether a limited-time, aggressive and highly focused engagement such as CEI can be impactful or cost effective for large public entities with complex decision-making. One possibility being considered is converting the CEI engagement into a long-term partnership with the county that is more steady in the long-term and less aggressive in the short-term.

The Grocery Chain

Participant three is a chain of grocery stores headquartered in California. The company was established a few years ago and has been rapidly growing ever since. The grocery store chain joined CEI in 2011 and enrolled a distribution hub and three food production facilities that occupy one million square feet in floor space. The grocery chain has shown a strong commitment to being environmentally conscious, and is also pursuing aggressive carbon reduction goals, including halving emissions from existing buildings by 2020. Participation in the CEI program provides the means to achieve current environmental objectives. While CEI participation has improved communications internally, no new projects have been identified so far. This deficiency can be primarily attributed to the lack of "low hanging" opportunities that do not require expensive studies, and also to the large size and complexity of buildings involved. However, the grocery chain is involved with several assessment studies at the time of writing, and implementation is likely to be completed beyond 2012.

The Private K-12 Boarding School

Participant four is a four-year, college-preparatory boarding school, established more than a hundred years ago. The school is nationally recognized for its academic excellence and has placed a great emphasis on sustainability. The school is partnering with CEI to implement strategic planning and other features of energy management to build a sustainable effort over the long term. Prior to CEI, energy projects were handled on a case-by-case basis without a uniform plan and approach. CEI has helped the school create consistent energy policy, goals and a planning structure that will govern future projects. Having a well-constructed energy policy is one of the most important elements in the energy management of organizations such as schools, where capital improvement projects are typically done in phases or stretched out over a long period of time due to time and budget constraints. One dormitory is scheduled for rehab in the summer of 2012, and the school is including energy efficiency features such as LED lighting, and high efficiency furnaces and appliances above and beyond the required building code. The school is also evaluating the feasibility of putting solar panels on the roof of the gymnasium.

A Quick-Serve Restaurant Chain

Participant five is a quick-serve restaurant chain with 1,500 sites throughout the US. Six stores in southern California are participating in the CEI program. The chain has no historical effort to actively manage energy use, although the company is starting an effort to build a culture more focused on sustainability and corporate stewardship. The company is interested in pursuing cost-effective energy measures, incorporating energy management into the day-to-day operating procedures, and integrating a strategic approach to energy management in their corporate operations. Since individual stores are typically small, and may not carry energy savings potential that would justify the cost of a CEI engagement on their own, the CEI advisor is focusing on the development of a scalable strategy that can be replicated across the chain. This strategy involves participation of store employees and competition among regional and national stores. The CEI advisor is also looking to develop a standardized assessment checklist that is usable for most stores. This list includes equal measures of capital projects (such as electro-commutated motors) and operational improvement projects (such as operation procedure for cooking equipment that includes slow- and down-time treatment).

Results and Findings

How is CEI Different from "X" Program?

The CEI program encountered significant difficulty in recruiting early on. As California has implemented energy efficiency programs for a long time with many different programs offered over the years, one of the first questions asked by the customer and utility account executives is: "how is CEI different from the other energy efficiency programs?" Indeed, in its 2010-12 filing to the California Public Utilities Commission (CPUC), SCE listed no fewer than 53 energy efficiency programs, which are broken down further into subprogram elements. It is fairly easy to see that the multitude of programs can create confusion. A typical large SCE business may receive sales pitches from a number of different energy efficiency programs at the same time, although market segmentation has helped alleviate this problem. To avoid unnecessary competition, CEI has been designed to fit into the broader market segment strategy by not claiming direct savings, but instead assigning the savings to market segment program where it is currently enrolled. This allows CEI to focus on delivering its value proposition of transforming the organization, and also co-exist with the segment-based program.

Over time, the CEI management team finds it helpful to tie the recruiting pitch to established branding and certification programs such as Energy Star, ISO-50001 and SEP, which helps explain CEI's value propositions. Since the release of ISO-50001 standards, CEI advisors have used specific examples from the standards to illustrate the organizational changes that a participant can realize from participating in CEI.

By the time CEI completed its enrollment in late 2011, only 30% of potential participants (both commercial and industrial) met with and pitched to signed up for the program. The participation rate was even lower earlier in the program, with enrollment rate of only 16% out those pitched to. Only when the program announced imminent closure due to lack of time remaining in the program cycle did enrollment pick up considerably. To account for this phenomenon, the PMT plans to institute a fixed and shorter annual enrollment period in the future, rather than offering open enrollment throughout the year. Based on the CEI advisors'

informal exit survey, the most common responses for declining were lack of human resources (35% of those declined), and already implementing a similar strategy on their own (27%). These responses are hardly unique, and in fact Puget Sound Energy designed a program specifically to address the lack of human resources (Younger et al., 2008).

If Hindsight is 20/20

It is notable that defining the scope and boundary of the Energy Management System (EnMs) is listed as one of the first requirements of ISO-50001. The exercise of setting the boundary is arguably one of the most important steps towards a successful CEI process. For organizations occupying single buildings, this exercise is fairly straightforward, but for organizations occupying multiple buildings, or even building complexes, setting the appropriate boundary can make or break the engagement. This is particularly crucial because large commercial-sector companies typically own or manage multiple offices, stores or buildings in general. As CEI's main principle is to address issues holistically and plan globally, there may be a natural tendency to include as much footprint as possible. In multi-building CEI engagements with aggressive boundaries, limited resources that could have been used towards conducting more in-depth assessments were instead drained quickly by coordination and management costs. Proper selection of boundary should involve a screening process to establish areas with the highest potential impact and management aptitude for organizational transformation. It is also recommended that a scale-up strategy be created to expand the boundary gradually (or create new and separate boundaries) as resources allow.

Better screening of technical opportunities is another step that can be incorporated to ensure that each engagement delivers results more cost effectively. It should be pointed out that by design the CEI pilot does not include a rigorous screening of potential gains. In fact the screening process places more emphasis on organizational transformation opportunity and diversity in program participants in the selection of candidates.

Maintaining momentum is another critical element that should be considered in program design. In the existing CEI design, where the engagement phases are discretely broken out into assessment, planning, implementation and so on, there may be a tendency to spend an excessive amount of time in completing as many assessments as possible before moving to the planning phase. Much like prioritizing implementation of projects, assessments should also be prioritized based on scope and readiness as established in the walkthrough audit. Once viable projects are identified, planning and implementation should follow quickly to maintain momentum. Where possible, the assessment and planning phases should be blended together, and future assessment activities should be included in the short- or long-term plans as soon as identified.

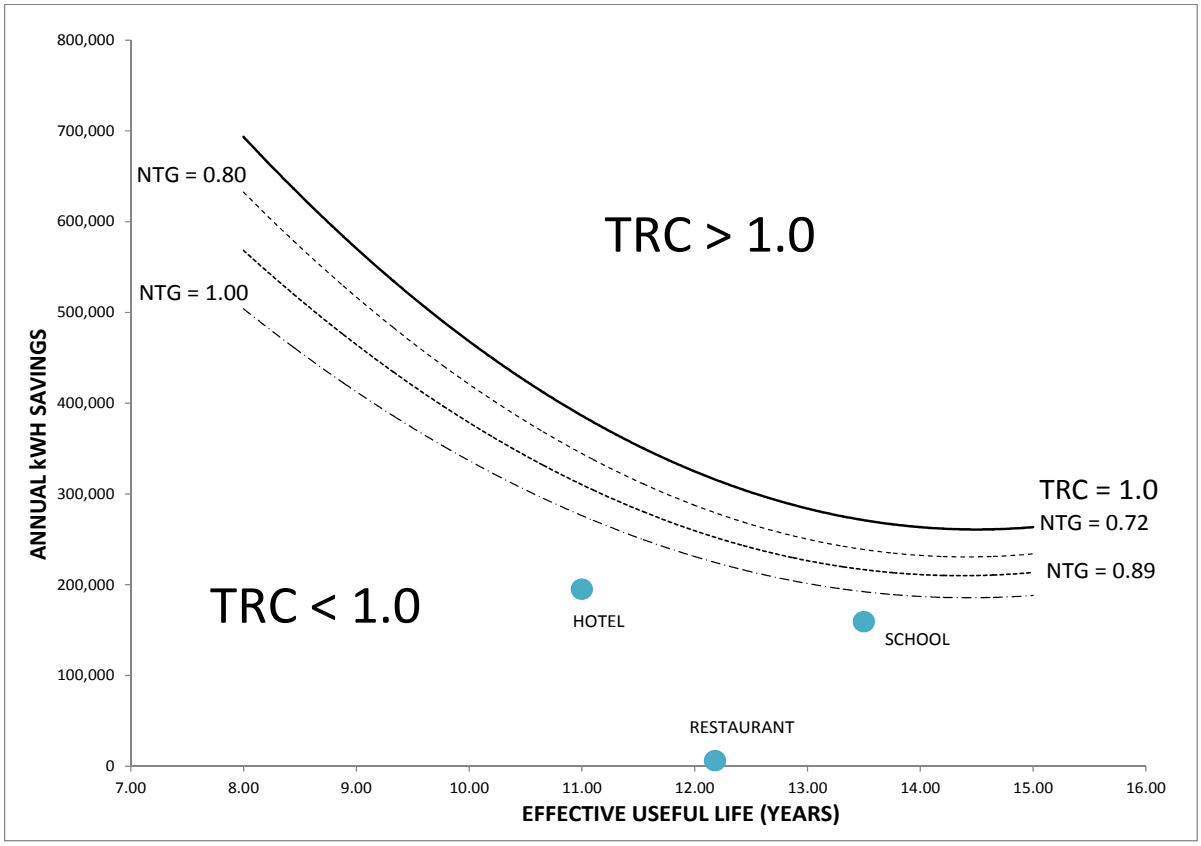
Another area that be improved upon is the inclusion of a formal exit strategy at various points in the engagement. The pilot was not designed to discontinue the engagement when early warning signs were detected. Instead, it focused more on attempting to take all projects through a full CEI cycle in the spirit of learning from failures and not leaving anyone behind. In practice, there are major barriers that cannot be overcome, such as changes in key personnel halfway through an engagement, or eroding support from the executive level. Various ways to end an unsuccessful engagement include requiring a pre-established level of investment at various milestones, terminating the agreement when the level of participation declines or even including a penalty clause for participants who decline to move forward due to no fault of the program.

Is CEI Cost Effective?

Although the pilot was not designed for maximum impact, it became apparent over time that the existing engagements may not have generated enough projects to meet the cost-effectiveness threshold. Figure 1 shows the expected 2012 program impact (retrofit savings only, operational and behavioral savings not included), along with the threshold savings required for cost-effectiveness[5]. As it can be seen, none of the commercial engagements are projected to deliver energy savings with a TRC of one or above, which renders them cost ineffective. Obviously, the CEI pilot is not optimized for cost effectiveness, and there are safeguards as previously discussed, such as better screening and boundary-setting, that could have pushed the engagements to be more cost effective. Once complicating factor is that the potential for savings in the commercial sector in California has severely diminished over time, primarily due to the ever-tightening building code. In fact, a recent market potential study (Navigant, 2011) shows a decline of greater than 30% in the commercial energy efficiency savings potential from 2012 to 2013, due to the new building code to be introduced in 2012, whereas the market potential in the industrial sector shows a modest increase from 2012 to 2013, before gradually decreasing over time. This dearth in savings begs the question: For whom can CEI be delivered cost effectively in California?

[5] Cost effectiveness is defined as a Total Resource Cost (TRC) of one or greater. The calculations of TRC are performed using the E-three calculator for SCE program implementation (http://ethree.com/public_projects/cpuc4.php) using actual program cost and some assumptions on project details (for example, project implementation cost, effective useful life, etc.)

Figure 1. Cost Effectiveness of CEI



The Custom Participant

As CEI intrinsically requires intensive preparation and coaching, which comes at a cost, it is likely that future implementation of CEI will not be done on a high-volume, mass-market basis. Due to the reason of cost effectiveness, it is likely that future CEI implementation for large customers will involve a highly customized level of service based on each participant's carefully researched potential. In this scenario, each participant will be uniquely qualified and assigned appropriate resources based on the engagement's pre-calculated cost-effectiveness. For example, if a participant appears to carry a potential of one million kWh in savings based on thorough screening, it will receive approximately double the resources of those with half a million kWh potential. As the building code tightens further, it is also likely that a large portion of the savings would have to come from persistent operational and behavioral improvements.

With respect to small- to medium-size customers, it is unknown at this time if CEI for these customers can be delivered cost effectively. As personal coaching and consultancy requires a significant cost, it is most likely any starting point with this segment will involve a group delivery or "cohort" model to maximize program impact.

The Role of ISO-50001 and Certification Standards

One interesting observation from SCE's CEI experience is that none of the five commercial participants have expressed interest in pursuing ISO-50001 certification, while five

of the twelve industrial participants are currently pursuing ISO-50001 certification. This may be explained by the fact that industrial companies are more familiar with, and therefore sensitive to the value of an ISO certification relative to their commercial counterparts.

Energy management certifications such as ISO-50001 are expected play a more dominant role in future CEI engagements. There are two primary reasons why this is so, and both reasons resonate well with CEI's value propositions. With respect to organizational transformation, certification allows for a quantitative rather than qualitative target, which tends to be hard to measure. In most CEI engagements, organizational improvement is often seen and felt, but it is mostly difficult to measure. Establishing certification as a target allows a hard, tangible and measurable goal that can define success or lack-there-of. With respect to technical and cost gains, certifications are expected to bring the following enhancements:

- Certification can extend measure effective-useful life. An ISO-50001certified company has a system in place to monitor performance over time, and this system will compel or even necessitate expiring measures be replaced with like- or better-performing measures.
- Certification can increase the program NTG. Since CEI is influential in getting the facility certified, it can be argued that this influence should be extended to all future decisions made in compliance with the certification, thereby elevating the overall net-to-gross for CEI.
- Certification can increase program spillover. As certification raises energy awareness in general, it will increase activities not captured in CEI or any other programs. It is likely that this spillover takes the shape of behavioral and/or operational improvements that have been historically not or under captured in California programs.

Figure 1 highlights the importance of ISO-50001 to a program like CEI in that it lowers the barrier to program entry. As the NTG and effective useful life increase, the amount of savings required to exceed the cost-effectiveness threshold decreases, thereby allowing CEI to work with more participants than it would otherwise. Obviously, more studies need to be done to establish the actual impact that certifications will have on energy efficiency programs, and as more companies get certified (including those currently enrolled in CEI), this study may become feasible in the future.

Conclusions

The CEI pilot has identified key design elements that can be applied to future implementation of CEI in California and elsewhere. These key design elements are summarized in Table 1. While the pilot did not focus solely on cost-effectiveness, critical steps that could be taken to ensure cost-effectiveness include proper selection of boundary, comprehensive screening, careful exit strategy and steady momentum. While none of the existing commercial projects meet the cost-effectiveness threshold, future engagements can be made cost effective despite the declining market potential by carefully assigning the proper amount of benefits that can be provided relative to the potential expected for each participant. The usefulness of incorporating certifications such as ISO-50001 is also argued since it may lower the threshold of participating by improving the benefits assignment to CEI and other utility programs.

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[BPwES] http://www.energystar.gov/index.cfm?c=eeps_guidebook.eeps_building_performance

[Co] http://www.bchydro.com/powersmart/business/commercial/continuous_optimization.html

[CLTEESP] http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/eesp/

[ISO-50001] http://www.iso.org/iso/iso_50001_energy.pdf