

The PPL Electric Utilities Walk the Talk Continuous Energy Improvement Program for Utilities

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ABSTRACT

As PPL Electric Utilities (PPL EU, based in Allentown, PA, www.pplelectric.com) helped industrial clients become more energy efficient, they saw the need to adopt a ISO 50001 based Continuous Energy Improvement (CEI) Program in their facilities. Strategic Energy Group (SEG) worked with PPL EU to customize a CEI Program to best fit their culture.

In 2010, two of the company's service centers participated in the CEI Program as a pilot. Following the pilot's success, five additional teams were formed at their large service centers in a "Walk the Talk" cohort. Each service center is comprised of a warehouse, linemen maintenance shop, truck repair shop and office building. The service centers are very similar to an industrial setting which would include warehousing, maintenance shipping operations. Over the next twelve months, regional energy teams adopted the CEI process.

CEI required each service center to adopt a process aligning with the program scope as follows:

- Establish sponsorship
- Review Energy Policy
- Establish cross functional energy teams
- Understand energy use
- Participate in building tune-up
- Identify energy savings opportunities
- Register for EPA's ENERGY STAR® Portfolio Manager Program
- Build a Monitoring, Targeting, and Reporting Model
- Draft a Strategic Energy Management Plan

The pilot resulted in savings of 550,000 kWh at the end of year one; with the additional five service centers, PPL EU saved over 2,900,000 kWh. CEI has become integrated into the core business practices of the service centers. The first PPL EU Service Center was awarded ENERGY STAR® Certification in November 2012.

This paper discusses the process, results, and lessons learned when a utility adopts a CEI Program. It discusses how and why PPL EU committed its service centers, navigated around cultural barriers, tracked and verified savings, and recognized achievement.

Introduction

PPL Electric Utilities is a publicly owned distribution utility. In 2010, PPL EU served 1.4 million customers in 29 counties and maintained more than 48,000 miles of power lines in central and eastern Pennsylvania. They employed 2,300 people and are the 4th largest employer

in the Lehigh Valley region of Pennsylvania. After deciding to offer CEI to their large industrial customers, PPL EU decided to initiate a pilot involving their own service centers to assist them with ongoing energy management efforts.

The pilot design concept was named “Walk the Talk” as PPL EU wanted to not only lead efforts on energy efficiency but also set an example by participating in that effort. It was deployed to help service centers adopt a CEI process, addressing both O&M and technical opportunities from a strategic standpoint. The program pilot was designed with two phases. The first phase would pilot two service centers, one large and one small, and the implementation phase would roll the CEI process out to the remaining sites. Initially, the implementation phase focused on the remaining five large service centers and then in the following years to all service centers, 26 in total.

Introducing a CEI process results in cultural change and it is critical for senior management to exhibit support for the program. The utilities’ unique organizational structure provided challenges when introducing a cultural change initiative. Unlike many organizations that are managed by a senior site official, the service centers are managed by numerous functional heads. Therefore, company management had to support the CEI Program. PPL EU’s CEO accepted the role as sponsor.

The first step was to identify two service centers representing the demographics of typical service centers to test CEI implementation design and process. Bethlehem and Lancaster both have an administrative building, maintenance building, and a garage area housing the service center vehicles; these locations were chosen as the pilot sites. As service centers were being identified, the Industrial CEI Pilot was recruiting medium to large industrial customers to participate in an industry cohort. A cohort is defined as a group of similar market participants who share the same experience. The industrial cohort representation included food processors, aluminum manufacturing, and plastic blow molders. The implementation materials for commercial and industrial cohorts were similar enough to integrate the two service centers into the industrial cohort. PPL EU key account managers were actively involved in the process from recruitment of industrial customers to participation on the service center teams.

The next critical step was to identify a Company Energy Champion to manage the implementation process of the two sites, define the roll-out strategy for the other sites, and report progress to the senior executive sponsor. The CEO integrated the Company Energy Champion task as a management development opportunity. This position was deemed 50% of a position for a twelve month period.

SEG facilitated a process between the sponsor and energy champion to clearly define the CEI Program scope. The written scope became a living document clearly identifying program boundaries and expectations. With the program scope in hand, the executive sponsor, energy champion, and program manager drafted a company Energy Policy which was integrated into a standard business policy.

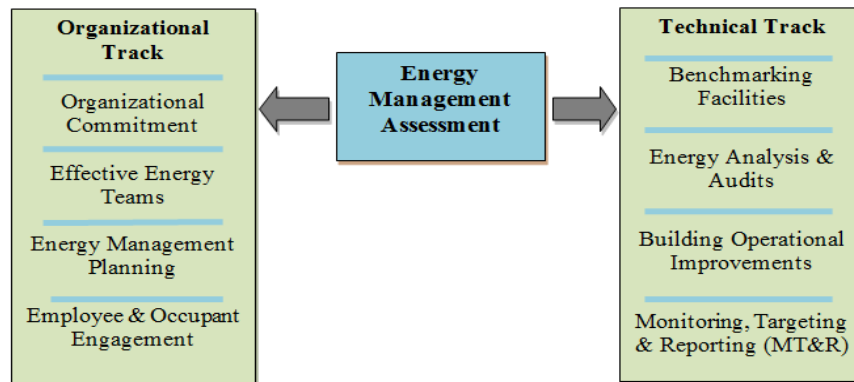
Continuous Energy Improvement Process

Implementation Delivery

SEG presented a series of building block workshops, webinars, and assessments to lay the foundation for a sustainable energy improvement process. A Strategic Energy Management

Plan was drafted, identifying long term plans to roll out the CEI process. As characterized in Figure 1 below, the CEI process is broken into two tracks.

Figure 1. Strategic Energy Management – Two Tracks

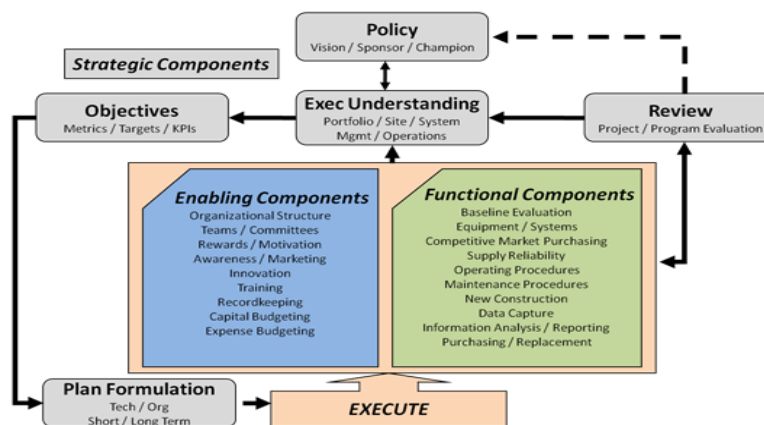


Each track is pursued simultaneously, and linked to one another. For example, benchmarking facility energy use helps the service center in goal setting. Identifying building operational improvements result in tangible savings and engage energy teams. Following are brief descriptions of each CEI session.

Energy management assessment (EMA). The EMA is an on-site self-assessment benchmarking the organization’s energy management practices and identifying practices to be adopted to sustain a CEI Program. The team and champion discuss their current practices against the International Service centers for Standardization (ISO) 50001 Energy Management Standard. Figure 2 identifies the specific topics benchmarked using the SEG proprietary analysis tool called SEGEMA.

Figure 2. Energy Management Assessment

SEGEMA - MANAGEMENT SYSTEM



Organizational commitment. A kickoff workshop was held to review the elements of CEI and solidify executive commitment. In advance of the workshop, a program scope had been developed. A formal Company Energy Management Policy was approved and each service center was required to support the commitment. Key policy components include a mission

statement, guiding principles, company goals, and performance metrics. In the PPL EU Pilot the company Energy Policy was created and owned by the Vice President of Customer Services.

Effective energy teams. This activity includes team formation and characteristics, team evolution and dynamics, and prioritizing team activities and tasks. An effective energy team has cross functional representation, understands and takes responsibility for carrying out the Energy Management Policy, creates a Strategic Energy Management Plan (SEMP) and related operating plans, has appropriate time and resources for implementation, and has a passion to succeed.

Energy management planning. This webinar was conducted to review the importance of drafting a written energy management plan and the critical elements needed to support the plan. A SEMP provides the service centers with a roadmap for becoming CEI practitioners and ensures alignment with company objectives. It covers a wide range of topics, from changes in routine business practices and operational improvements, to behavioral initiatives and capital projects.

Employee and occupant engagement. Behavioral based energy management strategies and activities are moving beyond facility's operations and maintenance to engage all employees and building occupants. In this workshop, relevant members of each service center's energy team discuss and plan for an effective and ongoing employee awareness and engagement campaign.

Benchmarking facilities. Benchmarking facility energy use provides an understanding of current energy efficiency levels and which buildings in a property portfolio are likely to have good savings potential. Beginning with an overview of ENERGY STAR's® Portfolio Manager and its use, hands on training is provided, including collecting data and buildings characteristics information, model inputs that may require judgment, and how to interpret and use the results. PPL EU service centers were classified as office and warehousing.

Energy analysis and audits. Energy team members are trained on data collection and analysis, how to conduct different levels of audits, and use of available tools and resources to perform these activities. Team champions engage in a series of exercises applying example data sets and related information to uncover facility operational issues and estimate the potential benefits of taking corrective action.

Building operational improvements. A focus on existing facilities, systems, and equipment can achieve significant energy savings without major capital investments. This activity engages building engineers and team members in a structured approach to identify operational and maintenance issues (and capital improvements), prioritize these opportunities, and establish action steps and the service center's accountability required to implement.

Monitoring, targeting & reporting (MT&R). MT&R assures that energy savings achieved are recognized, corrective actions taken, and service centers are able to realize their results. Team champions become familiar with available tools and models. Team members are supported in determining an appropriate methodology, and assisted in its application and use.

Pilot Implementation Experience To-Date

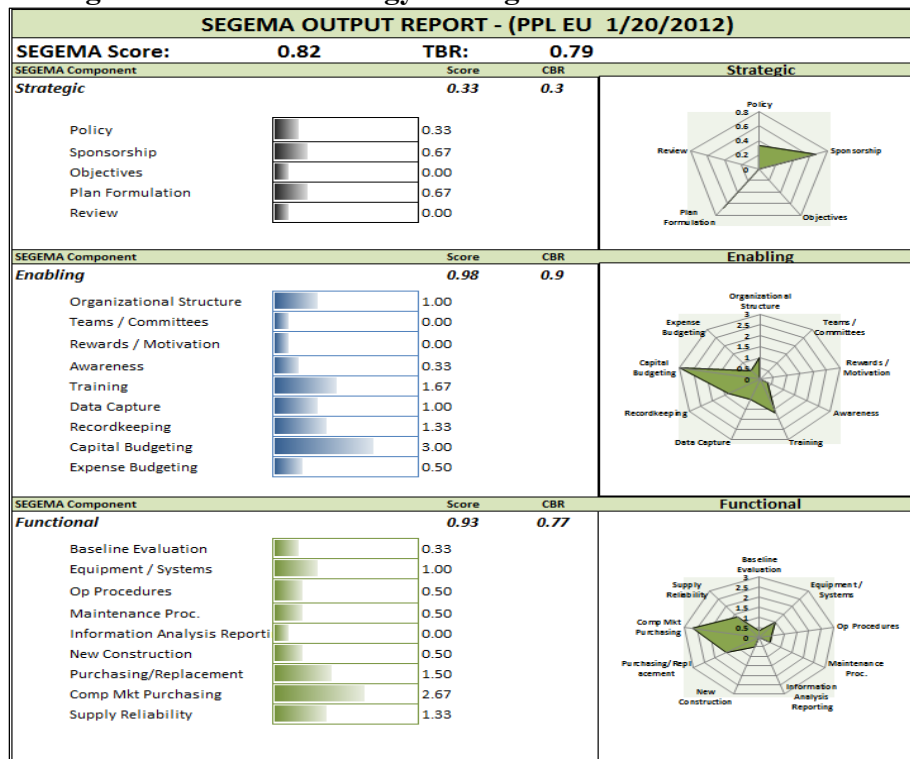
PPL EU service centers have made significant progress through the pilot to-date. The seven teams, from both large and small service centers, are actively moving forward with energy management. Energy efficiency has improved through operational and maintenance activities and projects geared toward improving building operating performance. The workshops and assessments characterized above were conducted; each service center is at a different point on the CEI adoption curve, and each has its own challenges. Yet, there are a number of commonalities across the teams. An overarching factor propelling progress by all teams is simultaneous advancement on the organizational track and the technical track, re-enforce one another.

Energy Management Assessment

An Energy Management Assessment was completed; all service centers were represented with several team members. The EMA allows energy champions to benchmark their energy management practices against “best practices” as defined in ISO 50001. There were several discoveries when teams realized the CEI process touched every functional area and each employee has an impact improving energy efficiency. Each team shared their perspective on current practices, identified barriers, and various energy savings opportunities.

A near-term action plan providing each team a prioritized list of energy management practices results from the EMA. As in most EMAs, the energy teams were surprised to learn that capital plays a strategic role in CEI but behavior based practices play a core role in a sustaining CEI process. Figure 3 is a consolidated chart of the PPL EU EMA results.

Figure 3. PPL EU Energy Management Assessment Results



The SEGEMA assessment tool is based on the premise that sustaining CEI processes are the result of program balance. The action plans are focused on bringing about balance more than achieving a higher overall assessment score. As seen in the chart above, PPL EU teams were aware of the high level of company sponsorship. In contrast, there was little evidence of other Strategic elements. As a result, the Strategic Component was out of balance and an action plan was developed to improve those elements. When we evaluated the responses for Enabling we found the team conveyed an understanding of many of the elements, but not all. Again, specific action items were developed to bring the Enabling component in balance. In evaluating the Functional area we notice that the team understood support in purchasing, reliability and equipment, but little evidence in the other functional areas. The action plan that resulted was designed to bring more balance to each SEGEMA component as well as the overall CEI process.

Organizational Track Experience

The Company Energy Champion was responsible for supporting the service center energy champions in the development of the CEI process at their respective site. The company champion continues to work closely with the executive sponsor to provide program updates and refine overall strategy. Service center energy champions provide bi-annual updates on their program to the executive sponsor. The energy teams at each facility consist of facility staff and field operations personnel.

While the facilities maintenance team have been identifying and implementing energy efficiency projects for a number of years, no service center had a multi-year SEMP which outlined a prioritized list of capital projects and energy savings activities supporting energy goals. Each service center has a written SEMP now, outlining the specific actions to assure progress.

One of the prominent challenges to the team's efforts was establishing key energy performance indicators for buildings where energy information was not readily available. With more information becoming available, energy champions acknowledge the plan to focus on employee awareness and engagement. Occupant behavior often drives building operation, particularly if the service centers' culture is one where occupant complaints are accommodated regardless of circumstances. Service centers have introduced awareness campaigns that address what occupants can do to help manage energy consumption.

SEG worked with each energy team to facilitate a discussion between facility management and occupants of the building on level of comfort based on the ASHRAE standards. Energy champions continued to move forward on this, facing some resistance along the way. Most have standards of operation in place specifying seasonal temperature ranges, operating hours, and limiting after hour service.

Technical Track Experience

Facilities management is now part of the CEI team and helps the team understand the building operations and what can be done to improve them. Specific O&M protocols or checklists have been improved based on the Building Operations Assessment. In order to promote progress, benchmarking each service center is critical. Each participating service center has been benchmarked in the EPA's Energy Star Portfolio Manager. Table 1 outlines the benchmarking results.

Table 1. PPL EU Benchmarking Results

Service Center	Initial Benchmark Rating	Current Benchmark Rating
Bethlehem*	26	98
Lancaster*	21	52
Harrisburg	1	4
Hazleton	13	29
Lehigh	3	4
Scranton	3	7
Susquehanna	6	30

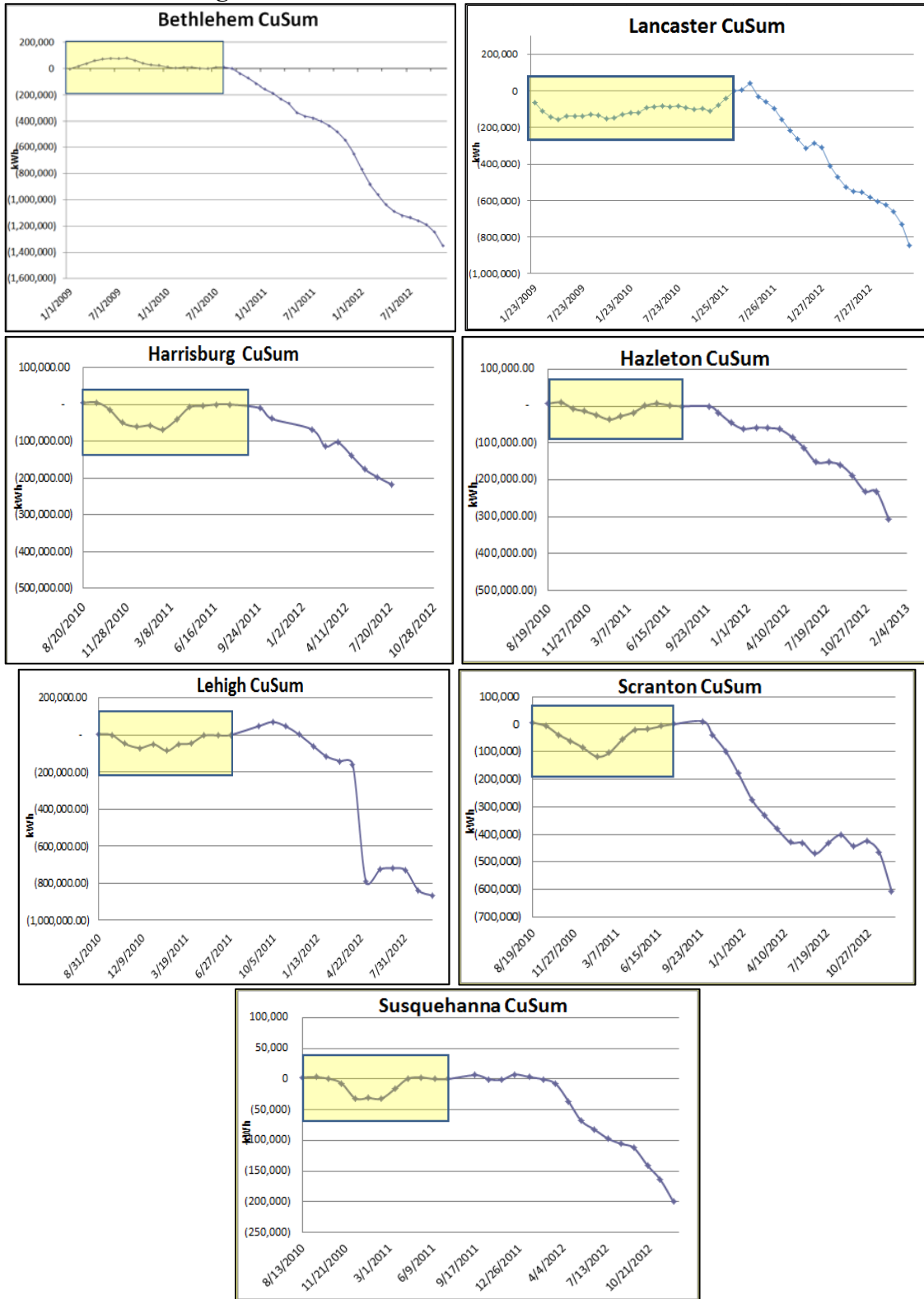
The asterisks above indicate service centers that have completed their second year of CEI adoption. The two initial pilot sites realized significant improvement in both years. As noted above the opportunities and challenges are on a wide spectrum for the year one participants, but in each case progress has been and is still being made.

An important action item of all teams was to establish a baseline and target energy intensities (kWh, / ft.). The company energy champion worked closely with SEG to develop and understand these metrics and then worked with each team to designate a team member and help them understand their building metrics. These measurements were posted at each facility and used to explain improvements in building performance.

The service center teams participated in an operations assessment workshop to learn how to use specific tools and techniques for assessing the operating performance. The emphasis was to identify operating practices to improve overall energy efficiency. Identified action items were prioritized, assigned accountability, and a completion timeframe. Energy champions followed on action items at each monthly meeting. An opportunity for the team champions is to become engaged in the business planning cycle and get energy team implementation budget allocated.

In order to track the energy savings results from CEI implementation we utilize an Opportunities Register to track specific activities to verify savings. We also used a Monitoring Targeting and Reporting (MT&R) model, multi-variant regression, showing capital and non-capital savings. Each service center has an MT&R model. In year one, the company champion managed the models and is now transitioning model management to service centers. The charts in figure 4 demonstrate the service center's savings.

Figure 4. PPL EU Service Center CuSum Charts



The implementation was very successful. Energy teams were developed, energy savings activities identified, and monthly performance was tracked. The energy teams and facilities group worked with the staff to identify standards of comfort for each site based on ASHRAE standards and site equipment capabilities. During implementation sub-metering was installed at each site. Up to this point the service centers were not metered for electric usage. Electric usage was not an expense budget item. In order to determine usage each service center had to be metered and sub-metered for each building to better manage usage and track performance. With this information in hand energy budgets could be established and energy teams could begin to see the impact of their activities to reduce usage. A written Strategic Energy Management Plan (SEMP) was presented to the executive sponsorship for approval. The service centers' SEMP outlined the significant energy savings activities as:

Table 2. PPL EU Service Center Opportunities

<p>Eliminate Waste - turn off:</p> <ul style="list-style-type: none"> - Computer monitors - TVs and other equipment - Space heaters 	<p>Consolidate appliances:</p> <ul style="list-style-type: none"> - Refrigerators - Coffee makers - Unit Heaters
<p>Lighting:</p> <ul style="list-style-type: none"> - Change any incandescent or fluorescent exit signs to LED - Implement a day lighting strategy in lobby using existing skylight - Occupancy lighting control offices, conference rooms, stairwells, and bathrooms - Retrofit 2F96 fixtures throughout - Manual switching until controls installed on bays using either breakers or existing switching - Replace/Retrofit all T12 lamps and ballasts - Eliminate Lighting in over lit areas 	<p>Fully commission new systems and equipment including:</p> <ul style="list-style-type: none"> - Verification of operations - Verification of appropriate inclusion of energy - Efficiency strategies - Verification of sequences of operation - Point-to-Point checkout of control system - Training on proper operation of system and operational intent
<p>Exclude Unit Heaters in the truck bays from operating</p>	<p>Calibrate zone temperature sensors</p>
<p>Ensure rooftop exhaust fans are not propped open</p>	<p>Men's Bathroom heater in garage not working properly</p>
<p>Modify minimum outside air damper position based on actual occupancy and DCV availability</p>	<p>Heat pumps clean coils (check make sure as appropriate)</p>
<p>Implement PPL Standard of Comfort</p> <ul style="list-style-type: none"> - Occupied and unoccupied hours 	<p>HVAC Scheduling optimize schedules for occupancy and include real holidays</p>
<p>Fans to cycle on unit heaters in lobby/stairwells</p>	<p>Economizer Operations</p> <ul style="list-style-type: none"> - noted 'D' setting used in most units
<p>Revised cleaning crew protocols to reduce lighting</p>	<p>Install garage IVU control system on bay unit heaters, to shut them off when doors are open</p>

Table 3 demonstrates percent savings of the participating Service Centers.

Table 3. PPL EU Service Center Savings

Service Center	Baseline Annual kWh	Current Annual kWh	Change from Baseline kWh	Percent Savings
Bethlehem*	667,659	321,744	354,915	51.8%
Lancaster*	2,881,334	1,981,975	899,359	31.2%
Harrisburg	2,353,971	1,917,858	436,113	18.5%
Hazleton	1,324,398	1,036,489	287,909	21.7%
Lehigh	9,150,408	9,016,529	133,879	1.4%
Scranton	4,873,453	3,915,804	957,649	19.6%
Susquehanna	1,880,069	1,257,954	622,115	33.1%
Total Savings	23,131,292	19,448,353	3,691,942	15.9%

Each service center made significant improvement in reducing kWh consumption through this program. The savings results achieved are from initial operating and behavioral based changes. Building operators and managers now have the ability to review their tracking data and information and relate it to recent changes made. While energy savings are modest at some of the facilities, sharing accomplishments and best practices made each facility aware of progress at the other facilities and provided a competitive environment to reduce energy. It is important to note that as the result of executive management support, the PPL EU service centers out-performed the typical industrial cohort as a group.

The PPL EU goal of 5% savings per facility for each of the next five years has been exceeded by all but one of the facilities in year one; that facility is expected to meet the goal this year. All energy champions are working closely with facility employees and becoming more deliberate in planning and scheduling capital projects that will further improve energy performance. Many of these projects were identified in the Building Audits and Analysis.

Lessons Learned

The PPL EU Walk the Talk CEI initiative was a huge success and met all expectations identified in the company's Energy Policy. The success with Bethlehem and Lancaster's programs led to a company-wide implementation. Performance tracking began in March 2011 and continued on a monthly basis. Benchmarking of all participating facilities was completed. Bethlehem was awarded the ENERGY STAR® Certification in November 2012. Each service center was fully engaged in the program and, even with very demanding competing priorities, was able to institute a program that had substantial savings. It was important to engage the entire team to ensure success of the program. Many of the service center employees are bargaining unit employees and including them in the team enabled all employees to be represented. In addition, determining the correct energy champion was an important aspect to the success of the team. Best practices were shared with all service centers helping them to realize immediate savings.

Executive Sponsorship

As with most large organizations, PPL EU has many competing priorities. Executive sponsorship and evidence of commitment ensured each team understood the importance of the CEI Program and kept teams focused and moving forward.

Program Scope

This was critical to ensure that everyone was focused on operational and behavior changes, not relying on capital investment. Through a well-defined scope, PPL EU started with a two facility service center pilot and moved to a company- wide implementation.

Adopting a Standard of Comfort

Early in the program we found that facilities management was at the “mercy” of employees and frustrated with lack of support from building staff. SEG worked with each team to understand the building systems capabilities, understand the ASHRAE standards and, come to a consensus on the best building environment that could be maintained with everyone’s support. This was a critical step in moving beyond each participant’s personal agenda and focused each team on maintaining the expectation agreed upon.

Acknowledging Resistance

Each service center operated within their boundaries and faced their own challenges. Our first step was to ensure executives, senior management, and supervisors were on board to support the implementation. Some resistance was identified early and immediately addressed by providing understanding of the program and engaging employees in advance of the kickoff meeting. Minor resistance was experienced when manual controls were replaced with automated, but this was addressed immediately and did not impact the programs’ momentum. If there was resistance it was often voiced to the representative on the team and they could explain details.

Energy Champion and Team

Appointing the most qualified energy champion was critical to the success of the team. The message was sent early on that participation in the CEI process is a “season not a sentence”. This allowed the company champion to make organizational changes when necessary with minimal collateral damage to program progress.

Connecting the CEI Process to Previous Successful Implementations

PPL EU has adopted a best in class Voluntary Protection Program (VPP) safety program. Teams identified energy opportunities and related the CEI Program to safety whenever possible. Due to the strong safety culture it was easier to make changes, like removing space heaters, as these are often safety hazards.

Initial Cultural Challenges

Each Service Center has a unique culture. Some were quick to embrace CEI; others were restrained by competing priorities. Each service center was able to recruit employees as part of the team who were involved and motivated.

Knowing that we were moving multiple organizations forward in this behavior based program it was critical to have a process in place to quantify the culture change. We conducted

an EMA early in the program. A survey was conducted at the beginning and end of the program and results were compared to see the culture change.

Sustainability: An Opportunity and a Challenge

All the service centers actively participated in the company's sustainability initiatives. Because of sustainability initiatives already in place, this was a tremendous opportunity to integrate energy efficiency into a company objective and well run initiative. Like the strong safety program, using the established sustainability program allowed us to find a well-defined path to integrate CEI business practices.

Energy Management is Everyone's Job

A common challenge for most energy champions has been integrating energy management as part of everyone's job. This has been a challenge for both staff and the facilities group. Comprising the energy team as a cross functional group with representatives from all functional areas has allowed this to happen without threatening anyone's position.

The Appeal of the Cohort Approach

The energy champion and other energy team members are being called upon to be change agents within their service centers. The appeal of the cohort approach is that by working together, energy champions see that other service centers have a similar interest in advancing their energy management. The energy champions also connect with their counterparts in other service centers. They share successes and discuss challenges and potential solutions.

Revising Standard Operating Procedures

A service center's culture and norms are changed by its leaders (both formal and informal). One of the most remarkable changes occurred when the energy champion discovered that energy usage remained the same after work hours and only dropped at about 2:00 a.m. The energy champion worked with the janitorial contractor to change their cleaning procedure by doing all tasks in one room at a time and ensure that lights were only on in the room where they worked. This standard operating procedure change resulted in substantial savings for the Bethlehem facility and was a best practice shared with the other service centers.

Tracking Building Operating Performance

In the past, tracking building performance was a primarily managed when there was an obvious problem. Understanding the building systems capabilities and understanding the role each staff can play has allowed for the team to resolve issues together. Having metrics in place to track improvements in energy performance gives the initiative credibility and ongoing service centers support.

Energy Awareness and Recognition

Team champions have developed a CEI newsletter that was shared among all service centers to promote best practices and recognizing achievement. Utilizing the company's SharePoint site that all team members had access to, allows each team to view other successes and gather new ideas for savings opportunities. Sharing ENERGY STAR® ratings and improvements provided a competitive environment among teams and encouraged teams to continue to work towards their ENERGY STAR® certification.

Conclusion

By defining a strong scope which was agreed to by all, building an inclusive, engaged team and establishing proper leadership these teams were able to put in place behavior changes that resulted in large savings for the organization. Using the cohort approach to adopt CEI reinforced the value of group implementations over direct delivery. The CEO's sponsorship and commitment drove the momentum to which the CEI process was adopted. Program momentum was increased when best practices were shared. Engineers became engaged when the building operations assessments were conducted and team pride began to flourish as teams were recognized in company awareness articles. The energy team's bi-annual meeting with the CEO also increased team pride. The significant savings realized exceeded expectations as we did not expect the facilities group and staff to come together on common ground to improve efficiency. There were decisions made that saw resistance but were supported on all levels. Facility energy champions and their teams drafted Strategic Energy Management Plans which resulted in total savings of over \$246,000. In 2013 PPL EU will continue enrolling their remaining facilities in the CEI process to gain additional energy savings and momentum on their CEI journey. PPL EU has another "Best in Class" program to be benchmarked by others in the industry.