Energy Master Planning Drives Energy Efficiency Investments

Sadie Bronk, CLEAResult

ABSTRACT

A comprehensive approach to energy management begins with benchmarking energy usage to cost effectively and strategically pinpoint areas of potential efficiency improvement in a portfolio of facilities, but this is only the first step. Providing the analysis in an easy to understand format and presenting to key decision-makers in a facilitated forum are critical to ensuring energy efficiency policies are developed, procedures are followed, and projects are implemented. CLEAResult has found that customers are more likely to follow up on benchmarking findings, identify actions, assign responsibilities, and implement energy-saving projects when benchmarking services are paired with Energy Master Planning Workshops.

CLEAResult has benchmarked over 7,000 buildings and provided Energy Master Planning services for 380 partners across the nation using both CLEAResult's Energy Performance Benchmarking Database and the U.S. EPA's ENERGY STAR Portfolio Manager Tool under utility-sponsored programs offered to school districts and municipalities. This paper will highlight state-wide program results in Texas to show how the application of our benchmarking and energy planning process is effectively used to identify areas of energy efficiency opportunity, drive energy efficiency projects and create a long term strategy that prepares organizations for ongoing energy management success.

Introduction

Utility programs designed to promote the use of energy efficient technologies emerged in the late 1970's. Over the past three decades, energy efficiency program design and implementation have evolved with the changing energy industry. This paper will outline the successful results of the CitySmart and SCORE program design currently being implemented in eight IOU's in Texas. Although these programs offer cash incentives for energy efficiency upgrades, the primary focus of this paper is to provide an overview of how the non-cash incentives shift the way public sector organizations manage their energy by presenting easy to understand data, educating decision makers and delivering an energy plan that will serve as a roadmap for a long term energy management strategy. These market transformation programs incorporate benchmarking and energy master planning services to help drive public sector investment in energy efficiency upgrades. The success of incorporating non-cash incentives to drive energy efficiency investment between the years of 2006-2011 will be presented and evaluated.

Benchmarking

Benchmarking the energy performance of buildings is the first step in determining where and how to implement energy improvements. CLEAResult's energy performance benchmarking process compares buildings' energy performance against each other and against regional and national databases. This comparison can help a public sector organization identify which of its

buildings have the greatest opportunities for energy and cost savings. It also provides a platform to validate all meters and billing points for all forms of energy used at each facility, and aggregate usage information for ten-year projections and greenhouse gas accounting.

Data Collection

The backbone and first stage of benchmarking is the collection of correct and complete building and utility data. Many organizations encounter some difficulty locating data, and this exercise provides the additional benefit of helping them understand the importance of keeping records organized. Some public sector organizations can take months to collect basic building data which may include:

- 12 months of energy consumption data (electricity and natural gas data)
- Number of computers in the facility
- Facility gross square footage
- Percentage of space heated and air conditioned
- Number of occupants
- Hours of operation

The CitySmart and SCORE programs can also benchmark specialized facilities such as wastewater treatment facilities, water treatment and distribution utilities, data centers, senior care facilities and natatoriums. These specialty facilities require additional or different data points to complete a benchmarking analysis, including:

- Pool size
- Flow rates
- Total pump horsepower
- Change in distribution elevation
- IT configuration (UPS configuration)

For the data collection process to be successful, the organization must designate a single point of contact for information to flow through and collect the required data points. The appointed person should have the skills to effectively navigate their internal organization to locate and delegate any necessary building data gathering efforts.

In addition to having a single point of contact, success in gathering building data also requires the support of program staff. It is essential that program staff collaborates with utilities to identify a process for obtaining energy data directly after helping partners organize meter numbers and account ID's. The program staff must collaborate and communicate with every affected employee throughout the data-gathering and reporting process – from high-level decision makers to administrative assistants in the maintenance department. Through this process, the program staff will come to understand the barriers to monitoring and tracking energy data unique to each organization and be able to assist partners to overcome these barriers by directing them to insurance documents, construction as-builts and in some cases will set up a meeting on site to review utility bills. This process is very beneficial in helping the organization understand the importance of this information and developing a process and structure for ongoing tracking.

Data Analysis and Reporting

Each facility has unique characteristics and utility metering configurations that can make benchmarking a challenge. Once all the data has been collected, it is analyzed for missing data and anomalies. In some cases, an educated guess about which data pertains to a particular facility is necessary. Examples of these types of situations include:

- Primary metered campuses
- Utility billing anomalies such as billing errors and missing months
- Summing multiple utility accounts to determine total monthly usage by facility

After the data scrubbing process is complete, the benchmarking report is developed. The data is entered into CLEAResult's proprietary Program Regional Database and the EPA Portfolio Manager Database. The CLEAResult database contains information from more than 350 organizations and over 7,000 individual sites. It compares facilities against similar building types in the same weather region. The EPA Portfolio Manager Database is based on actual building and utility data and adjusted for regional climate differences, ranks buildings on a scale from 1 to 100 (with 50 being average), and buildings scoring 75 or higher are potentially eligible to apply for ENERGY STAR® label.

In order to act as a catalyst for facility improvement, the benchmarking report must provide information that the customer can use to make sound energy decisions, without overwhelming them with superfluous data. The delivered energy benchmarking report provides an introduction and an overview of the benchmarking process, presents the organization's overall energy performance as well as the performance of each building, and provides information about how to receive recognition for the organization's energy efficiency efforts. In addition, the report provides several charts and graphs that offer a comprehensive comparison of the organization's buildings' energy performance against each other and against regional and national databases. This comparison helps them to identify which of the organization's buildings have the greatest opportunities for energy usage and cost savings. Charts and graphs included in the report include:

- Graphical representations of greenhouse gas emissions
- Figures showing the least efficient buildings along with the best performers
- Organization-wide summaries and individual building analysis
- Usage and cost analysis

The comparison of organization's energy performance is shown using several Key Performance Indicators (KPI's) that are helpful in prioritizing energy efficiency efforts such as:

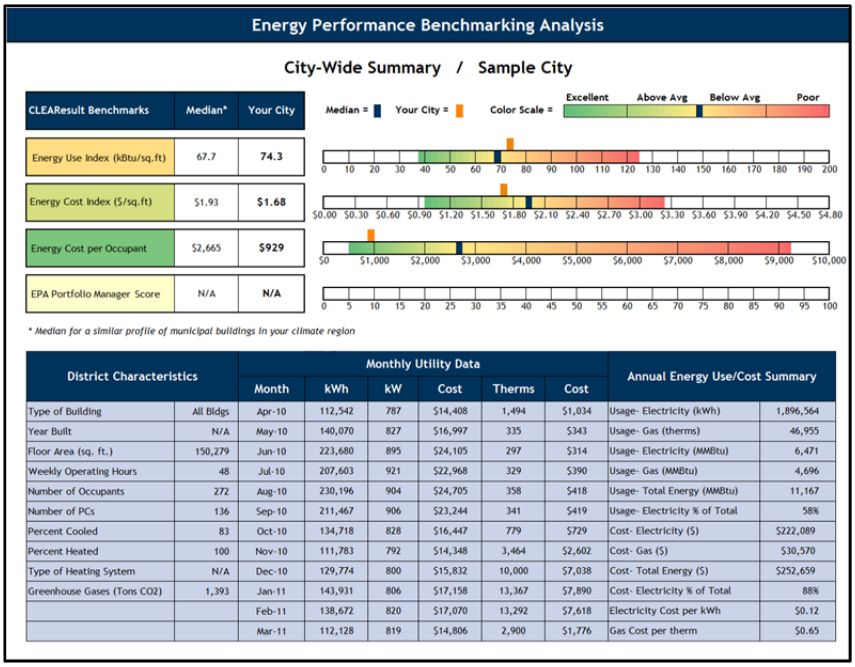
- **Energy Use Index (EUI)** – Also known as site energy, Energy Use Index is one of the most common ways to compare energy consumption between buildings. This metric includes twelve months of utility consumption data in units of kBtu, divided by the total square footage of the building.

- **Energy Cost Index (ECI)** – Potential to reduce energy costs is a prime motivator for investment in energy efficiency upgrades. This metric includes twelve months of utility costs, divided by the total square footage of the building. Energy Cost Index is a simple way to compare how much it costs to operate each building.
- **Energy Cost per Occupant –** Another useful way to compare the cost of operations and maintenance between buildings is by occupant. This metric includes twelve months of utility costs, divided by the average number of occupants in the building. The lower the cost per occupant and cost per square foot, the more efficient the building.
- **Portfolio Manager Rating** – Uses EPA's Portfolio Manager Database to generate a score on a scale of 1 to 100. Portfolio Manager incorporates *both* energy consumption data and building characteristics – such as number of computers, square footage, and location (for weather adjustments) – into its calculations. A score of 50 indicates that the building is performing better than half of buildings nationwide. Buildings scoring 75 or better may be eligible to apply for the ENERGY STAR® Label. Not all facility types are supported in this database but where applicable, the report will provide the score.

The *Energy Performance Benchmarking Analysis* chart shown in *Figure 1* is an example of the in depth analysis provided. The top half of the chart consists of a scale of the energy performance metrics described above. The upper left corner of the chart contains two columns of data. The first column is the median for each energy performance metric (for a particular climate region and building type), and the second column is the building's calculated metric. The scales to the right illustrate where the building ranks compared to the median and other buildings for each energy performance metric.

The median for each performance metric is colored dark blue, and the organization's building(s) is colored orange above the scale. The color-coded scale shows the range of values in our database for each particular energy performance metric. The scale moves from those buildings performing well (green) to average (yellow) to poorly (red). The bottom half of the chart summarizes the building characteristics and energy use/cost data for the building(s).

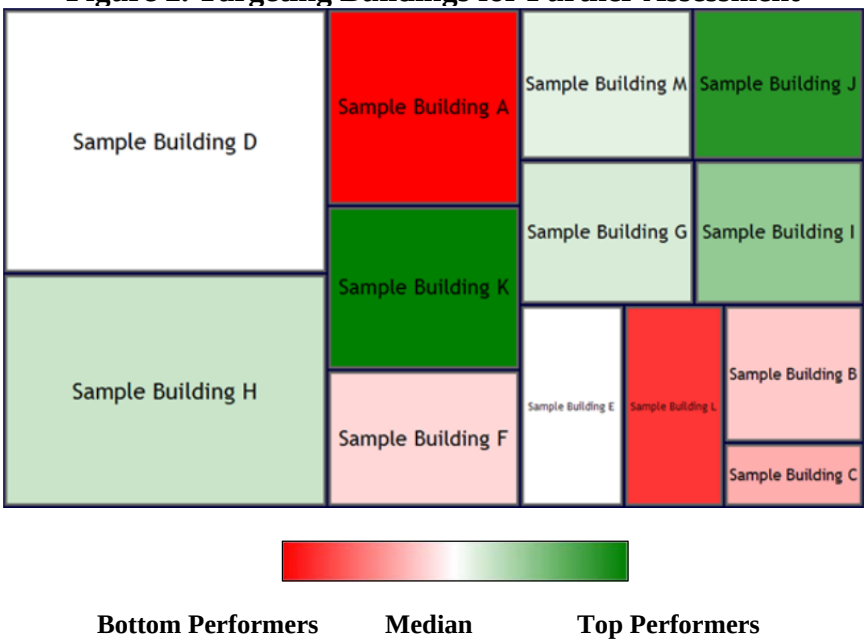
Figure 1. Energy Performance Benchmarking Analysis



The appendix of the report provides detailed analysis just like this example for each facility benchmarked for the organization.

The Targeting Buildings for Further Assessment chart shown *Figure 2* is an example of a high level conceptual chart that displays the energy savings opportunity for each of the organization's buildings. The size of each box indicates the respective square footage of each building, and the color represents its energy performance compared to the median. For example, a large dark red box points to a large building that is consuming significantly more energy per square foot than the regional median, which would make it an ideal building to target for further assessment.

Figure 2. Targeting Buildings for Further Assessment



Energy Master Planning Workshop

An energy master planning workshop is vital to truly involve organizational staff in the benchmarking process, transforming the benchmarking study from a report in an email inbox to a discussion that can engage all levels of facility staff into action. These workshops also act as a way to verify the facility data that was collected, giving staff an additional opportunity to provide input and refine the benchmarking study to better reflect facility operations. Once the benchmarking report is complete and delivered, the program staff will schedule and facilitate an energy master planning workshop that gathers the organization's senior leadership, financial and facility decision makers in the same room. During the workshop the facilitator reviews the partner's benchmarking results, discusses organizational energy management, and works with the partner to complete a diagnostic energy performance best practices scorecard that helps the organization and program staff team identify and prioritize strengths, weaknesses, opportunities, and tactics for improvement.

One of the most valuable components of the workshop is getting all levels of the organization in the same room to discuss energy management best practices. Below are examples of typical workshop attendees:

- **School Workshop Attendees:** Superintendent, Assistant Superintendent, Board Members, CFO, Director of Facilities and/or Operations, Energy Manager, Maintenance Staff, Director of Athletics, and Principals.
- **City Workshop Attendees:** Mayor, City Manager, Council Members, CFO, Director of Facilities and/or Operations, Maintenance Staff, Custodial Staff, City Clerk, Police Chief, Fire Chief, and Public Works Director.
- **County Workshop Attendees:** Judge, Commissioners, CFO, Director of Facilities and/or Operations, Custodial Staff, Grant Writer, and Librarian.

Having all of these attendees in the same meeting is a rare occurrence, let alone a three hour workshop with a facilitator. Therefore, the goal of the program team is to use this forum to help participants understand the benchmarking results, identify and set goals, "sell" cost effective energy efficiency improvement projects to financial decision makers, identify funding strategies and help participants create an organizational culture of energy awareness.
The workshop agenda includes five main topics:

- Planning and Decision Making
- Evaluation, Assessment and Monitoring (review benchmarking report)
- Funding Energy Efficiency
- Facility Operations
- Energy Awareness

Planning and Decision Making

The Planning and Decision Making module sets the framework for the workshop. Expanding on the Deming PDCA Cycle, it provides an overview of the decision making process that is necessary to create a long-term culture of resolve toward energy management. As shown in *Figure 3: Resolve*, the framework is simple but requires a commitment from senior management and dedication from the entire organization to making energy management a priority.

Figure 3: Resolve

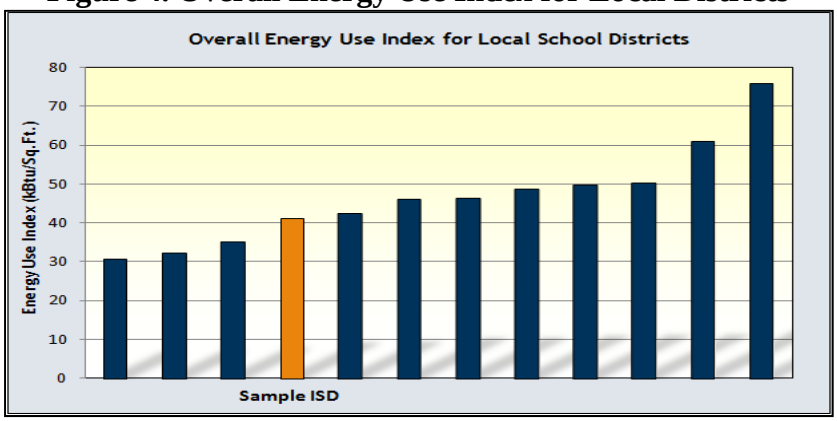
After providing a high-level overview of the framework, each step is discussed in detail, providing examples such as creating an internal energy management committee that meets quarterly to prioritize energy efficiency upgrades, review energy reports, and assign accountability for implementing action items. Once the organization is familiar with the resolve framework, a facilitated discussion takes place to identify their largest obstacles to achieving resolve and also their current strengths. Recognition of achievements is extremely important to keep the momentum going and encourage behavioral changes.

Evaluation, Assessment and Monitoring

The Evaluation, Assessment and Monitoring module of the workshop is when decision makers get to review and understand the results of their comprehensive benchmarking report. Participants are provided a copy of the benchmarking report and taken through a series of related slides that highlight and explain the most compelling discoveries of the report. The program team selects up to eight individual buildings to review with the group. It is important to select a mixture of excellent-performing facilities along with the worst-performing buildings. This strategy helps the participants realize that some of their assumptions may be incorrect and break through the notion that nothing can be done. The concept being delivered is - if positive results are being reported at one similar use facility, it can be achieved at the other.

Additionally, the benchmarking report is structured to spur competition among peers. These public sector participants are benchmarked against not only their own facilities but also their peers in the same weather region. For example, in *Figure 4: Overall Energy Use Index for Local School Districts*, participants get to see how much energy they are using compared to other districts in their immediate local area.

Figure 4. Overall Energy Use Index for Local Districts



This chart typically initiates a healthy competitive conversation between decisions makers with the first questions usually being, “Who are the other school districts?” The program team explains the need for confidentiality but helps facilitate a discussion on why participants think they ranked as they did (good or bad).

Funding Energy Efficiency

The Funding Energy Efficiency module of the workshop is structured to 1) help participants understand how to prioritize their spending (solar panels vs. lighting upgrades), 2) make a case that energy efficiency is a low-risk, high return investment, 3) show participants that if money is not available in current capital budgets, alternative financing is available and 4) provide case study examples of financed energy efficiency projects. The program team often learns that money is available in budgets to implement projects that may have been stalling for months or years; it is only a matter of “selling the project” and breaking down communication barriers by facilitating a conversation between financial decision makers and field personnel to get projects moving forward. The energy master planning workshop provides a conduit so information is heard, the financial case is made and senior management can make decisions based on facts versus assumptions or lack of information.

Facility and Operations

The Facility and Operations module emphasizes the importance of paying attention to operation and maintenance because it provides the most rapid means of reducing energy consumption and costs in most buildings. Not only do correct procedures aid in the proper utilization of the facility's equipment (heating, cooling, ventilation, etc.) and the energy involved, but they also help to maintain the attractiveness and increase the longevity of the building itself. O&M Opportunities are highlighted and discussed in the following areas:

- Off-Hour Opportunities
- Computers and Office Equipment
- Unnecessary Lighting
- HVAC Systems
- Exhaust Fans

- Door and Window Operation
- Water Usage
- Commissioning

In most cases there is a representative from the Facility Operations/Maintenance Department present in the room. This gives that individual the chance to share their experience working in the organization and provides validation for their day-to-day efforts. Not often does a custodian have the ear of the CFO to express their day-to-day duties, share the obstacles they are facing to implement best O&M practices, or voice achievements they have made to improve and save the organization money.

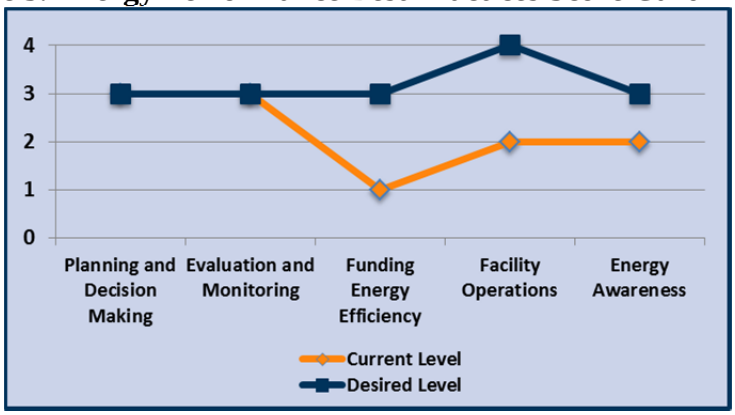
Energy Awareness

The final educational module outlines the importance of creating and maintaining a culture of energy awareness throughout the organization. As the participants start thinking about how to create and implement a sustainable culture of energy awareness, three areas of focus are needed: training, communication and coordination and recognition. Each area of focus is discussed. Through this facilitated conversation, the CLEAResult team is able to gather enough information to identify short and long-term action items to outline in the final energy master plan to ensure the organization can create an energy awareness program.

Energy Performance Best Practices Score Cards

At the close of each of the five modules, attendees participate in a five to ten minute exercise where they utilize the Energy Performance Best Practices Scorecard to identify their current level of implementing best practices discusses and also identify the desired level they are working to achieve. Through a facilitated discussion, the group comes to an agreed-on current and desired level. *The Energy Performance Best Practices Score Card Results* shown below in *Figure 5* is an example of the results of a completed scorecard.

Figure 5. Energy Performance Best Practices Score Card Results



In some cases the desired level for a given topic may be the same as the current level. This visual representation is a quick guide to help participants narrow their focus and prioritize

their efforts. This exercise also helps keep the workshop participants engaged in the workshop process and creates accountability to implement the final delivered energy master plan.

Energy Master Plan

Using insights gained during the workshop, the energy master plan is developed and delivered shortly after the conclusion of the energy master planning workshop. As discussed above, the workshop provides enough information to deliver a plan that presents and discusses the facility benchmarks and the Energy Performance Best Practices Score Cards. The final plan identifies strengths and areas in need of improvement in the five key areas: Planning and Decision Making; Evaluation, Assessment and Monitoring; Funding Energy Efficiency, Facility Operations; and Energy Awareness. The delivered plan organizes the results and information gathered into the following sections:

- *Mission* – this section introduces the document and its purpose while presenting a recommended long-term goal for energy reduction (for example: 20% by 2020) specific for each organization.
- *Project Implementation Opportunities* – this section identifies and highlights any already identified cost effective Energy Conservation Measures (ECMs).
- *Current Benchmarked Performance Overview* – this section provides an overview of the community's current benchmark assessment providing a baseline for future assessment.
- *High Priority Next Steps* – this section outlines four to five high priority action items that should be implemented over the next 90 days along with the personnel accountable.
- *Recommended Equipment Specifications* – this section provides energy efficiency strategies for energy using equipment like lighting, HVAC, and roofing.
- *Operation and Maintenance (O&M) Best Practices* – this section outlines O&M best practices and opportunities to help guide the organization to implement no-cost, low-cost behavioral changes.
- *Recognized Achievements* – this section highlights current achievements in energy efficiency and energy management, which helps create momentum and encourages future improvements.
- *Endorsement* – this section provides a vehicle to formally endorse the plan. It identifies the key decision makers in the organization who are responsible for driving and implementing energy efficiency and encourages a culture of consensus and accountability.
- *Appendix* – this section will provide details on identified strengths, short-term action items (six months) and long-term action items (over a year) in the five key energy management focus areas: Planning and Decision Making, Evaluation, Assessment and Monitoring, Funding Energy Efficiency, and Energy Awareness.

The final energy master plan is intended to be an evolving document that will adapt to changing needs and new information, allowing any organization to plan effectively and efficiently in terms of funding, facility operations, new construction and other constraints. It serves as a roadmap to help overcome internal barriers blocking progress of energy efficiency implementation efforts.

Texas Programs Case Study

The following case study highlights the success CLEAResult's program approach has achieved in public sector energy efficiency programs in Texas. CLEAResult serves as a third party administrator and implementer of public sector programs for various electric distribution utilities in the state of Texas most commonly called CitySmart and SCORE. CLEAResult's program design includes: Benchmarking, Energy Master Planning Workshop, Delivered Energy Master Plans, Project Support, Technical Support, Communications Support, and Financial Incentives.

Program Overview

SCORE/CitySmart was developed to help participants identify energy efficiency opportunities and overcome public sector barriers. Through experience, program design staff identified ways to overcome common barriers and designed the program based on those principles. SWEPCO (AEP) was CLEAResult's first client followed by CenterPoint and Oncor becoming clients in 2005 for the 2006 program year. In 2007, CLEAResult added two more clients, AEP Texas Central Company (TCC) and Texas North (TNC). By 2008, CLEAResult implemented SCORE/CitySmart for 8 of the 9 IOU's in Texas, expanding to El Paso Electric, Entergy TX, and Texas New Mexico Power (TNMP).

Program Results

The program has been successful in helping over 351 Texas public sector organization's improve energy effieicney in their facilities. Between the years of 2006-2011, the CitySmart and SCORE programs have helped save and pay for:

- 88,360 kW
- 209,968,049 kWh
- $17,293,298 Incentives Paid

Much of the programs' success stems from the dynamic program design. The program includes cash incentives and non-cash incentives. Participants are eligible for the non-cash incentives during anytime in their program participation. Non-cash incentives include energy master planning services, technical assistance, and communications support. CLEAResult's findings show that participants who take advantage of the benchmarking and energy master planning services are likely to receive more in paid cash incentives and move to implement energy efficiency upgrades through retrofits and new construction projects. *Figure 6: Incentives Paid to Public Sectors Participants* shows the breakout of incentives to participants taking advantage of energy master planning services versus those who did not.

Figure 6. Incentives Paid to Public Sector Participants

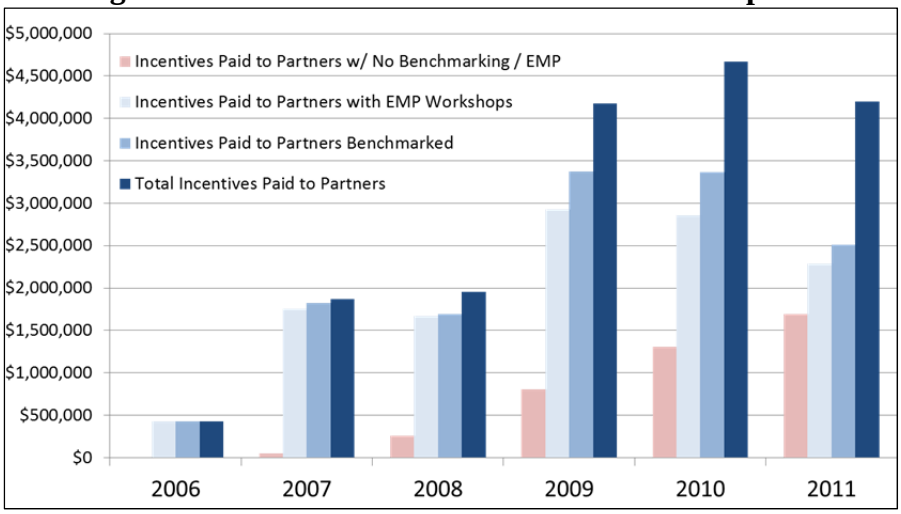
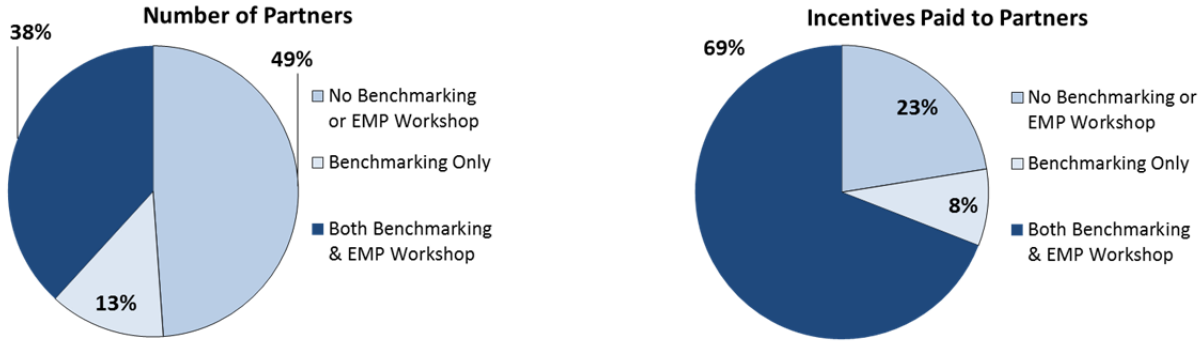


Figure 7: Energy Master Planning Services Impact, highlights that during the years of 2006-2011, 38% of the enrolled partners participated in the benchmarking process and energy master planning workshops and took advantage of 69% of the total incentives paid in the programs. Energy master planning helps prioritize projects and maximize utility incentive to reduce the impact on tight budgets.

Figure 7. Energy Master Planning Services Impact



Conclusion

Benchmarking and Energy Master Planning has been done for years with nominal results in terms of actual energy savings and implementation. Experience has proven a successful new design for benchmarking and energy master planning can be a catalyst for the implementation of efficiency projects. Aspects that lend to the success of these programs include focusing on creating an attitude of learning, engaging all levels of facility staff from the VP to the facility night shift, treating all levels of facility staff as knowledgeable professionals with valuable insight to improve the process, and delivering program participants with quality data in a comprehensible format that gives their organization confidence in moving forward with energy

efficiency projects. The CitySmart and SCORE programs' benchmarking and energy master planning services have evolved in this direction and the success can be seen in the movement of real projects at organizations that have obtained these services. The Texas program findings have proven that participants who fully engage in the program and take full advantage of the energy master planning services are most likely to implement multiple projects over several years. The delivered energy master plan serves as a road map for public sector organizations, helping them overcome political boundaries and establish energy efficiency as a high priority in their budgeting processes. While this process is primarily applied in the public sector at the present time, this same process can be applied in the private sector as well.

References:

Gilligan, D. (2002). Energy Efficiency Program Planning Workbook. Washington DC: National Association of Energy Service Companies.

Kleinman, J., E. Belliveau, B. Bowman, and T. Romano (2006). *Maximizing Program Yield with Negotiated Incentives*. ACEEE Summer Study on Energy Efficiency in Buildings

Moen, R. and C. Norman (2010). *Circling Back, Clearing Up Myths About the Deming Cycle and Seeing How it Keeps Evolving*. www.qualityprogress.com

Rose, A., A. Ahrens, J. Stimmel, and J. Oyhenart (2008). *Breaking Down Silos: Bridging the Communications and Knowledge Gap between Departments to Implement Energy Efficiency in the Public Sector*. ACEEE Summer Study.

Younger, B., L. Moen, T. Brown, and B. Wilhelm (2008). *Implementing a Resource Conservation Manager Program at Puget Sound Energy*. ACEEE Summer Study.