From Energy Assessment to Maximum Implementation: Reducing the "Implementation Gap" for *Save Energy Now* LEADERS[1]

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ABSTRACT

In 2010, the Oak Ridge Partnership for Industrial Energy Efficiency (sponsored by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy's Industrial Technologies Program) was tasked with identifying and implementing improved processes for increasing the rates of implementation of energy savings opportunities identified through Energy Savings Assessments (ESAs). The goal of this effort was to create resources and processes to maximize the implementation of energy projects identified during energy assessments conducted under ITP's new Save Energy Now LEADER Initiative.

Based on experiences and information drawn from previous DOE energy assessments, the Oak Ridge Partnership team developed a series of new approaches designed to improve the success rate of future ESAs conducted by DOE. Key elements of these new approaches can be used to improve effectiveness of assessment programs and services provided outside of DOE as they include strategies designed to lead to maximum implementation of identified assessment opportunities and support a culture of continuous improvement.

This paper will discuss the following major strategies by the Oak Ridge Partnership for Industrial Energy Efficiency:

- Redesign of the ESA process to effectively promote implementation of identified opportunities, including training of the experts who perform the assessments in these processes
- Broadcast of a series of 12 monthly webinars that focus on company processes that need to be in place to enhance assessment implementation
- Completion of an "Assessment to Implementation" guidebook that clearly outlines the implementation principles that need to be in place in companies and plants.

The paper also highlights early results from assessments performed under the LEADERS Initiative using these new strategies.

Introduction and Overview

In 2010, the Oak Ridge Partnership for Industrial Energy Efficiency (sponsored by the U.S. Department of Energy's Industrial Technologies Program) was tasked with identifying and implementing improved processes for increasing the rates of implementation of energy savings

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opportunities identified through Industrial Technology Program (ITP) Energy Savings Assessments (ESAs). The goal of this effort was to create processes and resources to maximize the effectiveness of assessments provided by DOE under ITP's new *Save Energy Now* LEADER Initiative, while supporting a culture of continuous improvement followed by the LEADER companies. As dictated by EPACT 2005 Section 106, under the LEADER Initiative, participating U.S. manufacturers establish voluntary commitments to reduce energy intensity by 25% over a 10-year period. In exchange for these voluntary commitments, LEADERS are eligible to receive "technical assistance", such as ESAs and special training, along with recognition for their achievements towards their goals. Improving the effectiveness of the ESAs would ultimately help the LEADERS meet their goals under the voluntary agreements.

Thus, effort was undertaken to reduce the "implementation gap" that was observed for ESAs conducted in 2006 through 2009 in order to improve effectiveness of assessments conducted under LEADERS beginning in mid-2010. Implementation rates based on assessment follow-up data are captured in the Energy Savings Assessment Management System (ESAMS) database managed by Project Performance Corporation (PPC) for DOE. ORNL regularly reviews ESAMS energy savings data for Save Energy Now assessments to monitor assessment progress and effectiveness. Approximately 20% of the identified energy savings from the 2006-2009 assessments have been implemented by the recipient plants. Another 29% of the energy savings were either immediately rejected or decommissioned by the plants. The remaining 52% of the energy savings identified have not been implemented. This unimplemented 52% represents the "implementation gap" or in financial terms from the perspective of recipient plants, "the check that has not been cashed." Data trends from these information reviews were used to develop strategies for improving assessment effectiveness for DOE.

The Oak Ridge Partnership, which includes staff from the Oak Ridge National Laboratory (ORNL), Georgia Tech University, FCS Consulting, BCS Inc., and Rutgers University developed a comprehensive series of new approaches designed to improve the implementation rate achieved in future LEADER ESAs. Energy assessments typically do not include practices designed to maximize implementation of identified savings opportunities, and these approaches may be considered for all similar-typed assessment programs. This paper discusses the following strategies initiated by the Partnership:

- Redesign of the ESA process to effectively promote implementation of identified opportunities, and training of the experts who deliver the assessments in these processes
- Broadcast of a series of 12, monthly webinars that focused on important company processes that need to be in place to enhance assessment implementation
- Completion of an "Assessment to Implementation" guidebook that clearly outlines the implementation systems that needs to be in place in companies and plants.

Results from 2006-2009 ESAs Conducted Before Save Energy Now LEADERS

Beginning in late 2005/early 2006, ITP developed ESAs in response to volatile energy prices following Hurricane Katrina. Those original ESAs focused on steam and process heating assessments, two systems with heavy demands for natural gas. The success of the 2006 efforts led to the addition of assessments of compressed air, pump, and fan systems starting in 2007.

ESAs have typically been three days in duration and utilize DOE's Energy Experts[1] who apply ITP software tools to conduct a single-system energy evaluation. The fundamental approach of system-based assessments for ESAs continues through the LEADERS Initiative today.

Through the end of 2009, 804 assessments with final assessment reports were completed, as documented in summary reports of ESA results (Wright et al. 2007, 2009, 2010). For these 804 ESAs, the *identified* energy cost saving opportunities totaled $1.13 billion/year, with total *identified* source energy savings of 153.3 TBtu/year. The energy-intensive steam and process heating systems accounted for 85% of *identified* cost and energy savings opportunities.

A large portion of the ESA's conducted from 2006-2009 included follow-up interviews with plant personnel at 6-, 12-, and 24-months after ESAs were completed.[2] These interviews included the status of assessment recommendations that were categorized by plant personnel as: implemented, in-progress, in-planning, rejected or decommissioned.[3]

As of July 1, 2010, ORNL obtained the most recent follow-up data for 579 pre-LEADER ESAs, which yielded significant findings.[4] Identified source energy savings for 579 pre-LEADER ESAs is 114 TBtu/yr and cost savings are $852 million/yr. As a result of these assessments, projects were implemented that save $166 million/year (20% of ESA-identified energy cost savings) and 28.4 TBtu/year of source energy (25% of ESA-identified energy savings). Simple payback was less than 2 years for 90% of the implemented projects. Projects that were positioned to save an additional $178 million and 26 TBtu per year were reported to be "in-progress" at the last interview with plant personnel. These "in-progress" projects represented an additional 21% and 23%, respectively, of total identified cost and energy savings from the ESAs. About 29% ($243 million/year) of savings opportunities identified in the 579 ESAs were either rejected or decommissioned.

In July 2010, ORNL staff reported this "implementation gap" to ITP staff and started to develop ideas on how to improve implementation rates for future ESAs that would be conducted under the new Save Energy Now LEADER Initiative. The ORNL team's efforts to improve implementation focused on assessment process development and Energy Expert training. Prior to the LEADER Initiative, DOE Energy Experts performed energy assessments without specific guidance on optimizing implementation during the ESAs. Additionally, the ESA process did not have an explicit focus on enhancing implementation of identified opportunities. Considering these circumstances, implementation in the range of 20% might not be unexpected and training the Energy Experts on methods to improve implementation rates was an obvious area for improvement.

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[1] Energy Experts are represented by engineers, consultants, vendor and utility representatives, university-based Industrial Assessment Center (IAC) Directors and the like, who hold DOE Qualified Specialist designations in steam, process heating, compressed air, pumping and fan systems, and have demonstrated a history of experience applying the DOE system tools on energy assessments internal or external to DOE program funding.

[2] ESA follow-up protocol included interviews conducted with plant personnel at 6,12, and 24-month intervals. In the transition to the LEADER Initiative in 2010, 24-month interviews from assessments conducted in 2008 and 12 and 24-month interviews from assessments conducted in 2009 and early 2010 were not completed. The data reported in this paper reflect the most complete set of data that were available at publication.

[3] Implementation status of assessment recommendations falls under the following categories: Implemented — savings project actually in the ground; in progress — implementation is underway and is expected to be completed shortly; in planning — projects are receiving additional financial and/or technical analyses; and rejected or decommissioned.

[4] Implementation data on the remaining assessments were not available either due to non-responsiveness of ESA participants or because follow-up interviews ceased in 2010 due to the transition to the LEADERS Initiative.

The team was also guided by information provided by plant personnel in ESA follow-up interviews about major barriers to implementation of identified energy saving opportunities. In summary, the key reasons reported by plant personnel regarding why the earlier ESA recommendations were not implemented were:

- Further evaluation found an unattractive return on investment
- A change in company policy de-emphasized energy reduction
- Process-related limitations, concern regarding operational changes
- Limitations of the currently available technology or design
- Red flags raised by the employees, or political reasons
- Limited in-house engineering availability
- Company merger and new policies
- Budget priorities and budget cycle
- Operational downtime and impacts on production; scheduling issues

Improving the Overall ESA Process for the LEADERS Initiative

As mentioned previously, ESAs performed from 2006 through 2009 did not include a distinct focus on promoting implementation of identified opportunities. The ORNL Partnership team started an extensive effort in November 2009 to fully redesign the ESA assessment process to include implementation principles throughout future LEADER assessments, including the following:

A series of planning meetings were held in November 2009 with ORNL Partnership team members and senior DOE Energy Experts (those who deliver "Qualified Specialist" training for the ITP industrial software tools used in ESAs). Through these meetings the ORNL team identified a number of areas of focus for the improved ESA process.

1. The protocol used for the ESAs performed in 2006 through 2009 was fully redesigned to create a focus on promoting ESA opportunity implementation by, first, requiring that Energy Experts identify the "hurdle rate" that a plant requires for implementing an opportunity, and then requiring that recommended ESA opportunities meet this hurdle rate or other specific criteria for implementation. Before assessments begin, Energy Experts must notify plant personnel of the expectation that identified opportunities should be implemented, and the ESA closeout meeting must include an explicit discussion of next steps toward implementation. The opportunities identified in the ESA will be listed on a sign-off sheet, and someone from the plant will need to sign this sheet as an indication that the plant plans to pursue implementation of identified opportunities.
2. The ORNL team developed a services evaluation form and scoring criteria to evaluate savings evidence for receiving direct assistance. Scoring criteria includes items like energy consumption and energy savings potential of plants, demonstrated commitment to fund energy projects, organizational commitment to energy management, record of implementation, and cost-share commitment.
3. A new concept was created to provide technical support to Save Energy Now LEADER companies. Technical Account Managers (TAMs) work with LEADER companies to help them work toward achieving their LEADER goals and to provide follow-up assistance on ESAs to promote implementation of identified improvements.

4. The ESA reporting format was redesigned to include all of the items identified in item #2 above, and TAMs will not approve ESA reports that do not include next steps and completed sign-off sheets.
5. A competitive solicitation was held to identify highly qualified Energy Experts to perform LEADER ESAs starting in 2010. Criteria included DOE Qualified Specialist designation, outstanding performance on past assessments and demonstration of a strong history of relevant, successful, assessment experience. The 2010 criteria was expanded to include the ability to provide further assistance after an ESA to promote implementation of identified opportunities. This new group of Energy Experts was trained in how to apply the new ESA protocols and use the updated ESA reporting format.

The *Save Energy Now* LEADER Implementation Webinar Series — Peer-to-Peer Sharing of Implementation Best Practices

As part of the ORNL Partnership's work scope for DOE, FCS Consulting developed a comprehensive 12-month webinar series to help energy managers overcome challenges related to implementing energy efficiency projects. The series provided information on how to promote implementation before, during, and after an energy assessment.

Each webinar included a presentation from an industry leader who had been successful in the area covered by the webinar. A number of simple software tools for tracking energy projects and highlighting the value of energy efficiency improvements, were also presented, discussed, and made available to webinar participants. The topics and supporting companies were the following:

- Creating a Climate for Successful Project Implementation — 3M
- Preparing for Project Implementation before an Energy Assessment — Saint-Gobain
- Preparing for Project Implementation during an Energy Assessment — Nissan North America, Inc.
- Preparing for Project Implementation after an Energy Assessment — PPG Industries
- Assigning Accountability — DOW Chemical
- Providing Resources for Implementation — Schneider Electric
- Motivating Employees to Implement Projects — Cal Portland
- *Having Plant Management Announce "The Prize"* — Alcoa
- *Financing Project Implementation* — General Motors and United Auto Workers
- *Measuring Energy Achievements* — ArcelorMittal
- *Communicating Accomplishments to all Stakeholders* — Raytheon
- *Providing Rewards and Recognition* — 3M

These webinars were the first to provide guidance and tools specifically to support implementation of savings opportunities identified through energy assessments. Approximately 50 people participated in each webinar. The majority of the participants were from Save Energy Now LEADER companies and organizations supporting LEADER companies. All of the webinars were recorded and are available for anyone to view at: *www1.eere.energy.gov/industry/saveenergynow/leader_webinars.html*.

Developing an "Assessment to Implementation" Guide

Positive responses to the webinar series made clear that developing an "Assessment to Implementation" guidebook would provide great value to the entire U.S. industrial community. With this goal in mind, a workshop was organized and held in July 2010: "Learning from Success – Assessment-to-Implementation Best Practices." This workshop was co-sponsored by ITP and the American Public Power Association and was led by staff from BCS Inc., part of the ORNL Partnership for Industrial Energy Efficiency team. More than 25 leaders with experience in successful energy efficiency project implementation representing industry, utilities, states, and energy efficiency consultants participated in the workshop.

The workshop participants developed the material that went into the guidebook — eleven implementation principles (shown in Table 1) that are critical to supporting effective energy efficiency project implementation, along with "take-aways," or sub-principles that are important to promoting successful implementation. "Assessment to Implementation" is the first comprehensive guide on how to create effective methods and procedures to ensure maximum implementation of opportunities identified during energy assessments.

Table 1. Implementation Principles and Take-Aways Outlined in the "Assessment to Implementation" Guidebook

Implementation Principles	Take-Aways
1. Integrate the process of identifying energy-savings opportunities with the process of implementing energy-savings opportunities	• Integrate major processes to promote the implementation of identified energy savings
2. Assign clear accountability to those participating in the assessment	• Assign individuals to complete specific activities/projects
3. Explain and communicate the implications of performing an assessment	• Understand the value of an assessment • Recognize that no assessment is free • Understand management expectations related to identified implementation opportunities • Ensure that plant personnel understand the value of identified savings opportunities • Identify roles and responsibilities of assessment participants • Identify who can claim the energy savings from an assessment
4. Understand the company scheduled to conduct the assessment	• Verify the credentials of the assessment company • Ensure that the assessor understands what motivates company decisions • Review assessor's history of follow-up and partnership with clients
5. Perform an assessment only if the plant welcomes it and demonstrates its commitment to implementation	• Make sure the plant welcomes the assessment and shows its commitment to implementation • Ensure that plant management provides resources for the assessment and the implementation of recommendations
6. Organize assessment logistics to promote a successful identification process for opportunities	• Ensure that assessment experts are provided with "need-to-know" information before the assessment • Conduct safety briefings and address confidentiality issues • Make certain that provisions are in place before an assessment starts for the collection of diagnostic data to support assessment analyses. If formal measurement and verification (M&V) will be required for implemented measures, begin to develop an understanding of future M&V needs. • Request participation and support from utilities and important plant service providers • Ensure that plant team members are available to assist • Conduct assessments primarily when targeted systems are operational; some additional savings may be found during off shift hours depending on the system assessed.
7. Employ an assessment process that moves smoothly from identifying to implementing opportunities	• Ensure that identified opportunities meet facility financial hurdle rates • Discuss next-step activities to increase implementation • Have the appropriate plant person sign off on all cost-effective opportunities identified during the assessment • Assign ownership for all identified assessment opportunities to ensure accountability • Obtain management participation in a closeout meeting
8. Maintain continued momentum from the assessment to the implementation of approved energy-savings projects	• Ensure that "risk" issues are evaluated and resolved • Ensure that funding is available for identified opportunities

Table 1. Implementation Principles and Take-Aways Outlined in the "Assessment to Implementation" Guidebook, cont.

Implementation Principles	Take-Aways
9. Quantify energy-savings benefits from assessments	• Track the status of approved energy projects after the assessment • Periodically report implementation progress to senior management • Assess and perform M&V of energy savings for implemented projects • In case direct M&V measurements cannot be made, ensure that provisions are in place for development and use of alternate methods of verifying savings
10. Publicize successful implementation results and recognize employee contributions	• Inform stakeholders of accomplishments • Have communications and public relations staff continually announce progress • Celebrate company and individual achievements through recognition programs
11. Identify lessons learned to support continuous improvement	• Have plant personnel review assessment and implementation efforts • Identify and implement process improvements

Save Energy Now LEADERs ESA Implementation Snapshot

In 2010, 72 ESAs were completed in Save Energy Now LEADER plants. At the writing of this paper, the first phase of implementation data collection for these plants was underway. Follow-up efforts, however, have been hampered somewhat due to delays in the installment of an automated system intended to allow LEADER plants to provide feedback directly via the online LEADERS portal.

The 6-month implementation data from ESAs completed in 2006 - 2009 is summarized in Table 2. Data from a total of 579 ESAs is summarized in this table.

Table 2. Summary of 6-month ESA Follow-Up Data for ESAs Conducted in 2006-2009 (Based on $/yr of Identified Savings Opportunities, Data as of July 1, 2010)

	2006	2007	2008	2009	Cumulative
Number of ESAs	181	173	150	75	579
Total $/year savings IDENTIFIED	$454,200,000	$159,500,000	$181,000,000	$57,300,000	$852,000,000
% of total $/year IMPLEMENTED	6.7%	15.7%	8.4%	12.1%	9.1%
% of total $/year IN PROGRESS	21.7%	14.3%	30.5%	30.7%	22.8%
% of total $/year IN PLANNING	39.6%	43.9%	40.0%	39.9%	40.5%

The results shown in Table 2 illustrate the following information:

- It was noted previously that, on the basis of $/year savings, about 20% of ESA-identified opportunities were recorded as implemented. In the past (2006-2009) roughly half (9.1%) of the total project implementation occurs within 6 months after an ESA is completed. Assessment implementation is a time-dependent activity in industrial plants.
- In 2006-2009, a significant percentage of identified energy savings (21%) were in progress toward being implemented.
- The cumulative sum of projects implemented, in progress, and in planning in Table 2 is 72.4% of the total identified ESA savings. This illustrates that 6 months after past ESAs were completed, about 28% of the identified projects were not under consideration for implementation (rejected or decommissioned).

In 2010, approximately 72 LEADER ESAs were completed using the new ESA processes. Due to the delays in the automated follow-up systems on the LEADER portal, a limited number of follow-ups were available for review at the time of publication. This limited data set provides an early snapshot of the ESA recipients' responses to the changes implemented. There are indications from these early results that, at least for the group of ESAs discussed below, modifying the assessment process is having a positive impact on the percent of opportunities implemented. As follow-up data becomes increasingly available, a more complete picture of the situation will evolve. Additionally, the impact of the LEADERS commitment itself on implementation rates should also be evident.

Six-month implementation data were available for a group of 13 LEADER ESA plants. For these 13 plants, about $9.3 million/year of savings were identified. According to the early plant interviews, 31% of the identified $/year savings were implemented after 6 months resulting in $2.2 million/year of savings. For these 13 LEADER plants, 8 had implementation rates greater than 20% within 6 months after the ESAs were completed. This is a substantial improvement over the 6 month implementation data noted above for ESAs conducted in 2006 through 2009, however, the reader is cautioned that a full dataset was not available at the time this study was published. Analysis of data from the full group of ESAs conducted in 2010 is still necessary to substantiate these initial positive findings resulting from the new ESA strategies.

Summary and Conclusions

Energy assessments are a key component of continuous improvement efforts aimed at reducing the energy intensity in industrial plants. However, experience has shown that a substantial share of the potential energy and energy cost savings will be left "on the table" if the assessment process and recipient organization does not recognize and address key elements that promote implementation.

In 2009 and 2010, the ORNL Industrial Partnership for Industrial Energy Efficiency created processes and resources designed to attack the "implementation gap" identified in the ITP ESAs conducted in 2006 through 2009, in order to improve the effectiveness of assessments conducted under DOE's new Save Energy Now LEADER Initiative. These strategies focused on supporting a culture of continuous improvement committed to by LEADERS under their voluntary agreements. The new processes, which address the obstacles to implementation identified by plant personnel, and integrated the expectation and path toward implementation

into every aspect of the assessment, are being embraced and used by Energy Experts performing ESAs and by the companies who are the recipients of these assessments. Just as importantly, the webinars, the "Assessment to Implementation" guidebook and Technical Account Managers are resources available to companies to help them optimize the value of industrial energy assessments.

Early implementation results reflect positively on the changes put in place, as well as on the LEADERS Initiative. However, the full situation must be evaluated in its entirety when a complete set of implementation data is available from the LEADER plants.

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