Superior Energy Performance:
A Roadmap for Achieving Continual Energy Performance Improvement

Paul Scheihing, U.S. Department of Energy
Joe Almaguer, Dow Chemical
Steve Schultz, 3M Company
Aimee McKane, Lawrence Berkeley National Laboratory
William Meffert, Georgia Institute of Technology

ABSTRACT

This paper presents the development status of the Superior Energy Performance (SEP) initiative. By building on industry's own skills with management systems, SEP seeks to use a different approach to standards (in the areas of energy management and system assessments) to promote continuous improvement in energy efficiency. Based on conformance with an energy management standard (initially ANSI MSE 2000:2008, then ISO 50001) and documented energy performance improvements, SEP will provide a foundation for achieving the national goal of reducing energy intensity of U.S. manufacturing by 25% in 10 years.

To achieve dramatic growth in industrial energy efficiency, SEP must create value for participating plants and mobilize potential sources of implementation assistance for plants through utilities and states. Realizing the vision of a self-supporting, ANSI-accredited program administered by a non-government entity requires a careful balance between validation and cost. Program growth and acceptance will also be driven by the skill with which SEP incorporates current best practices, address weaknesses of past energy management efforts, and provides greater access to a high level of technical assistance needed for both implementation of energy management plans and in the identification and implementation of energy efficiency improvement projects to move investment decisions to energy efficient solutions.

This work is guided by the US Council for Energy Efficient Manufacturing, a cooperative effort that brings together the respective strengths of industry, standards-making bodies, several federal agencies, national laboratories, universities, and technical experts to develop and initiate this voluntary program.

Introduction

The Superior Energy Performance initiative is designed to provide industrial facilities with a road map for achieving continual improvement in energy efficiency while maintaining competitiveness. Likewise, to encourage broad participation by US industry, Superior Energy Performance offers a tiered approach to demonstrating energy intensity improvement.

SEP Strategic Goals

1. Foster an organizational culture of continuous improvement in energy efficiency;
2. Develop a transparent system to validate energy intensity improvements and management practices; and thus

3. Create a verified record of energy source fuel savings and carbon emission reductions with potential market value that could be widely recognized both nationally and internationally.

A central element of Superior Energy Performance is the implementation of the ISO 50001 energy management standard, with additional requirements to achieve and document energy intensity improvements over each 3-year period. The program provides a framework for fostering energy-efficiency at the plant level and a methodology for measuring and validating energy efficiency/intensity improvements. To ensure that Superior Energy Performance offers value and flexibility for plants of various sizes and experience in managing energy, the program is conducting field testing in five manufacturing plants through a pilot program in Texas.

The U.S. Council for Energy-Efficient Manufacturing guides the development of Superior Energy Performance. The partnership is a cooperative effort that brings together the respective strengths of industry, standards-making bodies, several federal agencies, national laboratories, universities, and technical experts to initiate the program. Superior Energy Performance will contribute toward reaching a national energy efficiency goal of reducing industrial energy intensity by 25% over the next decade.

This voluntary, industry-driven certification program is being designed to provide a transparent, globally-accepted system for validating energy intensity performance improvement and management practices at industrial plants. A non-governmental organization will provide ANSI-accredited certification to U.S. manufacturing facilities. It is anticipated that Superior Energy Performance will complete the transition from a federally-supported development period to a fee-based program administered by the non-governmental, not-for-profit entity by 2013.

The U.S. Council for Energy-Efficient Manufacturing seeks to enable U.S. industry to achieve global leadership in energy efficiency and greenhouse gas emissions reduction. It is a voluntary partnership between industry, government and other organizations and is led by a committee of representatives from the following organizations: 3M, the Alliance to Save Energy, Dow Chemical Company, Eastman Chemical, Ford Motor Company, Frito Lay, National Institute of Science & Technology (NIST) Manufacturing Extension Partnership Program, Owens Corning, PPG, Toyota, Texas Industries of the Future, SSAB, US Department of Energy Industrial Technologies Program (DOE/ITP), US Environmental Protection Agency (EPA) ENERGY STAR program, and Weyerhaeuser.

Need and Value to Industry

The cost of purchasing the energy needed for production by an industrial facility is viewed as managed input and typically receives significant attention, while the use of that energy once it is inside the factory is often viewed as simply the cost of doing business. While this is not true in all industrial facilities, experience has shown that unless the facility actively manages energy use and has a documented plan for doing so, these facilities are significantly less energy efficient than they could be. Without performance indicators that relate energy consumption to production output, it is difficult to measure or document improvements in energy intensity. Some U.S. industrial firms have already established internal goals to improve energy intensity and their environmental footprint; participation in Superior Energy Performance offers a practical and transparent approach for achieving and validating these efforts.

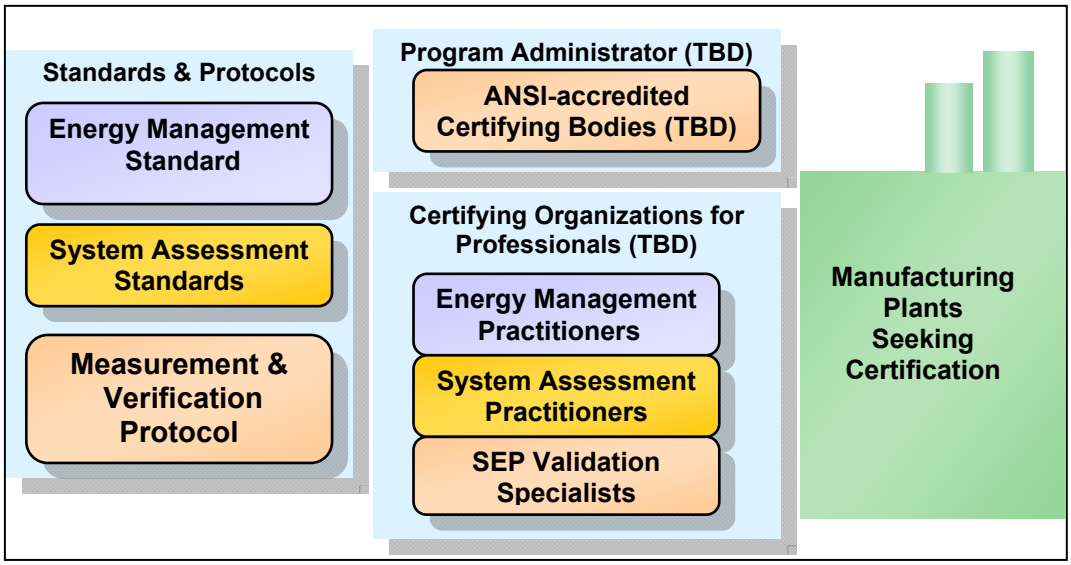
The value proposition to U.S. industry for participation in Superior Energy Performance also includes the following benefits:

- Increases a company's ability to replicate and document their energy management successes;
- Provides assurance that energy system assessment recommendations are sound and produce predicted results;
- Provides a mechanism for communicating to stakeholders about energy management progress;
- Provides national recognition by a third party of the site's leadership in energy management;
- Puts into place a process of continuous improvement of energy use per product output over time;
- Provides a recognized mechanism for a manufacturing facility to qualify for preferred supplier status based on energy management criteria; and
- Provides improved opportunities for utility and state financial incentives for energy efficiency as a result of using recognized assessment practices and measurement and verification (M&V) protocols.

Program Elements

In support of Superior Energy Performance, several program elements are under development (See Figure 1). These elements will address the fundamental problems: lack of awareness of the energy efficiency opportunities; lack of understanding on how to implement energy efficiency improvements, and, most importantly, the lack of a consistent organizational structure within most industrial facilities to effectively manage energy use.

Figure 1. Superior Energy Performance Planned Infrastructure



Source: US CEEM 2009

Energy Management Standard

The ISO management system standard for Energy (ISO 50001) is an international framework for industrial plants or entire companies to manage energy, including all aspects of procurement and use. ISO 50001 will provide organizations and companies with technical and management strategies to increase energy efficiency, reduce costs, and improve environmental performance. Based on broad applicability across national economic sectors, the standard could influence up to 60 percent of the world's energy demand.

Conformance with the energy management standard will demonstrate that the plant or company has sustainable energy management systems in place, has completed a baseline of energy use, and has a commitment to continuous improvement of their energy intensity. ISO 50001 is being written to be compatible with current management system standards such as ISO 9001 (quality management) and ISO 14001 (environmental management) – standards that are used widely throughout the world. The U.S. Council for Energy-Efficient Manufacturing and DOE are supporting ANSI's U.S. Technical Advisory Group (TAG) and ANSI's role as Secretariat of ISO Project Committee 242 in developing ISO 50001.

Georgia Institute of Technology developed the first comprehensive, ANSI-compatible energy management standard (MSE 2000) in 2000. This standard was revised in 2008 and is a core component of the SEP pilot program in Texas. The revised ANSI MSE is one of the inputs being presented to the ISO Project Committee 242. The initial plants certified under Superior Energy Performance will use the ANSI MSE energy management standard and the program will transition to ISO 50001.

System Assessment Standards

To support plants implementing a management system for energy, DOE spearheaded the development of assessment standards for four energy systems: pumping, compressed air, steam, and process heating. By applying these standards, the systems are analyzed through various techniques such as measurement and analysis, which will identify, document, and prioritize energy performance improvement opportunities. These standards are being developed by project teams with the ASME serving as the ANSI-accredited standards developer. Guidance documents are also being developed that provide technical background and application details to support use of the standards. The System Assessment Standards are not required for participation in the Superior Energy Performance, but are very valuable for participants because they clearly define a pathway for quickly achieving energy savings.

Measurement and Verification Protocol

An essential element of certifying plants for energy efficiency is validating plant performance through measurement and verification (M&V). The M&V protocol will offer a best practice methodology to 1) verify the results and impact from implementation of the energy management standard; 2) quantify energy savings from specific measures or projects; and 3) track how much intensity changes over time for the overall plant. The M&V protocol will be designed to document normalized energy performance indicators, such as Btu/pound of product, and to validate energy savings so that reported savings can be used to determine carbon impact.

Application and testing of the M &V protocol will begin in the Texas pilot plants in August 2009.

Separate classes of experts who can maintain independence during the verification process are required for this activity. While this area is still under development, based on other certification models, a two-part system is anticipated: Individuals who are certified to validate performance for a plant seeking certification (SEP Validation Specialists), and ANSI-accredited organization(s) legally qualified to issue a certification to the plant based on the reported and validated energy intensity improvement and energy management processes.

Certified Practitioners

Experiences in the U.S. and other countries have shown that the appropriate application of the energy management standard and system assessment standards will require significant training and skill. For this reason, a program to certify practitioners via a professional certification program is in development. Certified Practitioners will provide assistance to applicants in assessing energy efficiency opportunities in various types of energy systems and conforming to the requirements of the ISO 50001 energy management system and SEP program requirements. A company or industrial plant may use the energy management or system assessment standards on their own without engaging a Certified Practitioner. However, using a qualified individual adds a level of assurance for the plant that the standards will be properly applied.

These practitioners will be plant personnel, consulting professionals, or service providers with the appropriate technical experience in industrial systems. Candidates will be subject to a rigorous qualification exam and, once certified, periodic professional enrichment requirements. As noted above, a certification program will also be developed for application of the M&V Protocol. These practitioner certification programs will be developed starting in 2009 and training will begin in June 2010.

End-User Awareness Training

SEP partners need to be made aware of the overall SEP program requirements, ISO 50001, system assessment standards, and the M&V protocol. End-user awareness training modules will be brief overviews of these program elements that can be given stand-alone, via the internet, or integrated with more comprehensive training.

Texas Pilot Project

Energy experts are working with staff from five manufacturing plants in Texas to field test the program elements. The goal of the Texas Pilot Project is to verify that the processes, standards, and performance criteria under the Superior Energy Performance 1) are practical and achievable, 2) provide benefit to participating plants, and 3) reliably identify plants that meet the proposed certification criteria. Diverse facilities were recruited to provide a robust assessment of the proposed Superior Energy Performance program scheme. The sites represent four industrial sectors: food, insulation, semiconductors and chemicals, and range in size and experience in energy management.

The five facilities participating in the pilot project are:

- Cook Composites and Polymers Co. Houston plant
- Freescale Semiconductor Inc. Oak Hill plant
- Frito-Lay San Antonio plant
- Owens Corning Waxahachie plant, and
- Union Carbide's Texas City Operations (a subsidiary of The Dow Chemical Company)

Qualifying for Superior Energy Performance

Superior Energy Performance is designed to encourage participation among plants of all sizes and levels of experience in managing energy. The program offers flexibility by offering three tiers, depending on the degree of data validation desired by a plant. Plants will elect to become Participants, Partners or Certified Partners, depending on the value they perceive for verification or certification of savings and management practices (see Figure 2).

Figure 2. Superior Energy Performance Tiers and Summary of Requirements

PARTICIPANT*	PARTNER	CERTIFIED PARTNER
Criteria ▪ Conformance with energy management standard ▪ Measure and audit energy performance improvement Performance Levels ▪ Energy intensity improvement required Method of Verifying Results ▪ Self Declaration	Criteria ▪ Conformance with energy management standard ▪ Measure and verify energy performance improvement Performance Levels ▪ Energy intensity improvement required, minimum requirements set by program ▪ Two Pathways Available: Energy Intensity or Mature Energy Method of Verifying Results ▪ Third party verification via remote review	Criteria ▪ Conformance with energy management standard ▪ Measure, verify, and certify energy performance improvement Performance Levels ▪ Energy intensity improvement required, minimum requirements set by program ▪ Two Pathways Available: Energy Intensity or Mature Energy Method of Verifying Results ▪ ANSI-accredited certification with onsite visit

*This tier includes candidate plants which set (but have not yet met) energy intensity improvement targets.

Source: US CEEM 2009

Conformance with Energy Management Standard

All plants must conform with the ANSI MSE 2000:2008 (ISO 50001) energy management standard.

Achievement of Performance Levels

The variety of performance levels offered through SEP acknowledges the wide range of industrial plants and their varying levels of experience. All plants applying to SEP must demonstrate an energy intensity improvement over the previous three-years to qualify. To encourage plants to achieve greater energy intensity reductions, SEP also offers silver, gold, and platinum designations based on higher performance levels. These designations are available only at the Partner and Certified Partner tiers.

The program also provides two pathways for demonstrating performance levels. Most plants will qualify through the first pathway by demonstrating an energy intensity improvement. Achieving high percentages of energy intensity improvements will prove to be more challenging for plants that have mature energy management programs in place and have already identified energy saving opportunities and implemented efficiency improvements for the last decade or more. Therefore, the second pathway takes into account both a plant's energy management system and continued efforts to improve energy intensity. These two pathways apply only to plants at the Partner or Certified Partner level.

Method of Verifying Results

All participating plants are required to verify conformance with the energy management system and energy performance improvement using the Superior Energy Performance M&V Protocol. Three methods for verifying results are offered:

- **Self-Declaration** (Participant): Plants applying to become Superior Energy Performance Participants will self-declare their conformance to the program requirements. Self-declaration may include audits conducted by team members within the plant or by off-site corporate representatives.
- **Third-party verification by remote review** (Partner): Plants applying to become Superior Energy Performance Partners are required to submit materials for a remote review. A Certified SEP Validation Specialist will conduct the remote review.
- **ANSI-accredited certification with onsite visit by SEP Validation Specialist** (Certified Partner)**:** Plants applying to become Certified Partners will submit required material to an ANSI-accredited third party Certifying Body. The Certifying Body will send a SEP Validation Specialist for a site visit and will provide certification of the results.

Renewal of Participation

Every three years participating plants will re-submit performance and management system information documenting that they have met Superior Energy Performance criteria.

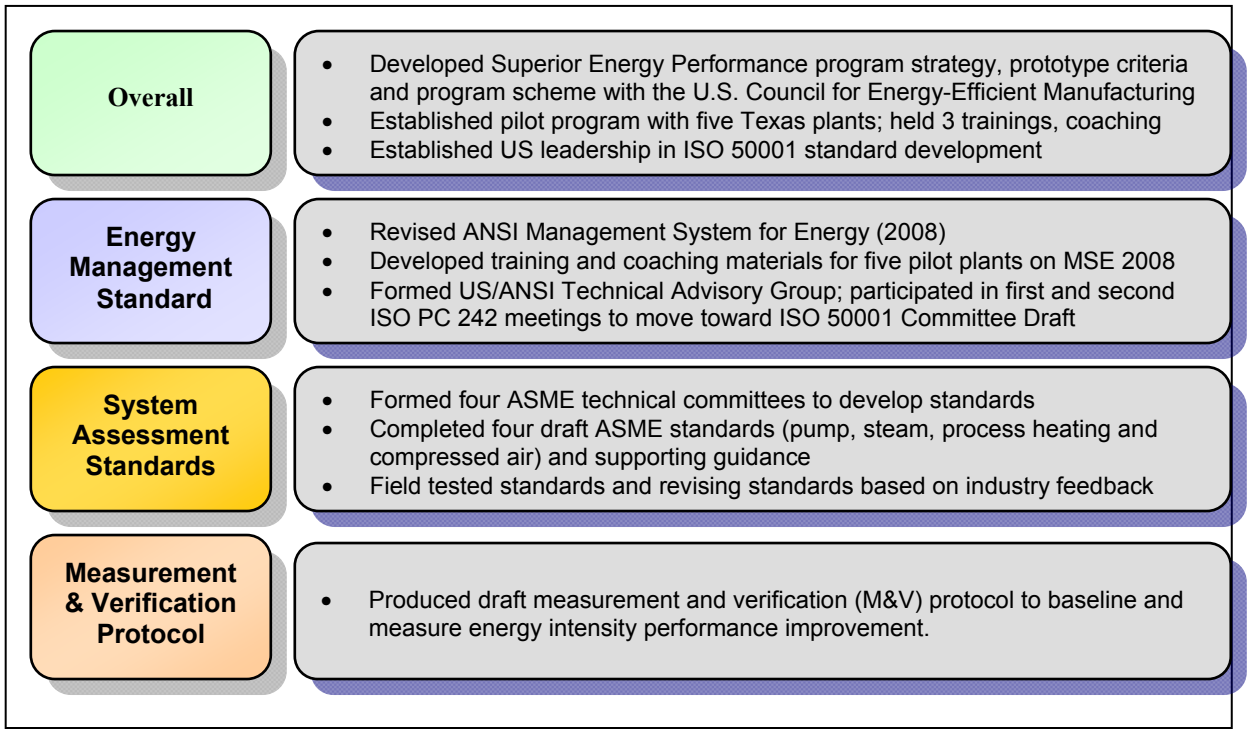
Superior Energy Performance Status

The U.S. Council for Energy-Efficient Manufacturing is providing guidance and oversight throughout the development process. Industry representatives are engaged in both developing and testing the program elements, strategy, scheme, and requirements. It is anticipated that the first plant will be certified in June 2010 and the national, voluntary program will launch in June 2011.

The current development status of SEP is shown in Figure 3. Other upcoming SEP activities include:

- Select SEP Program Administrator that will manage operations by March 2010
- Establish the public identity for the certification program
- Identify qualified Certifying Bodies
- Identify an ANSI-accredited personnel body to provide oversight for each type of Certified Practitioner

Figure 3. Superior Energy Performance Program Development Status



Source: US CEEM, May 2009

The U.S. Council for Energy-Efficient Manufacturing will conduct outreach to a wider stakeholder base to seek input in developing and defining the Superior Energy Performance program strategy. Stakeholders include state agencies, utilities, non-governmental organizations, trade associations, and equipment and service providers.

To learn more about Superior Energy Performance and the U.S. Council for Energy-Efficient Manufacturing, visit www.superiorenergyperformance.net.

Conclusion

Superior Energy Performance will provide industrial plants with an opportunity to improve their energy performance and validate their energy efficiency/intensity improvements through an ANSI-accredited process. The program encourages participation by plants of all sizes and levels of experience by providing a tiered approach and mobilizes resources from states and utilities to assist plants. The U.S. Council for Energy-Efficient Manufacturing is developing Superior Energy Performance and providing leadership in the development of standards and protocols to be applied in the program to achieve energy source fuel savings and carbon emission reductions with potential market value that could be recognized both nationally and internationally.

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