

Continual Improvement of Energy Performance with ISO 50001



*International Workshop - ISO 50001
Energy management system
Tokyo, Japan
12 November 2012*

Aimee McKane
Lawrence Berkeley National
Laboratory
atmckane@lbl.gov

Value of Energy Management

- Time and again, industrial energy efficiency has been demonstrated to be *cost effective* while having a positive effect on productivity
- Despite this, energy efficiency improvements with very favorable payback periods often *do not get implemented*
- Even projects that are implemented may *not be sustained* due to lack of supportive operational and maintenance practices

Problem: *Energy efficiency is not integrated into daily management practices.*

Solution: *Staff at all levels within an organization need to be engaged in the management of energy on an ongoing basis.*

Energy management requires an organization to shift from a project-by-project approach to one of continual improvement in energy performance

ISO 50001- Energy Management System Standard establishes a framework for industrial and commercial facilities and organizations to manage energy.
Published: June 15, 2011

- Provides the requirements for energy management systems
- Applies to any organization with energy uses
- Uses collection and analysis of available energy data to support energy management decision-making, and improve:
 - Ability to benchmark, measure and report
 - Transparency and communication to management
 - Operations and capital cost decisions

Global Reach and Impact

- 44 (now 49) countries involved in development, plus 14 observing
- Many countries adopting ISO 50001 as national standard, including the United States



Status of ISO 50001

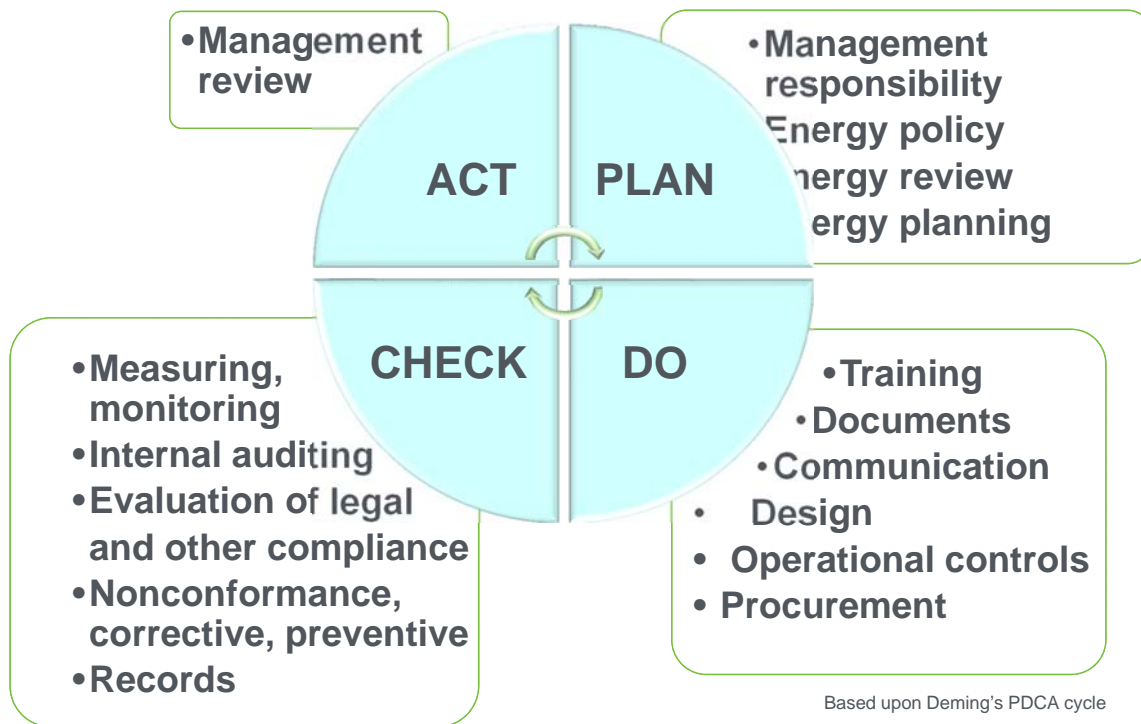
- Developed by ISO Project Committee 242; United States and Brazil lead effort with United Kingdom and China
- ISO PC 242 transitioned to TC 242, developing standards and guidance related to implementation of ISO 50001

Implementation of ISO 50001

- **Shifts the energy efficiency focus** from individual projects to a systematic, data-driven management approach
- **Requires top management to be engaged** on an ongoing basis.
- **Provides a context for informed decisions** concerning proposed energy efficiency projects, including new technologies.
- **Increases reliability of outcomes** through emphasis on business processes rather than reliance on a few individuals
- **Involves energy users and decision makers**, not just facility personnel and physical systems, to **sustain the change**.

Scope of energy management





5

Key Terms from ISO 50001

Energy Management System = EnMS

Energy Performance

measurable results related to [energy efficiency](#), [energy use](#) and [energy consumption](#)

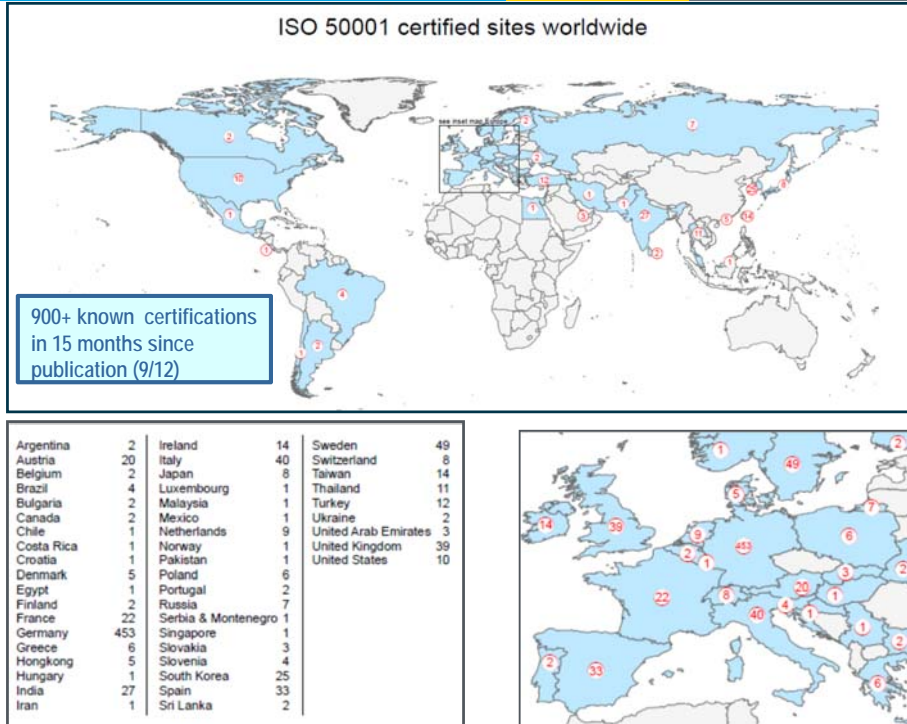
Energy Performance Indicator

EnPI

quantitative value or measure of energy performance, as defined by the organization

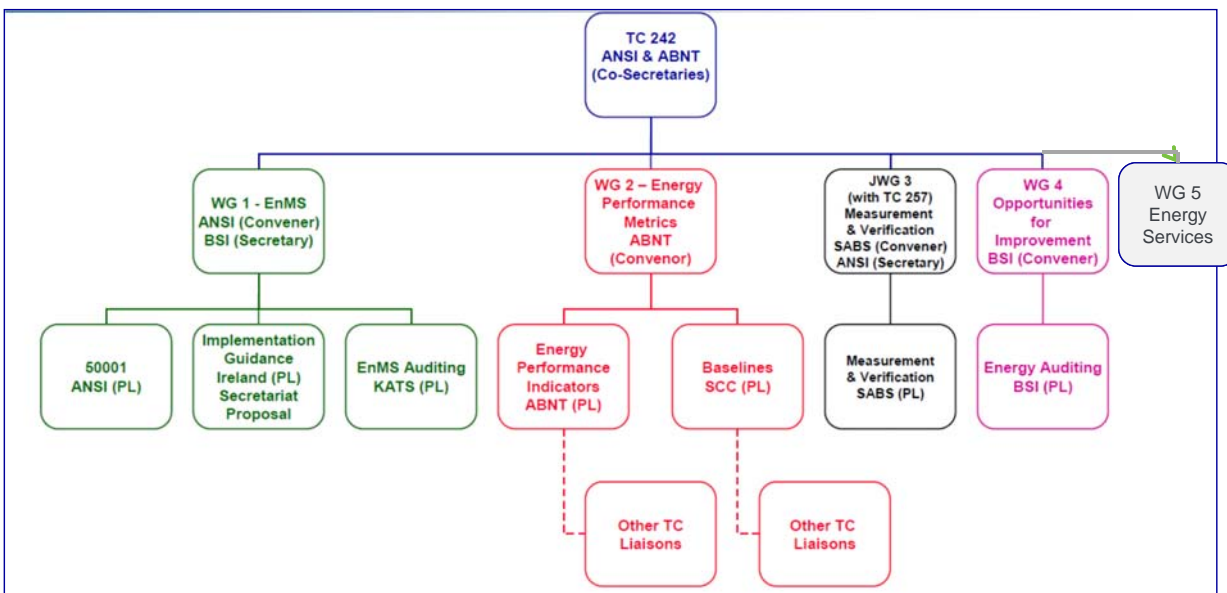
NOTE EnPIs could be expressed as a simple metric, ratio or a more complex model.

6



Source: Esri Data & Maps Sept 2012
German Federal Environment Agency, R. Peglau

ISO TC 242 Working Group Structure



Source: ISO TC 242 Draft Business Plan

WG 1 EnMS

- Project Team 1
CD for Comment - ISO 50004 Implementation Guidance
- Project Team 2
CD – ISO 50003 Energy Management System (EnMS Auditing)

WG 2 Energy Performance Metrics

- Project Teams for EnPIs and Baselines have combined their WDs to be released as a new WD 50006

JWG 3 Measurement and Verification

- CD- Measurement and Verification of Organizational Energy Performance

WG 4 Opportunities for Improvement

- CD ISO 50002 Energy Auditing

Chairman's Advisory Group

Task Group 1- Management System Standard (Guide 83)

Implementing ISO 50001

- Designed to be used independently, yet ***can be aligned or integrated*** with other management systems (e.g., ISO 9001 and ISO 14001).
- ***Certification is not required*** to benefit from use of ISO 50001
- ***Does not prescribe specific performance criteria or results*** with respect to energy.
- Needs ***enabling policies*** to realize its global potential for GHG emissions reductions
- Requires a ***skilled energy management workforce*** to implement the EnMS and conduct conformance audits



In the US, the enabling policy for ISO 50001 is called Superior Energy Performance^{cm}

Certification Requirements:

An ANSI/ANAB-accredited Verification Body will conduct a third-party audit to verify that the following requirements are met:

1. Energy Management System conformance to ISO 50001 Energy Management System Standard.
2. Energy performance improvement, as specified by pathway and sector



ISO 50001 is a foundational tool that any organization can use to manage energy.

ISO 50001

Components in place:

- Top Management
- Energy Team
- Policy
- Planning
- Baseline
- Performance Metrics



Superior Energy Performance

Single facility ISO 50001 conformance with verified energy performance improvement

ISO 50001

- Certified Partner OR
- Partner (Self declared)

SEP Performance Criteria for Certified Partners

Performance Characteristics		Silver	Gold	Platinum
Energy Performance Pathway	Energy Performance Improvement	Meets a specified energy performance threshold over the last 3 years:		
		5%	10%	15%
Mature Energy Pathway	Energy Performance Improvement	Meets 15% energy performance improvement threshold over the last 10 years.		
	Score on Best Practice Scorecard (out of 100 total points)	<ul style="list-style-type: none"> • At least 35 points • Minimum of 30 points for energy management best practices 	<ul style="list-style-type: none"> • At least 61 points • Minimum of 40 points for energy management best practices and 10 points for energy performance (<u>beyond</u> 15% over the last 10 years) 	<ul style="list-style-type: none"> • At least 81 points • Minimum of 40 points for energy management best practices and 20 points for energy performance (<u>beyond</u> 15% over the last 10 years)

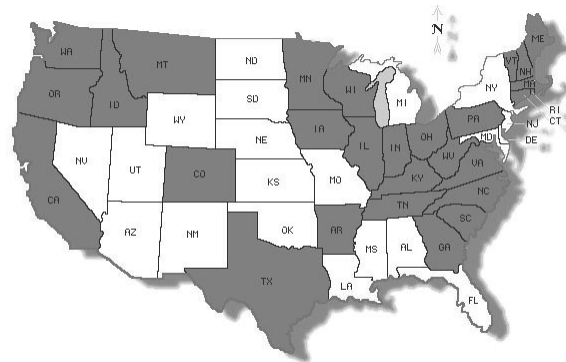
Superior Energy Performance: First Certified Partner Facilities

Facility Name	% Energy Performance Improvement	Performance Level
Volvo Trucks, NA <i>Dublin, VA</i>	25.8	Platinum
Dow Chemical Company <i>Texas City, TX: Manufacturing facility</i>	17.1	Platinum
3M Canada Company <i>Brockville, Ontario, Canada</i>	15.2	Platinum
Cook Composites and Polymers <i>Houston, TX</i>	14.9	Gold
Allsteel <i>Muscatine, IA</i>	10.2	Gold
Owens Corning <i>Waxahachie, TX</i>	9.6	Silver
Dow Chemical Company <i>Texas City, TX: Energy systems facility</i>	8.1	Silver
Nissan, NA <i>Smyrna, TN</i>	7.2	Silver
Freescale Semiconductor, Inc. <i>West Austin, TX</i>	6.5	Silver
3M Company <i>Cordova, IL</i>	6.2	Silver



Superior Energy Performance: Piloting & Demonstrations

States, regions, and utilities are partnering with U.S. DOE on Superior Energy Performance demonstrations with companies across the country. The program was initially piloted by five facilities in Texas from 2008-2010 using ANSI/MSE 2000:2008.

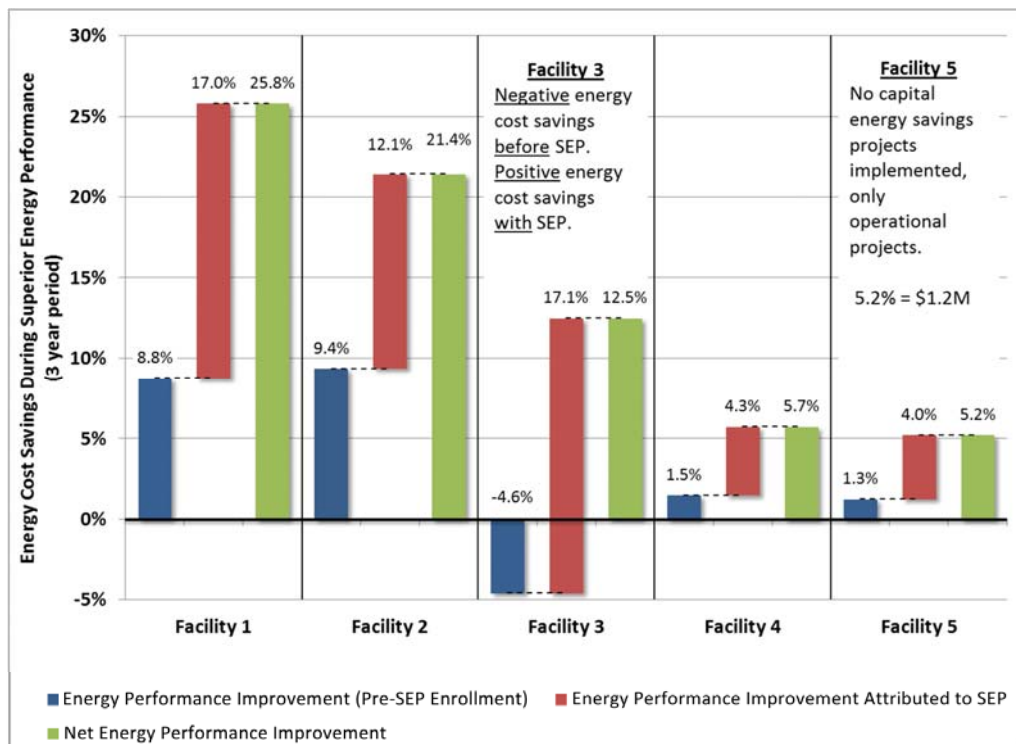


Industrial Participants:

- 3M
- Allsteel
- Amcor PET
- Ascend Performance Materials
- Bentley Prince Street
- Bridgestone Tire
- Coca-Cola
- CCP Composites
- Cooper Tire
- Cummins
- Curtiss-Wright Flow Control Company
- Didion Milling, Inc.
- Dixie Chemical
- Dow Chemical
- Eaton
- Freescale Semiconductors
- General Dynamics
- Gerdau
- Harbec Inc.
- Haynes International
- Ingersoll Rand
- Kenworth Trucks
- Land O'Lakes
- Lockheed Martin
- MedImmune
- Neenah Foundry Company
- Nissan
- North American Höganäs
- OLAM Spices
- Owens Corning
- Republic Conduit
- Schneider Electric
- Spirax Sarco
- UTC/Sikorsky
- United States Mint
- Volvo
- World Kitchen

<http://www.eere.energy.gov/industry/energymanagementdemonstrations/>

Impact on Energy Cost Savings for SEP-certified Industrial Facilities



Key Success Factors for Certifying to Superior Energy Performance

In addition to the general requirements of ISO 50001 facilities seeking SEP certification need to:

1. Establish EnMS Scope and Boundaries at the facility level that **include all energy sources**
2. Collect **data sufficient to establish a baseline year** (12 month period)
3. Establish significant energy uses that are **truly representative** of facility operations and energy consumption
 - Improve monitoring and measurement of these uses
 - Establish robust operational controls and training
4. Identify Superior Energy Performance Indicators (SEnPIs) to **accurately track improvements** in energy performance
5. **Document methodologies used** to support decisions made during the planning process

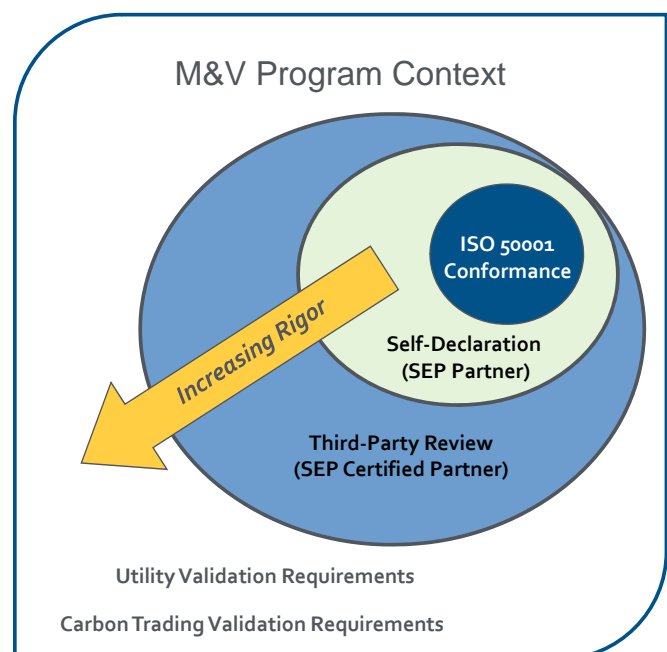
6. Prioritize and implement action plans / improve operational processes to **meet or exceed SEP energy performance improvement requirements**
7. **Track, report on, and evaluate the effectiveness** of action plans toward meeting energy performance improvement requirements
8. **Use sector-specific Measurement and Verification (M&V) Protocol** to determine SEP energy performance improvement
9. **Plan beyond the current certification cycle**- this is a long term commitment to re-certify every three years, not an isolated accomplishment
10. Prepare for a **third-party audit of both EnMS and energy performance**

ANSI MSE 50021- Superior Energy Performance — Additional Requirements for Energy Management Systems

Measurement and Verification (M&V) Protocol

Results for both SEP tiers are assessed using the **SEP Measurement & Verification Protocol for Industry**, which provides a methodology to:

1. Verify results and impact from implementation of energy management.
2. Track energy performance changes over time for the overall facility.
3. Document energy performance normalized to production.



Latest version available:

http://www.superiorenergyperformance.net/pdfs/SEP_MV_Protocol.pdf

- 10 facilities certified in U.S. pilots/demonstrations; 1 in Canada
Evaluating cost/benefits and other drivers of SEP:
 - Costs: Energy management system implementation, preparation for audit, consultants, metering, third-party audit.
 - Savings: Energy performance improvements ranging from 5% to 25% over three years
 - Other motivations by companies to implement SEP
- How to scale up Superior Energy Performance cost-effectively to more than 10,000 facilities?
Increase benefits/reduce cost of participation:
 - Developing a corporate-level certification
 - Developing self-declared tier (Partner)
 - Third party technical assistance through utilities, MEPs, and Certified Practitioners
- **e- Guide for ISO 50001** developed as a web-based tool to assist facilities in implementing ISO 50001 and preparing for Superior Energy Performance <https://save-energy-now.org/EM/SPM/Pages/Home.aspx>

Qualified Workforce

Training and skill are required for appropriate application of ISO 50001 and verification of conformance and resulting energy performance improvement. Superior Energy Performance is helping to build this workforce.

- **Certified Practitioners in Energy Management Systems (CP EnMS):**
Help facilities implement ISO 50001 and prepare for SEP certification
 - **ISO 50001 Auditor**
Perform third-party conformance audits to ISO 50001
 - **SEP Lead Auditors and SEP Performance Verifiers:**
Perform third-party audits to verify that a facility meets Superior Energy Performance requirements
http://www.superiorenergyperformance.net/certified_practitioners.html
- CP EnMS May 2012: Second class & exam
 - ISO 50001 Auditor National Exam
 - Institute for Energy Management Professionals (IENMP)
<http://www.ienmp.com/>
- **Certified Practitioner in Systems:**
Four planned- perform compressed air, process heating, pumping, or steam system assessments using ASME system assessment standards

GSEP Energy Management Working Group (EMWG) goal:

Implementation of an EnMS and ISO 50001 becomes common practice as part of continual improvement of energy performance in industrial and commercial facilities and companies.



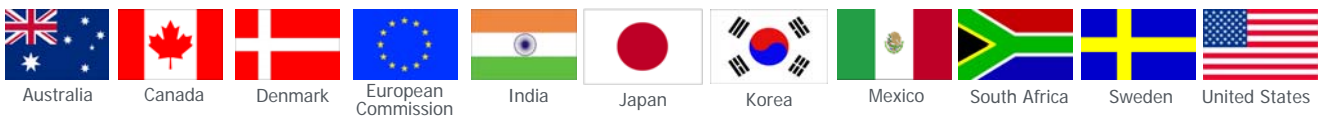
The Clean Energy Ministerial (CEM) is a high-level global forum to promote policies and programs that advance clean energy technology, to share lessons learned and best practices, and to encourage the transition to a global clean energy economy.

The GSEP EMWG is one of six working groups created through the CEM.

<http://www.cleanenergyministerial.org>

EMWG Strategic Objectives:

- 1. Energy Management:** Increase the implementation of energy management in the industrial and buildings sectors in order to improve energy efficiency and energy performance on an ongoing basis
- 2. Measurement and Verification (M&V):** Measure and verify energy performance improvements on a consistent basis
- 3. Qualified Workforce:** Build a qualified workforce of professionals with expertise in the fields of energy management, energy efficiency, and measurement and verification



Conclusions

Benefits of Superior Energy Performance

- ISO 50001 ensures that a facility has adopted the operational structure, systems, and practices to identify, prioritize, implement and measure the impacts of energy-saving projects on a continuing basis (to ensure persistence of energy benefits).
- Superior Energy Performance provides added value through third-party validation of a facility's use of the energy management system to actually achieve and sustain improved energy performance. Potential benefits:
 - Recognition from regional/national/international programs
 - Qualification for preferred supplier status and enhanced utility incentives
 - Positive public image with stockholders, customers and prospective employees
- Certified Practitioner credentialing increases energy management expertise in the workforce.



ISO 50001:

www.eere.energy.gov/energymanagement

Superior Energy Performance:

www.superiorenergyperformance.net/

Energy Management Demonstrations:

www.eere.energy.gov/industry/energymanagementdemonstrations/

Texas Pilot Program, Superior Energy Performance Case Studies:

www.superiorenergyperformance.net/texas_pilot.html