

# Accelerating Energy Management Globally

## ABSTRACT

Countries participating in the Global Superior Energy Performance (GSEP) Energy Management Working Group (EMWG) are leveraging their resources and taking collective action to strengthen national and international efforts to facilitate the adoption of energy management systems (EnMS) in the industrial and commercial building sectors. EnMS can help organizations potentially conserve 10%–40% of their energy use by institutionalizing the policies, procedures and tools to systematically track, analyze, and improve energy efficiency.

The EMWG harnesses the collective expertise of 11 member countries to provide assistance on policies and programs, advocate for energy management, and develop technical resources. Though national policies and programs to drive EnMS implementation vary, EMWG members are successfully collaborating on projects to build and improve the business case for energy management, workforce capacity, and measurement and verification. Each activity has the support of one or two country sponsors that provide strategic leadership and resources. This paper describes the activities of the EMWG.

## INTRODUCTION

### IMPORTANCE OF INDUSTRIAL ENERGY MANAGEMENT

Energy management represents a significant opportunity for organizations to reduce their energy use while maintaining or boosting productivity. The industrial and commercial sectors jointly account for approximately 60% of global energy use (EIA 2013). Organizations in these sectors can reduce their energy use 10% to 40% by effectively implementing an energy management system (EnMS) (IEA and IIP 2012; Duarte et al. 2011).

Companies in industry (as well as other sectors) can use energy efficiency as a business strategy to improve their competitiveness and also achieve societal environmental goals. However, barriers to energy efficiency include financial, technical, behavioural, organizational, and other challenges. As a result, organizations do not always consider energy efficiency to be a high priority compared to other business investments and often leave energy efficiency measures unimplemented (IEA and IIP 2012).

To help industry overcome these barriers, over forty countries working through the International Organization for Standardization (ISO) published the ISO 50001 EnMS standard in 2011. ISO 50001 builds on international best practices and provides guidelines for integrating energy efficiency into management practices—

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## GSEP Energy Management Working Group (EMWG)

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including fine-tuning production processes and improving the energy efficiency of industrial systems (McKane et al. 2009).

### GLOBAL SUPERIOR ENERGY PERFORMANCE

The Global Superior Energy Performance Partnership (GSEP) is an initiative of the Clean Energy Ministerial (CEM), a global forum for encouraging and facilitating the transition to a global clean energy economy, and the International Partnership for Energy Efficiency Cooperation (IPEEC). GSEP aims to significantly cut global energy use by encouraging the industrial and commercial buildings sectors to continually improve their energy efficiency.

GSEP's Energy Management Working Group (EMWG), the organizer for this paper, advocates the increased adoption of EnMS or ISO 50001 in industrial facilities and commercial buildings. Energy management programs can help countries meet their policy goals or targets for energy efficiency, energy security, economic growth, and climate change mitigation.

The 11 member countries of the EMWG include Japan, Sweden, and the United States as well as Australia, Canada, Denmark, the European Commission, India, Mexico, the Republic of Korea, and South Africa. These governments work collectively to strengthen the national and international efforts to make it easier for these sectors to adopt energy management as a key aspect of their operations.

### EMWG COLLABORATIVE APPROACH

The EMWG encourages active peer sharing among member countries on a broad range of relevant issues. The group provides diverse opportunities to present and discuss strategies, experiences, and best practices—inviting industry, non-government organizations (NGOs), and others to contribute as appropriate. The participating countries share their knowledge, experience, and insights to accomplish the following:

- **Advocate for energy management.** Build the business case for energy management to effectively communicate its diverse benefits for companies, communities, and countries.
- **Provide Support.** Provide guidance and resources to support implementation of energy management in GSEP countries. Develop and disseminate practical tools and resources to support and enable broad government and industry implementation efforts.
- **Set Policy.** Establish energy management as a key energy efficiency strategy for industrial and commercial buildings sectors. Offer stakeholders (governments, NGOs, etc.) technical support for their efforts to design, implement, and evaluate energy management policies and programs.

### GSEP EMWG Members

Eleven forward-looking governments actively participate in the GSEP EMWG to facilitate effective implementation of energy management systems.

- Australia
- Canada
- Denmark
- European Commission
- India
- Japan
- Mexico
- Republic of Korea
- South Africa
- Sweden
- United States

Though national policies and programs to drive EnMS implementation vary, the members of EMWG are working together on several projects with great success, including efforts to build the business case for energy management, prepare the workforce, and improve the accuracy and consistency in measuring outcomes. The EMWG has adopted a country-led approach to advance progress on activities. Each activity has the support of one or two country sponsors that provide strategic leadership and resources.

### Advocate for energy management

To gain management support for EnMS implementation, the EMWG is working to build the business case for EnMS by demonstrating that investing in an EnMS has a favorable payback.

### *EnMS Case Studies*

The EMWG is creating case studies that highlight the business value of EnMS implementation and cover range of companies across sectors, facility sizes, countries, government programs, and languages. Case studies will provide insights to companies considering EnMS and ISO 50001, such as the associated costs, demonstrated payback periods, implementation steps, keys to success, and lessons learned. The successes of early adopters will help the EMWG develop a compelling business case based on real-world data and experiences. Industrial companies and commercial buildings can then use the case studies to gain management support for EnMS implementation.

As of March 2014, the EMWG's collection of case studies now covers energy management investments and outcomes for six companies in Australia and the United States; additional case studies from other countries participating in the EMWG are anticipated. The four Australian case studies, which feature companies participating in the Australian Energy Efficiency Opportunities (EEO) Program, detail a range of methods used to increase energy productivity through energy optimization projects. The two case studies from the United States feature industrial facilities that have achieved certification through Superior Energy Performance, which requires implementation of an energy management system that is in conformance to ISO 50001 and achievement of an energy performance improvement, both of which are verified by a third party auditor. These two case studies each provide a detailed cost-benefit analysis for implementing and conforming to ISO 50001 and SEP requirements. For example, General Dynamics improved energy performance at its Scranton federal ammunition manufacturing facility by 11.9%, and achieved payback within 6 months. Nissan's Smyrna, Tennessee vehicle assembly plant, improved plant energy performance by 7.2% and saved \$938,000 each year, recouping its investment in SEP in only four months.

EMWG members produced a design template and content guidelines for use in developing these case studies, both of which are available to other governments

Case studies produced by the EMWG present the real-world data and experiences of early adopters who use EnMS to achieve savings.

and companies that are interested in collaborating with the EMWG to produce case studies to add to this portfolio.

### ***Energy Performance Database***

A robust dataset of EnMS implementation across multiple countries is needed. The Energy Performance Database (EPD) is a valuable tool that allows participating countries to gain a more detailed understanding of the drivers and barriers to effective energy management system (EnMS) implementation from sharing EnMS implementation data. Understanding these drivers and barriers can enable countries to refine their national programs and policies related to energy management.

Participating countries will submit data detailing EnMS implementation at organizations within their country. In time, the EPD will contain an array of information that will form a foundational tool to promote EnMS implementation and program and policy development as well as provide a source of valuable information on industrial energy use and consumption and the role of operational changes and technology upgrades in improving energy performance. Multiple layers of protection are employed to ensure the security and confidentiality of proprietary information within the submitted data.

Any government with national EnMS programs in place or company that has implemented an EnMS is encouraged to contribute data. Results and findings will be shared with contributors.

### **Provide Support**

To support implementation of energy management, the EMWG is developing tools to support and enable broad government and industry implementation efforts and to improve accuracy and consistency in measuring outcomes.

### ***EnMS Practitioner's Toolbox***

Many corporations want proven, cost effective tools that can be enacted in a timely manner to deliver immediate EnMS benefits. Currently under development in partnership with the Institute for Industrial Productivity, this online toolbox will contain a practical suite of proven and cost-effective tools, measures, and activities for companies to improve energy efficiency through effective energy management.

The EnMS Practitioner's Toolbox can increase the value of existing tools to both current and new users and provide leverage for accelerated implementation and substantial energy and carbon savings.

### ***Job-Specific Knowledge and Skills for EnMS Implementation***

To successfully capture the potential savings that an energy management system (EnMS) can offer, specific expertise is needed. Access to the skills of an experienced professional in energy management—whether staffed within a company or an external consultant—will result in more effective implementation of the EnMS and greater energy savings. The EMWG recognizes that countries

share similar challenges in preparing workforces to successfully implement and maintain an EnMS. Many governments have incorporated energy management requirements into their programs, while others have adopted EnMS standards such as ISO 50001. The EMWG prioritizes workforce development and training to help foster EnMS adoption in industry and commercial buildings.

GSEP conducted a multi-country analysis of the knowledge and skills currently covered in workforce programs for professionals engaged in energy assessment and energy management in Australia, Japan, Republic of Korea, South Africa, and the United States.

The report also identified relevant knowledge and skills for key personnel that can influence energy management decisions and that may be involved in the various steps of implementing EnMS. As examples, some of those positions include: Chief Financial Officers, sustainability officers, accountants and financial professions, Environment, Health and Safety (EH&S) professions, engineers, technicians, and tradespeople.

The recommended knowledge and skills in this report may impart guidance to workforce programs under development, generate opportunities for collaboration among developing or expanding training programs, facilitate greater consistency among existing professional programs, and increase awareness about the energy efficiency potential that can be achieved through skills programs. Ultimately, building skills in the workforce will help countries achieve their national energy efficiency goals.

(Also see “GSEP ISO 50001 Auditor Certification Scheme” on page 5.)

### ***Improve Accuracy and Consistency in Measuring Outcomes***

The measurement and verification (M&V) of energy performance improvements is an important method to determine and report on the value of an implemented energy conservation measure or project.

The EMWG has various activities to enhance M&V practices to promote successful implementation of EnMS, facilitate comparison of results across countries and companies, and improve the accuracy and confidence in reported EnMS implementation outcomes and energy savings:

**M&V Data Quality guidance document:** This document seeks to provide assistance and guidance to global M&V practitioners, resulting in increased stakeholder confidence in M&V data quality and more informed decision making when analyzing and interpreting measured or derived M&V data.

This document shares a recommended M&V data quality framework as well as guidance on determining the measures to report, M&V reporting format and reporting periods, definition of data quality, M&V approaches, data quality value versus cost, statistical methods, and uncertainty management.

The recommended knowledge and skills in the EMWG report aims to provide guidance for workforce programs, generate opportunities for collaboration, facilitate greater consistency, and increase awareness about the energy efficiency potential that can be achieved through skills programs.

This document does not seek to globally standardize data quality, issue prescriptive guidelines, or attempt to cover all of the M&V protocols and methodologies that may be used. Rather, the aim is to help make M&V reporting more comparable across the Global Superior Energy Performance Partnership (GSEP) countries and globally. International comparability of results not only enables countries to more effectively share results with one another, it also facilitates improved knowledge sharing regarding the challenges and successes a facility or country may have faced while implementing M&V. Accordingly, the target audience for this document includes all M&V practitioners within the GSEP countries, as well as the wider global M&V community.

**M&V Decision Tree:** The purpose of this document is to explain what is understood by the term M&V as it applies to efficiency demand side management (EEDSM) projects, explain the basic M&V process, where and when M&V fits into the EEDSM implementation process of projects, and provide a “roadmap” (methodology, process or decision tree) that can be used to develop consistent, impartial, reliable, and repeatable project-specific M&V plans to be used for credible and accurate reporting of savings.

Reporting savings which are deemed credible and acceptable is dependent on following appropriate M&V processes, as well as applying the correct protocol and methodology (combined forming the M&V plan).

**Energy Accounting:** When conducting M&V, the accounting of a facility’s energy consumption is dependent on different contexts that are often unclear in how to navigate. This activity will produce a report, largely in the form of a series of decision trees, to assist M&V practitioners in navigating EnMS measurements and energy accounting calculations. This project will help establish best practices to aid decision making, improve data collection consistency, and enable M&V results to be compared more easily across countries.

**International Approaches to Measurement and Verification:** The EMWG has conducted analysis to identify areas of commonality across the M&V documents and programs and has considered the challenges for developing standardized M&V documents. Understanding the context and constraints of the diverse existing approaches can help us move toward a common approach that will support and enhance their values.

This paper reviews a number of existing guidance documents from the six countries involved in the GSEP EMWG, in terms of how they address these M&V issues, what context they’re designed for, and what elements might be needed to extend them to address other contexts.

Issues that M&V needs to address to support an energy management program such as ISO 50001 include the following: defining boundaries for which improvement is to be measured, defining improvement metrics, creating appropriate baselines, determining what should be normalized for and how it

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should be done, reporting and potentially setting requirements for accuracy and reliability of data, specifying data quality requirements and accounting for total consumption across multiple energy sources.

### Set Policy

To establish energy management as a key energy efficiency strategy for industrial and commercial buildings sectors, the EMWG is working to elevate energy management in their own countries and around the globe. EMWG members have shared technical support for efforts to design, implement, and evaluate energy management policies and programs.

### ***GSEP ISO 50001 Auditor Certification Scheme***

This activity aims to produce a consensus-based, international certification scheme that supports greater consistency in ISO 50001 certification outcomes and demonstrates the value of EnMS business practices. The outputs of this activity include job task analyses, certification schemes, and general implementation principles for ISO 50001 Auditor and Lead Auditor. Countries will individually decide how best to implement the certification schemes in their country.

The ISO 50001 EnMS standard has a dual focus on the development of an energy management system (EnMS) and data-driven improvements in energy performance. This dual focus requires a set of skills in the business processes of a management system and the technical requirements of energy performance that are unique in the field of conformity assessment. Since global energy consumption represents the largest contributor to greenhouse gas emissions, effective and robust implementation of ISO 50001 has the potential to be a significant driver in efforts to reduce these emissions.

The EMWG is working to address the lack of skilled and trained personnel available to review an organization's EnMS. This activity focuses on the knowledge and skills needed to effectively conduct audits of organizations seeking certification to ISO 50001.

### ***EnMS Pilot Projects***

EMWG members are sharing best practices, resources, and protocols to conduct pilot projects, which have focused on EnMS implementation and measuring results with companies on a national level. Canada, the Republic of Korea, and the U.S. collaborated on a number of aspects of government program development and implemented EnMS pilot projects with facilities in each of their respective countries. In Canada, a two-year pilot supported by GSEP to implement EnMS resulted in a 15.2 percent energy performance improvement at a 3M manufacturing facility. The Republic of Korea completed the second stage of an EnMS Pilot Project involving 10 facilities that combine energy management with energy performance evaluation. In the U.S., 16 facilities are certified to Superior Energy Performance. Those facilities implemented an EnMS in

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conformance with ISO 50001 and improved energy performance between 5-25% over three years and 16-40% over ten years.

### CONCLUSIONS

Energy management systems help an organization institutionalize the policies, procedures, and tools to systematically track, analyze, and improve energy efficiency—leading to continual improvements in energy performance. EMWG members seek to promote broad use of EnMS worldwide by sharing knowledge and expertise, learning from each other and leveraging each other’s strengths. The EMWG prioritizes the activities described in this report due to their potential to accelerate energy management implementation in industry while maximizing the contributions of working group members, available resources, and outreach partnerships. Collectively, these efforts will help countries foster continual energy improvement in the industrial and commercial buildings sectors and help meet national energy and climate mitigation goals.

More information about the EMWG and its activities is available at:

[www.cleanenergyministerial.org/energymanagement](http://www.cleanenergyministerial.org/energymanagement).

### References

- Duarte, C., Acker, B., Grosshans, R., Manic, M., Van Den Wymelenberg, K., and C. Rieger. 2011. Prioritizing and Visualizing Energy Management and Control System Data to Provide Actionable Information for Building Operators. Paper presented at the Western Energy Policy Research Conference, Boise, ID, U.S.: August 25-26.  
[http://mhrgrg.if.uidaho.edu/papers/2011/WEPC11\\_DuarteAckerKevin\\_EMSSDataVisualisation.pdf](http://mhrgrg.if.uidaho.edu/papers/2011/WEPC11_DuarteAckerKevin_EMSSDataVisualisation.pdf)
- EIA (Energy Information Administration). 2013. *International Energy Outlook 2013*, DOE/EIA-0484(2013). Washington, DC: U.S. Department of Energy.  
[http://www.eia.gov/forecasts/ieo/pdf/0484\(2013\).pdf](http://www.eia.gov/forecasts/ieo/pdf/0484(2013).pdf)
- IEA (International Energy Agency) and IIP (Institute for Industrial Productivity). 2012. *Energy Management Programmes for Industry: Gaining through saving*. Paris, France: IEA Publications.  
[https://www.iea.org/publications/freepublications/publication/policy\\_pathways\\_industry.pdf](https://www.iea.org/publications/freepublications/publication/policy_pathways_industry.pdf)
- McKane, A., Desai, D., Matteini, M., Meffert, W., Williams, R. And R. Risser. 2009. *Thinking Globally: How ISO 50001 – Energy Management can make industrial energy efficiency standard practice*. Berkeley, CA: Lawrence Berkeley National Laboratory. <http://industrial-energy.lbl.gov/files/industrial-energy/active/0/rpt78616.pdf>