

# Large-scale adoption of energy management systems: global energy efficiency programme insights

## Background materials for the Public-Private Roundtable, CEM 4 Energy Management Working Group, 17-18 April 2013, New Delhi

The [Institute for Industrial Productivity \(IIP\)](#) works to achieve significant gains in industrial energy productivity, focusing on the countries and sectors that drive industrial demand and offer major opportunities for improvement in industry in China, India and the United States. IIP is conducting research on policies and programmes to accelerate corporate adoption of energy management systems (EnMSs). We have identified a set of smart policies and regulatory mechanisms to mobilise large-scale energy efficiency in industry, including those that can be carried forth through CEM public-private collaboration.

### KEY POINTS

- Systematic energy management is one of the most effective approaches to capture energy efficiency potential in industries. It equips companies with practices and procedures to identify and implement continuous energy efficiency (EE) improvement opportunities.
- Adopting an energy management system (EnMS), whether it be the ISO 50001 standard or a custom EnMS approach for a facility, can reduce costs, increase operational efficiency and productivity, and improve risk management. These achievements may also result in various other co-benefits such as reduced loss of materials.
- Companies such as DuPont, BASF, 3M and Dow Chemical have adopted an EnMS approach, increasing production and reducing energy use and greenhouse gas (GHG) emissions. For example, 3M Canada achieved a 15.2% energy performance improvement over two years.
- Some countries are mandating corporate adoption of EnMSs, while others are encouraging voluntary uptake by providing financial incentives and/or awards. Both approaches are typically coupled with support systems, capacity building and technical assistance from governments and third parties.
- Other players are also driving EnMS uptake. Third parties such as energy providers, multinational companies, multilateral and commercial banks, and industry associations around the world have started to initiate large-scale EnMS-oriented energy efficiency programmes.
- Meeting the imperative to reduce industrial energy consumption, however, requires large-scale mobilisation. Public-private collaboration can bridge the gap between vanguard initiatives and widespread industry adoption.

## INTRODUCTION

Encouraging results regarding the annual 1.7% decrease in industrial energy intensity in the past decades are counteracted by the annual 1.2% increase in energy demand.<sup>1</sup> Industrial energy use still accounts for roughly one-third of this global energy demand.<sup>2</sup> However, this year's IEA World Energy Outlook demonstrates that this sector still holds significant potential to decrease energy consumption.

Yet opportunities to improve energy efficiency remain severely underexploited. Although energy efficiency measures have repeatedly demonstrated their effectiveness in increasing company competitiveness and productivity, they have yet to attain mainstream recognition as a strategic investment in future profitability.

Energy management is gaining increasing attention among industry leaders who recognise the strategic potential of energy efficiency as a means to cost-effectively save energy, reduce GHG emissions and enhance energy security. Systematic energy management is indeed one of the most effective approaches to continuously improve energy efficiency in industries because it equips companies with practices and procedures to identify and implement new opportunities for improvement, and achieve energy-saving objectives on an ongoing basis.

When compared to selective measures (ad hoc energy management), continuous application of this process clearly reduces the energy-related costs of a company, as shown in figure 1 below.

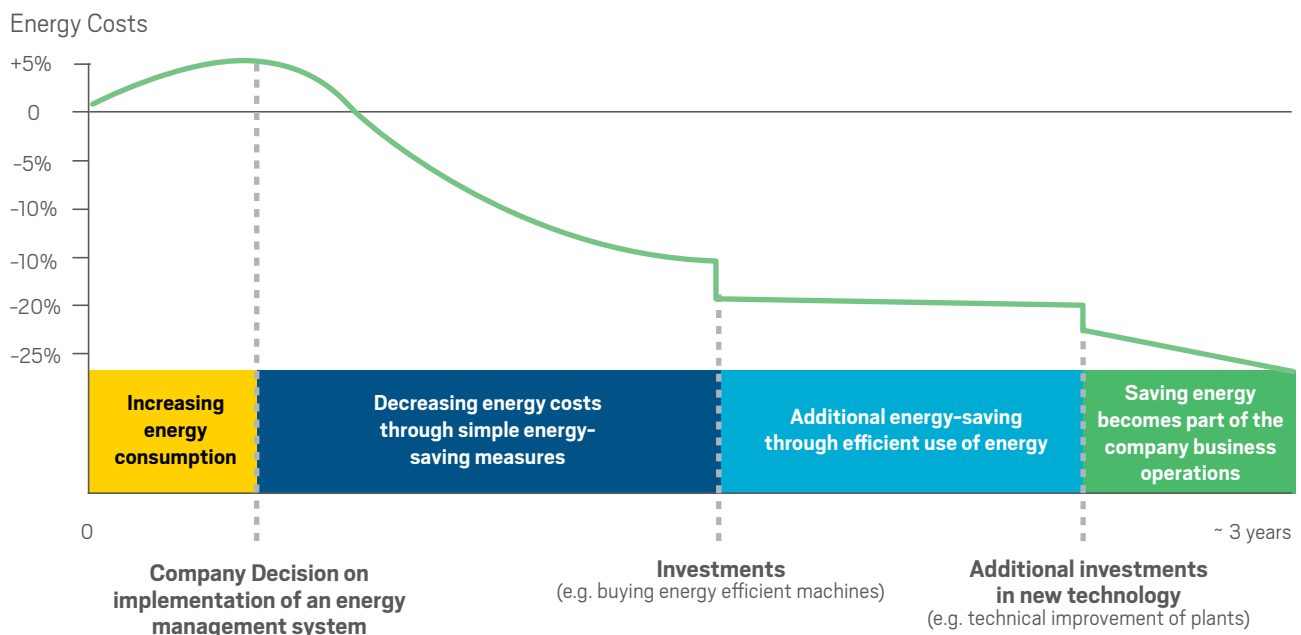
## WHAT IS ENMS?

An energy management system (EnMS) is a suite of procedures and practices to ensure systematic tracking, analysis and planning of energy use in industry. It enables companies to maximise energy savings and improve energy performance continuously through organisation and technology changes.

An EnMS typically includes:

- Energy policy and targets
- Cross-divisional management team with senior management support
- Baseline of energy use
- Energy review and planning process, identifying improvement opportunities
- Energy performance indicators
- Action plans, internal audit and third-party certification.

**FIGURE 1:** Continuous cost reduction from EnMSs



**SOURCE:** Kahlenborn et al. (2012), based on Lackner & Holanek (2007).

<sup>1</sup> While in recent decades industrial energy intensity has been decreasing at an average rate of 1.7% per year, energy demand is still expected to increase by at least 1.2% annually up to 2035. Source: IEA.

<sup>2</sup> Source: IEA.

## ENERGY MANAGEMENT SYSTEM BENEFITS

Industrial energy efficiency is achieved as much by changing how energy is managed as by installing new technologies. Organisations, large and small, can save energy by applying the same sound management principles and techniques used in relation to key resources such as raw materials and labour. These management practices must include full managerial accountability for energy use.

An EnMS enables continuous energy and cost reductions, which provide a competitive advantage in a global market, and identifies opportunities to adopt energy-saving technologies, including those opportunities that do not necessarily require capital investment.<sup>3</sup>

An EnMS is increasingly recognised as a means of overcoming informational, institutional and behavioural barriers to energy efficiency. For example, senior management and energy management staff are both involved in the execution of the processes and procedures called for in an EnMS, giving energy efficiency issues a higher profile and priority within the organisation.

An EnMS establishes a framework for industrial facilities to manage energy. The implementation of the identified energy efficiency measures in the industry sector can, however, be slow to materialise. In many cases, industry needs to be a participant in mandatory energy-saving programmes or be incentivised to fully realise the potentials.

## ENMS RESULTS

Industries that adopt energy management practices may save up to 10–30% of their total energy use. Companies including Dow Chemical, United Technologies Corporation, 3M, St Marys Cement and Toyota have achieved major energy-intensity improvement using EnMSs. Achieving the international ISO 50001 standard for EnMSs has also provided companies with an internationally recognised response to sustainability and energy efficiency issues. Worldwide, 1530 industrial sites are certified under the ISO 50001 standard (according to the so-called “Peglau Statistics”, Status: 02.2013).

## STRATEGIES TO ENABLE LARGE SCALE ADOPTION OF ENERGY MANAGEMENT AND SUBSEQUENT TAKE UP OF OPPORTUNITIES

The two main complementary strategies identified to mobilise large-scale adoption of energy management in industry and trigger uptake of energy efficiency improvement opportunities include:

- Government-led energy management programmes, which mandate or directly encourage companies to implement EnMS practices and to invest in identified energy savings;
- Private-sector initiatives, which drive the uptake of EnMSs in industry and stimulate industry decision makers to take action.

### 1. GOVERNMENTAL ENERGY MANAGEMENT PROGRAMMES

Several countries around the world are now promoting EnMSs as a viable means of reducing energy consumption. Lessons learned from those countries show that government-led energy management programmes are most effective when planned and implemented as part of broader, legislated industry requirements or energy efficiency agreements between industry and government, coupled with a carefully designed mix of incentives and support systems. Encouragingly, energy savings resulting from the adoption of EnMSs far exceed what companies had been able to achieve with the agreements alone.

While many countries may have formally adopted standards for EnMSs through their national standardisation bodies,

<sup>3</sup> Dow Chemical achieved a 22% improvement between 1994 and 2005 (USD 4 billion savings) and is seeking an additional 25% between 2005 and 2015. United Technologies Corporation reduced global GHG emissions by 46% per dollar of revenue from 2001 to 2006. Toyota's North American Energy Management Organisation reduced energy use per unit by 23% since 2002; companywide energy savings efforts have saved USD 9.2 million since 1999 (Scheihing, 2009). Following adoption of the international standard ISO 50001 for energy management, St Marys cement in Canada gained an 8% absolute reduction in energy operating costs over five years, amounting to savings of \$C 1 million in total operating costs per year. Similarly, the 3M Canada Brockville plant achieved a 15.2% improvement in energy-intensity over two years.

including the international ISO 50001 standard, far fewer have integrated EnMSs (standardised or not) into mandatory or voluntary government energy-saving programmes. Countries that have integrated EnMSs into government programmes, or are planning such integration, include Australia, Brazil, China, Denmark, Finland, Germany, Ireland, Republic of Korea, the Netherlands, Sweden, the United Kingdom and the United States, as illustrated in table 1 below.<sup>4</sup>

**TABLE 1:** Selected countries with energy management programmes

| Country     | Programme Name   | EnMS type                | Voluntary Mandatory | Certification | Drivers                              |
|-------------|--|--------------------------|---------------------|---------------|--------------------------------------|
| Australia   | Energy Efficiency Opportunities                        | EEO Assessment Framework | M                   | No            | Public reporting of EE opportunities |
| China       | Top 10,000 Enterprise Programme                        | GB 23331                 | M                   | Voluntary     | Mandatory                            |
| Denmark     | Energy Agreements Programme                            | ISO 50001                | V                   | Yes           | Tax Rebate                           |
| Ireland     | Energy Efficiency Opportunities                        | ISO 50001                | V                   | Yes           | Extensive technical support          |
| South Korea | GHG and Energy Target Management scheme                | ISO 50001                | M                   | Yes           | Mandatory                            |
| Sweden      | Energy Efficiency in Energy Intensive Industries (PFE) | ISO 50001                | V                   | Yes           | Tax Rebate                           |
| USA         | Superior Energy Performance                            | ISO 50001                | V                   | Voluntary     | Awards, possible tax rebate          |

A combination of drivers, incentives and support mechanisms is also an integral part of government-initiated energy management programmes. Typical support for EnMSs includes:

- financial incentives (such as tax relief),
- recognition programmes,
- ease of access to information (best practice, exchange and co-operation schemes, networking, implementation guidelines, etc.) and
- technical tools (support to carry out energy audits, development of technical energy profiles, benchmarking tools).<sup>5</sup>

Support mechanisms such as these address specific barriers, such as lack of capacity, finance and limited access to technical know-how. They also contribute toward building the skills of the energy management workforce.

Governments can also play an important role in establishing a framework to stimulate uptake of EnMSs by promoting the creation of new business opportunities in the area of energy services. In addition to building the EnMS capacity of companies, government energy management programmes are often coupled with capacity building and technical assistance for third parties (including EnMS certification bodies).

### QUESTIONS FOR DISCUSSION:

- What type of government policies and support structures are required to promote successful EnMS adoption and to encourage industry to develop their own initiatives?
- What support structures can help third parties (such as energy service companies) and industry to deal with issues such as technology selection, lack of capacity and finance?

<sup>4</sup> Source: <http://www.iipnetwork.org/databases/programs>.

<sup>5</sup> Small and medium enterprises (SMEs) usually have limited resources and capacity, and so may need additional capacity building, support and/or financial assistance, relative to the needs of larger enterprises.

## 2. ALTERNATE AND COMPLEMENTARY CHANNELS TO DELIVER CORPORATE ADOPTION OF ENMS

Other players are also driving EnMS uptake, driven by different needs and/or motives (see table 2 below). Energy providers, multinational corporations, multilateral and commercial banks, and industry associations around the world have started to initiate large-scale energy efficiency programmes that have EnMSs at their heart. Such programmes stimulate companies to adopt EnMSs and invest in energy savings for the reasons mentioned in table 2 below:

**TABLE 2:** Delivery models for EnMS implementation

| Delivery Models                               | Drivers for Players to Develop EnMS Programmes (examples)   | Drivers for EnMS Adoption by Companies   |
|---|---|--|
| Supply Chains (large corporations)            | <ul style="list-style-type: none"> <li>Enhance company's reputation</li> <li>EnMS can be used by all industrial players, large and small</li> <li>Government support by allowing companies to meet their energy efficiency obligations by engaging their value chain</li> </ul> | <ul style="list-style-type: none"> <li>Buying power of the large company</li> <li>Cost savings</li> <li>Possible implementation support</li> </ul> |
| Utility Programmes (utility or third parties) | <ul style="list-style-type: none"> <li>Improve the utility's customer relations</li> <li>Strategy to improve reliability and availability of power supply at a lower cost than supply resources</li> <li>Regulatory requirements for energy efficiency</li> </ul>               | <ul style="list-style-type: none"> <li>Sustainable source of financing</li> <li>Technical assistance</li> </ul>                                    |
| Financial Institutions                        | <ul style="list-style-type: none"> <li>Increase number of deals and project finance</li> <li>Help assess the risks and returns of EE projects</li> <li>Reduce investment risk</li> <li>Improve and enhance customer relations</li> </ul>  | <ul style="list-style-type: none"> <li>Lower loan transaction costs</li> <li>Blending technical assistance with financial products</li> </ul>      |
| Industry associations                         | <ul style="list-style-type: none"> <li>Provide valuable service to member companies</li> </ul>  | <ul style="list-style-type: none"> <li>Sharing of information</li> <li>Possible implementation support</li> </ul>                                  |

### ENMS AND SUPPLY CHAIN INITIATIVES

To mobilise energy efficiency on a large scale, corporations are initiating activities beyond their own walls, with their supply chains. These so-called “supply chain initiatives” (SCIs) are company-based programmes, whereby companies (i.e. buyers) work with supply chain partners to encourage or support them to save energy and/or reduce GHG emissions. These initiatives are driven principally by the need to foster the buyer company's reputation and credibility, and to respond to public, consumer and investor concern about opaque and complex supply chains involved in production of consumer goods.

Buyers are employing a number of different approaches to influence and motivate suppliers. These approaches range from mandating energy or emissions savings and energy audits, to monitoring and reporting of supplier emissions and procurement requirements, to partnership approaches that include a wide spectrum of collaboration and support activities. For example:

- Ford requires/encourages supplier implementation of the environmental management standard ISO 14001.
- Prorail, in charge of the rail network in the Netherlands, uses a preferential purchasing strategy (using the “CO2 Performance Ladder”) that gives a weighted preference to supply chain partners that achieve superior energy and GHG performance.





- IKEA has launched a supplier development programme, which works to improve supplier's performance across a range of sustainability criteria, including energy efficiency.
- Under Walmart's Supplier Energy Efficiency Program, Walmart covers the cost of energy audits if the energy efficiency opportunities identified through these audits are implemented.
- The Home Depot partnered with third party Intertek to work with 29 supplier factories in China. Intertek provides capacity building involving on-site energy assessments, and identification and implementation of energy-saving measures.

In the context of energy management, SCIs have the potential to drive and accelerate effective energy management practices across a broad business base. Companies are indeed taking interest in energy management systems (EnMSs) as one approach in engaging suppliers to continuously make cost savings and increase efficiencies across their value chains. While EnMS supply chain approaches are in the early stages of development, several initiatives are already emerging. For example, SKF requires all of its suppliers classed as "energy intensive" to be ISO 50001 certified by 2016, while Hewlett-Packard has piloted the implementation of the Chinese EnMS standard GB 23331 in selected supplier factories in China and Taiwan.

## ENMS AND UTILITY ENERGY EFFICIENCY OBLIGATIONS

Utility energy efficiency obligation (EEOs) programmes, also known in North America as energy efficiency resource acquisition (EERA) programmes, seek to encourage utilities or designated third parties, such as an energy services company, to deliver energy savings in customer premises, often through financial or technical assistance. In most programmes, energy efficiency services and projects are primarily funded with money collected by utilities from end-use consumers. These funds may be collected through a special system benefit charge, or as an imbedded part of overall tariffs. This method provides a secure and stable source of funding.

While such programmes have traditionally focused on the residential sector, utilities or third parties have begun to expand their services to the industry sector. Furthermore, programmes are also beginning to expand beyond technical assistance and financial incentives for simple technology/capital retrofit, and towards more comprehensive programmes with training and support on specific energy management approaches.



Utilities and third parties are now considering EnMS training and implementation assistance as part of their core programme offerings to industry. This is the case for the Energy Trust of Oregon (ETO), which has an EnMS at the heart of its programme offering and provides an example for how EnMS adoption can be brought to scale by industrial customers with only high-level government oversight. EnMS implementation is not mandatory for enterprises, but they are motivated to manage their energy use because of the cost savings and productivity gains that it provides.

Utility programmes can further encourage EnMS implementation by linking its adoption to specific incentives. In a U.S. state, a utility has teamed up with a third party (an energy and verification consultancy) to pilot the U.S. Superior Energy Performance (SEP)<sup>6</sup> programme with its customers. To achieve a SEP award, companies are required to implement the international EnMS standard ISO 50001. In this specific case, the utility has tied ISO 50001 adoption to financial incentives. Once specific milestones relating to EnMS implementation have been achieved, companies are eligible for direct financial incentives, as outlined in table 3:

<sup>6</sup> SEP is a voluntary certification programme that provides industrial facilities with a roadmap for achieving continuous improvement in energy efficiency. The programme is based around the EnMS standard ISO 50001, which provides a transparent, globally accepted system for verifying energy performance improvements and management practices. Several levels of awards (silver, gold, or platinum) are delivered to companies depending on the energy performance achieved.

**TABLE 3:** Milestones and incentives in utility EnMS programme

| Milestones Achieved                       | Certification Path Incentives (required for enterprises >2,000 MWh/yr) |
|---|--|
| Energy Action Plan approved               | \$7,500  |
| Certification readiness Report issued     | \$7,500  |
| ISO 50,001 certification received         | \$7,500  |
| Superior Energy Performance certification | \$7,500  |

**SOURCE:** Klaus (2012).

## ENMS AND FINANCIAL INSTITUTIONS

International financial institutions have been active in helping companies to identify energy efficiency opportunities, promoting corporate EnMS adoption and addressing the lack of availability of finance for energy efficiency investments in industry. By leveraging the power of banks to encourage companies to adopt EnMS, ongoing and growing energy efficiency savings can be expected as companies take up energy efficiency projects that are closely integrated into their investment and financing decision-making processes.

Models that blend financing with technical assistance and energy management systems capacity building are beginning to emerge. The leader in this area is the European Bank for Reconstruction and Development (EBRD), which has developed internal technical capacity to make energy efficiency assessment part of its standard loan evaluation process. EBRD promotion of EnMS to its customers (they offer both capacity-building assistance and financing for monitoring equipment and analytical software) has become increasingly important as EBRD's financing for energy efficiency and climate change has grown from 4% to over 30% of its loan portfolio in the past ten years. Every euro of EBRD's EE technical assistance produces EUR 1000 of energy efficiency investments.

Another example of this approach is the Global Environment Facility (GEF)-funded programme, Energy Efficiency Market Transformation, which is running from 2010 to 2015 in Russia. In this programme, EBRD and the United Nations Industrial Development Organization (UNIDO) jointly work to develop effective business models for energy efficiency finance and to promote EnMS adoption in industry. EBRD provides support to larger enterprises, while UNIDO focuses on small to medium-sized enterprises (SMEs) and policy support.

As part of this programme, specific implementation support for industrial companies provided by EBRD includes:

- Technical assistance and capacity building to industry chief financial officers (CFOs) to develop bankable EE projects (i.e. investment-grade EE projects that lenders deem are viable to finance).
- Implementation of EnMSs compatible with the ISO 50001 within large industrial companies. This implementation includes intensive on-site training, energy audits, system assessments and the development of energy efficiency investment plans.

## ENMSS AND INDUSTRY ASSOCIATIONS

Industry associations can also play a role in initiating large-scale energy efficiency programmes that have EnMSs at their heart. For example, in the United States Pacific Northwest, the largest industry trade organisation, the Northwest Food Processing Association (NWFPFA), introduced a voluntary collaborative EnMS framework to its the 100+ members. Partnering with an

energy service provider, the Northwest Energy Efficiency Alliance (NEEA), this collaborative framework convenes company leadership and action around common energy reduction goals.

Food processing companies are encouraged to implement EnMS, funded by utilities that are mandated to save energy in their customers' premises. NEEA's role in this effort is to convene government, enterprises and utilities to provide industry wide education on EnMS practices, and assist with the implementation of this energy management programme across an entire industry.

Aggregating energy saving efforts through NWFPFA allows an entire industry – as opposed to individual enterprises – to apply resources toward a unified energy reduction goal – sharing in the risk, efficiency and energy savings potential and adoption of EnMSs as an ongoing business practice.

In 2009, NWFPFA member enterprises set a ground-breaking industry wide energy intensity reduction goal of 25% in 10 years, and 50% in 20 years. NWFPFA was the first U.S. industry wide association to commit to this goal, and signed a pledge with the U.S. Department of Energy.

#### QUESTIONS FOR DISCUSSION:

- How can manufacturing companies encourage EnMS adoption in smaller and less-experienced companies, including within their own supply chain?
- What is the role for sector associations in implementing EnMSs and in encouraging leading companies to help smaller and less-experienced companies?
- What sources of stable funding, an essential element of all successful EE programs and industrial EE investments, are available?
- How can financial institutions, particularly government and multi-lateral development banks and export financing agencies be induced to routinely integrate EnMSs and other energy efficiency considerations into their lending?
- Can government guarantees facilitate financing of SMEs in supply chain initiatives?







## ISSUES FOR DISCUSSION

Despite this global push for EnMSs, encouraging widespread adoption remains a challenge. Participants at this round table session will be asked to look at the key design elements of large-scale energy management programmes – initiated by both government and other players – and to discuss whether public-private collaboration can further help achieve scale in promoting corporate adoption of EnMSs.

Governments can play an important role in establishing a framework to promote uptake of EnMSs by developing methodologies and tools, promoting the creation of new business opportunities in the area of energy services and integrating energy efficiency considerations into official sources of finance. Yet a variety of actors with different incentives and priorities are implementing energy efficiency programmes.

- **Support structures:** What is the best way to ensure that programmes encouraging the adoption of energy management systems meet the needs of industry and address EnMS implementation barriers?

Traditionally, encouraging EnMS adoption and energy savings has been the role of governments, which have targeted a specific group of companies directly (i.e. large energy users or energy-intensive industries). The involvement of other actors, such as energy providers, industry associations and large corporations, who can leverage a broader base of industrial companies, may, however, drive widespread uptake. Efforts to encourage corporate supply chain energy management are now receiving governmental attention/support. Similarly, utilities (energy providers) and third parties, mandated by governments, have been providing sustainable sources of technical expertise and funding.

- **Public-private collaboration:** What types of public-private (PP) collaboration can encourage other players to complement governments' efforts? How can the private sector work with governments to help strengthen energy management programmes?

A significant amount of work is being undertaken at the international level on industrial energy efficiency and energy management. For example, the Global Superior Energy Performance (GSEP) Energy Management working group, the Energy Management Action Network (EMAK), the United Nations Industrial Development Organisation (UNIDO) and the Institute for Industrial Productivity (IIP), with complementary remits, all provide some level of assistance and focus on the adoption energy management.

- **International collaboration initiatives:** How can synergies across these different organisations' activities and initiatives be captured, with the aim to better optimise resources and deliver more cost-effective and targeted energy efficiency outcomes? How can a coordinated international collaboration effort help the national PP collaboration efforts?

## REFERENCES

- Goldberg A., E. Holdaway, J. Reinaud, & S. O’Keeffe (2012). Promoting energy savings and GHG mitigation through industrial supply chain initiatives. Institute for Industrial Productivity.
- IEA (2012). World Energy Outlook. Paris: OECD/IEA.
- Kahlenborn W., S. Kabisch, J. Klein, I. Richter, & S. Schürmann (2012). Energy management systems in practice, ISO 50001: A guide for companies and organisations. Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and Federal Environment Agency (UBA).
- Klaus, C. (2012). Pilot program for implementation of energy management systems. DNV KEMA. Presentation to the eceee Industrial Summer Study. Arnhem, Netherlands. 14 September, 2012.
- Lackner, P., & N. Holanek (2007). BESS-Handbook: Schritt für schritt. Anleitung zur einföhrung von energiemanagementsystemen. Wien.
- McKane, A. (2011). Inputs provided.
- Mey, J. (2011). “How can we facilitate the introduction of energy management systems (EnMS)?”. European Council for an Energy Efficient Economy.
- McKane, A., D. Desai, M. Matteini, W. Meffert, R. Williams, & R. Risser (2009). Thinking globally: How ISO 15001 – Energy management can make industrial energy efficiency standard practice.
- Reinaud, J., A. Goldberg, & V. Rozite (2012). Energy management programmes in industry – Gaining through saving. IEA Policy Pathway Series. Paris: OECD/IEA.
- Reinaud, J., & A. Goldberg (2011). The boardroom perspective: How does energy efficiency policy influence decision making in industry? Paris: OECD/IEA.
- Scheihing, P. (2009). “Energy management standards” (webcast). U.S. Department of Energy.
- Taylor B., D. Trombley, & J. Reinaud (2012). Energy efficiency resource acquisition program models in North America. Institute for Industrial Productivity.

## FURTHER READING

- Reinaud, J., A. Goldberg, & V. Rozite (2012). Energy management programmes in industry – Gaining through saving. IEA Policy Pathway Series. Paris: OECD/IEA.
- Kahlenborn W., S. Kabisch, J. Klein, I. Richter, & S. Schürmann (2012). Energy management systems in practice, ISO 50001: A guide for companies and organisations. Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and Federal Environment Agency (UBA).