

# **Achieving Sustainable Energy Efficiency in Industry through Energy Management Standards**

**Aimee McKane,  
Lawrence Berkeley National Laboratory**

Workshop on International Standards to Promote  
Energy Efficiency and Reduce Carbon Emissions

OECD Conference Centre, Paris

16 March 2009

# Agenda



- Policy context- industrial energy efficiency
- Purpose of an energy management standard
- Global overview of energy management standards and specifications
- Benefits and results
- Examples of enabling policies and programs
- Energy management standards in China

# Why Industrial Energy Efficiency?



- Represents more than *one-third* of both global primary energy and energy related carbon-dioxide emissions<sup>1</sup>
- For developing countries, this is often in excess of *50%* of the total and can produce supply problems
- Developing economies lead growth in both industrial energy use and carbon-related emissions
- It is much more cost-effective to build in energy efficiency the first time than retrofit it later
- In industry, a missed opportunity for energy efficiency may not reoccur- *for decades or at all* until the original installation fails or becomes obsolete

<sup>1</sup> Price, et al 2006

- China initiated plan to reduce energy use 20% per unit of GDP over 2005 levels by 2010- focus on Top 1000 industrial enterprises.
- Energy efficiency is now a major focus of G-8 meetings and is recognized by the International Energy Agency as a primary source of short-term GHG emission reductions.
- International Organization for Standardization (ISO) is initiating a broad portfolio of initiatives to promote energy efficiency, including ISO 50001.
- UN Industrial Development Organization is promoting systems energy efficiency and energy management standards for both developed and developing nations.
- Through the Asia Pacific Partnership, the U.S., Australia, Korea, Japan, China, and India are promoting greater industrial energy efficiency.



# What are Industry's Priorities?



## Current

1. Stay profitable
2. Operate a safe workplace
3. Be compliant with environmental regulations
4. Meet legal and social responsibilities
5. Monitor supply chain for potential liability

## Emerging

6. Manage GHG emissions, carbon footprint



# Why an Energy Management Standard?



- Most energy efficiency in industry is achieved through changes in *how energy is managed* in an industrial facility, rather than through installation of new technologies;
- An energy management standard provides a method for integrating energy efficiency into existing industrial management systems for continuous improvement;
- All existing and planned energy management standards are compatible with ISO 9000/14000<sup>1</sup>;
- Companies who have voluntarily adopted an energy management plan (a central feature of an EM standard) have achieved major energy intensity improvements<sup>2</sup>.
- Also applicable to commercial, institutional, and transportation sectors

<sup>1</sup> International Organization for Standardization (ISO)

<sup>2</sup> Btu/lb of product

# Energy Management Results



- Companies who have used energy management to achieve major energy intensity improvements include:
  - Dow Chemical** achieved 22% improvement (\$4B savings) between 1994 and 2005, and is now seeking another 25% from 2005 to 2015
  - United Technologies Corp** reduced global GHG emissions by 46% per dollar of revenue from 2001 to 2006, and is now seeking an additional 12% reduction from 2006 to 2010
  - Toyota's** North American (NA) Energy Management Organization has reduced energy use per unit by 23% since 2002; company-wide energy-saving efforts have saved \$9.2 million in NA since 1999.

Implementation of an energy management plan assists a company to:

- Develop a baseline of energy use
- Actively managing energy use and costs
- Reduce emissions without negative effect on operations
- Continue to improve energy use/product output over time
- Document savings for internal and external use (e.g. emission credits)



[www.ansi.org](http://www.ansi.org)

## Current Status

- Several countries already have national energy management standards (Denmark, Ireland, Sweden, US, Thailand, Korea)
- The EU has nearly completed work on a regional energy management standard, prEN 16001
- Energy management standards are under development in China, Spain, and Brazil
- ISO has initiated work on an international energy management standard (2008-2011), with preparatory assistance from the United Nations Industrial Development Organization (UNIDO)

# Existing Energy Management Standards

Participating Countries	Management Commitment Required	Develop energy management plan	Establish energy use baseline	Management Appointed Representative	Establish Cross-Divisional Implementation Team	Emphasis on Continuous Improvement	Document Energy Savings	Establish Performance Indicators & Energy Saving Targets	Document & Train Employees on Procedural/ Operational Changes	Specified Interval for Re-evaluating Performance Targets	Reporting to Public Entity Required	Energy Savings Externally Validated or Certified	Year Initially Published	Approx Market Penetration by Industrial Energy Use
<i>Existing</i>														
<b>Denmark</b>	yes	yes	yes	yes	yes	yes	yes	yes	yes	suggests annual	yes	optional <sup>1</sup>	2001	60% <sup>2</sup>
<b>Ireland</b>	yes	yes	yes	yes	yes	yes	yes	yes	yes	industry sets own	yes	optional <sup>1</sup>	2005	25%
<b>Japan<sup>3</sup></b>	yes	yes	yes	licensed	implied	yes	yes	yes	yes	yes, annually	yes	yes	1979	90%
<b>Korea</b>	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes, annually	optional	optional <sup>4</sup>	2007	data not yet avail
<b>Netherlands<sup>5</sup></b>	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	optional <sup>1</sup>	2000	20-90% <sup>6</sup>
<b>Sweden</b>	yes	yes	yes	yes	unclear	yes	yes	yes	yes	yes <sup>1</sup>	yes	optional <sup>1</sup>	2003	50%elect
<b>Thailand</b>	yes	yes	yes	yes	implied	yes	yes	yes	yes	industry sets own annual recomm	yes	evaluation plan	2004	not known <sup>7</sup>
<b>United States</b>	yes	yes	yes	yes	yes	yes	yes	yes	yes	annual recomm	no	no <sup>8</sup>	2000	<5% <sup>8</sup>
<i>Under Development</i>														
<b>CEN (EU)</b>	yes	yes	yes	yes	implied	yes	yes	yes	yes	industry sets own	national schemes	national schemes		
<b>China</b>	yes	yes	yes	yes	yes	yes	yes	yes	yes	industry sets own	not avail	not avail		

1 Certification is required for companies participating in voluntary agreements (also specified interval in Sweden). In Denmark, Netherlands & Sweden linked to tax relief eligibility.

2 As of 2002, latest date for which data is available

3 Japan has the Act Concerning the Rational Use of Energy, which includes a requirement for energy management

4 Korea invites large companies that agree to share information to join a peer-to peer networking scheme and receive technical assistance and incentives

5 Netherlands has an Energy Management System, not a standard, per se, developed in 1998 and linked to Long Term Agreements in 2000.

6 800 companies representing 20% of energy use have LTAs and must use the Energy Management System. The 150 most energy intensive companies, representing 70% of the energy use, have a separate, more stringent, bench marking covenant and are typically ISO 14000 certified, but are not required to use the EM System.

7 Thailand has made the energy management standard is mandatory for large companies, linked it to existing ISO-related program activities, coupled with tax relief; program evaluation not yet available

8 To date, the US government has encouraged energy management practices, but not use of the standard. A program was initiated in 2008 to address this which also includes validation; program evaluation results anticipated in 2011.

NOTE: National standards and specifications were used as source documents to develop this table

Source: McKane, 2007 as updated by the author in 2008

# Supportive Policies for National Energy Management Standards



- In countries with existing standards:
  - Energy management standards are voluntary<sup>1</sup>
  - Programs target large industrial plants
  - Technical assistance is available
  - Case studies are used to publicize benefits
  - Recognition provided for outstanding performers
- In addition, most countries:
  - Offer financial incentives for compliance, usually as part of a target-setting agreement<sup>2</sup>
  - Provide training on standards compliance
  - Provide opportunities for companies to network and learn from each other
  - Several countries also offer system optimization training

1 Mandatory for targeted companies in Thailand

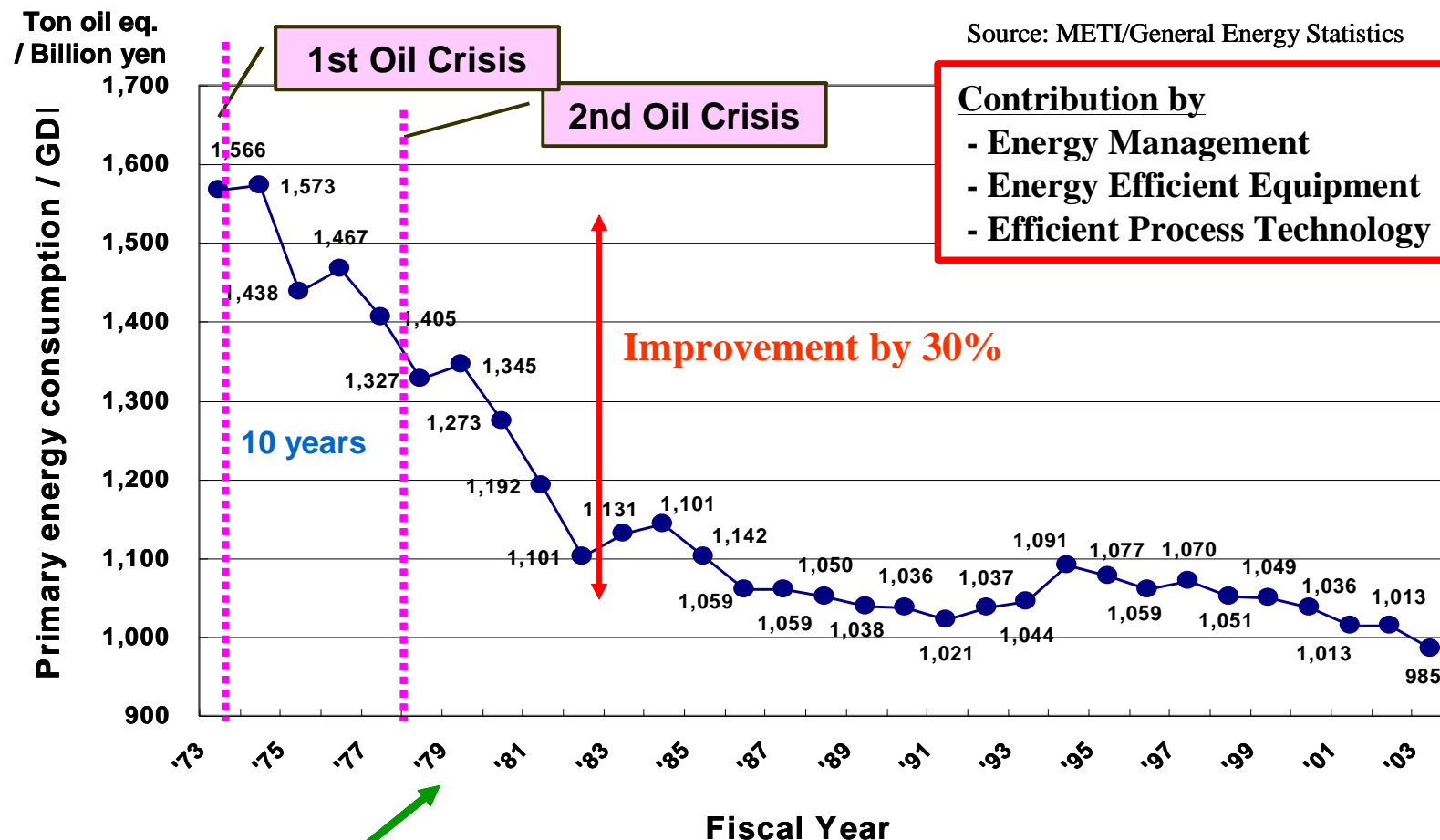
2 typically energy or carbon dioxide tax relief

# Energy Efficiency Policies in Japan



Source: METI/General Energy Statistics

- Contribution by**
- Energy Management
  - Energy Efficient Equipment
  - Efficient Process Technology



**1979 : Legislation of the Energy Conservation Law (the Law Concerning the Rational Use of Energy)**

**Amendment : 1983 (1<sup>st</sup>) 1993 (2<sup>nd</sup>) 1998 (3<sup>rd</sup>) 2002 (4<sup>th</sup>) 2005 (5<sup>th</sup>)**



# China's National Standards of Management System for Energy

Li Tienan,

China National Institute of Standardization

## Main concept of MSE series of standards



- ❑ MSE standards specify the requirements & guidance to provide a systematic way for an organization to develop and implement energy (energy saving and energy efficiency) policies and objectives
- ❑ Based on clear objectives, responsibilities, procedures and resources, the organization implements MSE by PDCA (Plan-Do-Check-Action) approach
- ❑ Recommendation on use low cost and no cost methods, practical energy saving techniques and best practices
- ❑ Guidance on launching internal and/or external energy audit, MSE review, MSE internal audit and the third part audit

# Key concerns of MSE series of standards



## Core Orientation

- ❑ To develop China's national standards and to implement national wide
- ❑ To develop a serials of MSE standards based on China's experiences and try to co-operate with other countries

## Harmonization with other management system standards

- ❑ ISO 9000 series standards
- ❑ ISO14000 series standards

## Focus on implementation

- ❑ Combine MSE requirements with guidance for performance
- ❑ Focus on specified industry, Especially for guidance



# China MSE Standards Framework



## The series of China MSE standards including:

- Management System for Energy: Requirements
- Management System for Energy: Guidelines for performance

# Key References



- GB/T19000: Quality management Systems-Fundamentals and Vocabulary
- GB/T19001: Quality Management System - Requirements
- GB/T24001: Environmental management systems-Requirements with guidance for use
- National laws & regulations, and standards regarding energy consumption measurement, audit, etc. For example:
  - a) GB/T17166-1997 General Principles of Energy Audit on Industrial and Commercial Enterprises
  - b) GB/T17167-2006 General Principle for Equipping and Managing of the Measuring Instrument of Energy in Organizations of Energy Using

# Progress Update



- China National MSE standard : “GB/TXXXX Management system for energy—Requirements” was finalized by the end of late year. It will be formally published and enforced soon in China.
- China is planning to develop a parallel national standard on MSE: “GB/TXXXX Management system for energy—Guidance for use”

# Ongoing Projects



- Development of implementation guideline of energy management system for key industries (Including iron and steel sector and cement sector);
- Promotion of Application and Demonstration Projects of Energy Management System Standard in Enterprises — Development of Serialized Implementation Guides of Energy Management System (including Thermal Power and Synthetic Ammonia Industries)



## For more information

**Aimee T. McKane**  
**Lawrence Berkeley National Laboratory**  
**P.O. Box 790**  
**Latham, NY 12110**  
**USA**  
**518 782 7002**  
**[atmckane@lbl.gov](mailto:atmckane@lbl.gov)**

**<http://industrial-energy.lbl.gov/>**