

# **INDUSTRIAL ENERGY EFFICIENCY POLICIES IN JAPAN**



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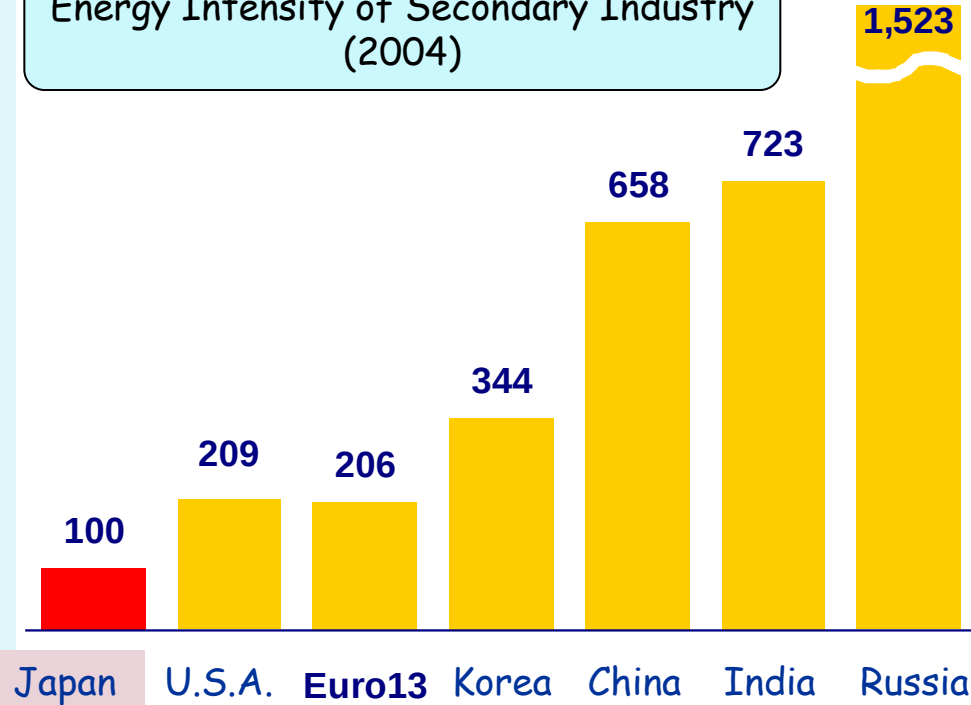
**30 September 2011**

**Paris**

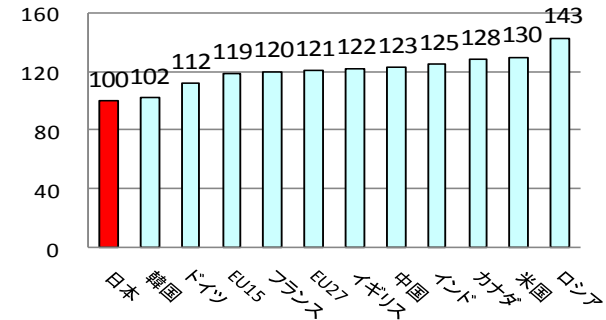
**IEA-EEP Policy Pathway on Energy Management Programmes WS**

# Japan's EE of Manufacturing is among the top

Energy Intensity of Secondary Industry  
(2004)

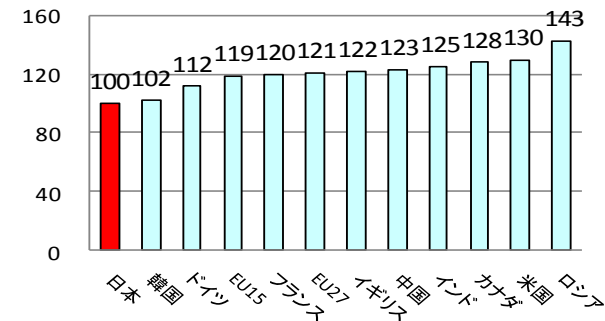


Index of Steel Production Energy Intensity



(Source: IEA「Energy Technology Perspectives 2008」)

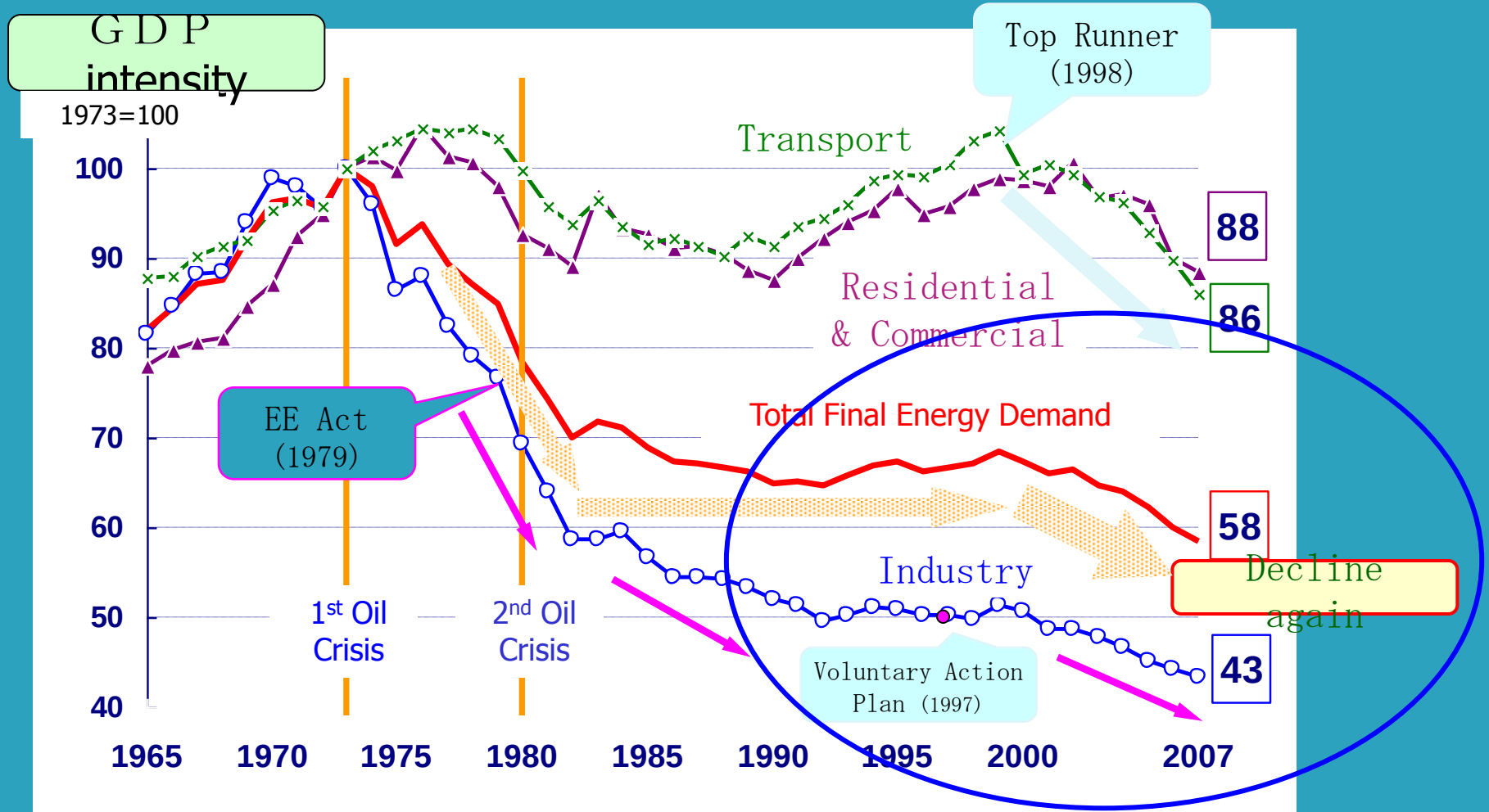
Index of Clinker Production Energy Intensity



(注) クリンク：セメントの製造過程でできる  
中間製品  
(Source: Estimation based on RITE Model (2005))

Japan's manufacturing industries are among the top level of the world in Energy Efficiency.

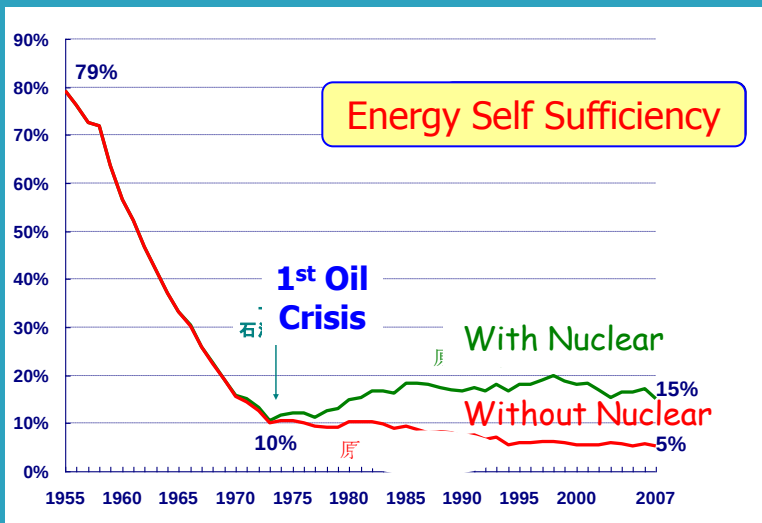
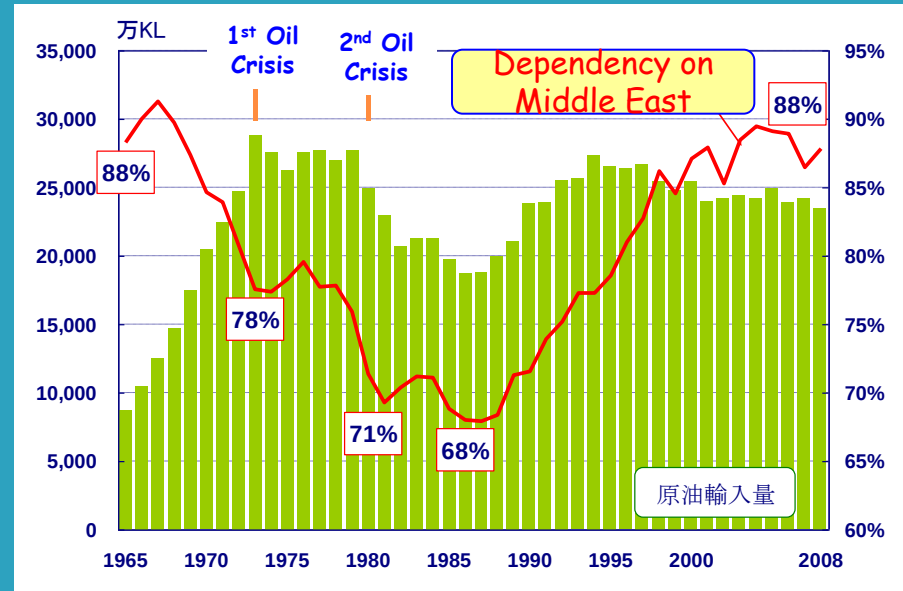
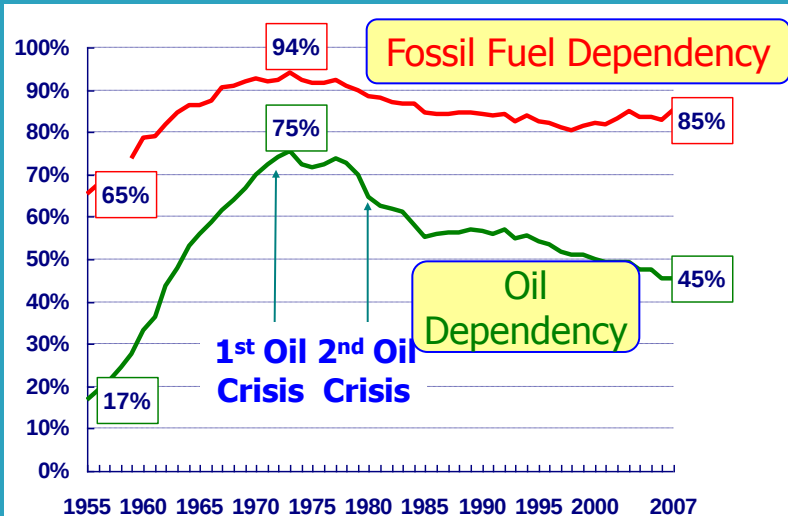
# Huge EE Improvement in Industry Sector



**Energy Efficiency** improved notably in the industry sector after the oil crises bringing energy intensity of GDP down by 40%. On the other hand, intensity of **Residential & Commercial** and **Transport** Sectors increased even after 1973. Thus the overall intensity did not improve much.

But EE improvement effort continues because (2):

# Energy Supply Security is Never ENOUGH



- **Oil dependency** declined but is still about **50%**. Dependency on **fossil fuels** is more than **80%**.

- Japan used to supply 80% of energy use with domestic coal and hydro power in 1950's. With shift towards imported oil and closure of domestic coal mines, **self sufficiency** dropped rapidly. It remains **low at 5%**.

- Dependency on **middle east oil** started to increase again after mid 80's and it is close to **90%**.

# EE Driving Forces for Industry Sector

## Energy Management (EM) and Technology

- **Energy Conservation Act (1979)**  
EM Designated Factories → Plan, Exercise and Report on EE
- Financial Support to Invest on EE Technologies (subsidies, tax reduction, etc.)
- Technology R&D (Collaboration by Government, Industries, Academics)

## Energy Price Hike

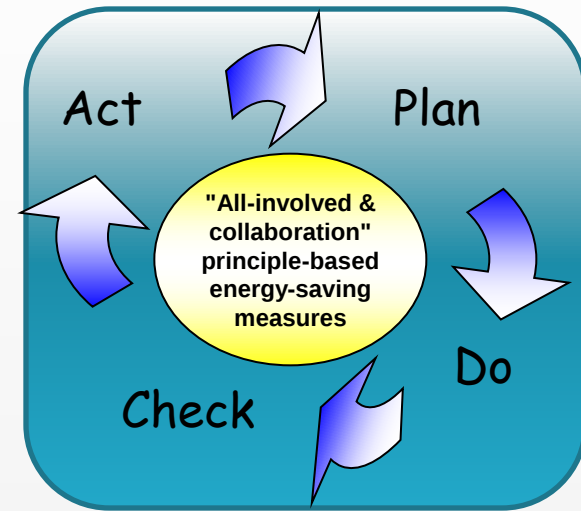
- Powerful incentive for EE&C
- Oil Crises → Challenge for Survival for business sectors

## Corporate Responsibility

- **CSR (Corporate Social Responsibility)** → Top Management's Responsibility
- **Keidanren Voluntary Action Plan (1997~)**

# Spirit of Energy Conservation Act (ECA)

- Based on **Heat Management Act** (1947)
- To encourage "autonomous effort" of EE&C as "cost effective" measures.
- 2 important factors :
  - Prepare a Energy Management (EM) system within each industry which allows "Plan-Do-Check-Act" cycle to function to improve EE autonomously while maintaining productivity.
  - Set EE as the basic rule of action for corporate activities.
- 4 major tools prepared:
  1. **Energy Manager** as a national certificate scheme
  2. **Nomination** of "energy managers" within the factories and offices to conduct EM.
  3. Establishment of **EM system** to monitor and report on EE&C.
  4. Making **Top Management** responsible for EE&C.



現場力 on-site experts' wisdom and skills are the KEY

# Main challenges for EC Act (prior to 2008)

- Manufacturing sector have **exhausted** cost-effective EE potential while Commercial (building) sector's energy consumption is **increasing**
- SMEs do not have enough knowledge and means for EE improvement
- There is no defined indicators (intensity) even for material industries (Iron & Steel, Cement, Paper & Pulp, Chemical) to see how much EE has been done and how much more is possible, etc.
- Those industries which have taken early actions and have exhausted EE potential ask for exemption from the annual 1% EE improvement target. But how to compare companies of same industry and give credit to the more advanced ones in terms of EE.
- A **transparent** and **fair** process is required to compare indicators on energy efficiency improvement effort.

# The Latest Change in EE Act (2010 April-)

- Introduction of comprehensive EM by business enterprises → Wider coverage (headquarter office of manufacturing, branch offices, smaller factories, etc.)
- Continuing regulation for big users (factories that use more than a certain amount of energy) with new tool.  
→ Introduction of Benchmark
- Each franchise chain in its entirety will be regulated as a single business. → Wider coverage (restaurants, convenience stores)
- Top management are made responsible to oversee EM.  
→ Swift Decision Making and robust EM system

# Basic Rules of Regulation (Factories and Offices)

Further promotion of Energy Management by introducing the new obligation:

-Obligation to Report Annually on:

- ① Transition of **Energy Intensities**
- ② Status of EE measures
- ③ **Benchmark Indicator** status

Penalty such as “Instruction”, “Announcement”, “Order” (“Fine” for disobeying order) when the status of the EE activities is considerably insufficient.

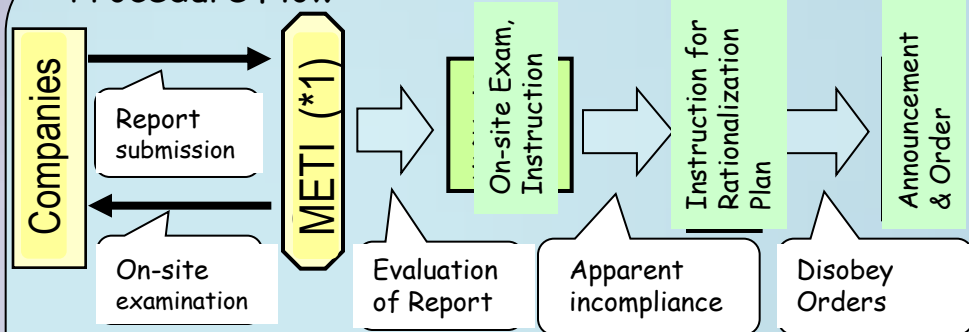
Universal Target: **1% annual improvement**

New Target: **Benchmark Indicators** and its **Target Level** are added to the universal target.

Designated sectors: **Steel, Electricity, Cement, Paper & Pulp, Oil Refinery, Chemical**

Target Level: The level which **top 10-20%** efficient firms achieve.

## Procedure Flow



(\*1) 100 officers METI central and local office combined. ※Disobedience to Order will be Fined

## Fact about “Energy Managers”

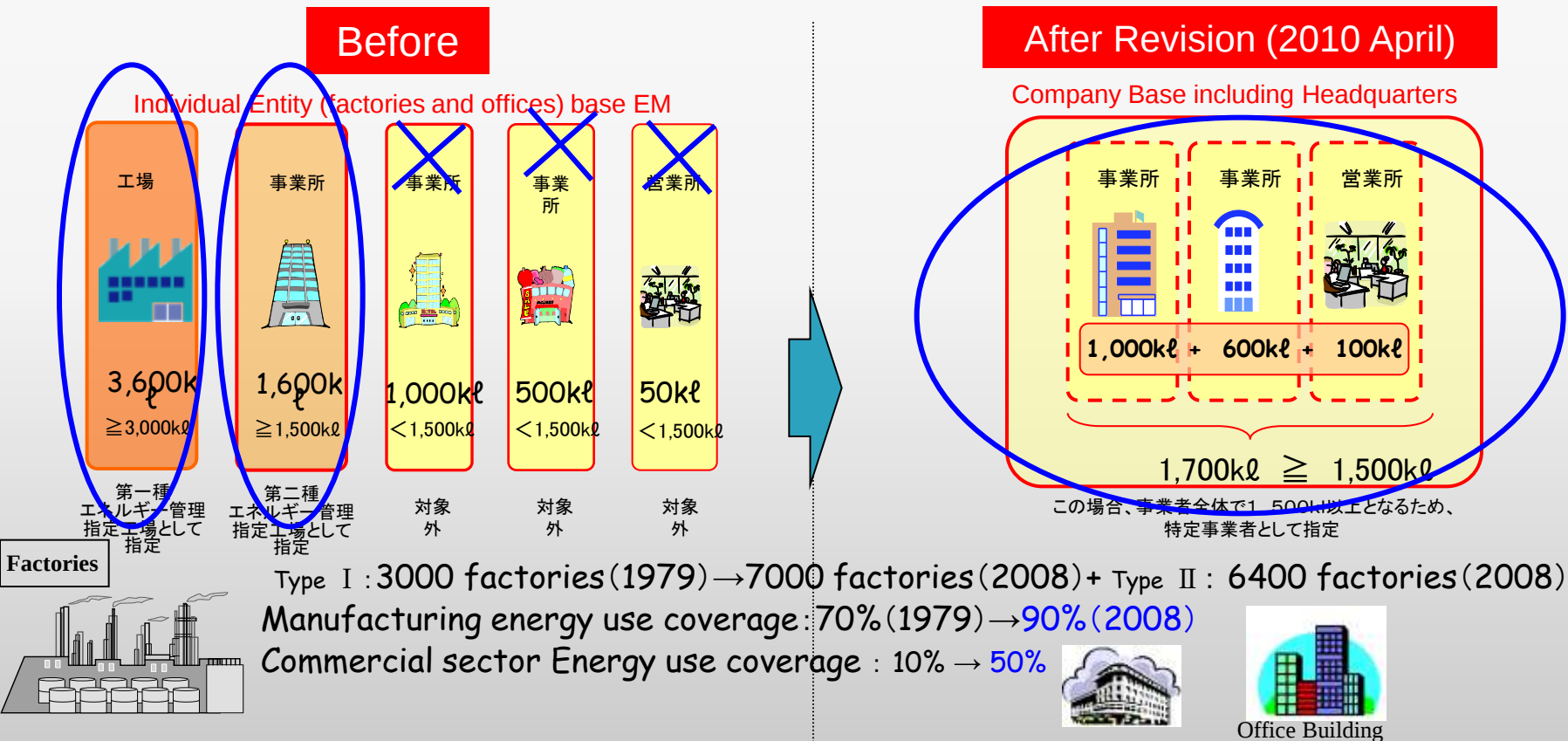
- Key Experts who are nominated and empowered to make EM plans, instructions to the workers and oversee EM within designated enterprises.
- National Certificate is required to become EMs under Japan's EC Act.
- For **5,800** designated factories, there are over **50,000** certified energy managers. Industries and enterprises have encouraged their employees to pass the exam of national certificate to strengthen EE skills of the workers.

- Obligation to appoint **Energy Manager (s)**

Big factories with more than 3,000kl energy consumption are designated and obligated to appoint EMs.

# Wider Coverage by Regulating Company level (factories, headquarter, branches)

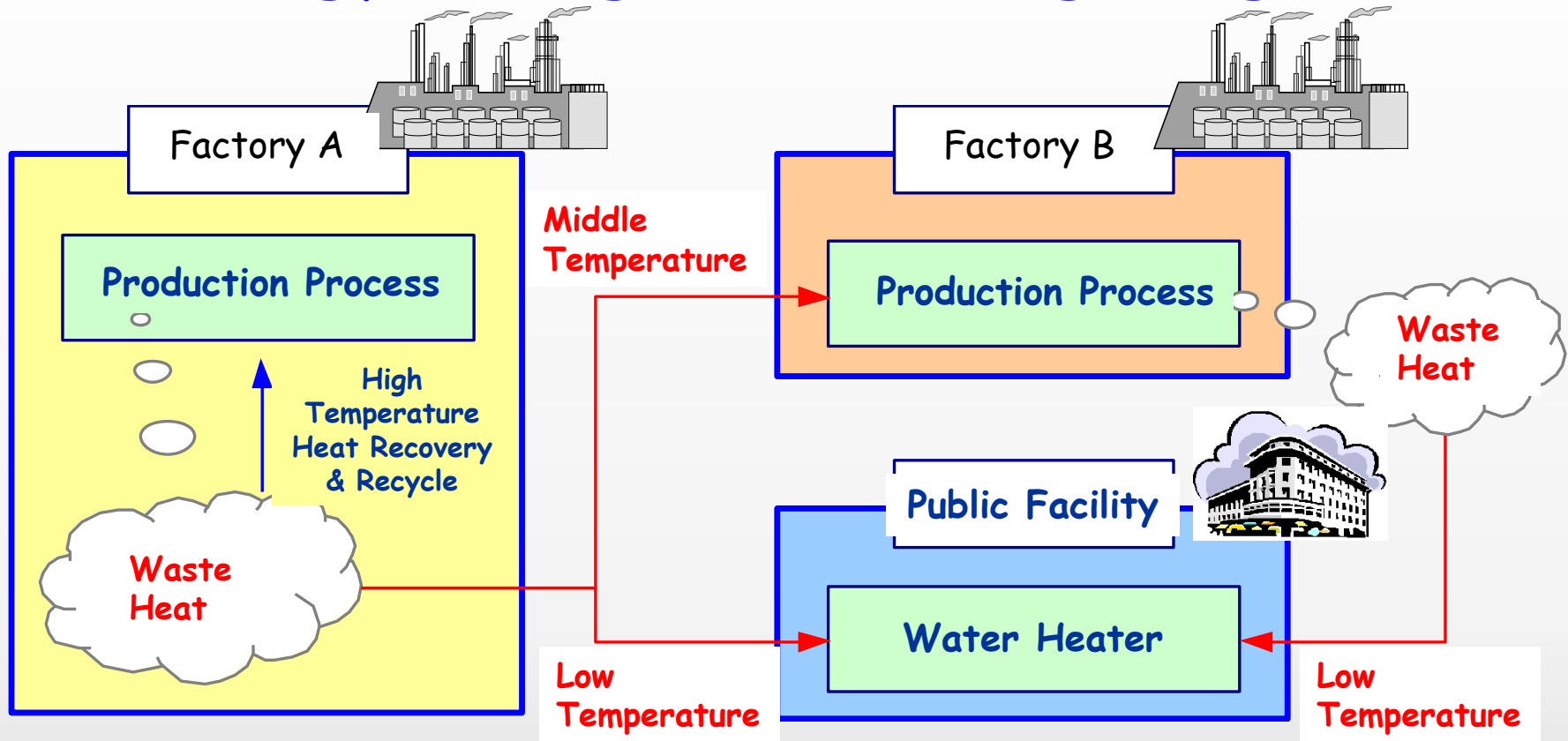
- **Business enterprises** who use more than 1500 kl (crude oil base) of energy in their factories are designated by the government as specific businesses.
- Each **franchise chain** in its entirety will be regulated as a single business and those with more than 15 million kl (crude oil base) of energy as a whole are designated as specific chain businesses.
- Obligation includes, formulation of **a medium- to long-term plan**, periodic **reporting** per business, appointment of **energy management supervisor** (top management class), etc.
- **Individual factories and offices** which use more than 3000 kl (Class 1) and more than 1500 kl (Class 2) **remain designated** entities and reporting and other obligation will continue to be in place.



# Why Benchmark?

- **Common evaluation standard** (benchmark) for principal sectors was required to enable **fair comparison** of the **EE status** among industries.
- Publication of **average, variance** and **best practices** will give **clear guidance** for other industries **to improve** their own EE status.
- Designated industries set common operation/production boundary, agreed on common intensity and collected data to estimate and define "**benchmark**". (by industries and by production categories)
- Those who have taken **early actions** now have ways to prove it with defined intensity and will be **excused from** meeting the ambitious target of **annual 1% improvement**.

# Joint Energy Management among Neighbors



- For manufacturing, "How to **recover** and **recycle** waste heat generated from energy use" is a key to a big **potential** for EE improvement.
- **Collaboration** with **neighboring** factories and facilities is effective

# Conclusion

Energy management is a “powerful tool”.

- ❖ The recent experience of power shortage in greater Tokyo Area proved that individual companies and factories could **move fast** and **adjust** daily operation with **flexibility** based on well **informed** knowledge of **daily EM**.
- ❖ More **targeted policy making** is required as potential for EE improvement gets exhausted.
- ❖ **Wider collaboration** is required **across** the **country** and **beyond** industrial **boundaries** to further utilize EE potential.
- ❖ Sharing **best practices domestically** and **internationally** can strengthen the efforts **globally**.

THE END

Thank you for your attention.

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# Benchmark Discussion

- Benchmarking was discussed for 3 years and will continue on commercial buildings.
- **Definition** is required on boundary, appropriate indicator, how to weight among different industries to estimate average, etc.
- **Chemical industry** faced challenge because of the expected shift towards higher value added from basic products with a big variety in product lines.
- **Assembling industries** could not agree on universal benchmark because of variety of products and difficulty in defining representative devisor (activity data) including values (added value, sales value, etc.)
- **Petroleum refineries** introduced integration index to consider level of integration as an important factor for refinery benchmark.
- **Individual data** are **not disclosed** because of confidentiality but overall average and variance will be announced for benchmarks.

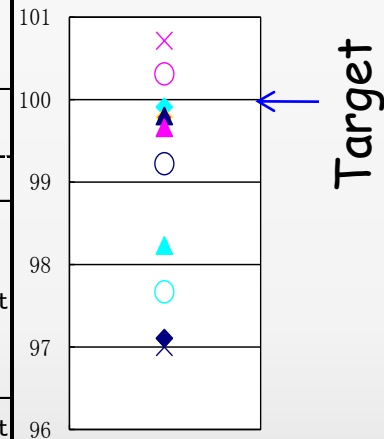


# Benchmark defined in 2009

- **Regulation** based on sectoral approach introduced for the first time in the world.
- Each designated sector must :
  - define "**Benchmark Indicator**" to enable comparison among manufacturers on their energy intensities ... and
  - set the "**Target Level**" of the benchmark indicator for mid/ long term.

|                                      | Benchmark                                                                                                                                                                                                                                                                                                                                          | Target          |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Blast furnace (BF)                   | Energy Consumption/crude steel production                                                                                                                                                                                                                                                                                                          | under 0.531kl/t |
| Electric arc furnace (EAF) : Regular | (Energy consumption for iron manufacturing /crude steel production)+(Energy consumption for rolling process/rolled steel production)                                                                                                                                                                                                               | under 0.143kl/t |
| Electric arc furnace (EAF) : Special | (Energy consumption for iron manufacturing /crude steel production)+(Energy consumption for rolling process/shipping volume)                                                                                                                                                                                                                       | under 0.36kl/t  |
| Power generation (Thermal Power)     | (1)Thermal efficiency at generating end by capability testing of declared power/design efficiency                                                                                                                                                                                                                                                  | upper 100.3%    |
|                                      | (2)Thermal power generation efficiency                                                                                                                                                                                                                                                                                                             | non             |
| Cement                               | (Energy Consumption during raw material processing/Raw material production(clinker-equivalent))+(Energy Consumption during calcination/clinker production)+(Energy consumption during blending process/cement output(portland cement equivalent))+(Energy consumption during shipment process/total shipment(various types of cement and clinker)) | Under 3891MJ/t  |
| Paper & Pulp Paper                   | Energy consumption/production                                                                                                                                                                                                                                                                                                                      | Under 8532MJ/t  |
| Paper & Pulp Paperboard              | Energy consumption/production                                                                                                                                                                                                                                                                                                                      | Under 4944MJ/t  |
| Petroleum Refinery                   | Energy consumption for petroleum refining process/ $\Sigma$ (throughputs of the different process unit $\times$ the product of average energy efficiency of different process unit based on CWB* coefficient )<br>*CWB(Complexity-Weighted Barrel) is the benchmark which assesses the energy efficiency of refinery and has developed by Solomon  | Under0.876      |
| Petrochemical                        | (1)Energy consumption for ethylene process/ethylene production                                                                                                                                                                                                                                                                                     | Under 11.9 GJ/t |
|                                      | (2)Equipment of steam production                                                                                                                                                                                                                                                                                                                   | (P)             |
| Soda                                 | (Energy consumption for electrolytic process/soda production from electrolytic process)+(Heat consumption for condensation process)/liquified soda production)                                                                                                                                                                                     | Under 3.45GJ/t  |

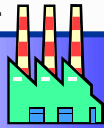
Benchmark Image



# Historical Development of EE Act

1947 Thermal Management Act

Industry



Residential  
Commercial



Transportation



## 1979 Establishment

Designated Energy Management Factories  
Guidance for Buildings and Appliances

1983 Amendment  
Licensed energy manager system

1993 Amendment  
Periodical reporting

1998 Amendment  
Expand coverage of factories

2005 Amendment  
Integration of Heat and Power  
Control

2008 Amendment  
Company based rather than plant based  
regulation, cooperative energy conservation,  
introduction of Bench Marking.

• Heat Management

→ Heat & Power Management

• Industry → Commercial → Transport

• Energy Management

→ Appliances & Vehicles

1998 Amendment  
Top Runner Program

2002 Amendment  
Energy Management of  
Office Buildings

2005 Amendment  
Reporting System on  
Energy by Carriers

2008 Amendment :Data  
sharing with tenants by building  
owners, coverage broaden to include  
franchised chains, introduction of  
Bench Marking.