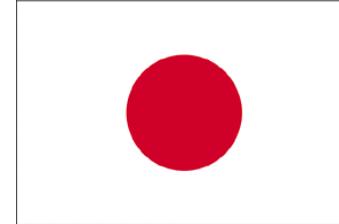


**International Partnership for Energy Efficiency
and Conservation (IPEEC)
Worldwide Energy Efficiency Action through
Capacity Building & Training (WEACT)
2nd Workshop (At Jakarta)
Session III : Energy Efficiency Indicator
- Panel Discussion -**



October 19th, 2011

(Panelist / WEACT Trainer) Kazuhiko YOSHIDA

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International Cooperation Division**

**The Energy Conservation Center, Japan (ECCJ)
On Behalf of Ministry of Economy, Trade and Industry**

Overview National Energy Efficiency Indicators and Targets (Japan and Other EAS Countries)

Countries	EE Indicator	Goals
Japan	Energy Intensity (TPES/GDP)	30% Improvement by 2030 from 2003 Level

Related Target

Indicator	Goals
Amount of GHG Emission	6% Reduction in 2008-2012 from 1990 Level

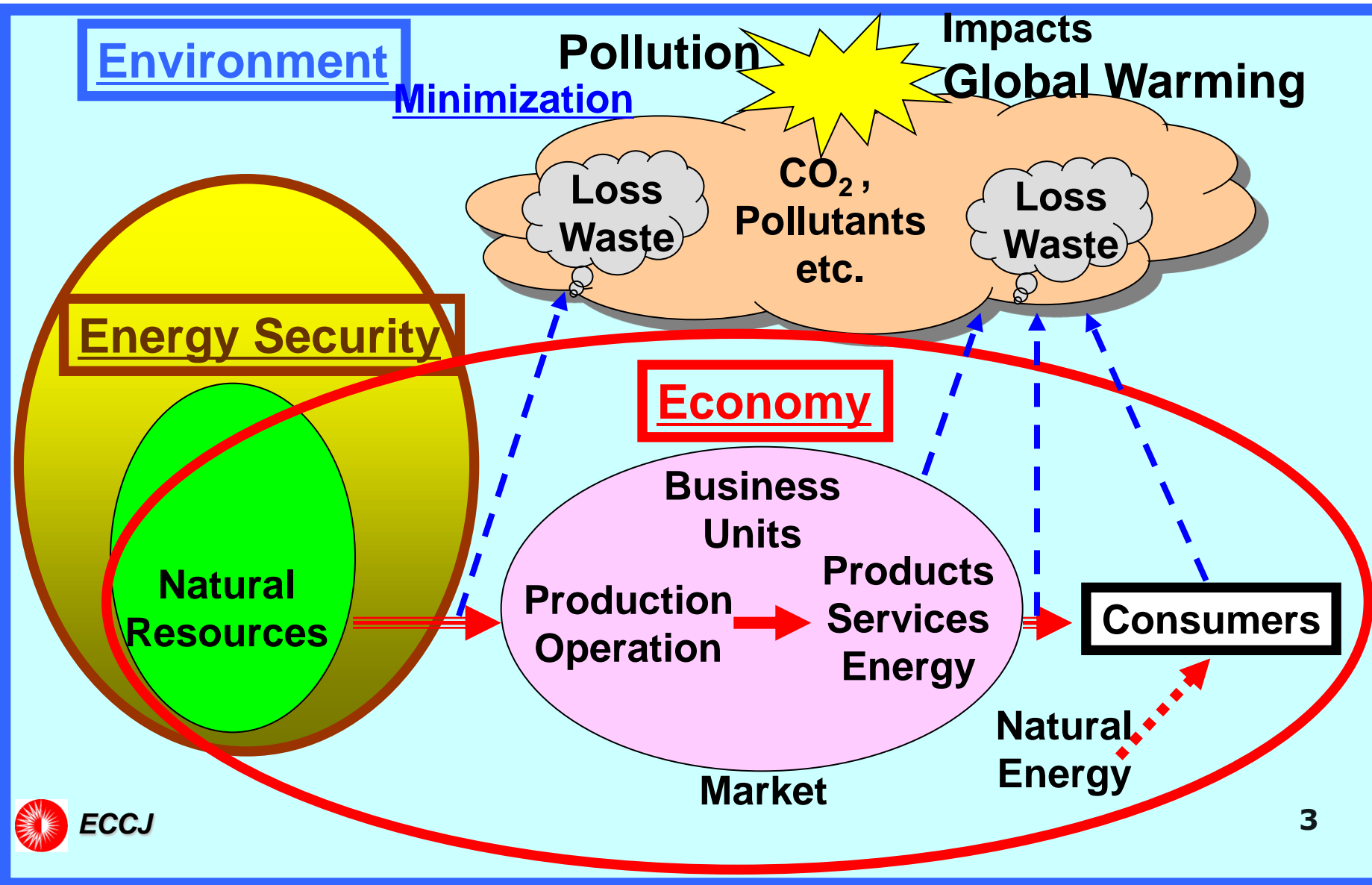
(For Reference) Other EAS (East Asia Summit) Countries

Countries	EE Indicator	Goals
Australia	Carbon Pollution	5% Reduction below 2000 Level by 2020
Brunei Darussalam	Energy Intensity (TPES/GDP)	25% Improvement by 2030 from 2005 Level
Cambodia	Final Energy Demand	10% Reduction from BAU by 2030
China	Energy Intensity (TPES/GDP)	16% Improvement during 12th 5-year Plan (2011-2015)
India	Not Submitted	
Indonesia	Energy Intensity (TPES/GDP)	Reducing 1% / Year until 2025
Korea	Energy Intensity (TPES/GDP)	46.7% Improvement by 2030 from 2006 Level
Lao PDR	Final Energy Demand	10% Reduction from BAU by 2030

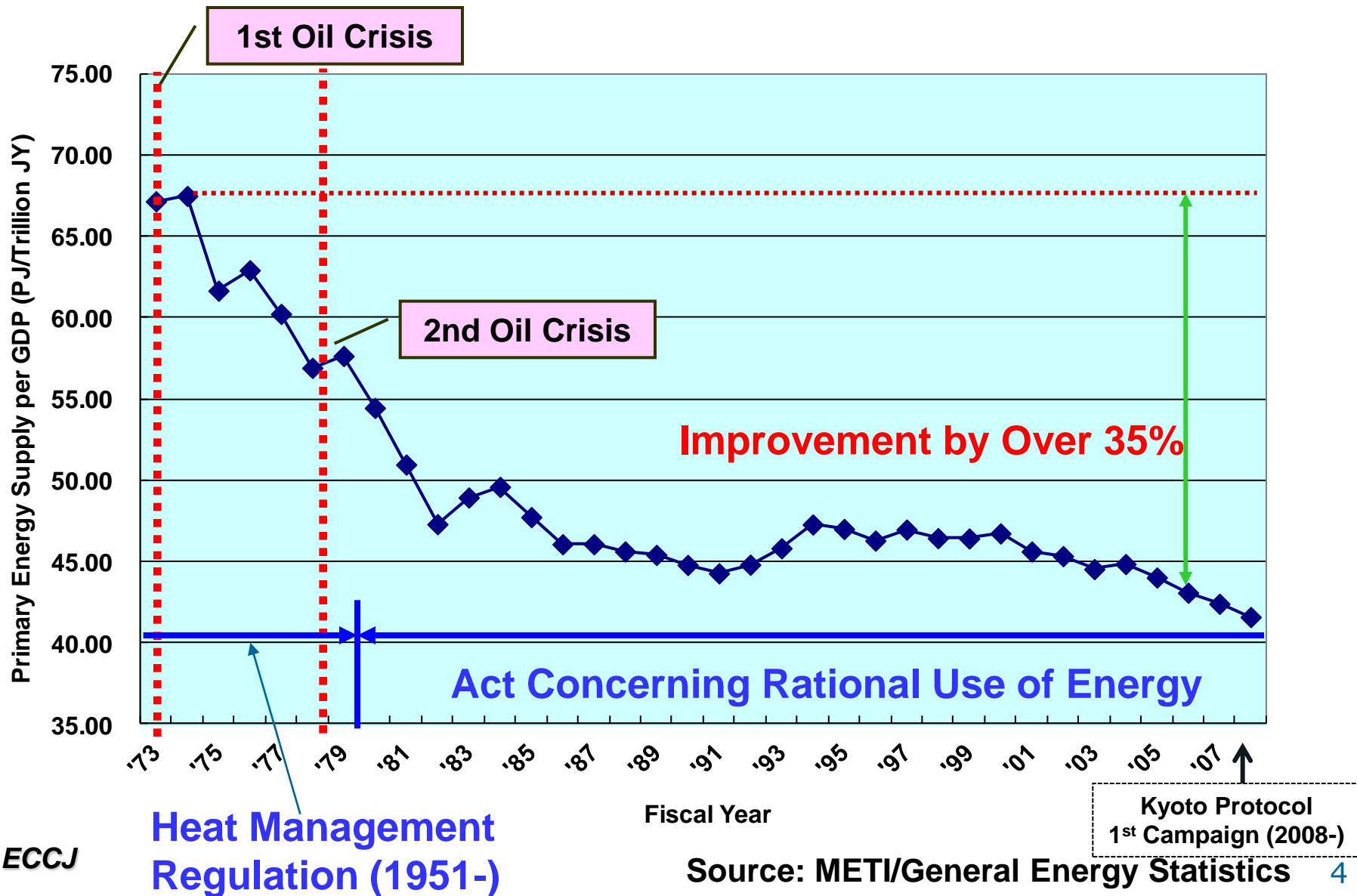
Countries	EE Indicator	Goals
Malaysia	Final Energy Demand	8.6% Reduction from BAU by 2020
Myanmar	TPES	5% by 2020 from 2005 Level 10% by 2030 from 2005 Level
New Zealand	Energy Intensity (TPES/GDP)	40% Improvement by 2025 from 1995 Level
Philippines	Final Energy Demand	10% Saving from BAU by 2030
Singapore	Energy Intensity (TPES/GDP)	20% by 2020 from 2005 Level 35% by 2030 from 2005 Level
Thailand	Energy Intensity (TPES/GDP)	15% by 2020 from 2005 Level 25% by 2030 from 2005 Level
Vietnam	Energy Intensity (TPES/GDP)	3-5% Saving from BAU (2010) 5-8% Saving from BAU (2015)

TPES : Total Primary Energy Supply
BAU : Business As Usual

E.E. Indicators : Policy Background to Harmonize “3Es” for Sustainable Development



Primary Energy Supply per GDP in Japan : Trend



Main Energy Policies to Realize the “3Es” Harmonization in Japan

1. Fundamental Law on Energy Policy Measures

(1) Legislative Measures for Energy Supply – Demand Management
(Including Financial Measures)

- 1) Act Concerning Rational Energy Use (EC Law)
- 2) Energy Conservation and Recycling Assistance Law

(2) Development of Basic Plan on Energy (Long Term Plan)

- 1) Establishment of Long-term / Comprehensive / Well-planned Measures for Energy Supply - Demand Management
- EC Law / Technological Strategy for R&D / Sectoral Benchmark Approach, etc.
- 2) Establishment of Measures for Intensive R&D of E. Technologies
- Development of Technological Strategy on Energy

2. Law Concerning the Promotion of Measures to Cope with Global Warming

Main Energy Policies to Realize the “3Es” Harmonization in Japan (Continued)

2. Law Concerning the Promotion of Measures to Cope with Global Warming (April 1999)

Establishment of the Following

(1) Kyoto Protocol Target Achievement Plan

National Basic Direction on Countermeasures against Global Warming / Measures by Sector

(2) Global Warming Prevention Headquarters

(3) Implementation Plans of National and Local Government

(4) National System for CO₂ Calculation / Reporting / Publication / Realization through the EC Act

**(5) National System to Implement Kyoto Mechanism (Registry)
Trading Rule of Credit / Protection of Trading**

(6) National and Regional Global Warming Prevention Centers to Promote Nation-wide CO₂ Reduction Activities

(7) Promoters to Facilitate National CO₂ Reduction Activities

Overview of Policy and Implementation System

Basic Plan on Energy

New and Renewable Energy

Energy Efficiency and Conservation

Basic Policy

- Basic Philosophy
- Responsibilities (Government etc.)
- Long-term Comprehensive Energy Plan
- Legislative Measures, etc.

National Energy Database

National Statistics

Regulation : Act Concerning Rational Use of Energy

Support : Tax Reduction for Green Investment

Promoting Measures (Award / Commendation System)

Government

Dialogue Opportunities
(Committees, etc.)

Report & Check System

Private Sector

Association - A

Association - B

Associations

Market and Business Oriented Activities

A : Companies

B : Companies

Companies

Companies . . .

Data & Info.
Required to
Submit

People

National Energy Balance : Basis to Establish E.E. Indicators

(10¹⁵J)

Primary E. Supply

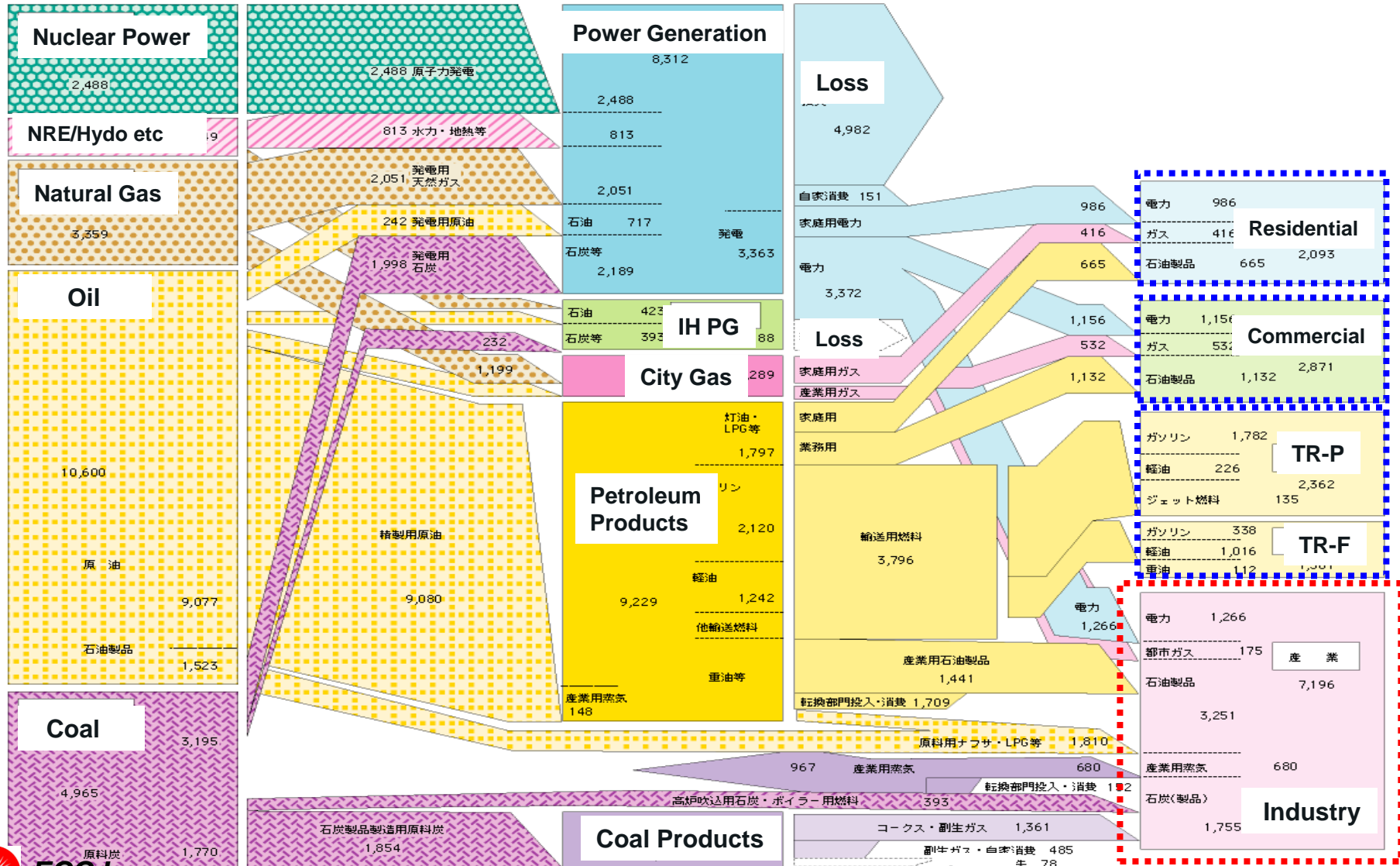
一次エネルギー国内供給 23,060

Transformation & Loss

エネルギー転換／転換損失 ▲6,871

Final Energy Consumption

最終エネルギー消費 16,024

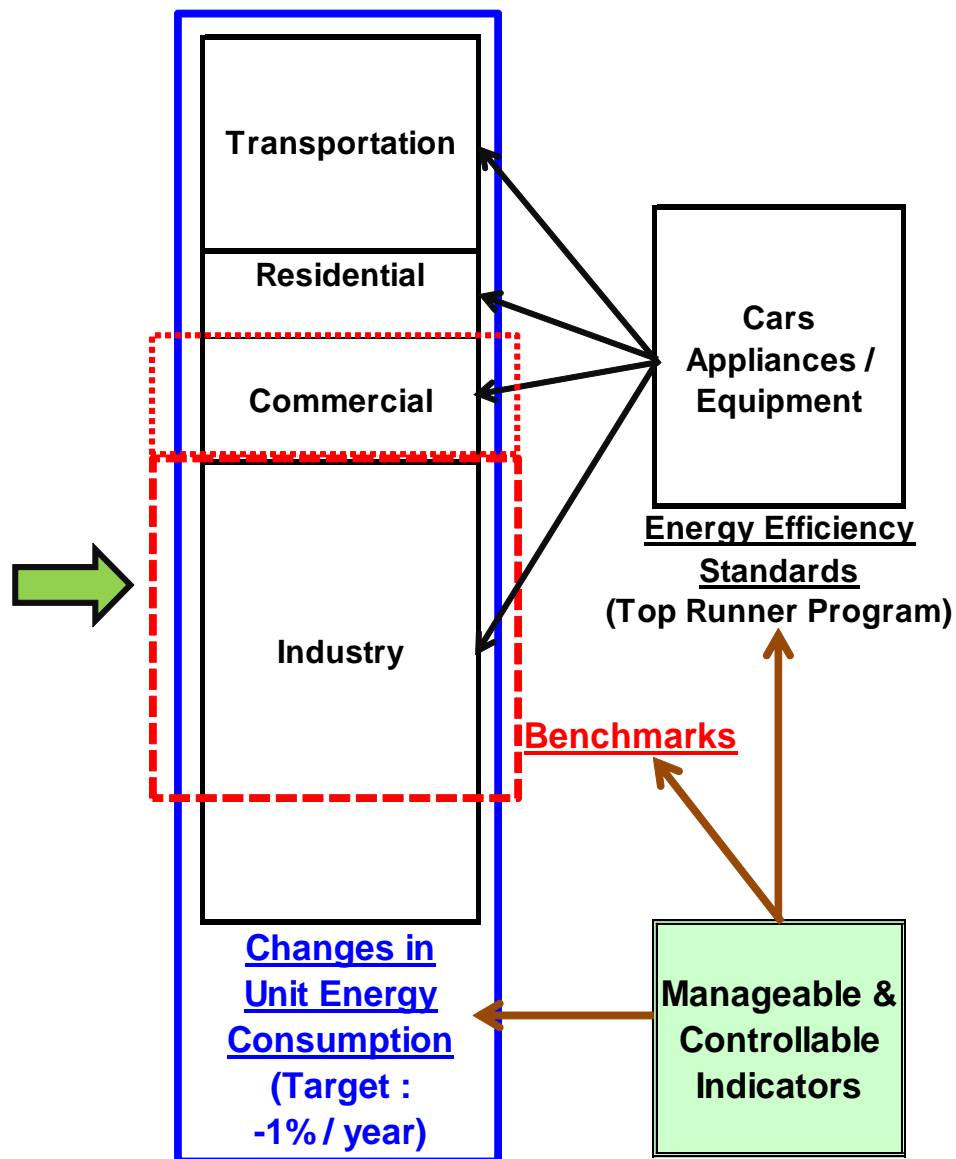
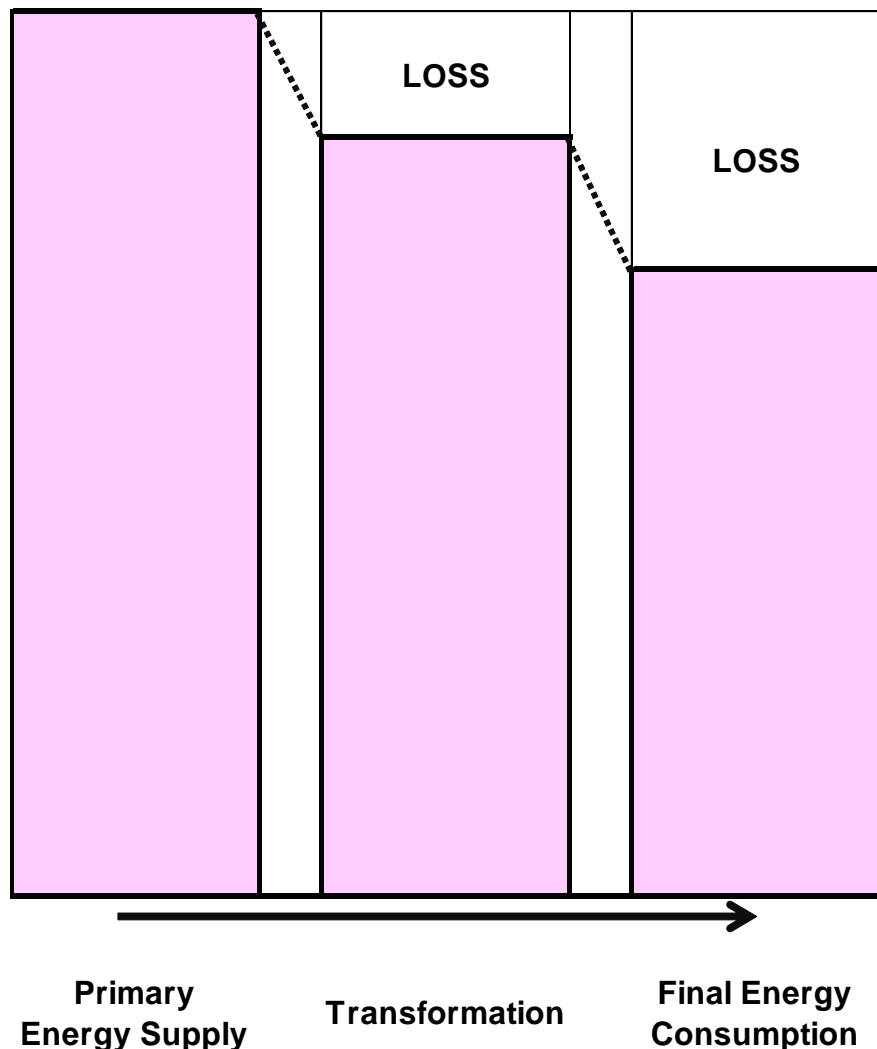


ECCJ

資料：資源エネルギー庁「総合エネルギー統計」

Source: Energy Statistics (Ministry of Economy, Trade and Industry of Japan)

National Energy Flow and Energy Efficiency Indicators



Basic Policy : Energy Efficiency Indicators to Setup and Target for Controlling

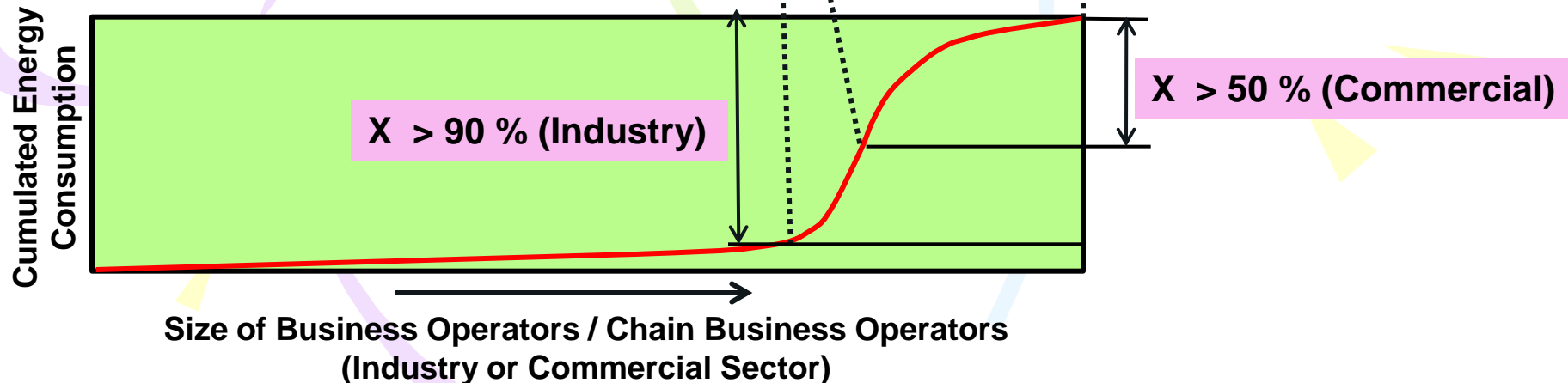
Factories / Buildings etc. Guided by EC Law
(Not Mandatory)

Incremental Target to Improve
1 % or More of Improvement in
Unit Energy Consumption
(Yearly Average (Exp. in Japan))

Factories etc.
Regulated
by EC Law

For Specific Energy
Intense Industries

Benchmark



Benchmark by EC Act in Japan (Iron and Steel)

Classification	Business Field	Benchmark Index (Definition)	Numerical Target
1A	Iron manufacturing using blast furnaces (Business to manufacture pig iron using blast furnaces to manufacture products)	Unit energy consumption obtained by A/B A : Energy consumption to manufacture steel using blast furnaces B : Amount of crude steel	0.531 kIOE/t or less
1B	Conventional steel manufacturing using electric arc furnaces (EAF) (Business to manufacture pig iron using EAF and to manufacture rolled steel products, excluding 1A)	Unit energy consumption obtained by ((1) + (2)) (1) EAF Process : Unit energy consumption obtained by A/B A : Energy consumption in the process to manufacture crude steel using EAF B : Amount of raw steel (2) Rolling Process : Unit energy consumption obtained by A/B A : Energy consumption in the process to manufacture rolled common steel products from slab or billet	0.143 kIOE/t or less
1C	Special steel manufacturing using electric arc furnaces (EAF) (Business to manufacture pig iron using EAF to manufacture special steel products (rolled special steel products, hot special steel pipes, cold-drawn special steel pipes, cold-finished special steel products, forged special steel products, cast special steel products), excluding 1A)	Unit energy consumption obtained by ((1) + (2)) (1) Unit energy consumption obtained by A/B A : EAF Process : Energy consumption in the process to manufacture crude steel using EAF B : Amount of crude steel (2) Finishing Process : Unit energy consumption obtained by A/B A : Energy consumption in the process to manufacture special steel products (rolled special steel products, hot special steel pipes, cold-drawn special steel pipes, cold-finished special steel products, forged special steel products, casted special steel products) from billet B : Amount of shipped (sold) steel	0.36 kIOE/t or less

Benchmark by EC Act in Japan (Cement / Paper)

Cement

Classification	Business Field	Benchmark Index	Numerical Target
3	Cement manufacturing (Business to manufacture Portland cement (JIS R 5210), blast furnace cement (JIS R 5211), silica cement (JIS R 5212), fly-ash cement (JIS R 5213))	Unit energy consumption obtained by ((1) + (2) + (3) + (4)) (1) Raw Material Preparation Process : Unit energy consumption obtained by A/B A : Energy consumption in the raw material preparation process B : Amount of prepared raw material (2) Clinker Making Process : Unit energy consumption obtained by A/B A : Energy consumption in the clinker making process B : Amount of clinker (3) Finishing Process : Unit energy consumption obtained by A/B A : Energy consumption in the finishing process B : Amount of finished cement (4) Shipping Process : Unit energy consumption obtained by A/B A : Energy consumption in the shipping process, etc. B : Amount of Shipped cement	3891 MJ/t or less

Paper

Classification	Business Field	Benchmark Index	Numerical Target
4A	Paper Manufacturing (Paper for printing, copying and wrapping, including newspaper)	Unit energy consumption : (Energy Consumption) / (Product)	8532 MJ/t or less
4B	Cardboard Manufacturing	Unit energy consumption : (Energy Consumption) / (Product)	4944 MJ/t or less



Benchmark by EC Act in Japan (Electric Power)

Classification	Business Field	Benchmark Index	Numerical Target
2	Electric power supplier (Industry that supplies electricity determined by 2.1 of Act on the Rational Use of Energy among general electricity industry or wholesale electricity industry defined by 2.1.3 of Electricity Utilities Industry Law)	Index obtained by A/B $A/B = \frac{\sum_{i=1}^n (Pr-iX(A/B)i)}{\sum_{i=1}^n Pr-i}$ (Standardized thermal efficiency index) For thermal power generation facilities of the electric power supplier specified except a low availability of facilities A : The actual thermal efficiency obtained by a performance test of rated output B : Designed efficiency of the rated output (Data to Submit for Reference) Thermal energy efficiency obtained by C/D C : Total electric power generated at the generation end D : Total calorific heat (gross) to generated the electric power specified by C	100.3% or more

Other Specified Industries for Benchmark

Oil Refining / Chemical (Ethylene and Caustic Soda Manufacturing)



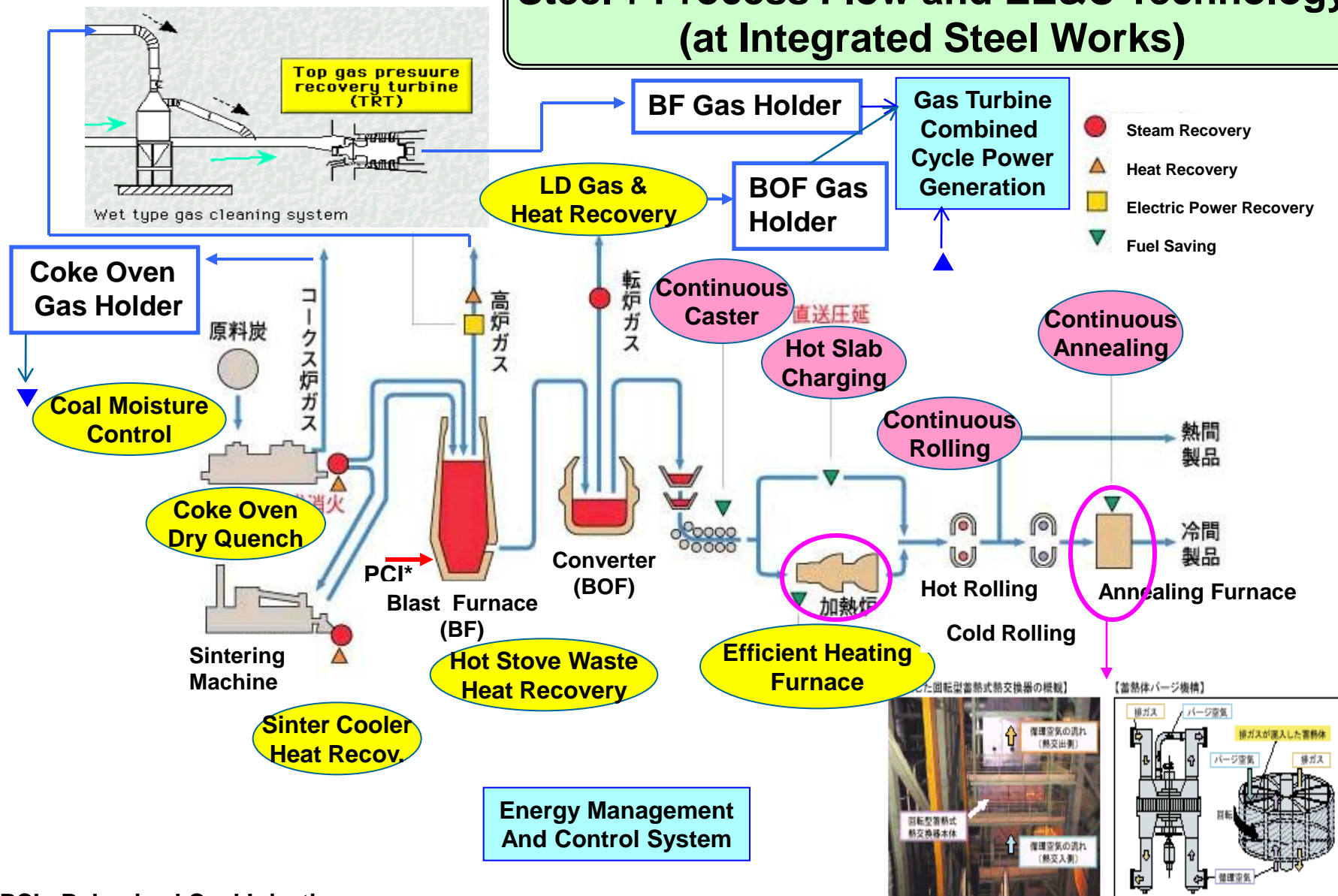
Realistic Benchmarks Manageable and Matched with The Actual Conditions for Each Industry

Conditions / Factors Affecting Benchmark (Iron & Steel)

Process Factors to Affect EE&C		Ironmaking		Steelmaking			Rolling / Finishing	
		Raw Material Pre-treatment	Blast Furnace (BF)	Hot Metal Pre-treatment	Converter (BOF / LD) Electric Arc Furnace	Casting	Hot Strip Mill (HSM)	Cold Strip Mill (CSM) Finishing
Raw Materials	Iron Ore - Total Fe - SiO ₂ /Al ₂ O ₃ , etc.	Sizing / Blending Sintering / Pelletizing - Basicity Control, etc.	Ore Mixing Conditions	Hot Metal Conditions ([S], [P])	Hot Metal Ratio Scrap Conditions Ferro Alloy Addition			
	Limestone - CaO Content Other Fluxes	Sizing / Blending Calcining (Quicklime)	Flux Conditions (Slag Basicity etc.)	Flux Conditions	Basicity Control (CaO Content in Slag)			
	Coal - Total C / Ash Content, etc.	Sizing / Blending Coke Making	Fuel Conditions Coke / Pulverized Coal / Natural Gas					
Utilities	Fuel / Electricity / Gas / Water etc.	Electricity / Fuel for Combustion / Heating Media / N ₂ , etc.	Cold Blast / O ₂ / Fuel for Hot Stove / Electricity / Water / N ₂ etc.	Blowing Gas	O ₂ & Ar for Refining & Degassing / Electricity / Water etc.	Electricity / Fuel for Heating / Water, etc.	Electricity / Fuel for Heating / Water, etc.	Electricity / Fuel for Heating / Water, etc.
Products			* Foundry Iron (Qualities)			Slab / Billet / Bloom (Qualities)	Kinds / Qualities / Lot Size etc. (Coil, Plate, Wire, Rod etc.)	Kinds / Qualities / Lot Size etc. (Coil, Plate, Wire, Rod etc.)
Typical Technologies	For Process	Sintering - Mixture Control - Ignition Furnace, etc. Coke Making - Combustion Control - Coal Moisture Control - Recycle waste Plastic	- Hot Blast Control (O ₂ Enrichment, etc.) - Burden / Gas Distribution Control	- Flux Injection - Synchronization of BF-BOF Operation	BOF - Bottom / Top Blowing - Refining Control - Ladle Furnace Treat. - Degasser EAF - Oxygen Blowing	- Continuous Casting (CC) - Synchronizing Control with Hot Rolling - Low Frequency Stirring	- Rolling Control - Continuous Rolling - Synchronizing Control with CC (Hot Slab Direct Charge) - Descaling	- Continuous Annealing (Temp. / Atmosphere Control) - Synchronization with HSM - Galvanizing / Plating / Coating
	For EE&C (Common) Energy Control Center, VVVF for Fan / Blower / Pumps, etc.)	Sintering - Cooling Heat Recovery Coke Making - C.O. Gas Recovery - CDQ	- BF Gas Recovery - TP Recovery Turbine - Hot Stove Waste Heat Recovery - Fuel Injection to Tuyere (Inc. Waste Plastic)		BOF - BOF Heat Recovery - LD Gas Recovery EAF - DC Type Furnace - Scrap Pre-heating	- Regenerative Burner	Re-heating Furnace - Combustion Control - Regenerative Type	Annealing Furnace - Temperature Control - Regenerative Heater
Unit Energy Consumptions		MJ / t - Sintered Ore						
		MJ / t - Coke						
			MJ / t - Hot Metal (Pig Iron)		MJ / t - Molten Crude Steel	MJ / t - Crude Steel (Slab, Billet, Ingot)	MJ / t - Hot Coil etc.	MJ / t - Finished Steel



Steel : Process Flow and EE&C Technology (at Integrated Steel Works)



*PCI : Pulverized Coal Injection

(* Source (Drawing) : JFE Steel Corporation)

Conditions / Factors Affecting Benchmark (Cement)

Process Factors to Affect EE&C		Raw Material Pre-treatment	Clinker Making		Finishing / Shipping
			Pre-Heating / Kiln	Cooling	
Raw Materials	Reutilized Waste - Waste Tire - Steel Slag - Fly Ash - Sludge etc.		Utilization of Recycled Tire, Oil, Plastics, Biomass Waste etc.		Mixing Conditions - Gypsum - BF Slag, Fly Ash etc.
	Limestone - CaO Contents Clay etc.	Sizing Blending			
	Coal - Total C / Ash Content, etc.				
Utilities	Fuel / Electricity / Gas / Water etc.	Electricity / Water etc.	Electricity / Fuel / Water etc.	Electricity / Water etc.	Electricity / Water, etc.
Products				Clinker	Kinds / Qualities / Lot Size etc. (Portland Cement, Mixing Cement etc.)
Typical Technologies	For Process	Dry Process Blending / Sizing Control - Vertical Type of Mill with Efficient Classifier etc. (Wet / Semi-Wet Processes Remain.)	Kiln Heat Utilization - Suspension Pre-heater (SP) - Caiciner (New Suspension Pre-heater(NSP)) Efficient Kiln Burner Heat Recovery of Waste Gas	Cooling Control	Additive Mixing Control Size Control - Pre-grinding Control - Efficient Separator
	For EE&C	Application of VVVF for Blowers etc.	Heat Recovery of Kiln Usage of Recycled Fuel (Including Pre-Treatment)	Heat Recovery of Coolant Air	Mixtrure of Recycled Slag and Fly Ash etc.
Unit Energy Consumptions		MJ / t - Mixture			
				MJ / t - Clinker	MJ / t - Finished Cement MJ / t - Shipped Cement

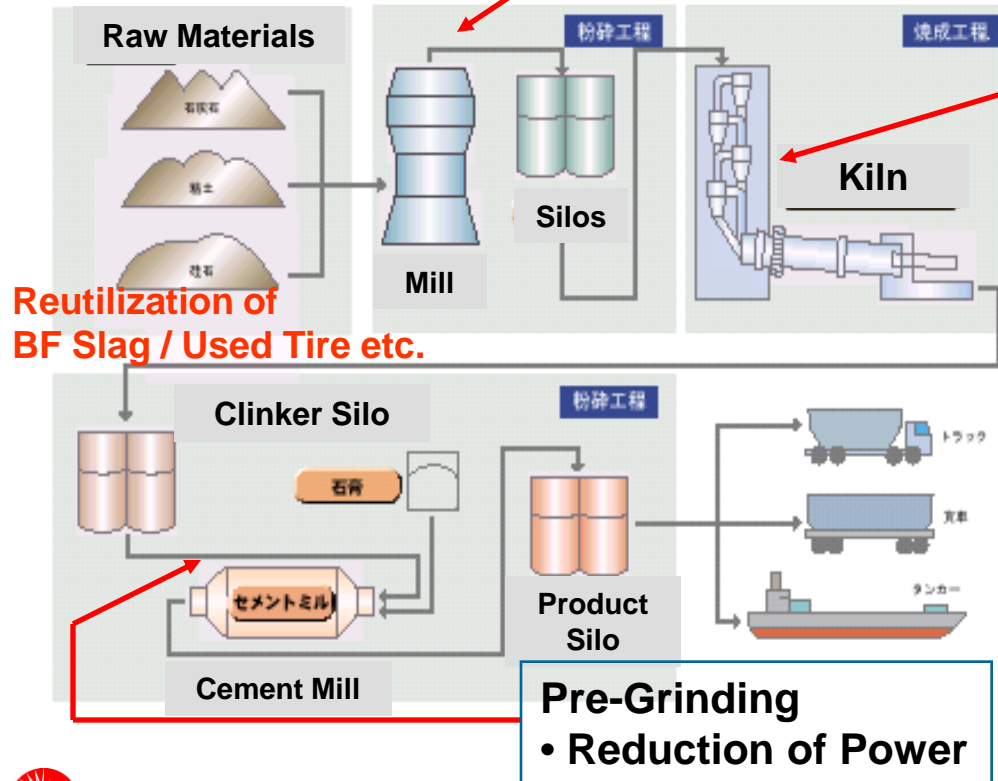
Cement Industry : Process Flow and EE&C Technology

Reutilization of Recycled Material
 • Slag / Sludge / Dust, etc.



Vertical Mill
 • Reduction in Electric Power
 • Excellent Classifier Control

NSP (New Suspension Pre-heater)
 Drying, Pre-heating and Calicining Raw Materials by Utilizing Waste Heat from Kiln
 Utilization of Recycled Tire, Fuels
 • Reduction of Fuel



Mixed Cement
 Reutilization of Waste Material (BF Slag, Fly Ash etc.)
 • Mixing Rate: 22-23%

Participation in International Benchmarking - Activities in APP (Asia-Pacific Partnership) (*) -

**Under Activities on Clean Development and Climate”
Benchmarking for Major Industries in 8 Areas (Cement,
Steel, Aluminum, Power Generation & Transmission, etc.)
(*) Transferred to IPEEC-GSEP (Global Superior Energy Performance)**

1. Define and Setup Benchmark

Based on Shared Data / Information

- (1) Key Operating Data (Production, Raw Materials etc.)**
- (2) Energy Data**
- (3) Applied Technologies and Equipment**

2. Typical Joint Activities to Prove Effects and Disseminate Effective Technologies to Achieve Benchmarks

- (1) Energy Audit / Investigation of Cooperating Factories to
Check Energy Performances etc.**
- (2) Implementation of Joint Projects, etc.**

Conclusion and Recommendation - 1

A. Energy Efficiency Indicators Manageable by Policy etc.

To Be Suitable for National Situations and Matched with Policy

A1. National Level Indicator Matched with National Policy

Monitoring / Evaluation of National Energy Performance toward
“Sustainable Development” Based on the “3Es Harmonization”

- Energy Intensity : (Total Primary Energy Supply) / (GDP)
- Energy Elasticity
- Total Primary Energy Supply, Energy Consumption, etc.

A2. Ministry Level Indicator Manageable by Policy

To Target and Check / Analyze the Actual Results under Policy / Law

- Amount of Used Energy (Incremental Change / Level)
- Energy Unit Consumption (Incremental Change / Level (Benchmark))
- Indicators Related to Environmental Indices

A3. Company Level Indicator Controllable / Manageable by EM etc.

Indicators for Main Process and Equipment to Control by Companies

- Amount of Used Energy (Incremental Change / Level)
- Energy Unit Consumption (Incremental Change / Level (Benchmark))
- Indicators Optimized with Cost and Sales Amount, etc.

Conclusion and Recommendation - 2

B. Establishment of National Database

(Basis) System to Collect, Monitor, Analyze Data / Information and to Evaluate Energy Performance

- National Statistics (GDP, Population, Number of Households etc.)
- Reporting / Checking System on Energy Use etc. under EC Law
- Definition of Data / Information Required to Establish E.E. Indicators

C. Dissemination of Good Energy Management System

**(Basis) System for Promoting EE&C through Systematic Practices of Energy Management by Company – Factory / Building
Appropriate E.E. Indicators to Monitor and Control Energy Performance by Utilizing Established Database**

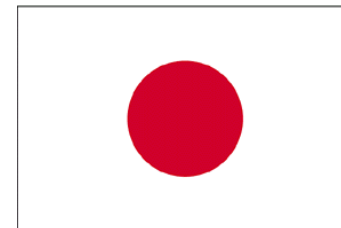
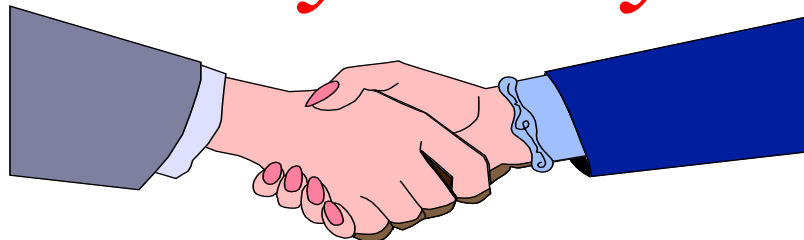
Energy Management System to Be Established through

- Energy Conservation Law (and/or)
- ISO 50001 Energy Management System

“EE Indicators Linked with Systematic Actions to Improve”



Thank you very much



For More Information

[The Energy Conservation Center, Japan \(ECCJ\)](http://www.eccj.or.jp)

<http://www.eccj.or.jp>

[Asia Energy Efficiency and Conservation Collaboration Center \(AEEC : Established in April 2007\)](http://www.asiaeec-col.eccj.or.jp/index.html)

<http://www.asiaeec-col.eccj.or.jp/index.html>

[Japanese Business Alliance for Smart Energy Worldwide](http://www.jase-w.eccj.or.jp/eng/index.html)

<http://www.jase-w.eccj.or.jp/eng/index.html>