Japanese Energy Efficiency Improvement Achieved and Planned

German-Japanese Energy Dialogue
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1) Accomplishments of Energy Conservation

- **Japan's GDP** has grown **2.5-fold** since the first Oil Crisis (1973).
- **Primary energy consumption** has grown **1.4-fold** and final energy consumption 1.5-fold.

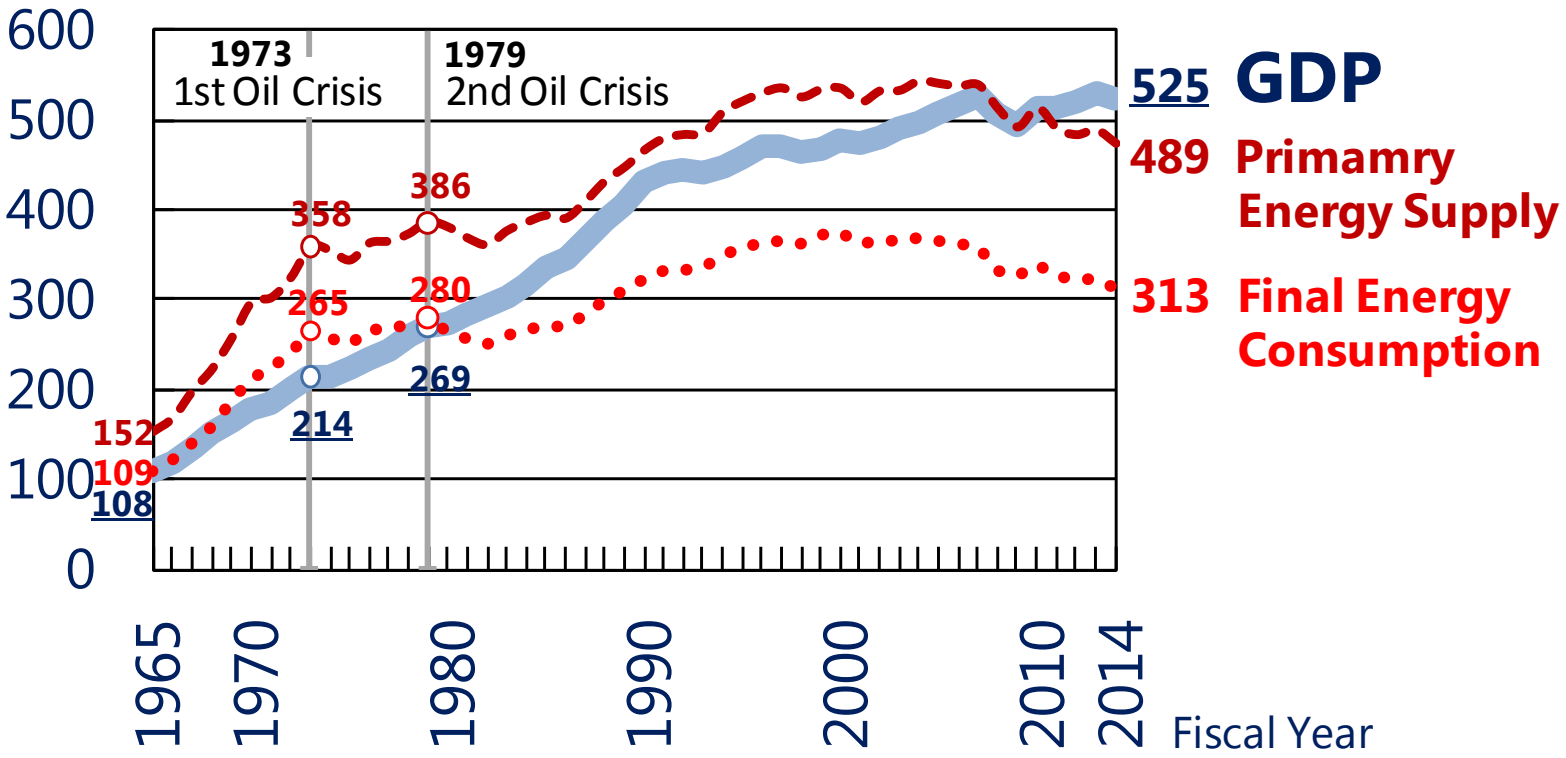
	1973 → 2014
GDP	214 → 525 (2.5 fold)
Primary Energy Supply	358 → 489 (1.4 fold)
Final Energy Consumption	265 → 313 (1.2 fold)

- In particular, **energy consumption in the manufacturing sector** has remained **virtually unchanged** for the last 40 years.
- **Energy efficiency of electric appliances** has improved **by 40 to 80%** in the last 20 years.
- **Fuel efficiency of automobiles** is one of **the best** in the world among major countries.

- As a result, along with the energy shift, **CO_2 emissions per kWh** have been improved by **about 30 to 40%.**

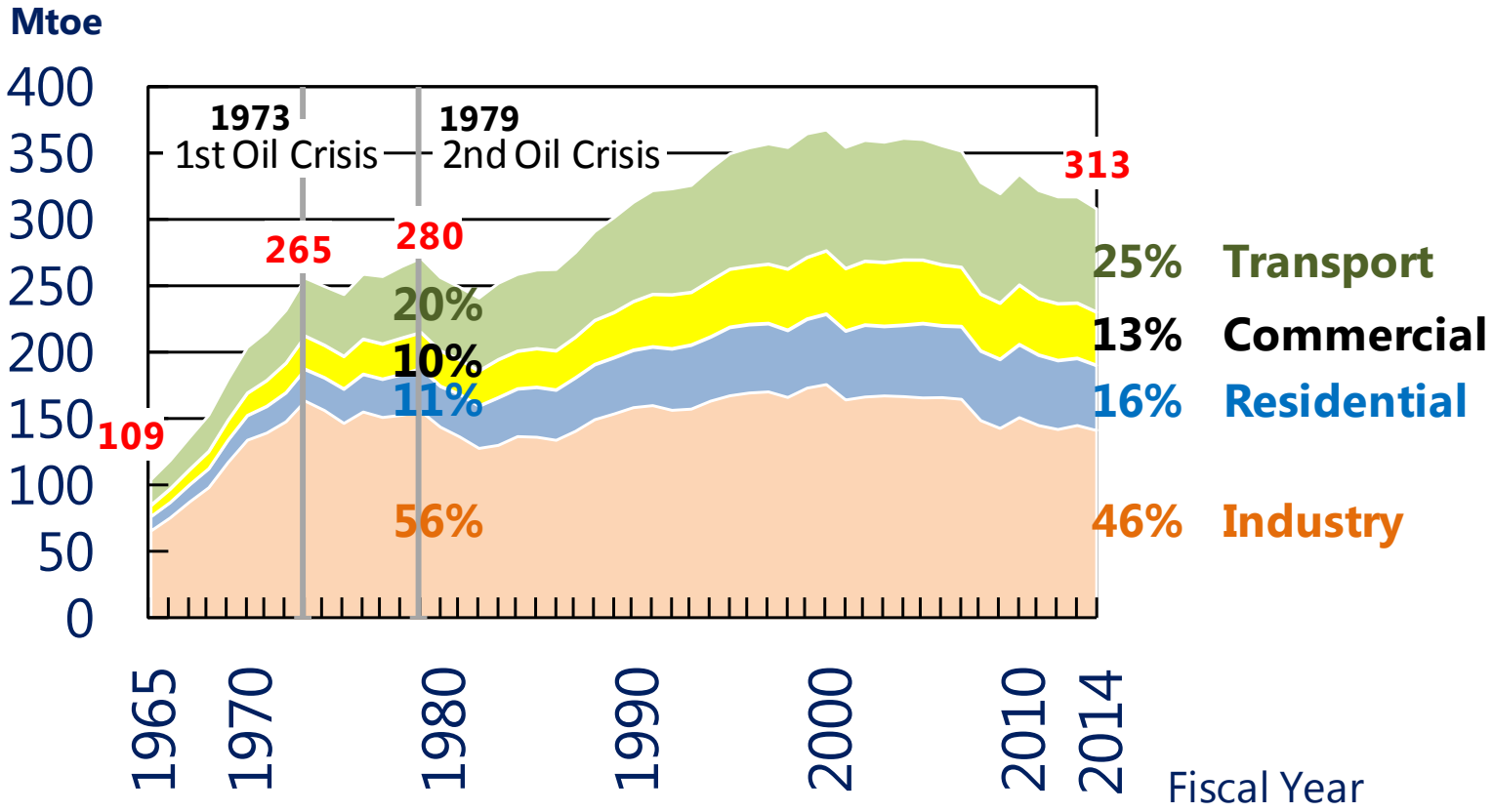
Energy Consumptions & Economic Growth (Japan)

[GDP] **Thousand Billion Yen** (Chained (2005) price)
[Energy] **Mtoe**



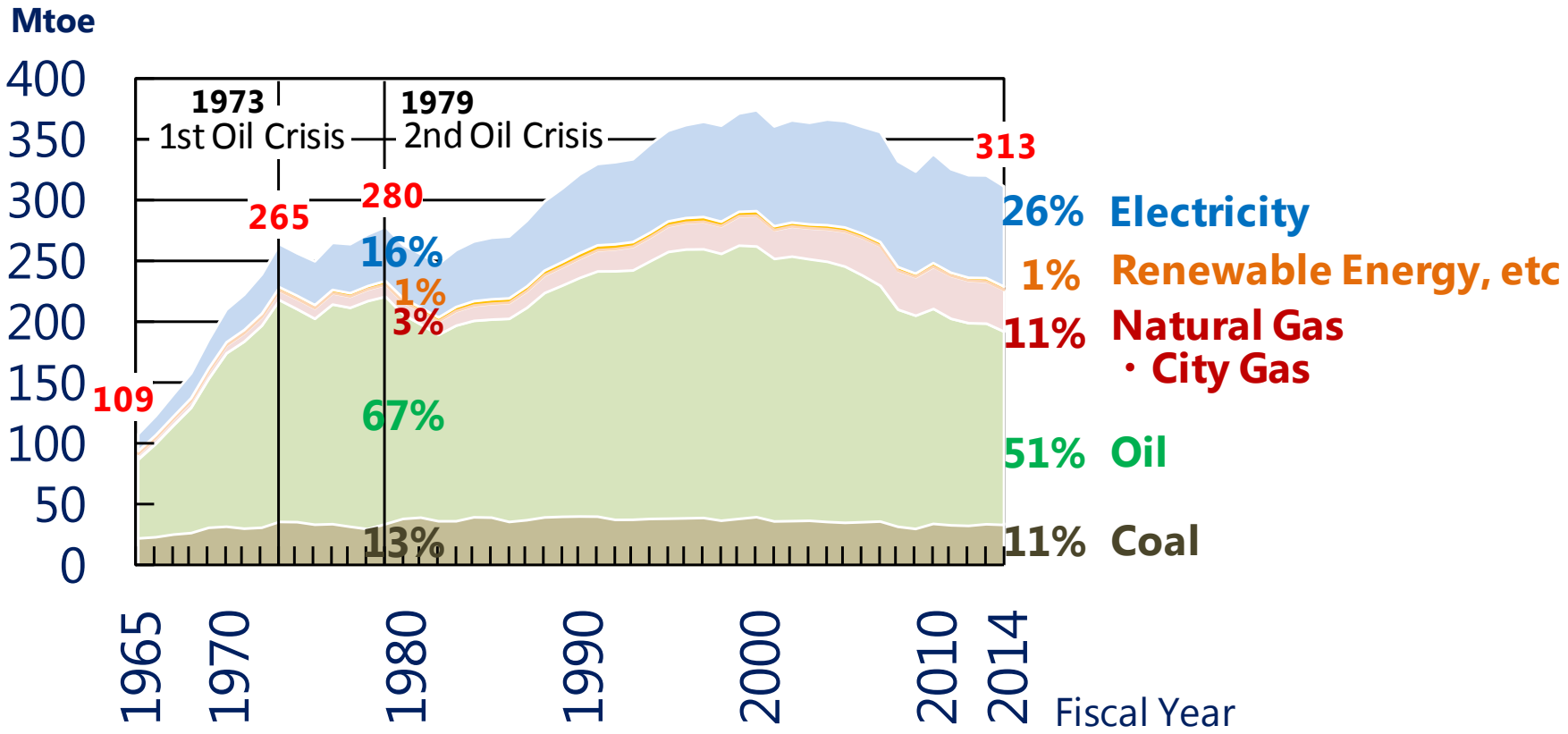
	1973 → 2014
GDP	214 → 525 (2.5 fold)
Primary Energy Supply	358 → 489 (1.4 fold)
Final Energy Consumption	265 → 313 (1.2 fold)

Final Energy Consumptions by Sector (Japan)

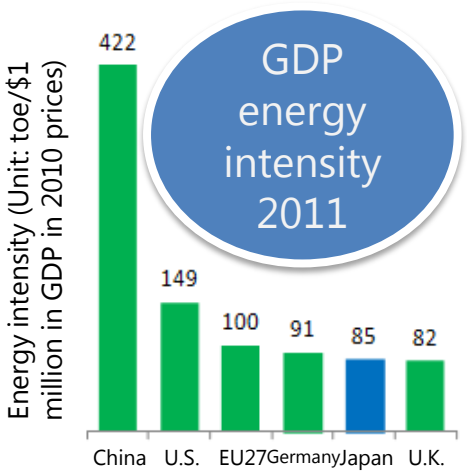


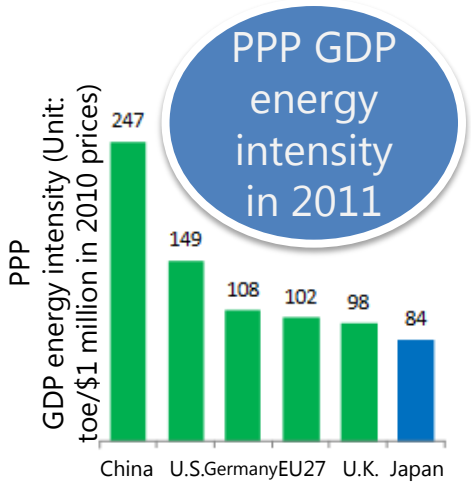
- The figure **exclude** the **Non-energy use**, and may not add up to the total 100%.
- **Non-energy use** covers those fuels that are used as **raw materials** in the different sectors and are not consumed as a fuel or transformed into another fuel.

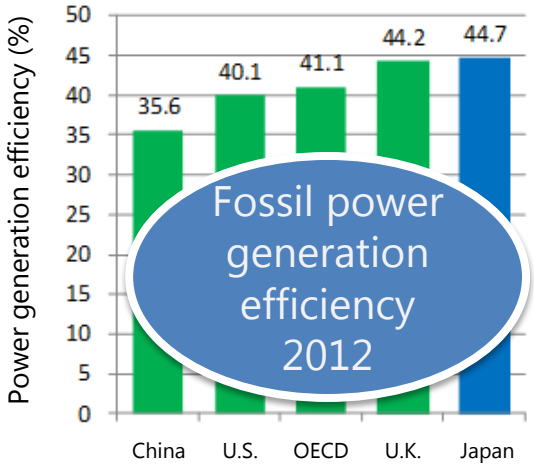
Final Energy Consumptions by Energy (Japan)



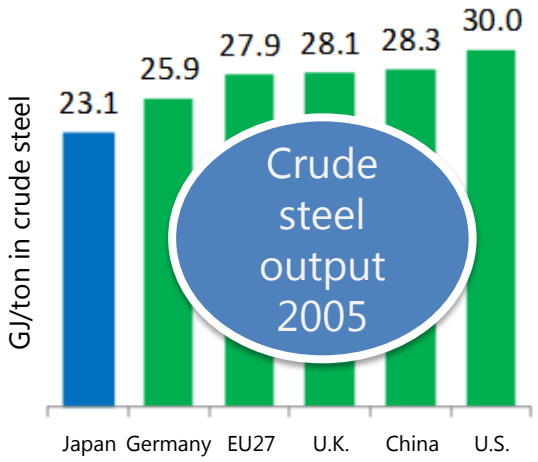
International Comparison of Energy Efficiency



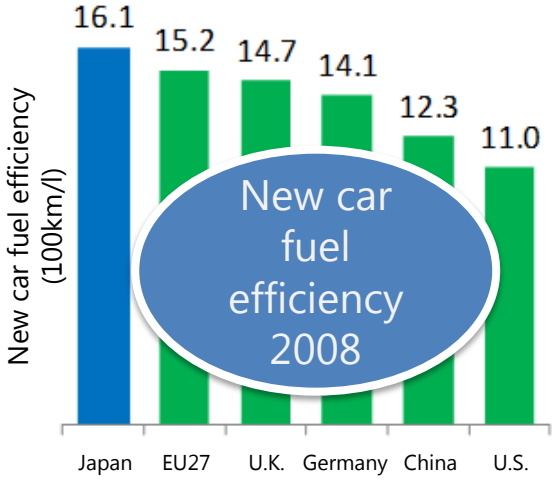




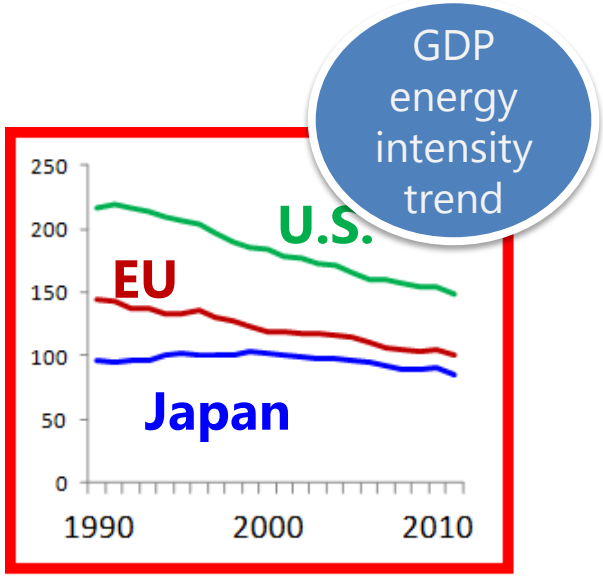
(Sources) Prepared from IEA Energy Balance Tables, World Development Indicators



Oda *et.al* (2012)



GFEI (2011)



2. Energy Conservation Policy in Japan

2) Conservation Policy Framework

<Conservation Policy Framework>

- Policies were developed and implemented in close coordination with the legislative and administrative bodies and advisory committees.

- Legal framework stipulates the following

  - **Regulation**
    - EE standards through Top-runner program
    - Buildings' mandatory compliance on EE standards

  - **Report, Evaluation, Review and Guidance**
    - Large-scale energy users' reporting system
      : New introduction of classification system
    - Benchmark system
      : Industry, commercial and power Generation

  - **Incentives**
    - Subsidies, tax breaks, low interest rate, and eco-points

Japan's Energy Conservation Policy Framework

Ministries/Comittes responsible for EE&C Policy-making

- **Ministry of Economy, Trade and Industry**
  - ★**Advisory Committee for Natural Resources and Energy**
    - ①Strategic Policy Committee
    - ②Committee on Energy Efficiency and Renewable Energy
  - ★Industrial Structure Council
- **Ministry of Environment**
  - ★Central Environmental Council
- **Ministry of Land, Infrastructure, Transport and Tourism**
  - ★Infrastructure Development Council （Buildings）, Transportation Policy Council

EE&C Target/Strategy

- **"Long-term Energy Demand and Supply" （2015）**
  - ★Energy Intensity Improvement – similar to the pace after the oil crisis.
  - ★35% achievement of energy intensity in 2030 from 2012.
  - ★Achievement of Energy savings at 50.30 million kl

Main Legislations on EE&C

- **"Law on Rational Use of Energy" （Energy Conservation Law） （1979）**
- **Law on the Global Warming Mitigation （1998）**
- **Basic Law on Energy Policy（2002）**
  - ★Main Guidelines：①Securing Stable Supply ②Improvement on Environment ③Use of Market Principle
  - ★**"Basic Energy Plan" （amended in 2014） （3E+S）**

Realization of comprehensive/thorough energy efficient society and smart/flexible consumption activities
（Promotion of EE&C across the sector, Use of demand response toward the efficient supply）

Basic Framework of Energy Conservation Law

Objective "Energy Conservation Law" Main Legislation on Energy Efficiency and Conservation Policy

Sectors

Factories (designated energy management factories/business entities)

Requirements: Annual energy consumption over 1,500kl

Regulation: Basic standard/measures for EE&C improvement

Responsibilities:
❶Designation of energy managers
❷Building on basic standard/measures, each factories/busines entities are required to set their own EE&C measures
❸Periodical reporting system
❹**Submission of middle-long term plan**

Target :
❶Annually more than **1% EE&C improvement**
❷peak shift
❸benchmark system

Transport

(1) Freight company with the number of trucks over 200

(2) Freight owners with over 30 million ton-kilometers of freight volume

Buildings

(1) Commercial Buildings over 300㎡

(2) Residential building suppliers over 150units/year

※Building Energy Conservation Law became effective in July 2015

Appliances

Top Runner Program

Electricity

Evaluation of Peak Shift

Consumers

Labeling System

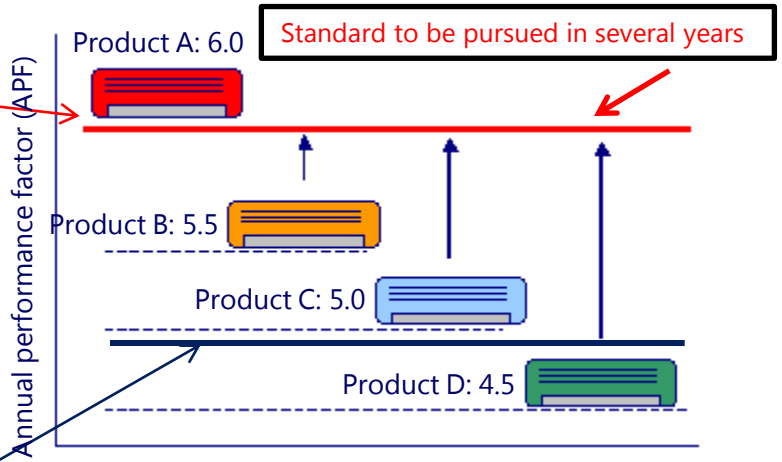
Regulation ❶Instructions or provision of guidelines in case not meeting the target,
❷Penalties

Main Feature ❶In-house energy manger,
❷inclusion of across the sectors for industry, commercial, residential and transport,
❸strong enforcement with penalties

Top Runner System

❶ Top Runner System

- ●Setting standards: top-level products in market + α
- ●Verification time：Target years (several years after standards are published)
- ●Indicators for judgment: A weighted average number of shipped units of each product at target companies within each category
- ● Target companies: excluding small and medium-sized enterprises (based on production volume) and special products
- ●Number of products subject to the system：31 (as of 2016)
- ● Ultimate objective: Promoting technological innovation

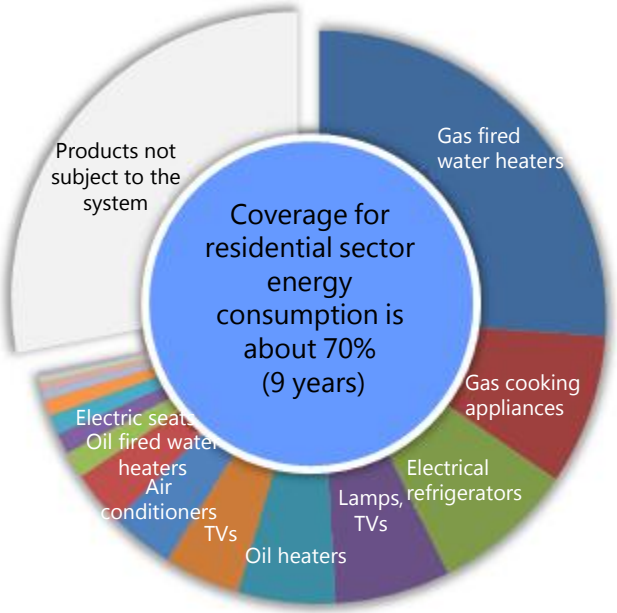


❷ Characteristics of MEPS (Minimum Energy Performance Standard) System

Each produced unit of a product, instead of an average, is required to meet the minimum energy performance standard.

❸ Characteristics of CAFÉ (Corporate Average Fuel Economy) Standard

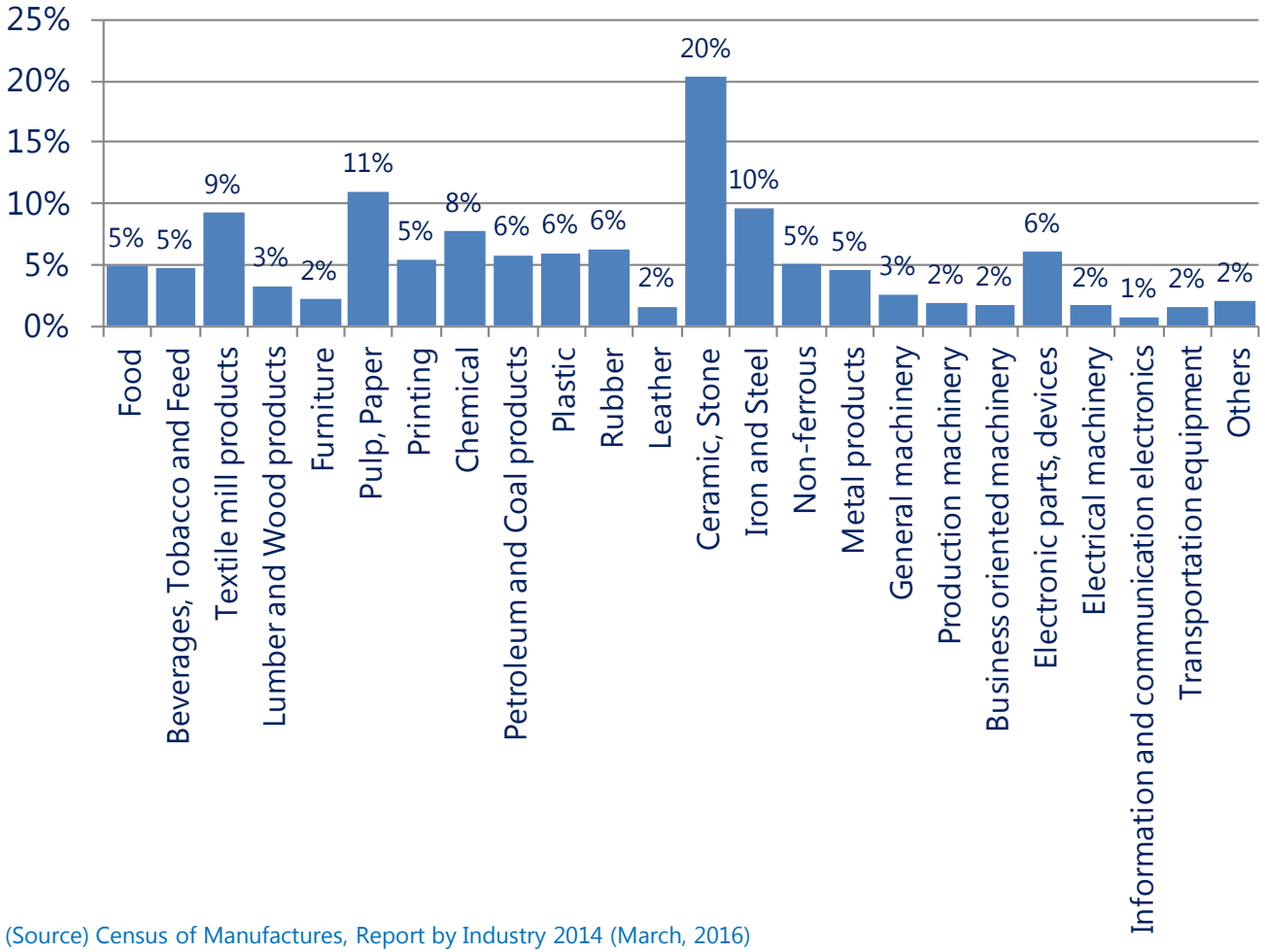
Each company is required to meet the efficiency standard in terms of corporate average fuel economy instead of category average fuel economy.



(Source) Institute of Energy Economics, Japan, "Fact-finding Survey on Buildings Sector Energy Consumption in FY2009"

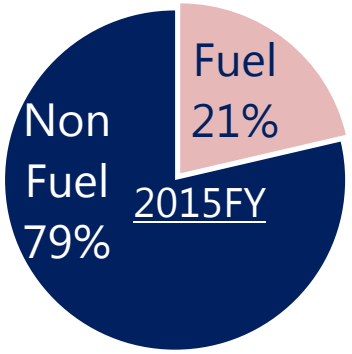
Saving Cost Potential by Sector (Japan)

Energy Cost Share by Sector (2014)



(Source) Census of Manufactures, Report by Industry 2014 (March, 2016)

Energy Import Share (2015)



(Source) IEEJ "Handbook of Energy & Economic Statistics in Japan"

Top Runner Program

- The "Top Runner Program" is a mandatory program for companies (manufacturers and importers), to fulfill the efficiency targets within 3 to 10 years, which encourages competition and innovation among the companies without increasing market prices.
- Companies make efforts toward those goals, so the program has contributed to improving energy efficiency of consumer electronics and automobiles in Japan.
- For instance, we had expected energy efficiency improvements of 16.0km/L for medium class gasoline passenger vehicles in fiscal year 1999, but actually, it attained 19.9km/L.

Achievement of Top Runner Program

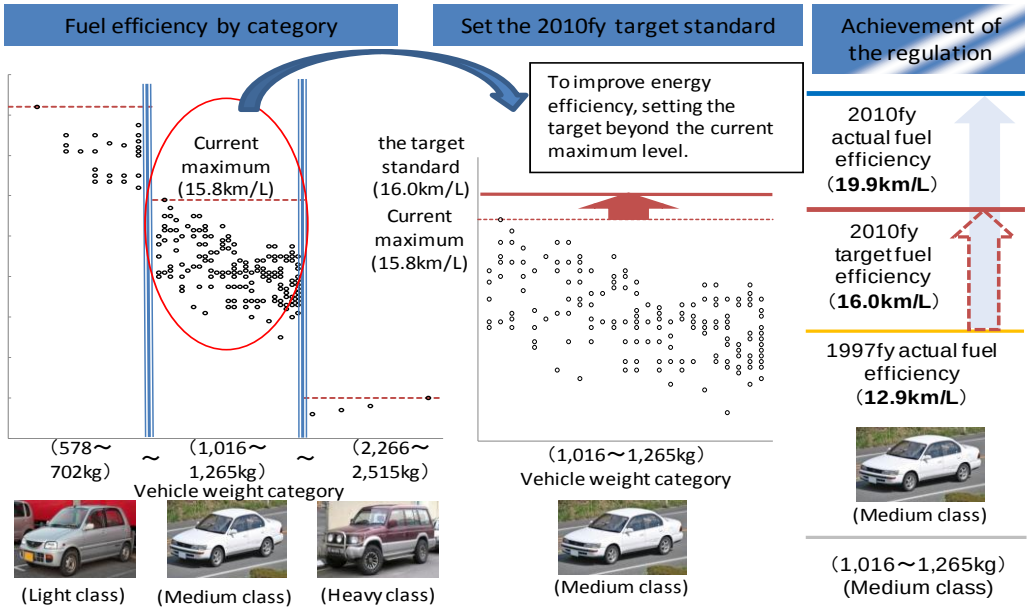
Gasoline passenger vehicles
48.8% (FY1995→FY2010)

Air-conditioners
(Types other than direct airflow & wall-mount)
32.3% (FY1997→FY2007)

Electric refrigerators
43.0% (FY2005→FY2010)

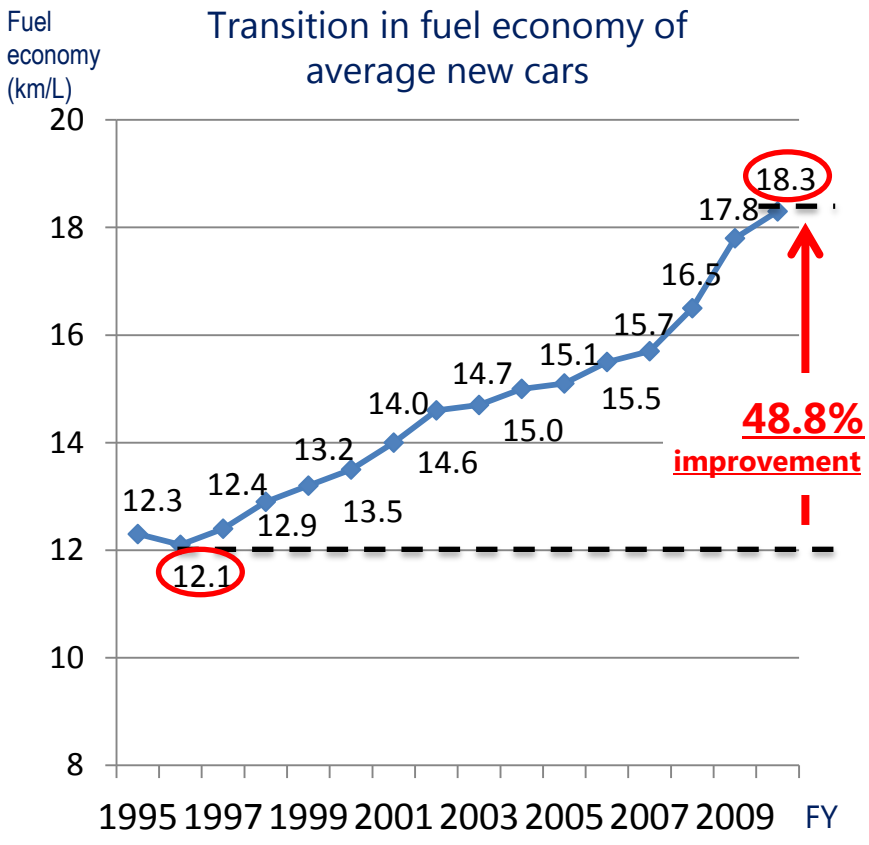
TV sets (LCD and PDP TVs)
29.6% (FY2004→FY2008)

Basic mechanism of Top Runner Program (The case of gasoline passenger vehicles)



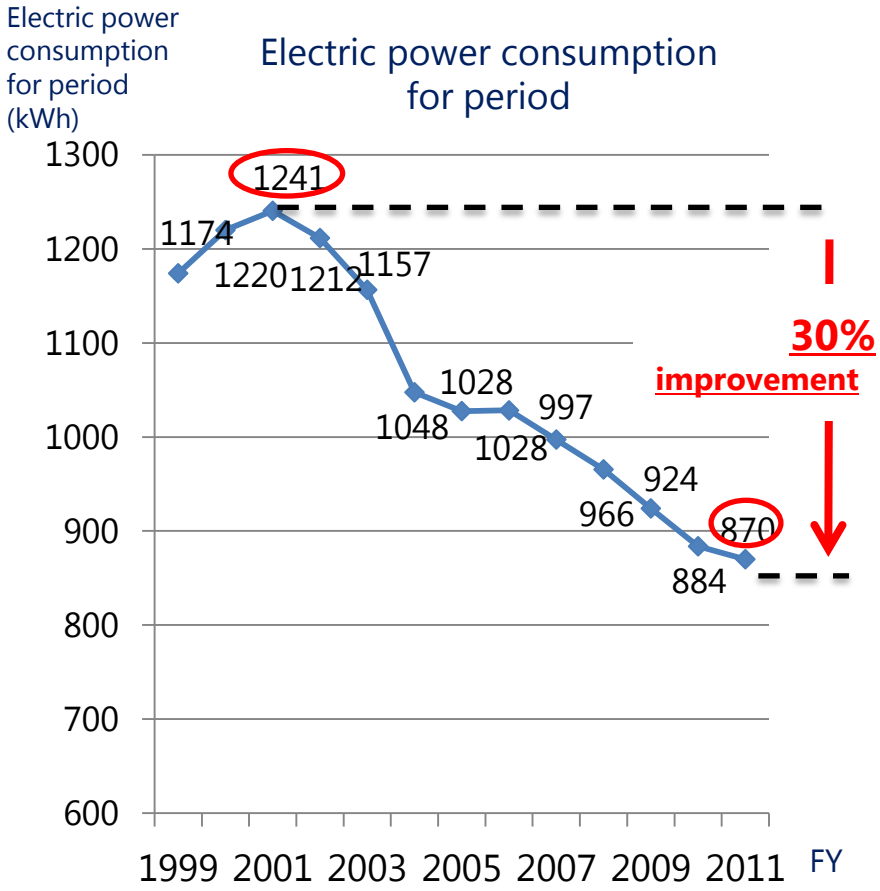
Improvements in Energy-Efficiency with Top Runner Program

[Passenger cars]



(Note) Fuel economy values for the 10-15 mode.

[Air conditioners]



(Note) Wall mounted cooling and heating units with cooling capacity of 2.8kW-class model; simple average values for a representative model of energy conserving-type products.

Japan's Top Runner Program – its Achievements

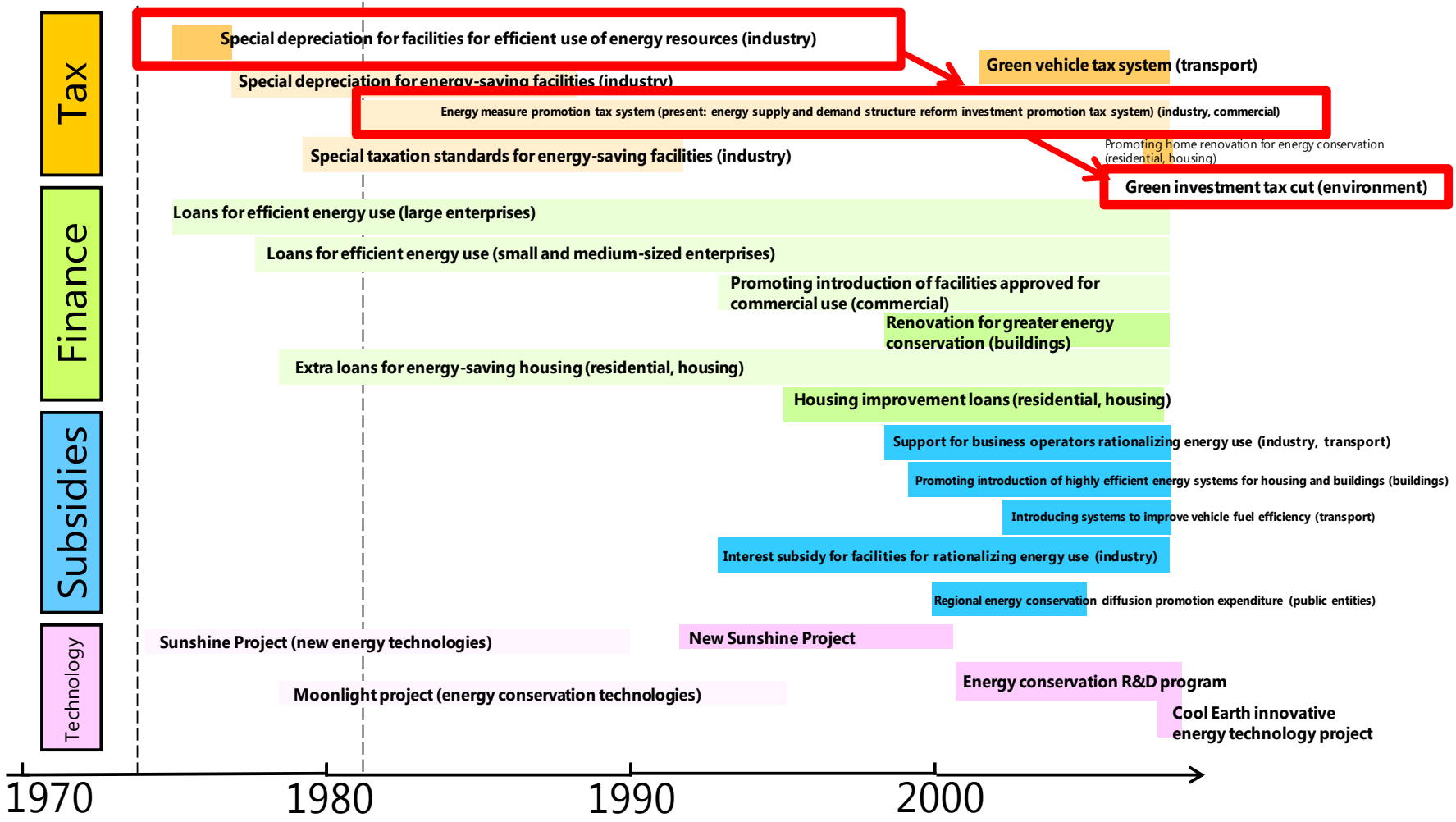
- Achieved energy efficiency through Top Runner Program surpassed those of target levels.
- Target for light duty vehicles was achieved earlier than the target year.

Item	Improvement in energy efficiency **(Achieved)**	Improvement in energy efficiency **(Target)**
TV set (CRT)	25.7% (1997=>2003)	16.4 %
Room air conditioner	67.8 % (1997=> 2004)	66.1 %
Refrigerator	55.2 % (1998=> 2004)	30.5 %
Freezer	29.6 % (1998=> 2004)	22.9 %
Light duty vehicle (gasoline)	22.8 % (1995=> 2005)	22.8 % (1995=>2010)
Freight vehicle (diesel)	21.7 % (1995=> 2005)	6.5 %
Vending machine	37.3 % (2000=> 2005)	33.9 %
Fluorescent lump	35.7 % (1997=> 2005)	16.6 %
Copy machine	72.5 % (1997=> 2006)	30.8 %
Computer	80.8 % (2001=> 2007)	69.2 %
Magnetic disc	85.7 % (2001=> 2007)	71.4 %
Washlet	14.6 % (2000=> 2006)	10.0 %

(Source) METI. Top-Runner Standards

Energy Conservation Subsidy Systems

Expanded and stable energy conservation subsidy systems



Regular Energy Conservation Campaigns and Energy Conservation Commendation Systems

Japan has various long-lived energy conservation commendation systems

	Energy conservation campaigns	Year for launching
1	Energy conservation month (February)	1977
2	Energy conservation Day (1st day of every month) Energy conservation checking day (December 1)	1980
3	Summer energy conservation checking day (August 1)	1990

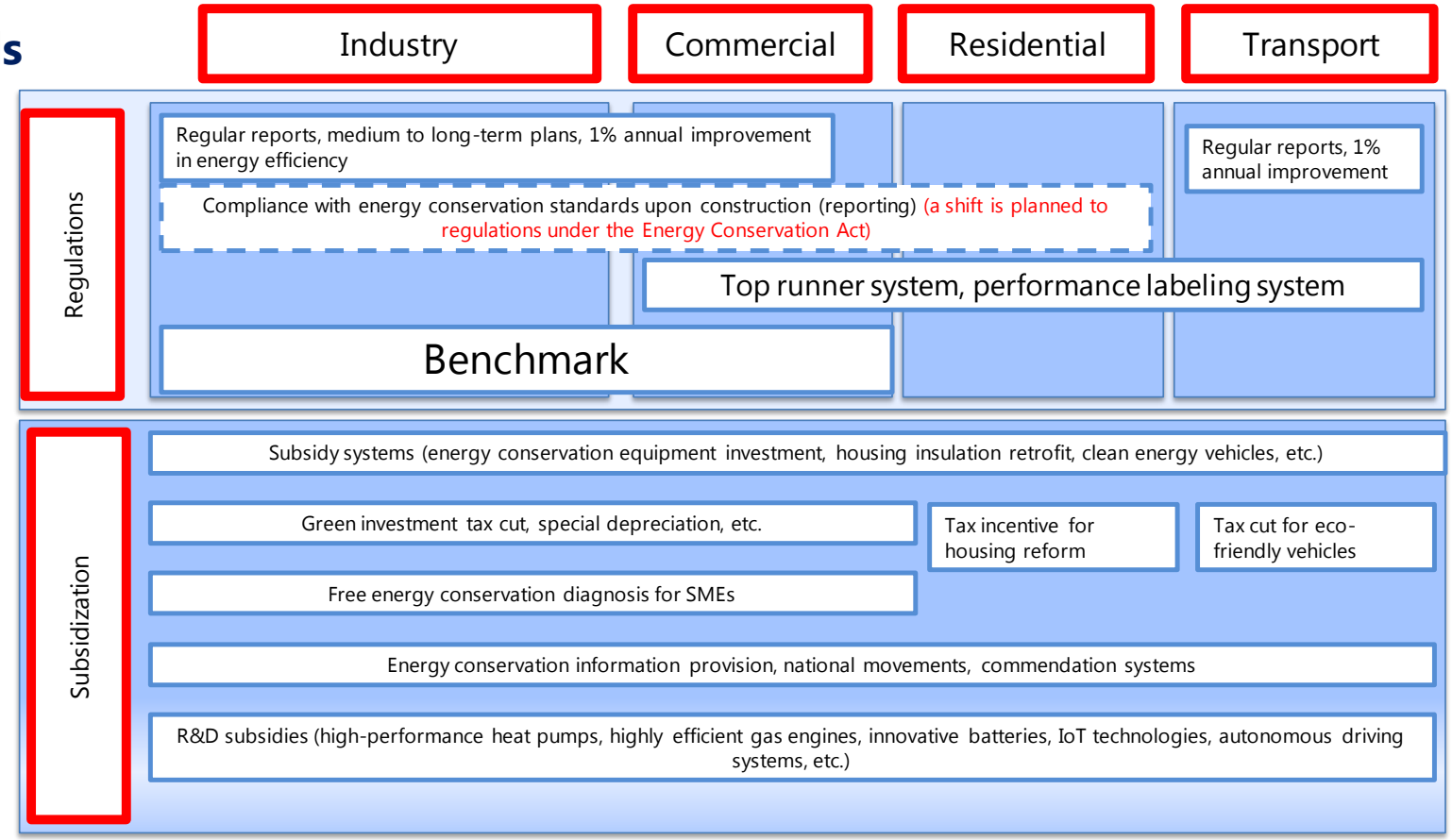
	Commendation name	Year for launching	Sponsor
1	Commendation for successful energy managers and excellent business operators in energy management	1948	METI
2	Commendation for excellent energy conservation cases in a nationwide contest	1975	METI
3	Commendation for persons of merit for energy conservation and excellent energy management technicians	1978	ECCJ
4	Energy conservation grand prix (for energy conservation cases and products/business models at present)	1990	METI
5	Commendation for excellent shops for promoting the diffusion of energy-saving products	2003	METI
6	Commendation for excellent ESCOs (Energy Service Companies)	2005	METI

Energy Conservation Policy Summary

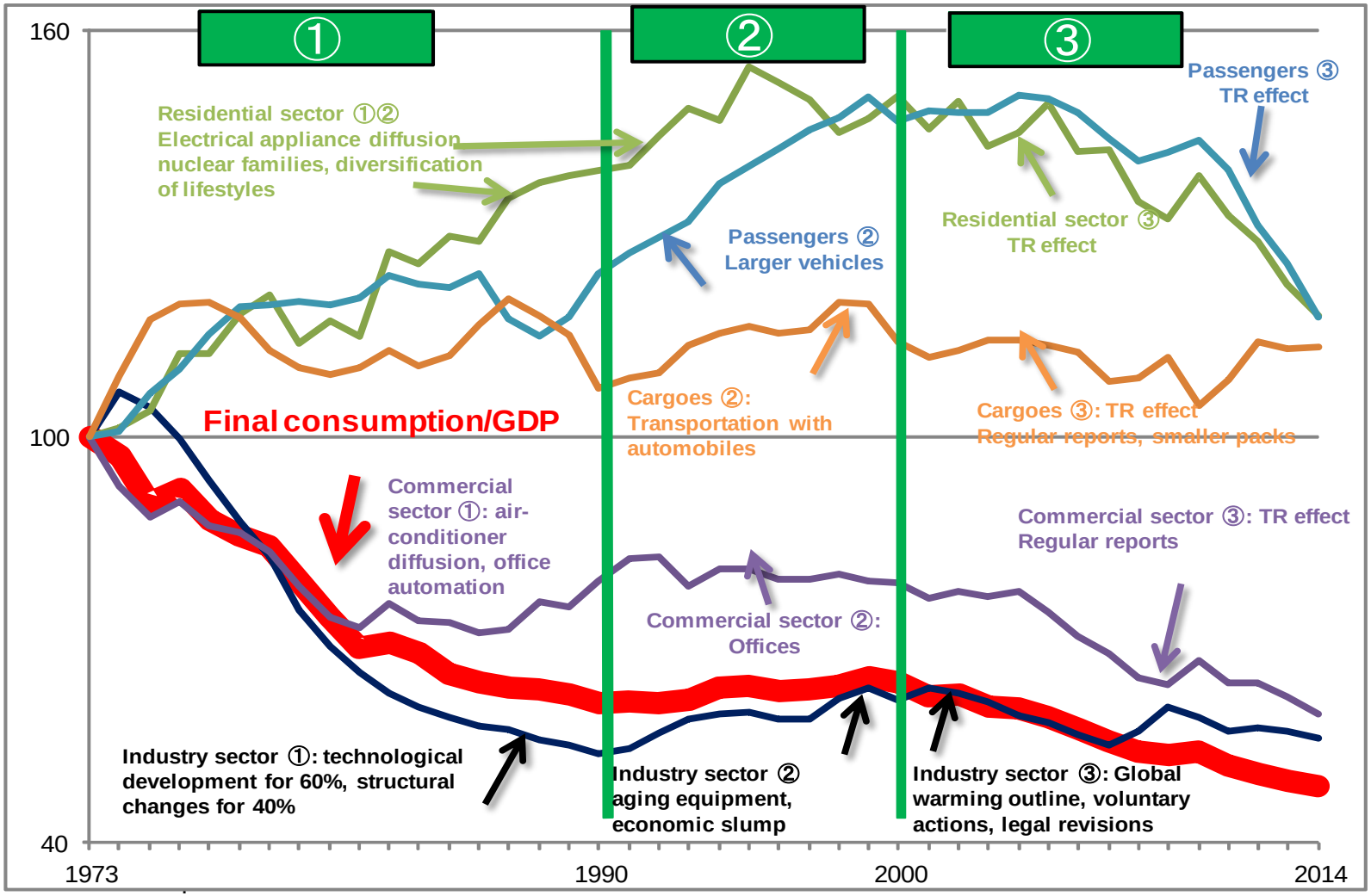
Characteristics

❶Simultaneous implementation of regulations under the Energy Conservation Act and technical/economic subsidization measures
❷ Fined-tuned policy implementation for each sector

Details



Energy Intensity Trend after Oil Crises



Note: Denominators for energy intensity calculation are GDP for final consumption, IIP for the industry sector, number of households for the residential sector, floor space for the commercial sector, person kilometers for passengers, and ton kilometers for cargoes.)
(Source) IEEJ, "Handbook of Energy & Economic Statistics in Japan" (2016)

Energy Conservation Trend after Oil Crises

	Until 1990	1990s	After Kyoto Protocol
Energy intensity changes	Sharp improvement	Deterioration	Improvement
Industry	Energy conservation equipment purchases, industrial structure advancement, energy conservation management	Investment round end, aging equipment, slowing structural changes, falling energy prices, economic slump	Global warming outline, Keidanren (Japan Business Federation) voluntary actions, Energy Conservation Act revision
Residential	Electrical appliance diffusion, nuclear families (rising number of households), diversification of lifestyles		Top runner system Enhancing insulation
Commercial	Air-conditioner diffusion, increased floor space	Increased floor space for office buildings, power consumption growth through office automation	Top runner system, requirement for regular reports
Transport	Growing demand for transportation with automobiles (progress in motorization)	Vehicle enlargement outdid fuel efficiency improvement	Top runner system, Fuel efficiency improvement with HVs and other new vehicles, requirement for regular reports

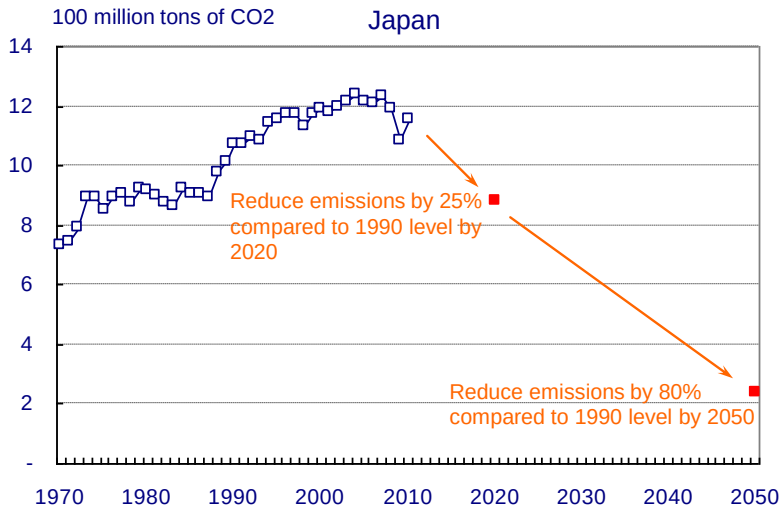
2. Energy Conservation Policy in Japan

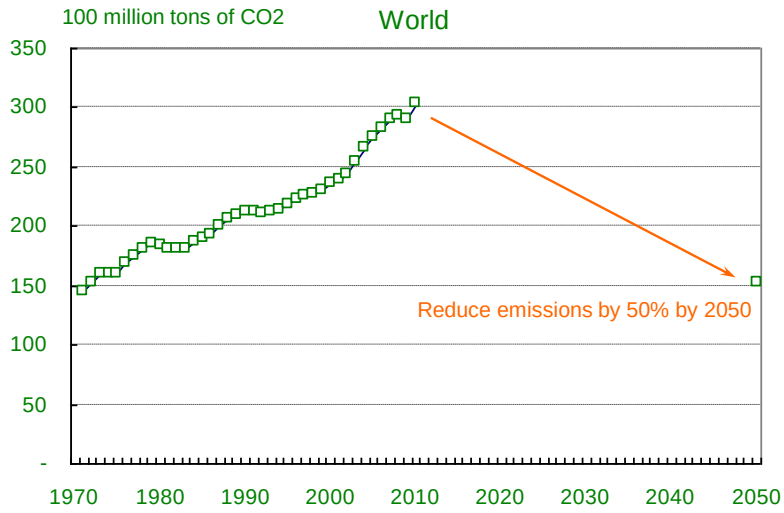
3) New Policy for More Efficient Energy Use

<New Policy for More Efficient Energy Use>

- New target for energy use was announced **in July 2015**
- Thorough energy conservation measures would reduce final energy consumption **by 13%** (50.3 million kl) to 326 million kl.
- Energy conservation measures would be accumulated to improve energy efficiency as much as just after the oil crises, namely **35% energy intensity improvement**

Role of Energy Conservation for Low-Carbon Society





Kaya Identity

$$C = \frac{C}{E} \times \frac{E}{GDP} \times GDP \quad \rightarrow \quad \frac{\Delta C}{C} = \frac{\Delta(C/E)}{C/E} + \frac{\Delta(E/GDP)}{E/GDP} + \frac{\Delta(GDP)}{GDP}$$

Reduction in C/E: Shifting to low-carbon society

- Shifting to new energy supplies

Need for measures based on "technology"

Reduction in E/GDP: Energy conservation

- Energy conservation by technology
- Energy conservation by consumers (visualization technology)
- Changes in industrial structure and lifestyle

Basic Elements of Japan's Energy Policy

- Enhancement of safety is considered as the pre conditions for energy policy, while simultaneous achievement of energy security, economic efficiency and environmental protection is presented as the energy policy objective.

Safety Enhancement as the Basis

Self-Sufficiency

Currently, 6% only

⇒ 【Target】 **Surpass the pre-2011 level （20%） to reach 25%**

Electricity Price

Substantial increase of electricity price from 2011
※FY 2013 （Industry＝30%, Residential＝20%）

Renewable levy at 1.3 trillion yen in 2014
（2.7 trillion yen once all permitted renewables become operational, which will continue over the next about 20years）

⇒ 【Target】 **Decrease from current level**

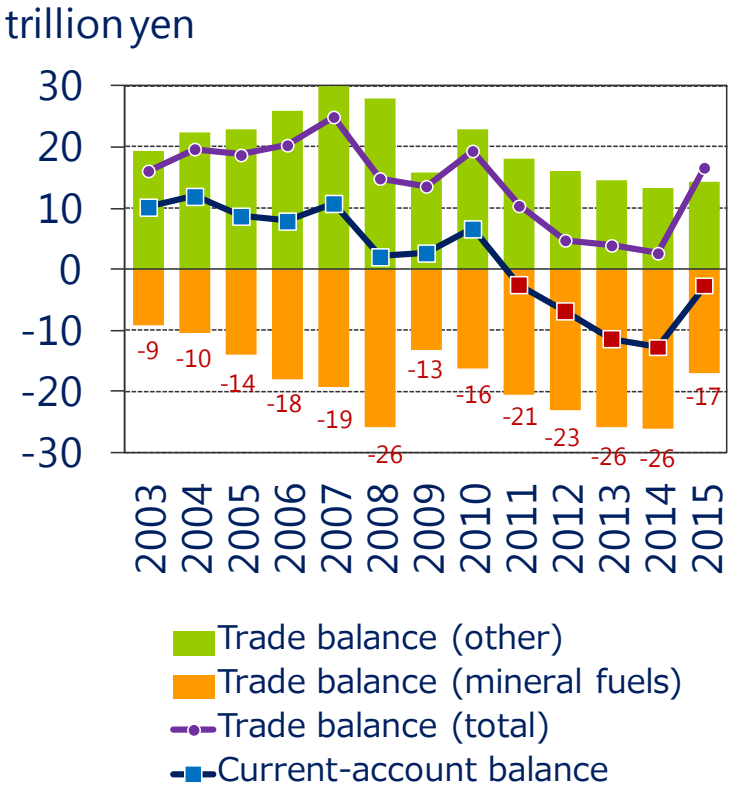
GHG Emissions Reduction

Worst CO_2 emissions level from fuel combustion

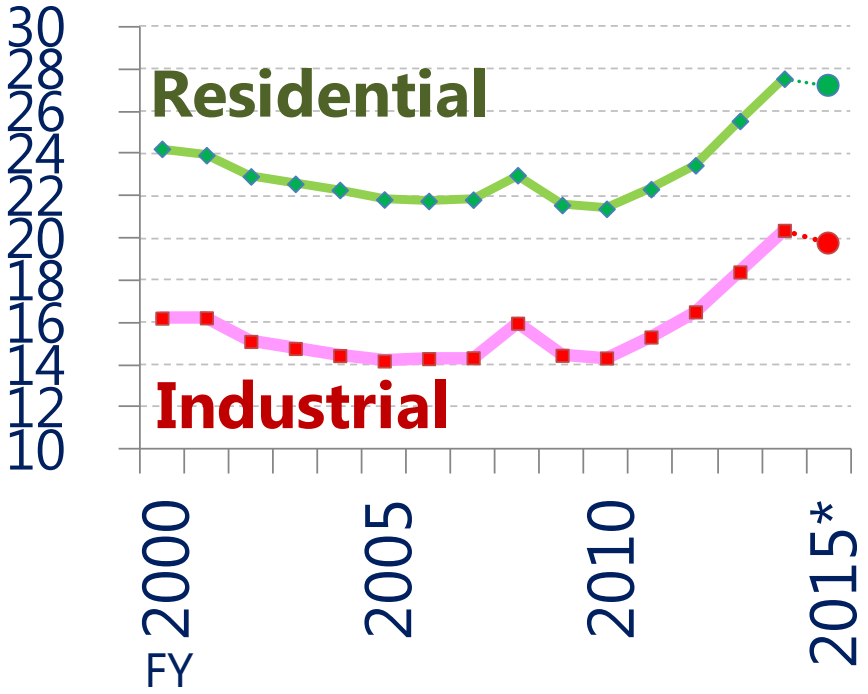
⇒ 【Target】 **As high as those of EU/US**

Electricity prices are rising （Economic Efficiency)

Trade and Current-account Balances



Electricity prices



- In 2011, the trade balance fell into the red for the first time since the second Oil Shock 31 years ago (1980) when the trade balance was running a deficit due to soaring oil prices.

* Prices for FY 2015 are based on first half (Apr.-Sep.) average price.

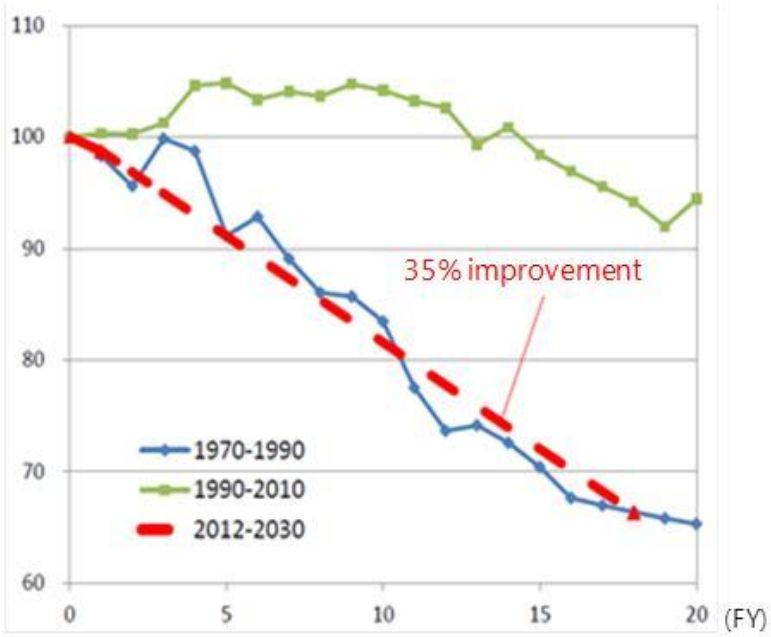
(Source) Produced based on MOF's "Balance of Payments Statistics" and other documents

(Source) IEEJ "Handbook of Energy & Economic Statistics in Japan"

Promotion of Energy Conservation

- Thorough energy conservation measures would reduce final energy consumption by 13% to 326 million kl.
- Energy conservation measures would be accumulated to improve energy efficiency as much as just after the oil crises.

【Energy efficiency improvement】



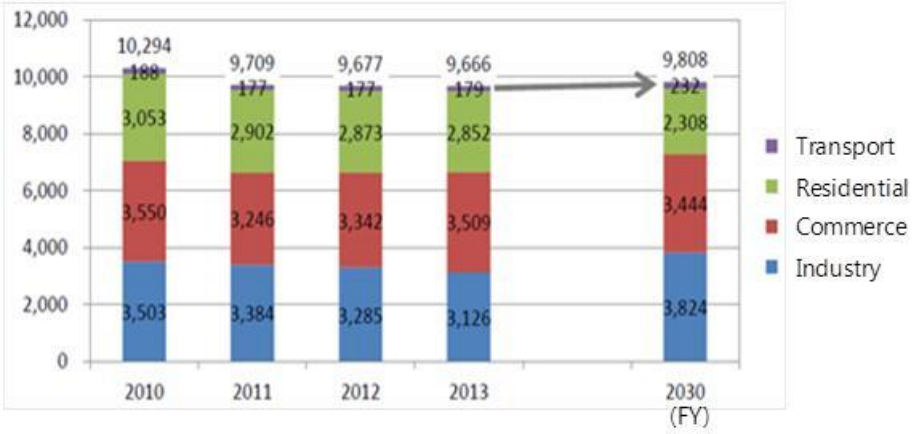
Energy efficiency=final energy consumption/real GDP

Electricity demand (100 million kWh)

	FY2013		FY2030 Reference		FY2030 Energy conservation	
Industry	3,126	32%	4,284	36%	3,824	39%
Commerce	3,509	36%	4,387	37%	3,444	35%
Residential	2,852	30%	2,909	25%	2,308	24%
Transport	179	2%	189	2%	232	2%
Total	9,666	100%	11,769	100%	9,808	100%

※Numbers for FY2030 are estimates.

Changes in electricity demand (100 million kWh)



(Source) Document 3 "Long-term Energy Supply/Demand Outlook, Related Documents" p.66 (left chart) and p.69 (right chart) at 11th meeting (July 16, 2015) of the Long-term Energy Supply and Demand Outlook Subcommittee, Strategic Policy Committee, Advisory Committee for Natural Resources and Energy

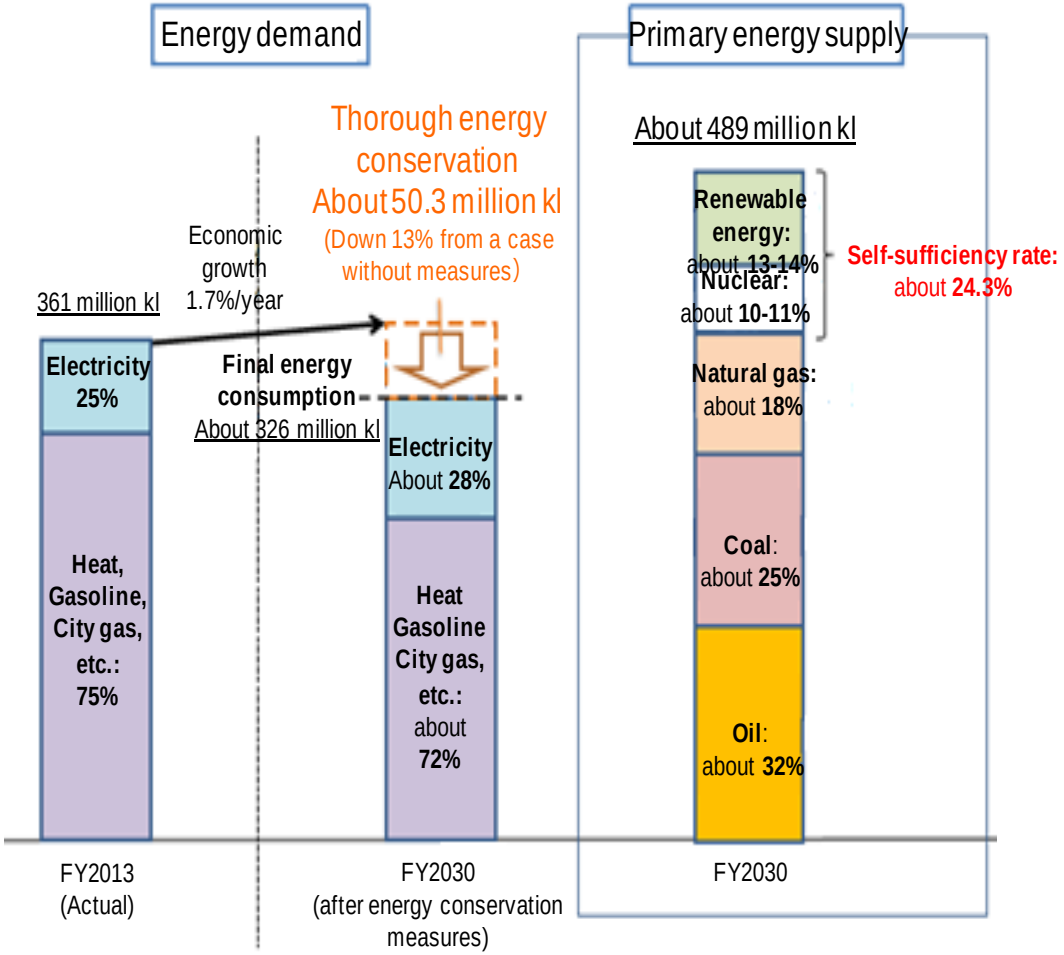
Energy Supply/Demand Structure in 2030
<I> Primary Energy

<1> Energy demand and primary energy supply structure

○ While energy demand growth is projected in line with economic growth (**an average 1.7%**), energy efficiency is expected to improve as much as after the oil crises thorough energy conservation (**35% in 20 years**).

◎ **Energy supply/demand structure improvement** (energy self-sufficiency rate: 6% in 2014 ⇒**24.3%** in 2030)

◎ **Energy-related CO_2 emissions**: **down 21.9%** from 2013



(Source) METI "Long-term Energy Supply/Demand Outlook" p.5 (July 16, 2015)

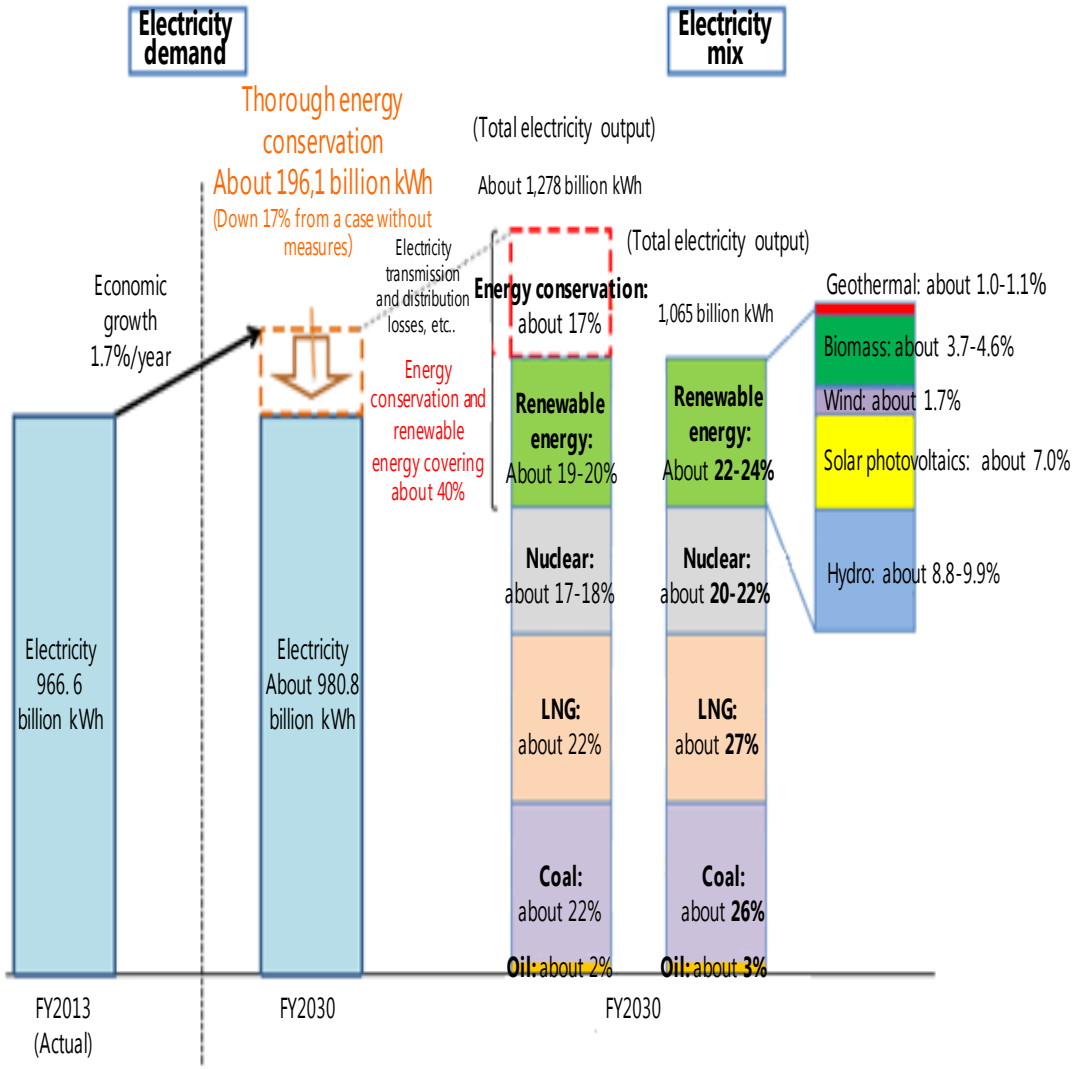
Energy Supply/Demand Structure in 2030
<II> Electricity Mix

<2> Electricity mix

○ Thorough energy conservation (electricity savings) and the maximum renewable energy diffusion will cover **about 40%** of electricity demand, reducing the dependence on nuclear power generation substantially (from **29%** before the 3/11 disaster to **20-22%**).

○ Base load share: **56%** (**63%** before the 3/11 disaster)

◎ **Electricity costs** to **decline by 2-5%** from the present level



(Source) METI "Long-term Energy Supply/Demand Outlook" p.7 (July 16, 2015)

3. Emerging More Enhanced Policy in Japan

<How to achieve the ambitious target for energy Conservation>

- Energy Mix announced in July 2015 provides energy conservation target with 35% energy intensity improvement, which is comparable to that for 20 years after the oil crises in 1970s

- New policies need to be provided

Current Energy Efficiency Barriers

Industry	Residential/Commercial	Transport
● Relatively small room for additional EE&C improvement due to already achieved energy savings ● Long payback period prohibits additional technological investment; thus, large-scale production units not being replaced for 20-30 years ● Policy approach necessary to evaluate the collaborative EE&C of multiple industry/business entities ● Middle, small-sized business entities lack funding, and human resources as well as technical know-how	● No system in place to share EE&C measures/know-how ● Middle, small-sized commercial business entities lack understanding on EE&C, ● Life style change required to promote EE&C ● Consumers lack understanding on EE&C	● Additional fuel economy improvement required to achieve passenger transport energy savings ● Traffic demand management required to be in place

Specific Energy Conservation Assumptions

■ Energy savings in each sector would be accumulated to save energy consumption by 50.3 million kl

<Major energy conservation measures in each sector>

Industry sector <Down about 10.42 million kl>

- **4 major industries (steel, chemicals, cement, paper-pulp)**
  ⇒ Promoting low-carbon society action plans
- **Promoting plant energy management**
  ⇒ Improving energy efficiency through visualization of manufacturing lines
- **Developing and introducing innovative technologies**
  ⇒ Introducing COURSE50 (CO_2 Ultimate Reduction in Steelmaking Process by Innovative Technology for Cool Earth 50) to cut CO_2 emissions by some 30% through hydrogen reduction of iron ore, blast furnace gas CO_2 separation, etc.)
- **Cross-industry introduction of highly efficient equipment**
  ⇒ Low-carbon industrial furnaces, high-performance boilers, etc.

Transport sector <Down about 16.07 million kl>

- **Diffusing next-generation vehicles, improving fuel efficiency**
  ⇒ One of every two vehicles would be a next-generation vehicle
  ⇒ Fuel cell vehicles: More than 100,000 units in maximum annual sales
- **Traffic flow measures**

Commerce sector <Down about 12.26 million kl>

- **Energy-saving buildings**
  ⇒ Energy conservation standard adaptation requirement for new buildings
- **Introducing LED lights and organic light emitting displays**
  ⇒ Diffusing LED and other highly efficient lights
- **BEMS building energy management system for energy management**
  ⇒ Introducing BEMS for a half of buildings
- **Promoting national movements**

Residential sector <Down 11.6 million kl>

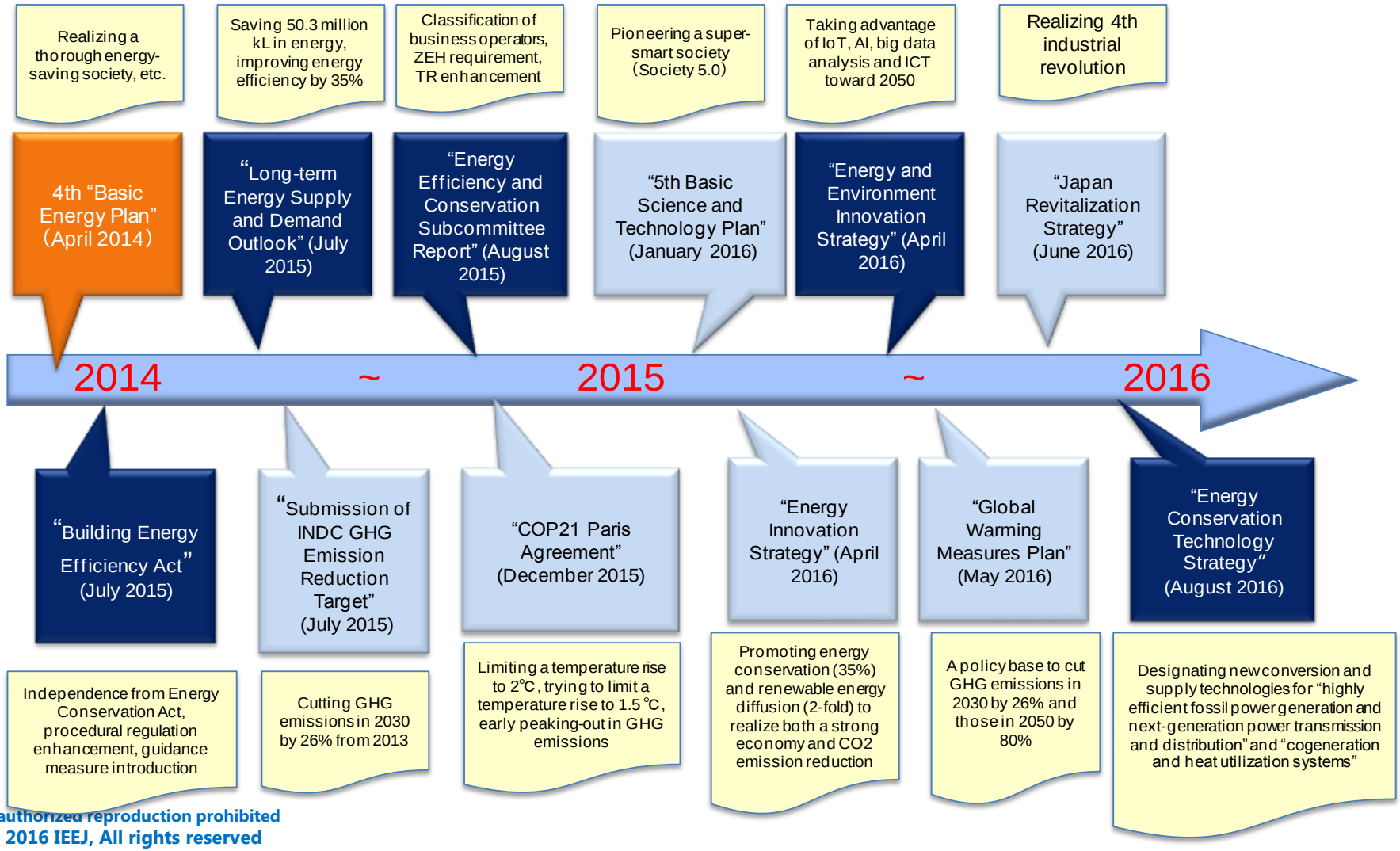
- **Energy-saving housing**
  ⇒ Energy conservation standard adaptation requirement for new housing
- **Introducing LED lights and organic light emitting displays**
  ⇒ Diffusing LED and other highly efficient lights
- **BEMS building energy management system for energy management**
  ⇒ Introducing BEMS for all houses
- **Promoting national movements**

(Note) The key issues include **"Facility Renovation"**, **"IT Utilization"**, and **"Energy Conservation in Buildings"** as well as the introduction of **"Benchmarking Systems"**.

(Source) Document 3 "Long-term Energy Supply/Demand Outlook, Related Documents" p.21 at 11th meeting (July 16, 2015) of the Long-term Energy Supply and Demand Outlook Subcommittee, Strategic Policy Committee, Advisory Committee for Natural Resources and Energy

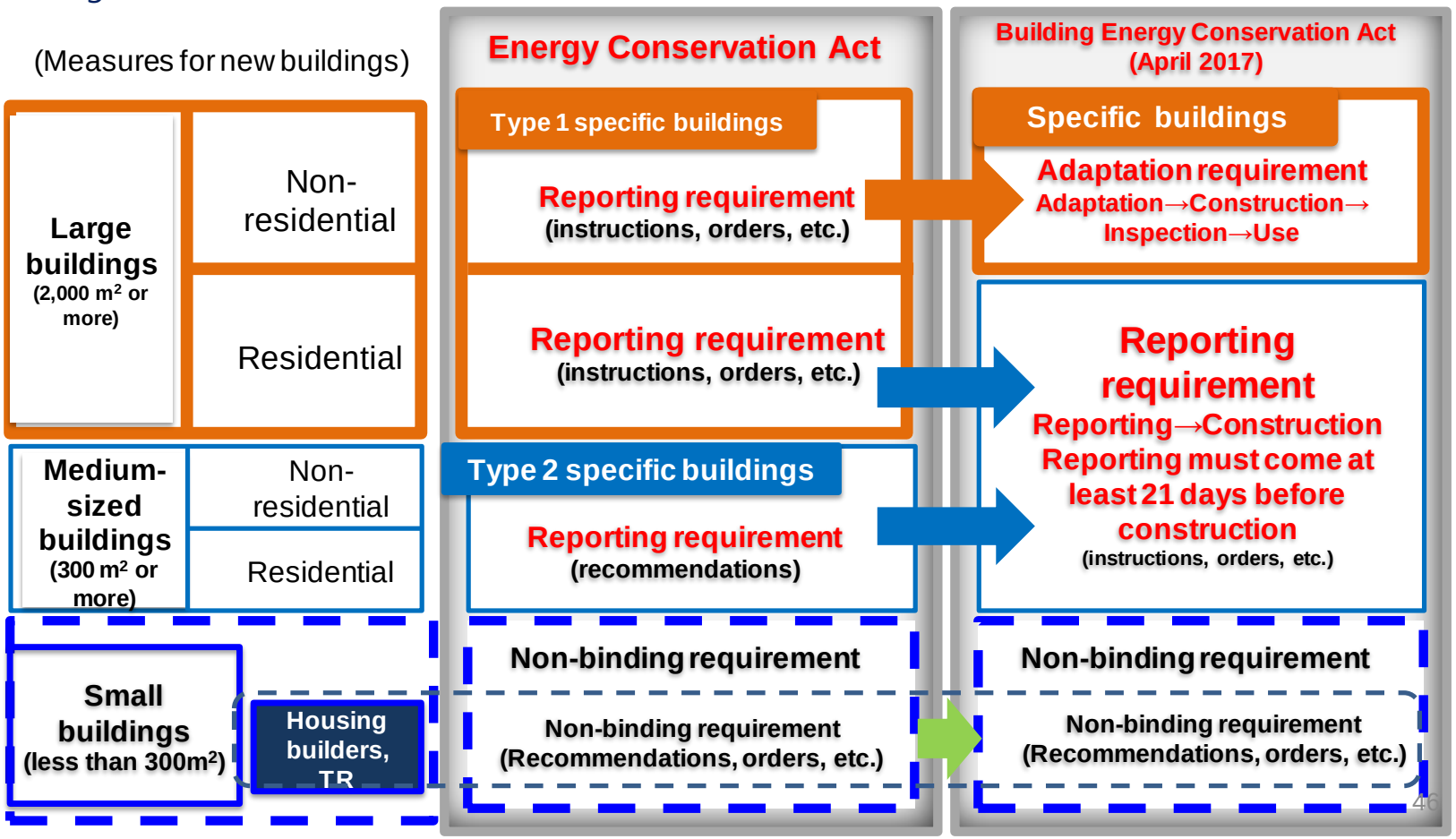
Recent Energy Conservation Policy Situation

➢Various policy-related moves and a new energy conservation phase



Building Energy Conservation Act

❶ Regulation: adaptation measures (large-scale construction and reconstruction) or reporting requirement
❷ Guidance for special floor-area ratios: all buildings ❸ Energy conservation labeling system (new and old buildings)



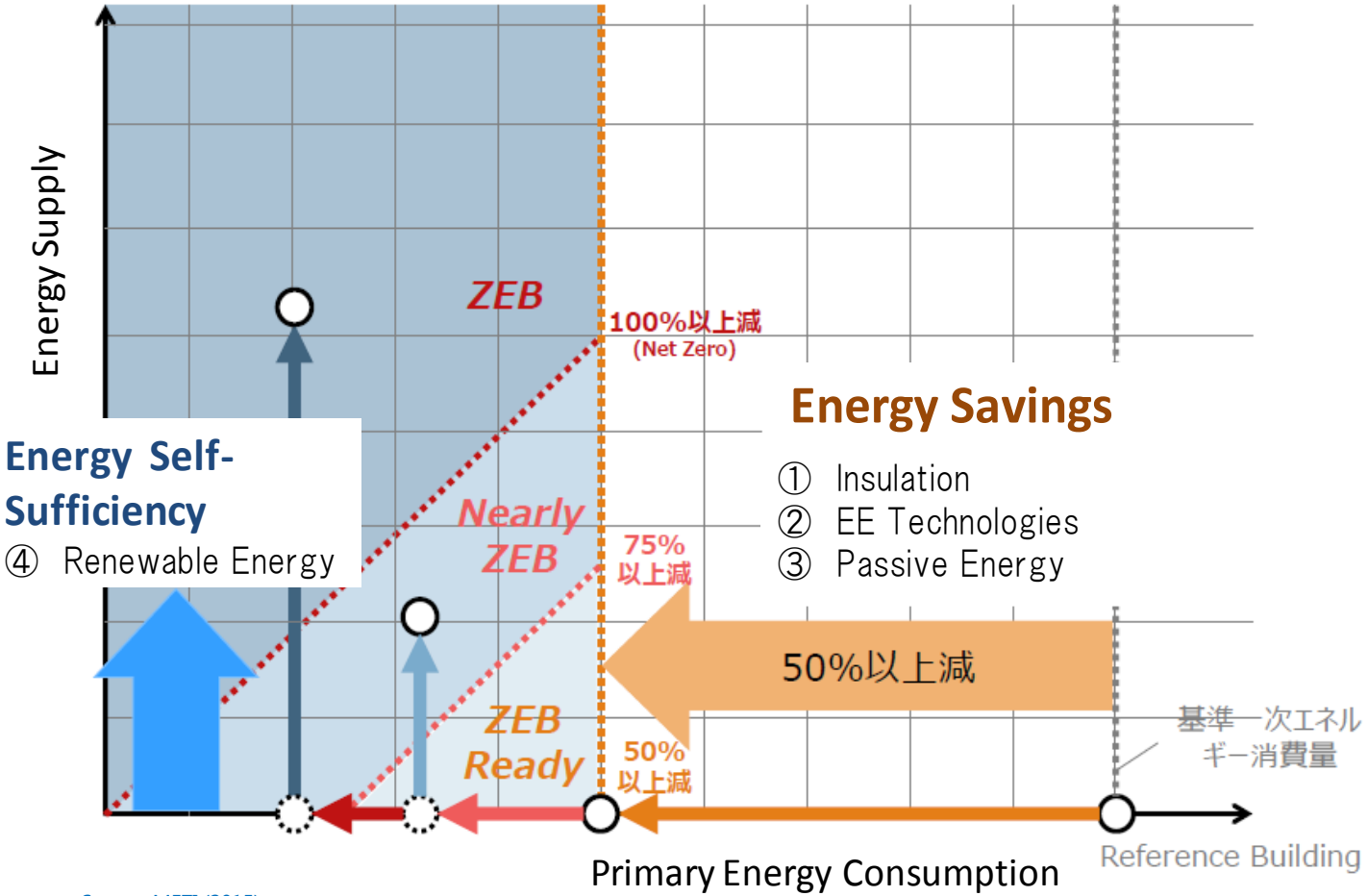
Policy Trend Based on "Energy Efficiency and Conservation Subcommittee Report"

➢Recent energy conservation policy measures

Industry	○Introducing a system in 2016 to classify specific business operators into four grades (S, A, B and C) （7775 S graders/12412=62.6&) ○ Energy conservation subsidization targets will be limited to equipment specified in medium to long-term plans in regular reports (from 2016) ○ Promoting combined energy conservation initiatives (introducing a system for utilizing unused heat (added to the numerators)) (from 2016) ○ Measures for SMEs (providing energy conservation knowhow and information, etc.)
Buildings	○Building Energy Conservation Act enacted (to require adaptation to energy conservation standards) for partial implementation from 2016 ○Enhanced TR (New / showcasing, reviewing / refrigerators 2016 / incandescent lamps, water heaters, large routers) ○ZEB・ZEH roadmap → Creating a ZEH builder system in 2016　ZEB guidelines under preparation ○Creating a benchmark system in the commercial sector (Convenience stores in 2016, department stores, rental offices, etc. in 2016)
Transport	○Considering introducing WLPT (Worldwide Harmonized Light-duty Test Procedure) (for implementation in October 2016) ○ The Autonomous Driving Business Commission released its "future policy" in March 2016.
Power generation, etc.	○ Planning to draft guidelines for energy retailers' energy conservation efforts ○ Implementing a benchmark system for fossil power generation from 2016 ○ Releasing "Energy Conservation Technology Development Strategy 2016" (July 2016) ○ Publishing BEMS (Building Energy Management System) data (2009), collecting additional data in the future

Definition of Zero Energy Building

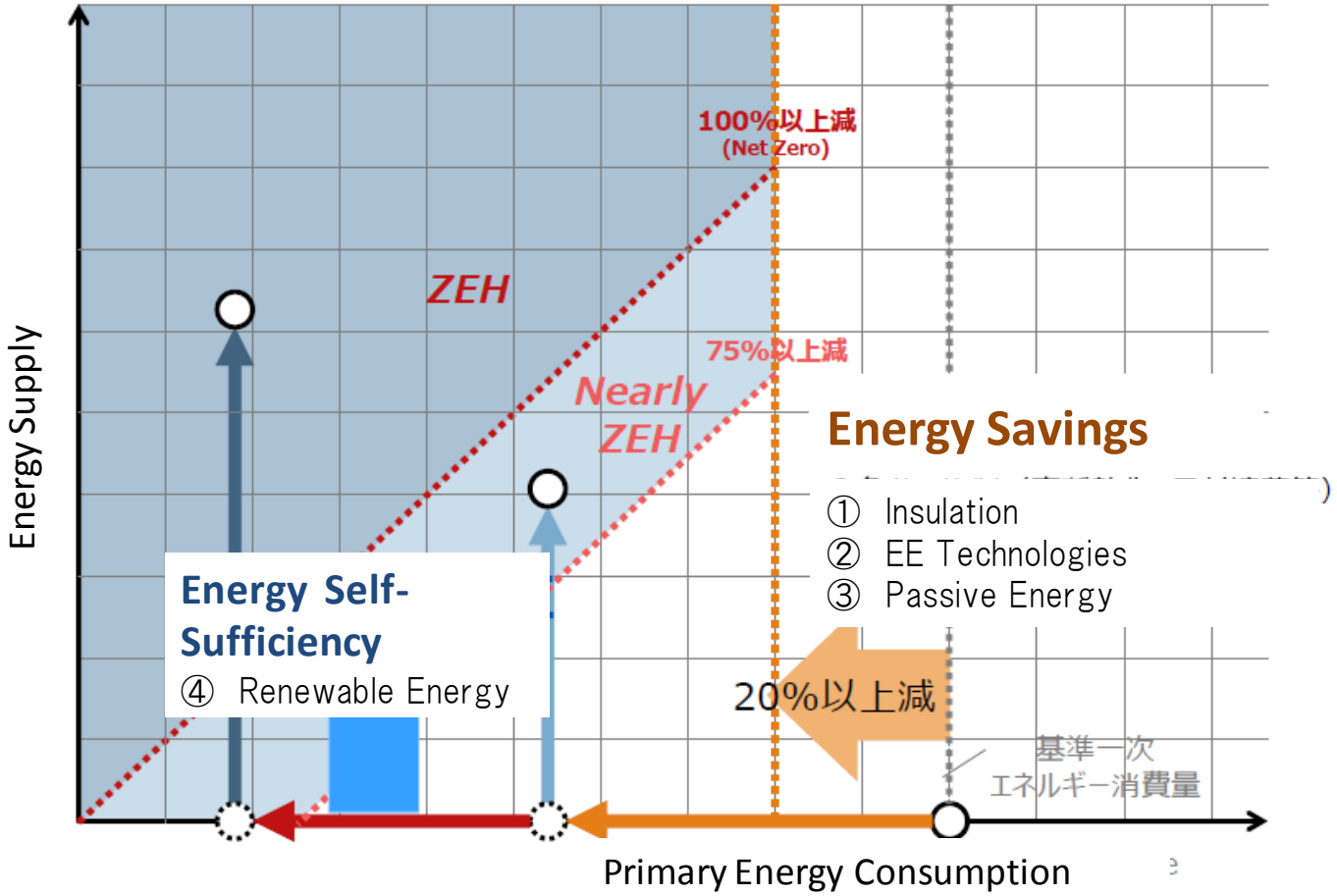
➢ Definition of ZEB: More than 50% energy savings + Renewable Energy Supply



Source: METI (2015)

Definition of Zero Energy House

➢ Definition of ZEB: More than 20% energy savings + Renewable Energy Supply



Source: METI (2015)

Current Regulatory Scheme at Manufacturing Plants, etc.

- Business operators with overall annual energy consumption (head office, manufacturing plants, branch offices, sales offices, etc.) of at least 1,500kl in crude oil equivalent are subject to regulations.
- Business modes, such as franchise chain of stores, are also considered single business operators and those consuming at least 1,500kl for the whole chain are subject to regulations.

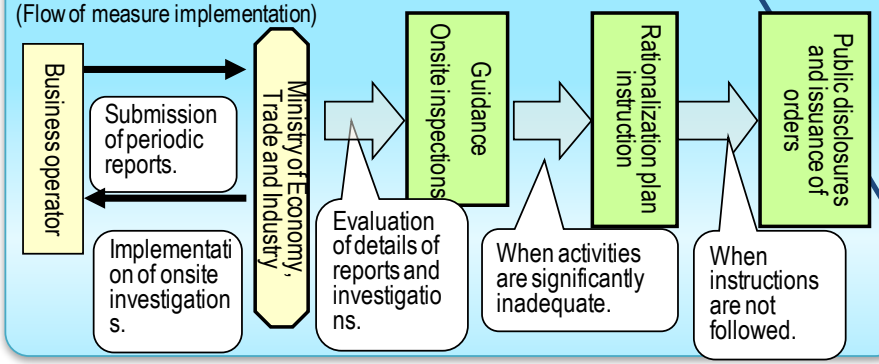
On the basis of energy consumption, about 90% of the industriy sector and about 40% of the commercial sector are covered subject to regulations.

○ Obligation to report periodically

① Transition of energy unit consumption
② Status of activities relating to energy conserving measures
③ Obligation to annually report on status of benchmark indices (for subject business lines only), etc.

Measures, such as instructions, public notices and orders (fines in case of violation against orders) implemented when energy conservation activities of a business operator are significantly inadequate.

(Flow of measure implementation)



* Fines imposed when orders are not followed.

○ Numerical targets: Reduction of annual average by at least 1%.

○ Guidelines pertaining to energy conservation measures:
Stipulation of standards (guidelines) based on the Energy Conservation Law as observance items for energy management.

➢ Energy conservation measures for business operators overall
- Maintenance of energy management organization.
- Allocation of persons in charge.
- Formulation of policies for activities pertaining to energy conservation targets, etc.

➢ Energy conservation measures at individual manufacturing plants and business establishments (Example: Air conditioning systems.)
Preparation and implementation of management standards (manuals) pertaining to the following measures:
- Operational management (operating time, set temperature, etc.).
- Periodical measurement and recording of temperature, humidity, etc.
- Periodical maintenance and inspection of facilities.

○ New numerical targets to include in addition to existing targets
Benchmark indices and standards to be targeted
Currently set business lines: Iron and steel, electric power, cement, paper manufacturing, petroleum refining and chemical.
Standards to be aimed for: Levels satisfied by most superior business operators in respective industries (10 to 20%).

Introduction of Class Evaluation System for Large-scale Energy Users

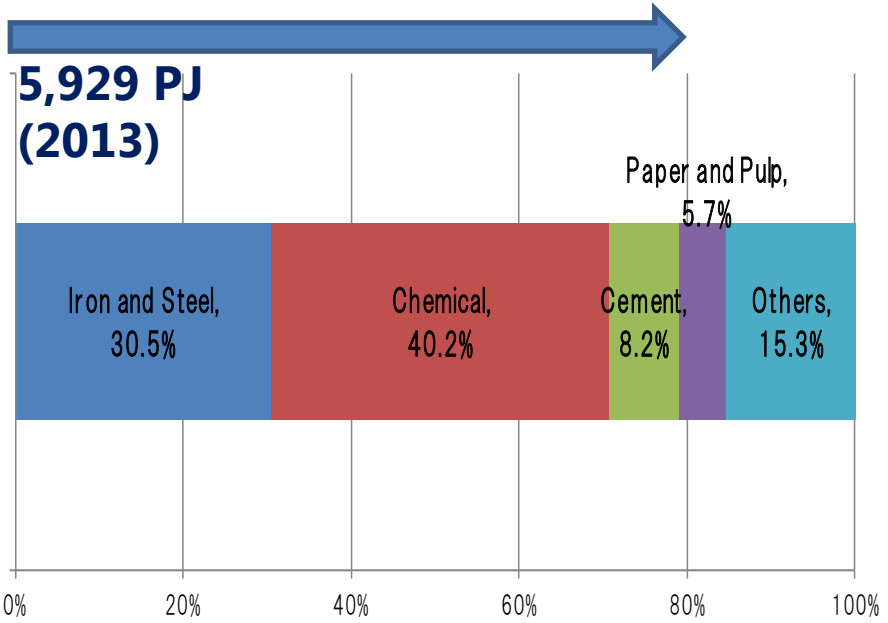
➢ Those companies that are required to report energy consumption/production will be classified into 4 categories depending on their EE&C achievements.

S Class (Companies w/t Superior EE&C)	**A Class** (Companies w/t Average EE&C)	**B Class** (Companies w/t Stagnant EE&C)	**C Class** (Companies w/t Poor EE&C)
【Criteria】 ① Achievement of 1% annual energy intensity improvement Or ② Achievement of benchmark target	**【Criteria】** Those companies that do not belong to either S class or B class	**【Criteria】** ① Non-achievement of annual energy intensity improvement target Or ② More than 5% energy intensity increase (5 years)	**【Criteria】** Those companies with substantial non-compliance on the annual energy intensity improvement target
Commend through METI Homepage	No particular action	Site inspection	Site inspection/guidance

Benchmark System

- 6 industry sub-sectors for 10 categories are under the benchmark system. Benchmark system allows the comparison of EE&C among the same type industry category.
- Those industries that belong to top 10-20% of each industry sub-sector are better rated in the annual reporting system.

Coverage of Benchmark System:
80% of industrial energy consumption



Industry Sub-sector Covered by Benchmark System:

(1) Iron and Steel (Blast Furnace)
(2) Iron and Steel (EAF, Ordinary Steel)
(3) Iron and Steel (EAF, Special Steel)
(4) Electric Suppliers
(5) Cement
(6) Paper
(7) Pulp
(8) Refinery
(9) Chemical
(10) Chlorine production

Dialogue between Public and Private Sectors

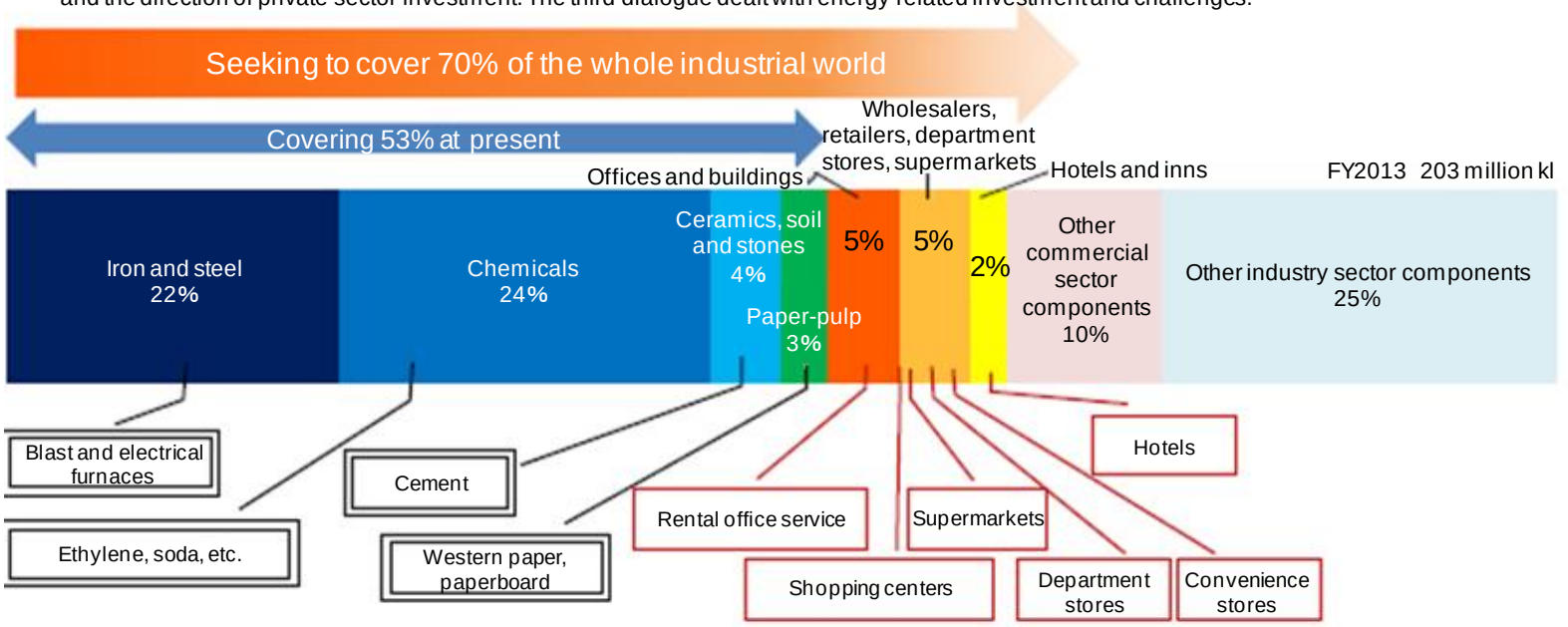
Dialogue between Public and Private Sectors (November 26, 2015)

Prime Minister's Statement

We plan to expand the benchmark system to the service industry with the coverage becoming 70% of total energy consumption of industry/commercial sectors.

Dialogue between public and private sectors

Based on the Japan Revitalization Strategy 2015 (Cabinet Decision on June 30, 2015), the dialogue between the public and private sectors for future investment is held for the two sectors to clarify the path the Japanese economy should follow in the age of uncertainties growing through the intensification of global competition and the rapid technological innovation and to share the government's desirable environment development course and the direction of private sector investment. The third dialogue dealt with energy-related investment and challenges.



(Source) IEEJ, Handbook of Energy & Economic Statistics in Japan (2015)

Introduction of the Benchmark System to Convenient Stores

Benchmark Indicator for Convenience Stores

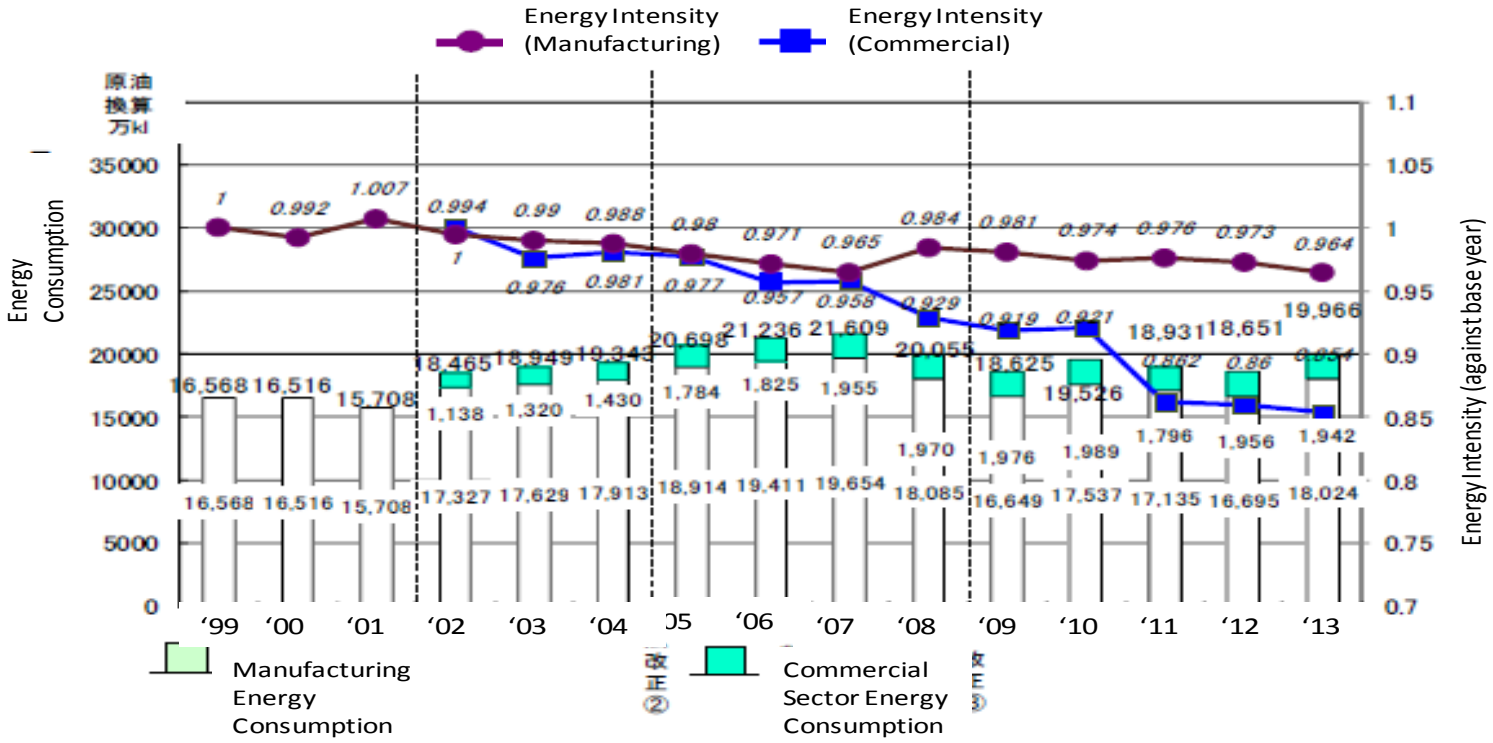
$$\textbf{Benchmark} = \frac{\text{Electricity consumption of convenience stores in kWh}}{\text{Sales convenience stores in million Yen}}$$

Benchmark = 845 kWh/million yen

Japan's Large-Scale Energy Users' Energy Intensity Improvement

- Manufacturing industry's energy intensity level showed relative small improvement since 1999.
- By contrast, the commercial sector's energy intensity substantially improved since its start in 2002.

Trends in Energy Intensity: Manufacturing Industry and Commercial Sector



Enhancing Classification Standards for Fossil Power Generation

① Numerical efficiency indicator for new plants ② Substantial benchmark modification

	Standard rated efficiency for new plants	Target efficiency	Benchmark A	Benchmark B
Coal	Ultra super critical (USC) 42.0% (Generating-end HHV)	41%	Target efficiency achievement rate 1.00 or more	Target thermal efficiency level 44.3% or more
Gas	Combined cycle (CC) 50.5% (Generating-end HHV)	48%	Weighted average of achievement rates for different fuels Coal/41%+ Gas/48%+ Oil/39% >=1	The level of 44.3% is calculated based on the energy mix: 41%x26 (Coal)+ 48%x27 (Gas)+ 39%x3 (Oil) =44.3%x(26+27+3)
Oil	Super critical (SC) 39.0% (Generating-end HHV)	39%		

"Energy Conservation Technology Strategy 2016" (METI/NEDO)

➢ Taking advantage of IoT and other technology development to save 50.3 million kl in energy **by 2030**

Energy conversion sector

❶Highly efficient fossil power generation, next-generation power transmission/distribution ❷Cogeneration and heat utilization

①Advanced ultra super critical (AUSC) power plants, 1700 ℃-class super high-temperature gas turbines (2020) (already in demonstration stage)
②Superconducting power transmission; ③FC business and mass production for industrial use (2020)

Industry sector

❶Manufacturing process ❷Systems, processing ❸Product energy conservation technology

① Innovative steelmaking process ② FEMS ③ Biomaterials, etc.

Residential/commercial sector

❶ZEB/ZEH ❷Energy-saving information equipment/systems ❸Energy-saving human factors

Super-insulated building materials, highly efficient air-conditioning/water-heating/lighting systems, next-generation telecommunications technology

Transport sector

❶Next-generation vehicles ❷ITS❸ Smart logistic systems

①Advanced ICE, EV, PHV, FC, etc. ②Autonomous driving and platooning vehicles, TDM, etc.

Cross-sectoral

❶ Innovative energy management technology ❷ Power electronics ❸ Next-generation heat pumps

① xEMS integrated control technology ② Wide-gap semiconductors, highly efficient inverters, etc.
③ Highly efficient heat pumps

NEDO Strategic Energy Conservation Technology Innovation Program gives priority

Key technologies cited in the "Technology Strategy" are given special treatment and funding priority when NEDO adopts the proposal-based Strategic Energy Conservation Technology Innovation Program.

"Energy and Environment Innovation Strategy"
(Cabinet Office's Council for Science, Technology and Innovation (CSTI))

➢ Promising innovative technologies that are optimal for the whole of the energy system and **designed toward 2050** and have great GHG emission reduction potential against the backdrop of COP21 targets and the coming super-smart society (Society 5.0)

Energy system integration technology	Utilization of ICT (information and communication technology), AI (artificial intelligence), big data and IoT (Internet of things) for MEMS (micro electro mechanical system) sensors
Core technology system components	Next-generation power electronics (substantial reduction of electricity losses, etc.), innovative sensors, multi-purpose superconductors
Energy conservation field	Innovative production process (using separation membranes and catalysts to save energy by 20-50%), super-lightweight heat-resistant structural materials
Energy storage field	Next-generation batteries (an innovative battery to allow a vehicle to run more than 700 km on a single charge), hydrogen production/storage/utilization
Energy creation field	Next-generation solar PV power generation (an innovative solar PV system to double power generation efficiency), using new geothermal energy resources that are difficult to use at present
CCS・CCU field	Separating CO2 to realize CO2-using industries (halving separation cost, increasing CO2 volume for effective use dramatically, improving efficiency for CO2 use substantially)

4. International Comparison of Policy

Country	Main feature of Energy Efficiency and Conservation (EE&C) policy
USA	● Federal level determines the EE&C standards, while main EE&C measures focus on financial incentives such as subsidies, tax breaks, and low interest loan. Recently, data driven approach has started to increase.
UK	● Comprehensive EE&C policy and measures have been implemented; such as voluntary action plan, energy suppliers obligation, and measures focused on the residential/commercial sectors including provision of economic incentives.
France	● Comprehensive EE&C approach has been taken across the sector, while the recent policy focus has been shifting toward the residential/commercial sectors with higher building EE standards, implementation of white certificate scheme, and provision of economic incentives.
Germany	● Comprehensive EE&C approach has been taken across the sector, while the policy has been focusing on the residential/commercial sectors with tightening buildings' EE&C standards, introduction of low interest loan (kfW) for new buildings/retrofit, and buildings EE&C labeling scheme.
China	● Meeting the energy intensity improvement target – specified in the five-year plan is supported by comprehensive approach across the sector, while strong focus is placed on the introduction of strong enforcement mechanisms such as through the implementation of target allocation to provincial level, policy-makers' performance evaluation based on the progress of energy intensity improvement, and mandatory replacement of old/small scale plants.
Korea	● Shifting from industry sector focused provision of economic incentives, EE&C approach has been strengthening the EE&C standard and regulation to include mandatory compliance on industry's GHG/energy management system. Measures for residential/commercial sectors have been strengthened to include consumers' economic incentives.

Thank you for your attention
IEEJ will contribute Japanese EE as well as world's

Contact :report@tky.ieej.or.jp