

Introduction of EEC policy in Japan

- One of the most important energy policies -

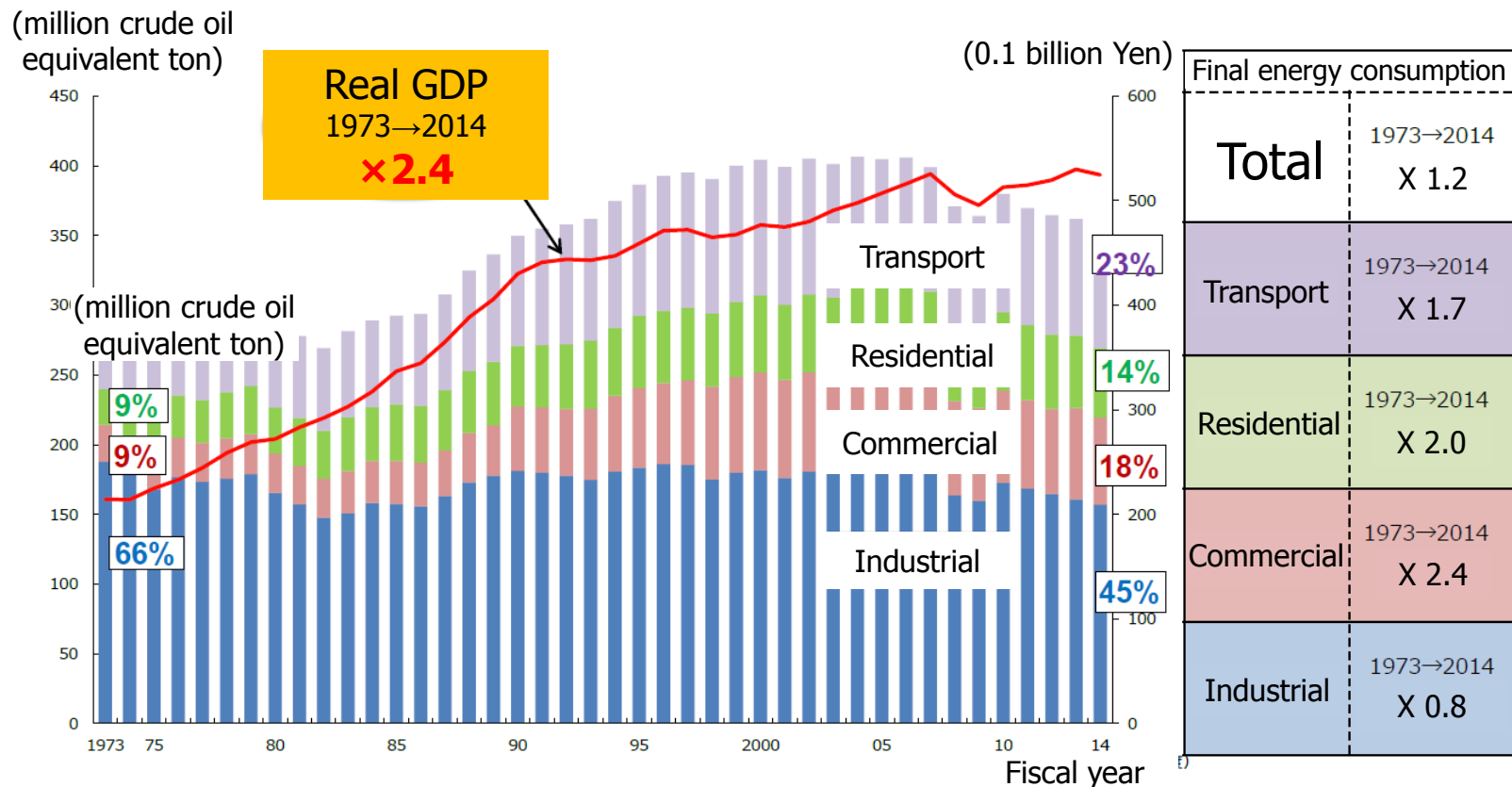
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Manila
Jun.2018

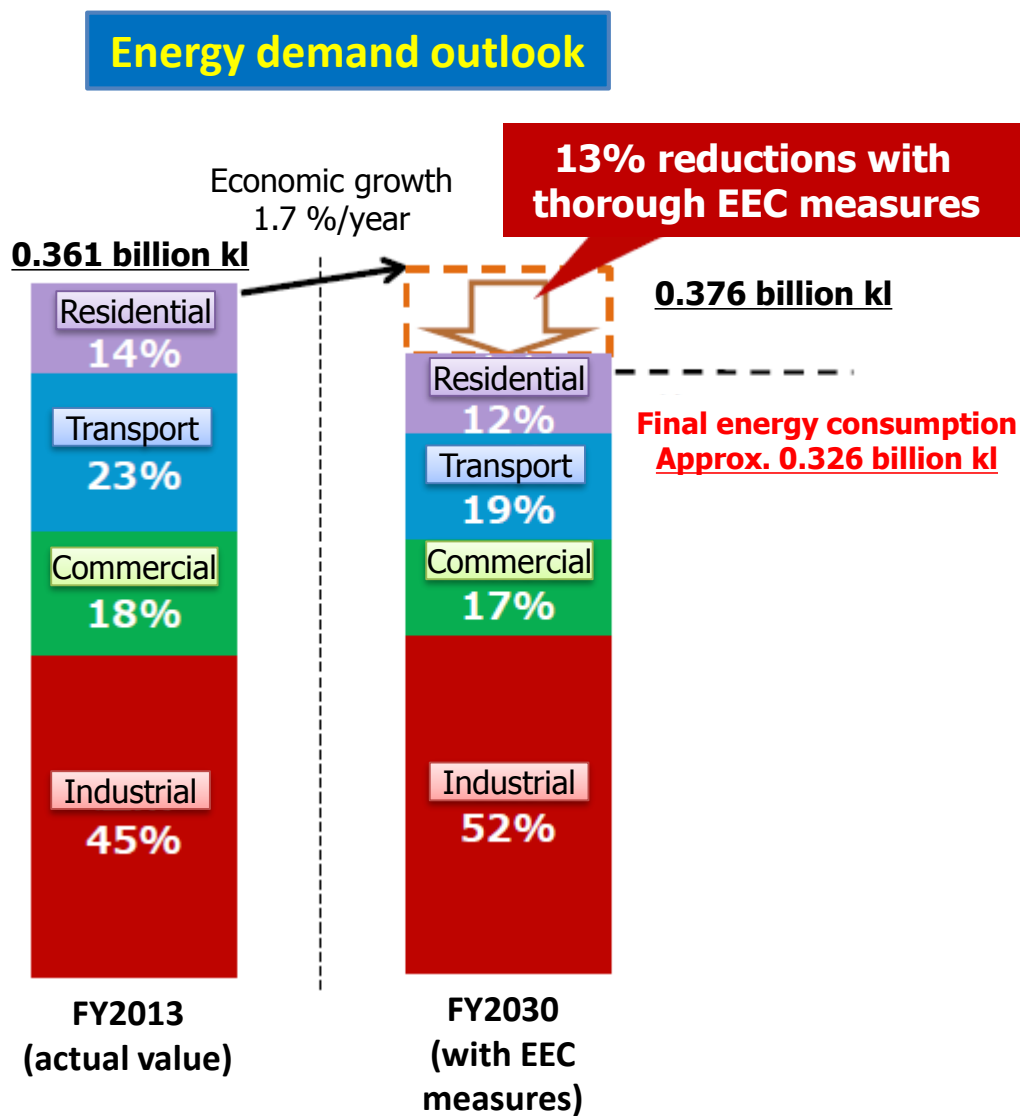
Transition of Japan's Final Energy Consumption and Real GDP

- After the oil crisis, though GDP has increased 2.4 times, final energy consumption has increase 1.2 times.
- While energy consumption in the industrial sector has decreased, that in the commercial, residential and transport sectors have been increasing.



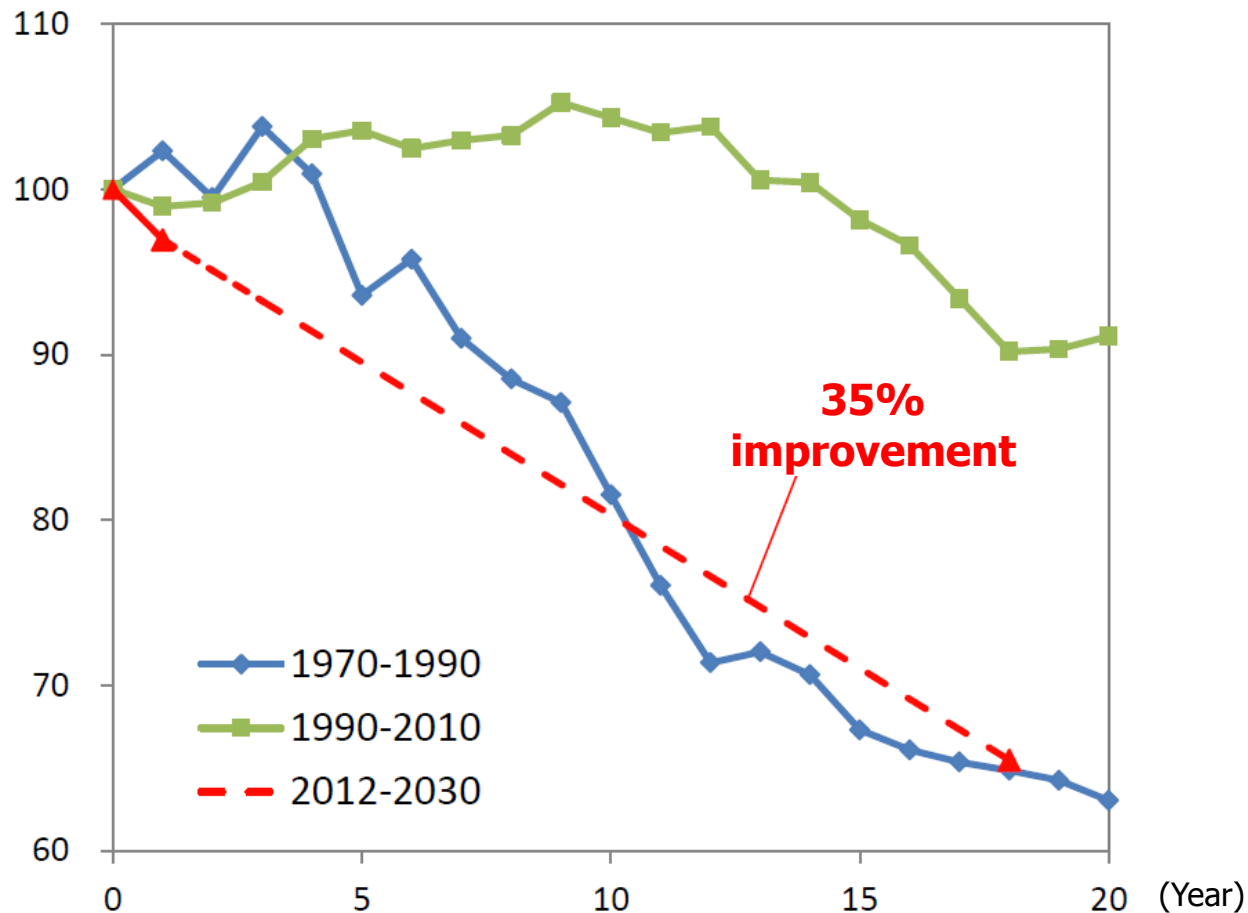
Source: The Consultant based on the material by METI (Feb. 2017)

Aim for 2030 (Long-Term Energy Supply and Demand Outlook)



Source: The Consultant based on the material by METI (Feb. 2017)


Improvement of energy efficiency



Source: The Consultant based on the material by METI (Feb. 2017)

To achieve the target (▲13%), EE improvement (final energy consumption / real GDP) which is similar to that after oil shock (35%) is required.

5th energy basic policy (draft)

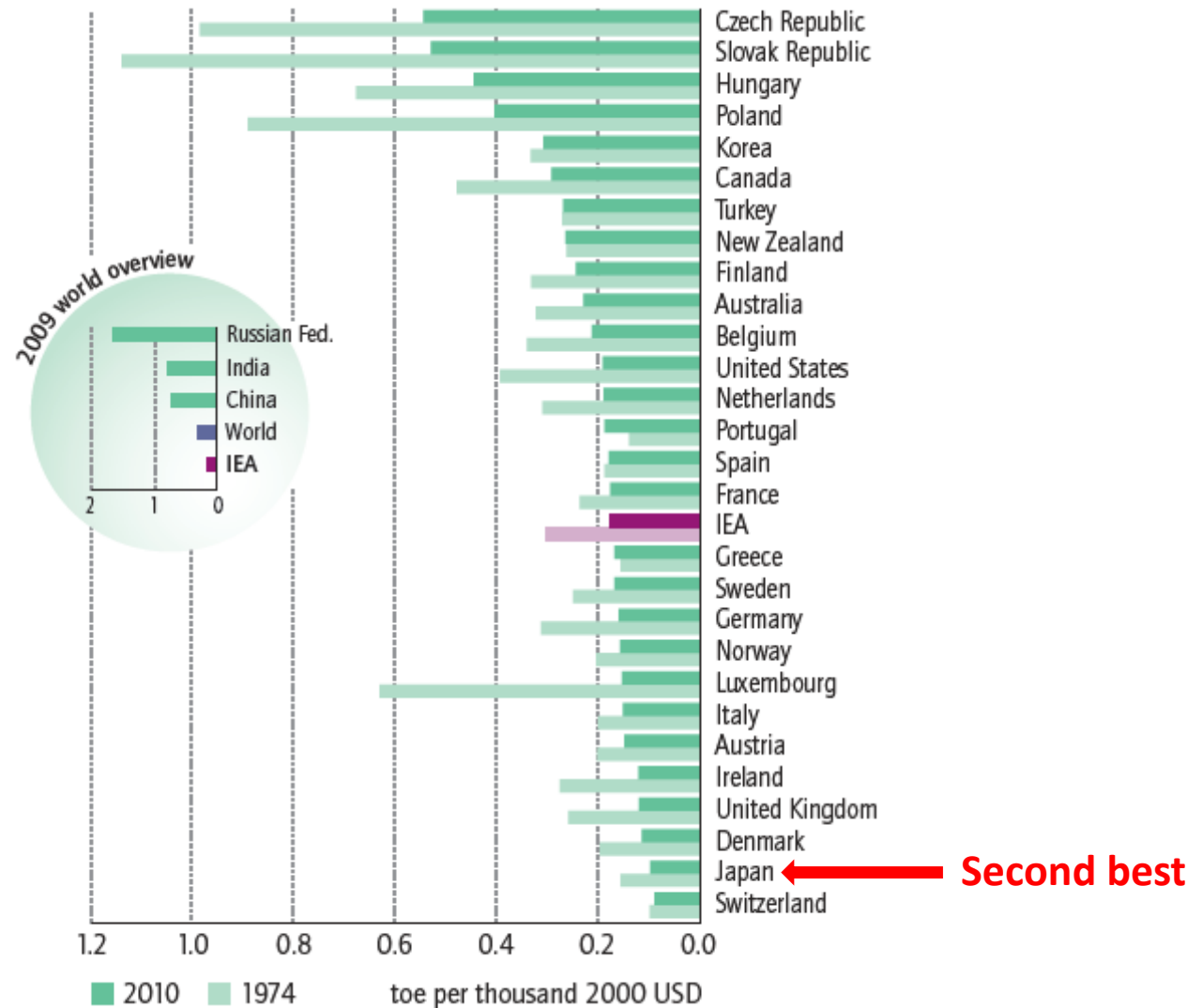
- Currently, under process of public comment (May 19.2018 - June 17.2018)
 - Securing resources
 - **Realizing a thorough energy saving society**  Secondly listed
 - Accelerate the introduction of renewable energy
 - Restructuring of nuclear energy policy
 - Efficient and stable use of fossil fuels
 - Drastic strengthening of efforts toward realization of hydrogen society
 - Energy system reform
 - Strengthening domestic energy supply network
 - Improvement of secondary energy structure
 - Energy industry policy
 - Development of international cooperation

Overview toward 2030 relating to EEC policy

	Approach	Verification	Action
2018 to 2030	Specific action target	Progress verification	Emphasis on achievements of targets
	<p>↓</p> <p>A linear approach with emphasis on implementation (= 2030 mix)</p> <ul style="list-style-type: none">• Self-sufficiency rate: 6% to approx.25%• Power cost suppression• 25% reductions of CO₂ emissions	<ul style="list-style-type: none">✓ Action plan of low carbon society✓ Regulation by EE law<ul style="list-style-type: none">- Top runner program for equipment- Top runner program for industry- EE improvement of buildings- Energy management and EE subsidy	<ul style="list-style-type: none">✓ Energy saving is 4th energy source✓ Challenge to the global top

Source: The Consultant based on the material by METI (Apr. 2018)

Total primary energy supply per GDP



Source: The Consultants based on IEA Scoreboard 2011

Top runner program for equipment

Top runner program for equipment started in 1998 which was defined in EE law (establishment: 1979)

- **Standards for performance of appliances, etc. are set at the top runner performance in that year.**
- **Other products (runner-up, etc.) have to catch up and qualify the top runner level in designated duration.**
- **Cover rate of the top runner target equipment exceeds 70% in energy consumption in a house.**

Current Target Products: 31

Passenger Vehicles, Freight Vehicles, Air Conditioners, Electric Refrigerators, Electric Freezers, Electric Rice Cookers, Microwave Ovens, Fluorescent Lights, Electric Toilet Seats, TV Sets, Video Cassette Recorders, DVD Recorders, Computers, Magnetic Disk Units, Routers, Switches, Copying Machines, Space Heaters(Gas/Oil), Gas Cooking Appliances, Video Tape Recorders, Multi-function Printers, Printers, Heat Pump Hot Water Heaters, AC Motors, Bulb type LED lamps, Insulation Materials, Sashes, Double Glazing, Refrigerating Showcases, Gas Water Heaters, Oil Water Heaters, Vending Machines, Transformers

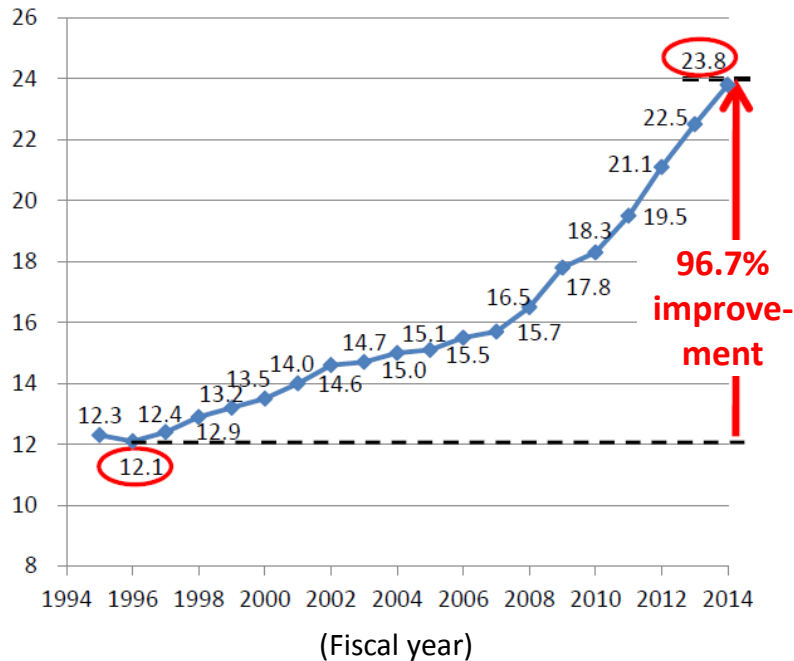
Source: The Consultant based on the material by METI (Feb. 2017) ,etc.

Efficiency improvements by top runner program for equipment

Passenger Vehicles

Change in average new vehicle fuel consumption

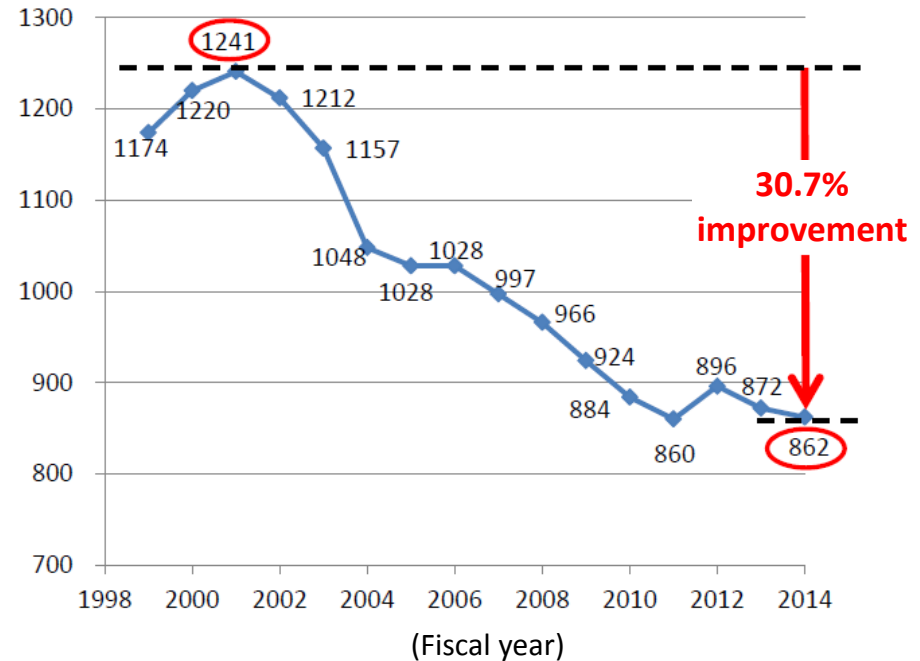
Fuel consumption
(km/L)



Air Conditioners

Change in power consumption in a period

Power consumption
in a period (kWh)



Source: The Consultant based on the material by METI (Feb. 2017)

Top runner program for industry - Benchmark system -

Top runner program for industry started in 2008 - 2009 which was defined in EE law.

- Business operators that use energy of more than 1,500 kl/year are obligated to submit periodic reports every year (end of July).
- In the event that business operators do not follow government's guide, they shall be publicized and receive an order.
→ **Never happened since EE law establishment.**
- In the event that business operators do not follow government's order, they shall be penalized.
→ **Never happened since EE law establishment.**

Top runner program for industry - Benchmark system -

- The EE law urges business operators to improve energy intensity based on evaluation criteria and government provides measures such as guidance if necessary.

<Evaluation criteria>

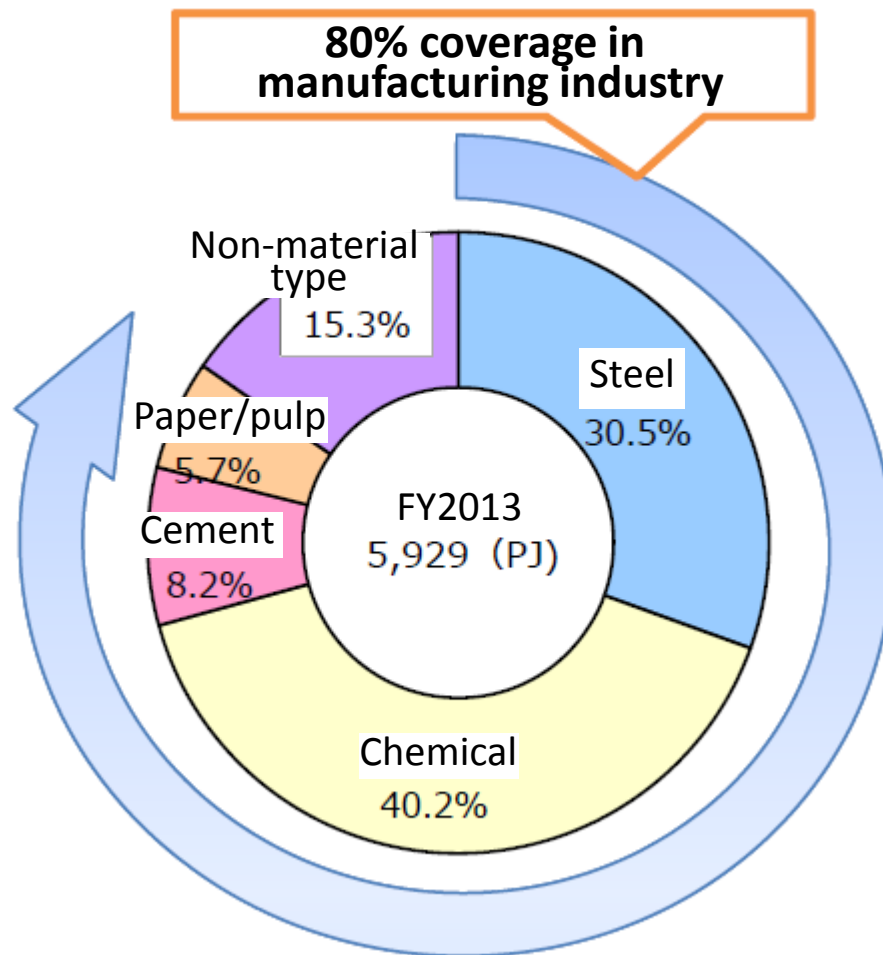
- ✓ Efforts of energy conservation measures
- ✓ Trends of energy intensity (Targeted 1% reduction/year has become difficult)
- ✓ Situation on **benchmark** indicator



- Set **benchmark to the level satisfied by the top business operator (10 to 20%)** in each subsectors in all businesses which includes industrial and commercial sectors.

3. Top runner program for industry

It is aimed to cover 70% of energy consumption of all businesses (industrial and commercial sectors) during FY 2018.



Target 7 Sub-sectors

1. Steel
2. Chemical
3. Cement
4. Paper/Pulp
5. Electric Power
6. Oil
7. Convenience Store

Source: The Consultant based on the material by METI (Feb. 2016)

EEC approach for buildings

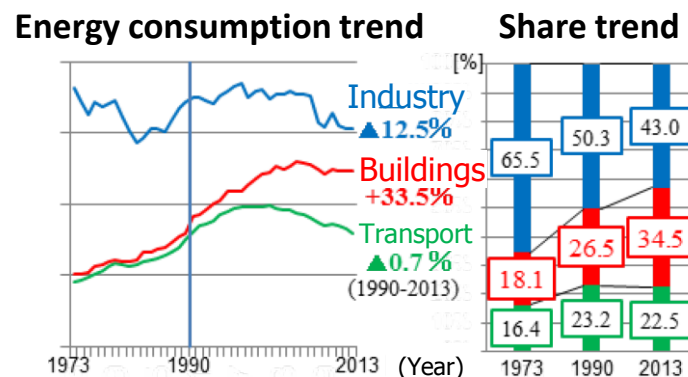
Regulation of buildings started in 1993 by EE law.

[Current situation]

- While energy consumption of other sectors (industrial and transport) is declining, that of building sector has increased significantly. Currently, occupying 1/3 of the total.

- Industrial sector : -12.5% (1973-2013)
- Transport sector : -0.7% (1990-2013)
- Building sector : +33.5% (1973-2013)

- It is essential to drastically **strengthen the EEC measures** of the building sector.



Source: The Consultant based on the material by METI (Feb. 2017)

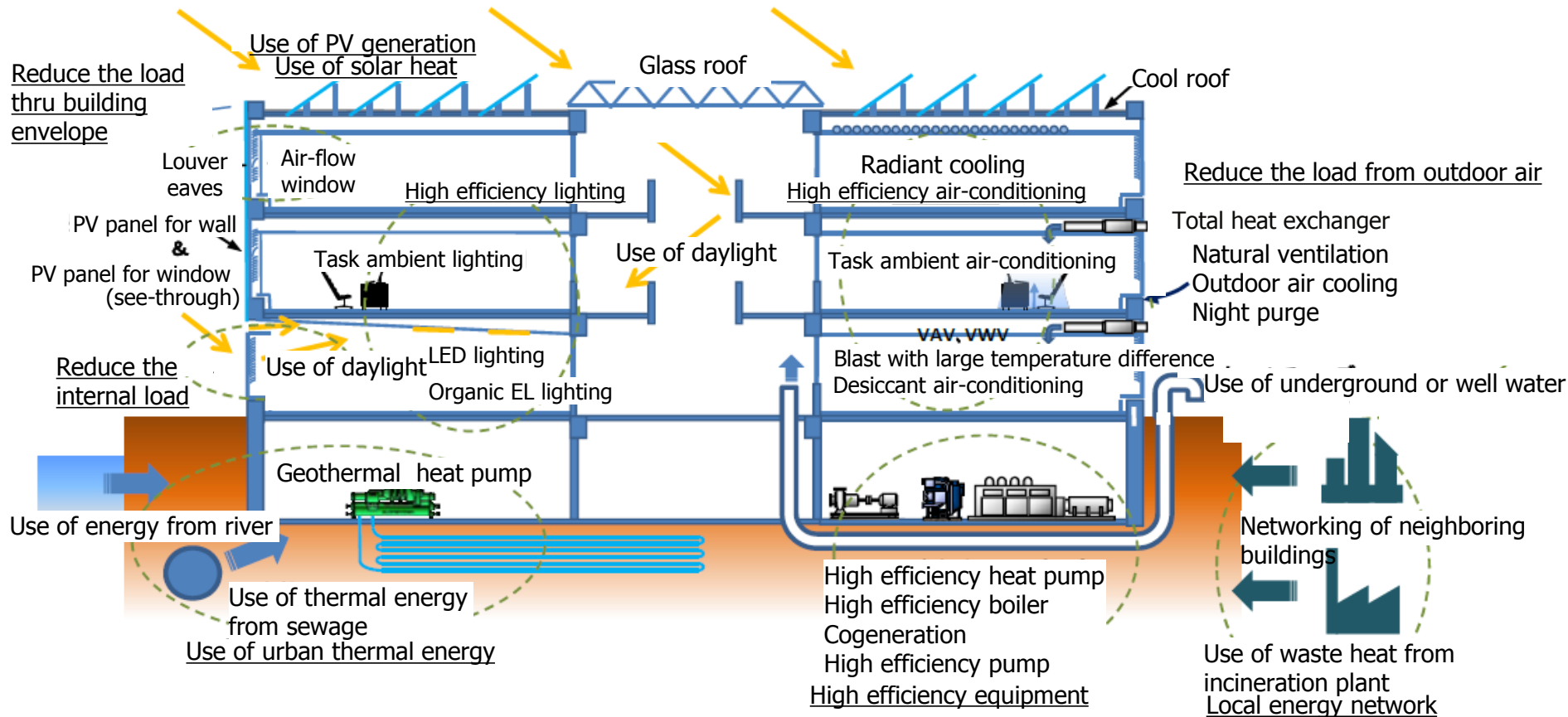
Outline of buildings EE law -measures pertaining to new construction- (enforcement :Apr. 2017)

Category of buildings		Buildings EE law
Large-scale buildings Over 2,000m ²	Non-residential	Compliance obligation to EE standards ➤ Linked to construction confirmation procedure
	Residential	Notification obligation ➤ In case of nonconformity to EE standards, direction/order ,etc. if necessary
Medium-scale buildings 300m ² – 2,000m ²	Non-residential	Notification obligation ➤ In case of nonconformity to EE standards, direction/order ,etc. if necessary
	Residential	Obligated to make efforts
Small-scale buildings Less than 300m ²	Residential Construction Client (house maker, construction company ,etc.)	Obligated to make efforts

Source: The Consultant based on the material by METI (Feb. 2017) ,etc.

Introduction of innovative energy saving technologies in buildings has been supported by government

Image of ZEB (Net Zero Energy Building)



Source: The Consultant based on various materials

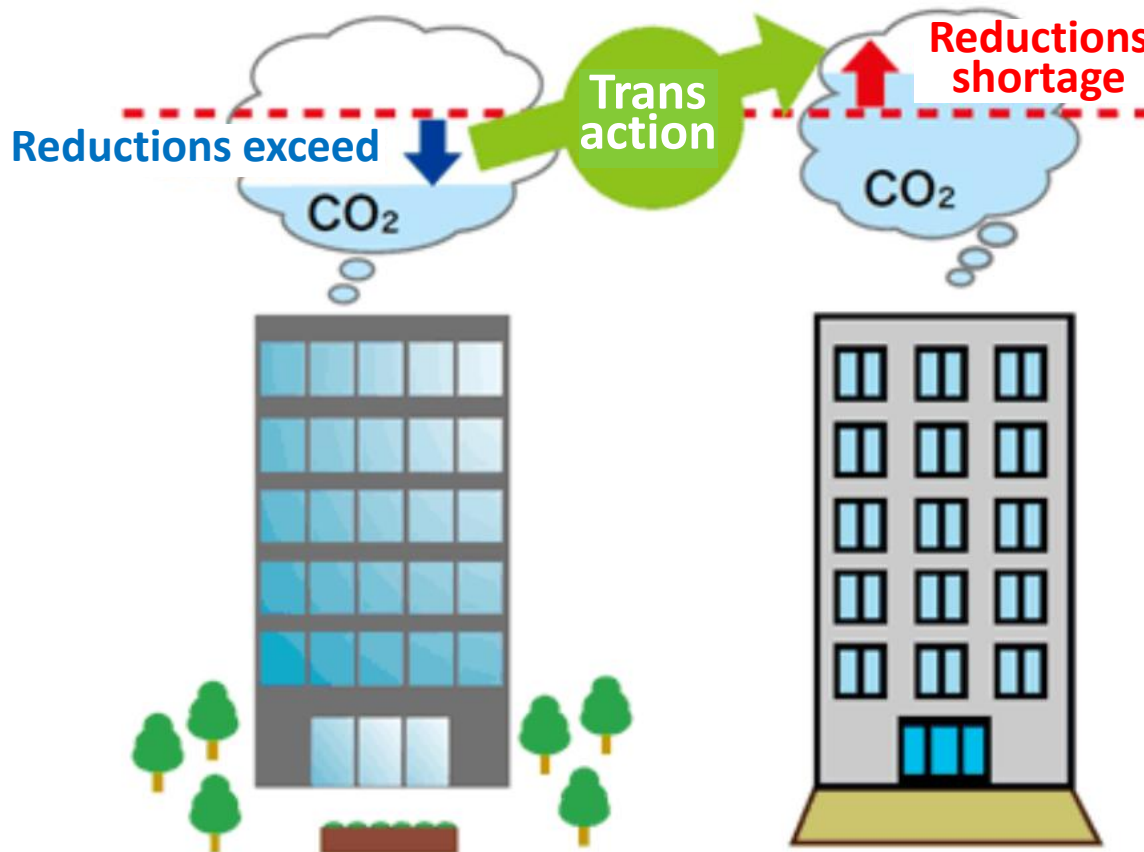
EEC approaches by Tokyo metropolitan government for existing facilities (1)

Target business establishment	Entity with energy consumption of 1,500 kL/year or more
Reduction plan period	Phase 1: FY2010 - FY2014 Phase 2: FY2015 - FY2019
Standard emissions	Average of three consecutive years from FY2002 to FY2007
Reduction obligation rate	Phase 1: Office buildings etc. 8%, factories etc. 6% Phase 2: Office buildings etc. 17%, factories etc. 15%
Promotion system at business establishment	Obligation of election of supervising management and technical manager -> Organizational energy management
Measures in case of non-compliance	In case of not achieving obligated reduction obligation <ul style="list-style-type: none">➤ Order : Reduction in obligation by x 1.3 times➤ In the event of an order violation, fines, publication of violation facts etc.

Source: The Consultant based on homepage of Tokyo metropolitan government

EEC approaches by Tokyo metropolitan government for existing facilities (2)

Image of cap & trade mechanism



- Priority shall be given to reducing emissions by **EEC measures**
- Utilization of **cap & trade mechanism** is also possible.

Source: The Consultant based on homepage of Tokyo Metropolitan government

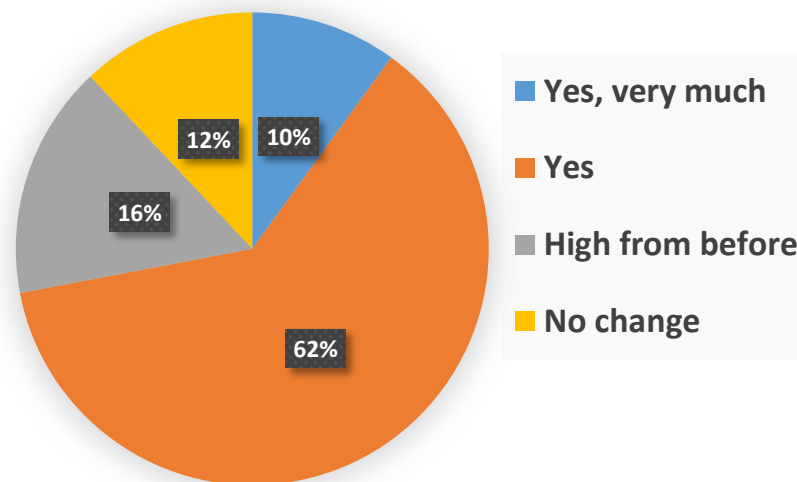
EEC approaches by Tokyo metropolitan government for existing facilities (3)

- Promotion system at business establishment is required
- Obligation of election of **supervising management and technical manager -> Organizational energy management**

Realization of purpose at system introduction

⇒ "Make EEC measures from the worksite to top management issues"

Has management's interest in the trend of CO₂ reduction increased ?
(Results of questionnaire in 2014)



Source: The Consultant based on homepage of Tokyo Metropolitan government's material

Best practice of EEC (1) : shopping mall

- **Outline of the building**

- **Location: Tokyo**
- **Floor area: 19,550m²**
- **Building structure: RC (Basement 1F – 4 floors)**
- **AC system: DHC (District Heating and Cooling) + AC units (partially)**
- **Number of workers: Approx.200 persons**

- **EEC approaches**

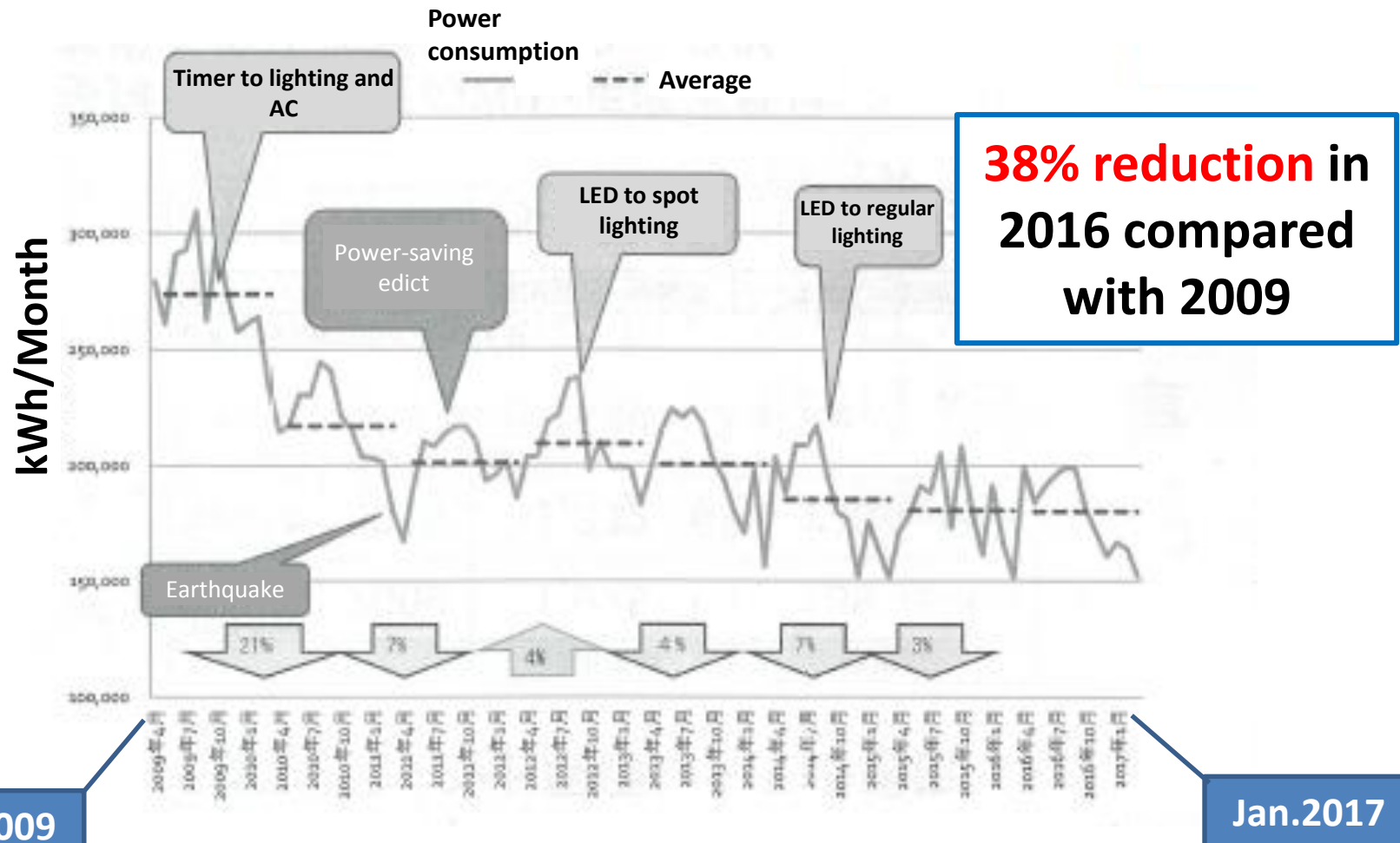
- **Introduction of auto timer to lighting and AC in 2009. (ON/OFF switch was operated manually in the past)**
- **Introduction of LED to spot lighting equipment (approx. 1,000 units) in 2012**
- **Introduction of LED to regular lighting equipment (approx. 2,000 units) in 2014**



Best practice of EEC (1)

Trend of power consumption reductions

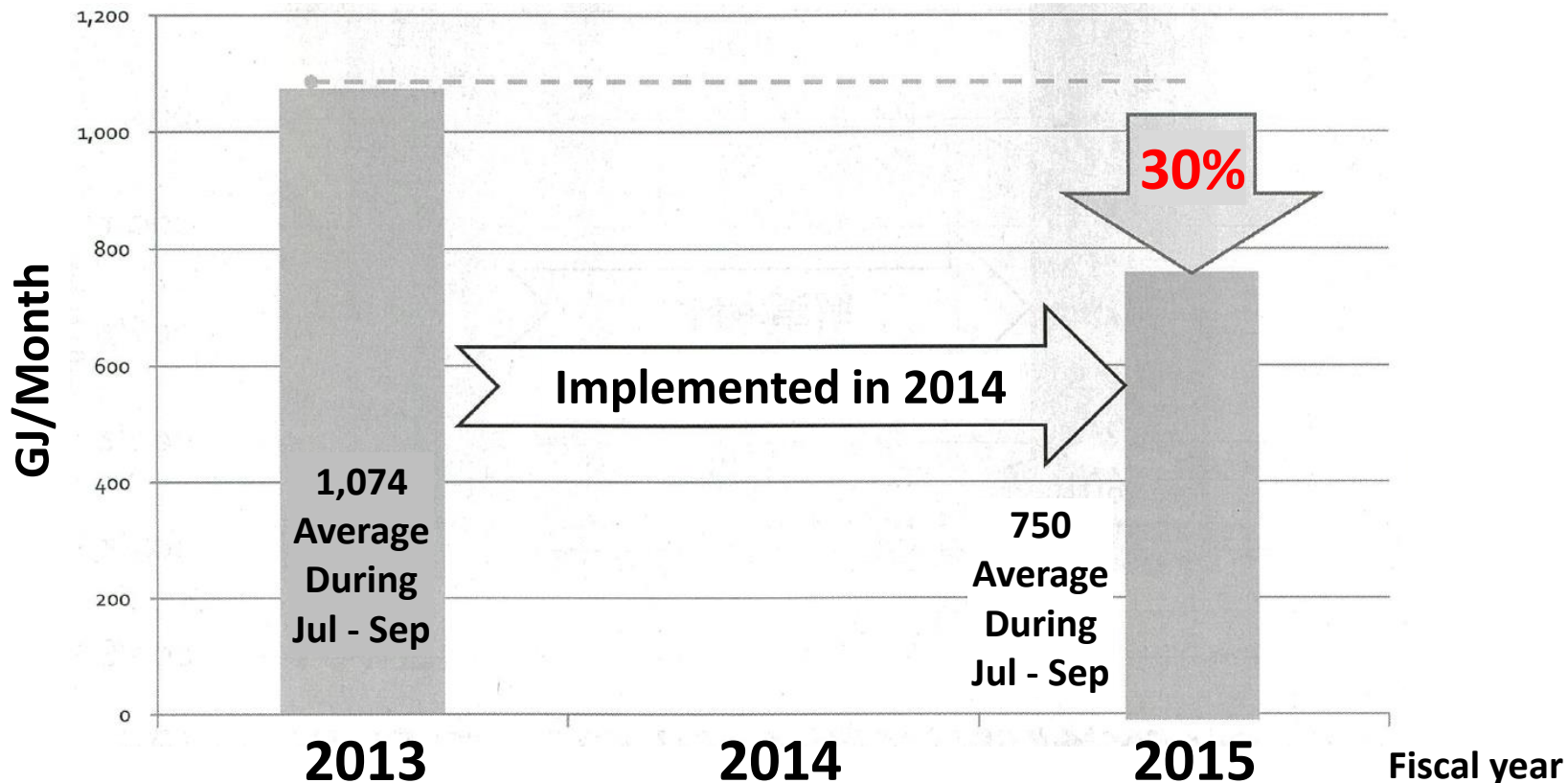
(approx.8years: Apr.2009-Jan.2017)



Source: The Consultant based on the material by the Tokyo metropolitan government (Jul.2017)

Best practice of EEC (1)

Effects on cooling demand reductions with introduction of LED to regular lighting system



Source: The Consultant based on the material by the Tokyo Metropolitan government (Jul.2017)

Introduction of LED realized reductions of waste heat from lighting equipment, and achieved cooling demand reductions in summer.

Best practice of EEC (1)

Evaluation of energy consumption reductions on primary energy basis

	Before		After		Primary energy consumption reductions
Energy	2009	2013	2015	2016	
Electric power consumption	275 MWh x 12 = 3,300 MWh/year			171 MWh x 12 = 2,052 MWh/year	
Primary energy consumption	3,300 x 9.97 = 32,901 GJ/year			2,052 x 9.97 = 20,458 GJ/year	32,901 – 20,458 = 12,443 GJ/year
Cooling& heating demand		445 GJ x 12 = 5,340 GJ/year	325 GJ x 12 = 3,900 GJ/year		
Primary energy consumption		5,340 GJ x 1.36 = 7,262 GJ/year	3,900 GJ x 1.36 = 5,304 GJ/year		7,262 – 5,304 = 1,958 GJ/year
Total	32,901 + 7,262 = 40,163 GJ/year		20,458 + 5,304 = 25,762 GJ/year		14,401 GJ/year (36%)

Note1: Calculation was made by the Consultant.

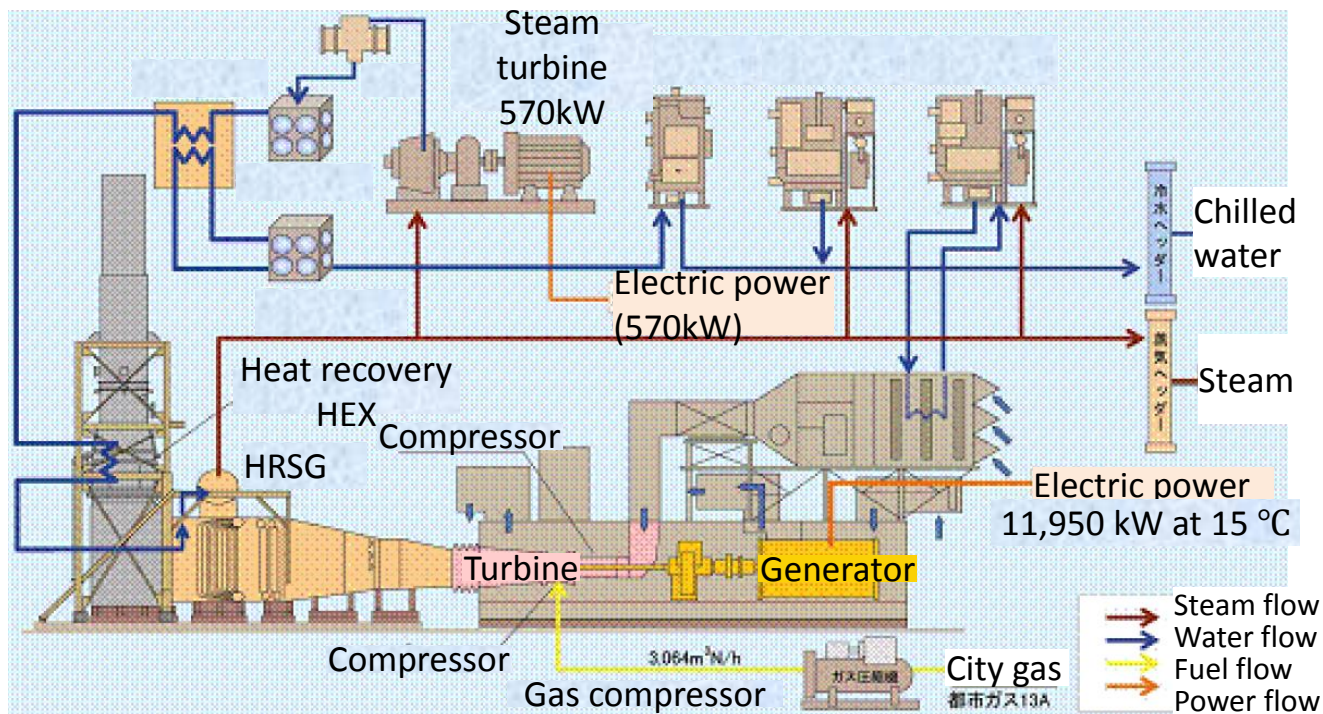
Note2: Conversion factors for electric power and DHC were based on the guide for completing periodical report regarding EE law . (METI, Aug.2017)

Note3: Changes of both heating and cooling demands by the introduction of LED are taken into account.

Source: The Consultant based on the material by the Tokyo Metropolitan government (Jul.2017)

Best practice of EEC (2)

Co-gen introduction example in chemical factory



Schematic flow of co-generation system in chemical factory

	CO ₂ emissions before EE measure (t)	CO ₂ emissions after EE measure (t)	CO ₂ emissions reduction (t)
Introduction of co-gen	99,927(FY2005)	75,238(FY2007)	24,689(-24.7%)

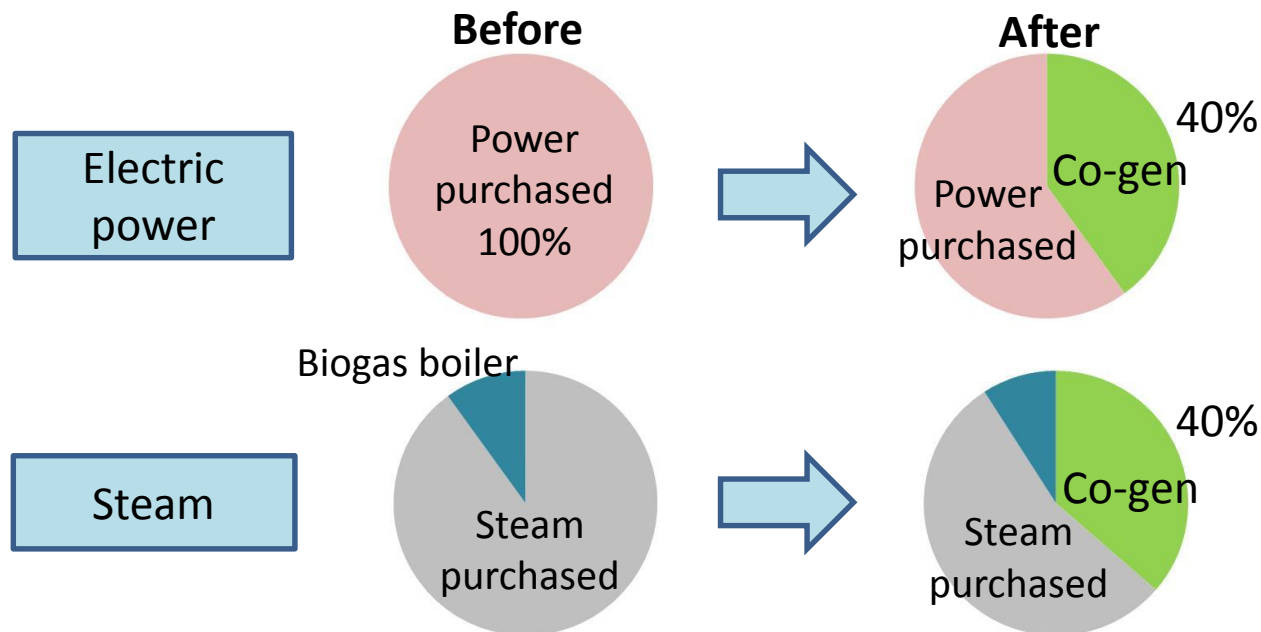
Effects on CO₂ emissions reductions

Source) CGS NEWS Vol.2 No.12 Dec.2010

Best practice of EEC (3)

Co-gen introduction example in beer factory


Description	Major specification of co-gen
Gas turbine co-gen	1,220kW x 2
Generation efficiency	24.9%
Heat recovery efficiency	46.2%
Total efficiency	71.1%



Source) Advanced co-generation and energy utilization center, Japan

Best practice of EEC (4) Example of railway station building

- ◆ EEC project: Railway station building
- ◆ EEC measures taken:
 - ✓ Mounting inverter to fans of air-handling units.
 - ✓ Mounting inverter to pumps for chillers and cooling water.

Before retrofitting		 32.1% reduction	After retrofitting (Actual results or estimates)
Consumption of electric power(kWh/year)	1,476,696		1,003,121
Consumption of primary energy (GJ/year)	14,515		9,860

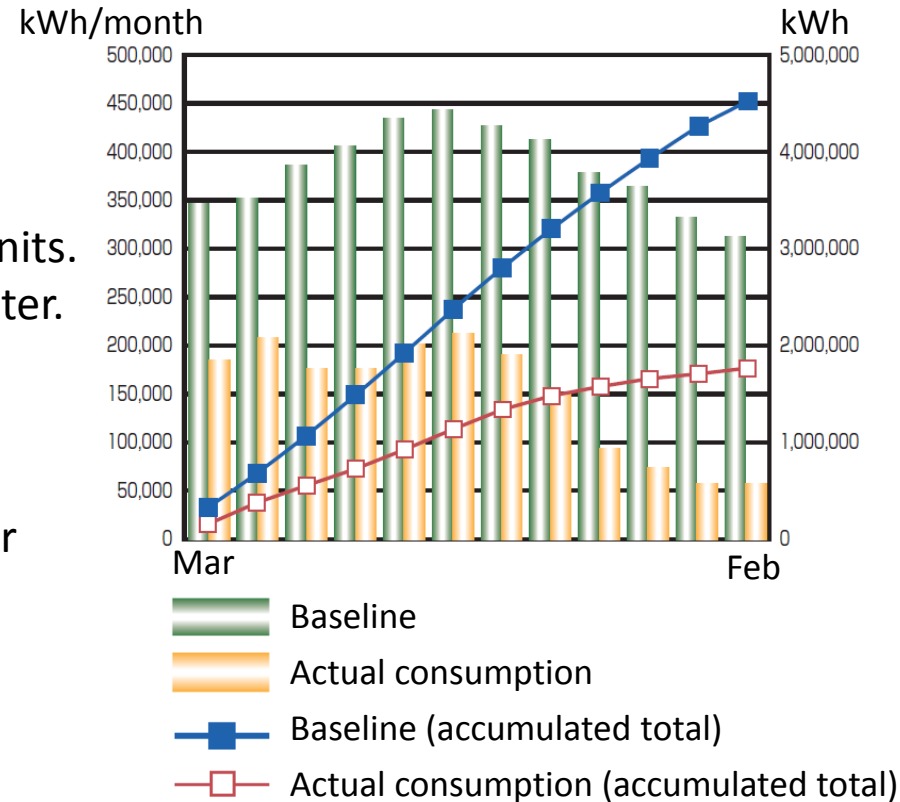
Source) Japan Association of Energy Service companies

Best practice of EEC (5) Inverter introduction example

- ◆ EEC project: Office building
- ◆ EEC measures taken:
 - ✓ Mounting inverter to fans of air-handling units.
 - ✓ Mounting inverter to pumps for cooling water.
 - ✓ Adoption of efficient reflector for lighting.



Newly added module for inverter

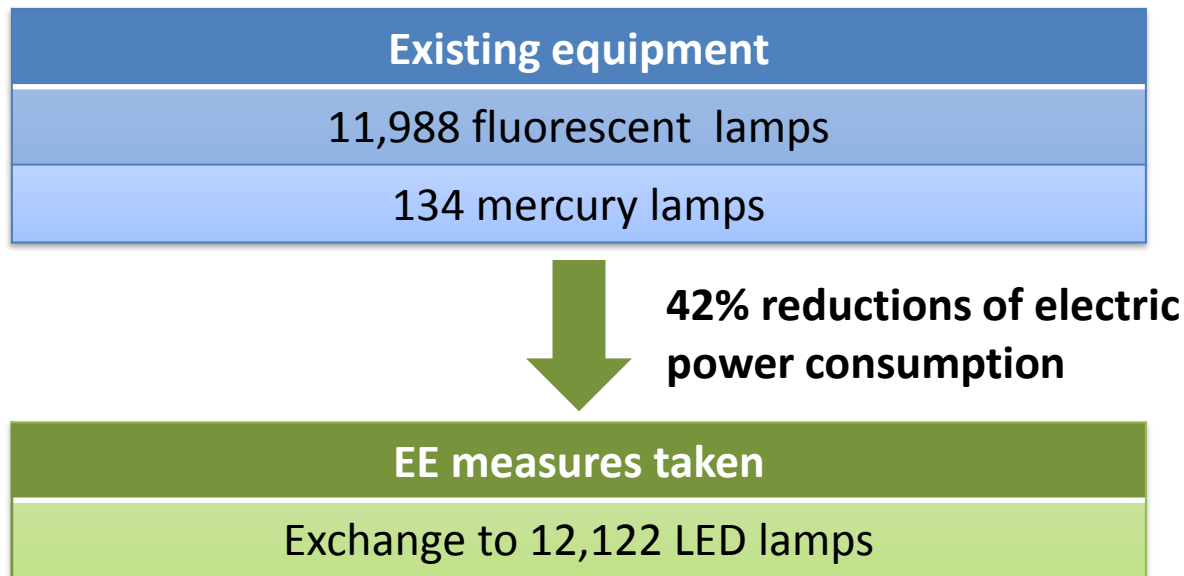


Before retrofitting		➔	18.1% reduction	After retrofitting (Actual results of estimates)	
Consumption of electric power(kWh/year)	20,413,120				16,709,280

Source) Japan Association of Energy Service companies

Best practice of EEC (6) LED lamps introduction example

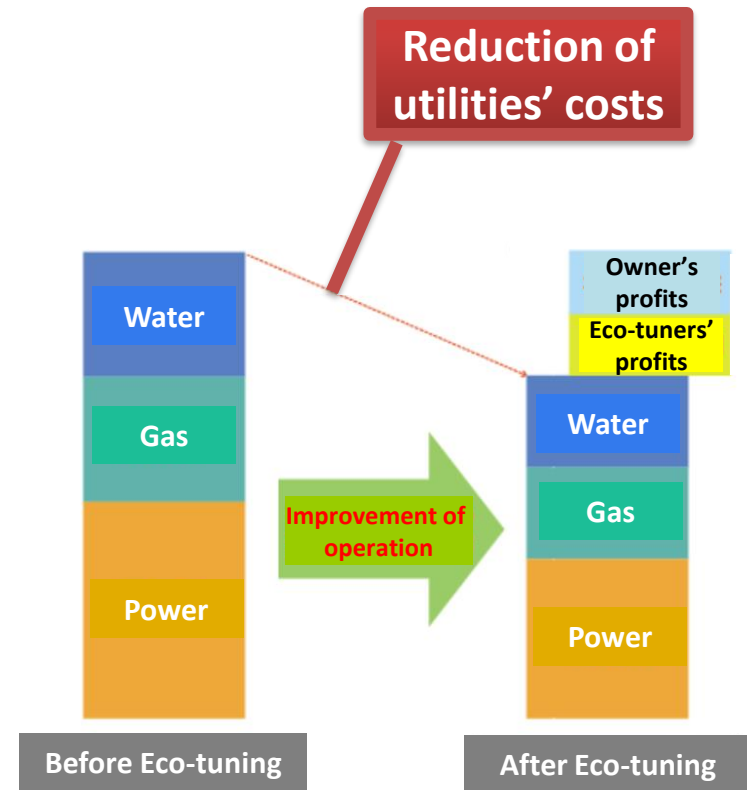
- ◆ EEC project: Security lamps (streets in H city)
- ◆ EEC measures taken:



Source) JAPAN FACILITY SOLUTIONS, INC

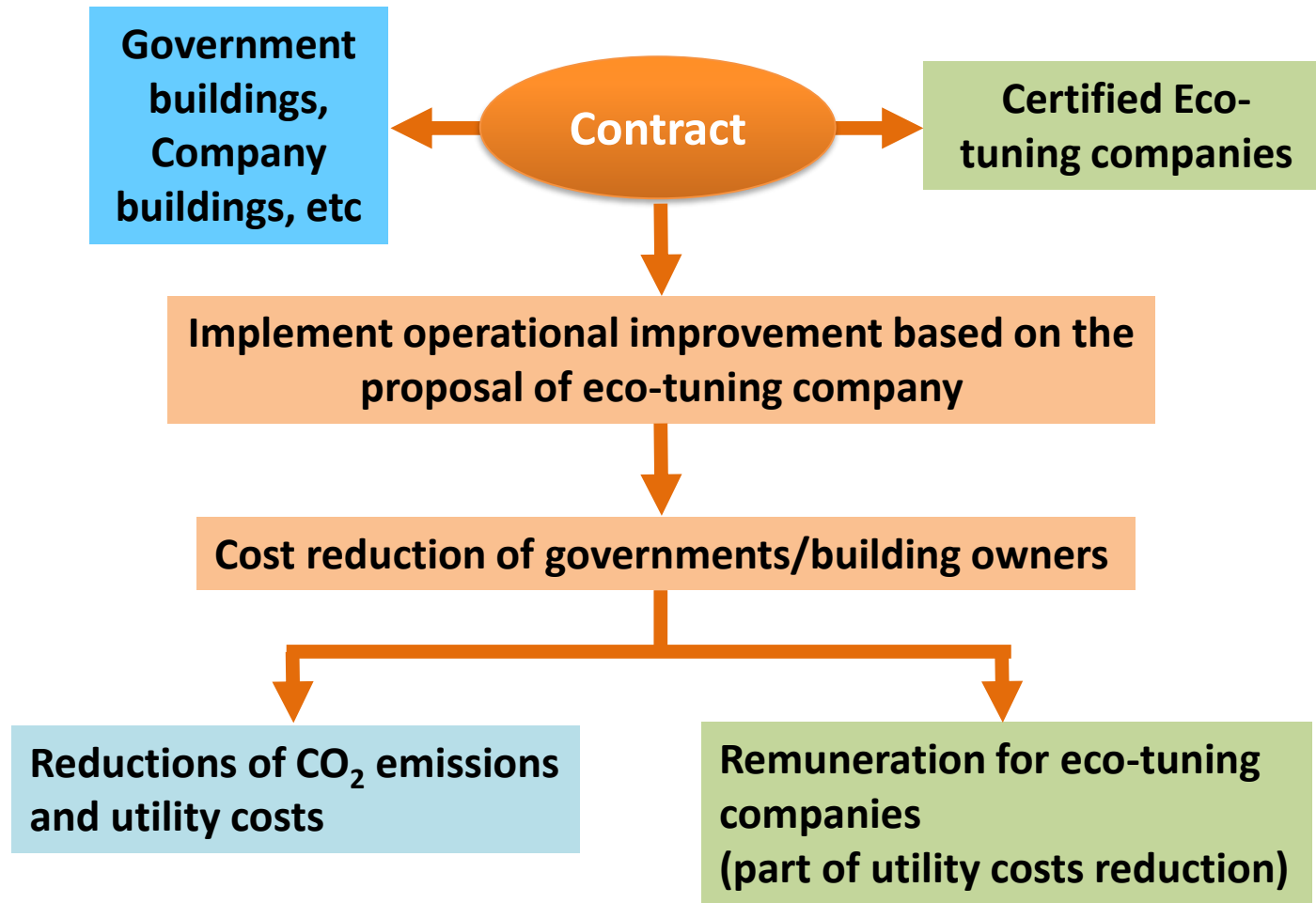
New EEC business model: Eco-tuning (soft ESCO)

- ✓ Facility management of conventional government buildings etc. is aimed at appropriately managing facilities according to the manual etc.
- ✓ In facility management by eco-tuning, eco-tuning will be added to facility management in daily government buildings.
- ✓ In eco-tuning, **operational improvements will be achieved** from the viewpoint of EEC without compromising comfort and productivity, under detailed analysis of energy consumption.



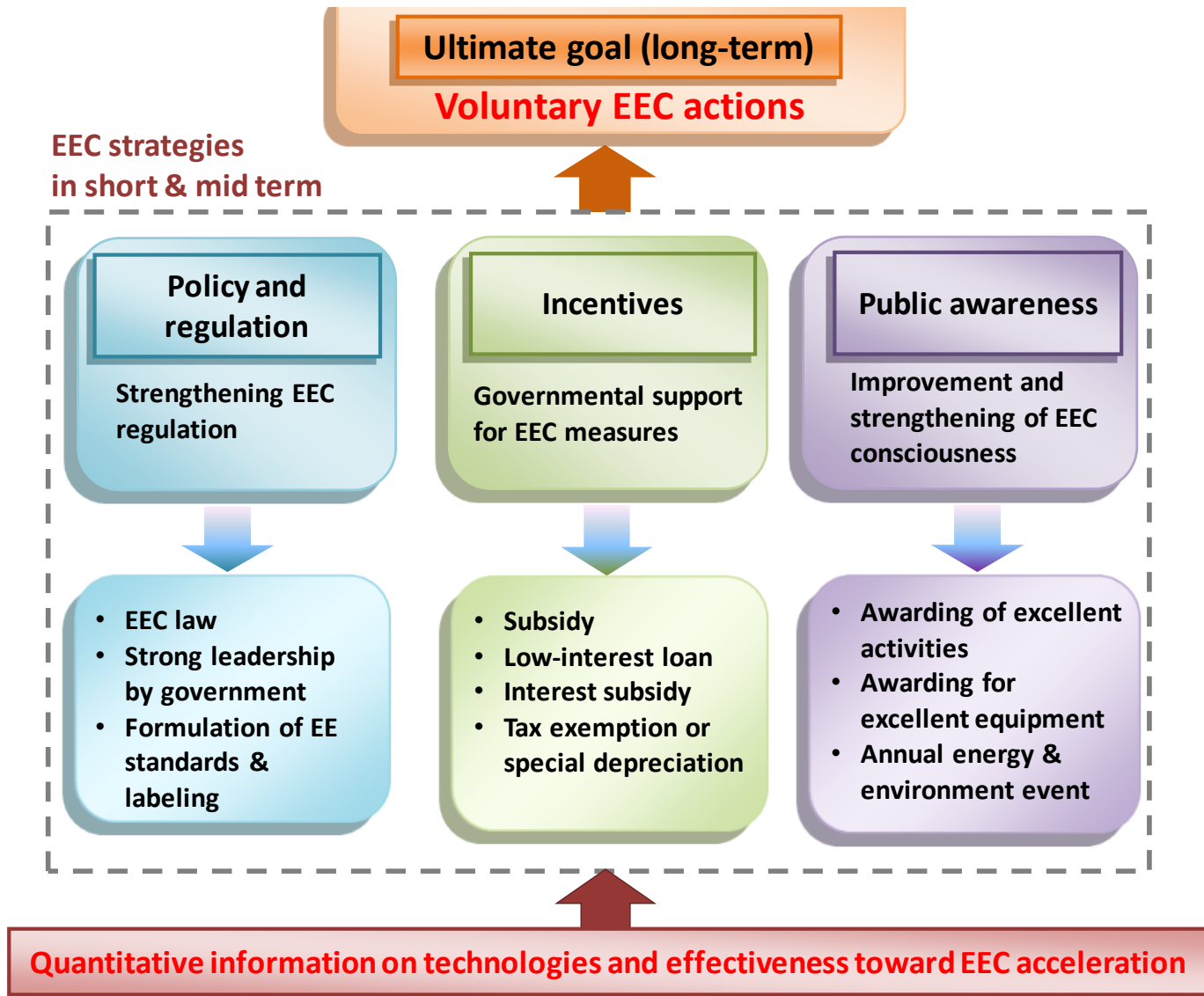
Source: The Consultant based on homepage of Ministry of Environment

Business scheme of Eco-tuning



Source: The Consultant based on homepage of Ministry of Environment

Three EEC promotion strategies



Source: The Consultant

**Thank you so much
for your kind attention !**

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