

# **Japan's Energy Efficiency Policy**

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**1. Past trend of Japan's energy efficiency**

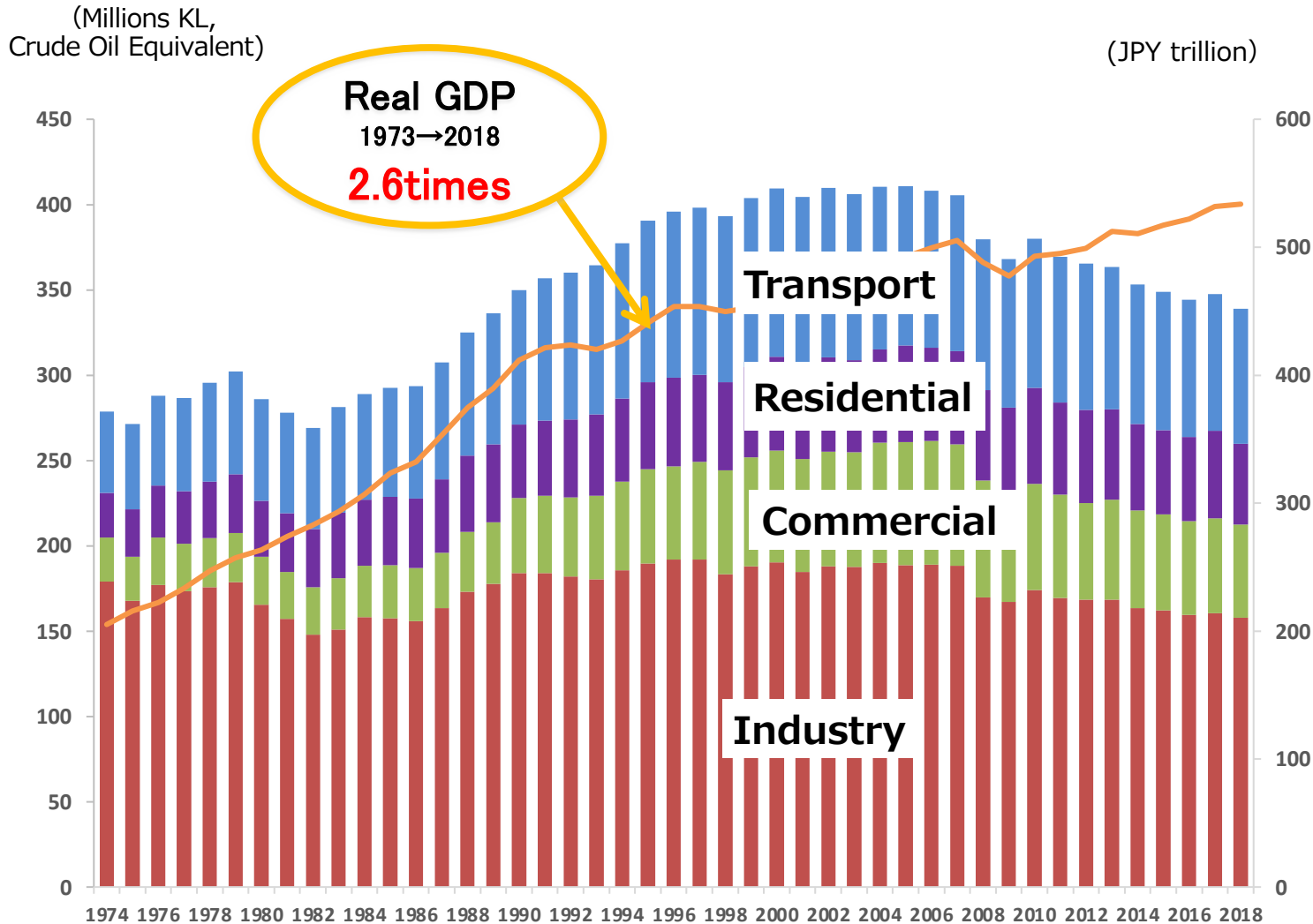
**2. Measures for energy efficiency**

**3. Challenge for Carbon Neutrality**

**4. Further actions**

# Trend of Japanese Final Energy Consumption

**GDP growth is 2.5 times** from 1970's, while growth of **final energy consumption** is less than the economic growth - **1.2 times**.



Final Energy Consumption	
Total	1973→2018 <b>1.2times</b>
Transport	1973→2018 <b>1.7times</b>
Residential	1973→2018 <b>1.9times</b>
Commercial	1973→2018 <b>2.1times</b>
Industry	1973→2018 <b>0.8times</b>

【Source】 Energy Statistics and Annual Report on National Accounts

(year)

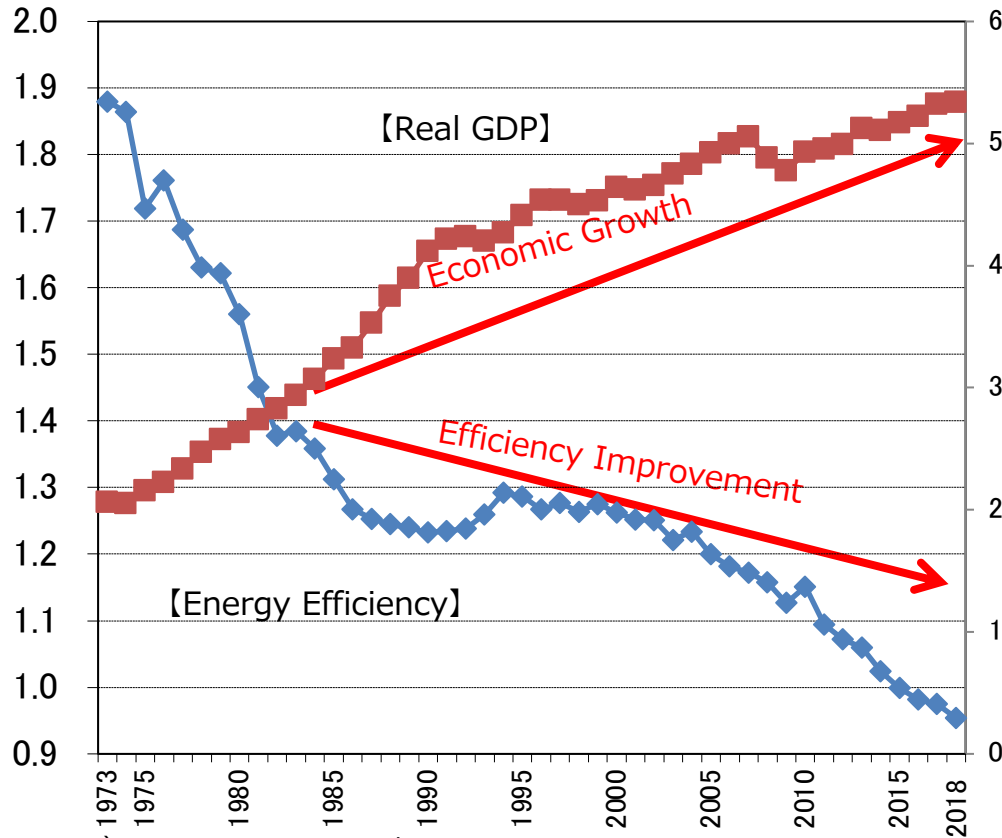
# Japanese Efforts on Energy Efficiency

Japanese economy has been growing, while furthering energy efficiency. Japan's **Energy Intensity** is one of the **lowest**.

【Annual change in the “Energy Supply per Real GDP”】

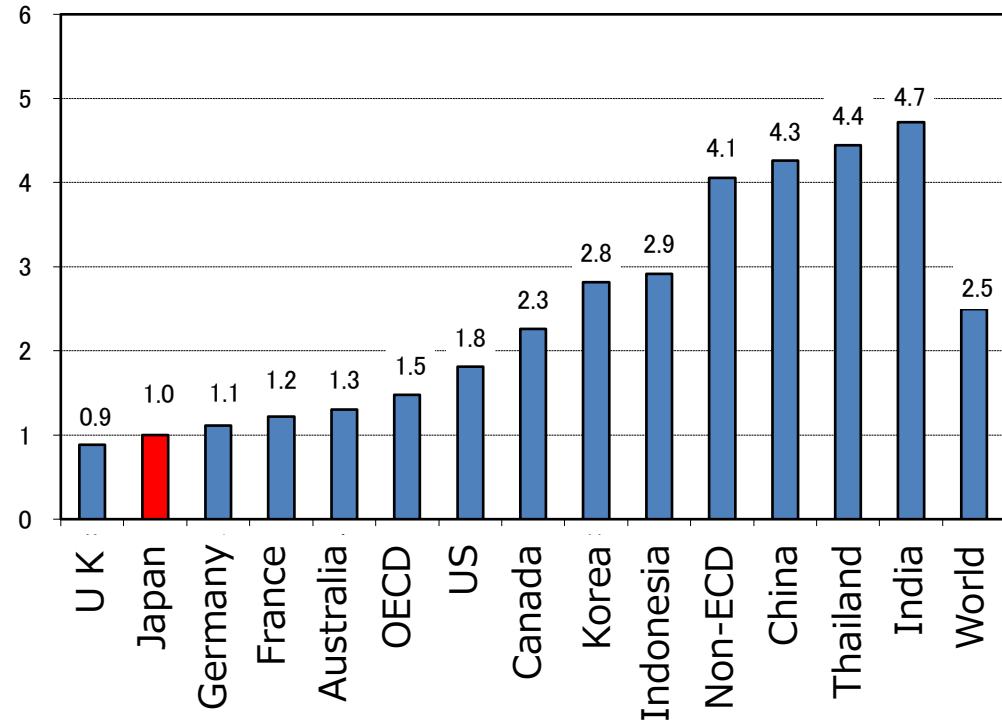
Millions KL, Crude Oil Equivalent per JPY trillion

JPY Trillion



Sources) Energy Statistics and SNA

【Energy Intensity (2018)】



Sources) IEA「World Energy Balances 2020 Edition」、World Bank「World Development Indicators 2020」

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# Rational Use of Energy Act

The Act, enacted in 1979, is the **core basis of energy efficiency policy** in Japan.

1. Report to government by business operators

2. Top-runner Program

## Industry sector

## Consumer sector

## Transport sector

### Commercial sector

### Residential sector

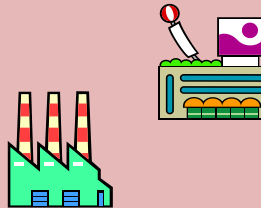
- ✓ **Annual reports** to the Government by business operators with 1,500 or more kl/yr energy consumption
  - energy conservation measures (energy management operation, facility maintenance/inspection etc.)
- ✓ 1% Reduction efforts each year

- ✓ **Periodic reports** by freight carriers and consigners
- ✓ 1% Reduction efforts each year

✓ Energy efficiency standards for buildings and houses (note: New law has been implemented from Apr. 2017, currently not a part of the Act)

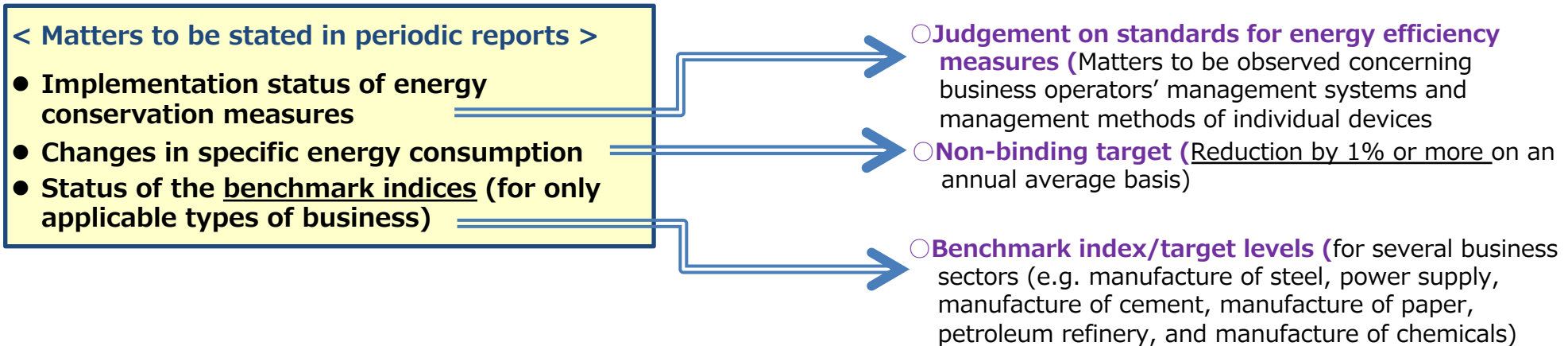
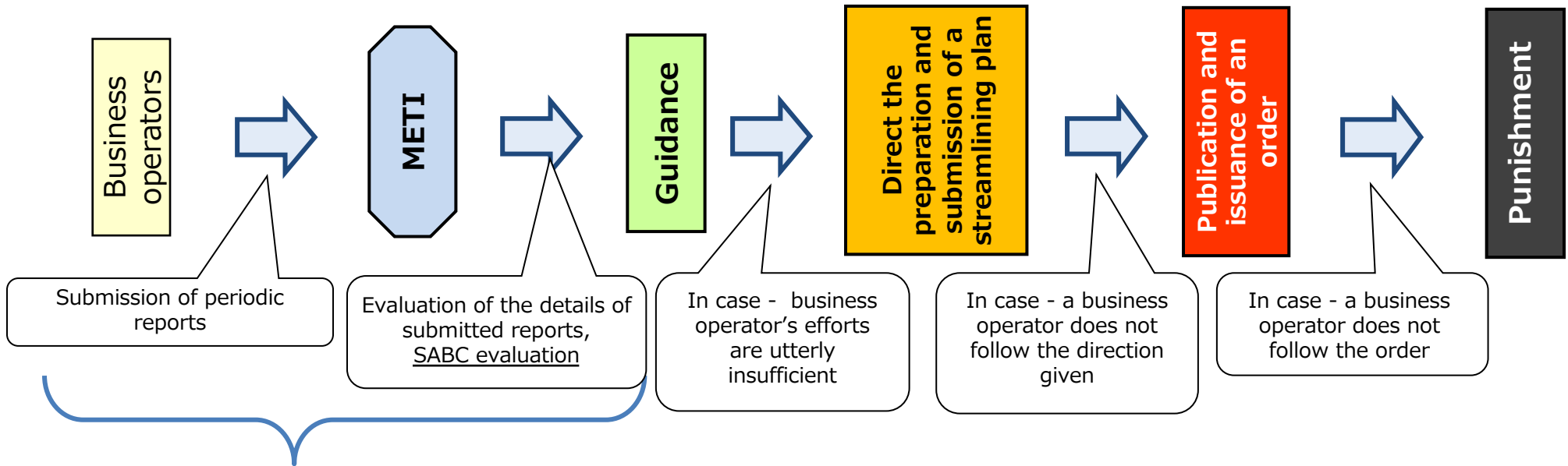
- ✓ **"Top runner program"** standards for household appliances, equipment, automobiles etc., 32 items in total (Account for about 70% of household energy consumption)

Regulatory measures



# Report to government with energy efficiency activities

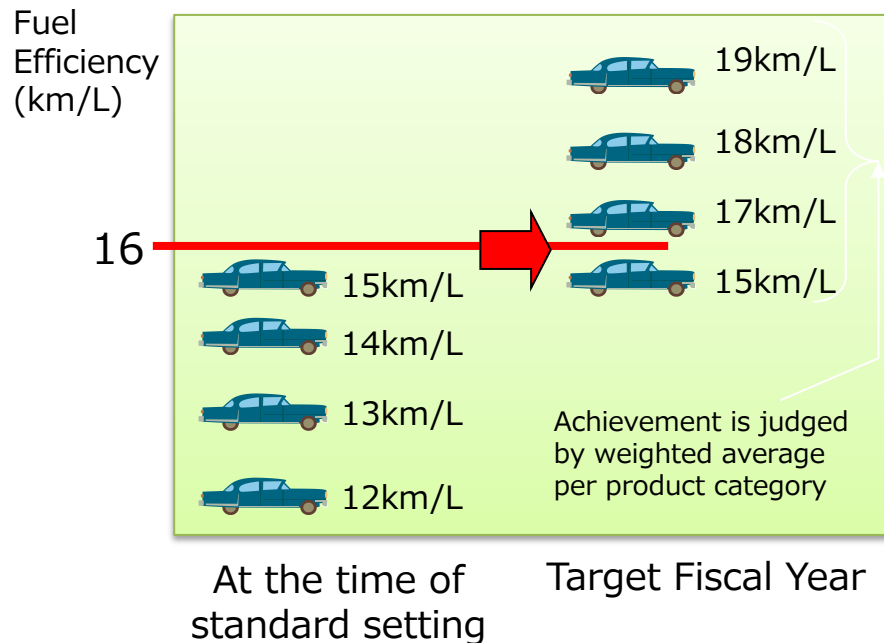
The Act requires **business operators to report their activities on energy efficiency** to the government. The government evaluates them with the report.



# Top-runner Program for equipment and materials

“Top Runner Program” is to encourage competition among companies by setting the higher efficiency targets to be achieved in three to ten years later.

## Example of Top Runner Program



## Improvement of energy efficiency



Gasoline passenger vehicles  
**48.8%** (1995FY→2010FY)



Air-conditioners  
(For ones of 4.0kW or less in cooling capacity)  
**16.3%** (2005FY→2010FY)



Electric refrigerators  
**43.0%** (2005FY→2010FY)



TV sets (LCD and PDP TV)  
**29.6%** (2004FY→2008FY)

etc.

32 items under the pro-gram

1. Passenger cars
2. Trucks
3. Air conditioners
4. Television receivers
5. Video tape recorders
6. Lighting apparatuses
7. Copying machines
8. Computers
9. Magnetic disk devices
10. Electrical refrigerators
11. Electrical freezers
12. Heaters
13. Gas cooking appliances
14. Gas water heating appliances
15. Oil water heaters
16. Electric toilet seats
17. Vending machines
18. Power transformer
19. Jar rice cookers
20. Microwave ovens
21. DVD recorders
22. Routing equipment
23. Switching equipment
24. Multifunction Devices
25. Printers
26. Heat Pump Water Heater
27. AC motors
28. LED lamps
29. Showcase
30. Heat insulating materials
31. Sashes
32. Multi-Paned Glazing



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**2. Measures for energy efficiency**

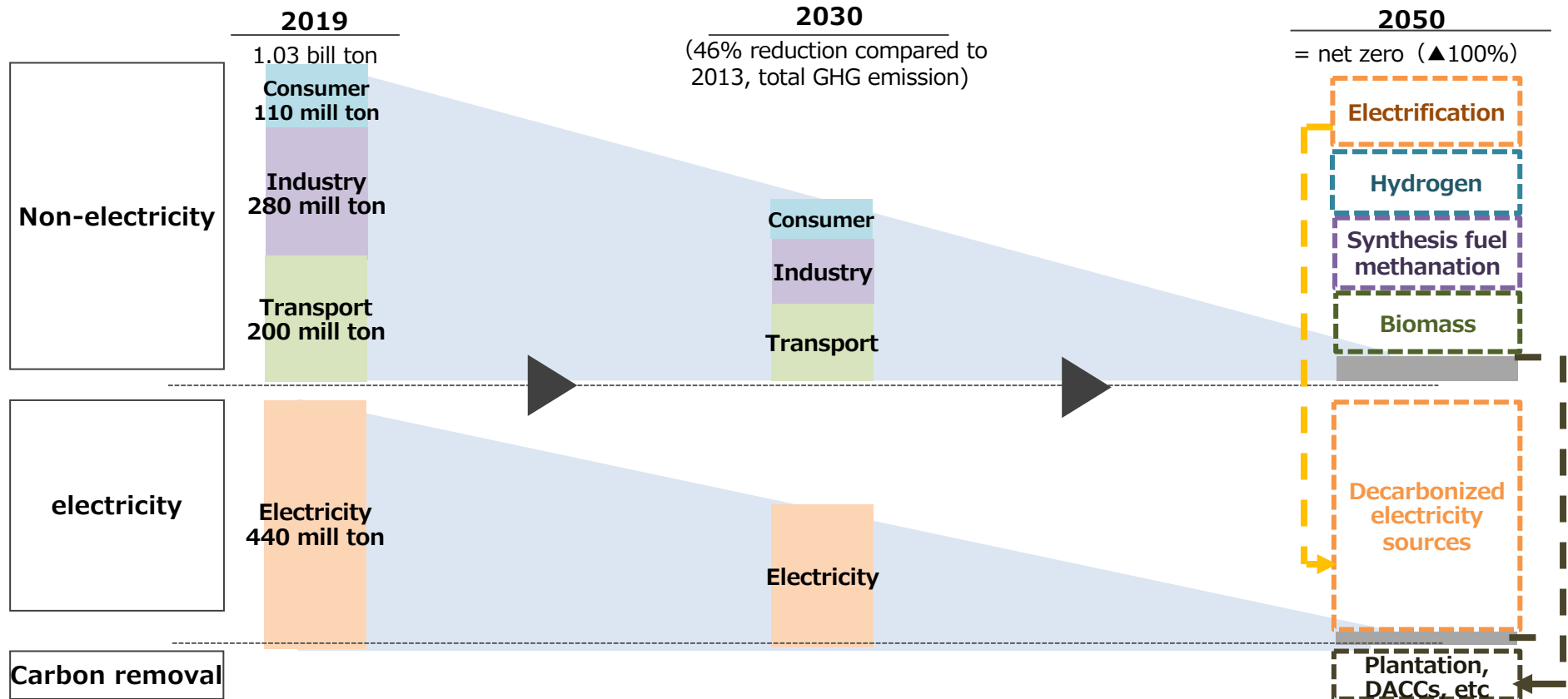
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# 2050 Carbon-Neutral and 2030 Reduction Target

In October 2020, Japan declared **Carbon-Neutrality by 2050**.

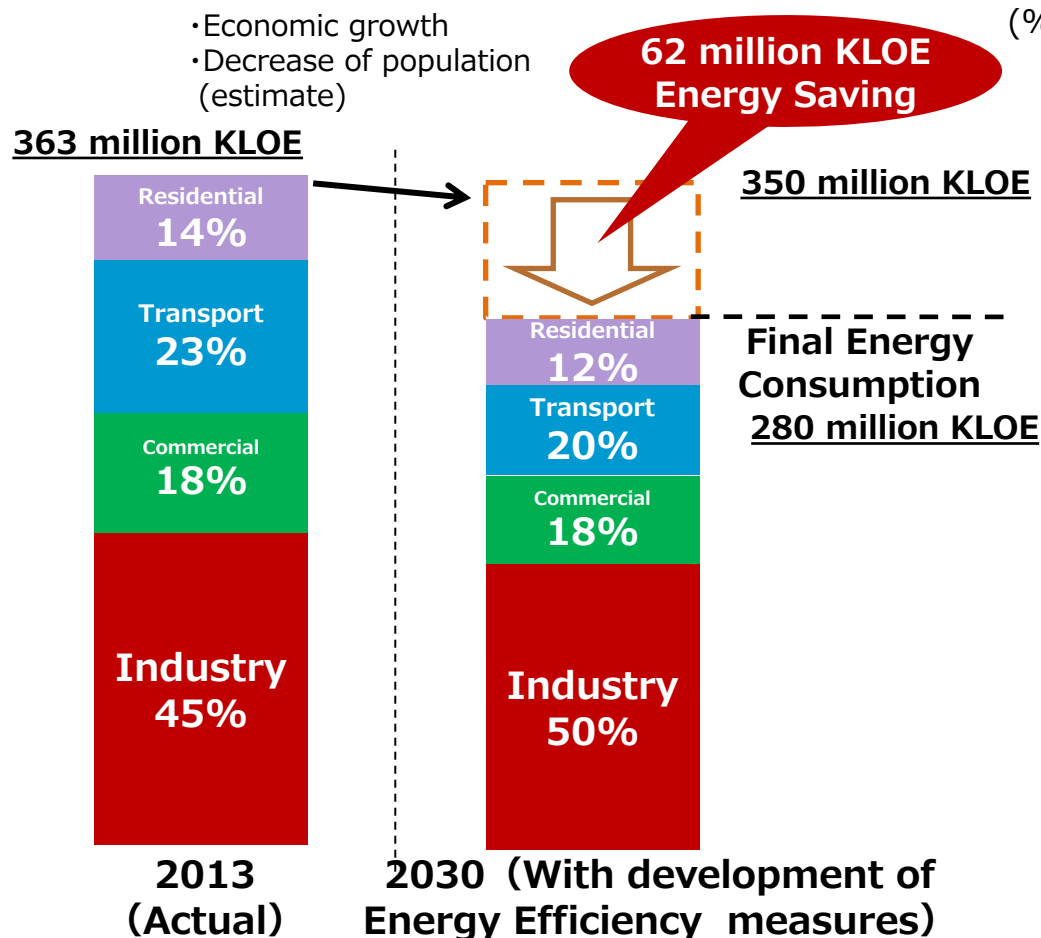
In April 2021, Japan announced **aiming to reduce its GHG emissions by 46 percent** in FY 2030 from its FY 2013 levels, with continued strenuous efforts toward 50 percent reduction.



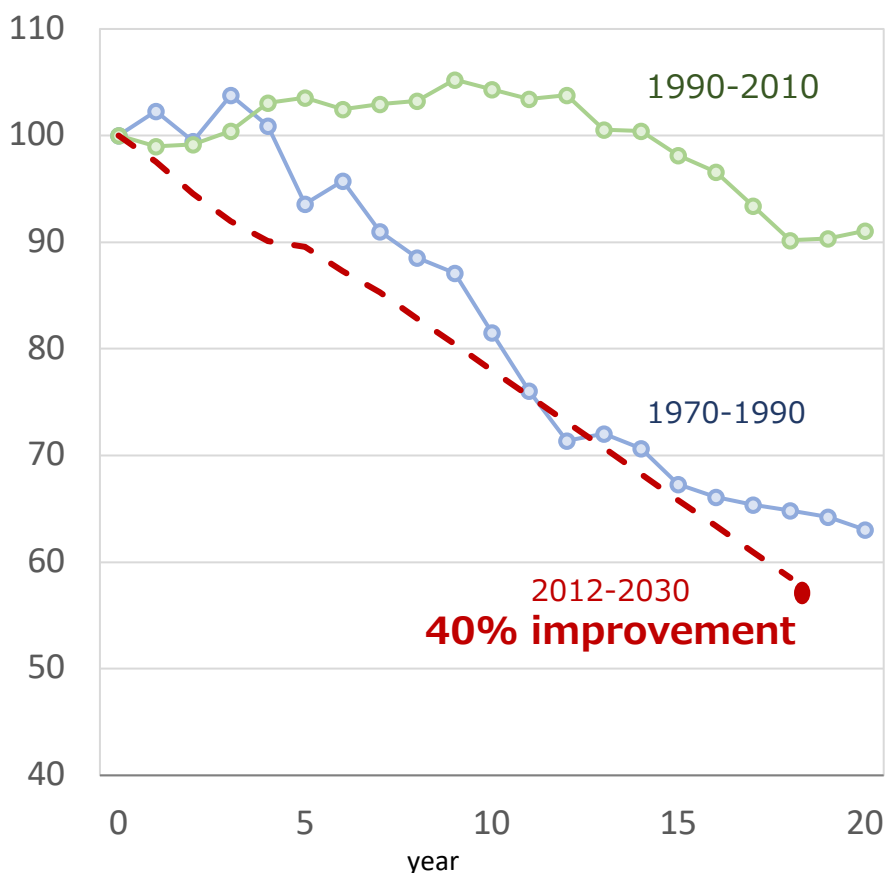
# Energy Efficiency Improvement towards 2030

New Strategic Energy Plan aims to achieve **62 million KLOE energy saving**, which requires **further 40% efficiency improvement** from 2013 to 2030. This is **faster than the improvement** in energy consumption efficiency after the oil shock.

## Final energy consumption (Long-term energy demand & supply outlook)



## Energy Efficiency Improvement

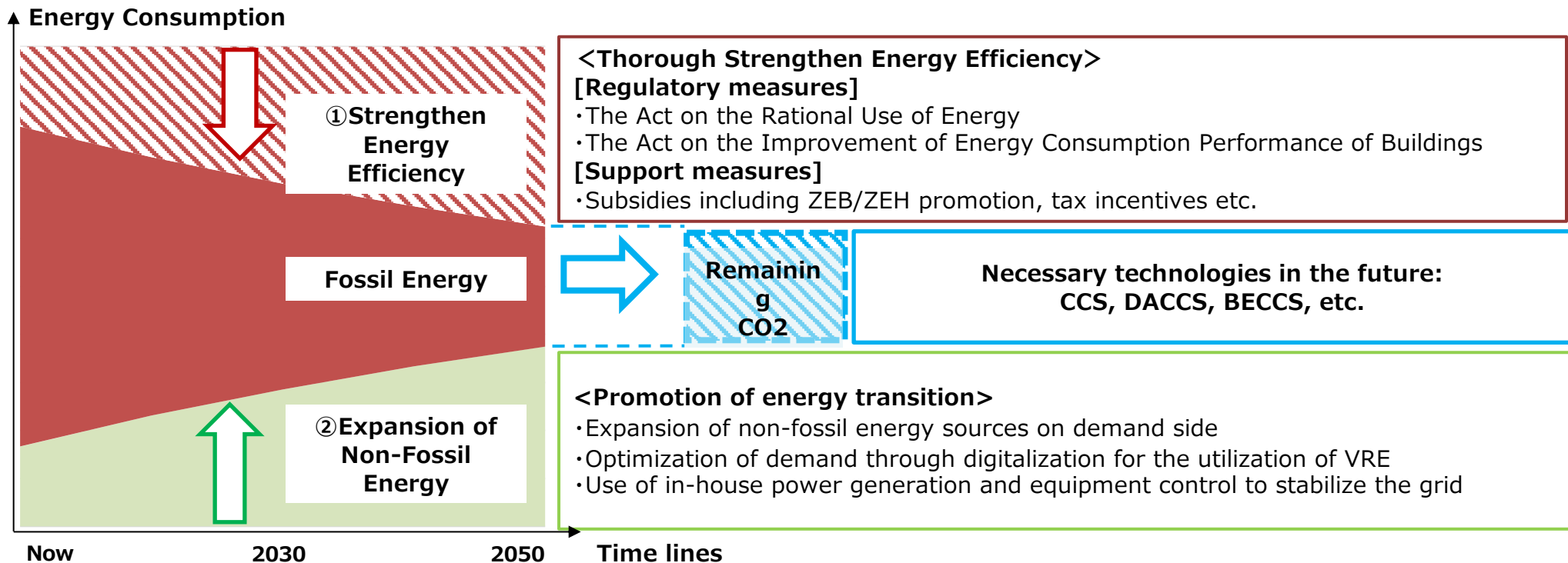


Energy efficiency rate = Final energy consumption / real GDP

# Direction of Demand Side Measures

For 2050 carbon-neutral target, it is necessary to **promote**

- ① **thorough energy efficiency and**
- ② **strengthen measures to expand the introduction of non-fossil energy.**



# Target of energy efficiency measures of “Energy Mix”

**62 million KLOE Energy Saving** can be estimated by energy conservation targets in the **industrial, business, residential, and transportation sectors.**

In addition to current energy conservation measures, we will work to strengthen enforcement of the **Rational use of Energy Act** and **support the development of advanced energy-saving technologies.**

**Total <approx. -62 million kl>**

## Industrial Sector <approx. -13.50 million kl>

### ➤ Main measures

- Promotion of efficient lights including LED [1.08 million kl]
- Introduction of industrial heat pump [0.88 million kl]
- Introduction of industrial motors and inverters [1.66 million kl]
- Implementation of energy management through FEMS [0.74 million kl]

## Commercial Sector <approx. -13.76million kl>

### ➤ Main measures

- Promotion of efficient lights including LED [1.95 million kl]
- Improve energy-saving performance of equipment by equipment top runner program [3.42 million kl]
- Implementation of energy management through BEMS [2.38 million kl]
- Promotion of energy-saving buildings [5.46 million kl]

## Residential Sector <approx. -12.08 million kl>

### ➤ Main measures

- Promotion of efficient lights including LED [1.93 million kl]
- Improve energy-saving performance of equipment by equipment top runner program [1.73 million kl]
- Promotion of energy-saving house [3.44 million kl]

## Transportation Sector <approx. -23.05 million kl>

### ➤ Main measures

- Diffusion of next-generation automobiles [9.90 million kl]
- Other measures in transportation sector [13.15 million kl]  
(Breakdown)
  - Freight transport [8.52 million kl]
  - Passenger transport [4.63 million kl]

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# Review the Definition of Energy and Expand the Use of Non-Fossil Energy

It is necessary to **promote further energy conservation and non-fossilization**. The government will aim to rationalize **all types of energy, including non-fossil energy**, and will establish **a system to secure the introduction and expansion of non-fossil energy**.

## Energy conservation

◎Rationalization of Fossil Energy Based on the Act on the Rational Use of Energy (Energy Conservation Act)

- Improve energy consumption efficiency by 1% per year
- Industry Benchmark Targets
- Implementation of energy conservation measures at factories

→ Guidance, advice, penalties, etc., as necessary (Institutional Collateral)

➤ Review of the definition of energy



◎Rationalization of all energy use

**-Combining incentives with regulations and subsidies based on the Energy Conservation Law to further promote energy conservation**

## Non- Fossilization and Energy Transition

◎To achieve the Act on the Rational Use of Energy (Energy Conservation Act)'s commitment  
Partial use of non-fossil energy

◎Low carbon society action plan, zero challenge, RE 100, EV 100,etc.

→Voluntary efforts by operators

➤ Develop a medium- to long-term plan for conversion to non-fossil energy sources

➤ Report them to the government



◎Promotion of non-fossilization and energy conversion

- Expanding the use of non-fossil energy
- Electrification of manufacturing processes, hydrogenation, etc.
- Non-fossilization of purchased energy

2050

### Program Content

#### Objectives

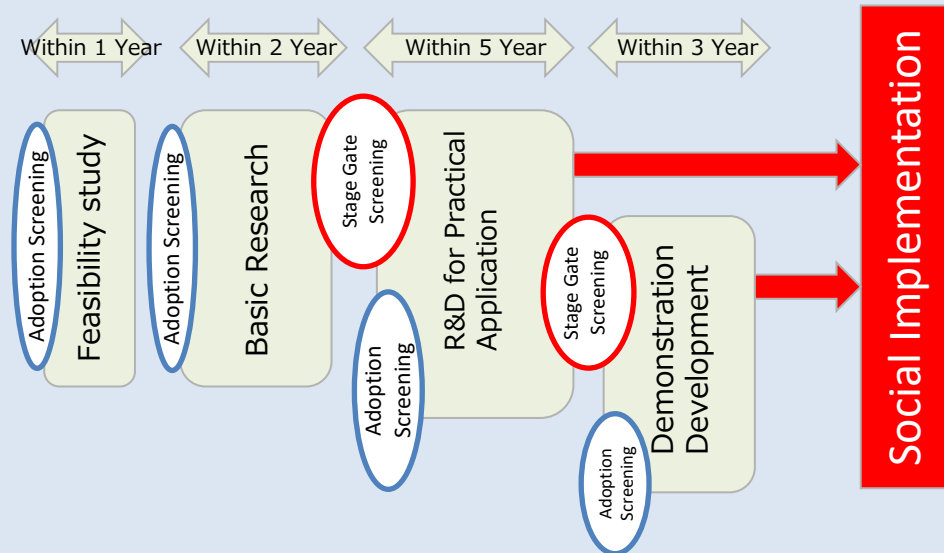
- Research and development of energy-saving technologies
- Development of technologies for innovative utilization of unused thermal energy

#### Outcome Targets

- (1) Contribute to reducing Japan's energy consumption by 20,000,000 kL of crude oil equivalent by 2050.
- (2) Contribute to a reduction of approximately 17,600,000 t/y of carbon dioxide by 2030 through the reduction, recovery, and reuse of unused thermal energy.

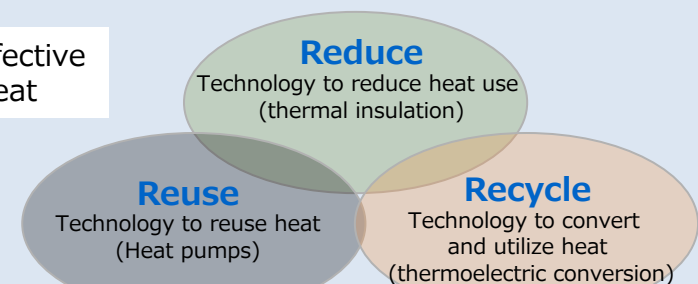
### Image of Program Execution

#### (1) Research and development of energy-saving technologies



#### (2) Development of technologies for innovative utilization of unused thermal energy

Forms of effective use of heat



The "3Rs" of heat



## High-efficiency gas turbine

(30 MW-class high-efficiency gas turbine with fast load response)

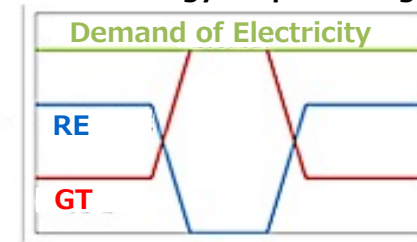
Renewable Energy (RE) with unstable output



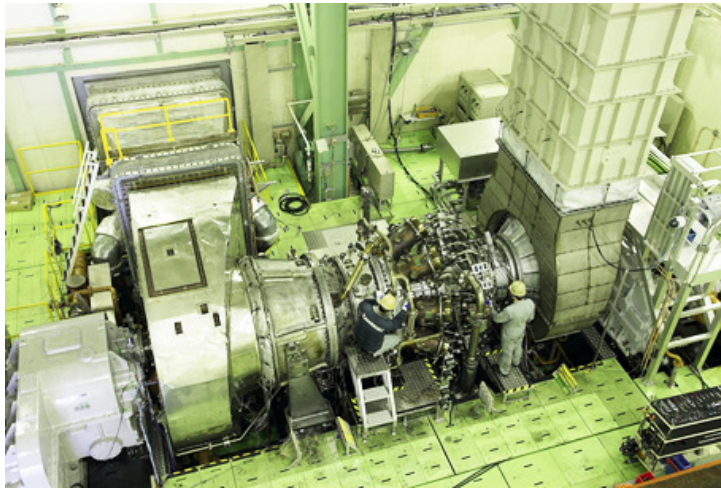
30 MW-class high-efficiency gas turbine (GT) capable of fast load response



Overall stabilization by linking unstable renewable energy output with gas turbine output



Developed 30 MW class high-efficiency gas turbine



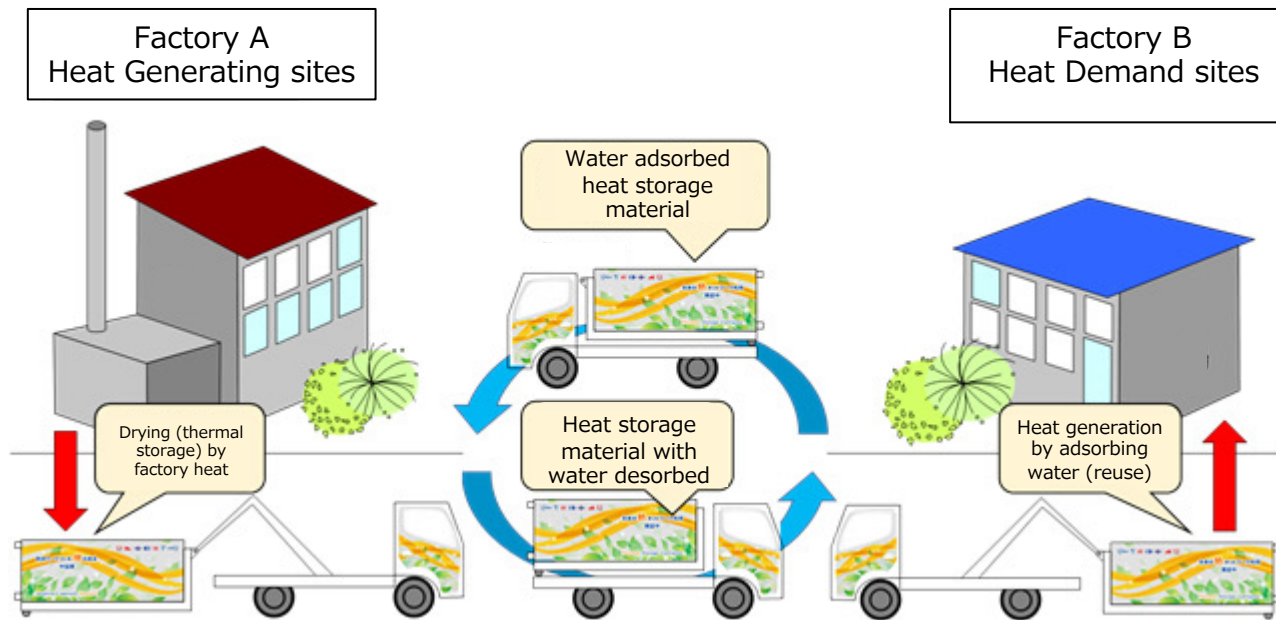
The combined cycle power plant (CCPP) with this new turbine improves power generation efficiency **from 51.1% to 54.4%**.

Subsidiaries: Kawasaki Heavy Industries, Ltd.

## High Performance Thermal Storage System

(Compact thermal storage system capable of utilizing waste heat below 100°C(212°F))

The plant using this technology achieved a **primary energy reduction of 22.7%** and a CO2 emissions reduction of **4,830 tons/year**.



Appearance of the improved haskley

Image of Heat utilization in off-line heat transport system (between plants)

On-site use: Demonstrated at the titanium oxide drying process at the Yokkaichi Plant of "Ishihara Sangyo".  
Offline heat transport: Demonstrated from "Hino Motors" Hamura Plant to the heated pool at the "Hamura City Swimming Center".

## CFRP Recycling System

(Technology to regenerate carbon fiber from CFRP waste with less energy)

Since CFRP(Carbon Fiber Reinforced Plastic) is lighter than iron and aluminum, as well as having equivalent or more strength, and has a high fatigue life, it is used for various applications including aircraft, rockets, automobiles, fishing rods, umbrellas and glasses.

### A variety of CFRP waste materials



**Thick high-pressure gas container**



**Prepreg**



**Vertical Material for Reinforcement**

**World's highest energy efficiency and economic efficiency**

**50% reduction** in kerosene consumption in carbonization furnaces

**70% reduction** in electricity costs for firing furnaces

**1/30th** of the manufacturing fuel cost per unit volume of CFRP for recycling

**Subsidiaries: Carbon Fiber Recycling Industry Co., Ltd.**

## High-efficiency power converters (high-efficiency compact power converter system using SiC devices)

- Toshiba developed an inverter that changes the motor drive according to the operating condition, and they introduced it in **newly built cars (Tokyo Metro 2000 series) on the Tokyo Metro Marunouchi Line** in FY2018.
- Compared with the current cars in Marunouchi Line, the new cars are expected to **reduce power consumption by about 33%**.



Tokyo Metro 2000 series



All-SiC element applied VVVF Inverter device

Subsidiaries: Toshiba Infrastructure Systems Corporation

# Thank you

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