

# **The Role of the Japanese Gas Industry in a Low Carbon Society**



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# I. Introduction

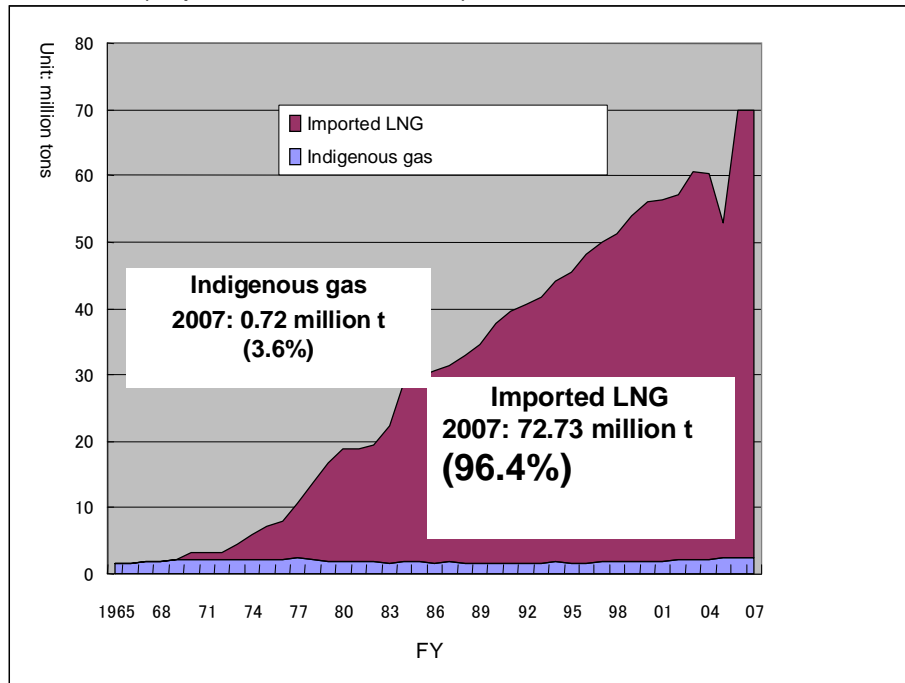


Trends in the Natural Gas Sector in Japan

# 1-1. Natural Gas Situation in Japan

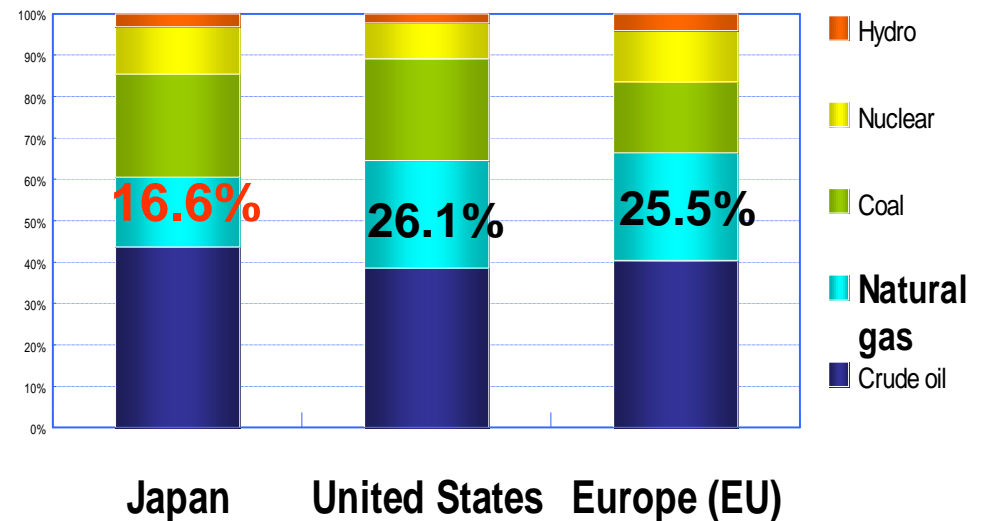
- u Very high dependency on imported natural gas (96.4% in 2007)
- u The share of natural gas in the total primary energy consumption is lower than in Europe and the US (16.6% in 2008).

Chart 1 - Natural gas import dependency (imported vs. domestic)



Source: METI, "Annual Statistics on Resources and Energy"

Chart 2 - Breakdown of primary energy consumption (Europe, the US and Japan) (2008)

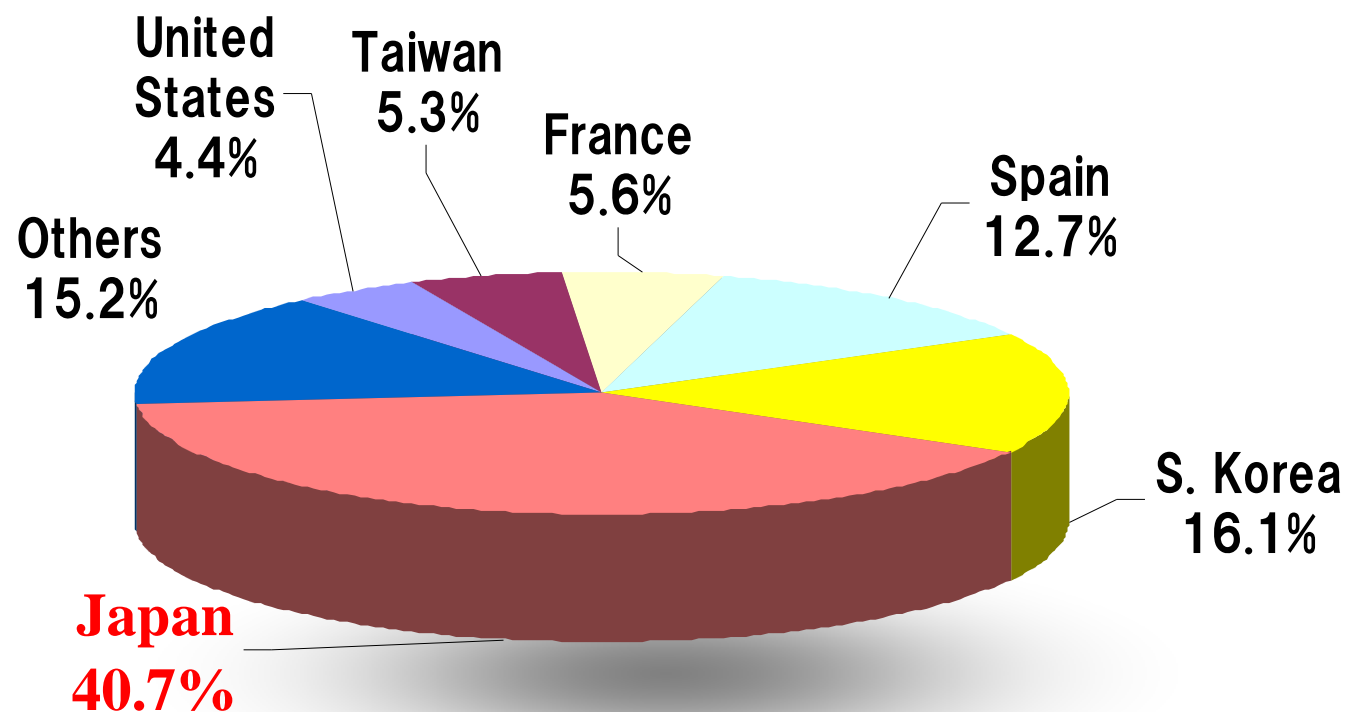


Source: BP Statistical Review of World Energy, June 2009

## 1-1. Natural Gas Situation in Japan

- Japan's LNG trading accounts for about 40% of worldwide LNG trading.

Chart 3 - Breakdown of global LNG trading (2008)



Source: BP Statistical Review of World Energy, June 2009

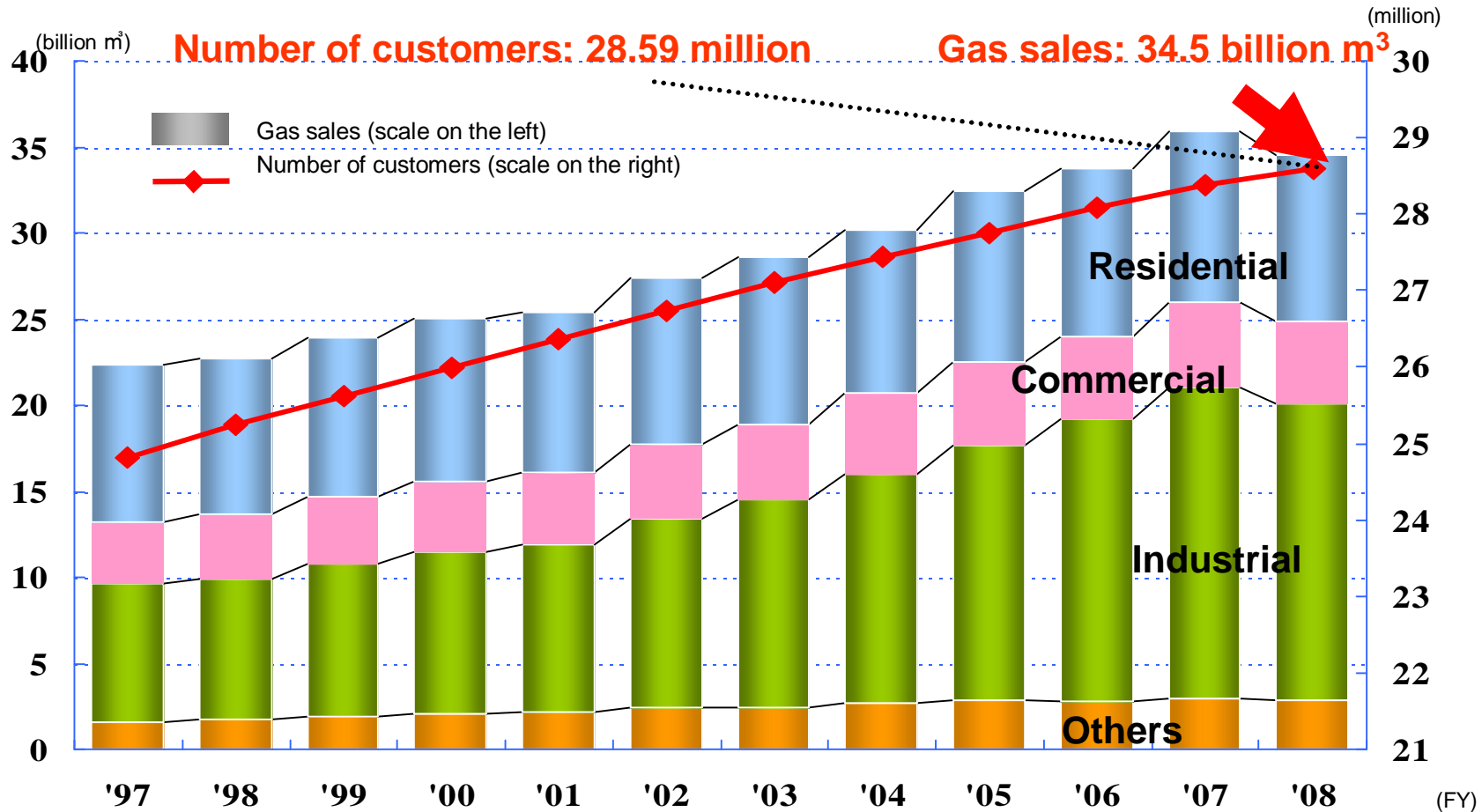
# II. The Situation for City Gas Utilities



1. Market Trends
2. Response to Global Warming

# 2-1. Gas sales and the number of customers

Gas sales continued to grow for 30 years, but last year annual sales fell for the first time due to the global recession. The number of customers is growing firmly.



Source: JGA

I Residential: Households (cooking, water heating, space cooling/heating, drying, etc.)

I Commercial: Company offices, wholesale and retail stores, restaurants and bars, hotels and inns, department stores and supermarkets, barber shops and beauty parlors, laundry service, entertainment, dormitories and hostels, etc.

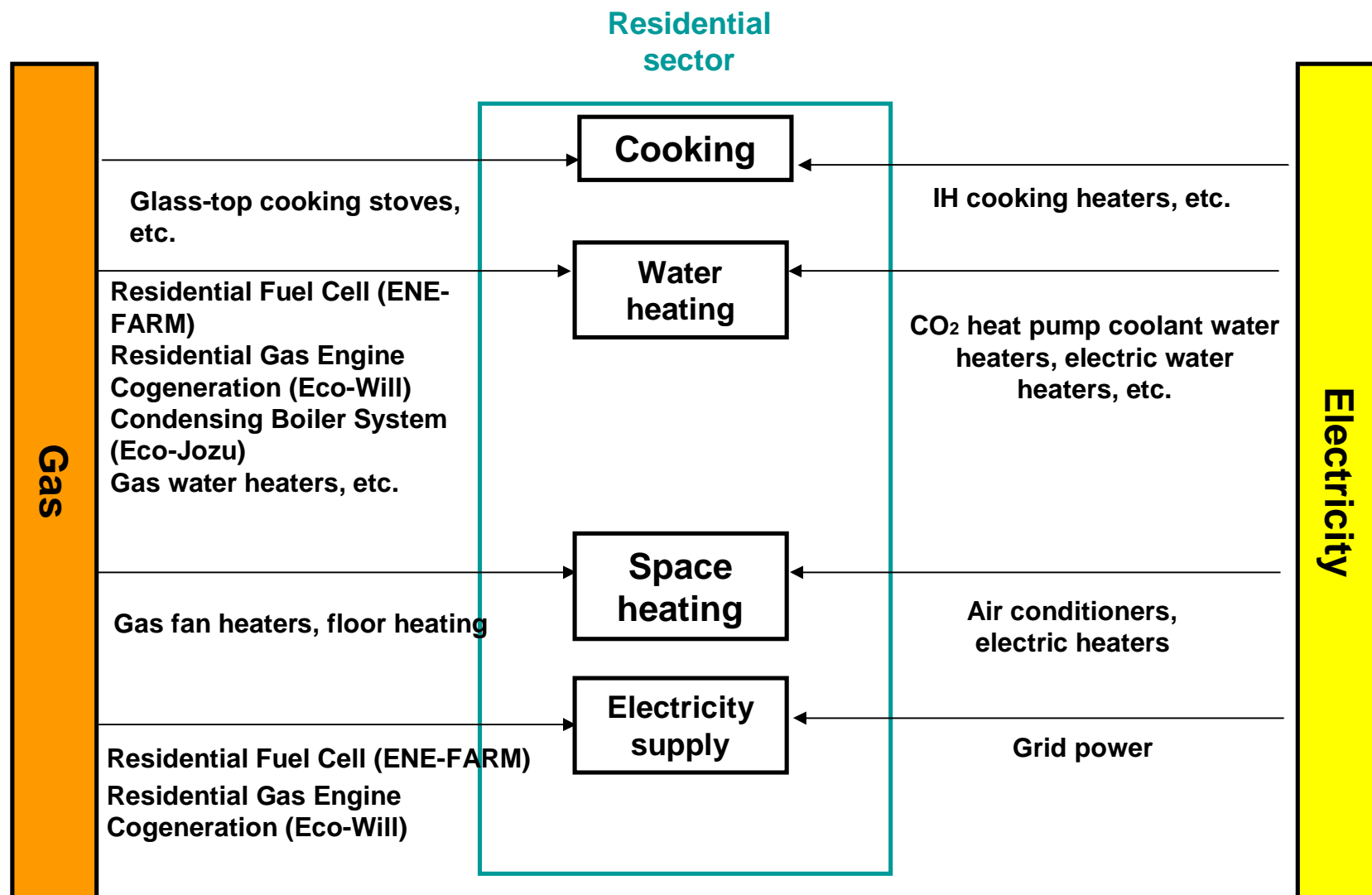
I Industrial: Food industry, textile industry, paper/pulp industry, chemical industry, ceramic/quarrying industry, steel industry, nonferrous metal industry, metal industry, machinery industry, other manufacturing business, etc.

I Others: Schools, public agencies, hospitals, clinics, etc.



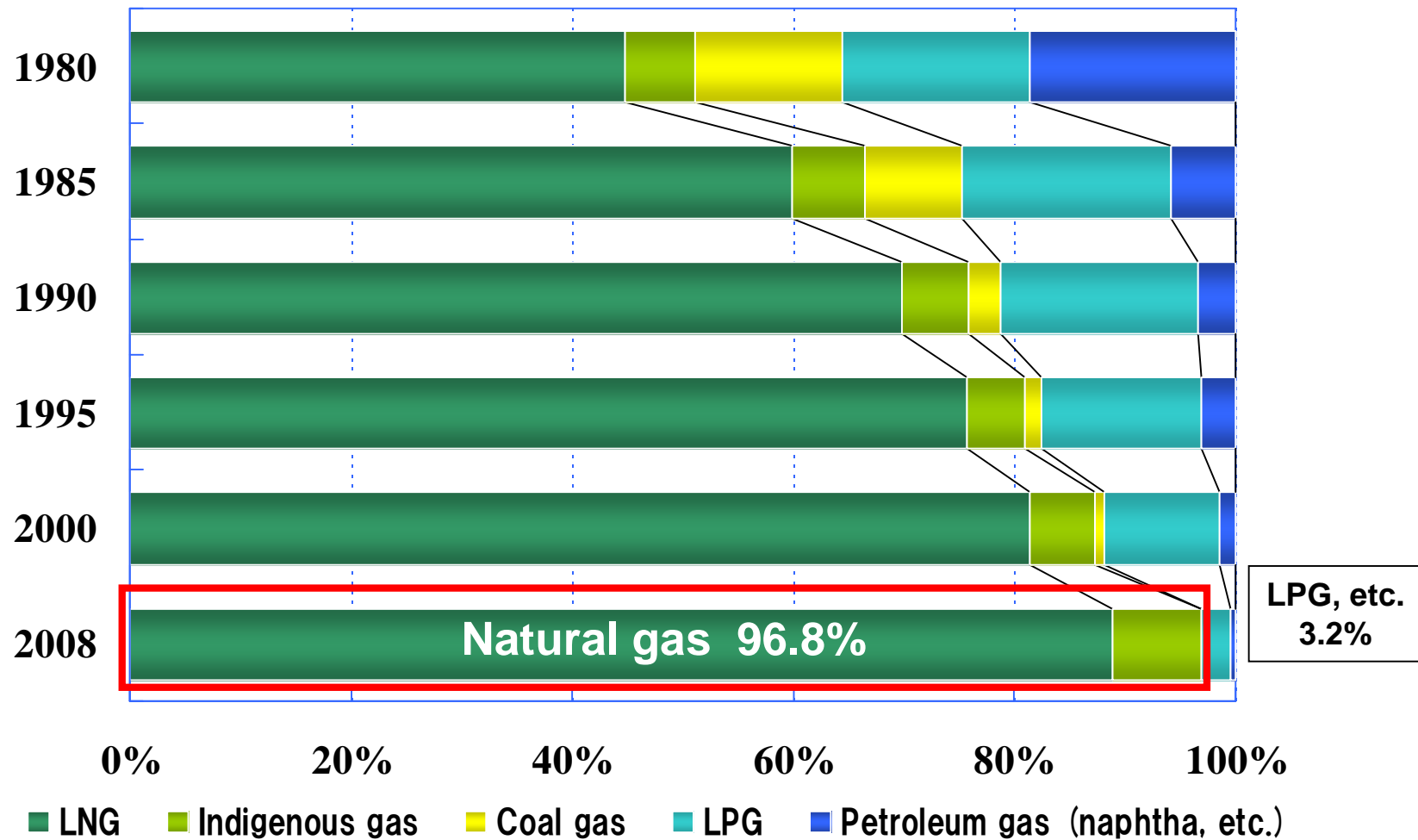
## 2-1. Energy competition with the gas market

In Japan, gas has been in fierce competition with other energy sources since even before deregulation.



## 2-1. Change in the composition of city gas (gas sources)

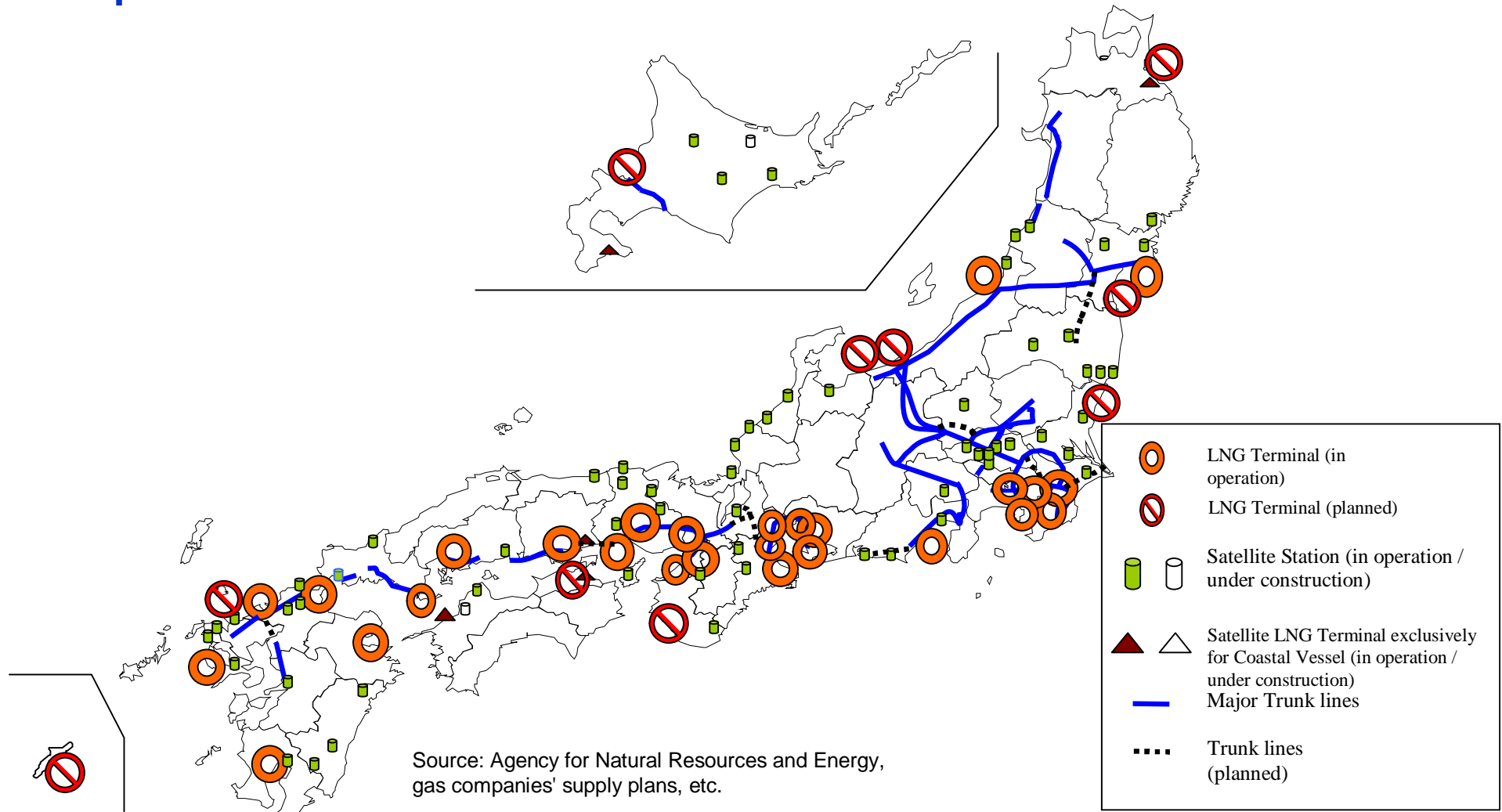
- City gas is mostly produced from natural gas (including indigenous gas).



Source: JGA

## 2-1. Construction of natural gas supply infrastructure

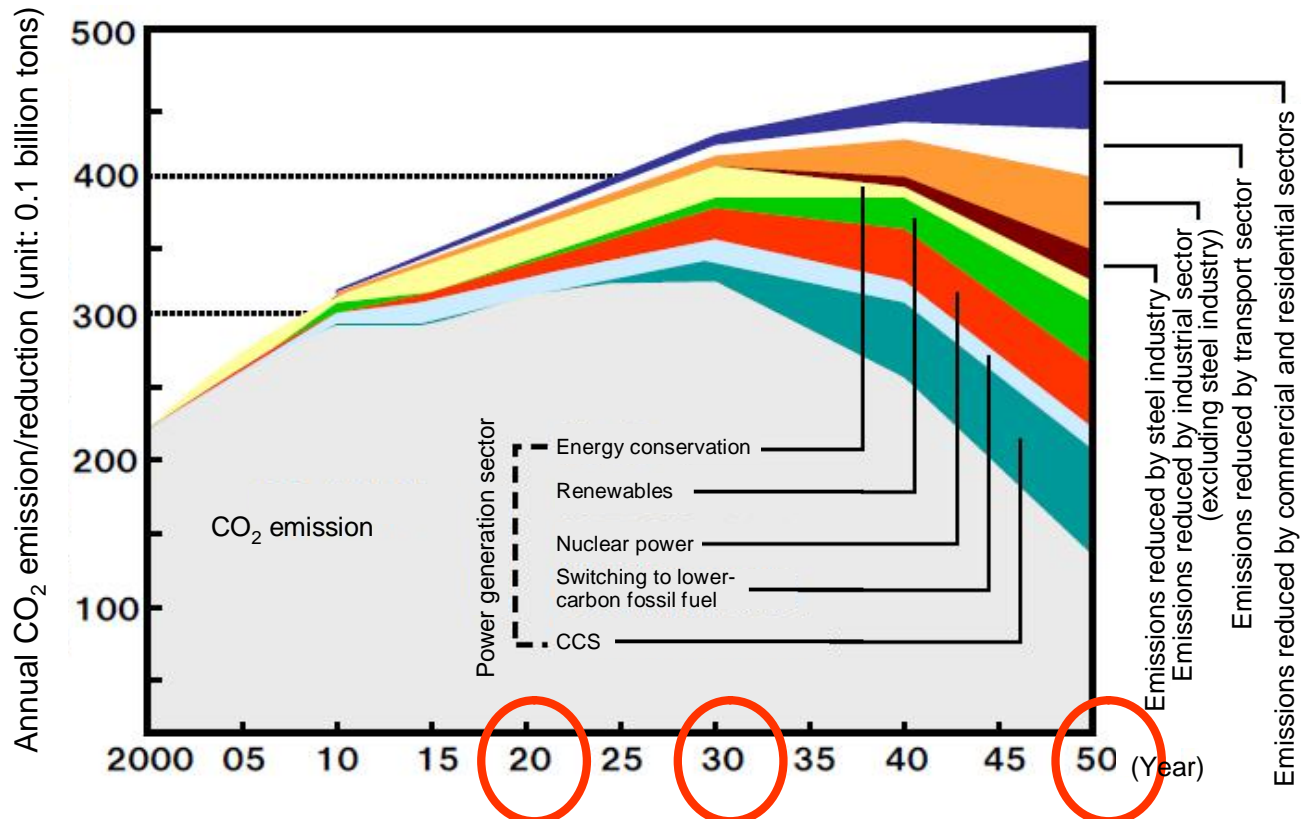
- Japan has 32 LNG receiving terminals in operation (as of January 2010).
- Japan has no nation-wide trunk line.



## 2-2. Global Warming Issues

**Long-term target for 2050: The world is to halve global CO<sub>2</sub> emissions, and Japan is to reduce emissions by 60-80% from the present level**

**Mid-term target: Japan to achieve 25% reduction from the 1990 level by 2020**



Research Institute of Innovative Technology for the Earth (RITE)

## 2-2. Changes in the Business Situation

- ① Wild fluctuations of energy prices and worsening economic situation
  - Concerns about the fragility of energy supply structure
- ② Need for internationally coordinated actions against global warming
  - Transition into a low carbon society



- Supporting the national policy for improving the energy supply structure
- Specific actions for reducing GHG emissions



How can natural gas help create a low carbon society?

# III. Initiatives by City Gas Utilities



1. Initiative to increase the use of natural gas and encourage advanced use of natural gas
2. Utilization of renewable energy sources
3. International efforts

# 3-1. Advantages of Cogeneration Technology

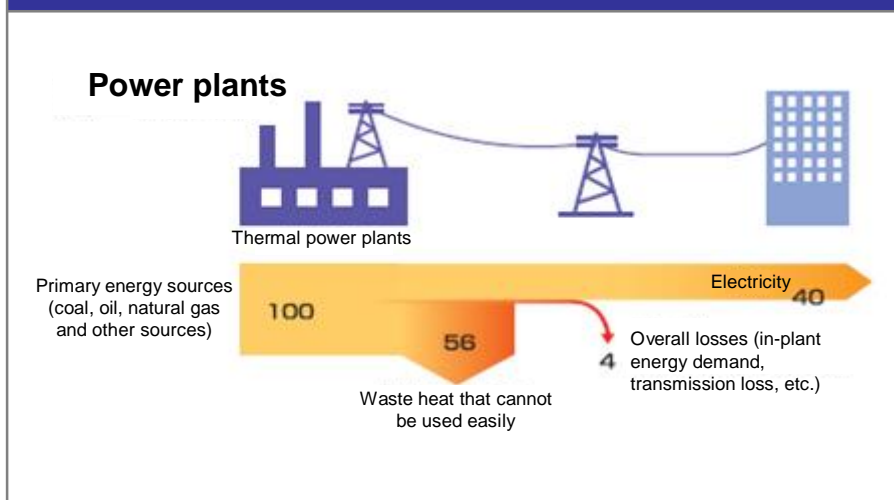
## Effectiveness of Cogeneration Technology

Cogeneration systems, which are installed in a demand center, allow the use of both electricity and heat and deliver an overall efficiency of 80%, thus enabling sizable reductions in energy and CO<sub>2</sub> emissions.

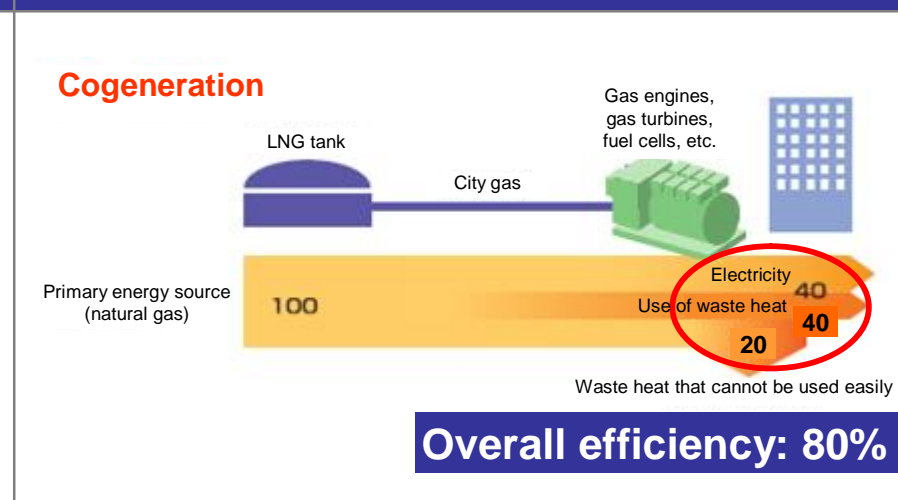
## Low-Carbon Quality of Cogeneration Technology

Natural gas-fueled cogeneration systems have the lowest CO<sub>2</sub> emission intensity among fossil fuel power sources. Increasing their use helps reduce the operations of fossil fuel power sources, thus contributing greatly to the creation of a low carbon society.

### Energy use efficiency is 40%.

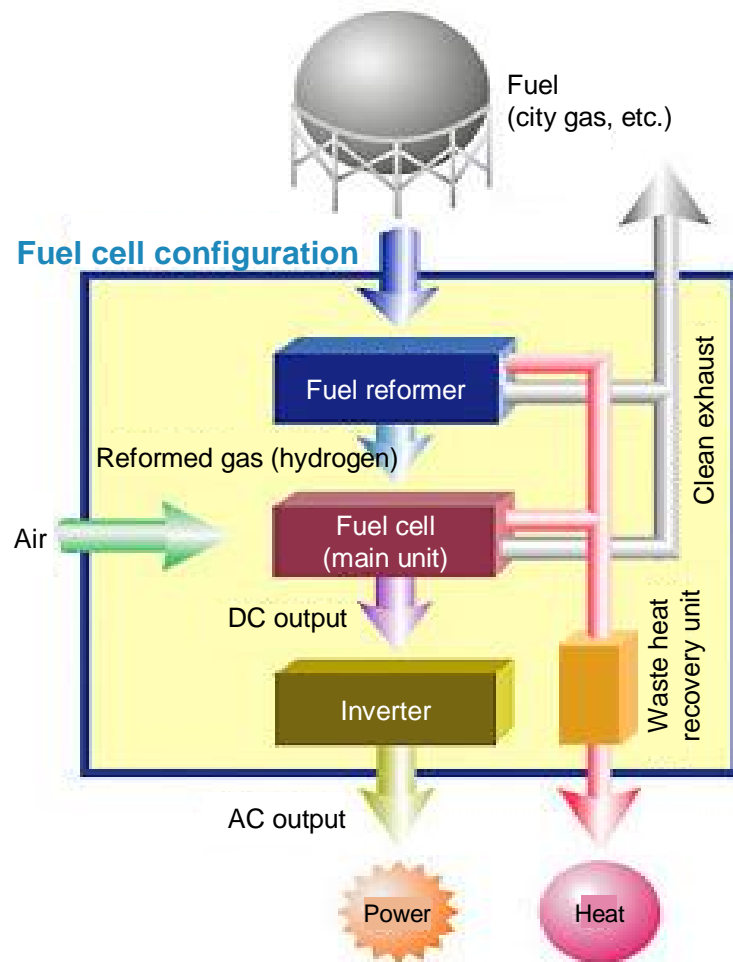


### Energy use efficiency is more than 80%.



# 3-1. Fuel Cell

Fuel cell technology is crucial to building a hydrogen-powered society.



## Polymer electrolyte fuel cell (PEFC)



The marketing of Ene-Farm (PEFC for residential use) started in May 2009.

**Overall efficiency: 80%**  
**Generation efficiency (\*): 33%→36%**  
 (residential-use PEFC, 2020-2030)  
**Waste heat recovery ratio: 44%**

## Solid oxide fuel cell (SOFC)



SOFCs are developed not only for residential use but also for commercial and industrial use.

**Overall efficiency: 80%**  
**Generation efficiency (\*): 40-55%**  
 (commercial and industrial use SOFC for deployment in 2020 or afterward)  
**Waste heat recovery ratio: 25%**

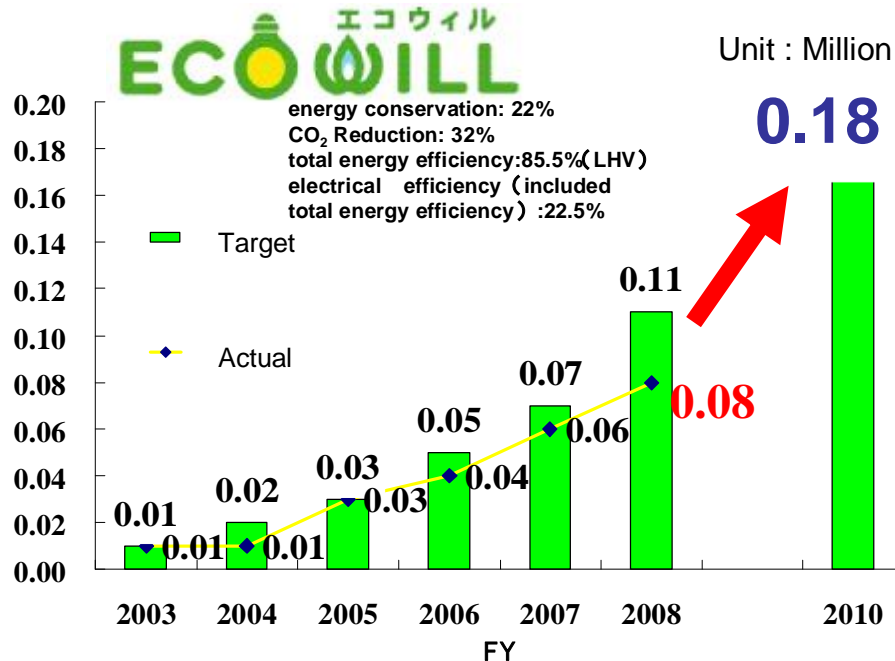
Companies in the energy business such as city gas utilities, Nippon Oil and Astomos Energy work in partnership with companies such as Panasonic, Toshiba, Kyocera, Toyota Motor Corp., Aisin Seiki and TOTO on developing and introducing fuel cells.

\*Power generation efficiencies are all represented with HHV.

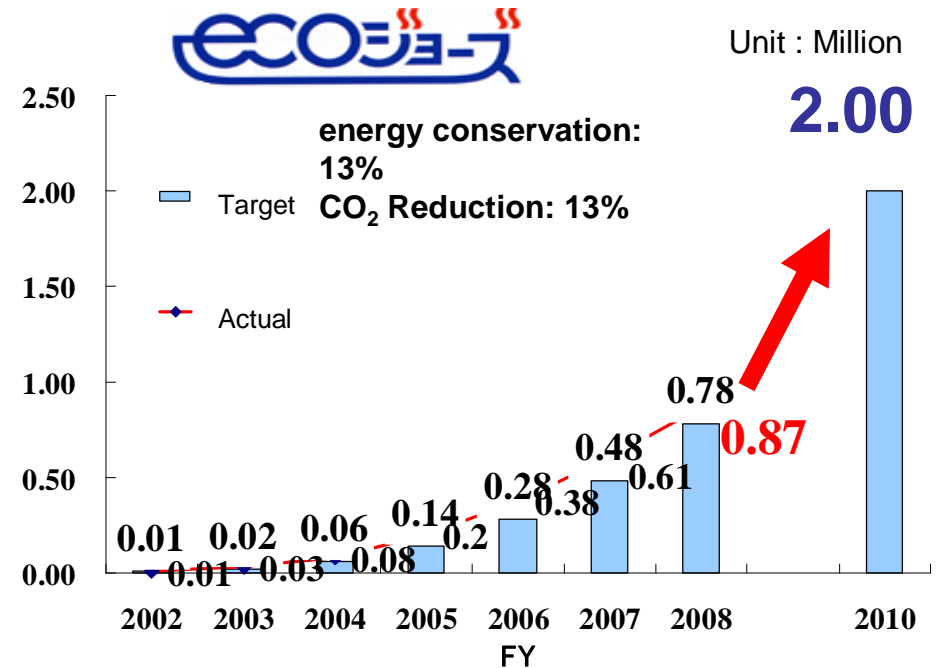
# 3-1. Residential gas engine cogeneration and condensing boiler system

## Target for 2010 and achievements (city gas only)

### Residential gas engine cogeneration (Eco-Will)



### Condensing boiler system (Eco-Jozu)

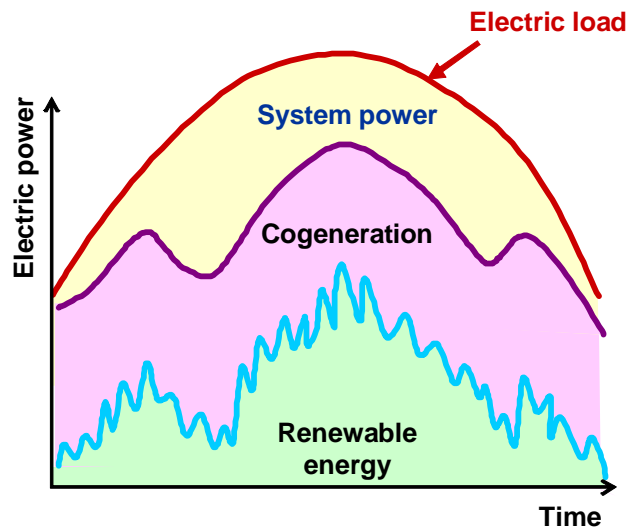


The deployment of highly efficient gas appliances, such as residential fuel cell (ENE-FARM), residential gas engine cogeneration (Eco-Will) and condensing boiler system (Eco-Jozu), is accelerated by government support such as subsidies for installation.

# 3-1. Additional Role of Cogeneration Technology

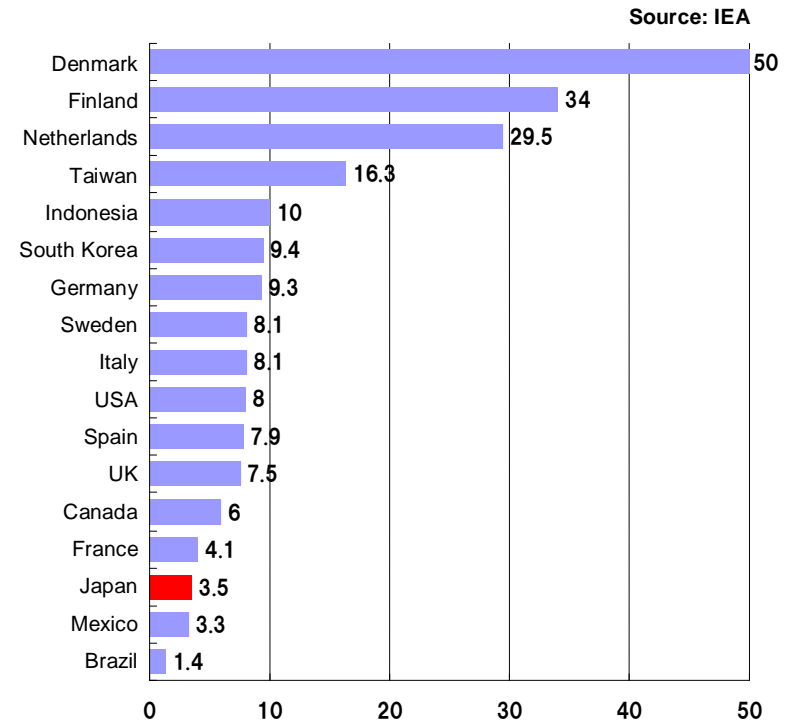
## Complementing Renewable Energy Sources

Renewable energy sources such as photovoltaic power have an unstable output but cogeneration technology helps stabilize such fluctuations, thereby stabilizing power systems and helping to create a low carbon society.



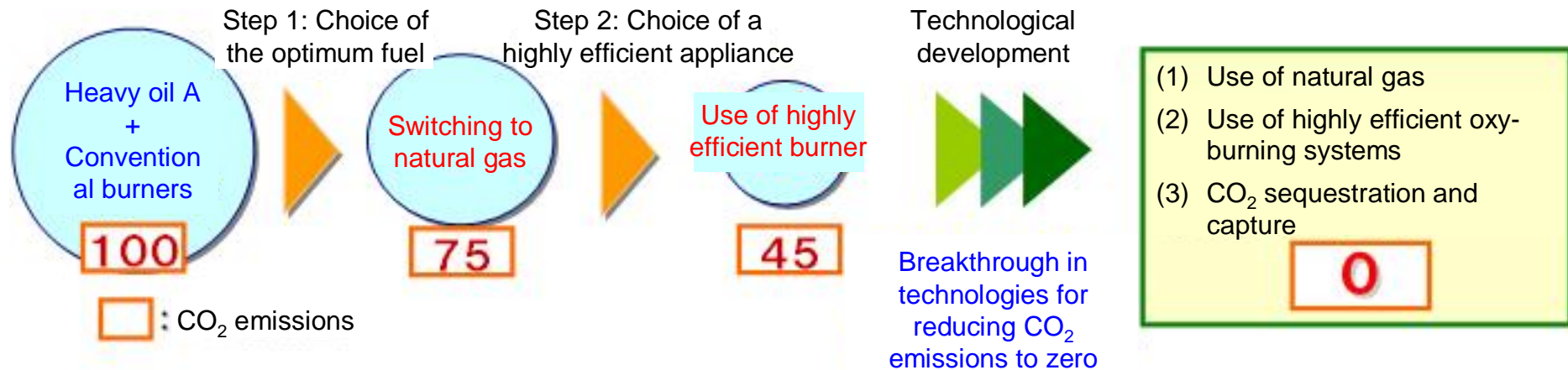
## Reference: Shares of Cogeneration Technology by Country

Cogeneration technology has a share of 3.5% in Japan, so there is ample room for expanding cogeneration capacity.



# 3-1. Advanced use of natural gas in the industrial sector

Promoting the advanced use of natural gas in meeting the heat demand from industries helps reduce energy consumption and CO<sub>2</sub> emissions. Further technical progress is required to almost eliminate CO<sub>2</sub> emissions.



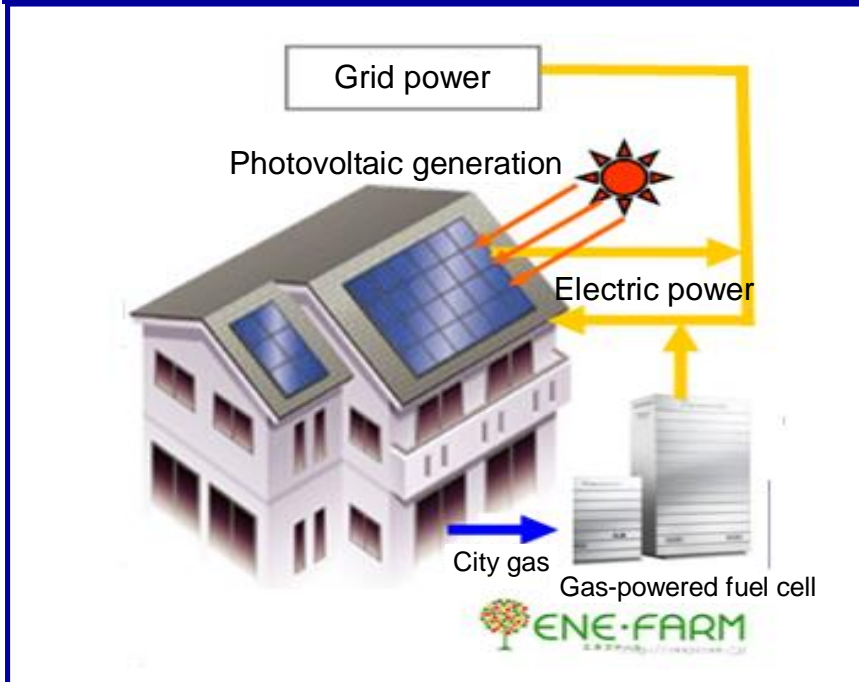
Pursuit of higher efficiency in energy utilization:  
Use of burners such as those that recover energy from the exhaust gas generated by combustion



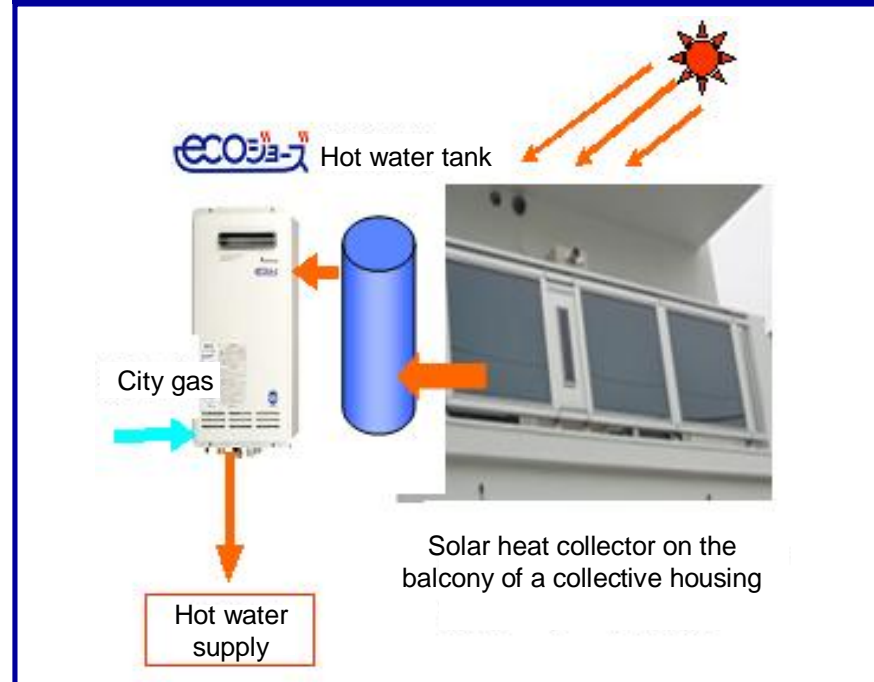
## 3-2. Expanding the use of renewable energy sources ①

### Using solar energy systems in harmony with natural gas utilization technologies

#### Dual mode generation system (photovoltaic and fuel cell)



#### Combining solar heat with a highly efficient gas water heating system



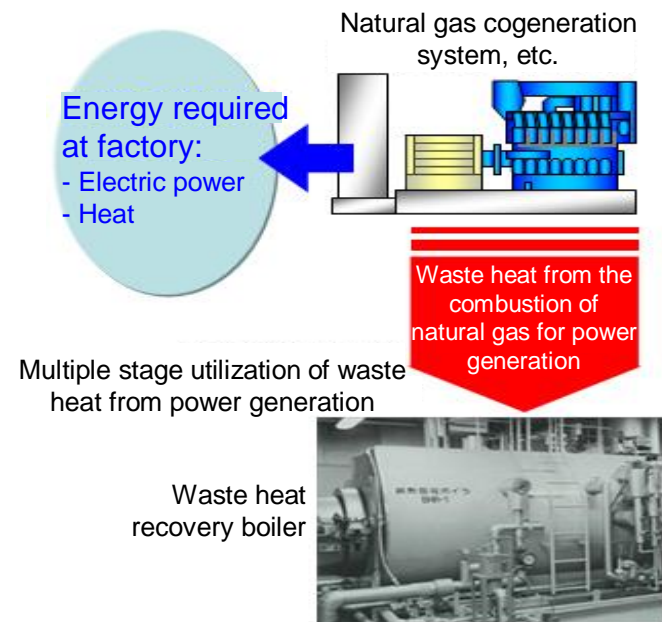
## 3-2. Expanding the use of renewable energy sources ②

The combination of renewables and natural gas utilization technologies support the optimum use of locally-available renewable energy and unused energy such as waste heat.

### Combining biogas with natural gas



### Recovery of unused energy (waste heat)



## 3-3. International activities

### **IEA** (International Energy Agency)

Established as an OECD organization in 1974 following the first oil crisis, as proposed by Henry Kissinger, then U.S. Secretary of State.

To prevent global warming and conserve energy, the IEA studies the following:

- Future scenarios and strategies on energy
- Improvement of energy efficiency
- Clean use of fossil fuels
- Renewables, etc.

### **IGU** (International Gas Union)

Established in 1931 to develop the gas industry, such as addressing energy and environmental issues, international cooperation and technologies.

Focuses on the role of natural gas in addressing climate change:

- Long-term outlook for the global natural gas industry
- Sustainability studies

### **JGA** (Japan Gas Association)