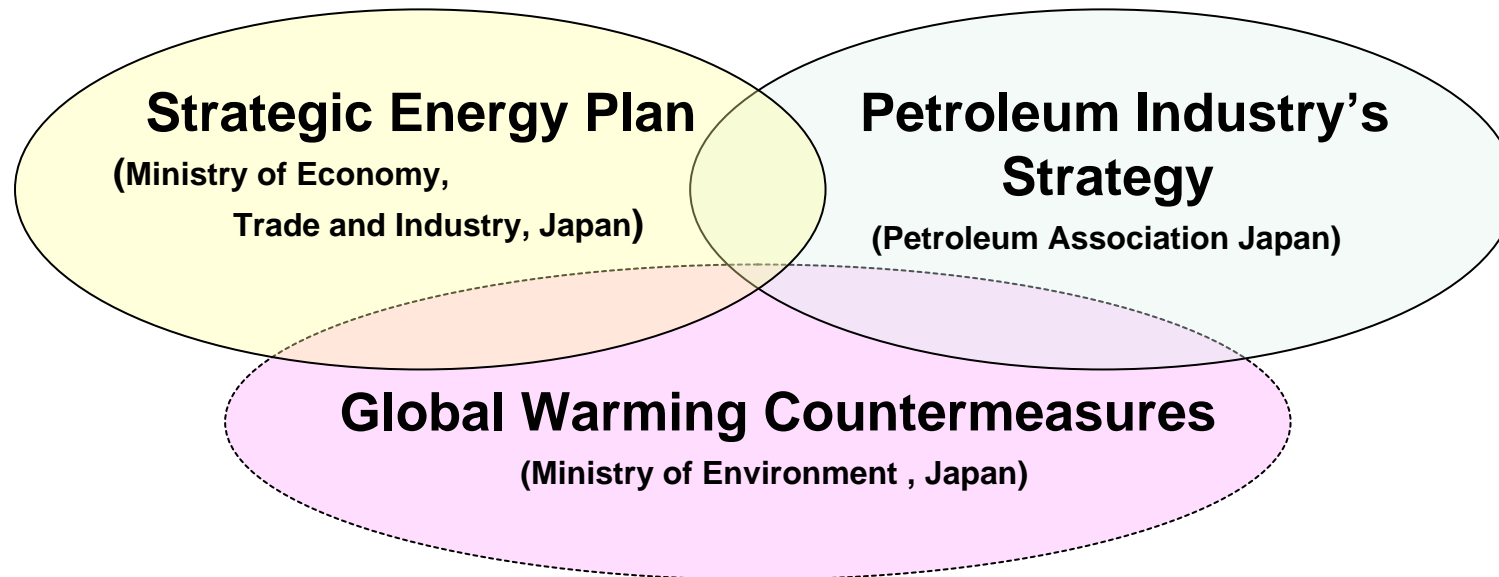


Petroleum Industry's Strategy to achieve Low Carbon Society in Japan

January, 2011

COSMO RESEARCH INSTITUTE

Petroleum Industry's Strategy to achieve Low Carbon Society in Japan



Specific Approach to FY2020

① Refining

- Best Available Technologies
- Petrochemical Integration
- Energy Saving : 140 million gallons of coe / year
(1.4 million tons of CO₂ eq. / year)

② Logistics

- Further improvement of efficiency
(distribution system, solar power generation, etc.)

Petroleum Industry' s Strategy to achieve Low Carbon Society in Japan

Specific Approach to FY2020

- ③ Consumption
- Mandate of Bio Ethanol blending (numerical target)
FY 2011- 2017 : 55~132 million gallons of coe / year
 - LCA (for Sustainable Standards for Biomass fuel)
 - Fuel cell vehicles
Operated by petroleum derived Hydrogen
 - Clean Diesel Powered Vehicle
 - High-efficiency Water Heater (House-hold)

Specific Approach to FY2030-2050

Development of Innovative Technologies for Refining

- Heavy oil cracking
- Membrane separation and adsorption of HCs
- CCS

References

Strategic Energy Plan of Japan

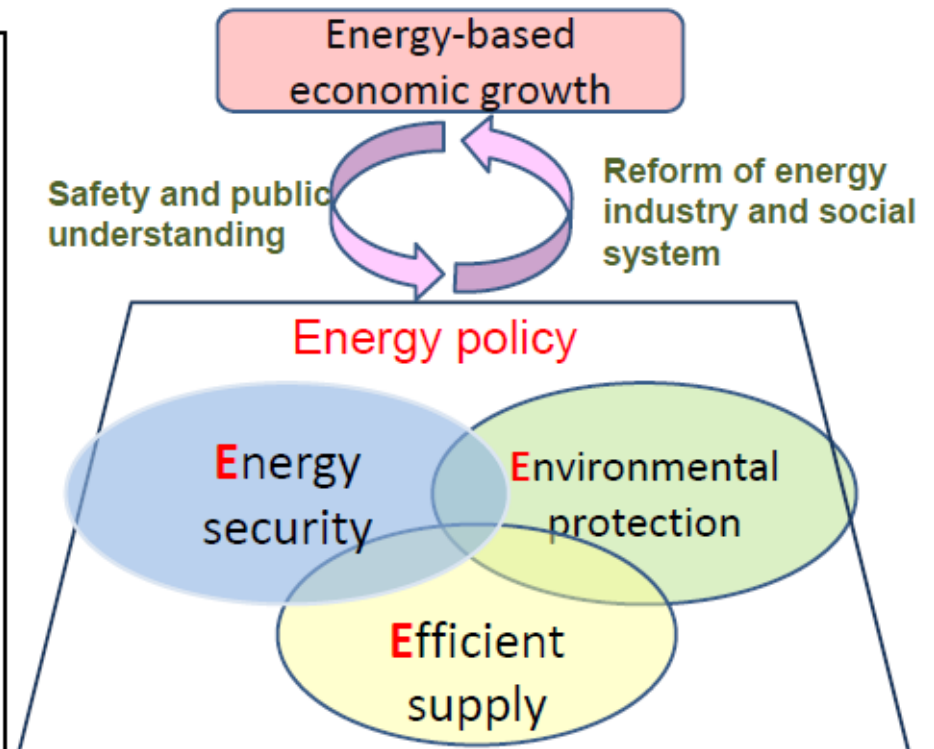
- ...articulates the fundamental direction of energy policy in Japan, based on the Basic Act on Energy Policy
- ... is required to be reviewed at least every three years, and to be revised if needed.
(formulation : 2003, revision : 2007 and 2010)

Basic point of view

○The basic point of view in energy policy is **energy security**, **environmental protection**, and **efficient supply**.

○In this revision, two new points of views were added. These are: **energy-based economic growth** and **reform of the energy industrial structure**.

○Japan will **fundamentally change its energy supply and demand system by 2030**.



Petroleum Industry's request

The petroleum industry has consistently advocated the following opinions for the simultaneous achievement of the energy policy's three basic principles

1. Achieve "the optimum energy mix" suitable for Japan by evaluating the characteristics of each energy source fairly and objectively.
2. Promote effective and efficient use of oil, which constitutes a large share of the primary energy supply.
3. Draw up a feasible energy supply and demand plan, in which new energies such as nuclear power and biomass should not arbitrarily be incorporated; their supply and demand should be forecast solely based on the feasibility of development.
4. Establish a policy framework for treating all energy sources impartially and promoting their advanced usage. To achieve "the optimum energy mix" in a true sense, the government should provide an equal footing regarding competitive conditions on taxation, stockpiling obligations, etc. among all energy sources.

Source: Petroleum Association of Japan

Toward the Advancement of Energy Supply Structure

A new law, “the Act on the Promotion of Nonfossil Energy Source Utilization and Effective Utilization of Fossil Energy Resources by Energy Suppliers” (enacted in July 2009)

To promote ① utilization of nonfossil energies and ② effective utilization of fossil energy sources
by Energy Suppliers (Electricity, Oil and City Gas)

Necessity for Enhancing Energy Suppliers' Efforts; Oblige Them to:

- Expand the use of nonfossil power sources, ramping up nonfossil power sources such as solar energy and nuclear power more than 50% by 2020 (Electric Companies)
- Purchase electricity by solar power generation at fair prices (Electric Companies)
- Use biomass fuels and biogas (Oil Companies and City Gas Companies)
- Use crude oil and natural gas effectively (Oil Companies and City Gas Companies)

Necessity for Promoting Technology Development; Development in:

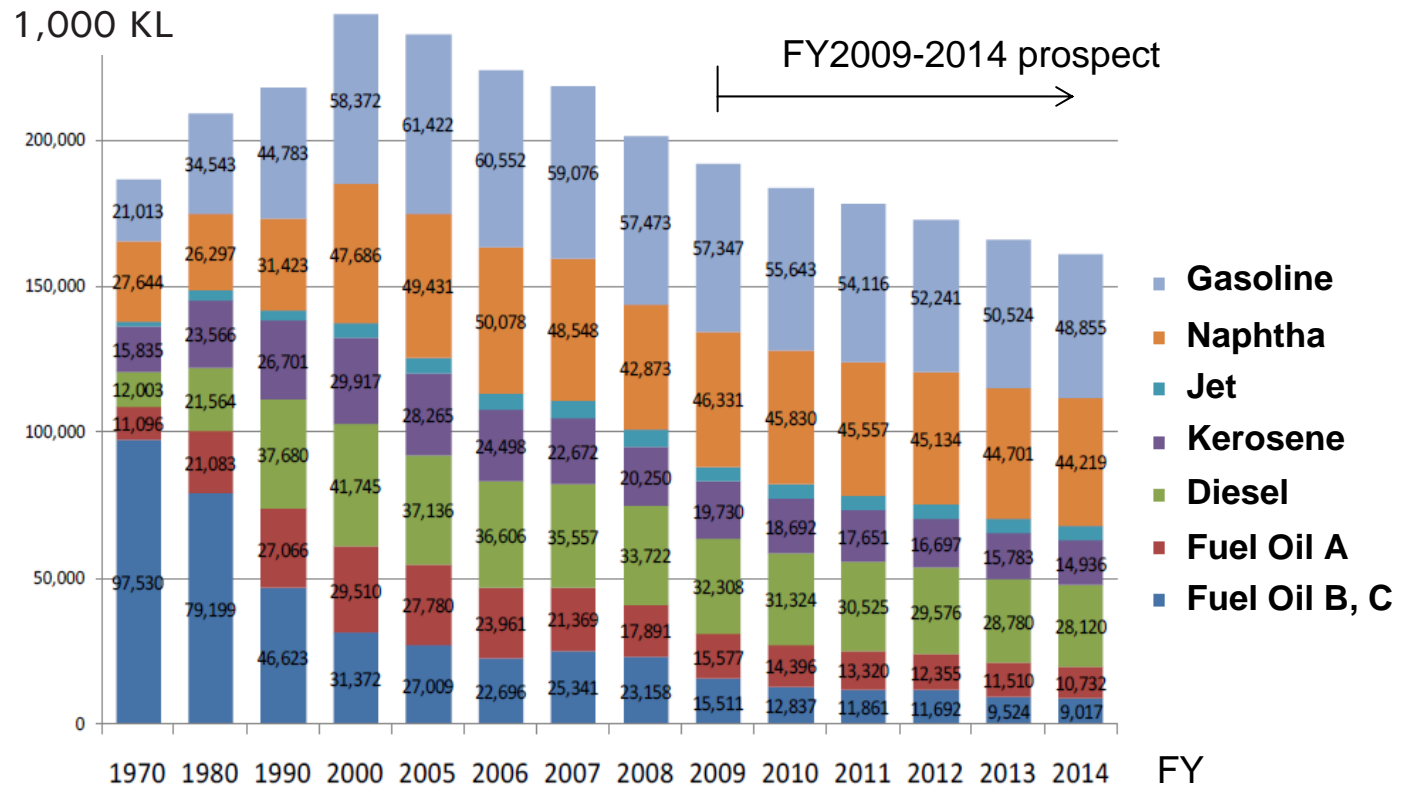
(Examples)

- Hydrogen production, storage and fuel cells toward building a hydrogen society
- Nonconventional resources (methane hydrate and oil sands)
- High efficiency cracking facilities for residual oils
- Integrated Gasification Combined Cycle (IGCC)
- Utilization of cellulosic biomass like woody waste

Domestic Trends Regarding Oil Demand

Major factors for the structural decline in petroleum demand in Japan

- Gathering momentum of post-oil policy
- Changes in social structure
- Global warming countermeasures



Source: Ministry of Economy, Trade and Industry, Japan
(August 2009)

Toward the Advancement of Energy Supply Structure

Long-term Energy Supply and Demand Outlook, issued in Mar. 2008, that indicates supply-demand forecast in 2020 as a milestone in addition to that of 2030, taking into account the quantitative analysis of technologies to realize the numeric targets in the “New Strategies”.

■ Long-term Primary Energy Supply Outlook

unit: million kl crude oil equivalent

(FY)		1990		2005		2008		2020						2030					
								Business-as-usual Case		Additional Measures Case		Political Initiative Case		Business-as-usual Case		Additional Measures Case		Political Initiative Case	
Primary Energy Domestic Supply		508		587		556		627		596		553		637		590		515	
Energy Category	Oil	265	52%	255	43%	216	39%	227	36%	215	36%	190	34%	220	35%	204	35%	168	33%
	LP Gas	19	4%	18	3%	17	3%	18	3%	18	3%	18	3%	18	3%	18	3%	17	3%
	Coal	85	17%	123	21%	127	23%	128	20%	120	20%	107	19%	131	21%	119	20%	92	18%
	Natural Gas	54	11%	88	15%	104	19%	114	18%	103	17%	89	16%	112	18%	94	16%	71	14%
	Nuclear Power	49	10%	69	12%	58	10%	99	16%	99	17%	99	18%	107	17%	107	18%	107	21%
	Hydropower	22	4%	17	3%	17	3%	19	3%	19	3%	19	3%	19	3%	19	3%	20	4%
	Geothermal	0	0%	1	0%	1	0%	1	0%	1	0%	1	0%	1	0%	1	0%	2	0%
	New Energy	13	3%	16	3%	17	3%	22	3%	22	4%	30	5%	29	5%	29	5%	38	7%

Source: Ministry of Economy, Trade and Industry, Japan
(August, 2009)

Toward the Advancement of Energy Supply Structure

These outlook states that oil will remain an important energy source in the future, even though oil's share in Japan's primary energy supply will decline to a little less than 40% in 2030.

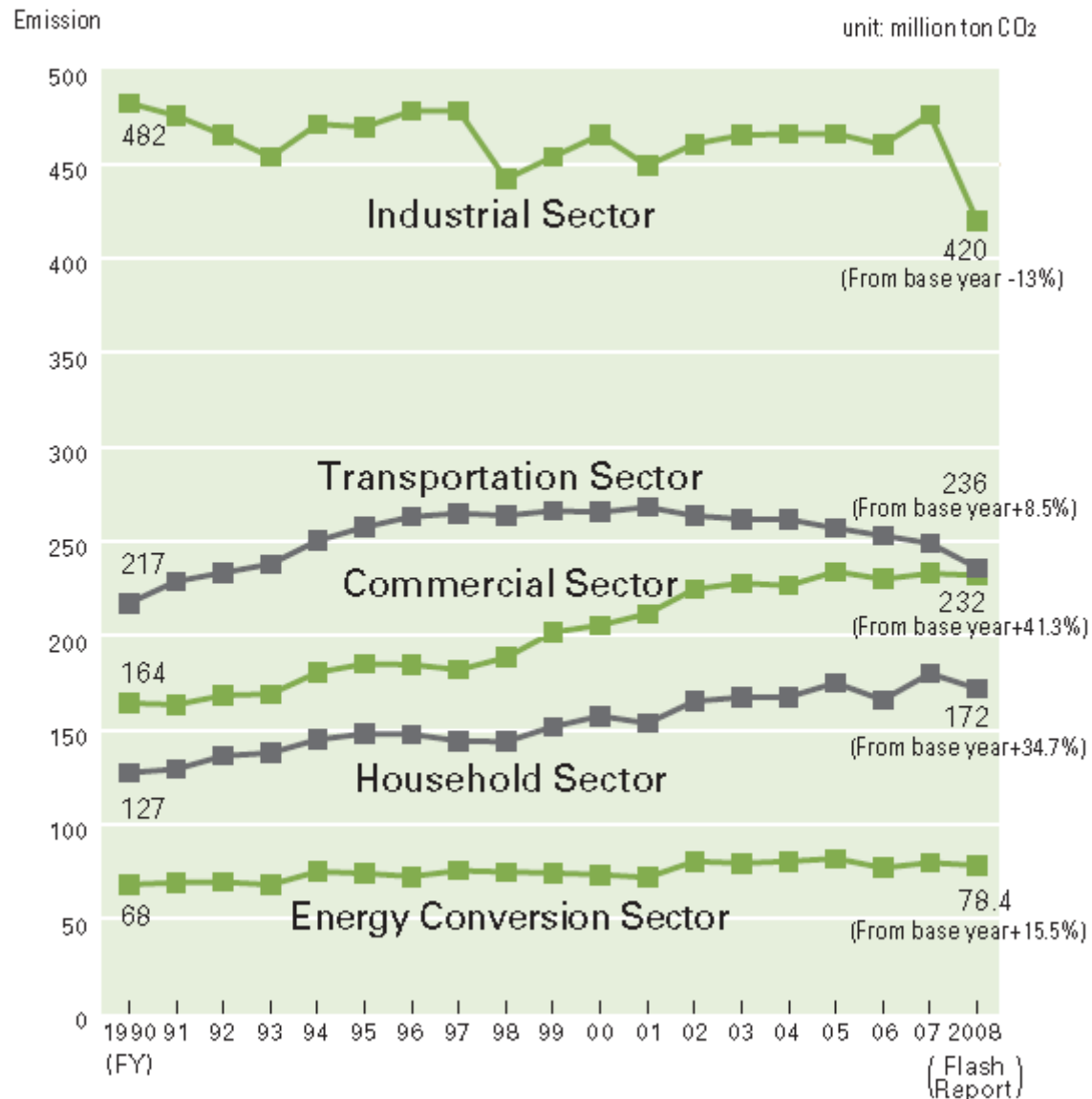
■ Long-term Final Energy Consumption Outlook

unit: million kl crude oil equivalent

(FY)	1990		2005		2008		2020						2030									
							Business-as-usual Case	Additional Measures Case	Political Initiative Case					Business-as-usual Case	Additional Measures Case	Political Initiative Case						
Final Energy Consumption	359	100%	413	100%	380	100%	421	100%	401	100%	375	100%	424	100%	391	100%	346	100%				
Industry	181	50%	181	44%	162	43%	180	43%	180	45%	177	47%	179	42%	179	46%	174	50%				
Household & Commercial	95	27%	134	32%	128	34%	149	35%	134	34%	121	32%	154	36%	130	33%	103	30%				
• Household	43	12%	56	14%	53	14%	61	14%	56	14%	52	14%	66	16%	56	14%	47	14%				
• Commercial, etc	52	15%	78	19%	75	20%	88	21%	78	20%	68	18%	87	21%	74	19%	56	16%				
Transportation	83	23%	98	24%	90	24%	92	22%	86	22%	78	21%	91	22%	82	21%	69	20%				

Source: Ministry of Economy, Trade and Industry, Japan
(August, 2009)

Domestic Trends Regarding the Climate Change Issue



Source: Ministry of Economy,
Trade and Industry, Japan
(October, 2009)

Long-term CO₂ emission reduction path

The long-term CO₂ emission path provides an image that approx. 0.5 billion tons will be reduced from the current level in about 20 years until 2030. By that time, about a half of the reduction amount to be achieved by 2050 (▲80% compared to 1990) will have been realized.

0.1 billion tons
of CO₂



Source: Ministry of Economy, Trade and Industry, Japan (June 2010)

Utilization of Biomass Fuel



Source: Petroleum Association of Japan

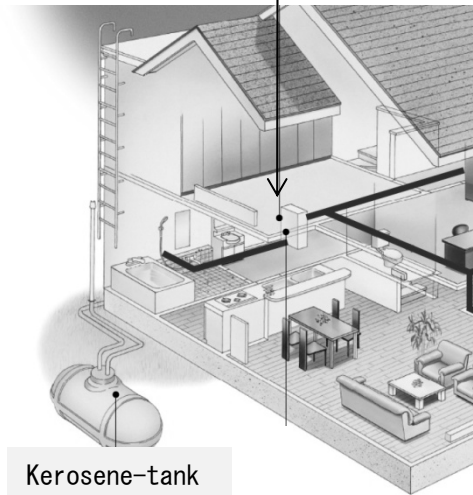
Utilization of Biomass Fuel



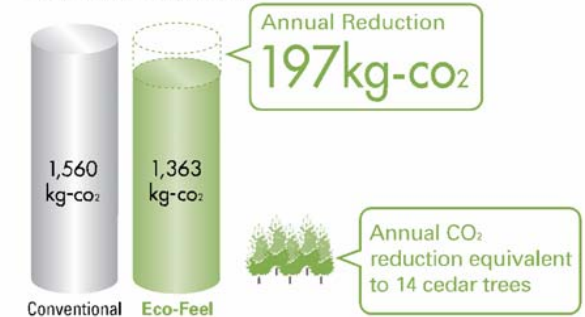
Efficient Use of Petroleum Products

House-hold

· High-Efficiency Water Heater, "Eco-Feel"

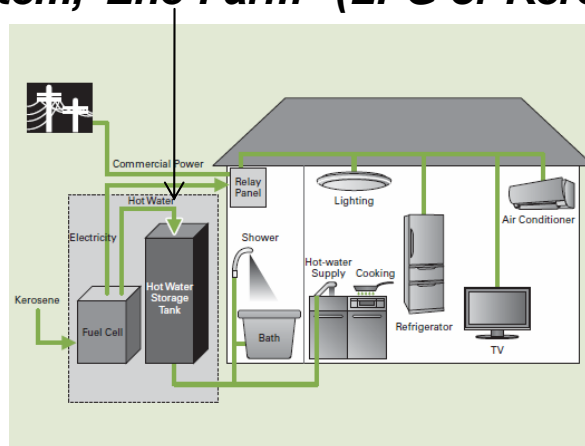


■ CO₂ Emissions



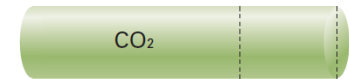
*For a typical family of four members, "Eco-Feel" emits 200kg less CO₂ a year compared with a conventional heater. As it also saves 79 liters of kerosene a year, "Eco-Feel" is an ecological and economical water heater.

· Stationary Fuel Cell system, "Ene-Farm" (LPG or Kerosene)

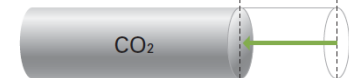


■ Comparison of CO₂ Emissions

Thermal Power Plant and Hot Water Supply



Household Fuel Cell Cogeneration System



±30% reduction

Source: Petroleum Association of Japan

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Efforts toward Developing New energies based Fuel Cell

-Hydrogen Supply to Fuel Cell Vehicles

**Number of Hydrogen Stations
9 stations in Kanto Area
(total 14 stations in Japan)**



■ Location of Hydrogen Stations (Kanto Area)

Senju Hydrogen Station

by Tokyo Gas Co., Ltd. and Taiyo Nippon Sanso Corp.

Relocatable Hydrogen Station (Kasumigaseki Station)

by Taiyo Nippon Sanso Corp.

Kawasaki Hydrogen Station

by Japan Air Gases, Ltd.

Sagamihara Hydrogen Station

by Kurita Water Industries, Ltd., Sinanen Co., Ltd., and Itochu Enex Co., Ltd.

Yokohama-Asahi Hydrogen Station

Naphtha Reforming by JX Nippon Oil & Energy Corp.

Yokohama-Daikoku Hydrogen Station

Desulfurized Gasoline Reforming by Cosmo Oil Co., Ltd.

Ariake Hydrogen Station

Liquid-Hydrogen by Showa Shell Sekiyu K.K. and Iwatani International Corp.

Relocatable Hydrogen Station (Funabashi Hydrogen Station)

High Pressure Hydrogen by JX Nippon Oil & Energy Corp., and Taiyo Nippon Sanso Corp.

Ichihara Hydrogen Station

Kerosene Reforming by Idemitsu Kosan Co., Ltd. and NEDO Project

● Hydrogen stations operated by oil companies are shown in green