The Best Energy Mix and the Need for Comprehensive Viewpoints

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Contents

1. The Best Energy Mix from Comprehensive Viewpoints

1. When reviewing the energy mix, we must solve <u>simultaneous equations with many variables. This requires objective and quantitative analyses.</u>

2. The following variables are important:
   1) S (safety)
   2) Three Es
      (i) Energy security
      (ii) Economic efficiency (particularly in terms of cost)
      (iii) The environment (compatibility with mitigating global warming)
   3) M (impacts on the macro economy)

1. The Best Energy Mix from Comprehensive Viewpoints 1) S (safety)

- **Safety is a prerequisite for energy policies and the activities of the energy industry itself.**
- **Safety is a measure of the overall competence in various areas including technology, appropriate regulatory framework, cooperation among national and local governments, and the allocation of responsibility among the national government, local governments and utilities.**
- **Since other energy options also have their advantages and disadvantages (in terms of supply stability, economic efficiency, global warming mitigation, etc.), completely phasing out nuclear power would incur significant risk. Japan must develop safer nuclear power, which is supported by people.**
- **In the rest of Asia, there are plans to increase the number of nuclear power plants by three to four times. They need Japan to supply safe nuclear technologies.**

Outlook on nuclear power deployment in Asia

	2009	2020		2030	
		Reference case	Technology development case	Reference case	Technology development case
China	9	48	80	80	130
Japan	49	62	62	68	68
Taiwan	8	8	8	6	8
Korea	18	27	32	30	46
ASEAN	0	0	0	4	18
India	4	20	26	33	85
Asia	85	165	210	224	366

Source: IEEJ

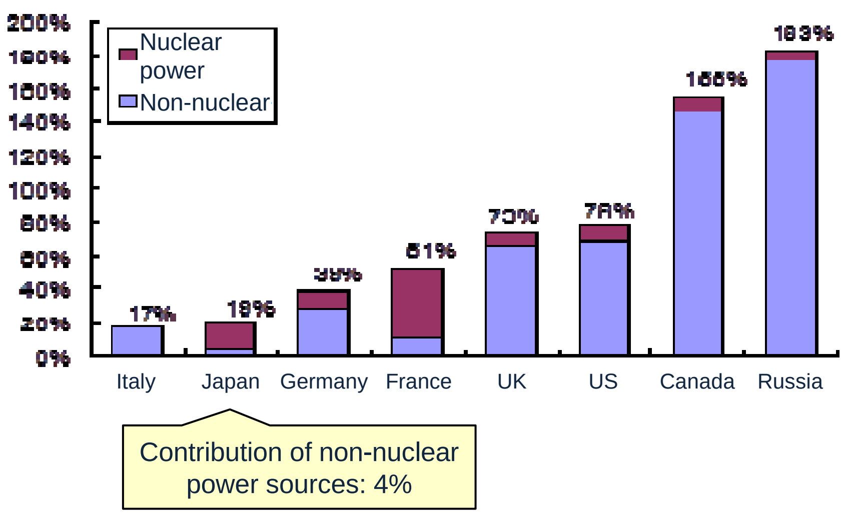
1. The Best Energy Mix from Comprehensive Viewpoints
2) Three Es - (i) Energy security

● **Japan is one of the world's most vulnerable countries in terms of energy security due to two weaknesses:**

a. Japan's energy self-sufficiency ratio (4%) is the lowest among the G8 countries.

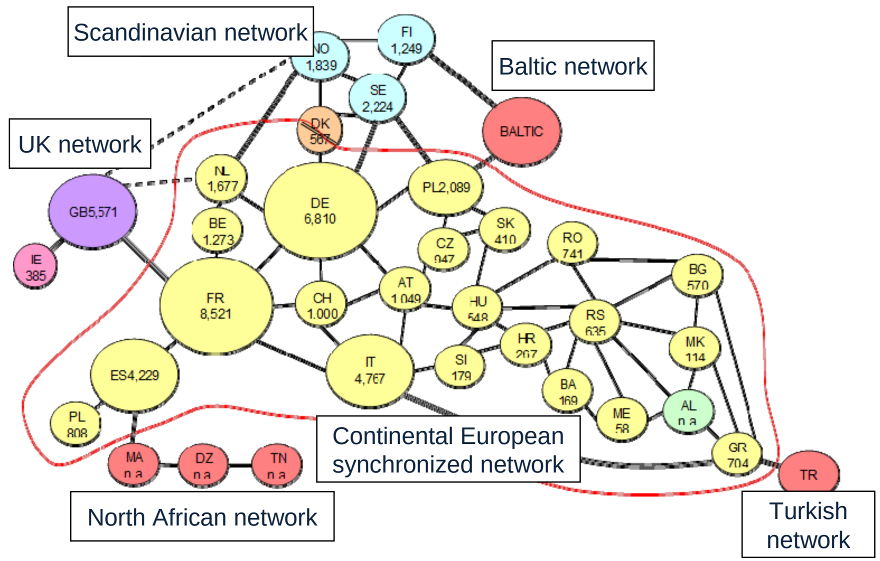
b. Like that among EU countries, Japan needs to build an international energy network covering the whole of Northeast Asia (with electricity interconnections and pipelines), but it is difficult to achieve this in the short to mid term due to various challenges such as geopolitical uncertainty and discrepancies in price and foreign exchange policies.

Energy self-sufficiency ratio of major countries



Source: IEA

Cross-national electricity interconnections in Europe



1. The Best Energy Mix from Comprehensive Viewpoints 2) Three Es - (i) Energy security

● **Energy supply risks have increased rapidly in the last 10 years:**

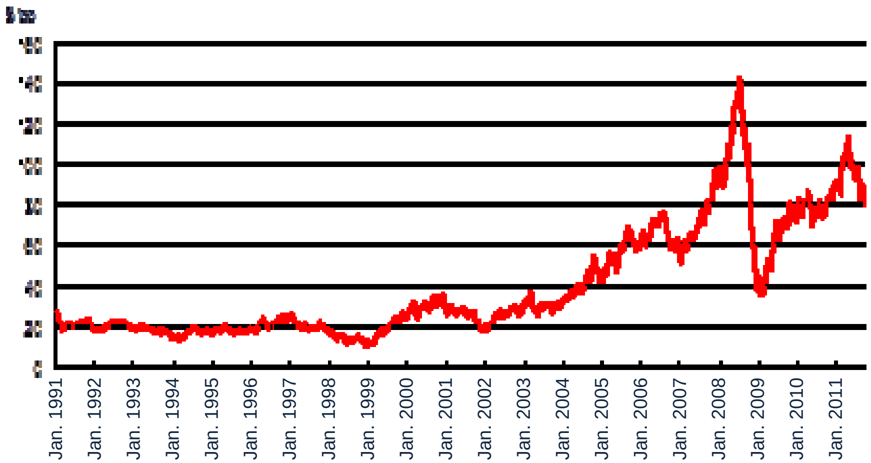
a. Energy demand has been growing rapidly, led by newly emerging countries, and there is fierce competition for energy resources.

b. The Arab Spring has increased political uncertainty in the Middle East, which is expected to continue for a long time.

c. US influence over other countries has waned, and the world has failed to build a satisfactory level of international governance.

d. Rampant speculation in the futures market for crude oil has amplified the fluctuations in crude oil prices. LNG prices are linked with crude oil prices. The growing demand has increased spot market prices for LNG.

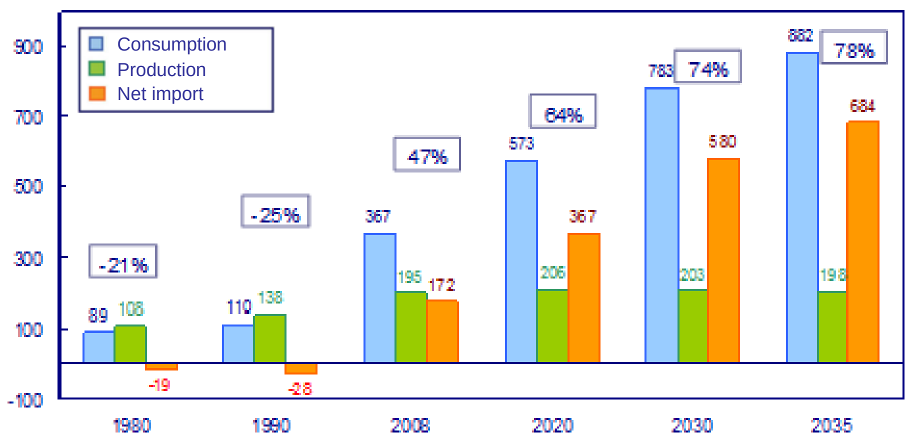
Movement of WTI crude oil prices



Source: U.S. Energy Information Administration

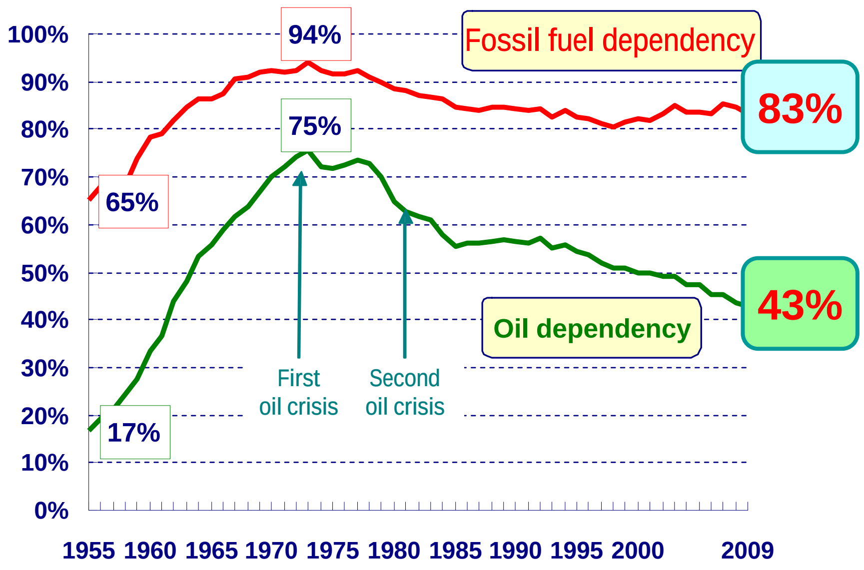
China's oil demand (actual + forecast)

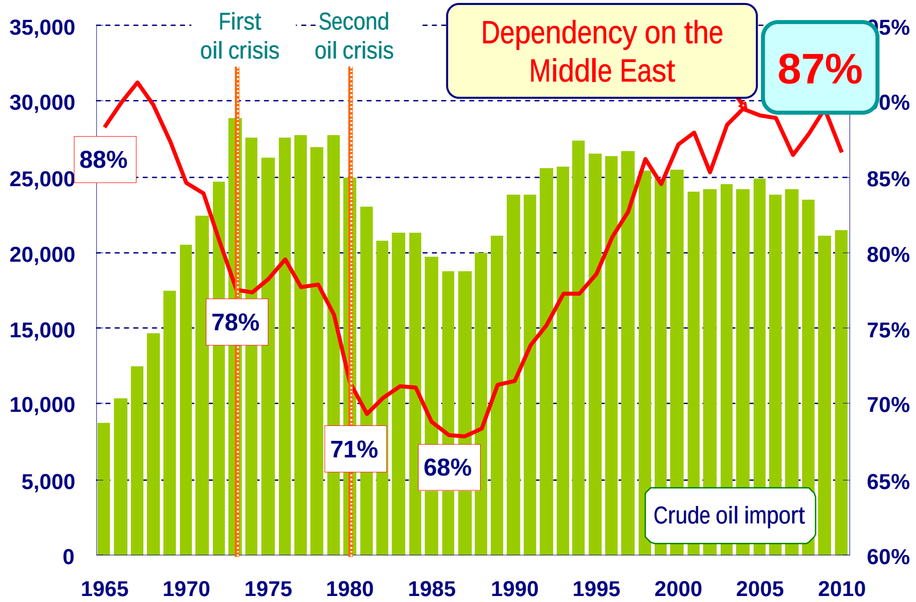
Unit: million oil equivalent ton

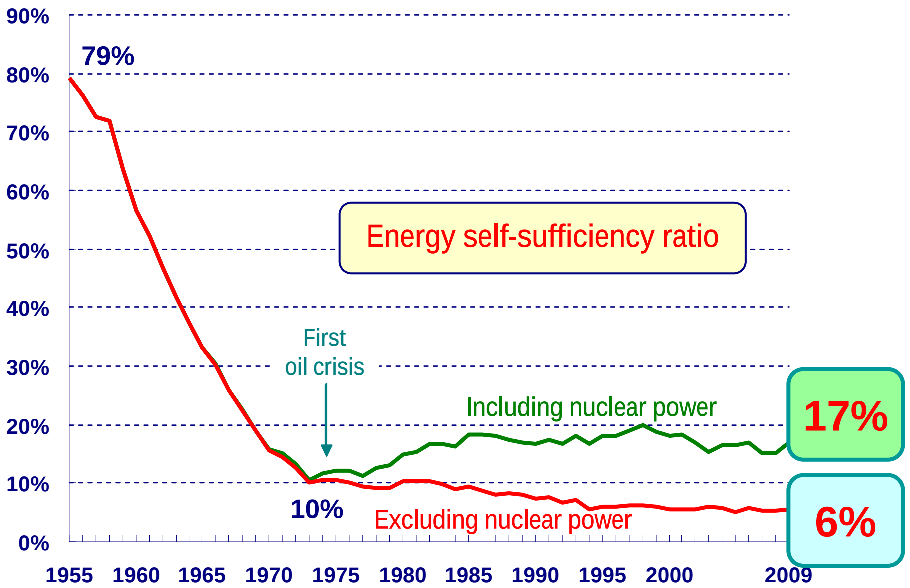


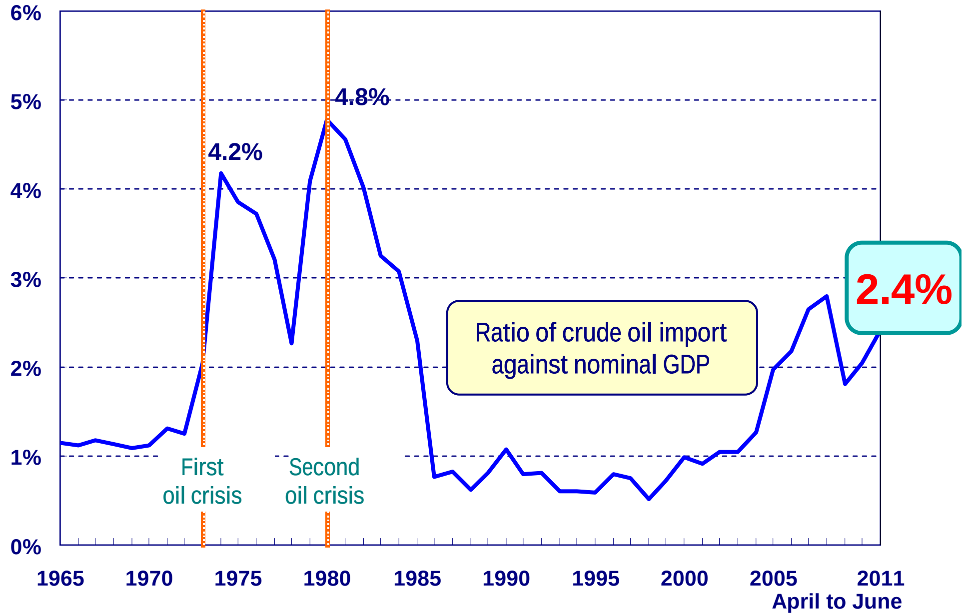
Source: IEEJ

(Reference) Inadequate Energy Security









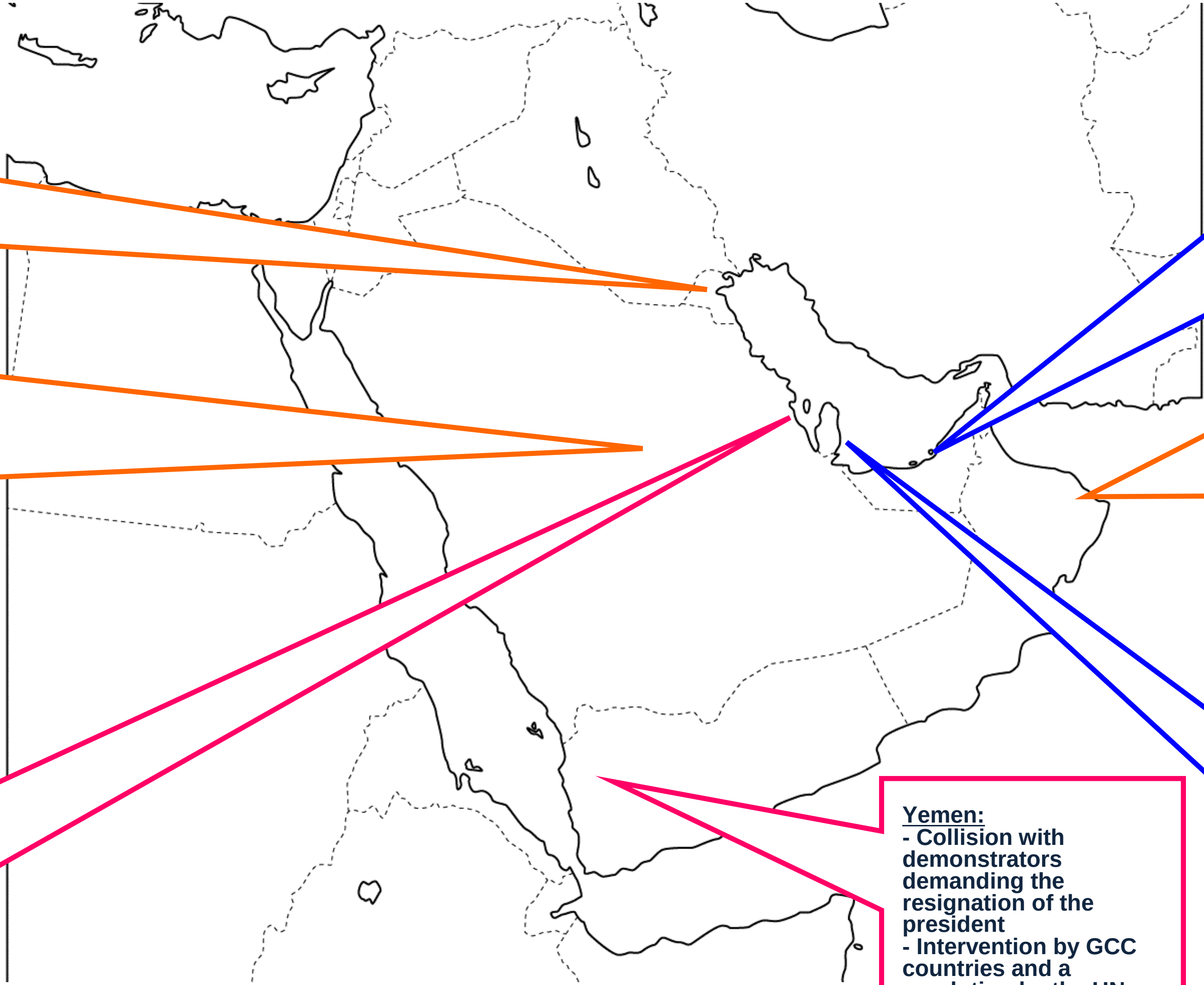
Sources: IEEJ "Overview of Energy and Economic Statistics" (etc.)

(Reference) Implications of the Arab Spring (long-term increase in political uncertainty among the Gulf countries of the Middle East)

Kuwait:
- Demonstration by Bedouins (people without citizenship)
- Protests against the prime minister
- Censoring of Twitter

Saudi Arabia:
- Demonstration by people
- Demand for political reform
- Collision with the Shi'ites in the Eastern Province
- Acceptance of voting by women
- Demand to permit women to hold a driver's license

Bahrain:
- Demonstration by people and persecution of the Shi'ites
- Criticism of imperial reign
- Intervention by armed forces of GCC countries
- Failed dialogue with the people
- Boycotting of parliamentary elections



UAE:
- Criticism of the Emirates on Facebook
- Arrest and persecution of activists
- Convening of tribal council meetings
- Slow progress toward parliamentary elections

Oman:
- Collision between demonstrators and security forces in major cities
- Implementation of political/economic reform
- Parliamentary elections

Qatar:
- Call for demonstration on Facebook
- Criticism of the Emirates
- Aggressive intervention in Libya and Syria

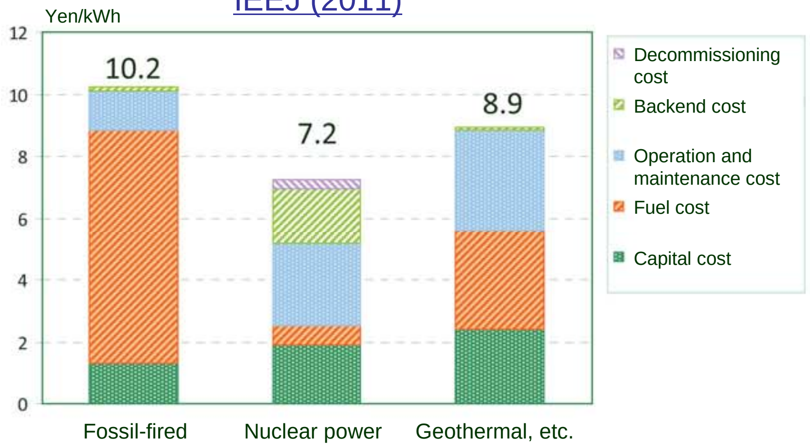
Yemen:
- Collision with demonstrators demanding the resignation of the president
- Intervention by GCC countries and a resolution by the UN Security Council
- Saleh's struggle to remain in power

Source: IEEJ, the Middle East Research Center

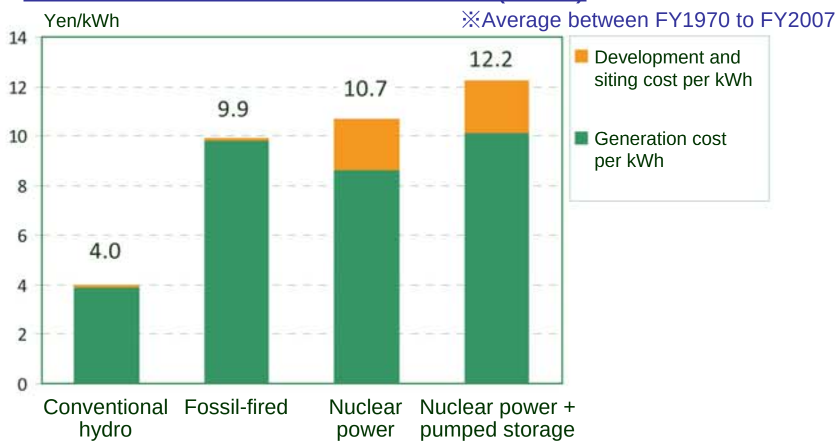
1. The Best Energy Mix from Comprehensive Viewpoints
2) Three Es - (ii) Economic efficiency (particularly in terms of cost)

● **The stabilization of energy cost is a prerequisite for people's welfare and for economic development.**

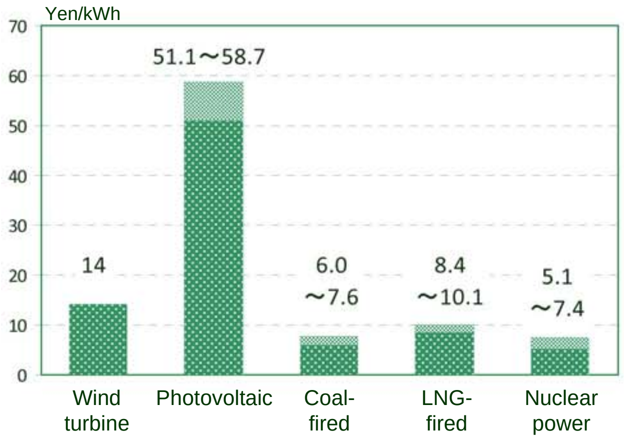
IEEJ (2011)



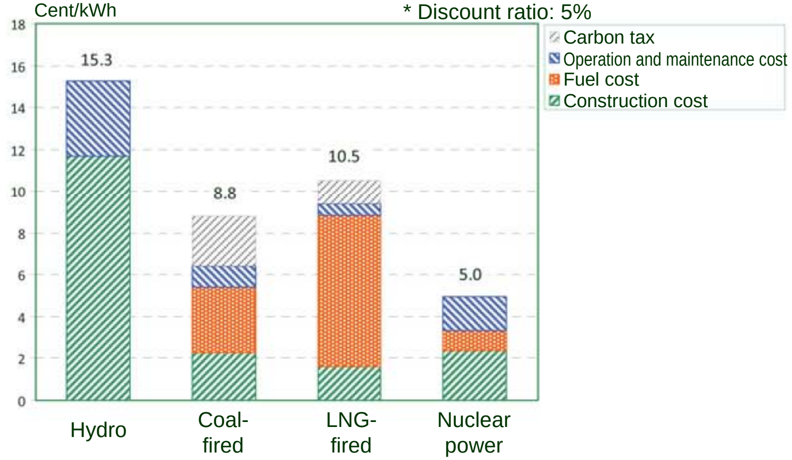
Prof. Oshima, Ritsumeikan Univ. (2010)



RITE (2011)



OECD（2010）

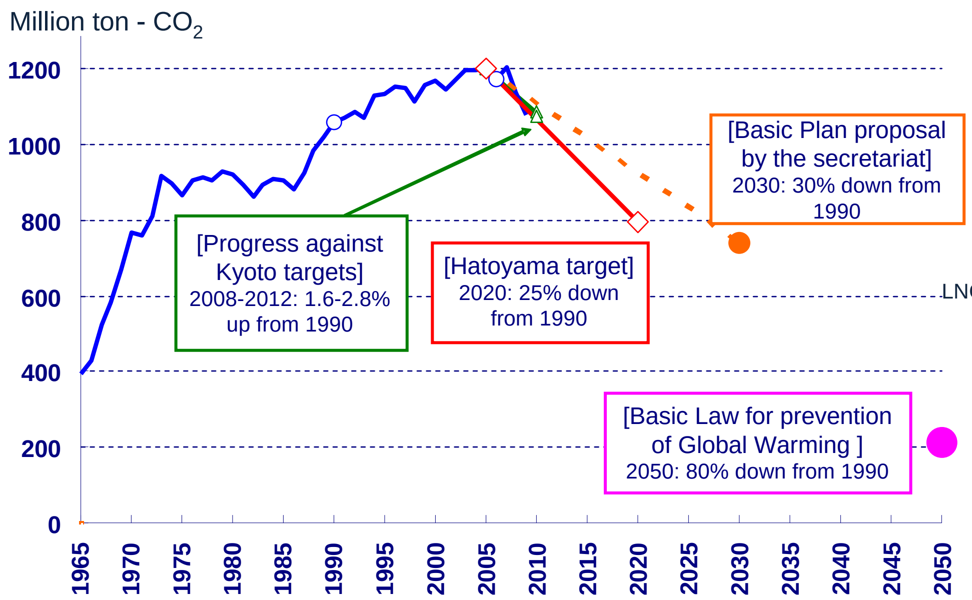


Sources: Keigo Akimoto (RITE) “Generation Cost Estimations” (2011); Kenichi Oshima “Political Economy of Renewable Energy” (Toyo Keizai Shinpo, 2010); OECD “Projected Costs of Generating Electricity 2010 Edition” (2010); IEEJ “Cost Estimations for Fossil-fired and Nuclear Power Generation on the Basis of Financial Statements” (2011)

1. The Best Energy Mix from Comprehensive Viewpoints
2) Three Es - (iii) The environment (compatibility with global warming mitigation)

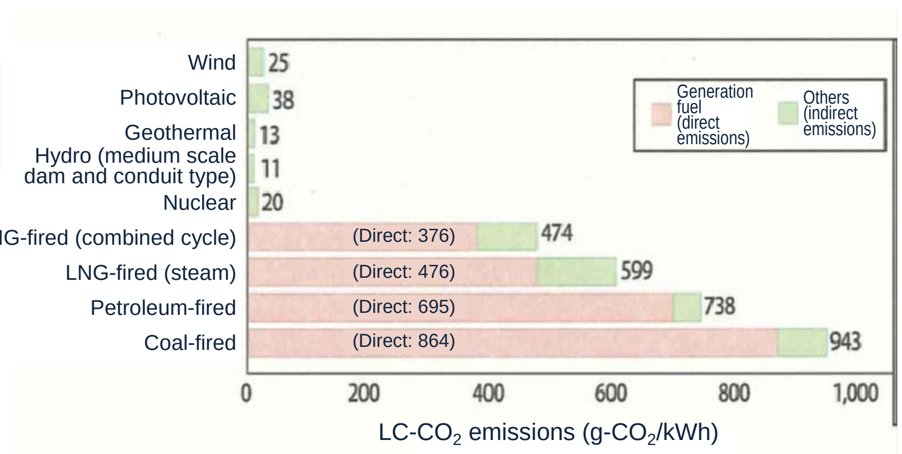
- **Even after the Great East Japan Earthquake, the importance of countermeasures against global warming remains unchanged for Japan as an economic giant.**
- **Considering the trajectory of GHG emissions, the basic plan (30% reduction from the 1990 level by 2030) is compatible with the long-term target (80% reduction from the 1990 level by 2050).**
- **Nuclear power and renewable energy greatly help mitigate global warming.**

Long-term trajectory of GHG emissions (conceptual)



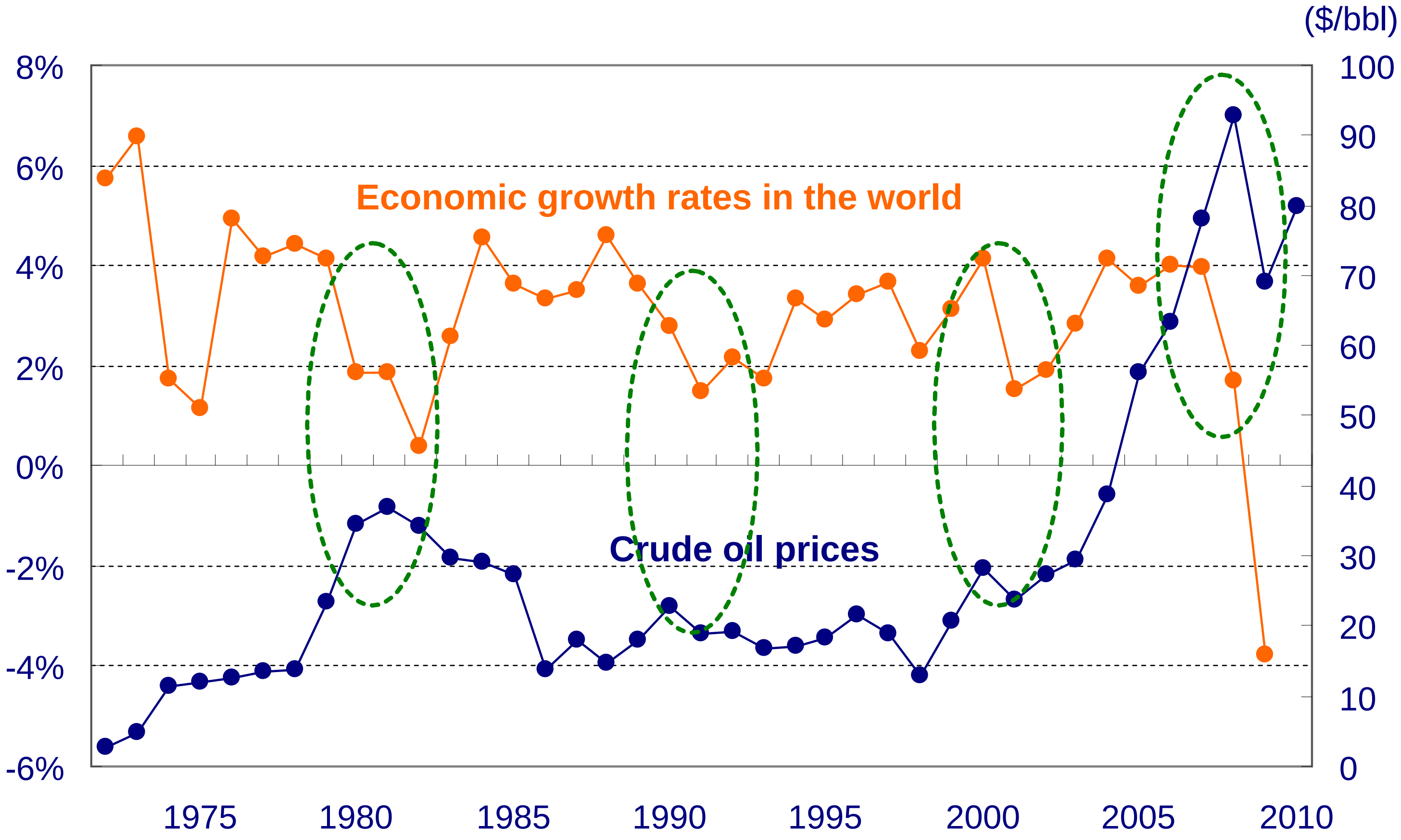
Sources: IEEJ “Overview of Energy and Economic Statistics” (etc.)

Assessment from the perspective of global warming mitigation



1. The Best Energy Mix from Comprehensive Viewpoints
3) M (impacts on the macro economy)

● **Energy shortages, rising energy costs and unstable supply negatively affect the macro economy (affecting GDP growth and the sustainability of employment, for example).**



Sources: IEEJ "Overview of Energy and Economic Statistics" (etc.)

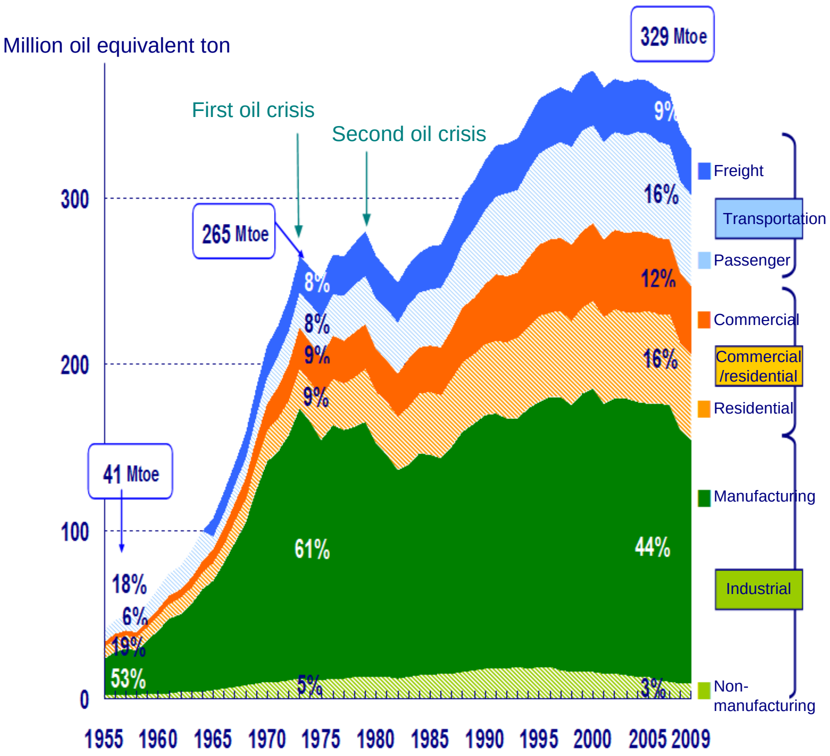
2. Overall, There Is No Perfect Energy Option
1) Energy Conservation

● **Even though energy conservation should be strengthened, the potential for further progress is limited:**

a. Excessive demands on companies will reduce their competitiveness and force manufacturers to relocate production overseas.

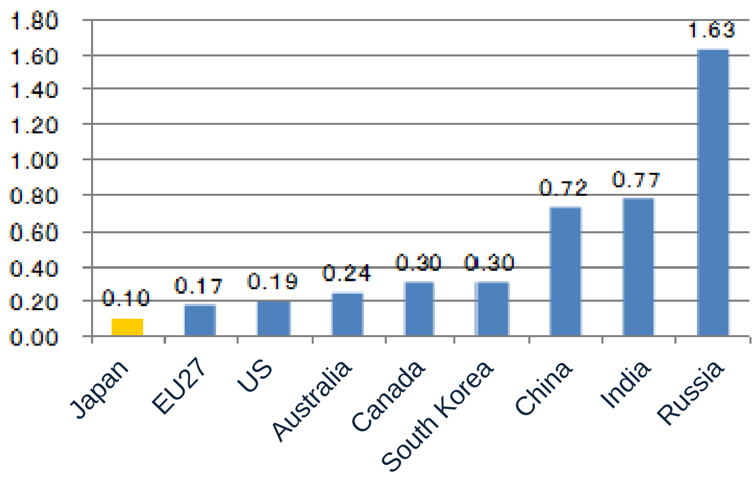
b. The commercial and residential sectors have room for further energy conservation, but the potential is limited.

Final energy consumption by sector



Sources: IEEJ "Overview of Energy and Economic Statistics" (etc.)

Energy supply per GDP (2009)



Source: IEA

2. Overall, There Is No Perfect Energy Option
1) Energy conservation

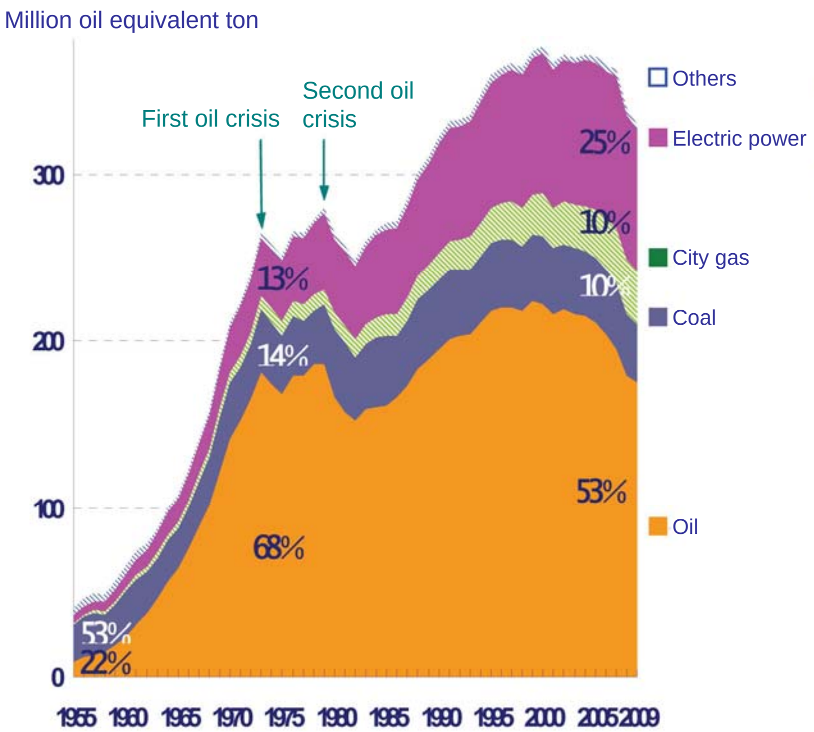
● **There is also a limit to the conservation of electric power, the demand for which is rising:**

a. The demand for electric power continues to grow because of its outstanding utility.

b. The demand for electricity will not decrease unless power is conserved more rapidly than the rate of economic growth.

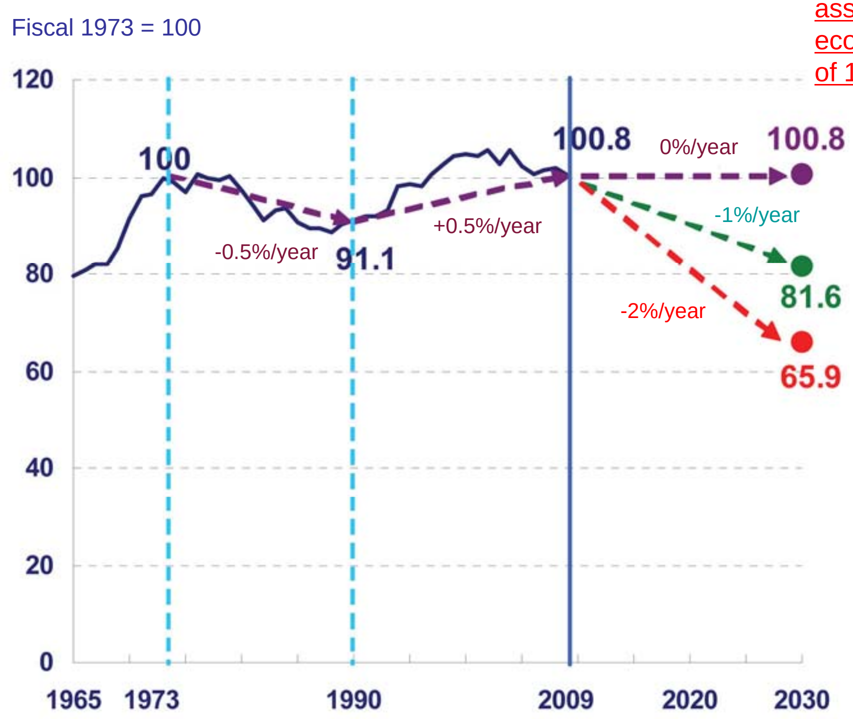
Note: "Visualization" by smart meters and tariff-based demand control are important.

Final energy consumption
(breakdown by fuel type)



Sources: IEEJ "Overview of Energy and Economic Statistics" (etc.)

Electricity demand per GDP



Anticipated increase or decrease of electricity demand from now to 2030 assuming the mean economic growth rate of 1%:

+23%

0%

-19%

2. Overall, There Is No Perfect Energy Option
2) Renewable energy

- **Even though renewable energy is environmentally compatible with combating global warming, it has problems concerning cost, stability and siting restrictions:**

a. Photovoltaic systems are handicapped by a low capacity factor. To achieve extensive deployment of photovoltaic systems, costs must be reduced and vast areas secured for installation in the suburbs.

b. Wind turbines are also handicapped by a low capacity factor. Despite being cheaper than photovoltaic systems, they require even larger areas. Offshore installation requires no land space but is costly and requires the adjustment of fishery rights.

c. Geothermal systems are very stable but in Japan, geothermal resources are located mostly in national parks where siting restrictions are severe.

		Capacity factor (%)	Generated power (0.1 billion kWh)	Requirement for the replacement of a million KW by nuclear power	
				Installed capacity (10,000kW)	Land space
Photovoltaic	Million kW	12	10.5	667	Equivalent to the area inside the Yamanote rail loop line in Tokyo
Wind (land)	Million kW	20	17.5	400	3.5 times as large as the area inside the Yamanote line
Wind (offshore)	Million kW	30	26.3	267	
Mini hydro	Million kW	80	70.1	100	
Geothermal	Million kW	70	61.3	114	
Nuclear	Million kW	80	70.1	100	

In meeting the actual demand . . .

A 10% saving of electric power is equivalent to:
- Installed capacity of 14.25 million kW of nuclear power
- Installed capacity of 95 million kW of photovoltaic systems

Source: IEEJ

(Reference) Other Renewable-based Generation Technologies

◎ Mini hydro

- Precipitations and waterways are examples of unexplored opportunities for mini hydro generation.
- The scale and cost vary greatly depending on the siting.
- Typically, a mini hydro system costs about 1.6 million yen per kilowatt. In terms of investment per kilowatt, it is more expensive than larger generation systems.
- The gross installed capacity of mini hydro systems at the generation cost of up to 12 yen/kW may potentially rise to 1.32 million kilowatt; the gross installation capacity of mini hydro systems at the generation cost of up to 20 yen/kW may potentially rise to 6.15 million kilowatt.

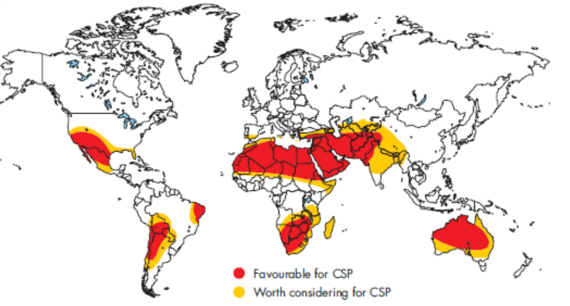
Mini hydro power station in Kamimashiki-gun, Kumamoto Prefecture

Source: New Energy Foundation

◎ Solar heat (Concentrated Solar Power or CSP)

- Steam produced by using heat from concentrated solar radiation drives a turbine to generate power.
- There are only a limited number of sites in the worlds that can accommodate such CSP plants. Nevertheless, CSP plants are already in commercial operation in countries like the United States and Spain.
- There is a plan to build large CSP plants in North Africa for the delivery of power to Europe.
- Siting conditions are severe because CSP plants can make use only of direct solar radiation.

Optimal locations for the siting of CSP plants



Source: IEA "Energy Technology Perspectives 2008"

◎ Biomass

- A power plant may run on biomass only (mono combustion) or mix several percents of biomass into the conventional fuel such as coal (mixed combustion).
- Biomass generation may help stimulate the local economy but it should be noted that the cost and supply quantity of biomass fuel depends largely on the type of biomass and the manner in which it is used.
- The total supply quantity of biomass fuel may potentially increase to be equivalent of 14 million kL of petroleum. Even when assuming that all of that quantity is used for power generation, the quantity of power generated from biomass will not be more than 30 billion kWh (3% of the gross electricity demand of today).

Biomass-fuelled power plant in Noshiro City, Akita Prefecture

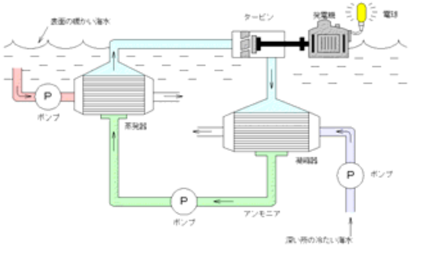
Source: Sony homepage

◎ Oceanic energy, etc.

- Researches are conducted for using tidal movement, tidal energy, ocean current, seawater temperature gradient, salt concentration gradient, etc., as the source of power.
These technologies are at an earlier stage of development when compared with other generation technologies.

Conceptual diagram of tidal power generation

Principle of generating power by temperature differences in ocean



Sources: Chubu Electric Power and Saga University

2. Overall, There Is No Perfect Energy Option
3) Fossil fuels (coal, oil and natural gas)

● **All fossil fuels emit CO_2, although with varying intensity.** (See Slide 10.)

a. Coal has the maximum intensity of CO_2 emissions but has the attraction of low, stable prices.

b. Oil excels in utility but has problems in price and supply stability.

c. Natural gas is attractive because of its relative excellence in supply stability and cleanliness, but natural gas prices are exceptionally high in Asian markets.

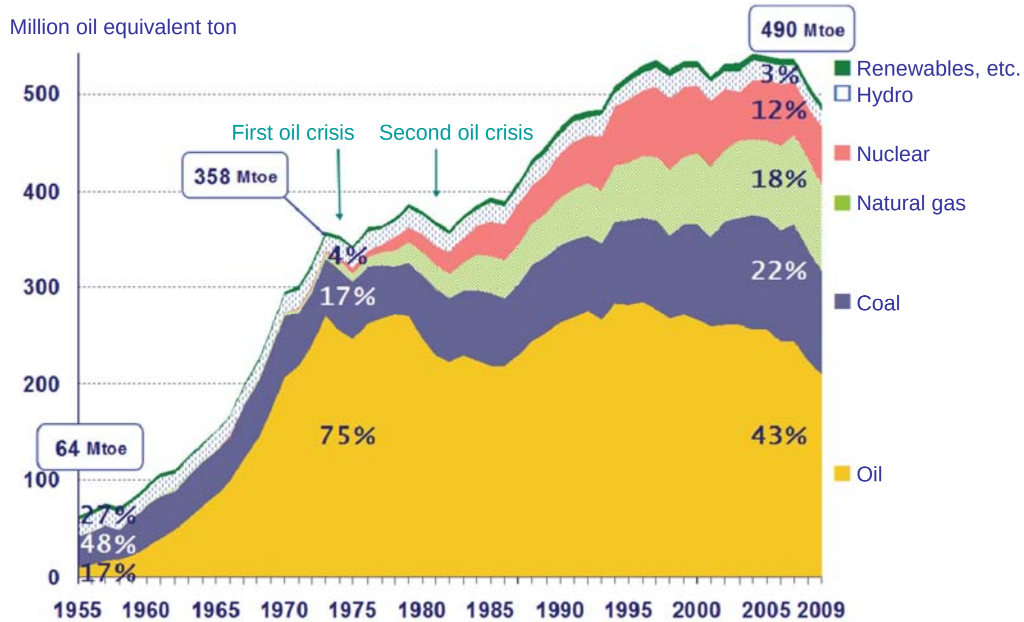
● Accelerated development of CCS and other related technologies is required.

Note: In Japan, there are no appropriate sites.

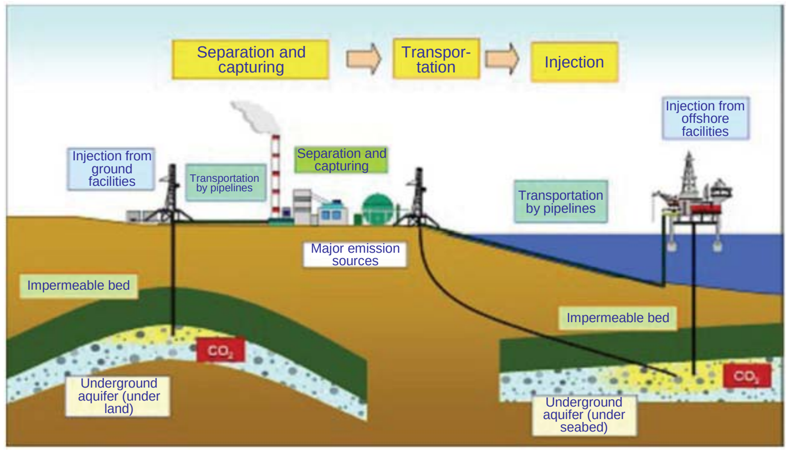
The cost of CCS is presently estimated to be 80-100 dollars/t-CO_2.

The actual cost may be higher for Japan due to transportation by ship to a storage site.

Primary energy domestic supply



Conceptual illustration of CCS



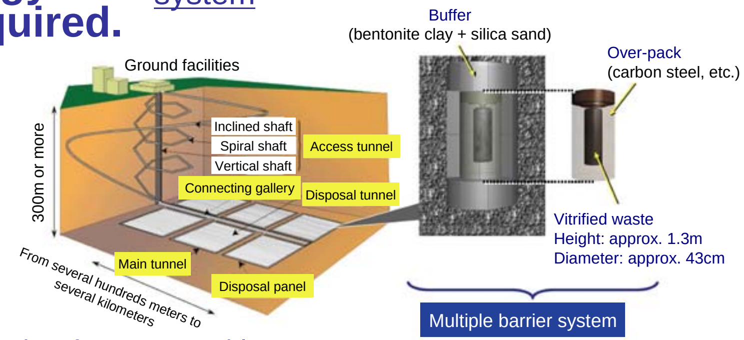
Source: "CCS2020: Present Status and Initiatives toward the Practical Application of Carbon Sequestration, Capturing and Underground Storage Technology" published by the Industrial Science and Technology Policy and Environment Bureau of METI on May 17, 2006

2. Overall, There Is No Perfect Energy Option
4) Nuclear power

- **Nuclear power has advantages in terms of energy security and environmental compatibility. It is also cost effective assuming that further increases in cost are limited to about 2 yen per kilowatt. (See Slide 9.)**
- **Uranium fuel excels in supply stability and ease of stockpiling. (Reprocessing allows efficient use of resources.)**
- **Japan has established waste disposal technology even though public acceptance remains to be acquired.**

Note: As to radioactive waste disposal programs overseas, Forsmark in Sweden and Olkiluodon in Finland have been selected as geological disposal sites.

Concept of geological disposal system

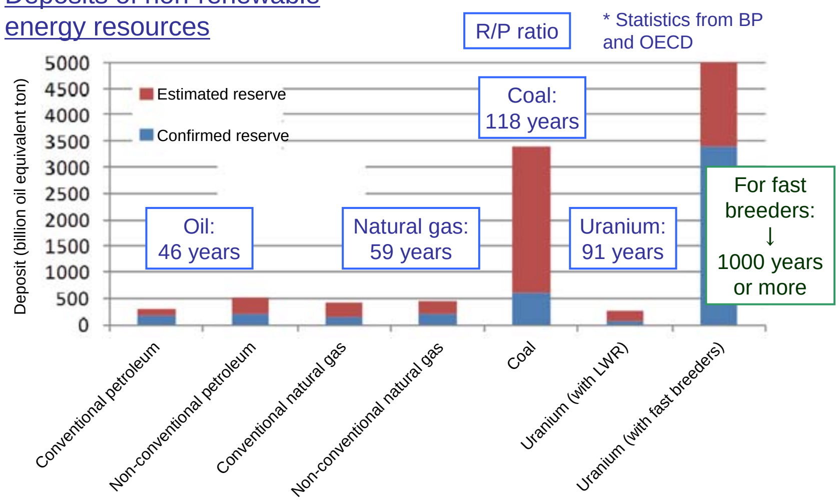


Supply stability and ease of stockpiling of uranium fuel

Supply stability of nuclear fuel:
- Uranium is available from countries that are relatively politically stable.
- They include countries such as Australia, Canada and Kazakhstan.
- Normally, uranium is procured under long-term contracts (usually 10 years).
- It takes about two years from procurement of uranium to loading of fuel into reactors.
- Uranium fuel assemblies usually remain loaded in reactors for four to five years.

Even if supply is disrupted, nuclear power plants can continue to operate for six to seven years.

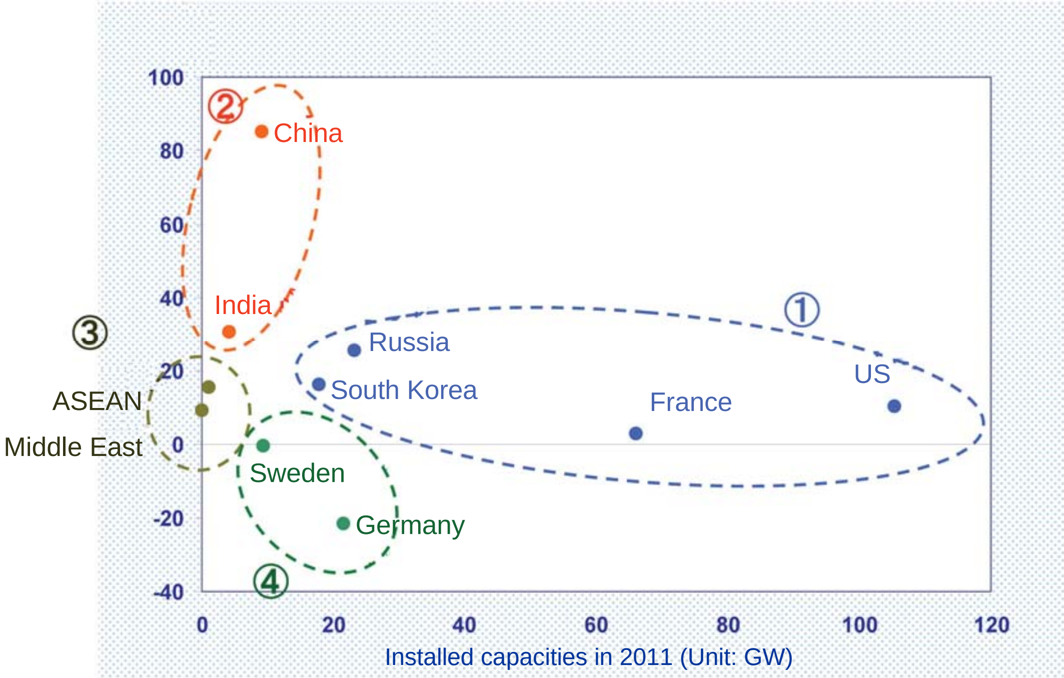
Deposits of non-renewable energy resources



Data from: Dr. Hans Holger Rogner

(Reference) Post-March 11 nuclear power policies of each nation

● **Most developed countries, with a few exceptions, have not greatly modified their policy to promote nuclear power, although they are strengthening safety measures.**



1) Countries that had been promoting nuclear power: These have been actively developing nuclear power domestically as well as overseas to improve the energy self-sufficiency ratio or for the strategic development of industries. Even though the number of new nuclear power plants that they need to build within their territories differs from country to country, their policy of strategically supporting the nuclear industry continues.

2) Countries expecting extended use of nuclear power: These need to greatly increase the number of nuclear power plants to cope with growing energy demands.

3) Countries planning to introduce nuclear power: In these countries, the energy situation in the past did not require nuclear power but they now plan to develop nuclear power to meet growing energy needs and conserve fossil fuel resources, for example.

4) Countries that are inclined to discontinue nuclear power: These already have nuclear power as a part of the energy-mix portfolio and do not need to expand nuclear power generation for now. However, the Blair government in the UK adhered to a policy of promoting nuclear power.

Sources:
Installed capacities in 2011: "Trend of Nuclear Power Development in the World" (2011) from the Japan Atomic Industrial Forum, Inc.
Estimates on installed capacities added by 2035: "Asian and Global Energy Outlook 2011" from IEEJ (Oct. 2011)

2. Overall, There Is No Perfect Energy Option
5) Desirability of well-balanced combination

● **Each energy option has its advantages and disadvantages. A well-balanced energy mix must be planned while considering factors such as reexamining the costs of nuclear power generation.**

		Energy security	Economic efficiency	Environmental compatibility	Stability	Social issues
		Fuel self-sufficiency ratio	Generation cost (yen/kWh)	CO_2 emissions by generation (gCO_2/kWh)	Capacity factor	
Fossil-fired	Oil	0.4 %	10.0 – 17.3	679	30 – 80 %	-
	Coal	0 %	7.8	815	70 – 80 %	-
	LNG	4 %	9.3	423	60 – 80 %	-
Nuclear power		0 – 100 %	4.4	0	70 %	Radiological risks
Natural energy	Hydro	100 %	13.5	0	45 %	Environmental impacts
	Photovoltaic	100 %	37 – 46	0	12 %	Right of sunshine, etc.
	Wind	100 %	11 – 26	0	20 %	Low frequency noises, etc.
	Geothermal	100 %	12 - 24	0	70 %	Siting restrictions in national parks, etc.

（Sources）OECD : "Projected Costs of Generating Electricity 2010 Edition" (2010)
再生可能エネルギーの全量買取に関するプロジェクトチーム：第4回会合資料,
コスト等検討小委員会(2004)など

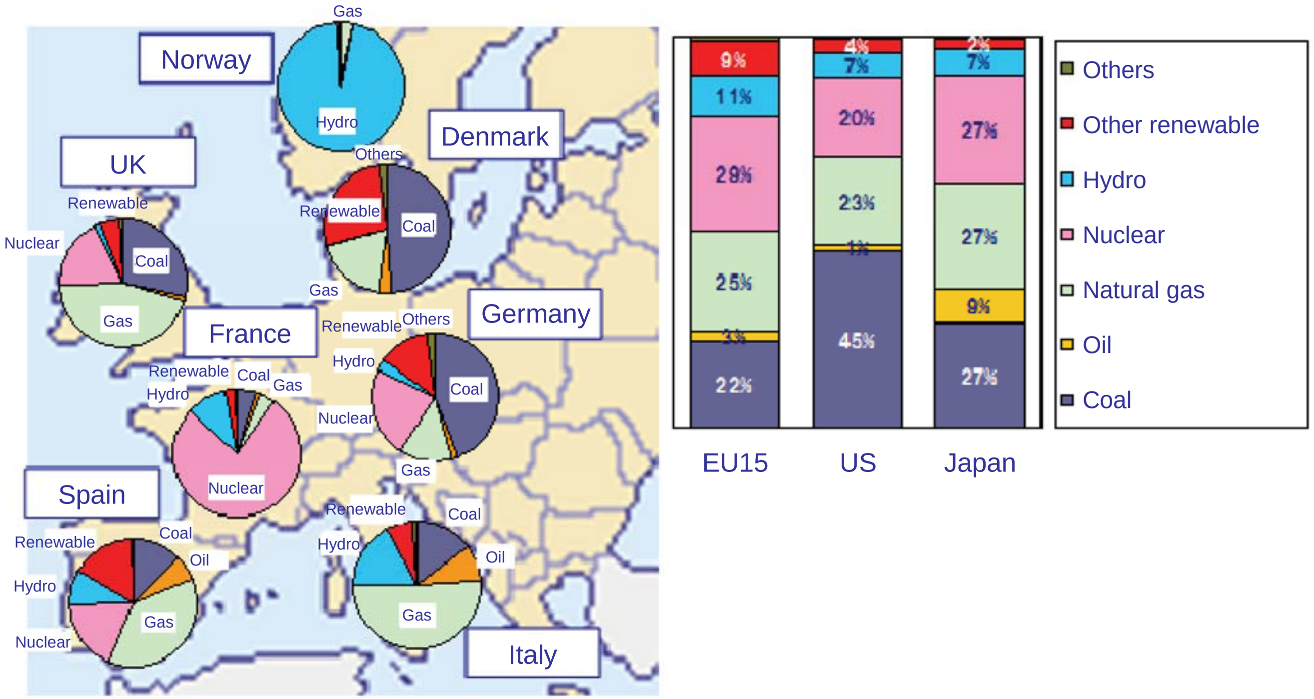
2. Overall, There Is No Perfect Energy Option
5) Desirability of well-balanced combination

● **Since there is no perfect energy option, it is desirable to combine the following four options:**

1) More manageable energy conservation
2) Cheaper renewable energy
3) Cleaner use of fossil fuels
4) Safer nuclear power

● **As a whole, the EU countries also seek a combination of renewable energy, fossil fuels, nuclear power and energy conservation, with energy conservation defined as an independent item.**

Generation mix comparison among Japan, US and Europe (2009)



Source: IEA

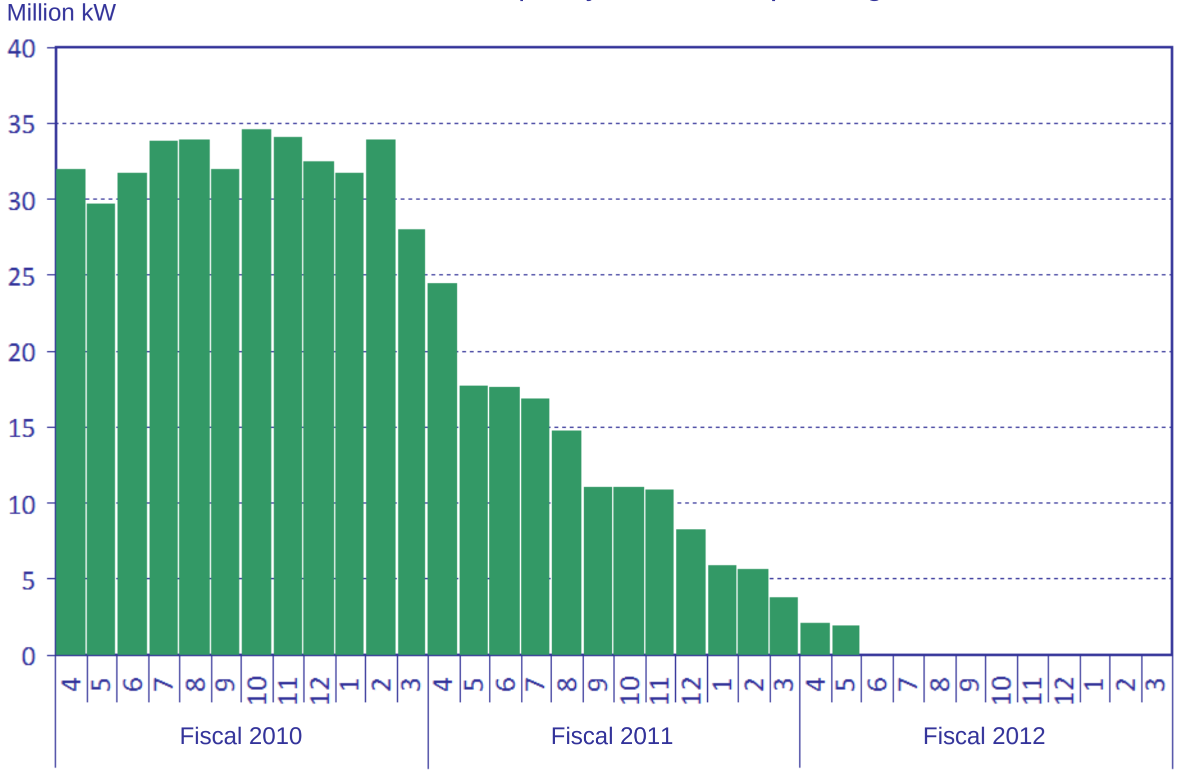
3. Short- to Mid-Term Challenges to Achieving the Best Energy Mix
1) Outlook for the operation of nuclear power plants in Japan

- **According to the worst-case scenario assuming a major delay in restarting nuclear power plants after scheduled outages:**

Power generation capability will be insufficient to cope with the peak demand in the summer of 2012, seriously affecting industrial activity, etc.

- **It is necessary to restart nuclear power plants that have been proven to be safe.**

Available installed capacity for nuclear power generation



3. Short- to Mid-Term Challenges to Achieving the Best Energy Mix
2) Possible consequences: power shortages, higher fuel costs and increased CO_2 emissions

- To replace nuclear power, utilities have maximized the use of oil and natural gas fired power generation.
- With the surging dependency on LNG-fired power generation, LNG spot market prices have risen rapidly by about 80% since the Great East Japan Earthquake.
- There is an urgent need to restart nuclear power plants after confirming their safety.

Impacts of prolonged delays in restarting nuclear power plants that have been, or will soon be, shut down for scheduled outage (calculated by IEEJ):

(1) There will be a very serious supply-demand situation in the summer of 2012, possibly affecting employment

- The gross generation capacity, the total of all utilities in Japan, will be about 7.8% lower than the peak demand. Assuming that a reserve capacity of at least 5% is essential, Japan as a whole needs to reduce electricity consumption by as much as 12.4%.

(2) Significant increase in fuel costs, accelerating the relocation of factories to overseas

* If the shortage of nuclear power is to be compensated by an increase in the operation of fossil-fired power plants, the fuel cost, inclusive of coal, LNG and oil, is expected to increase by 3.5 trillion yen from 2010. Assuming that this leads directly to higher tariffs, the electricity rate will increase by 3.7 yen per kWh. The monthly electricity bill for an average household will rise by 1,049 yen (18%). The electricity rate for industrial customers will rise by 36%.

(3) Due to the significant increase in energy-derived CO_2 emissions, Japan will fail to achieve its promised target.

Due to the increased consumption of fossil fuels, the total quantity of CO_2 emissions in 2012 is expected to reach 1.26 billion tons, 18% greater than the 1990 level.

Notes:
(1) The consequences will be less if power conservation measures are implemented.
(2) According to estimations by the Energy and Environment Council:
(a) In the summer of 2012, the power supply will fall by 4.1% - 9.2%.
(b) The financial losses from the prolonged shutdown of nuclear power plants will be about 3 trillion yen.
Source: IEEJ

3. Short- to Mid-Term Challenges to Achieving the Best Energy Mix
3) Impacts on the Macro Economy

● If all nuclear power plants in Japan are shut down without any plan to restart, this will seriously damage the macro economy.

Effects of power shortage on the macro economy

Assuming no nuclear plants restart (originally, GDP growth of 2.8% was assumed in the reference case scenario):

		Effects only during summer (July - September 2012)	Overall effects in fiscal 2012	
			Assuming improvement from autumn	Assuming continued effects
Effects on economy	Real gross GDP	-5.6 %	-1.6 %	-3.6 %
	Real gross GDP (trillion yen)	(-7.7)	(-9.1)	(-20.2)
	Manufacturing industry (IIP)	-8.2 %	-2.2%	-4.8 %
	Service industry (ITA)	-5.9 %	-1.6 %	-2.2 %
	Unemployment (10,000 persons)	+4.9	+9.8	+19.7

Note: The impacts will be less if power conservation measures can be implemented without adversely affecting economic activities.

Source: IEEJ

4. Mid- to Long-Term Challenges to Achieving the Best Energy Mix

1) Quantitative and objective evaluation of multiple scenarios (on the basis of generated power)

- Determining the best energy mix is like solving simultaneous equations with multiple variables.
- It is necessary to define **four or five scenarios** and evaluate them quantitatively and objectively from comprehensive viewpoints, including at least the cost, environmental compatibility and energy security, **to identify the best feasible solution**.

	Nuclear power	Renewable energy	Energy conservation + Cogeneration (See note)	Zero emission power sources
Basic Plan	50%	20%	0%※	70%
Scenario 1	30%	25%	15%	70%
Scenario 2	25%	30%	15%	70%
Scenario 3	15%	30%	15%	60%
Scenario 4	0%	40%	15%	55%

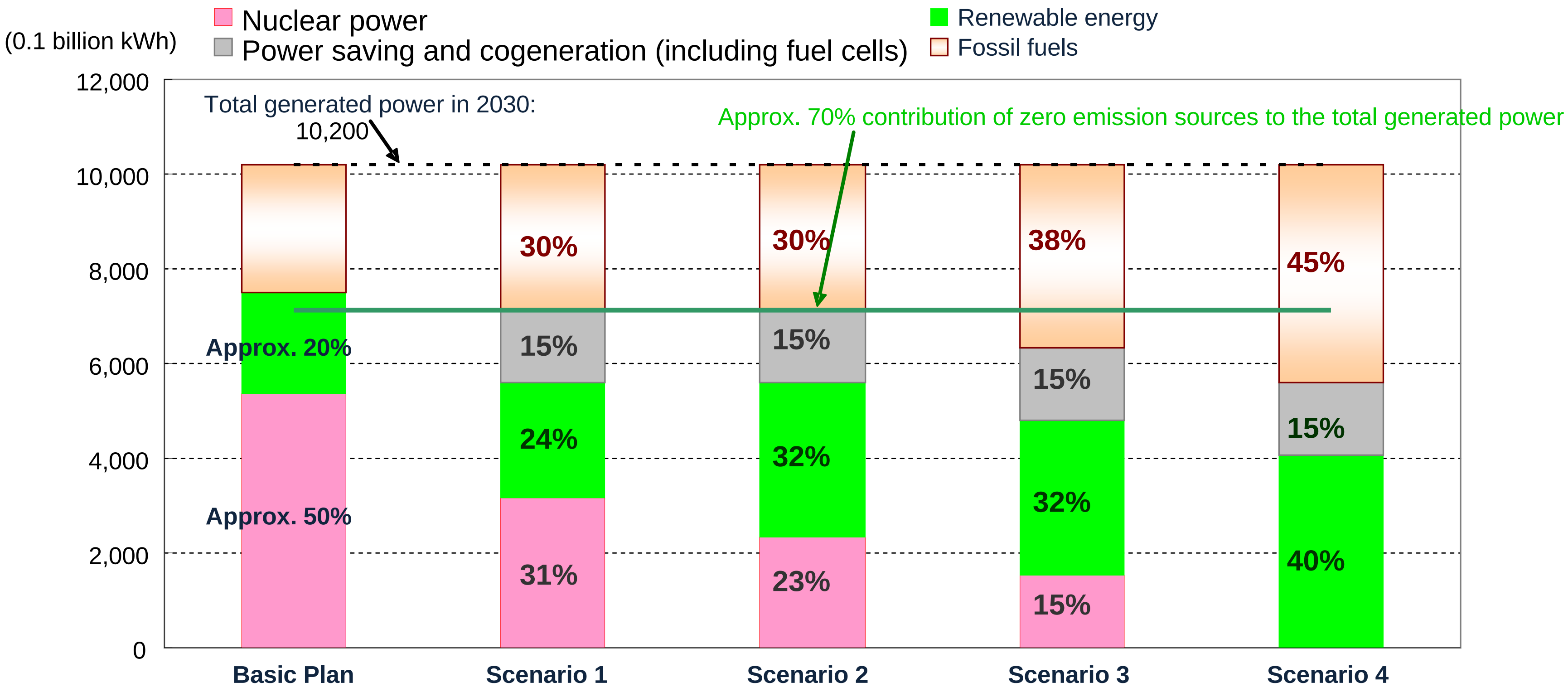
Note: Strictly, the contribution of *energy conservation and cogeneration* should be subtracted from the gross quantity of generated power (denominator) instead of being included in the calculation of the numerator (percentage of zero-emission power sources). However, the latter method is chosen here to simplify comparison with the Basic Plan.

* The growth of electricity demand due to (1) economic growth and (2) electrification may be surprised by about 30% by the improvement of energy efficiency (according to materials distributed at the 2nd Energy and Environment Council).

4. Mid- to Long-Term Challenges to Achieving the Best Energy Mix
1) Quantitative and objective evaluation of multiple scenarios (on the basis of generated power)

- **With Scenario 1 or 2, approx. 70% of power generation can be procured by zero-emission power sources by 2030, but this cannot be achieved with Scenario 3 or 4.**

Breakdown of generated power in 2030



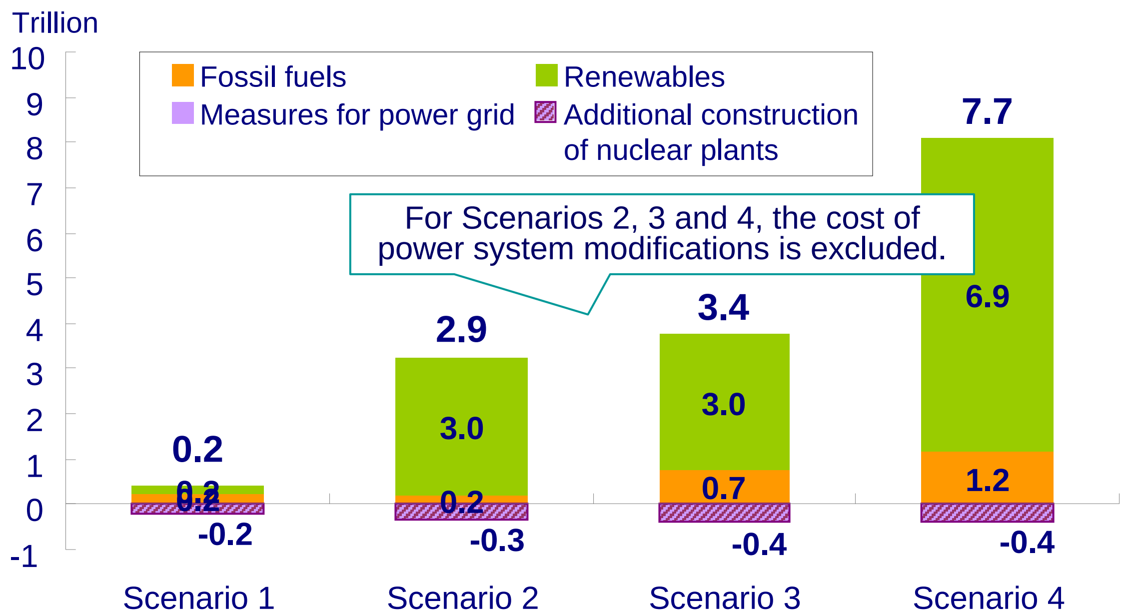
* If the share of cogeneration is 5% and the overall efficiency (including power generation and heat) is about twice that of normal thermal power, CO2 emissions equivalent to 2.5% (50%) will be produced. By combining 12.5% by power saving and 2.5% by CO2 reduction through cogeneration, a figure of 15% is yield.
Note: Strictly, the contribution of power saving and cogeneration should be subtracted from the quantity of gross generated power (denominator) instead of being included in the calculation of the numerator (percentage of zero-emission power sources). However, the latter method is chosen here to simplify comparison with the Basic Plan.

4. Mid- to Long-Term Challenges to Achieving the Best Energy Mix

3) Estimation of cost increase and CO_2 emissions for each scenario (comparison with the Basic Plan toward 2030)

● **Scenarios 3 and 4 appear unrealistic in terms of cost and the environment.**
Scenario 1 appears excellent in terms of cost and the environment but the siting of nuclear power plants will be more difficult due to the Fukushima accident.

Estimated increase of cost (comparison with the Basic Plan toward 2030)



		Scenario 1	Scenario 2	Scenario 3	Scenario 4	
Economic efficiency	Increment of power cost	0.2	2.8	3.3	7.6	Yen/kWh
	*1 Increment of power charge of standard household	(65 yen) 1%	(852 yen) 13%	(997 yen) 15%	(2269 yen) 35%	Yen/Month, %
	*1 Power charge increase rate of industrial use	2%	28%	33%	74%	
Environment	*2 CO_2 emission compared with 1990	-28%	-28%	-23%	-20%	
Energy security	Self-sufficiency rate of power sources	70%	70%	62%	55%	

*1: It is assumed that the increase in generation cost is fully met by the increase of retail prices.
*2: Expanded use of cogeneration systems is factored in when estimating the quantity of CO_2 emissions.
- Fuel prices in 2030 (estimations based on CIF-based import prices in 2009): 110$/b for oil, 110$/t for coal and 845$/t for LNG. (See the Asia and World Energy Outlook 2010 from the IEEJ.)
The reference cost for the construction of nuclear power plants is 400,000 yen/kW. We factored in decreases in cost that will result from avoiding the construction of new nuclear power plants.
Regarding renewable energy, the purchasing price for photovoltaic power is assumed to fall gradually from 42 yen to 24 yen per kWh while the purchasing price for other renewable-based power is assumed to be 30 yen/kWh. As to the amount of grant-in-aid, it is assumed to be from zero to 48,000 yen per kilowatt for photovoltaic systems and 30% of the construction cost for geothermal and small-to-mid.size hydro systems.

4. Mid- to Long-Term Challenges to Achieving the Best Energy Mix
4) Evaluation of the four scenarios concerning the generation mix (on the basis of generated power) (tentative)

- Assuming that S (safety) is assured, it is important that the four scenarios are evaluated objectively and quantitatively in terms of cost, environmental compatibility and energy safety.
- In the near future, when the cost of nuclear power generation is recalculated, detailed quantitative evaluations should be implemented while including the cost for the interconnection of distributed power sources to commercial grids.

	Cost	CO_2	Energy security (self-sufficiency ratio)	Feasibility
Scenario 1	○	○	○	△△
Scenario 2	△	○	○	△
Scenario 3	△ △	△	△	△ △ △
Scenario 4	△ △ △	△ △	△ △	△ △ △ △

Thank you for your attention.

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