To Know More about Energy (Main Energy-Related Websites)

Energy-related websites are introduced below to deepen knowledge or understanding on energy.

●Agency for Natural Resources and Energy　http://www.enecho.meti.go.jp/

Research and information

● The Institute of Energy Economics, Japan	http://www.ieej.or.jp/
● The Institute of Applied Energy	http://www.iae.or.jp/

Energy conservation

● The Energy Conservation Center, Japan	http://www.eccj.or.jp/

Nuclear power and nuclear fuel cycle

● Nuclear and Industrial Safety Agency (Safety assurance in the nuclear power)	http://www.nisa.meti.go.jp/english/index.htm
● Japan Atomic Energy Commission	http://www.aec.go.jp/
● Nuclear Safety Commission of Japan	http://www.nsc.go.jp/
● Ensuring Safety of Nuclear Energy and Radiation Uses (Within the website of the Ministry of Education, Culture, Sports, Science and Technology)	http://www.mext.go.jp/english/nuclearsafety/index.htm
● Japan Nuclear Energy Safety Organization	http://www.jnes.go.jp/
● Nuclear Waste Management Organization of Japan (NUMO)	http://www.numo.or.jp/

New energies, hydro power and geothermal power

● New Energy and Industrial Technology Development Organization (NEDO)	http://www.nedo.go.jp/
● New Energy Foundation	http://www.nef.or.jp/

Natural resources and fuel

● Japan Oil, Gas and Metals National Corporation	http://www.jogmec.go.jp/
● Petroleum Association of Japan	http://www.paj.gr.jp/
● Japan Coal Energy Center (JCOAL)	http://www.jcoal.or.jp/

Electricity and gas

● The Federation of Electric Power Companies of Japan	http://www.fepc.or.jp/
● The Japan Gas Association	http://www.gas.or.jp/

If you have any questions regarding this brochure, please contact the division posted in the right column.

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1-3-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8931
Tel.03-3501-1511(switchboard) http://www.enecho.meti.go.jp/

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Energy in Japan

2010

Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry

Energy in Japan 2010

contents

1 The Energy Situation in Japan

Energy Supporting Our Life and Society

Our life and economic activities are based on the consumption of energy resources, and we use various energies such as electricity, gas and gasoline in

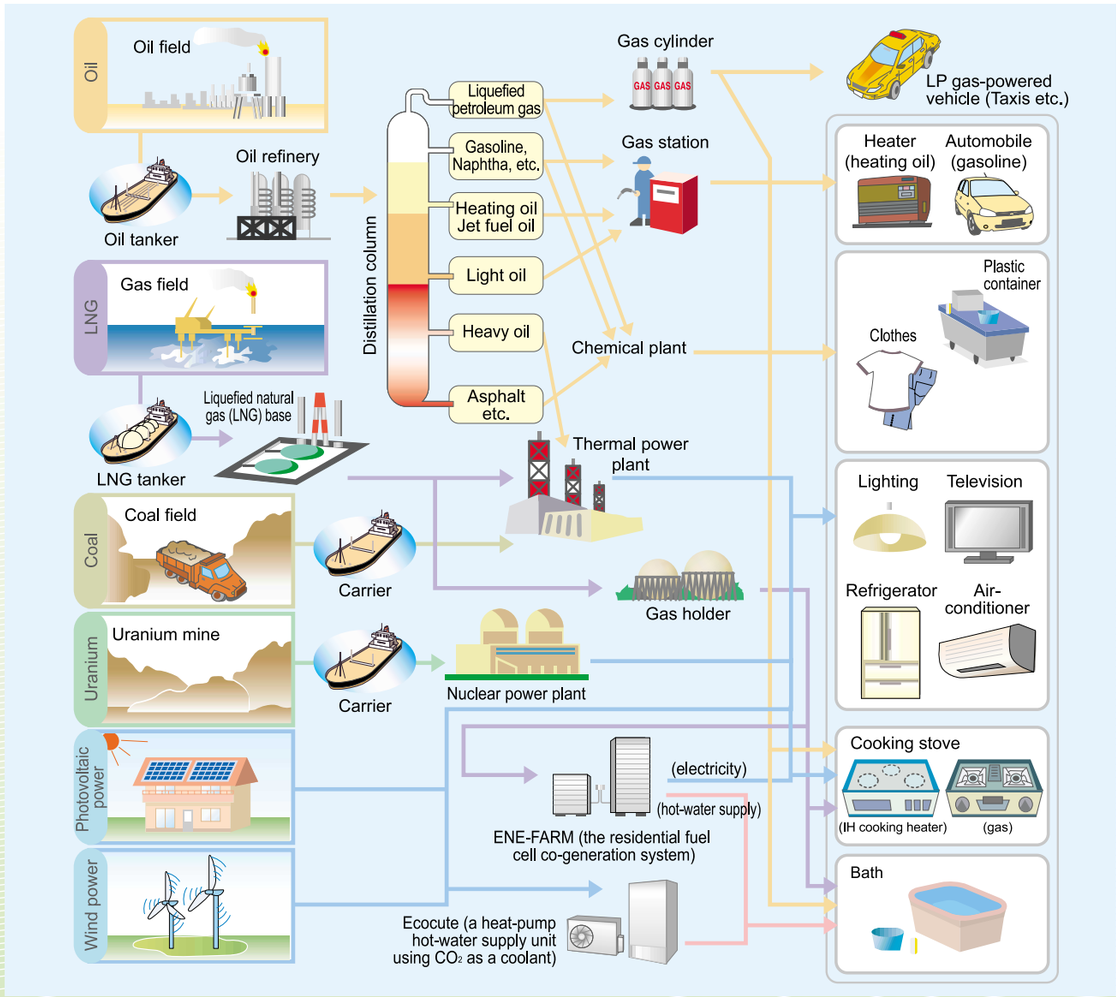
Energy Necessary for Our Life

Our society and life are currently supported by a large quantity of energy resources. Energy is used for traffic, transportation, communication and everything else that provides the basis of modern society, not to mention electricity, gas and water services, which are essential in daily life.

In the areas that cannot be seen from daily life, energy is used for everything around us including water resources, food and industrial products, in the process of production or disposal.

Energy supporting our life

■ **Process of energy supply and form of use (Figure 1)**



Primary Energy and Secondary Energy

The resources that are used for generating energy comprise fossil resources such as crude oil, natural gas, and coal, as well as uranium used as fuel for nuclear power generation. About 96% of the energy resources supplied in Japan are imported from overseas. These energy resources are called primary energy. Primary energy is converted into secondary energy including gasoline, heating oil, electricity and city gas, which are easy for people to use, by oil and electricity and gas business operators, to be delivered to consumers for use (Figure 1, Table 1).

Oil Accounts for Half of the Primary Energy Supply

Oil accounts for about 47% of the primary energy supplied to Japan. Although this percentage has been declining from 77% in the peak year of 1973, the share is still the largest of all energy resources (Figure 2). In some areas, mainly in the transport sector, the degree of dependence on oil is almost 100%. In addition, since the use of oil has penetrated to a wide range of uses in comparison with other energy resources (Figure 3).

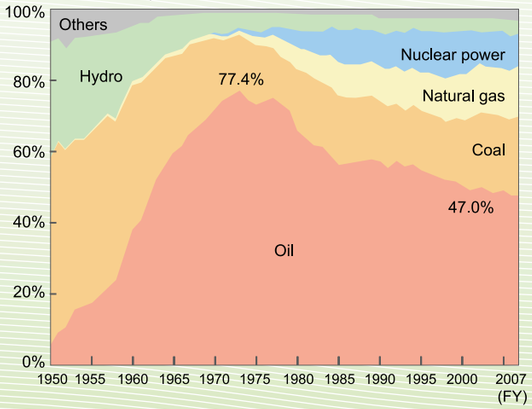
Energy is used for the production of everything

■ **Indirect energy used in the manufacture/transportation of items for daily life (Table 1)**
Source: Data from the Ministry of Education, Culture, Sports, Science and Technology

Item	Production process	Energy input (crude oil-equivalent)
Rice cultivation (1 kg of brown rice)	Cultivation → harvest → shipment	0.35 L
Suit of clothes (men's jacket) (600 g)	Material → manufacture of cloth → sewing	7 L
Automobile (1,800 cc)	Steel manifacturing → press (manufacture of each part) → processing / assembly	1,442 L
Dwelling house (one-unit home / floor area: 100m^2)	Lumber sawing → processing and assembly	8,774 L
Color television set (21-inch model)	Manufacture of the material (resin and electronic parts) → assembly → transportation	38 L
Book (300 g)	Paper manufacturing → printing → bookbinding	0.55 L

Oil still accounts for the largest share

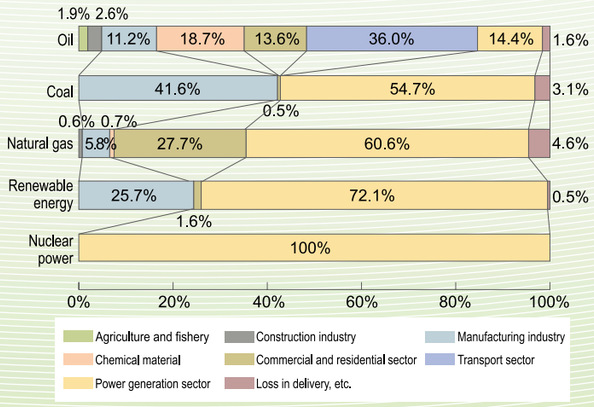
■ **Composition of the total supply of primary energy (Figure 2)**
Source: Agency for Natural Resources and Energy, "Comprehensive Energy Statistics"
The Institute of Energy Economics, Japan, "EDMC Handbook of Energy & Economic Statistics in Japan"



NB: Note that in the "Comprehensive Energy Statistics" before 1990, a different method was used to calculate statistics. Also, calendar years were used for years before 1953.

Oil used for a wide range of purposes

■ **Uses of energy resources (FY 2007) (Figure 3)**
Source: Agency for Natural Resources and Energy, "Comprehensive Energy Statistics"



Note: Fuel input for steam for industrial use is included in "manufacturing industry." In the power generation sector, the total power generated for business and private use is shown.
* Renewable energy: hydro, biomass, etc.

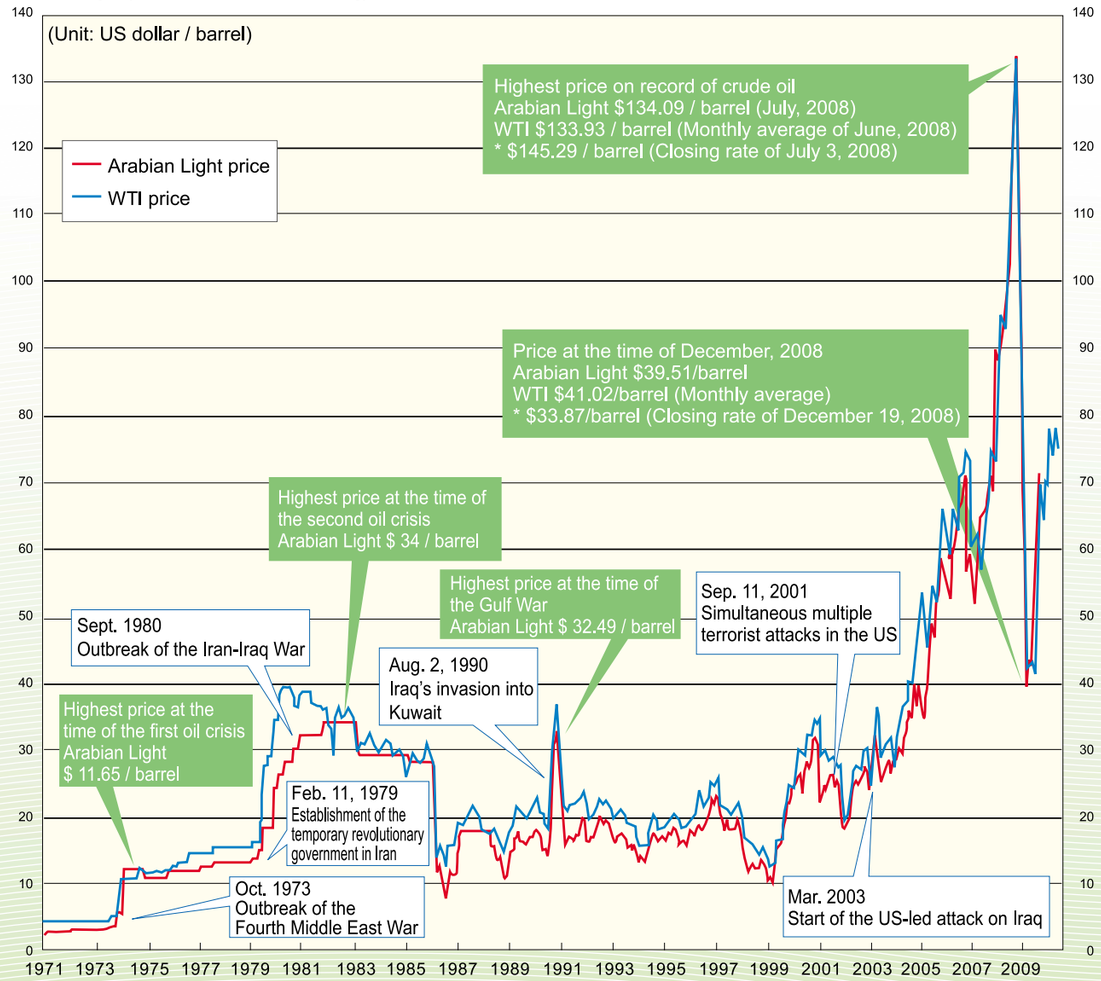
Long-term Changes in the Price of Crude Oil

The long-term changes in the price of Arabian Light, a representative type of oil imported to Japan, show that the price, which hovered around 2 – 3 US dollars in the past, soared to 12 and further to 34 dollars a barrel at the time of the first and second oil crises, in 1973 and 1979, respectively. However, under the influence of the decline in the demand caused by the price hike, the increase in production by non-OPEC countries, and other factors, the price plummeted to below 10 dollars in 1986, hovering roughly between 10 and 20 dollars thereafter.

When the world economy recovered after the Asian economic crisis in 1999, the price turned to follow a rising trend, marking an all-time high of 134.09 dollars in July 2008. Subsequently, the price, turned in a drop basic tone, of the history best to fall in 39.51 dollars and less than a one-third in December, 2008 spiked. The price changes between 80 dollars from 60 dollars from June, 2009 (Figure 4).

Crude oil price maintains high level

■ **Changes in the international price of crude oil (Figure 4)**
Source: Agency for Natural Resources and Energy



Note 1: Last official announcement of Arabian Light price was June 2009.
Note 2: WTI is short for 'West Texas Intermediate', a type of crude oil used as a benchmark in oil pricing of New York Mercantile Exchange's oil futures contracts.
Note 3: One barrel, the measurement unit of oil, is about 159 liters.

Energy Consumption in Japan (1) ~Reduction in energy intensity~

The two oil crises of the 1970s were turning points which saw Japan achieve considerable success in energy conservation. However, the continued pursuit of comfort and convenience by Japanese people in recent years has increased the nation's energy consumption.

Energy Consumption Increasing

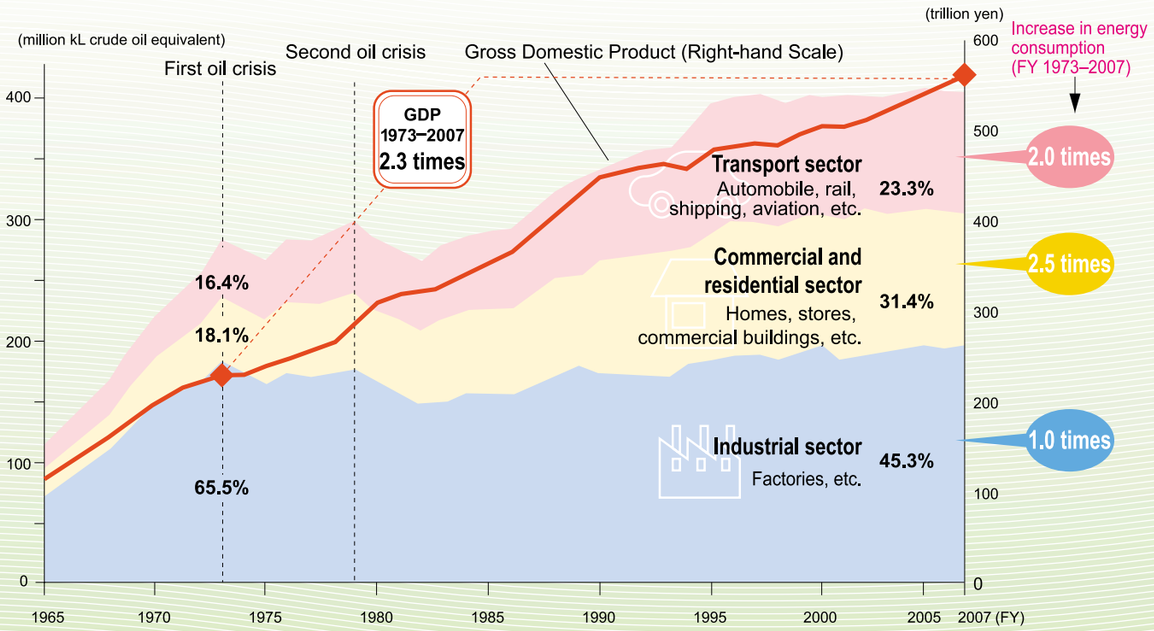
Energy consumption in Japan can be divided into three sectors, namely, the commercial and residential sector, in which we directly use energy at home or in the workplace; the transport sector, in which energy is used for transporting people and goods; and the industrial sector, in which energy is used to produce goods.

In the industrial sector, the amount of consumption has remained roughly around the same level after the oil crises. In contrast, in the commercial and residential sector as well as the transport sector, the amount has sharply increased. The relative proportions of the industrial: commercial and residential: transport sectors recently (in FY 2007) changed to 2:1.4:1 from 4:1:1 at the time of the oil crises (Figure 5).

Energy consumption in Japan has increased in the commercial/residential and transport sectors

■ **Trends in energy consumption and GDP in Japan (Figure 5)**

Source: Agency for Natural Resources and Energy, "Comprehensive Energy Statistics" ; Cabinet Office, "Annual National Accounts Bulletin" ; The Institute of Energy Economics, Japan, "EDMC Handbook of Energy & Economic Statistics in Japan"



Note 1: For GDP, the former SNA 1990 is the base year up to FY 1980, the new SNA 1995 is the base year up to FY 1980–1993, and the chaining method SNA is adopted from FY 1994 on.
Note 2: Crude oil equivalent is a figure generated by converting units of different sources (coal, natural gas, etc.) to the amount of crude oil that would produce the same amount of energy.

Simultaneous Achievement of Economic Growth and Energy Conservation

After World War II, particularly during the almost two decades between the 1950s and 1970s, Japan achieved high economic growth, and the nation's energy consumption steadily increased.

However, the two oil crises of the 1970s were severe shocks to the Japanese economy, and the nation's industries thereafter implemented thorough energy conservation measures. As a result, energy intensity (*) was reduced (Figure 6), and economic growth was attained without an accompanying increase in energy demand.

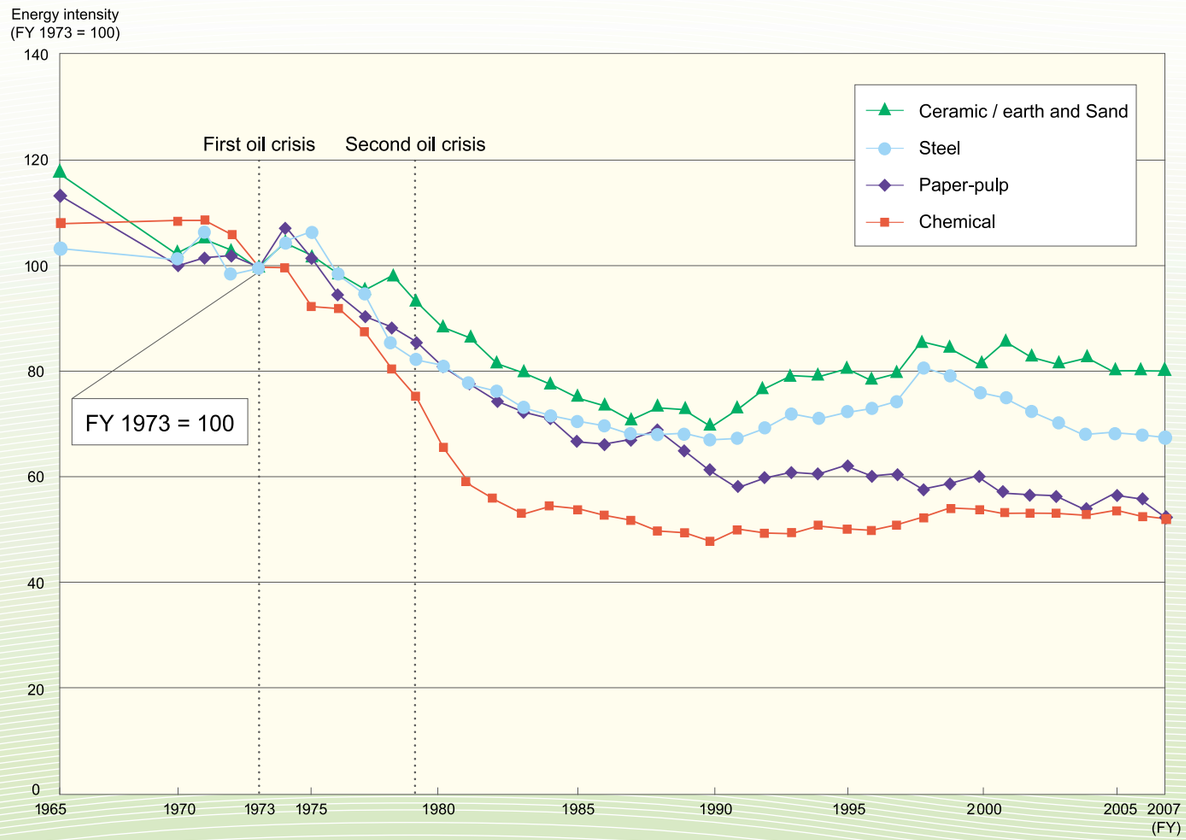
*** What is energy intensity?**

This is a value obtained by dividing the amount of energy used by the amount produced consuming the energy.
The smaller this value is, the better the production efficiency is, and so energy intensity is a means of measuring energy conservation performance.

In the industrial sector, energy consumed has been progressively saved

■ **Changes in energy consumption per unit production by the principal manufacturing industry sector (Figure 6)**

Source: Agency for Natural Resources and Energy, "Comprehensive Energy Statistics" ; Cabinet Office, "Annual National Accounts Bulletin" ; The Institute of Energy Economics, Japan, "EDMC Handbook of Energy & Economic Statistics in Japan"



Energy Consumption in Japan (2)~Characteristics of each sector~

◯Energy consumption in the commercial / residential and transport sectors

Energy consumption in the commercial / residential and transport sectors is increasing with changes in lifestyle and, in the background, the higher rate of vehicle ownership and so forth. Promoting energy saving in the commercial / residential and transport sectors is a major task for us.

Energy Consumption in the Commercial / Residential Sector

The commercial / residential sector comprises the home and commercial sectors. The home sector consumes energy more double that of the time of the first oil crisis. While after the oil crisis development of energy-saving type home electric appliances, gas apparatuses and so forth advanced, penetrating progressively to homes, energy consumption has been increasing under the influence of changes in national lifestyle in pursuit of convenience and comfort, an increase in the number of households, and changes in the social structure such as rise in the proportion of the aged and use of larger electric appliances, etc (Figure 7).

The commercial sector, comprising offices / buildings of businesses, service industry including hotels and department stores, consumes almost triple the energy it consumed at the time of the first oil crisis. Causes for the rise are the increase in the total floor area of offices, retail stores, etc., the accompanying increase in air-conditioning and lighting equipment, advances in OA, and so forth.

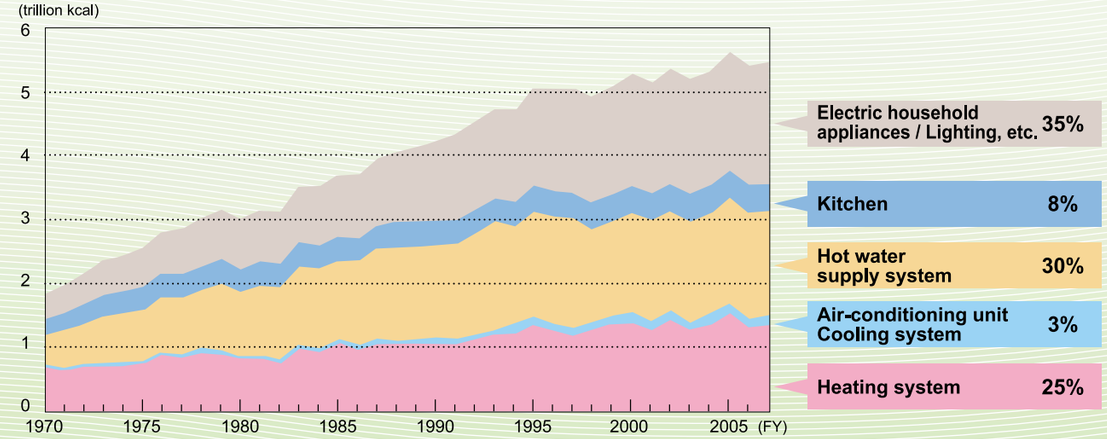
Energy Consumption in the Transport Sector

The transport sector, comprising the passenger service sector, consisting of passenger cars, busses, etc., cargo sector such as land transport, marine transport, air cargo, etc., now consumes twice the energy it did at the time of the first oil crisis. As for the main cause for the increase, the higher rate of automobile ownership can be mentioned. In the passenger service sector the share of the railway and busses is declining, while that of passenger cars is increasing. In the cargo sector the share of railway and marine transport is declining, while that of trucks is increasing. In this connection, the energy intensity of passenger cars is growing in comparison with that of other means of transport.

The demand for more comfortable lifestyles is increasing household electricity consumption

■ **Energy consumption of the home sector by usage (Figure 7)**

Source: The Institute of Energy Economics, Japan, "EDMC Handbook of Energy & Economic Statistics in Japan"



Note: Electric household appliances / Lighting etc., Washing machine, Clothing drier, Futon drier, Television, Videotape recorder, Stereo audio sets, CD player, DVD player/recorder, Vacuum cleaner, Personal computer, Shower toilets, etc.

◯Energy consumption in the industrial sector

Energy consumption in the industrial sector remains around the same level, thanks to the active efforts to address energy saving, despite economic expansion.

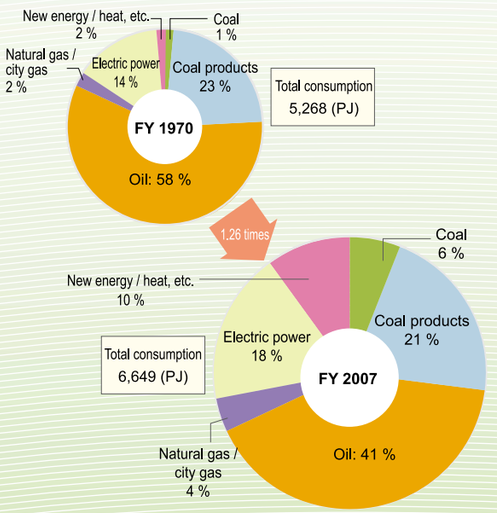
Trends in Energy Consumption in the Industrial Sector

Manufacturing industry accounts for approximately 90% of the industrial sector, consuming about 45% of the energy used as a whole. Energy consumption in manufacturing industry increased only slightly, despite the fact that its economic scale more than doubled after the first oil crisis in 1973 (refer to Figure 5). This is because energy efficiency (energy intensity) in manufacturing sector was significantly improved by the 1980s.

Dependence of the manufacturing industry on oil declining

■ **Trends in energy consumption in manufacturing industry by energy source (Figure 8)**

Source: Agency for Natural Resources and Energy, "Comprehensive Energy Statistics"



Note 1: In the Comprehensive Energy Statistics, the calculation method has been changed for the values of FY 1990 and onward.
Note 2: Oil denotes the total of crude oil and petroleum products.

Energy Consumption in the Manufacturing Sector by Energy Source

While oil consumption accounted for approximately 60% of the source of energy used in manufacturing in 1970, the oil crises were turning points which saw Japan advance its diversification, resulting in a decline to around 40% in 2007 (Figure 8).

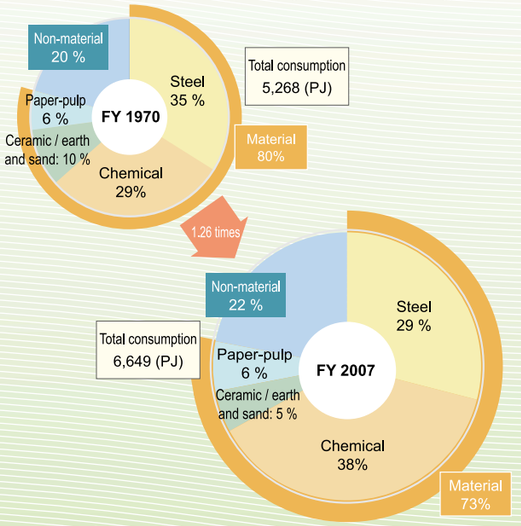
Energy Consumption in the Manufacturing Industry by Category of Business

Although four sectors of the manufacturing industry, namely steel, chemical, ceramic-earth and sand (including cement) and paper-pulp continue to account for 70% of the energy consumption of the manufacturing industry as a whole, their share is slightly declining due partly to energy saving in these industries (Figure 9).

Four categories of business accounting for 70% of energy consumption

■ **Trends in energy consumption in the manufacturing sector by category of business (Figure 9)**

Source: Agency for Natural Resources and Energy, "Comprehensive Energy Statistics"



Note 1: In the Comprehensive Energy Statistics, the calculation method has been changed for the values of FY 1990 and onward.
Note 2: Energy consumption in the chemical industry includes raw materials for manufacturing petrochemical products such as naphtha.

Energy Supply in Japan (1) ~Diversification of the Energy Supply Structure~

Before the oil crises, oil supplied approximately 80% of Japan's energy needs. After the oil crises, the degree of dependence on oil for its energy has been reduced below 50%. However, the degree of dependence on the fossil fuel is more than 80% sequentially, and renewable energy and the introduction expansion of the nuclear power are demanded.

Decline in Oil Dependence and Diversification of Energy Sources

Japan's high economic growth was fueled by oil which came to be supplied in large quantities at low costs, taking the place of coal as the main supply. In FY 1973 oil supplied 77% of the nation's energy requirements.

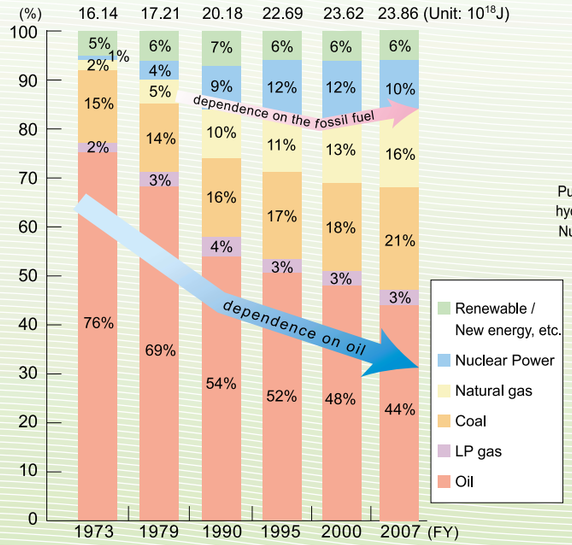
When the first oil crises occurred in 1973, crude oil prices soared and supply was threatened with interruptions. To promote energy conservation and to stabilize its energy supply, Japan endeavored to reduce its dependence on oil through the introduction of nuclear power and natural gas, etc. After that time, crude oil prices once again increased dramatically after the second oil crisis in 1979, accelerating the process of introducing nuclear power and the development and introduction of new energy.

The current degree of dependence on oil is 47% (included LP Gas), but considerably decreases when it compare it with 77% at the time of the first oil crisis. However, the degree of dependence on natural gas (16%) and coal (21%) has also been higher, and that on fossil fuels as a whole is maintaining a very high level of dependence at 84%. Therefore, it is necessary to aim at the diversification of the energy supply structure such as further increase in introduction of non-fossil energies (renewable energies including solar energy, nuclear power) and effective use of fossil fuels (Figures 10 and 11).

Use of nuclear power and natural gas increasing

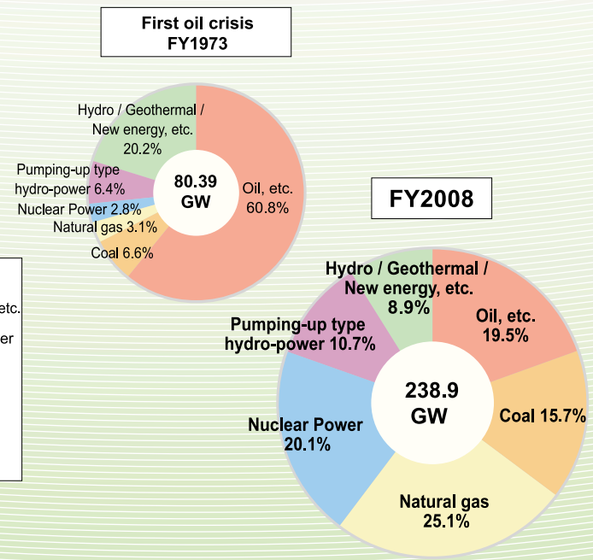
■ **Trends in Japan's primary energy supply (Figure 10)**

Source: Agency for Natural Resources and Energy, "Comprehensive Energy Statistics"



Note: In the "Comprehensive Energy Statistics," the calculation method has been changed for the values of FY 1990 and onward.

■ **Trends of electrical generation facilities' capacity by type of fuel (for general electricity business) (generating end) [total amounts of 10 electric power companies] (Figure 11)**



For the purpose of reviewing the direction of the energy policy in consideration of such situation, the development / introduction of non-fossil energy, replacing the energy alternative to oil, has been promoted through the revision of the "Law for the Promotion of Development and Introduction of the Energy Alternative to Oil", and, at the same time, the "Law for the Promotion of the Use of Non-Fossil Energy Sources and Effective Use of Raw Materials for Fossil Energy by Business Operators of Energy Supply" was established, which obligates the business operators of energy supply use non-fossil energies and effective use fossil fuels (Refer to "For More Sophisticated Methods of Energy Supply Structures" on Page 45).

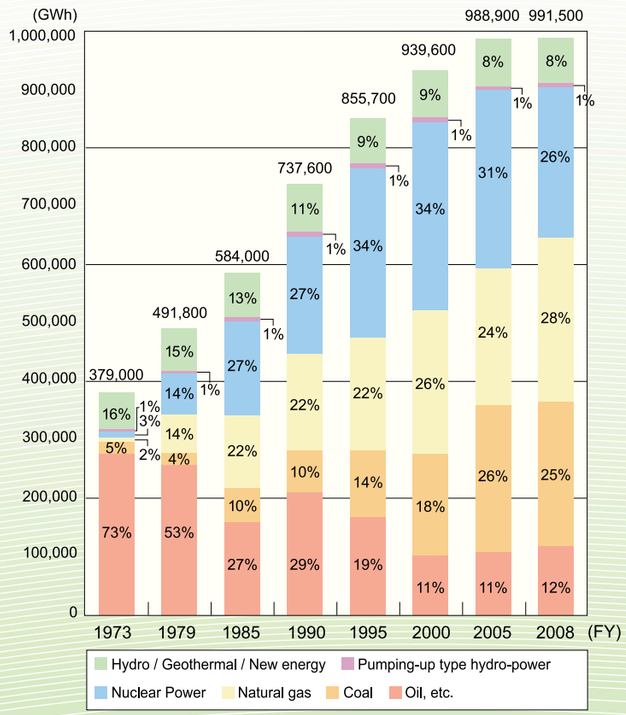
Degrees of Dependence on Oil and Fossil Fuel are 12% and 65% in the Power Generation Sector

Nearly half of the primary energy sources such as oil and coal are converted into the secondary energy source of electricity. The ratio of electricity to the total primary energy supply (electrification ratio) grew from 27.8% in FY1970 to 42.7% in FY 2006.

The transition from the use of oil to nuclear power, coal and natural gas in the generation of electricity has made significant progress, and in FY 2008 these were the major power sources, with nuclear power supplying 26%, coal 25% and natural gas 28% of the nation's electricity (Figure 12 and 13).

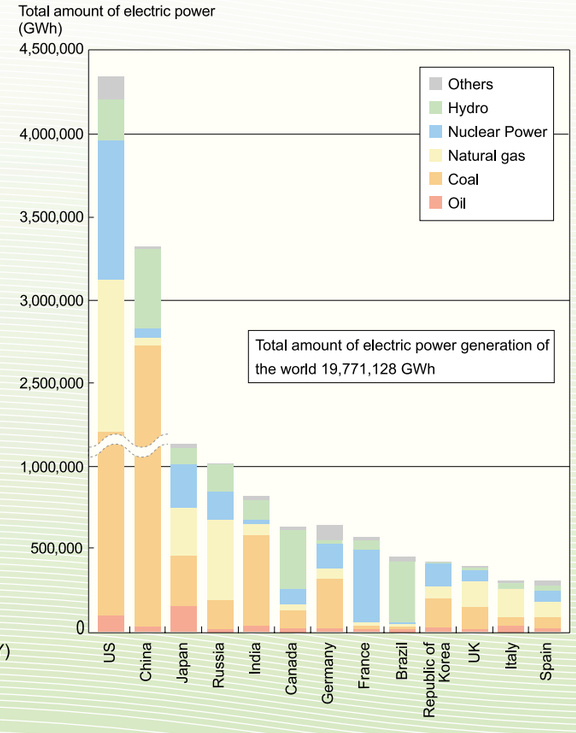
In the power generation sector nuclear power, coal and natural gas are major power sources

■ **Trends in electric power amount generated (for general electricity business) (Figure 12)**



■ **Component of electric power amount generated by type of fuel of major countries (2007) (Figure 13)**

Source: IEA/Energy Balances of OECD/NON-OECD Countries



Energy Supply in Japan (2) ~Low self-sufficiency ratio~

Low Self-sufficiency Ratio in Energy in Japan

Among the necessary primary energy for life or economic activity, the ratio of the amount that can be secured in the home country is called the energy self-sufficiency ratio. Our country, in 1960 for instance, attained an energy self-sufficiency ratio of about 60% by using domestic natural resource energies such as domestically produced coal and hydroelectric power. However, the energy self-sufficiency ratio has decreased largely because a large amount of cheap oil was subsequently supplied under the circumstances of high economic growth, which led to the conversion of fuel sources from coal to oil, the import of a large amount of oil, the shift of the production of coal to import and so forth.

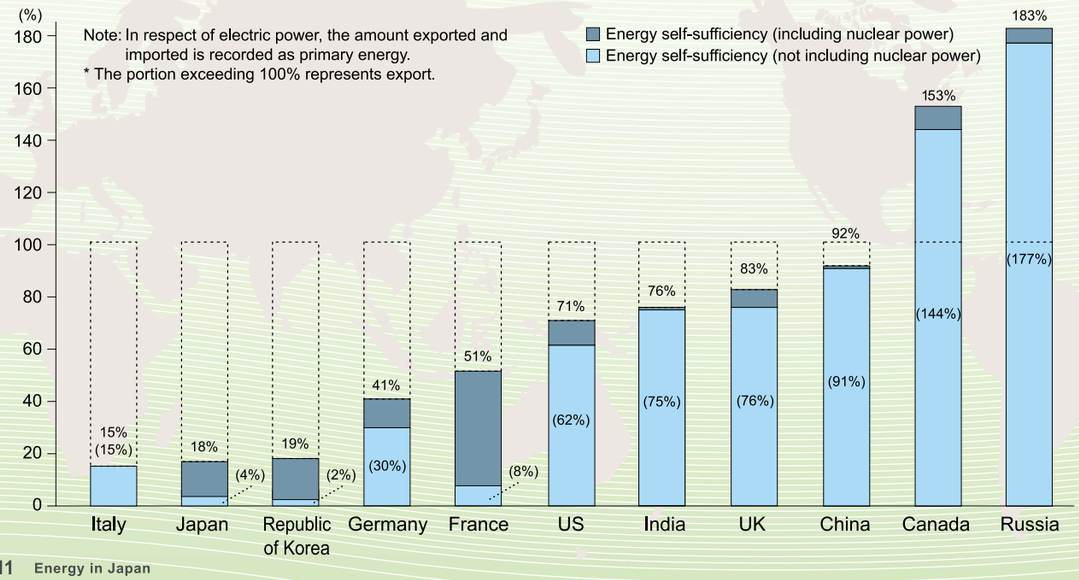
Furthermore, in regard to the natural gas and uranium used in nuclear power generation, introduced after the oil crisis, almost the entire amount was imported from overseas. Therefore, our energy self-sufficiency ratio including hydroelectric power in 2007 was as low as 4% (Figure 14). It is greatly lower than the food self-sufficiency (calorie base) ratio of Japan at 40% that is said to be low, and this also represents a low level as compared with other countries.

In this connection, nuclear power may be regarded as energy that is quasi-domestic, since uranium can be utilized for a long term after it is imported. Based on this way of thinking, our energy self-sufficiency ratio in 2007 was approximately 18%.

Japan's energy self-sufficiency is low in comparison with other countries

■ **Energy self-sufficiency ratio of major countries (2007) (Figure 14)**

Source: IEA / Energy Balances of OECD / NON-OECD Countries 2006-2007 (2009 Edition)



Three-dimensional physical exploration ship, ("Resources")

"Shigen" was introduced in 2008 as a public ship for the purpose of flexibly and efficiently gathering data on oil and natural gas reserves in the sea area around Japan.

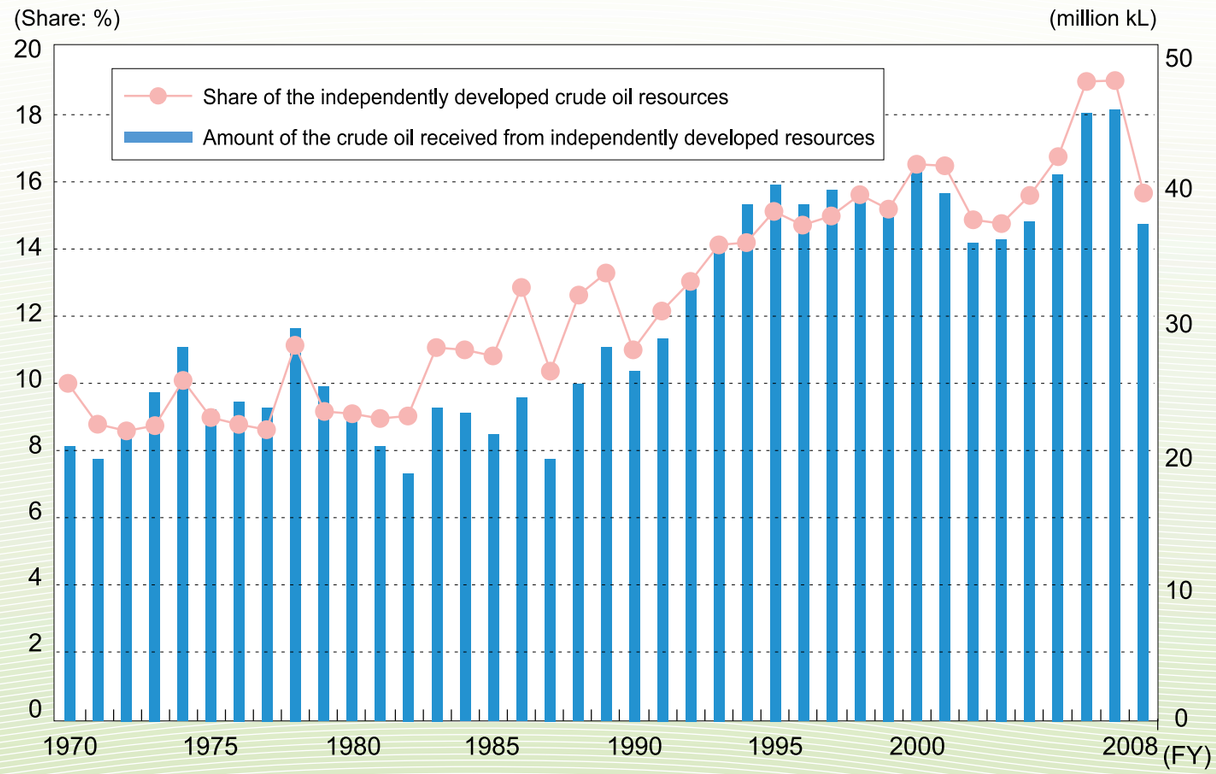
Low Ratio of Crude Oil Resources Independently Developed by Japan

Japan has progressively made efforts to secure independently developed crude oil resources for which Japan owns the right to explore or develop oil fields, and so forth. As a result, the ratio of crude oil resources independently developed by Japan improved gradually from about 8% in FY 1973 to about 16% in FY 2008 (Figure 15), but is still far behind other countries.

Independent development of crude oil resources lagging behind

■ **Trends in the ratio of independently developed crude oil resources and the amount received (Figure 15)**

Source: Document of Japan Petroleum Development Association



The numerical value after 2000 is a ratio for the crude oil import gross weight of the crude oil volume of business in our the country company rights and interests, not a ratio for the crude oil total volume of import of the voluntary development crude oil volume of import.

Global Energy Consumption and Supply

From now on, while the global demand for energy increases, it is possible that Japan could be severely affected by the changes in the global energy situation. As the international energy market is facing structural changes in terms of both supply and demand, a long-term approach is necessary to tackle energy and related issues from various viewpoints.

Shanghai, China growing to be the central city in East Asia.

Limited Natural Resources

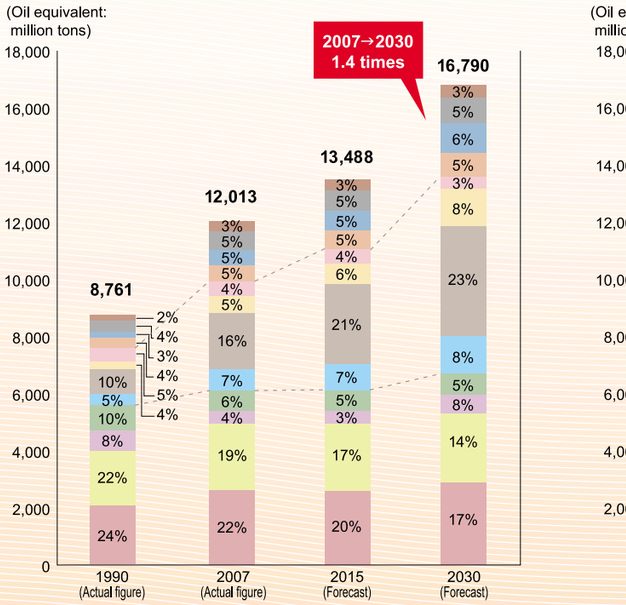
Global energy consumption in 2030 is anticipated to rise to 1.4 times its present level, while it is said that about half of the increase will be caused by Asia. It is expected that the demand for fossil fuels such as oil, coal and natural gas will continue to increase along with economic growth in developing countries such as China and India (Figures 16 and 17).

On the other hand, with respect to the amount of the energy available for supply (years over which exploitable reserves can continue to be available) in the world, the expected period is 122 years for coal, but, at the same time, 42 and 60 years for oil and natural gas respectively, based on the present rate of consumption. Although there is of course the possibility that new oil fields and mines will be discovered in the future, it cannot be denied that they are limited natural resources (Figure 18).

Energy demand increasing sharply mainly in Asia

■ **Anticipated global energy demand by region (Figure 16)**

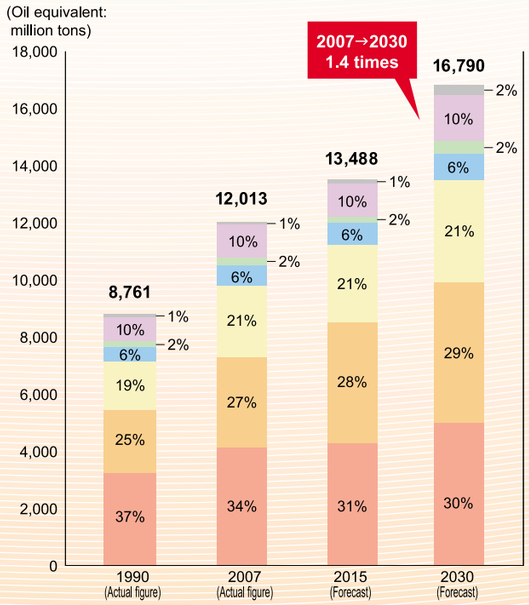
Source: IEA/World Energy Outlook 2009



Demand for Fossil fuel increasing

■ **Anticipated global energy demand by type of fuel (Figure 17)**

Source: IEA/World Energy Outlook 2009



* Marine and aviation bunkers use it for the international transportation. Consumption by ships and airplane engaged in domestic navigation is excluded.

Fragile Structure of Supply and Demand

With respect to oil, in particular, for which demand will continue to be the largest in the future, concerns about securing supplies are evident because of factors such as the stagnation of the development investment in oil-producing countries in the period of falling prices following the second oil crisis. In addition, oil reserves are disproportionately located in the Middle East where the political situation is unstable. If oil demand increases as anticipated and the world continues to depend on imports from the Middle East, the global entire energy situation will be increasingly affected by the political conditions prevailing in the Middle East (Figure 19).

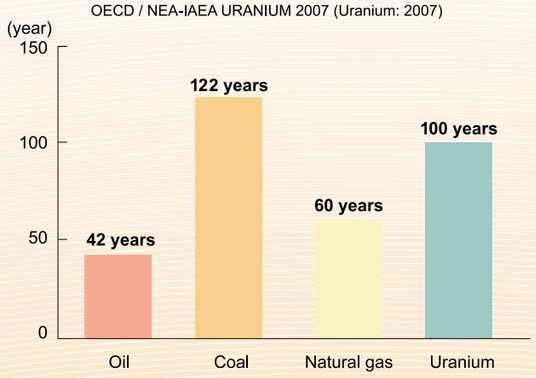
In addition, should the supply of oil or natural gas be less than the demand, energy prices, could jump and, at the same time, it could become increasingly difficult to secure the necessary resources. In particular, Japan, poor in domestic resources and dependant mostly on overseas fossil fuels including oil, may be affected seriously by future changes in the global energy situation.

It is anticipated that the problem of the structural changes in the international energy market such as the rapid increase in energy demand mainly in Asia cannot be solved in the short term. Therefore, we must take various measures from the global and long-term perspective in order to seek a stable energy supply for Japan.

Fossil fuels are limited resources

■ **Remaining exploitable global energy resources in terms of years (Figure 18)**

Source: BP Statistics 2009 (Oil, natural gas, coal: 2008)
OECD / NEA-IAEA URANIUM 2007 (Uranium: 2007)

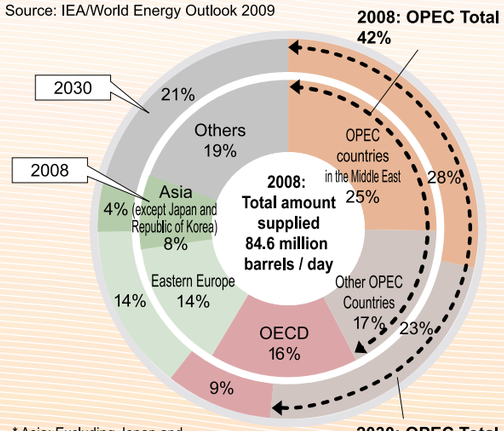


$$\text{Exploitable years} = \frac{\text{Confirmed exploitable reserve}}{\text{Annual production}}$$

Demand for Fossil fuel increasing

■ **Anticipated global oil supply by region (Figure 19)**

Source: IEA/World Energy Outlook 2009



* Asia: Excluding Japan and Republic of Korea, China, India, etc.

Total amount to be supplied in 2030: 105.2 million barrels / day

Issue of Global Warming and Energy

The reduction of the environmental burden accompanying energy use has become an increasingly important task. Since, among other things, the amount of greenhouse gas emission amount including CO_2, has increased in recent years, and, at the same time, the issue of global warming has become seriously aggravated, viewing energy issues from the perspective of reduction of greenhouse gas emissions / global warming prevention has emerged as an extremely important element in considering what the policies concerning energy supply and demand should be.

Formulation of the Kyoto Protocol and Efforts for its Accomplishment

In recent years, greenhouse gas emissions are increasing, accompanying the economic development and the rise in energy consumption. Problems surrounding the mankind such as water and food shortage, natural disasters and the rampancy of diseases due to the deterioration of global environment have come to be more serious, leading to the further concern for the adverse influence growing at an accelerated rate due to the global warming. Therefore, the Kyoto Protocol based on the United Nations Framework Convention on Climate Change was adopted in 1997, coming into force in February, 2005 in order to hold down greenhouse gas emissions with the cooperation of every country in the world. In this Kyoto Protocol legally binding numerical targets for the greenhouse gas emissions in developed countries are determined, and it is stipulated that Japan has to reduce the overall greenhouse gas emissions by 6% on average from FY 2008 to FY 2012, compared with the FY 1990 level.

Aiming at fulfilling this obligation for reduction, efforts are being made, based on the "Kyoto Protocol Target Achievement Plan" (formulated in April, 2005 and utterly revised in March, 2008). The target of this plan is to keep the amount of the carbon dioxide emissions accompanying energy consumption that accounts for about 90 % of greenhouse gas emissions to 1,076 – 1,089 million tons in FY 2010 (Table 2).

■ **Targets of amount for holding down / absorbing greenhouse gas emissions (Table 2)**

Category		Approximate targets for the emission amount in FY 2010 (Note)	
		(Million tons of CO_2)	Compared with the total emission amount in the base year
CO_2 originating from energy		1,076 – 1,089	+1.3 – +2.3%
	Industry sector	424 – 428	-4.6 – -4.3%
	Business and other sector	208 – 210	+3.4 – +3.6%
	Household sector	138 – 141	+0.9 – +1.1%
	Transport sector	240 – 243	+1.8 – +2.0%
	Energy conversion sector	66	-0.1%
CO_2, CH_4 and N_2O originating from non-energy		132	-1.5%
3 gases including hydro chlorofluorocarbon		31	-1.6%
Greenhouse gas emission amount		1,239 – 1,252	-1.8% – -0.8%

Note: Approximate targets are established for two cases where the measure accomplishes the largest / smallest effect envisaged. Naturally, the case where the measure accomplishes the largest effect is aimed at, though the approximate targets are set so as to accomplish the targets of the Kyoto Protocol even in the case of the smallest effect.

Japan's Energy Conservation Technology and Contribution to the World

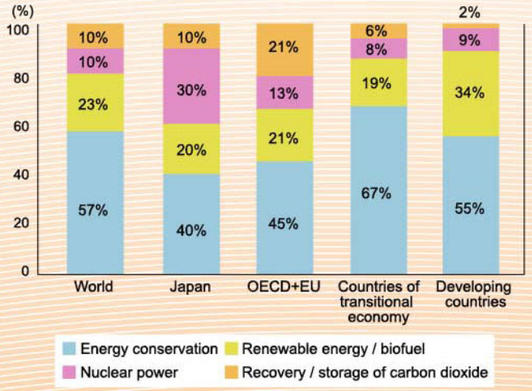
The combustion of fossil-energy fuels / resources such as oil or coal accounts for the major part of greenhouse gas emissions. Therefore, in order to reduce the greenhouse gas emissions, it is required to use such fossil energy / resources even more efficiently and reduce its overall consumption. For the task of holding down the amount of emission in the world as a whole, it helps considerably to advance the effort on a global scale for energy conservation and diversification of the energy resources that have so far been promoted by Japan (Figure 20).

Japan has strenuously developed technology and know-how for energy conservation, achieving good results steadily (Figure 21). It is important for Japan who has such most advanced knowledge in the world and for the entire world as well that Japan makes maximum efforts for the reduction of greenhouse gas emission within the country as well as across the world, and, in addition, actively cooperates / contributes in the international society with the aim of reducing emissions, making full use of its excellent technology and experience.

Immediately most effective measure – energy conservation

■ **Potential for the reduction of CO_2 emissions in 2030 (compared with 2007) (Figure 20)**

Source: IEA / World Energy Outlook 2009



Note 1: "Countries of transitional economy" represent China, Russia, Brazil, South Africa and those of the Middle East

Note 2: "Developing countries" represents those of Africa (excluding South Africa), Central and South America (excluding Brazil), Asia (excluding Japan, China and Republic of Korea) as well as Eastern Europe / Eurasia.

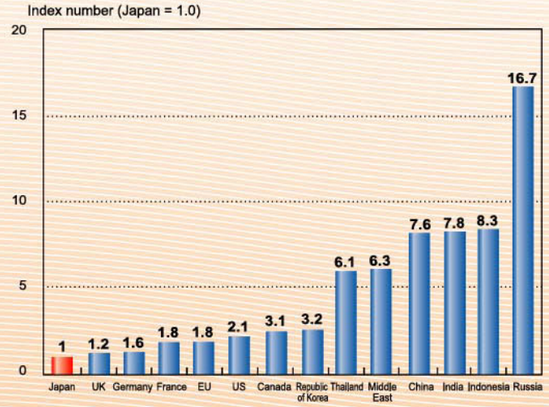
Efforts Aimed at Constructing a New International Framework

With regard to the current Kyoto Protocol, the United States does not ratify it, while major developing countries such as China and India are not obligated to reduce greenhouse gas emissions. For this reason, the emission amount of the countries obligated to reduce greenhouse gas emissions under the Protocol remains at slightly less than 30% of the world total (Page 17, Figure 22). On the other hand, the emission amount of the major developing countries, China, India, and other principal developing countries / regions which are not obligated to reduce emissions currently is anticipated to increase rapidly (Page 17, Figure 23). In order to effectively reduce the greenhouse gas of the entire planet, it is indispensable for the world as a whole all major economies to act in unison. Consequently, in the international negotiations aimed at constructing a new international framework after 2013, Japan has firmly insisted for all major economies to share the goal of halving the global emission

Japan's energy conservation, the most advanced in the world

■ **Comparison of the primary energy supply amount per unit of GDP of each country (2007) (Figure 21)**

Source: IEA / Energy Balances of OECD / NON-OECD Countries 2009



Note: Index number in the case of Japan = 1, based on the numerical value obtained by dividing primary energy consumption amount by GDP.

by 2050 and make such framework fair and effective in which all of them participate.

At the 15th Conference of Parties of United Nations Framework Convention on Climate (COP15) held in Copenhagen in December, 2009, leaders of more than 100 countries took part to discuss the new international framework to be established after 2013, and the "Copenhagen Accord" was taken note of. In this "Copenhagen Accord", it was decided that developed and developing countries register their targets for the reduction of greenhouse gas emissions by 2020 and actions for alleviation respectively.

On the basis of this Copenhagen Accord, Japan registered the ambitious target of the 25% reduction of greenhouse gas emissions by 2020, compared to 1990 level, premised on the establishment of a fair and effective international framework in which all major economies participate and on agreement by those economies on ambitious targets. In addition, many countries including main ones such as the United States, China and India also registered targets for reduction or actions for alleviation. In this way, the total of such countries and others who expressed support to the Copenhagen Accord reached about 100 nations, while the total of the emission amount of the countries who registered the targets for reduction or actions for alleviation accounts for about 80% of the energy-originated emission amount of the entire world (as of February, 2010; according to the Secretariat of the United Nations Framework Convention on Climate Change).

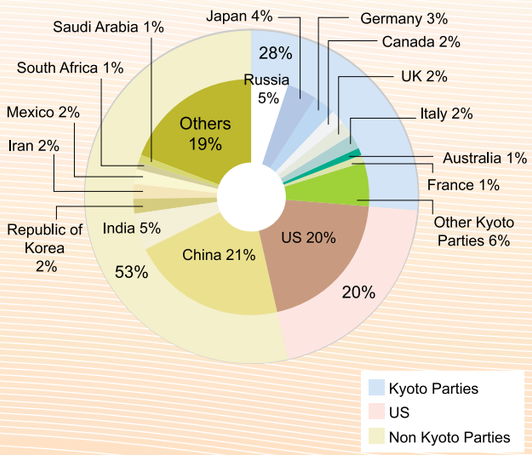
It is hereafter important to make efforts for further increase in support to this "Copenhagen Accord", and, at the same time, develop the international efforts based on this Accord to realize the establishment of a single fair and effective international legal framework in which all major economies participate.

Emission amount of the reduction-obligated nations accounting for less than 30% of the world total

■ **Energy-originated CO_2 emission amount in the world (2007) (Figure 22)**

Source: IEA, CO_2 Emissions from Fuel Combustion (2009 edition)

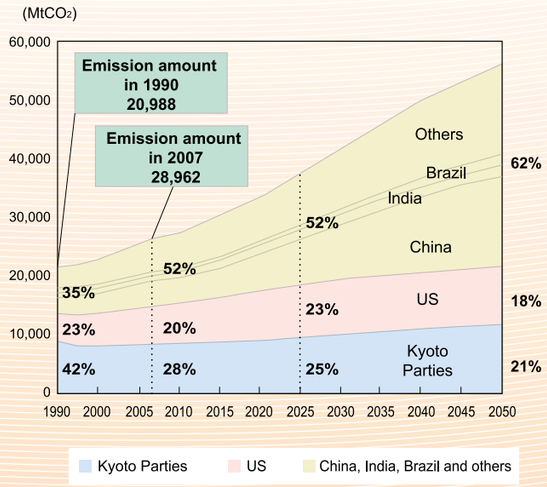
Emission amount of the countries obligated for reduction under the Kyoto Protocol accounts for 28% of the total.



Increasing emission amount of developing nations

■ **Long-term outlook for the CO_2 emissions (Figure 23)**

Source: Research Institute of Innovative Technology for the Earth (RITE)



3 Japan's Energy Policy to Resolve Energy Problems

Japan's Energy Policy

It is the Basic Act on Energy Policy what established the basic principles of the energy policy in Japan. This law holds up the basic principles of the energy policy, namely "Securing of Stable Supply" and "Environmental Suitability" as well as "Utilization of Market Mechanisms", based on the full consideration of these two concepts.

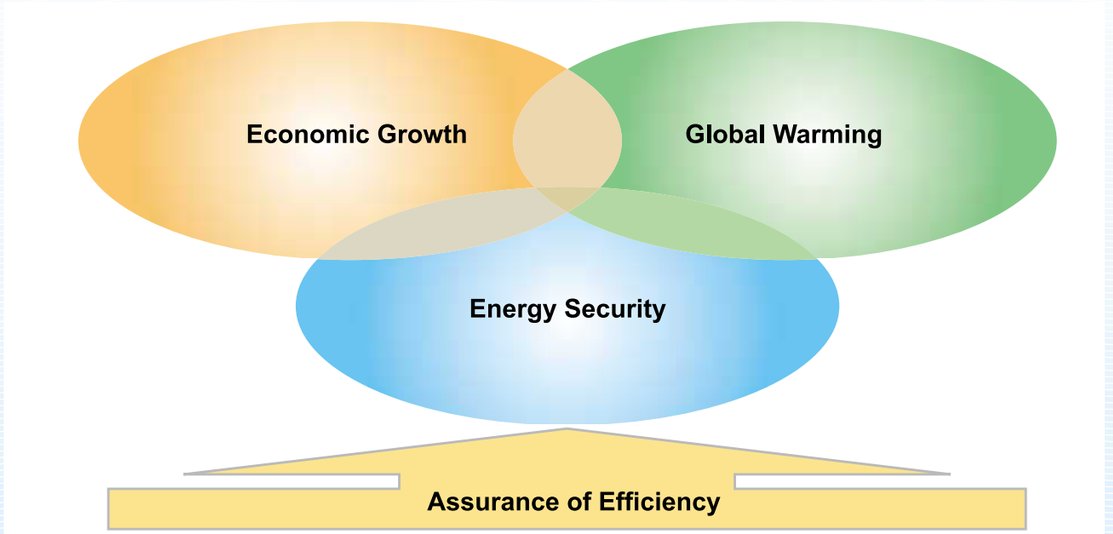
Rise in the Importance of Resources and Energy Policy at an Accelerated Rate

In Japan that is dependent largely on the overseas for resources and energy, the central importance has heretofore been placed on the task indispensable for the economic development to realize low-cost and stable energy supply. More specifically, after having experienced oil crises twice, three core bases have been established, namely (1) assurance of a stable oil supply, (2) promotion of the development and introduction of energies alternative to oil, and (3) promotion of energy conservation.

Later, while new policy issues have emerged, such as how to handle the problem of climate change and form an efficient energy market, the Basic Act on Energy Policy was established in June, 2002, and three concepts,"Securing of Stable Supply", "Environmental Suitability" and "Utilization of Market Mechanisms", were positioned as the basic principles of the energy policy.

Furthermore, in recent years, the circumstances surrounding the policy for resources and energy are significantly and rapidly changing, as we see the wild fluctuation of the prices of resources, intensification of the international competition for securing resources, rise in social request for the countermeasures against global warming, and so on. Japan will make efforts for the improvement of energy security, promotion of the countermeasures against global warming and integrated realization of sustainable economic growth in order to overcome these constraints and acquire the driving power for the medium- to long-term growth (Figure 24).

■ **Energy Trilemma (Figure 24)**



Nuclear Power Generation and the Nuclear Fuel Cycle (1)

~Nuclear Power as the Essential Source of Electricity~

Nuclear power generation is playing a major role in the supply of electric power in Japan. In addition, since nuclear power generation does not produce greenhouse gases and is excellent in supply stability, there has been a movement (called the 'Nuclear Power Renaissance') to review and promote the introduction of nuclear power generation in countries in the world in recent years.

Nuclear Power as the Essential Source of Electricity

Since the oil crises, components of electricity sources have been shifted to non-oil-based ones such as nuclear power and, at present, about 30% of the total electricity generated in Japan is being supplied by nuclear power generation (Figure 25).

Clean Nuclear Power

Following the coming into effect of the Kyoto Protocol in February 2005, the "Kyoto Protocol Target Achievement Plan" was formulated in April of the same year. Since nuclear power is a form of clean energy in that it does not emit CO_2 in the process of power generation (Figure 26), its development and introduction are being positively promoted, together with energy conservation measures under the said Plan.

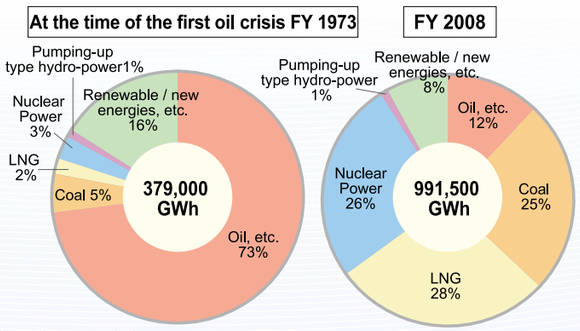
For instance, if a thermal power plant of average size had been replaced by a 1,350 MW class-nuclear power plant, Japan's carbon dioxide emissions of 1990 could have been reduced by 0.5%.

In addition, in the "Action Plan for the Development of a Low-Carbon Society", approved in a Cabinet meeting in July, 2008, nuclear power was evaluated as the central core of the low-carbon energy to occupy a very important position in promoting the countermeasure against global warming, and the importance of the nuclear power generation was recognized anew as an action for environment.

Shift in power source to nuclear power and other non-oil sources

■ **Changes in the amount of power generated by power source (for general electricity business) (Figure 25)**

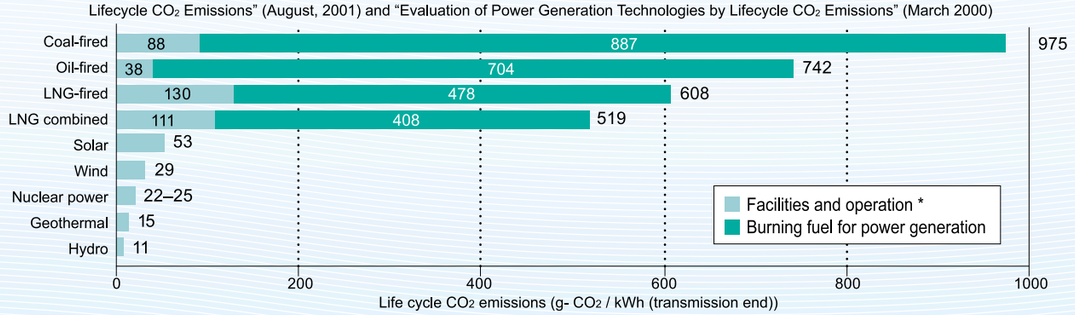
Source: Agency for Natural Resources and Energy, "Outline of Electric Power Source Development"



Nuclear Power that does not emit CO_2 in the process of power generation

■ **CO_2 emissions for different types of electric power generation (Figure 26)**

Source: Central Research Institute of the Electric Power Industry, "Evaluation of Nuclear Power Generation Technologies by Lifecycle CO_2 Emissions" (August, 2001) and "Evaluation of Power Generation Technologies by Lifecycle CO_2 Emissions" (March 2000)



* CO_2 emissions produced by total energy consumption required for mining and drilling, construction, transport, refining, operation of facility (actual generation), maintenance, etc. (e. g.) Coal: Mining / Dressing ▶ Transport ▶ Generation ▶ Disposal of ash

Calculations for nuclear power assume enrichment of Uranium by gas diffusion and once through processes (no recycling).

Nuclear Power Renaissance and Expectation on Japan

In the U.S., due to accidents at the Three Mile Island Nuclear Power Plant in the U.S. in 1979 and Chernobyl in the former Soviet Union in 1986, etc., stagnation in the construction of nuclear power plants continued in the U.S. and other countries.

However, in recent years, from the viewpoint of the necessity of countering global warming and the need to assure a stable supply of energy, etc., the movement toward new construction and expansion of nuclear power plants has started to be seen in the U.S., the UK, Finland, etc. where nuclear power generation and growth has hitherto stagnated. Thus, the movement to re-evaluate nuclear power (the Nuclear Power Renaissance) is gaining ground globally (Figure 27).

Even during the lull in the fortunes of nuclear power globally, Japan has steadily continued to construct nuclear reactors and, through such experience, has gained high a high level of technology in the construction of nuclear reactors and power plants. Thus, Japan now plays a central role among the major nuclear industry groups of the world. Japan is expected to exercise its leadership in expanding safe and economic nuclear power generation in the world.

(U.S.)

No construction of new nuclear power plants since the 1970s. ➡ A new plant, the first one in 30 years, is to be constructed.

(UK and Italy, Sweden)

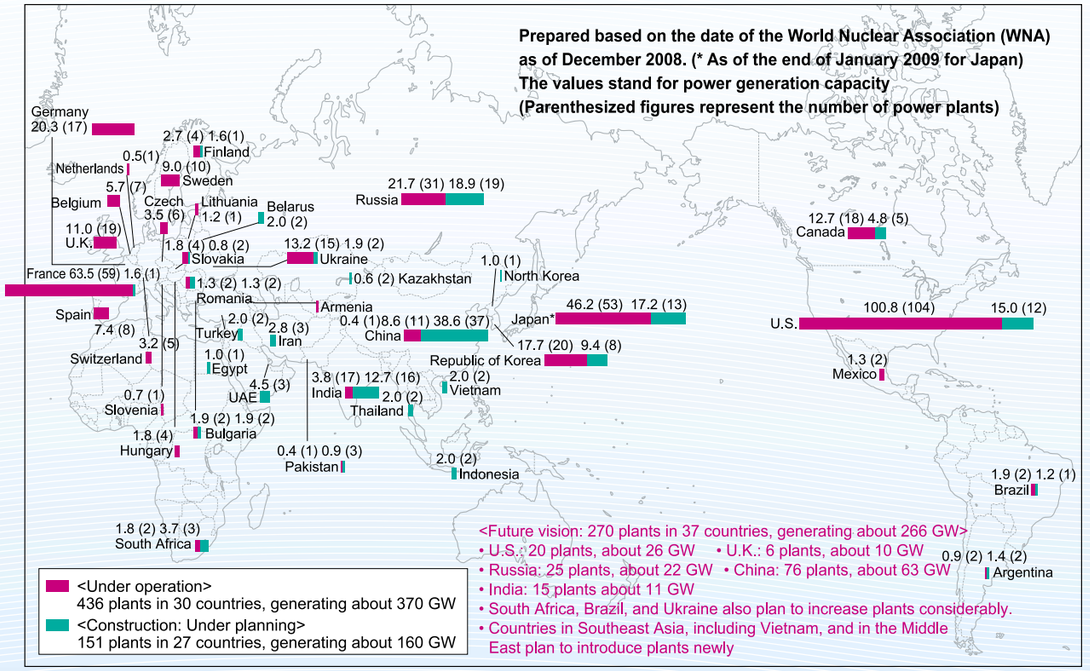
Formerly negative toward nuclear power following Chernobyl in 1986. ➡ Policy shifting to the construction of new nuclear power plants.

(China, India, and Russia)

Very little movement in nuclear power. In Russia, almost no new construction in the last 20 years. ➡ Planning to construct 20 or more new plants in each country.

■ **Current Status of Nuclear Power Reactor in the World (Figure 27)**

Source: White Paper on Nuclear Energy 2008



Nuclear Power Generation and the Nuclear Fuel Cycle (2)

~Securing the Front-end~

In line with the worldwide re-recognition of nuclear power in recent years, it has become an important issue to secure Uranium resources and enrichment work, which requires high-level technologies. In order to secure a supply of fuel for nuclear power generation in Japan, it is important to promote the independent development of Uranium resources in various countries, steadily commercialize the domestic enrichment business, and advance international cooperation in the field of enrichment.

Approaches to Secure Stability in Supply of Uranium Resources

In order to stably secure Uranium resources, it is important to obtain mining rights in various countries and develop mines independently. For this purpose, the Agency for Natural Resources and Energy is making efforts for promoting and supporting private Japanese companies to participate in the development of Uranium mines. More specifically, the Agency is trying to strengthen the systems to support overseas exploration projects of private Japanese companies through Japan Oil, Gas and Metals National Corporation (JOGMEC).

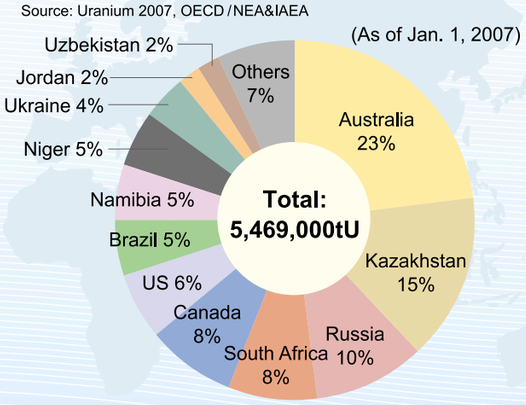
In addition, we are developing our resource diplomacy with resource-rich countries and so on.

We are making efforts to strengthen relationship with countries promising in resources in the field of nuclear power such as Kazakhstan through participation of Japanese enterprises in the projects in recent years, in addition to those already known as resource-rich countries including Canada and Australia. (Figure 28)

Uranium is distributed over wide areas of the world

■ **World's reserve of Uranium resources (Figure 28)**

Source: Uranium 2007, OECD /NEA&IAEA



Promotion of Steady Commercialization of the Domestic Enrichment Business

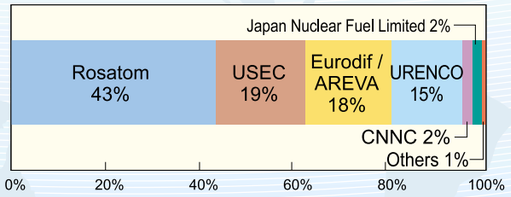
With over 90% of the world's enrichment facilities being controlled by Rosatom (Russia), USEC (U.S.), AREVA (France) and URENCO (UK / Netherlands / Germany), etc., and with the price of Uranium resources rising, demand for enrichment, which makes it possible to extract more combustible Uranium 235 from the least amount of Uranium in the process of enrichment, is increasing. Because of this, the approach toward growing demand for enrichment is an issue is as important as the efforts to secure Uranium resources. Japan is making efforts to develop centrifugal separator technology that can meet the international standard of economic efficiency and capability. We replace the new model centrifuge in current Uranium-enrichment plants at Rokkasyo-village, and we aim for the maintenance of the domestic concentration plants having the institution scale of 1,500tSWU/ year. (Figure 29)

Note: tSWU: this unit indicates the amount of work required for Uranium enrichment

A steady expansion of enrichment is a major task for Japan

■ **Percentage of the capacity of the Uranium enrichment facilities in the world (Figure 29)**

Source: "The Global Nuclear Fuel Market (2007)". World Nuclear Association



Note: USEC and Eurodif / AREVA use the gas diffusion method, and others the centrifugal separation method.

Nuclear Power Generation and the Nuclear Fuel Cycle (3)

~Promotion of the Nuclear Fuel Cycle~

It is important for Japan to take a steady approach with various kinds of measures to establish the nuclear fuel cycle from the viewpoint of securing a long-term stable supply of energy by using Uranium resources effectively and processing / disposing of radioactive wastes appropriately.

Effect of Saving Uranium Resources by the Nuclear Fuel Cycle

Uranium fuel used at nuclear power plants (spent fuel) contains useful materials such as Plutonium and Uranium that can still be used. Limited Uranium resources can be effectively used by separating, recovering and reusing these useful wastes through chemical treatment called reprocessing. The flow of recycling of nuclear fuels such as Uranium fuel is called the nuclear fuel cycle (Figure 30), which can further improve the characteristics of nuclear power generation already advantageous in terms of its stability of supply and so forth.

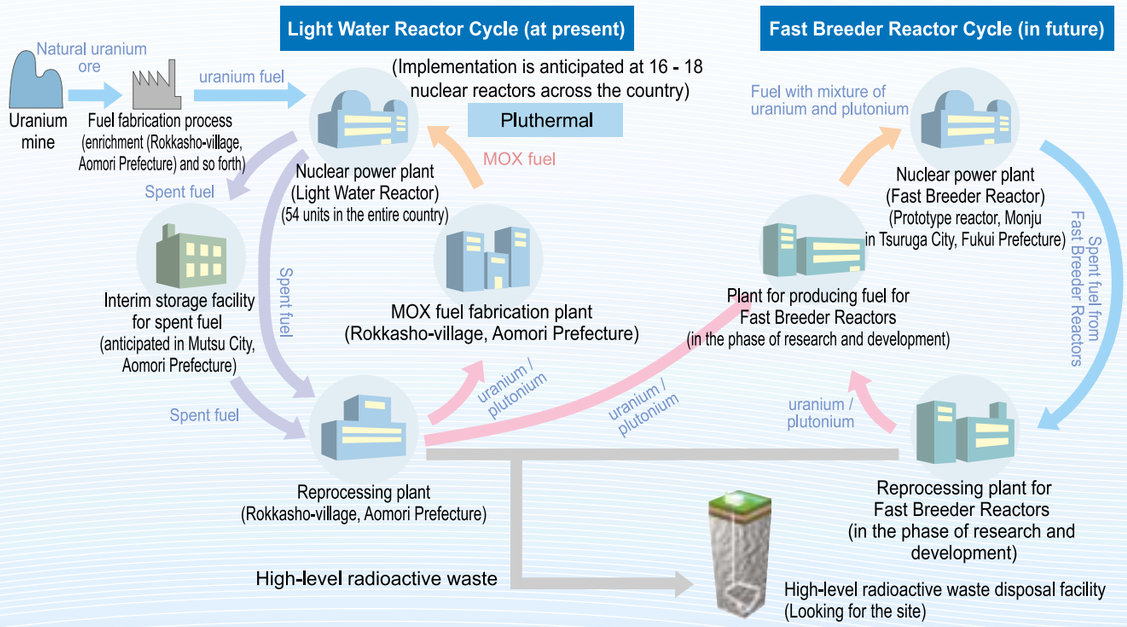
Reprocessing spent fuel and using reprocessed Uranium at the existing nuclear power plants (called Light Water Reactors) through the Pluthermal process saves 10 to 20% of Uranium resources in comparison to direct disposal.

In addition, even further effective use of Uranium resources could be achieved if the nuclear fuel cycle could be put into practice, using Fast Breeder Reactors (*).

(*) A Fast Breeder Reactor can produce more nuclear fuel than it consumes while generating electricity, and thus can dramatically enhance the efficiency of use of Uranium resources (Page 23, Figure 31).

From the Light Water Reactor cycle to Fast Breeder Reactor cycle

■ **Nuclear Fuel Cycle Conceptual diagram (Figure 30)**



Necessity of Pluthermal

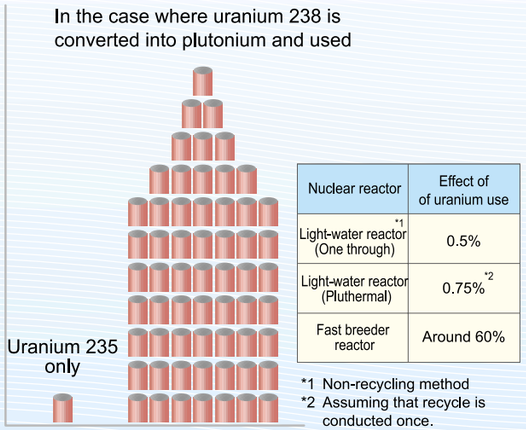
Pluthermal refers to the utilization of MOX fuel (a mixed chemical compound of Uranium and Plutonium, recovered from spent fuel) in Light Water Reactors. Pluthermal is an approach to make the effective use of precious energy resources and has a great significance for Japan which depends on imports for the major part of energy resources.

At present, Plutonium is making a contribution to electric power generation also at nuclear power plants in operation (Figure 32). This is because a part of the Plutonium derived from Uranium 238 in the course of operation undergoes nuclear fission. Energy derived from nuclear fission of these Plutonium reaches about one third of the total energy generated in Light Water Reactors. In the world, Pluthermal started operation in the 1960s, and about 6,350 MOX fuel assemblies have been actually used in 58 nuclear reactors (as at the end of December 2008, thus fully confirming its safety.

In addition, in Japan' MOX fuel use has achieved operational results of 770 assemblies over about 24 years at Advanced Thermal Reactor Fugen, at two assemblies at Tsuruga Nuclear Power Plant No.1 reactor and four assemblies at Mihama Nuclear Power Plant No.1 reactor.

■ **Effective utilization of Uranium resources (Figure 31)**

Source: "Plutonium", written and edited by Atsuyuki Suzuki



Nuclear reactor	Effect of of uranium use
Light-water reactor (One through) *1	0.5%
Light-water reactor (Pluthermal)	0.75% *2
Fast breeder reactor	Around 60%

*1 Non-recycling method
*2 Assuming that recycle is conducted once.

Processing and Disposal of Radioactive Wastes

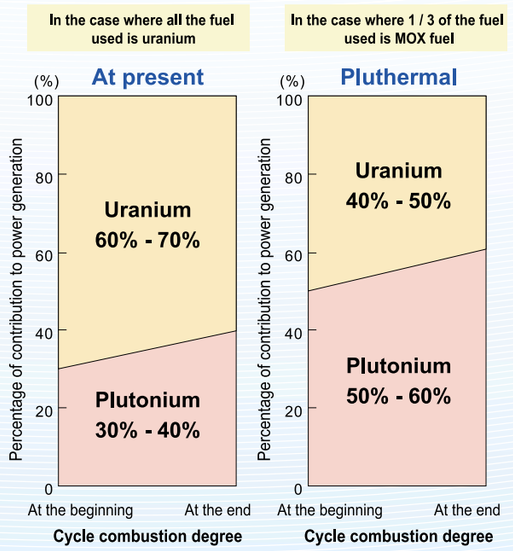
It is an extremely important issue to safely and securely dispose of radioactive wastes in line with the promotion of nuclear power such as nuclear power generation and the nuclear fuel cycle, etc.

Radioactive wastes are roughly classified into high- and low-level types. In turn, low-level radioactive wastes are controlled after being classified into several types depending on the type of radioactive materials, their density and the site of generation (Figure 33, at left).

In processing and disposing radioactive wastes, it is important to do so safely and rationally in accordance with the relevant classifications. Thus, wastes are disposed of separately, after selecting the depth and barrier required in accordance with the level of radioactivity, either at a shallow depth or a certain depth with appropriate allowance below the earth's surface or in a geological formation (Figure 33 at right).

■ **Contribution of Plutonium at the reactor core to power generation (Example of the BWR reactor's equilibrium core) (Figure 32)**

Source: Agency for Natural Resources and Energy

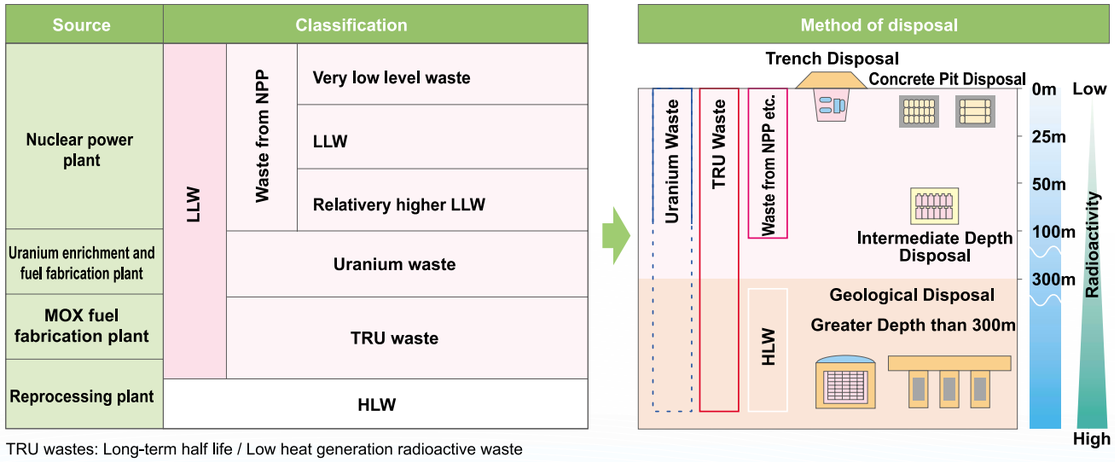


* Since in a nuclear power plant about 1/4 - 1/3 of the fuel at the reactor core is replaced over a period of about a year of operation, the figure at left shows the case in which about 1/4 - 1/3 of the fuel is replaced.

By means of combining the use of a stable deep underground geological formation (a natural barrier) with a multiple engineered barriers, geological disposal of high-level radioactive wastes confines radioactive materials and fully minimizes the influence on human life and environment (Figure 34).

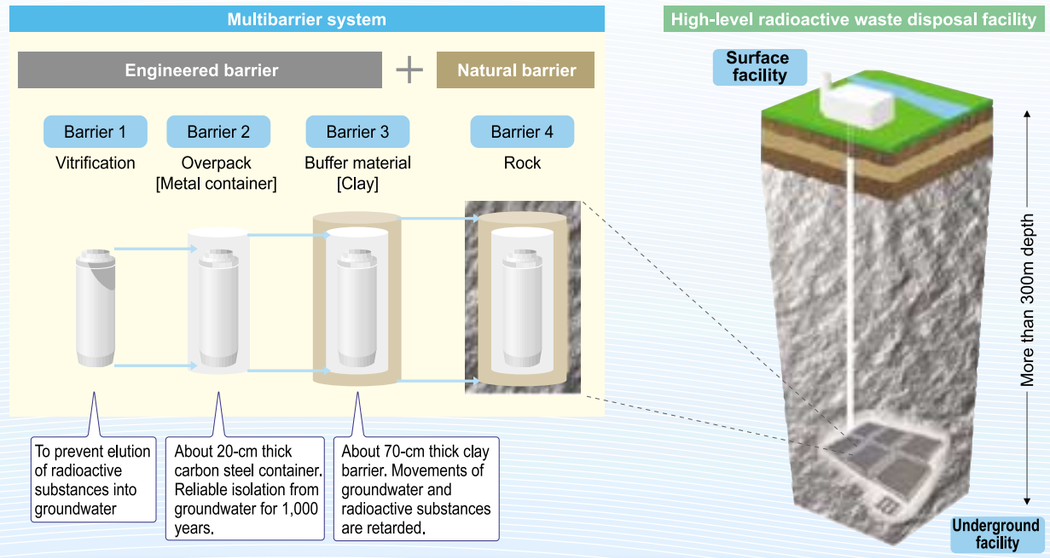
For high-level radioactive wastes that require geological disposal, Nuclear Waste Management Organization of Japan (NUMO) is appealing to the public for candidate sites from all municipalities throughout Japan.

■ **Types of radioactive wastes and methods of disposal (Figure 33)**



TRU wastes: Long-term half life / Low heat generation radioactive waste

■ **Geological Disposal--Containment (Figure 34)**



New Energies, etc. ~Positioning and issues~

Although new energy still accounts for a relatively small percentage of Japan's energy supply, environmentally-friendly and domestically produced new energy forms part of our nation's primary energy supply, and we are actively working on promoting its further introduction.

What are New Energies?

"New energies" are those of "renewable energies" generated from the sun, wind, biomass, geothermal energy, hydroelectric power, etc., constantly replenished by processes derived from nature, which require support for their dissemination as they are high in cost, though they are in the stage of introduction from the technological viewpoint (Figure 35).

■ **Definition of the new energy (Figure 35)**

(Based on the Order for Enforcement of the New Energy Law (Revised in January, 2008)
Source: Agency for Natural Resources and Energy

Renewable energy

Large-scale hydroelectric power generation

Geothermal energy

New energy

- Small- and medium-scale hydroelectric power generation *smaller than 1,000kW
- Photovoltaic power generation
- Wind power generation
- Biomass-fired power generation
- Fabricating fuel from biomass *Including use of the energy of biomass-derived waste

- Geothermal energy *limited to binary generator
- Utilization of solar thermal
- Use of snow and ice
- Biomass heat use
- Use of the heat from temperature differentials

(Wave power generation)

(Ocean thermal power generation)

Contribution to the Diversification of Energy Sources and Countermeasures against Global Warming

New energies contribute to the diversification of energy sources and countermeasures against global warming. Besides, they are precious energies, as they are expected to contribute to the revitalization of the regional economy involving dispersion-type energy system. Photovoltaic power generation, biomass energy use, small-scale hydroelectric power generation, etc., as well as provide the opportunity for each citizen to take part in energy supply and for each region to make use of their ingenuity. In addition, it is important as industrial strategy to positively promote their technological development and maintain high technical strength, as these energies including photovoltaic cell and battery constitute a field with tremendous technological potential.

Problems with New Energy

On the other hand, the cost of power generation is higher in introducing new energies than that of existing energies such as thermal power generation, due to the problems including of low utilization ratio because of the decisive influence of natural conditions (Table 3). In addition, output is unstable, and facilities can be established only in a limited number of areas due to the required conditions of topography and so forth.

Therefore, efforts are being progressively made for technological development to overcome such problems, as well as for the increase in introduction.

High costs, etc. are problems

■ **Trial calculation of electric power generation cost by power source (Table 3)**

Source: Agency for Natural Resources and Energy

Power source	Unit price of electric power generation	Utilization rate
Hydro	8.2 – 13.3 yen	45%
Oil	10.0 – 17.3 yen	30 – 80%
LNG	5.8 – 7.1 yen	60 – 80%
Coal	5.0 – 6.5 yen	70 – 80%
Nuclear power	4.8 – 6.2 yen	70 – 85%
Photovoltaic power	49 yen	12%
Wind power	9 – 14 yen	20%

Note: Hydro – Nuclear power, trial calculation made by Federation of Electric Power Companies (January 2004)
Photovoltaic power – Wind power, intermediate report (August 2009)

[calculation form] unit price of electric power generation = (capital cost + fuel cost + operation and maintenance cost) / electric power amount
[precondition] operation period: 40years (20 years in case of Photovoltaic power and Wind power) discount rate: 0 – 4%
fossil fuel price: $27.41/b (average price, 2002)
In case of nuclear power disposal cost of radioactive waste is included.
* discount rate = a rate used in the calculation of discount from future value to the present one for the purpose of evaluation on the long term investment efficiency
[example] in case that operation period is 40 years, utilization rate is 80% and discount rate is 3%, unit price of nuclear power generation is ¥5.3/kWh, fuel cost is ¥1.47/kWh

Continuous Positive Introduction in the Future

Active support is being offered to local governments, businesses and nonprofit organizations (private nonprofit organizations), etc. that are introducing new energies. Moreover, we are working on regulations under RPS Law (*1) as well as support to the independent approaches in the private sector such as the utilization of the Green Power Certificate (*2). In addition, attempt is made to increase introduction by combining support including the "System of Purchasing Excess Power Generated by Sunlight (Details are stated on the next page.)", started in November, 2009, regulation and independent efforts in the private sector integrally. Technological development is promoted as well so that new energies may be disseminated further from the medium- to long-term viewpoint. Moreover, study has been started on the "System of Purchasing Total Amount of Renewable Energies" (as of March, 2010).

Furthermore, the installation of the "Next-Generation Energy Park" is being promoted, in which citizens can actually experience new energies and so forth, by seeing and touching them. In such a way attempts are being made in many places of the country, making full use of the characteristics of the region concerned (25 places are accredited as of March, 2010).

*1 RPS Law: The popular name for the "Special Measures Law on Use of New Energy, etc., by Electric Utilities". Its objective is to seek increase in introduction of new energies, etc. in the field of electric power, by obligating electric utilities to use a certain minimum amount of the electric power generated by new energies, etc. such as wind power, sunlight, biomass and so forth (power generated by new energies, etc.). The total amount of the electric power generated by new energies, etc., used by electric utilities in FY2009, reached 7,920 GWh.

*2 Green Power Certificate: This involves a mechanism to trade in the form of the certificate "a value other than that of electricity itself (= environmental added value)" contained in the electric power generated by using wind power, sunlight, biomass, water power and geothermal heat (Green Power). As the enterprises and organizations that purchased such a certificate can be deemed to have used the Green Power, this mechanism is utilized in the electric power consumed in offices, broadcast stations and so forth. By the Green Power Certificate economic merit accrues to the power generator, leading to further increase in dissemination of new energies, etc.

Smart Grid

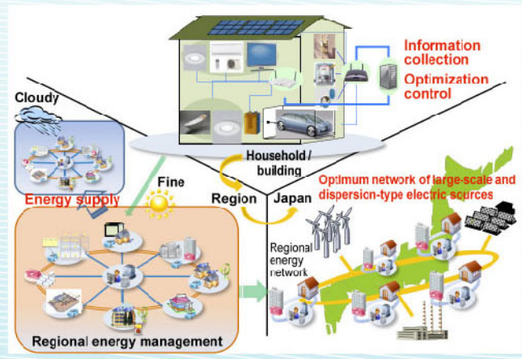
When actively increasing the introduction of the new energy, there are risks of the local problem of voltage fluctuation or uncertainty of frequency in the case of introduction in large amount because of the instability of the power output, affected largely by the natural condition. Therefore, sufficient acceptance may not necessarily be possible in the current power supply system. For this reason, in order to realize efficient use of power, the "Smart Grid" is used, which is the power transmission and distribution network to efficiently attain supply and demand balance, making use of the information and communication technology and achieve the stable power supply (Figure 36).

On the other hand, from the viewpoint of effective use of energy, it is important to study what the social system ("smart community") should be like, bringing into view the entire picture of the lifestyle of the people including not only the electric power but also the thermal energy and traffic system.

While the approach to the "smart community" expands internationally, to deploy Japan's excellent new energy / energy conservation technology and smart grid-related technology across the world will lead to the development of new growth in Japan.

The Ministry of Economy, Trade and Industry is working on the implementation of the demonstration projects inside and outside Japan, formulation of the road map to realize out the smart grid, actions aimed at international standardization and so forth.

■ **Image of the Smart Grid (Figure 36)**



Photovoltaic Power Generation

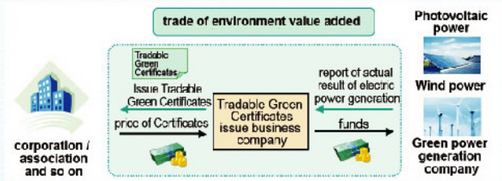
As of the end of 2008, Japan had introduced about 2,140 MW of photovoltaic energy (Figure 37).

Through more than 30 years of technical development and government subsidies for installation the cost per kWh has declined, but at about ¥49 per kWh, photovoltaic energy is still expensive, at about twice as much as the average household rate.

From the global point of view, Japan had been the largest introducing country, No.1 in the world, up to the end of 2004, but fell to the third place at the end of 2008, as Germany and Spain rapidly increased the introduction amount and got ahead of Japan. Moreover, Japan is at the second position in the world for the production of photovoltaic cells (Figure 38 and Table 4).

Recently, the cost has also fallen in parallel with advances in introduction. It is thought that success in cost reduction resulted from the fact that the domestic market for the photovoltaic energy has expanded due to the technological development through the joint effort of the public and private sectors, measures to support introduction, taken by the government, and regulations by RPS Law as well as the expansion of the domestic market for photovoltaic energy due to the integrated independent private efforts such as the utilization of the Green Power Certificate (See comment below.) In addition, further increase in dissemination is expected, as the "System for Purchasing Excess Power from Photovoltaic Power Generation" (*) was started in November, 2009.

[Explanation: Tradable Green Certificates]

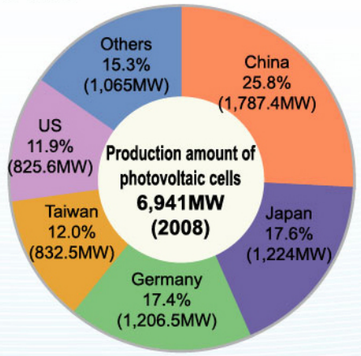


* "System for Purchasing Excess Power from Photovoltaic Power Generation" : The system in which electric utilities purchase excess power out of the amount generated by the photovoltaic power generation system at about double price in comparison to the past. The expense required for purchase is borne as photovoltaic power surcharge, by all the power users, depending on the amount of the power consumed. As the unit surcharge for FY 2010 is 0.00 yen / kWh due to, among other things the short length of the period of purchase (November – December, 2009), resulting in the small expense required for purchase, there is virtually no burden.
(For reference) With regard to the details of this system including how to calculate the purchase price / photovoltaic power surcharge for 2010 and so on, refer to the portal sight of the purchase system: (http://www.enecho.meti.go.jp/kaitori/).

Japan secondary leading the world in photovoltaic cells production

■ **International comparison of the production amount of photovoltaic cells (Figure 38)**

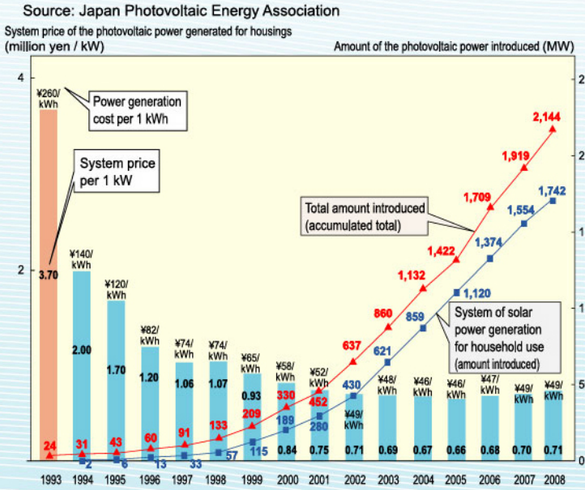
Source: PV NEWS



Costs have fallen as introduction has advanced

■ **Changes in the amount of photovoltaic power generation introduced, system prices and the cost of power generation (Figure 37)**

Source: Japan Photovoltaic Energy Association



■ **International comparison of photovoltaic power generation (Table 4)**

Source: IEA / PVPS

Capacity of the facility (MW)			
①	Germany	5,340	39.8%
②	Spain	3,354	25.0%
③	Japan	2,144	16.0%
④	US	1,169	8.7%
⑤	Italy	458	3.4%
⑥	South Korea	358	2.7%
⑦	France	180	1.3%
⑧	Australia	105	0.8%
⑨	Portugal	68	0.5%
⑩	Netherlands	57	0.4%
⑪	Switzerland	48	0.4%
⑫	Canada	33	0.2%
⑬	Austria	32	0.2%
⑭	UK	23	0.2%
⑮	Mexico	22	0.2%
⑯	Malaysia	9	0.1%
⑰	Norway	8	0.1%
⑱	Sweden	8	0.1%
⑲	Turkey	4	0.0%
⑳	Denmark	3	0.0%
㉑	Israel	3	0.0%
	World total	**13,424**	**100.0%**

Note: IEA/PVPS participant Australia, Austria, Canada, Switzerland, Denmark, Germany, Spain, France, UK, Israel, Italy, Japan, South Korea, Mexico, Netherlands, Norway, Sweden, US, Portugal, Malaysia, Turkey

Wind Power Generation

Japan had installed about 1,850 MW of wind power generator at the end of FY 2008 for the year (Figure 39).

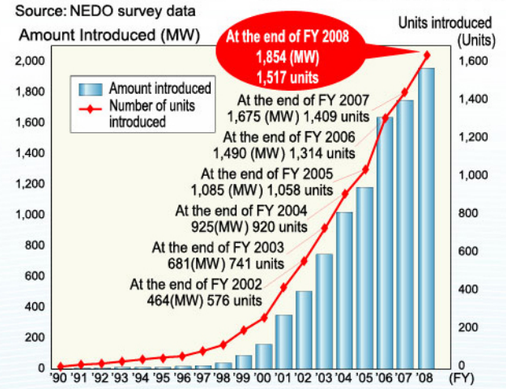
In the new energy, a generation cost is relatively low, and large-scale facilities (Wind-farm) continue to be constructing, predominantly in Hokkaido and Tohoku (Table 5).

From the global point of view, the amount of wind power introduced in Japan was ranked No.13 in the world at the end of 2008. This is because Japan has fewer regions suitable for the installation of wind power generators due to its topographical features, i.e. there are fewer flat places, geography is more complicated, and there is less reserve in the system of electric utilities, as compared with the U.S. and European countries (Figure 40).

Amount introduced increased steadily

■ **Changes in the amount of wind power introduced (Figure 39)**

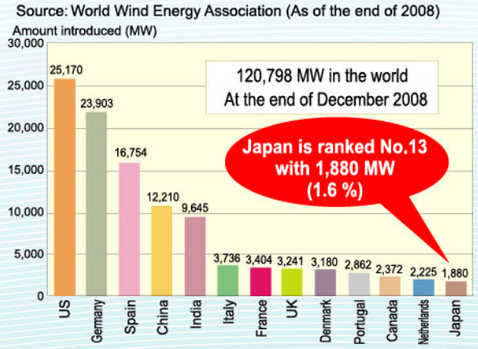
Source: NEDO survey data



Introduction is advancing in Europe and the U.S

■ **International comparison of the amount of wind power introduced (Figure 40)**

Source: World Wind Energy Association (As of the end of 2008)



■ **Ranking of Prefectures that have introduced wind power (at the end of FY 2008) (Table 5)**

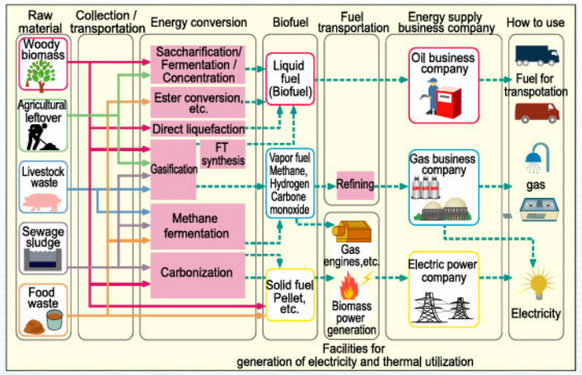
1	Aomori Pref.	277 (MW)	6	Yamaguchi Pref.	74 (MW)
2	Hokkaido	258 (MW)	7	Fukushima Pref.	70 (MW)
3	Kagoshima Pref.	137 (MW)	8	Chiba Pref.	68 (MW)
4	Akita Pref.	123 (MW)	9	Ibaraki Pref.	68 (MW)
5	Ishikawa Pref.	80 (MW)	10	Nagasaki Pref.	67 (MW)

Biomass Energy

Biomass energy is used in wide area, namely electricity, gas and fuel for transportation (Figure 41). Raw materials are derived from various resources, such as forest resources, residues of agricultural products and foods, as well as sewage sludge. (Figure 42) Therefore, industry academia and government are advancing various approaches including how to use resources effectively and local production for local consumption in consideration of the local characteristics. For example, research and development, etc. are being promoted, aimed at sustainable expansion, giving consideration to the compatibility of the development of biofuels for transportation with food supply, reduction in greenhouse gas emissions throughout the lifecycle and so forth.

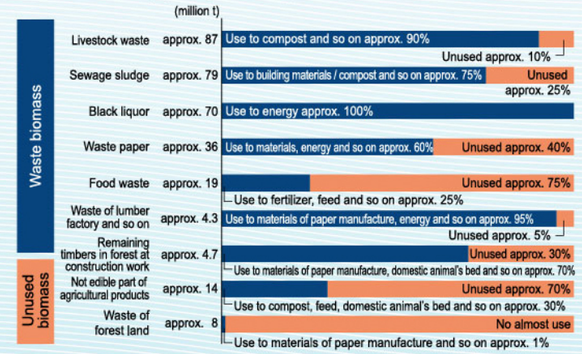
How to use biomass is various ways

■ **Flow from the collection of the raw materials of biomass to the energy supply (Figure 41)**



■ **Amount of biomass endowment and available quantity (Figure 42)**

Source: The 12th Biomass Nippon Strategy Promotion Council and advisory group joint meeting, reference data #2



* The utilization rate of food is calculated based upon the statistical results in FY2007 because the statistical ones in FY 2008 is not published at the present time.

Hydroelectric and Geothermal power generation

At present, hydroelectric power accounts for about 20% of the capacity of the electric power plants in Japan, and has been effectively used together with thermal and nuclear power as one of the important power sources in the power supply of our country.

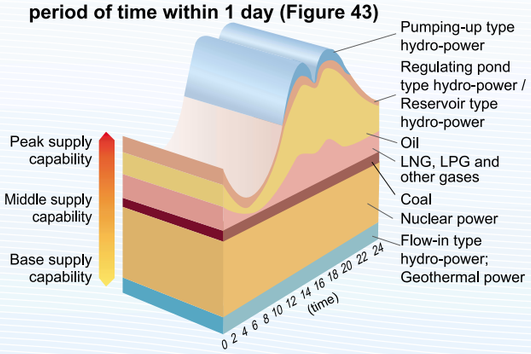
On the other hand attention has been paid to the potential of geothermal power generation, and research and development advanced at an early stage after the war as method of power generation that can make maximum use of land located in volcanic zones.

Power is now generated in 18 places in Japan, and the total capacity is over 530MW.

Hydroelectric power generation is a method to generate electricity by using the energy of falling water such as in a dam, and geothermal power generation is a method to generate electricity by extracting the steam heated by high-temperature magma deep underground through winze excavated underground. As such, they are clean energies as they emit no carbon dioxide in the power generation processes, and are attracting attention as sources of purely domestic renewable energy that can be used repeatedly.

Dealing with changes in demand

■ **Combination of electric power sources in each period of time within 1 day (Figure 43)**



● Power generation methods

"Pumping-up type hydro-power" and "Regulating pond type hydro-power / Reservoir type hydro-power" generation:
It is the supply that is necessary at a peak hour, because it can make dealing (output adjustment) quick for a change of the electricity demand.

"Flow-in type hydro-power" generation:
This is base supply, because it can always run by the approximately constant output.

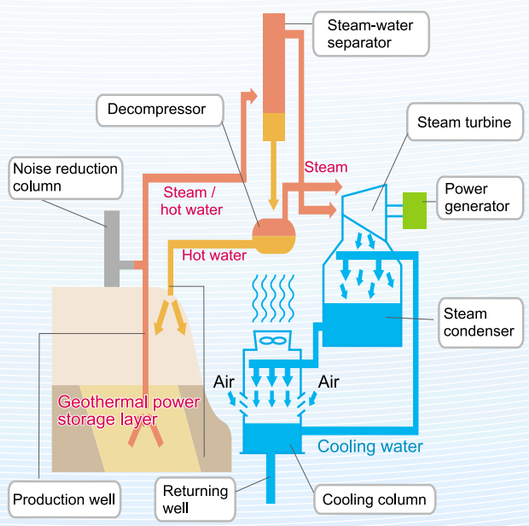
In addition, hydroelectric power generation includes the pumping-up of hydroelectric power generation by discharging in the daytime the hydroelectric pumped up to the dam, using surplus electricity at night. This generation contributes to load leveling, and plays an active role as a power source conducive to the stable supply of electric power, helping the grid deal with the peaks in demand and so forth (Figure 43).

Hydroelectric and geothermal power generation are power generation methods that make the best use of geographic characteristics of Japan, with so many areas with steep topography and its volcanic zones. These are important energy sources that conform to the basic principles of the energy policy of Japan, namely the "Assurance of Stable Supply" and "Adaptation to the Environment" (Figure 44).

With regard to the resource potential, it is expected that hydroelectric power generation can produce about 10,000 MW and geothermal power generation about 2,470 MW, though political support is indispensable to cover the disadvantages such as high development cost.

A part of the hydroelectric and geothermal power generation are designated as the target power sources in the RPS Law.

■ **Mechanism of geothermal power generation (Figure 44)**



Innovative Technology for the High-Level Use of Energy

As Japan is proud of its high technological capabilities for the battery that is the key for the fuel cell and electric vehicle and countermeasures for system, it is important to make efforts for its dissemination in the future.

Battery

The battery is indispensable for the electric and plug-in-hybrid car, much talked about recently. In addition, it is useful, as it can accumulate for a certain time the unstable power generated by sunlight or wind power and use it freely at home when necessary.

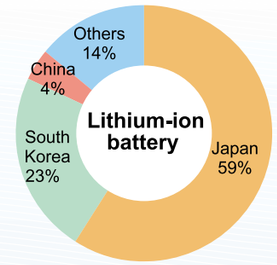
Among other things, while it is expected that the energy unstable in the output amount generated by sunlight or wind power will be introduced to homes and so forth on a large scale in the efforts aimed at the future low-carbon society, it is pointed out that quality of electricity in the power system may be deteriorated in the above-mentioned process, due to the problems of regional voltage fluctuation, unstable frequency and so on. Consequently, introduction of the battery is thought to play an effective and important role as the key technology in stabilizing and leveling output amount of electric power generated by sunlight, wind and so forth in order to alleviate the influence on the electric power system.

At present, the share of Japan is largest in the world in the production quantity of the battery for consumer use (Figure 45) , and intended purposes of use such as those for system coordination, electric vehicles, etc., not to speak of mobile phone, are expanding year after year, while, at the same time, higher-performance and lower-cost batteries are promptly required. Such development is seen also in the foreign countries including the United States and European countries, where research and development are actively conducted under the government support in the same way as in Japan where technological development for the battery is promoted in a positive manner.

Japan Leading the World in the Technology for Battery

■ **Share of the Production of Lithium-Ion Battery in the World (2007) (Figure 45)**

Source: Compiled by the Ministry of Economy, Trade and Industry from the materials of Yano Research Institute



Fuel Cell

With regard to the fuel cell, various types fuel cells, from small-scale (for residential, fuel cell vehicles, mobile device) to large-scale(for commercial buildings, industries, power plants) are being developed.

Above all, residential fuel cell systems have been commercialized in FY 2009, for the first time in the world. In addition, it aims to start fuel cell vehicle commercialization to generals in 2015.

The fuel cell vehicle does not emit any harmful substance while driving, only water is emitted.

The fuel cell, which uses the ultimate clean energy "hydrogen", has excellent characteristics that contributes to CO_2 reduction, energy-conservation, and suitable to the low environmental-burden society.

● **"ENE-FARM", the residential fuel cell co-generation system**

"ENE-FARM" is the unified logo for residential fuel cell co-generation system.

● **Fuel-Cell Vehicle**

Resources and Fuels (1) [Oil]

Oil accounts for about 50% of Japan's total primary energy supply, and almost all of it is imported. More specifically, Japan is dependent on the Middle East for 90% of its imports of oil. Even though efforts will be made to reduce the degree of dependence on oil, there will be no change in that oil will continue to remain as an important energy resource. To ensure a stable supply, Japan works to deepen relations with oil-exporting countries in the Middle Eastern region and stockpiles oil reserves.

Oil Excellent in Utility

The degree of dependence on oil for the primary energy supply in Japan has decreased since the first oil crisis, accounting for slightly less than 50% at present.

It is used, however, in various fields, supporting the economic society in Japan, and, now, has become indispensable in our social lives. More specifically, besides being used as fuel for cars, ships and so forth, oil is used also for home heaters, as boiler fuel in factories, as fuel for power generation in thermal power plants, as a raw material for petrochemical products, and so on. Moreover, it is very easy to transport or store oil, as it is in the form of liquid at and under ordinary temperature and pressure. Since oil is used in various fields, and is easy to transport and store, it can be said that it is extremely excellent in terms of its utility, compared with other sources of energy. (Refer to Figure 3 in Page 3)

High Dependence on Middle Eastern Oil

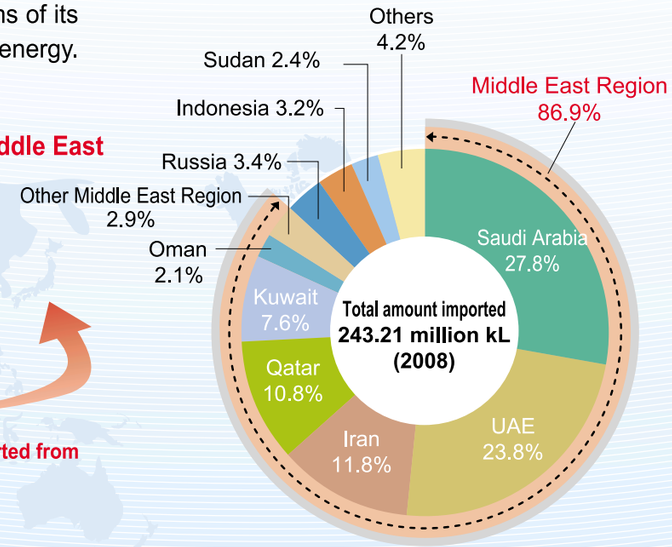
After the two oil crises, Japan instituted energy conservation measures and promoted diversification of energy sources. Despite these efforts, however, the nation still depends on oil for about 50% of its total energy supply.

Also, Japan made efforts to diversify its sources of oil to avoid over-dependence on any specific country or region, a policy that temporarily helped reduce our energy dependence on the Middle East. However, in the nations not located in the Middle East such as China and Indonesia domestic energy consumption has increased, and the import of oil from these regions decreased. As a result, Japan's dependence on the Middle East has been climbing again since the 1990s (Figures 46 and 47).

High degree of dependence on the Middle East

■ **Origin of oil imported to Japan (Figure 46)**

Source: METI, "Resources / Energy Statistics"



90% of Japan's oil is imported from the Middle East.

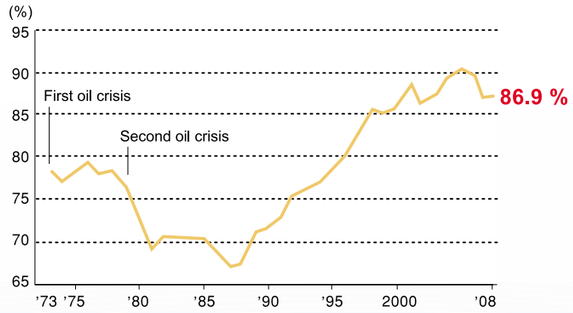
Japan's high dependence on oil imports from the Middle East is expected to continue, so it is important to implement exchanges with oil-producing countries not only on the government level but also on the private level, actively engaging in joint research and development projects and technological cooperation in energy fields, such as the development of high-precision refining technologies.

It is also important to promote development of energy within Japan in order to reduce dependence on import and secure stable supply of energy. In Japan, exploration for the potential resources in the adjacent sea is promoted, introducing 3D physical exploration ship "SHIGEN" since 2008.

Level of dependence on the Middle Eastern oil rising again

■ **Changes in the degree of dependence on the Middle East for the import of crude oil (Figure 47)**

Source: METI, "Resource / Energy Statistics"



Emergency Stockpiles

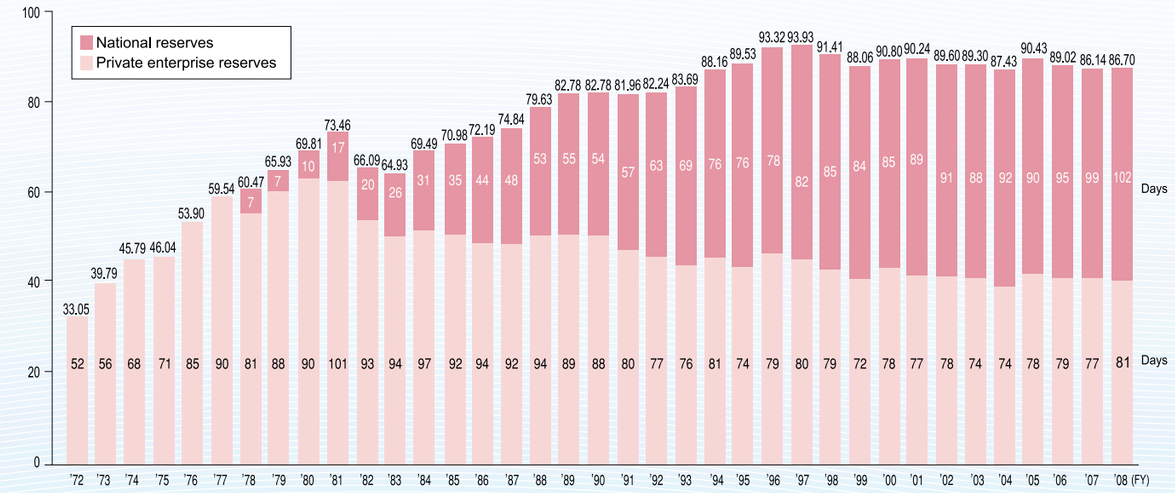
To prepare for a period of unanticipated suspension of imports, oil is being stockpiled both by the government and private sectors. A total of 83.64 million kL, about 197 days' worth was stockpiled as of the end of 2009 (a total of 86.70 million kL, our 184 days' worth was available at the end of FY 2008) (Figure 48).

This stockpile has functioned effectively in emergencies after the oil crises. For instance, oil was discharged to the market by lowering the amount of the private-sector stockpiling obligation at the time of the Gulf Crisis in August 1990 and following a major hurricane that disrupted the United States in August 2005.

184 days' supply stockpiled

■ **Trends in amount / days' supply of oil reserves in Japan (Figure 48)**

(Amount of reserves: million kL)



Note 1: The amount / days' supply of oil reserves are actual figures as of the end of the fiscal year.
Note 2: Figures for both private-sector and national reserves are converted in terms of product.
Note 3: The number of days' supply is calculated on the basis of the Petroleum Stockpiling Act.
* Figures of the days accumulated have been rounded off, and may not total the number of the days of expected stockpile duration.

Resources and Fuels (2) [Natural Gas]

Natural gas is distributed over the world widely, and there is it in richness. Since, relative to oil and coal, it releases relatively small amounts of carbon dioxide when burned, natural gas is used mainly as fuel for power generation and as city gas.

High Dependence on Imports, Import after Liquefaction

Natural gas is abundant deposits, and there is the natural gas in the many parts of the world widely. In addition, in comparison with oil and coal, it is known as clean energy because there are few discharges such as carbon dioxide or the nitrogen oxide. For this reason, in Japan its positive introduction has been promoted as the energy alternative to oil. The ammount of ratio of natural gas supply in Japanese primary energy was only 2% until the first oil crisis, but reached to 17% in 2008.

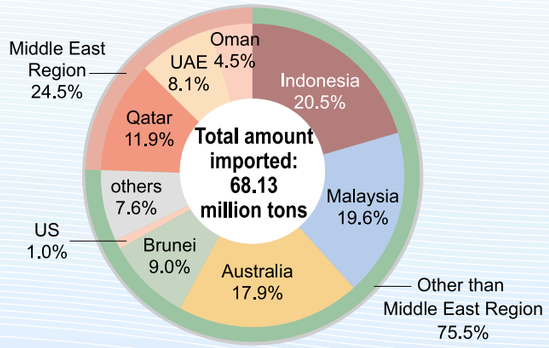
As it is imported from multiple regions such as Southeast Asia, Oceania and Middle East, efforts are made to disperse the supply source, unlike in the case of crude oil for which degree of dependence on the Middle East is high (Figure 49).

In Europe and the U.S., natural gas can be transported by pipelines in its gaseous state. Japan, however, is far from the gas fields, and the gas is therefore cooled to -162˚C so that it liquefies and it is transported to Japan in this state in tankers lined with thermal insulation. After arrival, it is reconverted into gas at the receiving station and supplied to power generation facilities and households via pipelines.

Degree of dependence on the Middle Eastern region is currently 25%

■ **Countries from which Japan imports natural gas(FY 2008) (Figure 49)**

Source: Ministry of Finance, "Monthly Report of Japanese Trade"



Dissemination and New Technologies

Several schemes have been put in operation to expand the use of natural gas in the future. These include converting thermal power plants from the use of oil and coal to natural gas, replacing oil with natural gas as the raw material for urban gas supplies, and promoting the use of vehicles fueled by natural gas (*).

Another new plan under consideration is to modify the gas and use it as a liquid fuel. In addition, it is also important to aim at higher-level use of the natural gas by introducing highly efficient equipment at the same time. These new fuels, called GTL (Gas-To-Liquid) and DME (Dimethyl Ether), are expected to provide fuel for transport and industry in the future.

The realization of these plans will require the systematic establishment of a domestic pipeline network to supply the natural gas.

Methane hydrate

Methane hydrate, a kind of natural gas resources, is an ice-like material in which methane gas and water are crystallized in the low-temperature and high-pressure condition. While a reserve of considerable amount is expected in the ocean area around Japan, development of a new production technology is required, because the methane hydrate buried underground in the form of solid does not belch out spontaneously.

For this reason, the government is promoting the technological development for the commercial production before any other country in the world for the purpose of using the methane hydrate as the future energy resources.

● The artificial methane hydrate which burns

Resources and Fuels (3) [LP Gas]

LPG is used in approximately 26 million households in Japan, and used in a wide range of other fields, including manufacturing and other industries, taxis and other LPG vehicles, as a chemical resource, and in the electric power industry, and is building national stockpiles with the aim of further ensuring a stable supply.

Clean Energy and Suitable for the Initial Response to the Disasters

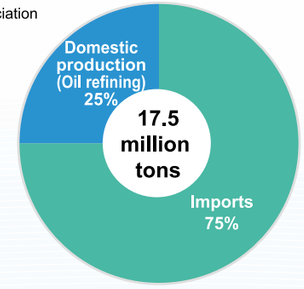
When burned, LPG emits virtually no SOx (sulfur oxides), a cause of acid rain, and relatively little CO_2 (carbon dioxide) that contributes to global warming. This makes it one of the clean energy sources. Furthermore, it is a dispersion-type energy closely related to the people's life, as it is suitable for the initial response to the disasters such as earthquake and so on.

3/4 of LPG is imported

■ **Japan's LPG Supply (FY 2008) (Figure 50)**

Source: Japan LP Gas Association

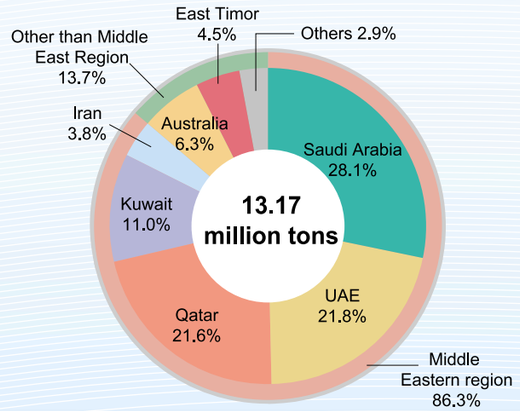
Note: Domestic production (oil refining) includes the portion for petrochemical industry.



Over 90% of LPG imports come from the Middle Eastern region

■ **Countries from which Japan imports LPG (FY 2008) (Figure 51)**

Source: Japan LP Gas Association



High Dependence on Middle Eastern Supplies and Ensuring a Stable Supply

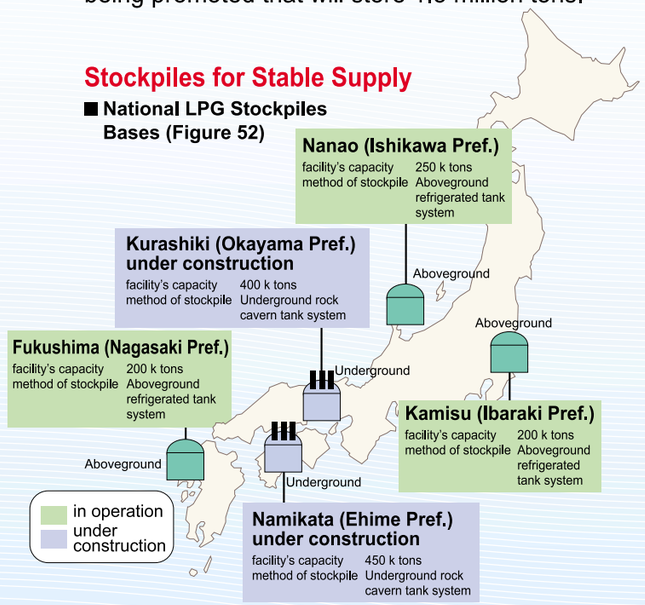
LPG is obtained from natural gas fields and oil fields, and is also produced through the process of refining crude oil. Approximately three quarters of all LPG used in Japan is imported, with the rest produced through the domestic process of refining crude oil that is also imported (Figure 50).

About 28% of the imported LPG comes from Saudi Arabia, and about 86% comes from the Middle East as a whole (Figure 51).

This makes it a task to reduce the dependence on the Middle East as in the case of oil (Figure 52). To help ensure a stable supply, Japanese importers are currently required by law to stockpile LPG (50 days' worth of the total amount imported annually). In addition, a national stockpiling system is being promoted that will store 1.5 million tons.

Stockpiles for Stable Supply

■ **National LPG Stockpiles Bases (Figure 52)**



Fossil Energy (4) [Coal]

While, at present, Japan depends on imports for almost all of the coal it consumes. The coal has a long remaining exploitable energy in comparison with the other energy, and is widely distributed throughout the world. In addition, the stability of coal supply is higher than that of other fossil fuel, and coal is superior in economy. Coal is positioned as an indispensable source from the viewpoint of being a stable supply of energy.

The Energy that is Superior in Stability of the Supply, Economy

Coal is abundant deposits, and it does existence widely in Asia, enabling Japan to import it from countries that have relative political stability such as Australia (Figure 53). And the cost of coal per thermal unit is low in comparison to oil, making it highly economical.

Consideration for the Environment

When burned, coal has the environmental drawback of emitting more CO_2, per unit amount of heat than other types of fossil fuels. For this reason, it has become an international task to use it efficiently.

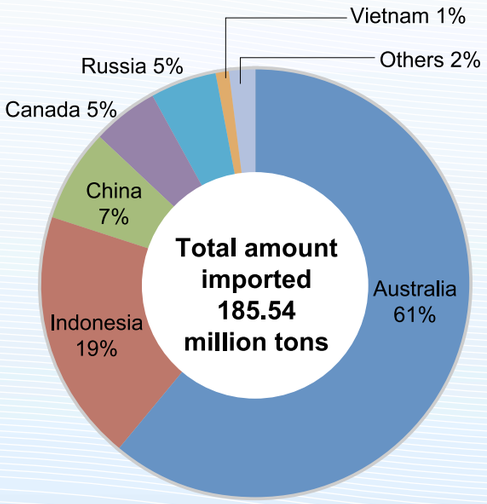
Japan's technology to reduce environmental burden accompanying the use of coal (clean coal technology) is very excellent, as the efficiency of the coal-fired power generation in Japan is in the top class in the world (Figure 54).

It is important hereafter to continue promoting development and dissemination of the clean coal technology to have the coal used widely as the cleaner energy, by burning the coal highly efficiently after gasification and so on.

Coal imports come from the Pan-Pacific region

■ **Countries from which Japan imports coal (FY 2008) (Figure 53)**

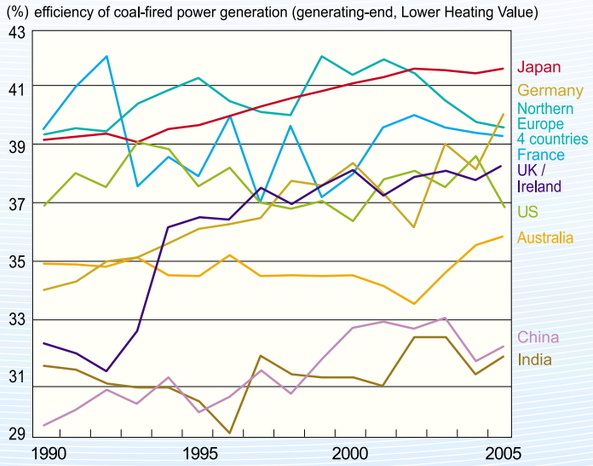
Source: Ministry of Finance, "Trade Statistics"



The Thermal Efficiency of the Japanese Coal Thermal Power Generation is the Highest in the World

■ **International comparison of the coal-fired power generation efficiency (Figure 54)**

Source: ECOFYS, International comparison of fossil power efficiency and CO_2 intensity, August 2008



Fossil Energy (5) [Rare Metal]

The rare metal is the raw material indispensable for the high-tech products such as automobiles, electric home appliances and IT-related equipment. Japan, in which the manufacturing industry flourishes, is a big consumer of the rare metal, for which it is dependent on import for almost all the quantity, and is, therefore, taking various measures to secure stable supply.

Rare Metal Called "Vitamin for the Industry"

At present, 31 kinds of rare metal are determined as those important for the industries of Japan. Since this rare metal is the raw material indispensable for manufacturing high-tech products, in which Japan especially has the superiority, it is also called "Vitamin for the Industry". For example, Dysprosium is used for the high-performance motor for automobiles and so forth, Platinum for the hybrid cars as catalyst and Indium for the liquid crystal panel respectively (Refer to the figure below).

Eccentrically-Located Rare Metal and Recent Trend

A part of the rare metal that has various kinds is eccentrically-located in specific countries with resources. Above all, rare earth (China: 97%) *, Tungsten (China: 75%) *, Platinum (South Africa: 77%) are located in limited countries. In recent years, high expectations are placed on rare metal resources located in the sea around Japan, from the viewpoint of high rise in the price of resources and stability of supply. * (Country name: output ratio)

To Secure Stable Supply of Rare Metal

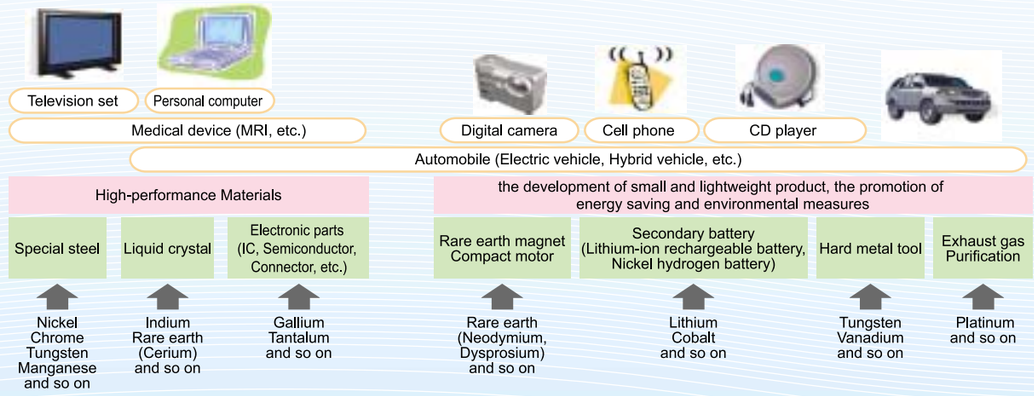
In order to secure stable supply of the rare metal, following multifaceted and comprehensive measures have been taken.

(1) To construct friendly relationship with the countries of the target resources, offering support to satisfy their needs and so on, as well as to assist private enterprises in securing resources at various stages of the mine development.

(2) To promote comprehensive utilization of "Urbany Mines", in such ways as to develop technology to recover rare metal efficiently from the used products and for recycle the rare metal discharged from the manufacturing process.

(3) To develop new materials that can exert the equivalent function with a view to reducing the amount of rare metal to be used.

(4) To implement the stockpile of the rare metal as the measure to prepare for the short-term impediments to the supply.



Promotion of Energy Conservation ~Realization of the World's Preeminent Energy-Conserving State~

Promotion of energy conservation is the necessary effort indispensable for Japan's economy not only for attaining energy security and overcoming the problem of global warming but also for achieving growth in the severe economic circumstances with wildly fluctuating crude oil prices. It is required for Japan to continue taking advantage of its strength and lead the world with its most advanced energy conservation technology in the world.

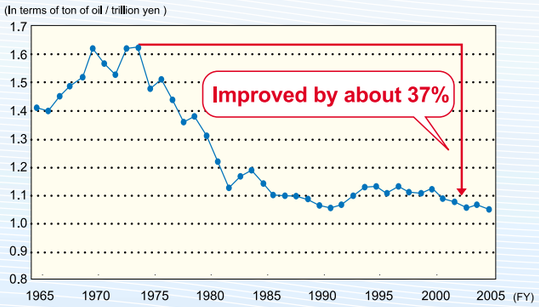
Circumstances Surrounding Japan's Energy Consumption

In Japan, after the oil crises, the government and private sector unified their efforts for energy conservation, and have improved the energy consumption efficiency by 37% over the past 30 years. As a result, primary energy supply amount per the unit of GDP in Japan has been reduced to the lowest level in the world (Figure 55).

On the other hand, the final energy consumption followed an increasing trend almost consistently over the period from 1973 to 2007, augmenting rapidly by 2.5 times in the private sector (business and household sector) in particular (Refer to Figure 5 in Page 5). In order to secure the stable supply of energy and promote the countermeasure against global warming, it is necessary to endeavor reinforcing further energy conservation measures mainly in the private sector where the increase in energy consumption is notable.

■ **Use of energy per real GDP in Japan (Figure 55)**

Source: Agency for Natural Resources and Energy, "Comprehensive Energy Statistics"

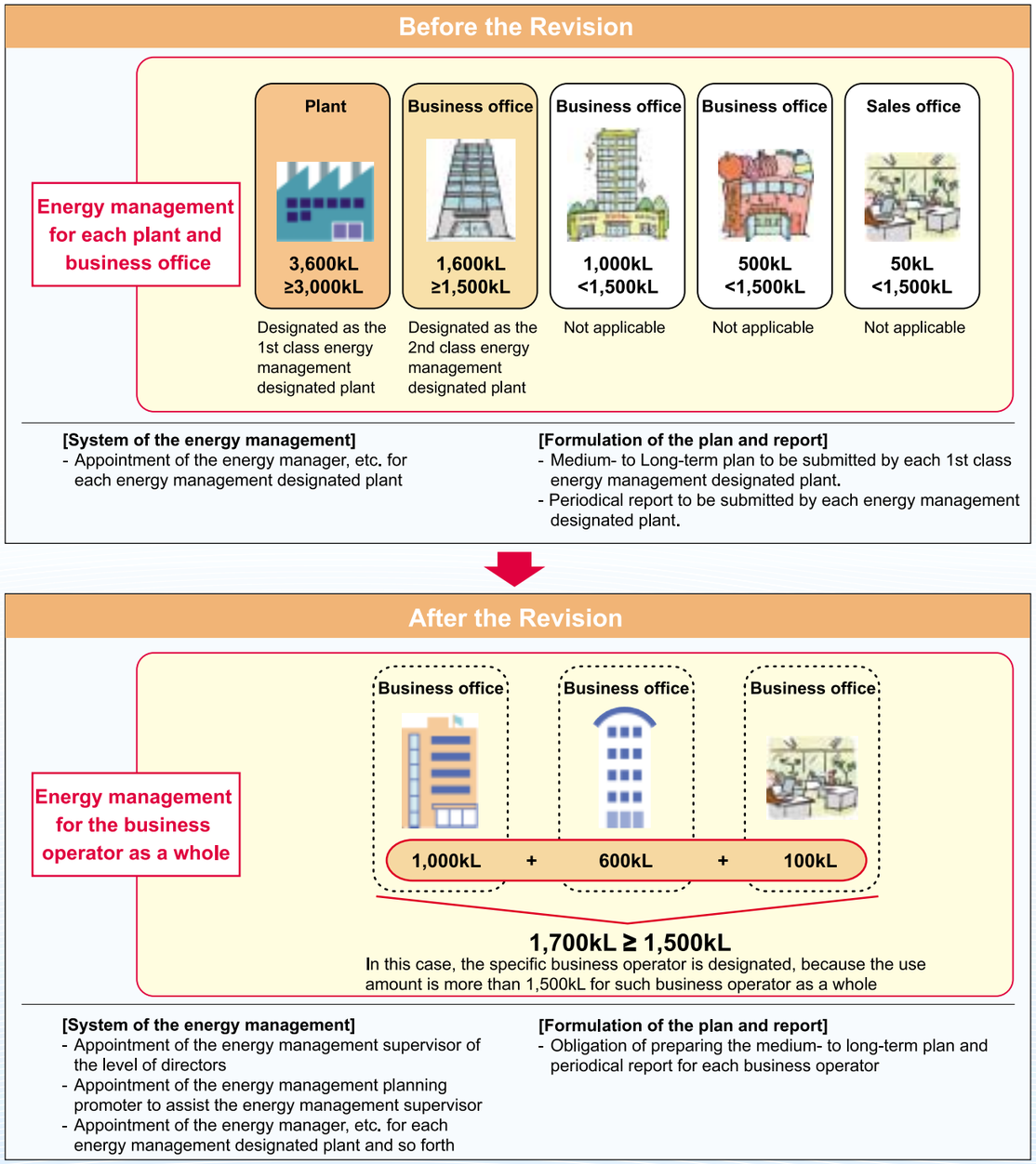


On the Energy Conservation Law

The government has, under the Energy Conservation Laws, obligated the plant, business office that uses 1,500kL of energy (in terms of crude oil) or more per year, to conduct energy management. In concrete terms, each plant, business office using 1,500kL or more of energy has to appoint an energy manager, etc., and submit a periodical report on the state of annual energy use every year. With regard to the measures for energy conservation for dwelling houses and buildings, the owners who newly build, renovate or repair them on a large scale have been obligated to notify the energy conservation measures to insulate the outer wall or window of the building and so forth.

In addition, in consideration of the large increase in the energy consumption amount in the private sector, the Energy Conservation Law was revised to obligate the energy management for each enterprise instead of each plant and business office as in the past. With this revision, it is now necessary for each enterprise to notify the government of the energy use amount, if such amount exceeds 1,500 kL (in terms of crude oil) in total in the entire enterprise concerned (including head office, plants, branch offices, sales offices and so forth). A franchise chain is treated as a business operator, to which the same regulation applied to each enterprise and similar regulation system are introduced (Figure 56). In the Energy Conservation Law revised this time, the measures for energy conservation in dwelling houses and buildings have been reinforced. More specifically, in the case where the efforts of the owner of the building who newly build, renovate or repair on a large scale are not sufficient, the order (penalty) from the government is newly added by this revision to the instruction and public announcement given by the government on the case in the past. Furthermore, the buildings of medium and small scale (excluding dwelling houses) are additionally obligated to newly notify the measures for energy conservation with a view to strengthening the energy conservation measures in the private sector.

■ **Cut-off values for each business operator and franchise chain (Figure 56)**



Crude oil equivalent annual energy consumption

Top Runner System

The Energy Conservation Law obligates manufacturers, etc. to achieve standard energy conservation target values set for any appliance, based on the top runner system, in order to promote the dissemination of the appliances with high energy conservation performance. The concept of this top runner system is to "make the energy conservation standards for each appliance such as the fuel efficiency standard for automobiles and energy conservation standard for electric appliances better than that of the most excellent product (top runner) among those commercialized at present. Due to the efforts of enterprises based on such a system, the energy conservation appliances of Japan have achieved high energy conservation efficiency, and 23 articles are checked with this system at present, namely air conditioners, televisions, electric refrigerators, etc. (Table 6).

Promotion of Introduction of Appliances, Dwelling Houses, Buildings, etc. with High Energy Conservation Effect

Efforts are being made for taking the following countermeasures against the rapid increase going on in the energy consumption in the private sector (business and household sector).

With regard to the support measures for dwelling houses, dissemination of energy-conserving ones is positively promoted through extending the period of the tax system for promotion of energy-conserving renovations in the tax system revision of FY 2010 and so on (Figure 57).

In addition, with a view to attaining the net zero energy in the dwelling houses and buildings in 2030, assistance is provided to those who introduce to dwelling houses and buildings the highly efficient energy system of high energy-conserving performance (capable of reducing the energy consumption amount by around 25% in a year) or the Building Energy Management System (BEMS). At the same time, the energy-conserving effect attained by such introduction and so forth will be verified, and efforts promoted for further energy conservation, drawing upon such achievements. Moreover, as the countermeasures against the problems facing small-and-medium-sized enterprises as well as a little larger ones, projects of diagnosis on the possibility of introducing energy-conserving technologies and so forth are implemented, while assistance is offered to the introduction of measurement monitoring system for "visualizing" the energy consumption amount. Hereafter, such efforts will continue to be advanced, while further actions for energy conservation will be concurrently promoted through both regulation and assistance.

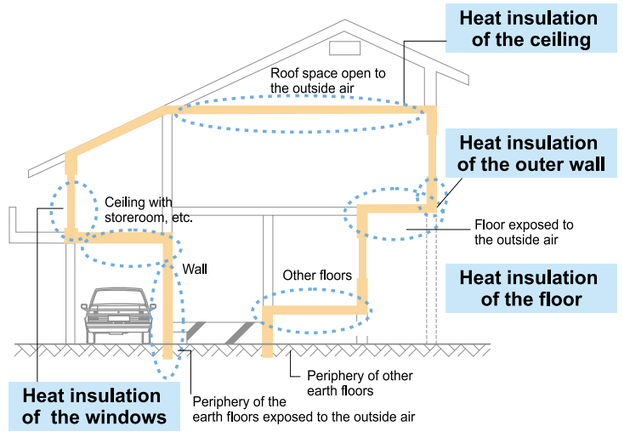
■ **Past energy conservation effects attained by the top runner system (Table 6)**

Name of appliance	Improvement in energy consumption efficiency (actual performance)	Details
Television (with Braun tubes)	25.7% (FY 1997 → 2003)	Annual power consumption amount (140kWh → 104kWh)
Video Tape Recorder	73.6% (FY 1997 → 2003)	Power consumption amount (4.55W → 1.20W)
Air conditioner (Room-air conditioner) *	67.8% (Refrigeration Year 1997 → 2004)	COP (3.01 → 5.05)
Electric refrigerator	55.2% (FY 1998 → 2004)	Annual power consumption amount (647.3kWh → 290.3kWh)
Electric freezer	29.6% (FY 1998 → 2004)	Annual power consumption amount (524.8kWh → 369.7kWh)
Gasoline-powered passenger car *	22.8% (FY 1995 → 2005)	Fuel efficiency (12.3km/l → 15.1km/l)
Diesel-powered truck *	21.7% (FY 1995 → 2005)	Fuel efficiency (13.8km/l → 16.8km/l)
Vending machine	37.3% (FY 2000 → 2005)	Annual power consumption amount (2,617kWh → 1,642kWh)
Fluorescent lighting fittings *	35.7% (FY 1997 → 2005)	Lumen / Watt (63.1lm/W → 85.6lm/W)
Electronic computer	99.1% (FY 1997 → 2005)	Watt / Mega computing (0.17 → 0.0015)
Magnetic disk device	98.2% (FY 1997 → 2005)	Watt / Gigabyte (1.4 → 0.0255)
Copier	72.5% (FY 1997 → 2006)	Power consumption amount (155Wh → 42.7Wh)
Electric toilet seat	14.6% (FY 2000 → 2006)	Annual power consumption amount (281kWh → 240kWh)
Gas water heater (Instantaneous gas water heater, Bathtub gas water heater)	5.5% (FY 2000 → 2006)	Heat efficiency (77.7% → 82.0%)
Gas cooking appliance (gas heater part)	15.7% (FY 2000 → 2006)	Heat efficiency (48.3% → 55.9%)
Gas stove	1.9% (FY 2000 → 2006)	Heat efficiency (80.9% → 82.4%)
Oil heater	5.4% (FY 2000 → 2006)	Heat efficiency (78.5% → 82.7%)

With regard to the appliances marked with *, energy conservation standard is determined by the energy consumption efficiency (example: km / liter) per unit, while for those not marked with * by energy consumption amount (example: kWh / year). "Improvement in the energy consumption efficiency" in the table above indicates the improvement ratio in accordance with each standard (example: When 10 km / liter or 10 kWh / year is improved to 15 km / liter or 5 kWh / year respectively (It is not thought that 33% improvement is achieved when the fuel consumption amount to drive over 100 km is improved from 10 to 6.7 liters.), improvement ratio is thought to be 50 %).

■ **Extension of the period of the tax system for promotion of energy-conserving renovations (for fixed property tax) (Figure 57)**

[Fiscal year of the creation: FY 2008]



○ In the case where the resident has conducted certain energy-saving renovation work (change to double sash window and so forth) on the existing dwelling house for him to live in:

- To allow deduction of a certain percentage of the outstanding balance of the housing loan related to the construction work concerned (up to the limit of 10 million yen) from the annual income tax amount for 5 years.
- To reduce by 1 / 3 the fixed property tax amount for the following fiscal year related to the house concerned (only for the portion up to the limit of 120m^2)

Provision of Information on the Energy-Conserving Products, etc.

In order to facilitate the choice of energy-conserving appliances for the consumer out of electric home appliances, OA equipment and so forth, dissemination of and enlightenment on the energy conservation labeling system using the logo mark (Figure 58) and international energy star program system are promoted with a view to driving forward the dissemination of energy-conserving appliances and urging the appliance manufactures and so forth to make efforts for further efficiency improvement. Moreover, information on the energy-conserving performance of the electric home appliances is provided to consumers through the spread of and cultivation on the unified energy conservation label for the retailers to display energy conservation-related information on the product.

■ **Energy Conservation Labeling System (Figure 58)**

With a view to providing information on the energy-conserving property of the electric home appliances and promoting the dissemination of products with high energy conservation effect, the energy conservation labeling system has been implemented.

■ **Examples of display on the energy conservation label**

	Achievement rate of energy conservation standards	Annual power consumption amount
Target fiscal year: FY 2006	**108%**	**175**kWh / year

	Energy conservation standard achievement rate	Annual power consumption amount
Target fiscal year: FY 2006	**91%**	**206**kWh / year

Label to be pasted on the product itself

[As of February, 2010 – 16 items, namely air conditioner, refrigerator, fluorescent lighting fittings, television, stove, gas cooking appliance, gas water heater, oil water heater, electric toilet seat, electronic computer, magnetic disk, transformer, jar rice cooker, microwave and DVD recorder]

Efforts to Develop Next-Generation Energy in the Transport Sector

Japan's transport sector is almost 100% dependent on oil. We are aiming at reducing this dependence to about 80% by 2030.

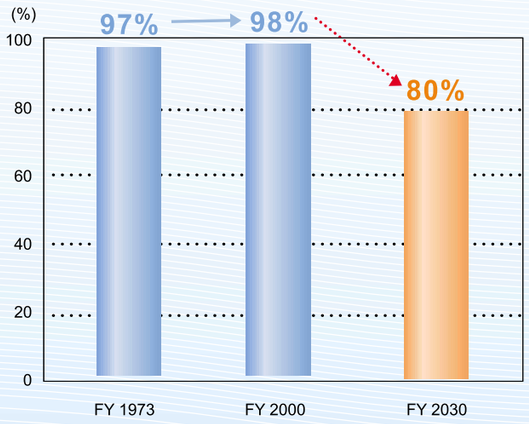
Reduction in Dependence on Oil

Oil accounts for about 50% of Japan's primary energy supply and, in particular, the transport sector, which features the use of automobiles depends almost 100% on oil. Thus, our vulnerability in terms of securing stable supply of energy remains very high. Because of this, the New National Energy Strategy aims to reduce the dependence on oil in the transport sector to 80% by 2030 (Figure 59), making efforts for developing next-generation energy sources for the transport sector an issue into the future.

Reduction in dependence on oil to around 80% by 2030

■ **Target of reduction in the degree of dependence on oil in the transport sector (Figure 59)**

Source: Ministry of Economy, Trade and Industry, "New National Energy Strategy"



Next-Generation Vehicles and Fuel Initiatives

Although, in reality, dependence on oil, which is convenient and efficient and already has an established infrastructure is inevitable to some degree or another, it is necessary to continue efforts to improve fuel economy, first of all, and, at the same time, diversify the range of fuels available for the transport sector by mixing new fuels such as biomass-derived fuels or GTL (Gas - To - Liquid) with existing oil-based fuels.

In addition, from the long-term point of view, fuels for the transport sector have to be diversified to electricity or oxygen by putting next-generation automobiles such as fuel-cell vehicles and electric cars into practical use and disseminating them.

For attaining the strategic target of reducing the degree of dependence on oil to 80% by 2030, approaches are being made to cooperate with automobile makers and the oil industry.

Five Strategies for the Next-Generation Vehicles and Fuel Initiatives

(1) Batteries: Promoting technology development of batteries and the construction of charging stations will lead to the widespread use of electric cars by 2030.

(2) Oxygen and fuel cells: Promoting research and development to be followed by verification tests to be implemented will lead to fuel prices price as low as that of the fuel for gasoline-based vehicles by 2030.

(3) Clean diesel: With industry-government-academia collaboration, we aim to the full-scale introduction of clean diesel cars after 2009, while trying to improve the image of diesel, while conducting a study on introducing diesel cars and to promote research and development.

(4) Biofuel: By accelerating technology development and improving legislative systems for securing good quality, we aim for a 100 yen / liter price (in 2015) tag for domestically-produced next-generation biofuel.

With further promotion of technological innovation, it is further aimed to realize 40 yen / liter.

(5) Vision for the world's most environment-friendly motorized society: By promoting technology development for automatic driving and traffic control, we aim to double the average driving speed in urban areas by 2030.

Roadmap for 2030

Target for 2030 — Dependence on oil in the transport sector to be reduced to 80% — Energy efficiency to be improved by 30%

		Present	2010	2015	2020	2030
Battery	Use / form	Small EV for electric power companies	For limited use Commuter EV High-performance HV	Fuel cell vehicles General commuter EV Plug-in HV car	High-performance plug-in HV car	Full-fledged EV
	Performance	1	1	1.5 times	3 times	7 times
	Cost	1	1/2 times	1/7 times	1/10 times	1/40 times
		200,000 yen / kWh	100,000 yen / kWh	30,000 yen / kWh	20,000 yen / kWh	5,000 yen / kWh
Hydrogen and fuel cell	Driving distance	300km	400km		800km	
	Vehicle value	20 times	3 - 5 times		1.2 times	
	Cost	Several million yen / kW	5,000 yen / kW		4,000 yen / kW	
	Durability	2,000 hours	3,000 hours		5,000 hours	
Clean diesel			Gas emission performance / price (including fuel cost), equal to the gasoline vehicle			
Biofuel	Raw material			Waste timbers from the saw mill, straws, etc.	Waste timbers left in the forest	
	Cost			100 yen / L Biomass Nippon Integral Strategy Promotion Conference [Process schedule for the production expansion of domestically-produced biofuel]	100 yen / L Biomass Nippon Integral Strategy Promotio Conference [Process schedule for the production expansion of domestically-produced biofuel]	
				40 yen / L Case of technological innovation (energy recovery ratio: 35%)	40 yen / L Case of technological innovation (energy recovery ratio: 35%)	
World's most environment- friendly motorized society				Average speed of cars in 3 largest urban areas to increase by 1.5 times (CO_2 emissions: to be reduced by 20%)		Average speed of cars in 3 largest urban areas to increase by 2 times (CO_2 emissions: to be reduced by 30%)

Reinforcement of Relationships with Resource-Rich Countries and Cooperation with Asia

It is important for Japan to strengthen its overall relationship with resource-rich countries. Therefore wide-ranging cooperation not limited to the resource and energy fields with resource-rich countries will be advanced. In addition, Japan will positively promote cooperation in the area of energy efficiency and conservation and so forth, in order to contribute to the solution of energy problems in Asia where the demand for energy is increasing rapidly.

Strengthening Integral Relationships with Resource-Rich Countries

It is important to make efforts for strengthening integral relationships with resource-rich countries. For this reason, Japan will carry out wide-ranging cooperation by prime minister and cabinet minister members not limited to the fields of resources and energy including research and development, education, environment and so forth in the scientific and technological area using ODA(Official Development Assistances), in the manner of responding adequately to the needs of the resource-rich countries. In addition, in various international conferences, meetings of oil-producing and consuming countries and so forth, continuous approaches will be actively made for stabilizing crude oil prices and market.

Cooperation with Asian Nations in the Energy and Environment Fields

The energy demands of China, India and other Asian nations is expecting to increase rapidly and it is indispensable to stabilize the growth of the energy market in the world to work on the energy problems of Asian nations. Japan, with its excellent energy and environmental technologies, will promote cooperation with the rest of Asia in the field of energy and environment in terms of, for example, disseminating energy conservation technology or technology for the clean use of coal, so as to contribute to the establishment of energy security and solutions to help tackle environmental problems in the entire Asian region.

Besides, especially with respect to China and India, relations will be strengthened through holding ministerial level dialogs.

Diplomacy on Resources and Energy

3rd Asian Ministerial Energy Roundtable Meeting

In April, 2009, the 3rd Asian Ministerial Roundtable Meeting was held in Tokyo hosted jointly by Japan and Qatar. It is a significant achievement that it was decided in this meeting to request the regulatory authorities for further concerted actions to strengthen supervision of the commodity future market and improve transparency in such a market, with a view to stabilizing the oil market. In addition, it was been decided to promote specific projects, namely ① Formulation of the forecast of supply and demand in Asia, ② Sharing of the cases of advanced projects for energy conservation / new energies, and ③Mutual provision of the opportunities for training (Japan indicated the acceptance of 2,000 trainees over 3 years), and so forth.

G8 Energy Ministerial Meeting

In May, 2009, the G8 Energy Ministerial Meeting was held in Italy, which Minister of Economy, Trade and Industry Nikai attended. In this meeting, Japan reported on the results of the Asian Ministerial Roundtable Meeting of April, achievements of which were reflected on the joint statement.

Moreover, the signing ceremony for the establishment of International Partnership for Energy Efficiency Cooperation (IPEEC), which had been led by Japan to its formation, was carried out under the auspices of the co-chairmen, Italy and Japan. It is really a significant attainment that the framework for promoting energy conservation globally was formally inaugurated at last with the participation of principal economies such as China, Brazil and Mexico, in addition to G8 countries.

2nd Preparatory Meeting for the Establishment of the International Renewable Energy Agency (IRENA)

In June, 2009, the 2nd preparatory meeting for the establishment of the International Renewable Energy Agency (IRENA) to help the Capacity Building of developing nations and recommend policies to them, aimed at disseminating the use of renewable energies, was held in Abu Dhabi, which Parliamentary Secretary for Foreign Affairs Nishimura attended from Japan for signing documents to become its member. In this meeting 15 countries including Japan, USA, UK and Australia signed in the same way to become new members, increasing the total number of member countries to 136 at the end of the meeting. In addition, in this meeting voting for the countries of interim headquarters and Interim Director General of IRENA were conducted, and Abu Dhabi and Pelosse of France Deputy Head of Staff in the Private Office of French Minister for Ecology were elected respectively. Hereafter, the action plan and budget will be formulated in preparation for the establishment in 2010.

IEA Ministerial Meeting

In October, 2009 the IEA Ministerial Meeting was held in France, which Minister of Economy, Trade and Industry Naoshima attended. In this meeting, the following subjects were discussed, and a joint statement was adopted. ① To let emerging nations such as China, India and Russia participate in the activities of IEA, ② Measures for energy to realize the scenario of halving the CO_2 emissions of the entire world in 2050 ("450 ppm Scenario"), ③ Cooperation between IEA and regulating and supervising authorities, aimed at the stabilization of crude oil prices, and so forth.

Cooperation with Asian Nations in the Energy and Environment Fields

ASEAN+3/EAS Energy Ministers' Meeting

In July, 2009, the 6th ASEAN + 3 Energy Ministers' Meeting and the 3rd EAS Energy Ministers' Meeting were held in Myanmar (Mandalay), which the Councilor of the Resources and Energy Agency attended, acting as the co-chairman in both meetings. In the 6th ASEAN+3 Energy Ministers' Meeting, Japan emphasized the importance of the oil stockpile, welcomed the progress in the efforts of each country aimed at the formulation of road map for oil stockpile in Asia, and, at the same time, expressed its readiness to share Japan's experience and know-how with regard to the responsive actions at the time of emergency. In addition, in the 3rd EAS Energy Ministers' Meeting, it was agreed that each country will follow up the energy conservation target / action program submitted under the leadership of Japan. All of these points were included in the joint statement.

Japan-China Energy Conservation Forum

In November, 2009, the "4th Japan-China Energy Conservation Forum (Japan-China Comprehensive Forum on Energy Conservation and Environment)" was held in Beijing, in which participated more than 1,000 related people in both government and private sectors of both countries, including Minister of Economy, Trade and Industry Naoshima and Vice-Premier Li Keqiang from Japanese and Chinese side respectively. In this forum, agreements on 42 items for cooperation, the largest number ever, were signed. Viewing the signed agreements by region, up to the last time they were mainly in the Chinese coastal areas, though this time the areas covered by agreements were expanded to the inland. Furthermore, viewing them by field, projects related to resources recycling are increasing in number in addition to those of cooperation for energy conservation and water treatment. Consequently, the breadth of cooperation between Japan and China for energy conservation and environment as the business was widened further.

For More Sophisticated Methods of Energy Supply Structures

Since the necessity is intensified for the efforts to sophisticate the energy supply structures in consideration of the recent situation surrounding Japan in respect of energy, the "Law Concerning Promotion of the Development and Introduction of Alternative Energy (Alternative Energy Law)" was revised in July, 2009, and, at the same time, the "Law Concerning the Promotion of Use of Non-Fossil Energy Sources and Effective Use of Fossil Energy Raw Materials by Energy Suppliers (Law Concerning Sophisticated Methods of Energy Supply Structures)" was established.

Revision of the Oil AlternativeEnergy Law

In revising the Oil Alternative Energy Law this time, the name of the law is changed to the "Law Concerning the Promotion of Development and Introduction of Non-Fossil Energy (Non-Fossil Energy Law)", while, at the same time, the recipient of assistance is switched from the energy alternative to oil to the "non-fossil energy", which can be obtained without using oil, coal, natural gas and so forth.

Furthermore, on the basis of this revision, the Minister of Economy, Trade and Industry is to formulate and publish the supply targets of non-fossil energies, and, at the same time, provide, as required, guidance and advice to those who conduct business, using energy, after formulating and publishing the guideline for the introduction of non-fossil energies.

Establishment of the Law Concerning More Sophisticated Methods of Energy Supply Structures

The objective of the Law Concerning Sophisticated Methods of Energy Supply Structures is to promote the use of the non-fossil energy sources and effective use of the fossil energy raw materials by energy suppliers such as electricity, oil and gas business operators, through the efforts for expanding use of non-fossil electrical energy sources such as nuclear, solar and wind power as well as biomass energy, purchasing electric power generated by sunlight at a certain minimum price and so on. (Table 7)

Its content is that the Minister of Economy, Trade and Industry shall first formulate and publish to the energy suppliers the "fundamental policy" to indicate the basic principles and direction of the policy for promoting comprehensively and systematically the use of non-fossil energy sources and effective use of fossil energy raw materials, as the matter to keep in mind in conducting business of each of them.

Next, the Minister of Economy, Trade and Industry will:

- formulate the "criteria for judgment" for each type of business on the measures for the energy suppliers to work on in order to promote comprehensively and systematically use of non-fossil energy and effective use of fossil energy raw materials, and publish it, while, at the same time,
- obligate specific business operators of a certain minimum scale, selected from among all energy suppliers, who can technically and economically use non-fossil energy sources or effectively use fossil energy raw materials, to prepare and submit the plan related to the measures to be tackled, and, in addition,
- give the advice and order to the specific business operators concerned, in the case where the state of efforts by such specific business operators, based on the plan submitted, is notably insufficient, in the lightg of the "criteria for judgment". (Figure 60)

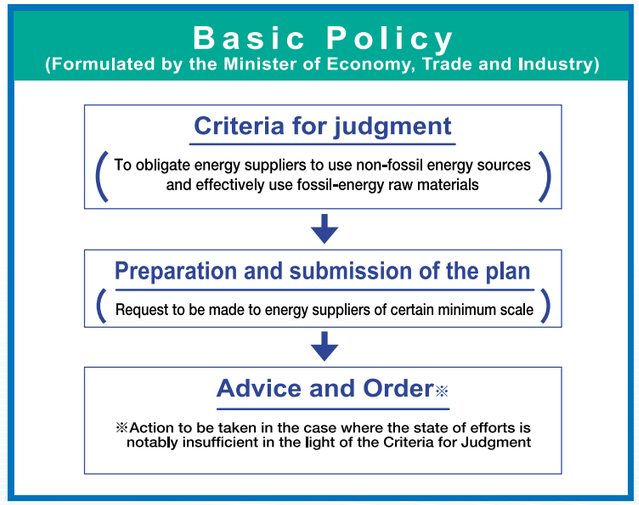
Direction of the Approaches

As seen above, in consideration of the circumstances surrounding energy for Japan, it is necessary to positively make efforts to secure the stable and appropriate supply of energy in the medium- to long-term, through the measures based on the Non-Fossil Energy Law and the Law Concerning Sophisticated Methods of Energy Supply Structures.

Moreover, in the process of promoting such efforts, there remain tasks required to be worked on in the long term, such as realization of a low-carbon societyand necessity of the change in the way of thinking / in the lifestyle of the Japanese people as a whole. For these tasks, it is necessary and indispensable to realize innovative technological development and transform the social system on the basis of such development. For this purpose, it is required for each of the central and local governments as well as energy users, to positively make efforts, getting over the barriers among the different sectors.

Revision / establishment of these two laws of this time constitute an important step for such a process, and efforts will be steadily made, aiming at further sophistication of the energy supply structure of Japan.

■Schematic diagram of the Law More Concerning Sophisticated Methods of Energy Supply Structures (Figure 60)



■Efforts to be made by the business operator of each category, based on the Law More Concerning SophisticatedMethods of Energy Supply Structures (Table 7)

	Electricity business operators	Oil business operators	Gas business operators
Promotion of the use of non-fossil energy sources	●Increase in the use of non-fossil electric power sources such as nuclear power and renewable energies ●Implementation of the purchase of electric power generated by sunlight at an appropriate price during a certain period	●Increase in the supply of bio-gasoline	●Use of bio-gas as the raw material for the city gas
Promotion of the effective use of fossil energy raw materials	(No obligation imposed)	●Reduction in the residue in the oil refining process	●Use of Boil-off gas (BOG)※ ※Gas generated from LNG through spontaneous vaporization

Develop Innovative Technologies in the Field of Energy

Our country is advocating a long-term target of halving global greenhouse gas emissions by 2050 to counter climate change. Innovative energy technologies are essential if we are going to reach this target. Therefore METI is promoting concrete efforts for innovative technological development and international cooperation in the energy field looking toward 2050.

Current State of Energy Technology Development

While energy technology development requires a long time and a large-scale investment up to the stage of its practical use, it involves enormous uncertainty for the future. For this reason, it is a field that the government should share a big role in terms of research and development (R&D) investment, since such an approach by private enterprise is not always easy.

However, although the energy R&D investment of the government and private sectors in many countries once increased following the two oil crises, it has stagnated after peaking in 1980 owing to the subsequent stability of the price of crude oil (Figure 61).

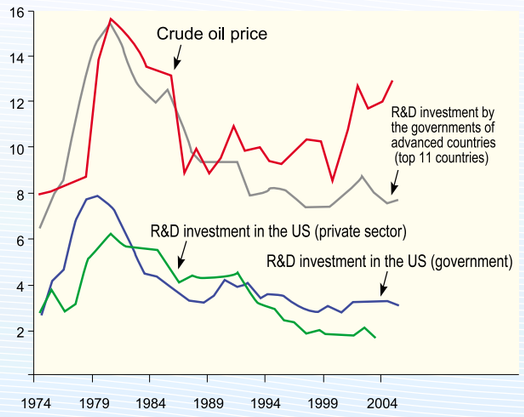
In regard to country-by-country investment, Japan, the U.S. and Europe are leading the world, and a long-term, continuous approach to investment in the energy field must be promoted as we face a global task to deal with the problem of climate change in addition to maintaining and promoting energy security (Figure 62).

Stagnant R&D investment

■ **Growing recognition on the importance of energy technology development (Figure 61)**

Source: JGCRI「Global Energy Technology Strategy」

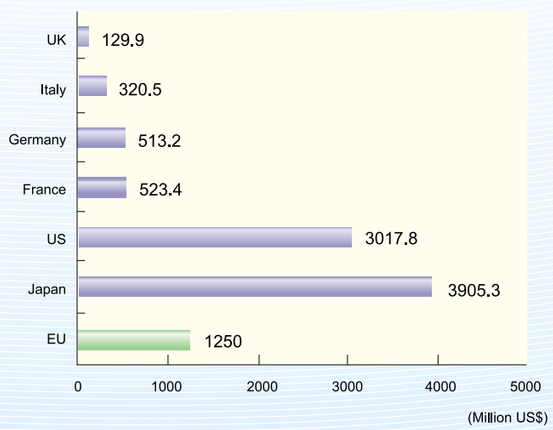
Unit: billion US$ (in 2005 price)



Note: Crude oil price: Price of Arabian Light crude oil up to 1985, and of Dubai crude oil after 1986

Japan, the U.S. and Europe lead the world in the amount of investment

■ **Public investment on energy technology R&D in developed countries (2005) (Figure 62)**



Note: EU data for 2007 were taken from materials supplied by the EU

Innovative Energy Technology that should be Focused on as a Priority

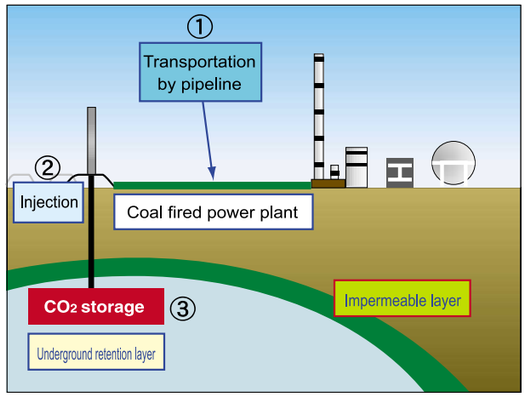
21 technologies that may potentially contribute greatly to substantial CO_2 emissions reduction are to be selected as technologies with which our country can lead the world in the fields such as power generation and transmission, transport, industry, and in the commercial and residential sectors and so forth, in order to accelerate and promote innovative technological development in the energy field. With regard to these technologies, road maps for the development of each technology are being made to clarify R&D direction and to show milestones to facilitate the steady advancement of technological development over the long term.

Specific Examples of Innovative Energy Technologies

Examples of innovative energy technologies include high-efficiency coal fired power generation, carbon dioxide Capture and Storage (CCS), and innovative photovoltaic power generation. High-efficiency coal fired power generation achieves high-efficiency thermal power generation by gasifying coal while emissions could be further reduced to zero, if combined with CCS to efficiently separate and recover the generated CO_2 and store it underground (Figure 63).

Moreover, innovative materials and structures such as quantum nanostructures are being developed to drastically improve the efficiency of photovoltaic power generation technology and to reduce costs with the adoption of organic PV cells. In addition, technology that contributes to significant reductions of CO_2 in various fields is expected to be created. It is important to steadily promote the research and development, based on the road map (Figure 64).

■ **Technology that can reduce to zero the CO_2 emissions from coal fired power generation (Figure 63)**



(CO_2 recovery / storage)

Note 1:CCS (CO_2 recovery / storage) Note 2:HEMS (Home Energy Management System)
Note 3:BEMS (Building Energy Management System) Note 4:EMS (Energy Management System)

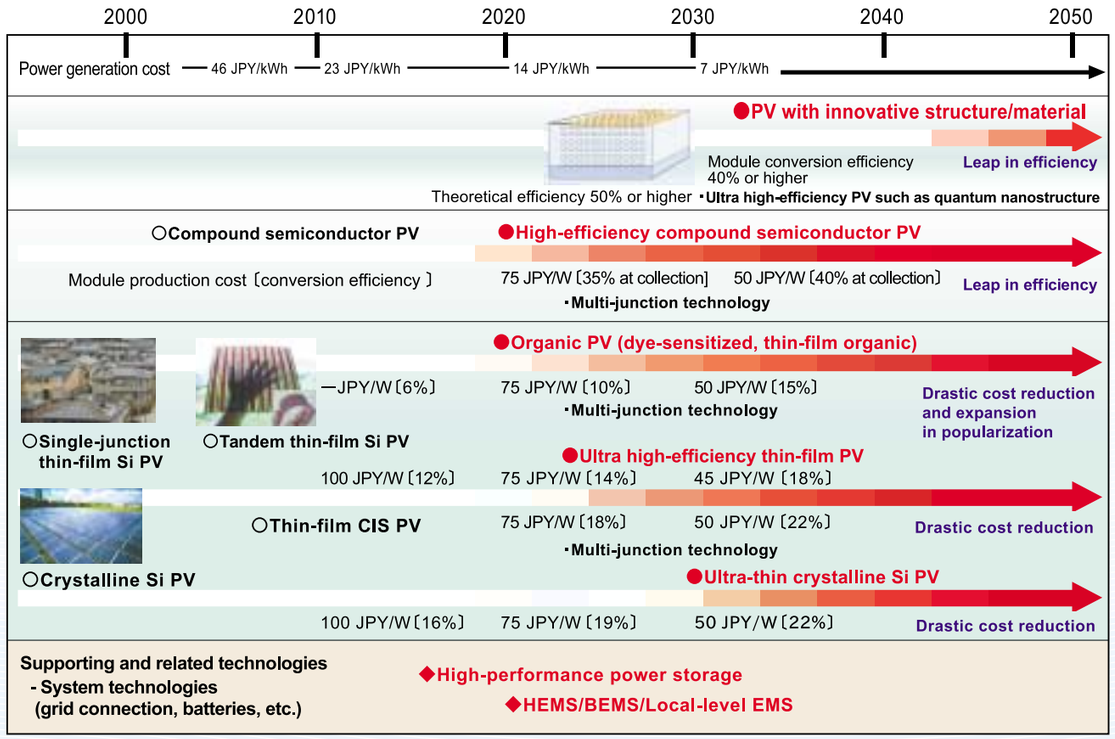
Cooperation with overseas countries

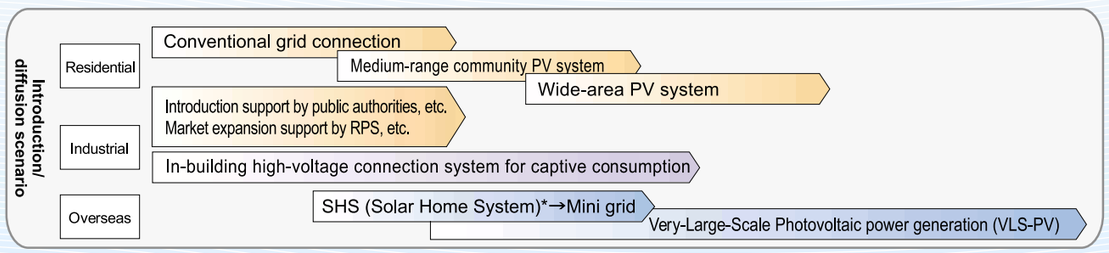
In order to halve the amount of CO_2 in the world, international cooperation is important. In the area where it is thought to be effective to efficiently advance technological development through international cooperation, Japan is promoting collaboration through the bilateral frameworks between Japan and the United States, Europe, etc. as well as the multilateral framework such as IEA, depending on the progress in the technological development of Japan, international trend and so forth.

● Flexible PV Cells

Innovative photovoltaic power generation technology that allows the panel to be installed anywhere without the need of choosing the place, by making use of thin-film silicon and so forth.

■ Example of road map
(Innovative Photovoltaic Power Generation) (Figure 64)





*Small-scale system for houses in areas without electricity supply in developing nations

Promotion of Energy-Related Education

The Agency for Natural Resources and Energy is implementing the following projects to improve the education of energy issues so as to enhance the capability of children, who will play the main role in the next generation, to have the ability to exercise the appropriate judgment and courses of action for the future.

Energy Education Practice School (Elementary, Junior High and Senior High Schools, etc.)

Elementary, Junior High and Senior High Schools, etc. that intend to positively address energy education in or out of class and so on are selected as "Energy Education Practice School" where various kinds of practical research are conducted. At the same time, by having the achievements at such schools known in details by schools across the country, these activities are aimed at promoting the approach of, systematically improving the quality of and dissemination and diversification of energy education. By FY 2008, these activities had been actually conducted at 174 elementary schools, 106 junior high schools and 110 senior high schools.

From FY 2009, 36 "Trial Schools"(28 elementary schools and 8 junior high schools) have been selected, where energy education was practiced for one year in accordance with the "subjects for learning" prepared in advance and the "examples of class development" that provide the instances of development for the actual class, while 21 "Pilot Schools"(6 elementary schools, 5 junior high schools and 10 senior high schools) have been separately selected, where energy education was practiced for three years in accordance with the learning program prepared independently by each school on the basis of the "Tasks" provided in advance.

Energy Education Promotion Conference, Regional Base University and Advanced Regional Base University

Universities scheduled to be the bases in the region for the research and practice in relation to the energy education had been chosen as the regional base universities (36) and advanced regional base universities (11) up to FY 2008, which had propelled the research and systematization for promoting energy education.

From FY 2009, in 5 blocks across the country, namely "Hokkaido and Tohoku", "Kanto and Koshin-etsu","Chubu, Hokuriku and Kinki", "Chugoku and Shikoku" and "Kyushu and Okinawa", the "Energy Education Promotion Conference" composed of energy education-related people in each block was organized, those who intend to conduct activities for dissemination and enlightenment and practice / research of energy education were selected, and the activities for the practice and research of energy education are being promoted.

Orientation Session for Teachers, etc.

Lecture meetings of experts on the latest energy situation and energy and environmental problems, workshops in relation to the development of curriculums and educational materials, where examples of educational practices are presented and so forth are held for teachers of elementary, junior high and senior high schools as well as students of teacher training courses including the faculty of education in universities, etc. Training sessions of such composition and tours to the energy-related facilities and so forth, all fitted to the actual condition of the area of venue, are held at about 5 places across the country. At the same time, supplementary educational materials to be used in the classes of elementary, junior high and senior high schools are compiled and distributed to school.