# ELECTRICITY REVIEW JAPAN

2010

The Federation of Electric Power Companies of Japan

# History of Japan's Electric Power Industry

Electricity was first used in Japan on March 25, 1878 at the Institute of Technology in Toranomon, Tokyo when an arc lamp was switched on in commemoration of the opening of the Central Telegraph Office. Eight years later in 1886, Tokyo Electric Lighting commenced operations as the nation's first electric power company, and began supplying electricity to the public in the following year.

In the early days, electricity was used primarily for lighting and gradually found broader applications as a power source. By 1896, the number of electric utilities established throughout the nation reached a total of 33, and the number of electric lights with a power supply increased to 120,000.

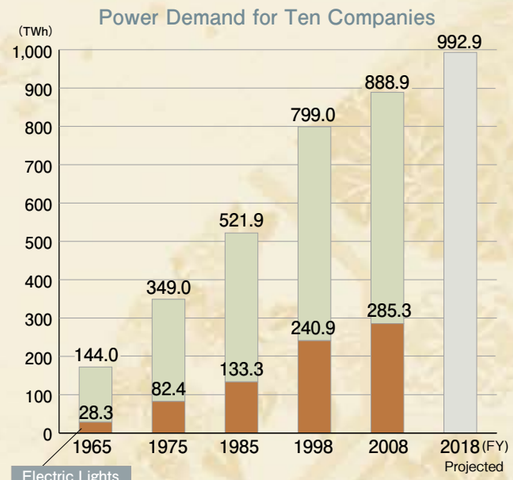
The early 20th century marked the establishment of long-distance transmission technology. As larger power plants were introduced, generation costs fell and electric lights came into wider use throughout the country. Consequently, electricity became an indispensable power source for industry as well.

In the years that followed, the electric power industry grew in tandem with the modernization and development of Japan's industry. At the same time, the industry experienced a major restructuring that led to the dissolution of 700 electric utilities, which merged to create five major electric utilities after the First World War. During the Second World War, the electric power industry was completely state-controlled and utilities were integrated into Nihon Hatsusoden Co. (a nationwide power generating and transmitting company) and nine distribution companies.

By the end of the war in 1945, Japan's electric power facilities had been destroyed by bombing during the conflict or had deteriorated from overuse. While restructuring of the industry was being discussed, the Korean War broke out in 1950. The resulting war boom allowed utilities to recover rapidly, and as a result, nine regional private electric power companies (Hokkaido, Tohoku, Tokyo, Chubu, Hokuriku, Kansai, Chugoku, Shikoku and Kyushu) were established in 1951. This structure remains to this day, and with the return of Okinawa to Japan in 1972, Okinawa Electric Power Co. joined as a tenth member.

In March 2000, partial liberalization of power retail supply for extra-high voltage users started. The Electricity Industry Committee (an Advisory Committee for Natural Resources and Energy, a consultative body to the Minister of Economy, Trade and Industry) verified the current scheme and discussed how the electric power industry should operate in the future. In conclusion, the committee proposed the establishment of a Japanese model of liberalization, which is based on fair competition and transparency while maintaining a vertical integration of generation, transmission, and distribution in the light of a stable supply of electricity. As a result, the revised Electricity Utilities Industry Law was promulgated in June 2003 and the scope of liberalization was expanded twice, once in April 2004 and again in April 2005.

Today, the ten electric power companies that make up the membership of the Federation of Electric Power Companies (FEPC) provide reliable electricity supplies to the entire nation. As in the past, the industry continues to grow and change, with issues such as environmental preservation and market liberalization.




Note: Data in 1965 is based on nine companies.
Sources: Handbook of Electric Power Industry and others

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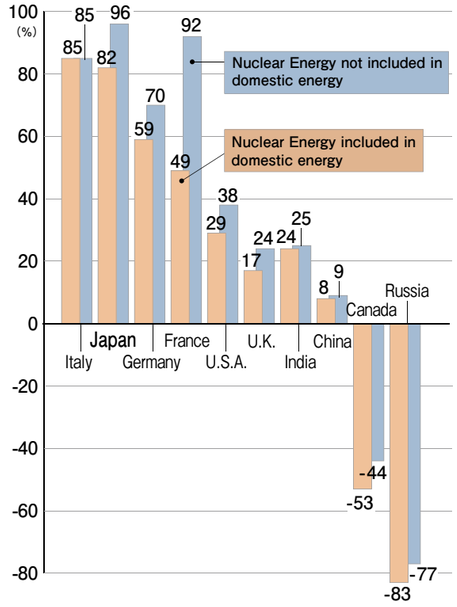
Note:
Nine Companies include Hokkaido, Tohoku, Tokyo, Chubu, Hokuriku, Kansai, Chugoku, Shikoku and Kyushu.
Ten Companies include the above Nine Companies plus Okinawa.

# Japan's Vulnerable Energy Supply Situation

Resource-poor Japan is dependent on imports for 96% of its primary energy supply; even if nuclear energy is included in domestic energy, dependency is still at 82%. Thus, Japan's energy supply structure is extremely vulnerable. Following the two oil crises in the 1970s, Japan has diversified its energy sources through increased use of nuclear energy, natural gas and coal, as well as the promotion of energy efficiency and conservation. Despite these improvements, oil still accounts for about 50% of Japan's primary energy supply, and nearly 90% of imported oil comes from the politically unstable Middle East. Moreover, prospects for importing electricity from neighboring countries are very poor because Japan is an island nation. Finally, there are growing concerns about environmental problems due to energy use and the need to reduce carbon dioxide emissions to cope with global warming. Therefore, Japan's energy situation forces the country to focus on the two prime concerns of energy security and environmental preservation.

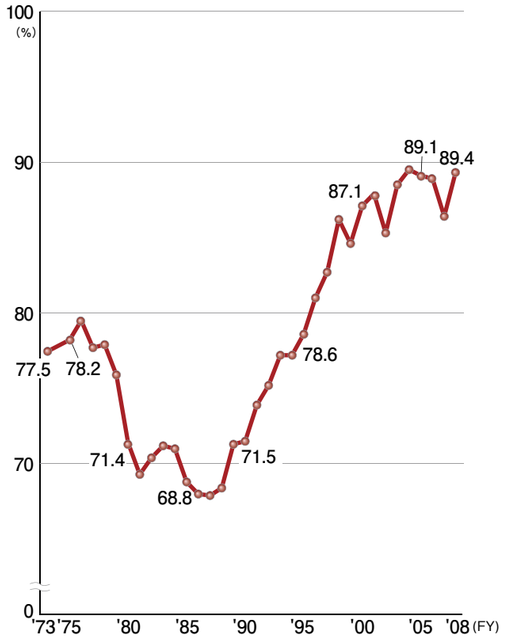
LNG Terminal

Dependence on Imported Energy Sources by Major Countries (2007)




Source: IEA "Energy Balances of OECD Countries 2009 Edition",
IEA "Energy Balances of Non-OECD Countries 2009 Edition"

Japan's Reliance on Middle East Crude Oil of Total Imports




Source: Petroleum Association of Japan

# Japan's Energy Policy

On the basis of such energy-related circumstances, the Basic Act on Energy Policy was promulgated by the national government in June 2002. The Act lays down three basic policies with respect to measures on energy supply and demand:

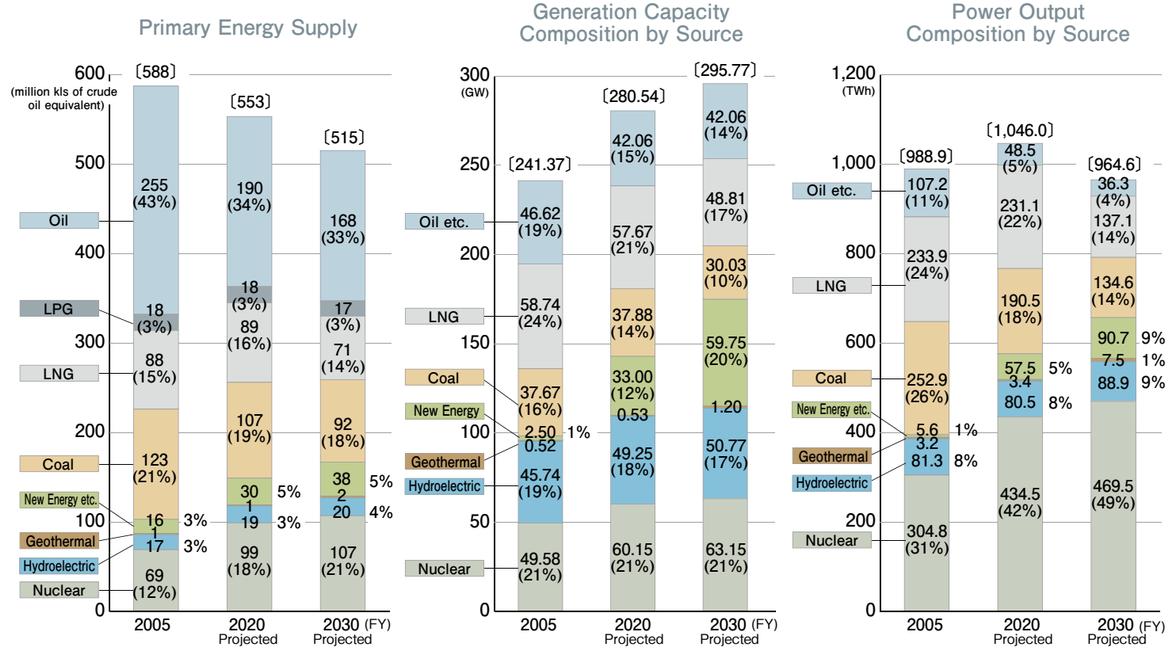
1) Securing stable supply,
2) Environmental suitability,
3) Utilization of market mechanisms, which should be coordinated with the first two basic policies.

As mandated by this Act, in October 2003 the Cabinet endorsed a national Basic Energy Plan, which outlines the fundamental direction of mid- and long-term energy supply and demand policies until 2030. The Plan was revised in 2007 in accordance with the law which stipulates that the government shall review the plan at least once every 3 years.

In May 2006, METI drafted the New National Energy Strategy, which presents Japan's long-term energy strategy centered on the reinforcement of energy security and stipulates numerical targets. Regarding nuclear energy, maintaining its share of power output at least 30% to 40% until 2030 and beyond is clarified as a target.

In August 2005, The Energy Supply and Demand Subcommittee of the Advisory Committee for Natural Resources and Energy to the Minister of Economy, Trade and Industry (METI) presented the updated Long-term Energy Supply and Demand Outlook. This announcement followed Prime Minister Aso's decision to set a new mid-term GHG emission reduction target (to reduce the emissions by 15% from the 2005 level by 2020). The Outlook considers concrete measures for GHG emissions reduction to achieve the government's target along with refiguring of the prospect of energy supply and demand structure. While the Outlook provides three separate model cases based on the extent of development and introduction of energy technologies, all of the cases assume that measures will be taken to ensure that nuclear power generation continues to play an important role into the future as an essential power source; premises include the construction of nine new nuclear power plants and improvement of the overall capacity factor by approx. 20% to approx. 80% on average up to 2020.

Long-term Energy Supply and Demand Outlook (August 2009) -Maximum Introduction Case- (*)

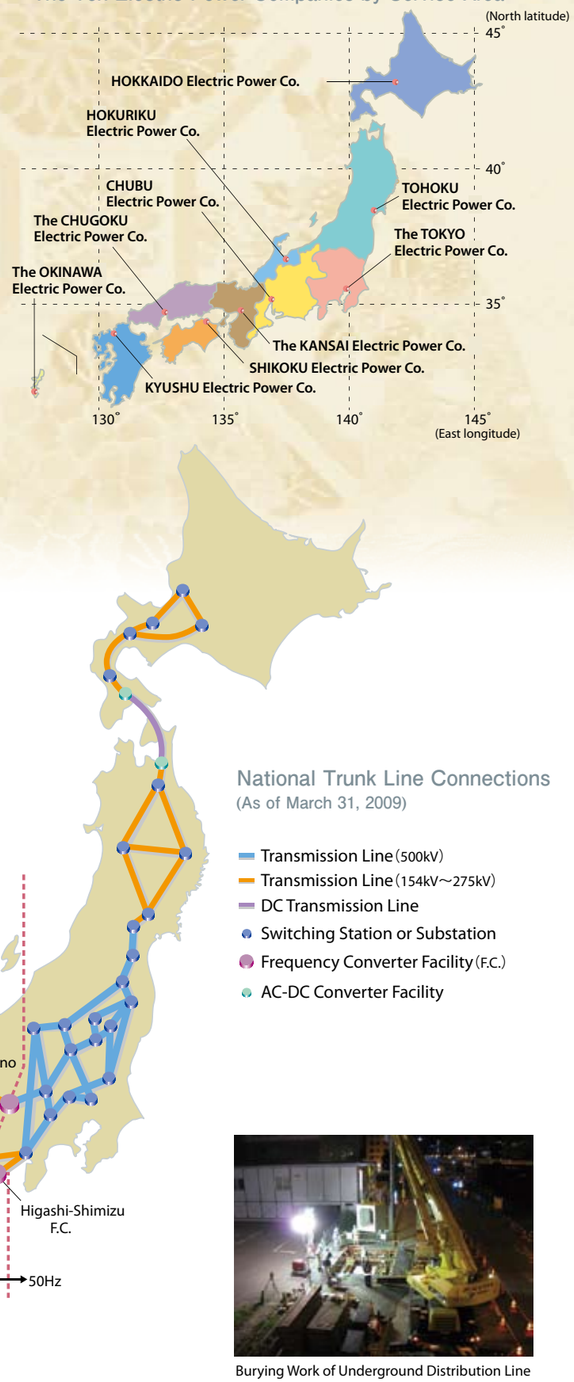



Note: (1) (*)This case assumes utmost dissemination of equipment, of which energy efficiency performance will significantly improve with cutting-edge technologies that are already at the deployment stage, without imposing obligatory measures on the people.
(2)Figures may not add up to the totals due to rounding.
Source: The Energy Supply and Demand Subcommittee of the Adcisory Committee for Natural Resources and Energy

# Ten Electric Power Company Structure

The ten privately-owned regional electric power companies in Japan are responsible for providing local operations from power generation to distribution and supplying electricity to their respective service areas. In addition, the ten electric power companies cooperate with each other to ensure a stable supply to customers nationwide. For example, the electric power companies work together to exchange or provide electricity in order to cope with emergency situations resulting from accidents, breakdowns, or summer peak demand. To ensure the smooth operation of power exchange, extra-high voltage transmission lines link the entire country from Hokkaido in the north to Kyushu in the south.

## The Ten Electric Power Companies by Service Area





Frequency Converter Facility

## National Trunk Line Connections
(As of March 31, 2009)


- Transmission Line (500kV)
- Transmission Line (154kV~275kV)
- DC Transmission Line
- Switching Station or Substation
- Frequency Converter Facility (F.C.)
- AC-DC Converter Facility


Burying Work of Underground Distribution Line



# Fair Competition and Transparency

The electric power market in Japan is gradually being liberalized, while the existing regional ten electric power companies, as "responsible entities," continue to handle their overall operations of generation, transmission, and distribution to ensure the stable supply of electricity.

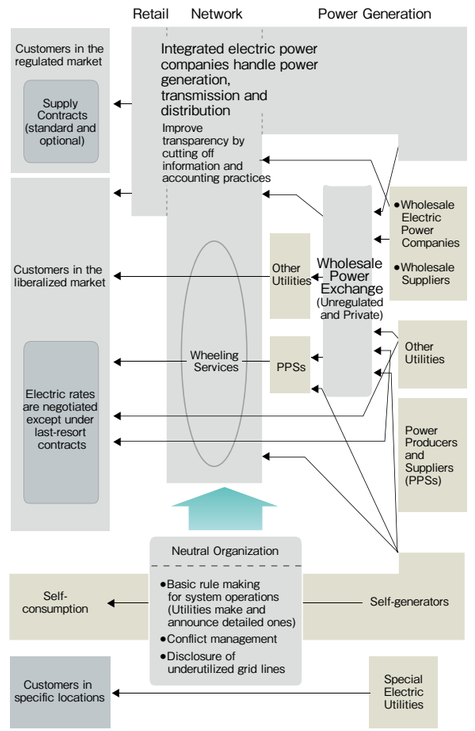
Japan has chosen to liberalize the electric power market in stages. In March 2000, the retail market was partially liberalized to allow power producers and suppliers (PPSs) to sell electricity to extra-high voltage users whose demand is approximately over 2MW. From April 2005, the scope of liberalization was expanded to all high-voltage users whose demand exceeds approximately 50kW. All customers in the regulated market continue to receive electricity supplied by each regional electric power company that is responsible for supplying electricity within its designated service area.

From April 2007, the pros and cons of total electric power liberalization were studied by the Electricity Industry Committee (an Advisory Committee for Natural Resources and Energy, a consultative body of the Ministry of Economy, Trade and Industry). In March 2008, the Committee concluded that total liberalization was unlikely to benefit customers under the present situation, and so the idea of expanding the scope of liberalization was abandoned at the time and would be subjected to future reviews after a certain period (approximately five years).

To ensure fair and transparent operations of electric power transmission and distribution, the Electric Power System Council of Japan (ESCJ) was established as a rule-maker and supervisor and started full-scale operation on April 1, 2005. In addition, Japan Electric Power Exchange (JEPX), which is formed by electric power companies, PPSs and self-generators, was established in November 2003 and started business on April 1, 2005.

* In Okinawa, the scope of market liberalization is different.

## The New Electricity Supply System (from April 2005)




Column

### Establishment of Electric Power System Council of Japan

In February 2004, the Electric Power System Council of Japan (ESCJ) was established in order to ensure fairness and transparency in transmission and distribution segments in which electric utilities own and operate the systems. The Council started to support power transmission and distribution from April 2005, aiming to formulate basic rules on power systems as well as to implement market oversight and dispute settlement functions.

### Establishment of Japan Electric Power Exchange

In November 2003, a private non-profit organization, Japan Electric Power Exchange (JEPX), was established through investments by the participants including electric power companies, new entrants (power providers and suppliers) and non-utility generators, to provide electric power in both spot and forward trading. JEPX started operation on April 1, 2005, and aims to promote competition and revitalize the distribution of electricity nationwide.

# Electric Power Development Plan

Electric power companies are steadily promoting the diversification of power sources for long-term stable supply, taking into consideration the high dependence on imported energy sources, the outlook for supply and demand, as well as environmental issues.

Electricity demand will be increasing annually by 0.8% on average up to fiscal 2018 with peak demand increasing every August by 0.6%.

By fiscal 2018, electric power companies will develop power generation facilities with a total capacity of 31.00GW, 40% (12.26GW) of which will be accounted for by nuclear power.

## Demand Outlook

| | FY2007 (Results) | FY2008 (Results) | FY2009 (Plan) | FY2013 (Plan) | FY2018 (Plan) | Annual Growth(%) 2007-2018 |
|---|---|---|---|---|---|---|
| Electricity Demand (TWh) | (909.6) 919.5 | (888.5) 888.9 | 891.6 | 938.3 | 992.9 | (0.8) 0.7 |
| Peak Demand (GW) | (173.4) 175.7 | (174.7) 175.2 | 173.4 | 178.7 | 185.8 | (0.6) 0.5 |
| Annual Load Factor (%) | (62.9) 62.8 | (61.2) 61.1 | 61.9 | 63.2 | 64.4 | |

Note: Figures in parentheses are adjusted temperature and leap-year variations.

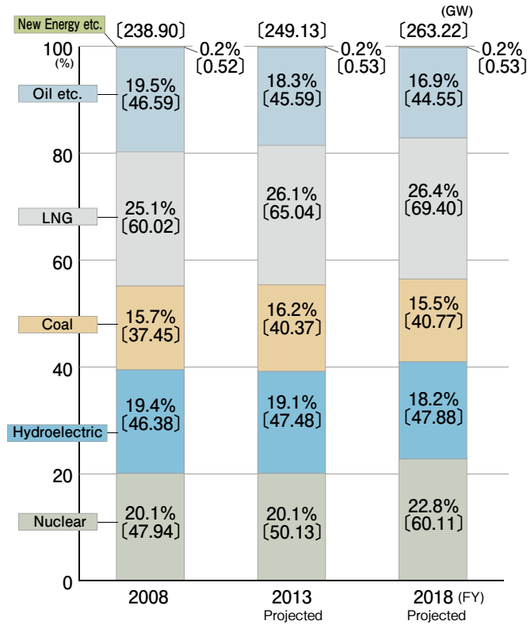
## Electric Power Development Capacity

| | FY2009-FY2018 | | Breakdown | |
|---|---|---|---|---|
| | GW | % | FY2009-FY2013 | FY2014-FY2018 |
| Nuclear | 12.26 | 40 | 2.29 | 9.98 |
| Hydro | 1.54 | 5 | 1.14 | 0.40 |
| Conventional | 0.27 | 1 | 0.07 | 0.20 |
| Pumped-storage | 1.27 | 5 | 1.07 | 0.20 |
| Thermal | 17.08 | 55 | 10.99 | 6.09 |
| Coal | 3.50 | 11 | 3.10 | 0.40 |
| LNG | 13.19 | 43 | 7.63 | 5.56 |
| Oil etc. | 0.39 | 1 | 2.60 | 0.13 |
| New Energy etc. | 0.12 | 0 | 0.12 | 0.00 |
| **Total** | **31.00** | **100** | **14.53** | **16.47** |

Note: Figures may not add up to totals due to rounding.
Source: Long-Term Electric Power Facilities Development Plan and others

## Generation Capacity Composition by Energy Source

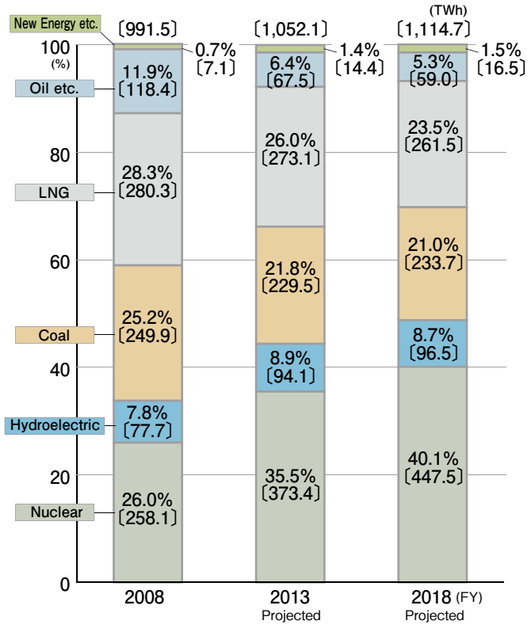
(For Ten Companies, Wholesale Electric Power Companies, Wholesale Suppliers and Others)




Note: Figures may not add up to totals due to rounding.
Sources: Long-Term Electric Power Facilities Development Plan and others

## Power Output Composition by Energy Source

(For Ten Companies, Wholesale Electric Power Companies, Wholesale Suppliers and Others)




Note: Figures may not add up to totals due to rounding.
Sources: Long-Term Electric Power Facilities Development Plan and others



# Optimal Combination of Power Sources

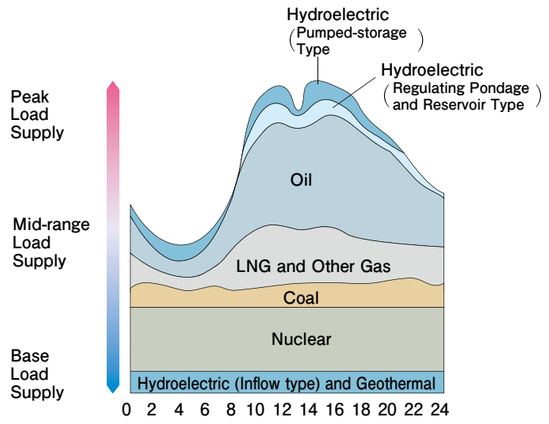
Due to the nature of supplying electric power — a commodity that is nearly impossible to store — electric power companies generate electricity by combining various power sources based on optimal operational and economic performances to ensure that the fluctuating demand can always be met.

Nuclear power generation is the key base-load power source and will continue to play an important role in contributing to stable supply and help to deal with global environmental issues. Hydroelectric and geothermal power generation, which have excellent environmental characteristics, will be developed considering environmental impacts as well as reduction in development costs.

Coal-fired power generation excels in stable base-load supply and economic performance, and so electric power companies will develop it while improving thermal efficiency and considering environmental impacts. Liquefied natural gas (LNG) fired power generation excels in high thermal efficiency and environmental characteristics, and its use will also continue to expand.

Finally, photovoltaic and wind power generation are clean, indigenous sources of energy, and electric power companies will cooperate with the national government to attain the goal for new energy utilization.

## (Example) Combination of Power Sources




Hydroelectric and nuclear power provides base load supply, while coal and LNG are major power sources for mid-range load supply. Oil-fired and pumped-storage hydroelectric power respond to peak demand fluctuation and contribute to consistent stable supply of electricity.

Recovery Operations from Heavy Snow Damage

Laying Operation of Submarine Cable

# Profile of Japan's Major Power Generation Sources

## Hydroelectric Power

Hydroelectric power is one of the few self-sufficient energy resources in resource-poor Japan. Hydroelectric power is an excellent source in terms of stable supply and generation cost over the long term. Hydroelectric power saw a rebirth in development following the oil crises of the 1970s. Although steady development of hydroelectric power plants is desired, Japan has used nearly all available sites for the construction of large-scale hydroelectric facilities, and so recent developments have been on a smaller scale.

As the gap in demand between daytime and nighttime continues to grow, electric power companies are also developing pumped-storage power generation plants to meet peak demand. The share of pumped-storage generation facilities of the total hydroelectric power capacity in Japan is growing year by year.

## Thermal Power

Initially, coal was the dominant fuel for thermal power generation in Japan, but it later lost that place to oil. Today, a diverse range of fuels including coal, oil, and LNG are used for the important generating role that thermal power plants play. In particular, in response to global environmental concerns, electric power companies are promoting the introduction of LNG fired plants, as they emit less $CO_2$ and other pollutants.

To enhance thermal efficiency further, combined-cycle generating plants with both gas and steam turbines have been installed. As a result, gross thermal efficiency (maximum designed value) has exceeded 50%. In the future, we will continue to research and develop new technologies in order to increase thermal efficiency as well as the use of integrated coal gasification combined cycle (IGCC) power generation.

## Nuclear Power

Japan's first commercial nuclear power plant started operation in Ibaraki Prefecture in 1966. As of the end of December 2009, Japan has fifty-four reactors operating around the country, usually accounting for around one-third of the country's total electric power output. By fiscal 2018, the nuclear output share is expected to reach 40 percent. Currently, there are three plants under construction, as well as another ten that are in the advanced planning stages.

While placing the highest priority on nuclear safety and public trust, Japanese electric power companies will continue to develop nuclear power generation as a base-load power source that plays an important role in Japan's electric power supply in order to secure a steady supply of electricity and address global environmental issues.

Nuclear power makes a great contribution to energy security for resource-poor Japan by reducing the energy-equivalent of approximately 440 million barrels of oil per year, which corresponds to about 20 percent of total annual crude imports. In addition, nuclear power generation does not emit carbon dioxide ($CO_2$), thus mitigating growing concerns about global warming. In FY2007, nuclear power generation had the net effect of reducing Japan's total $CO_2$ emissions by about 14%. For these reasons, nuclear power is expected to play a major role as a central power source in the years to come.

Column

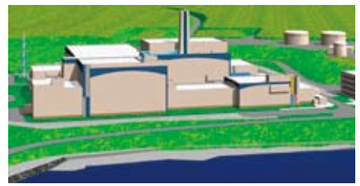
### Advancement of MOX Fuel Use in Thermal Reactors

In May 2009, three electric utility companies—Kyushu Electric Power Company (EPCo.); Shikoku EPCo.; and Chubu EPCo.—safely completed transport of MOX fuel from France. Of these three companies, Kyushu EPCo. completed the loading of MOX fuel into its Unit 3 reactor at the Genkai Power Station in October 2009 during a planned off-line inspection. As the Genkai-3 resumed commercial operation in December 2009, it marked the commencement of commercial use of MOX fuel in thermal reactors in Japan.

In March 2010, Shikoku EPCo's Ikata-3 reactor also began incorporating MOX fuel for commercial operation, thus becoming the second precedent for other power companies to follow.

### World's First Full-MOX Nuclear Power Plant

On April 23, 2008, METI permitted Electric Power Development Co. Ltd. (EPDC) to construct the Ohma Nuclear Power Plant (ABWR, 1383MW) in the town of Ohma in Aomori Prefecture. This marks the first construction of a nuclear power plant at a new site in Japan in a decade. Ohma Nuclear Power Plant is the world's first full-MOX nuclear power plant; it is designed to use MOX fuel in the entire core, thus playing a pivotal role in enhancing the flexibility of Japan's MOX fuel utilization program. EPDC plans to start operations in November 2014.



Ohma Nuclear Power Plant (Conceptual Drawing)

Okumino Hydroelectric Power Plant (Pumped-storage)

Noshiro Thermal Power Plant (Coal-fired)

Shimane Nuclear Power Plant (Unit No.3, ABWR, Under Construction)

Arimine Daiichi Hydroelectric Power Plant

Nanko Thermal Power Plant (LNG-fired)

Genkai Nuclear Power Plant (PWR)

# Japan's Nuclear Fuel Cycle

Japan has adopted a closed nuclear fuel cycle policy. Because Japan lacks sufficient natural resources, it has decided to recycle spent nuclear fuel domestically in order to establish nuclear power as a homegrown energy source. The benefits of a closed nuclear fuel cycle for Japan are clear: it adds to long-term energy security by reducing dependence on imported fuels; it conserves uranium resources; and it reduces the amount of high-level radioactive waste that must be disposed of.

Reprocessing is a chemical process that recovers plutonium and reusable uranium from spent fuel and separates radioactive wastes into more manageable forms. Once recovered, the plutonium is ready to be re-introduced into the nuclear power plants in the form known as uranium-plutonium mixed oxide (MOX) fuel. Japan's electric power companies remain committed to a plan to utilize recovered plutonium – in the form of MOX fuel – in 16 to 18 nuclear reactors by fiscal 2015 at the latest.

In the past, Japan has relied on countries such as the U.K. and France to reprocess most of the spent fuel it produced. However, to place Japan's domestic nuclear fuel cycle on a firmer footing, Japan Nuclear Fuel Limited (JNFL) is preparing to start the commercial operation of a reprocessing plant in 2010 at a site in Rokkasho-mura in the northern prefecture of Aomori. In addition, JNFL engages in uranium enrichment, temporary storage of vitrified waste, and disposal of low-level radioactive waste. JNFL also has plans to construct a MOX fuel fabrication plant.

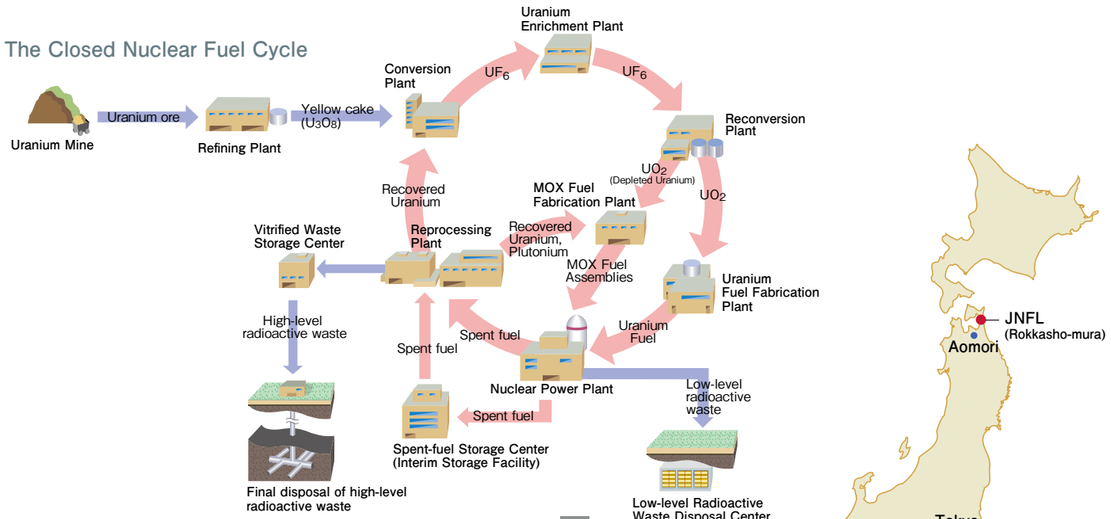
## Outline of JNFL's Nuclear Fuel Cycle Facilities (as of July 31, 2009)

| Facility | Reprocessing Plant | MOX fuel fabrication plant | Vitrified waste storage center | Uranium enrichment plant | Low-level radioactive waste disposal center |
|---|---|---|---|---|---|
| Site | Iyasakatai, Rokkasho-mura, Kamikita-gun, Aomori Prefecture | | | Oishitai, Rokkasho-mura, Kamikita-gun, Aomori Prefecture | |
| Capacity | Maximum capacity: 800 ton-U/year<br>Storage capacity for spent fuel: 3,000 ton-U | Maximum capacity: 130 ton-HM/year (*) | Storage capacity for wastes returned from overseas plants: 1,440 canisters of vitrified waste<br>Planned to be expanded to 2,880 canisters | 1,050 ton-SWU/year (*)<br>Planned to be expanded to a maximum capacity of 1,500 ton-SWU/year | Authorized capacity: 200,000m³ (equivalent to 1 million 200 litter drums)<br>Planned to be expanded to 600,000m³ (equivalent to 3 million 200 liter drums) |
| Current Status | Under construction | Applying for a business license | Cumulative number of stored canisters: 1,310 | Present capacity: 150 ton-SWU/year | Cumulative number of stored drums: 204,699 |
| Construction Cost | about 2,193 billion yen | about 190 billion yen | about 80 billion yen(**) | about 250 billion yen | about 160 billion yen(***) |
| Schedule | Start of construction: 1993<br>Start of operation: 2010(planned) | Start of operation: 2015(planned) | Start of construction: 1992<br>Start of storage: 1995 | Start of construction: 1988<br>Start of operation: 1992 | Start of construction: 1990<br>Start of operation: 1992 |

(*) "ton-HM" stands for "tons of heavy metal" which indicates the weight of plutonium and uranium metallic content in MOX. "SWU" stands for "Separative Work Unit" which is a measure of the work expended during an enrichment process of uranium
(**) Construction expense regarding 1,440 canisters of vitrified waste.
(***)Construction expense regarding 200,000 m³ low-level radioactive waste (equivalent to 1 million of 200 liter drums)

Sources: JNFL's website and others

## The Closed Nuclear Fuel Cycle






# The Peaceful Use of Nuclear Energy

Japan's electric power companies are fully committed to implementing the closed nuclear fuel cycle and plutonium utilization program consistent with all domestic laws and international nonproliferation standards. Since 1955, the domestic laws of Japan require that all nuclear activities, including commercial activities, be conducted only for peaceful purposes. Also, since 1968, Japan has embraced the "Three Non-Nuclear Principles," which state that Japan will not possess, produce, or permit the entry of nuclear weapons into its territory.

In addition, in 1976, the Government of Japan ratified the Nuclear Non-Proliferation Treaty (NPT) and thereby obligated itself to a national policy not to produce or acquire nuclear weapons. In order to ensure the application of more extensive safeguards, Japan signed the IAEA Additional Protocol in 1998, which allows the IAEA to carry out a range of additional inspection measures. In accordance with national laws, Japan's electric power companies submit reports on material accounting and safeguards activities to the Minister of Education, Culture, Sports, Science and Technology, and accept joint inspections by the IAEA and Japanese regulatory authorities to check the reports.

The results of each of these Japanese initiatives were reflected in the IAEA's conclusion in June 2004, which stated that all the nuclear materials in Japan are protected under IAEA safeguards and are not being diverted to the manufacture of nuclear weapons. As a result, more effective and efficient IAEA safeguards known as integrated safeguards commenced in Japan in September 2004.

JNFL's Reprocessing Plant

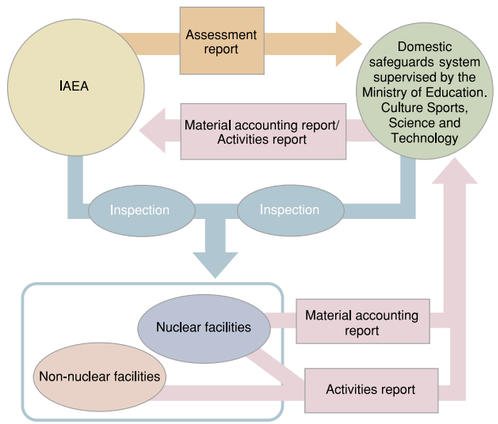
Central Control Room of Reprocessing Plant

**Column**

### Start of the "Active Test" and the Recovery of MOX Powder at Rokkasho Reprocessing Plant

On March 31, 2006, JNFL started the final-stage testing, called the "Active Test", at Rokkasho Reprocessing Plant. The Active Test processes real spent fuel and validates the plant's safety features and the performance of equipment and facilities before the start of commercial operations. On November 16, 2006, JNFL successfully recovered MOX powder through the testing. The most remarkable feature of the manufacturing technology at the Rokkasho plant is called co-denitration. The process, developed in Japan, does not yield pure plutonium, but produces MOX powder, which deters proliferation and will be fabricated into MOX fuel for reactors.

## The Safeguards Program



# Measures by the Electric Power Industry to Suppress $CO_2$ Emissions

The compatibility between stable electric power supply and environmental preservation is one of the most important challenges for the electric power industry. In particular, emissions of carbon dioxide ($CO_2$), a major cause of global warming, are closely related to energy utilization in economic activities and daily life, and so the reduction of $CO_2$ emissions is a major challenge for the electric power industry. Recognizing that comprehensive measures against global warming are required, electric power companies are making corresponding efforts at both the supply and demand sides of electricity, and are pursuing various projects for R&D and international cooperation.

The electric power industry is striving to achieve the target of decreasing the $CO_2$ emissions intensity (emissions per unit of user end electricity), averaged over the five fiscal years of 2008 through 2012, by approximately 20% from the level recorded in FY1990.

In May 2008, FEPC has drawn up "Efforts of the Electric Power Companies of Japan to Create a Low Carbon Society" which outlines plans to achieve the goals set forth in the Kyoto Protocol and to create a low carbon society in the post-Kyoto period. The electric power companies of Japan seek to increase the share of non-fossil energy (including hydro and renewables) from the present level of about 40% to 50% by fiscal 2020 based mainly on nuclear power.

The Japanese power industry will strive to achieve its emission intensity target of 0.33kg-$CO_2$/kWh by fiscal 2020 in efforts to create a low carbon society while securing a stable and economical supply of electricity.

## Decarbonization of energy at supply-side (Lowering of $CO_2$ emissions intensity)

**Expanding use of non-fossil energy sources**
- Promotion of nuclear power generation based on the premise safety assurance
- Development and expansion of use of renewable energy sources
  Hydroelectric, geothermal, solar, wind, and biomass power generation

**Improving efficiency of electric power equipment**
- Further improvement of thermal efficiency of thermal power plants
  Introduction of LNG combined-cycle power plant
- Reduction of transmission and distribution loss
  High-voltage transmission, low-loss transformers

**International efforts**
- Active utilization of the Kyoto Mechanisms
  Active utilization of the Clean Development Mechanisms & investment in Carbon Funds
- Sectral approaches
  Participation in the Asia-Pacific Partnership [APP] (Peer Review Activities, etc)

## Improvement of the energy usage efficiency at demand-side

**Energy conservation**
- Electrification promotion, energy conservation and expansion of high efficiency electric equipment
  Heat pumps, heat storage air conditioning, electric vehicles, and others
  Participation in energy saving and $CO_2$ reduction activities by utilizing the domestic credit system
- Utilization of untapped energy sources
  Heat recovery from river water, waste incineration facilities and substations
- PR-activities and provision of information aimed at energy conservation and $CO_2$ reduction
  Household eco-account book, exhibitions on energy-saving appliances and seminars on energy-saving
- Load leveling promotion such as heat pump & thermal storage systems
  Heat pump & thermal storage type air conditioning/hot-water supply

**Efforts by electric utility industry as users**
- Efforts in office-use energy conservation and the use of company-owned vehicles
  Reduction of amount of power
  Introduction of electric vehicles and fuel-efficient vehicles

## Research and Development

**Research and Development**

Supply-side
- Clean coal technology, $CO_2$ capture and storage technologies

Demand-side
- $CO_2$ refrigerant heat pump hot water heater, electric vehicles, and others



# Expanding the Share of Nuclear Power and LNG-fired Thermal Power

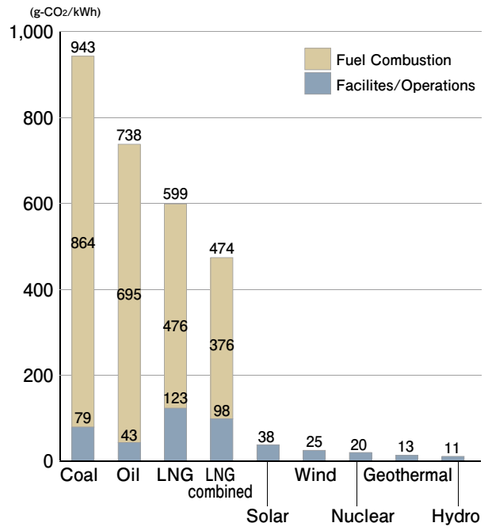
Electric power companies have been promoting nuclear power that emits no carbon dioxide ($CO_2$) in the process of power generation. Considering $CO_2$ emissions intensity over the entire life cycle of all available energy sources, $CO_2$ emissions from nuclear power are lower than those from thermal power, and are even lower than those from solar or wind power. Thus, nuclear power is an outstanding power source to prevent global warming.

The electric power companies of Japan are also striving to improve the capacity factor of nuclear power plants. A 1% improvement in the capacity factor at existing nuclear power plants in Japan is equivalent to a reduction of 3 million tons of $CO_2$.

In addition, the industry has been striving to increase the share of LNG-fired thermal power which has the advantage of relatively low $CO_2$ emissions, and improve the efficiency of thermal power plants.

As a result, since the oil crises of the 1970s, electricity demand in Japan has become 3.4 times greater, yet the $CO_2$ emission intensity level (end use electricity) in fiscal 2008 was 0.444 kg-$CO_2$ per kWh, meaning that emissions per kWh used have fallen by around 37% since 1970.

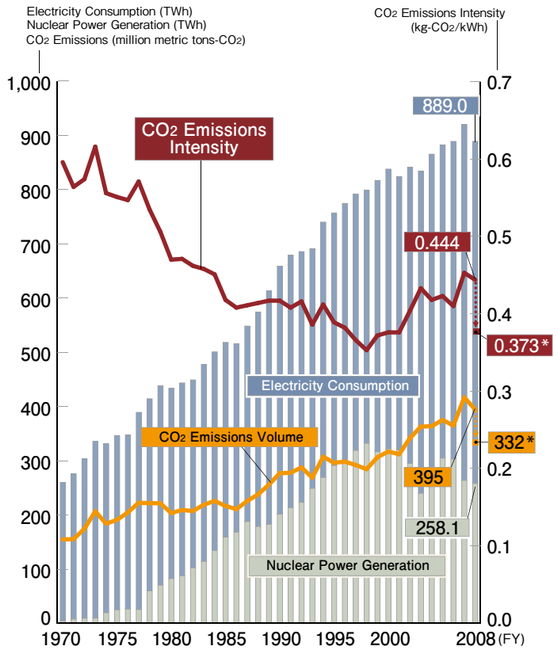
## $CO_2$ Emissions Intensity over the Entire Lifecycle by Source




Note: (1) Based on total $CO_2$ emissions from all energy consumed in energy extraction, transportation, refining, plant operation and maintenance, etc. in addition to burning of the fuel.
(2) Data for nuclear power: 1) includes spent fuel reprocessing in Japan (under development), MOX fuel use in thermal reactors (assuming recycling once) and disposal of high level radioactive waste, and 2) is based on the capacity-weighted average of $CO_2$ emissions intensities of existing BWR and PWR plants in Japan, which are 19g-$CO_2$/kWh and 21g-$CO_2$/kWh respectively.

Source: Report of the Central Research Institute of Electric Power Industry etc.

## Historical Trends in $CO_2$ Emissions from Power Generation (excluding self-generators)




Note: The numerical value of "0.373*" and "332*" reflected Kyoto Mechanism credit.
Source: FEPC

# Renewable Energy Sources

Recently, increasing numbers of photovoltaic and wind power plants have been installed across the country as clean energy sources that emit no $CO_2$.

In order to promote widespread dissemination of photovoltaic and wind power generation, Japanese electric power companies have been purchasing electricity generated from solar and wind energy as well as installing their own photovoltaic and wind power plants.

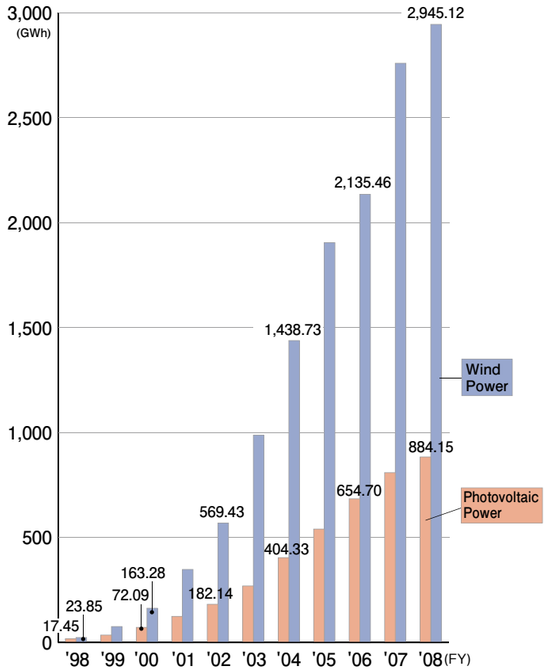
On November 1st, 2009, a new system for purchasing surplus power generated by solar power generation systems came into effect in accordance with the "Law on the Promotion of the Use of Nonfossil Energy Sources and Effective Use of Fossil Energy Materials by Energy Suppliers". Under this new system, electric power companies are required to purchase excess electricity produced by photovoltaic generation systems installed on ordinary houses at about twice the previous purchase price for the first decade and at gradually decreasing rates thereafter, while the expenses for these purchases are borne by ratepayers in the form of a surcharge.

Moreover, electric power companies of Japan are moving toward the construction of large-scale solar power plants to expand solar power in the future. In September 2008, the 10 power companies released a joint plan to build Mega Solar Power Plants with a total capacity of about 140 MW at around 30 sites throughout the country by 2020.

The Japanese power companies are also focusing aggressively on research and development to solve the problems associated with renewable energy sources, such as low generation efficiency, high generation cost, and technical difficulties in power system interconnection.

Through such measures, the electric power companies of Japan exhibit their continued commitment to efforts toward expanding and promoting renewable energy sources.

## Ten Electric Power Companies' Purchasing Volume of Photovoltaic and Wind Power




Source: FEPC

Mega Solar Power Generation Plant (Conceptual Drawing)

Wind Power



# Sharing Japan's Top-level Environmental Technologies with the World

As a result of taking various environmental measures at thermal power plants, Japan has achieved the world's top-level energy efficiency. Based on this achievement, the electric power industry in Japan has been making efforts to establish a mechanism for sharing such advanced technologies with electric power industries in other countries (see the column).

Through the cooperation between advanced and developing countries, and with the "sectoral approaches" for sector-by-sector improvement of energy efficiency, it will be possible to achieve compatibility between economic growth and global environmental preservation. The electric power industry of Japan has been proposing the sectoral approaches to the world as a new focus for the post-Kyoto period.

FEPC estimates that the sectoral approaches to the coal-fired power plants all over the world such as the introduction of best available technologies and the improvement of operation and maintenance would create the potential of reducing $CO_2$ emissions by about 1.87 billion tons-$CO_2$ per year in 2030, which is much greater than the total annual $CO_2$ emissions in Japan today (1.3 billion tons-$CO_2$).

Column

### Participation in Asia-Pacific Partnership (APP) on Clean Development and Climate

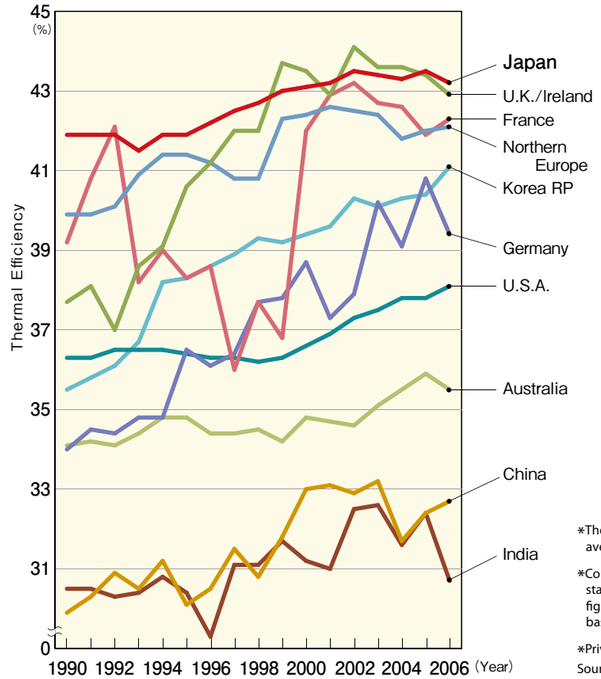
APP is a framework for inter-regional partnership for responding to the challenges of growing energy demand, energy security, climate change, and so on. Under this framework, the seven participating countries (United States, Australia, China, India, South Korea, Japan and Canada) are pursuing the development, transfer and spread of clean and energy-efficient technologies.

$CO_2$ emissions from the seven participating countries account for more than half of global $CO_2$ emissions, and so these seven countries' efforts for reducing $CO_2$ emissions will have a global impact. Electric power companies in Japan are actively involved in these efforts.

APP 2nd Peer Review Activity in India

Green Handbook and Review Sheet

## Comparison of Thermal Power Plant Efficiency in Japan and Other Countries




*Thermal efficiency is the gross generating efficiency based on the weighted averages of efficiencies for coal, petroleum and gas (low heat value standard).

*Comparisons are made after converting Japanese data (higher heating value standard) to lower heating value standard, which is generally used overseas. The figures based on lower heating value are around 5-10% higher than the figures based on higher heating value.

*Private power generation facilities, etc. not covered.

Source: International Comparison of Fossil Power Efficiency and $CO_2$ Intensity(ECOFYS)

# Demand-side Efforts for $CO_2$ Reduction

In Japan, the energy demand for water heating constitutes about 30% of the total energy demand in the household sector, and so energy-saving and $CO_2$ reduction measures in this area are very effective. Electric power companies have been working hard to develop and promote electric appliances and systems to reduce $CO_2$ emissions. One example is EcoCute, a water heating system with a heat pump that uses $CO_2$ as refrigerant.

EcoCute heats water by transferring the thermal energy in air, which is freely available, to water by means of refrigerant. With a *single unit* of electric energy for heat pump operation and *two units or more* of thermal energy from air, it produces *three units or more* of thermal energy.

Thanks to this principle, $CO_2$ emissions are cut by about 50% compared with conventional combustion type water heaters. Because of this advantage, the government and industry are jointly promoting the use of heat pump systems as a key means of preventing global warming in the consumer sector (household and commercial sectors). When heat pump systems fully penetrate the consumer and industrial sectors, the resulting $CO_2$ emissions reduction will amount to about 10% of the present annual $CO_2$ emissions in Japan, which is about 1.3 billion tons-$CO_2$.

Column

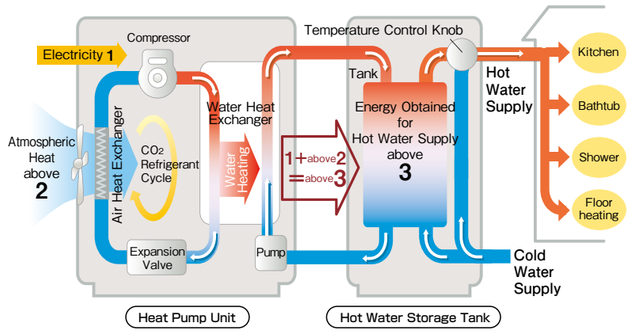
### Electric Vehicle Deployment Plan

The electric power companies of Japan have been working hard to achieve full-scale commercialization of environmentally-efficient electric vehicles, such as conducting driving tests and developing new fast battery chargers jointly with automobile manufacturers. To expand the use of electric vehicles, the electric power companies jointly decided to introduce about 10,000 electric vehicles (including plug-in hybrid vehicles) in total for commercial use by FY2020.

Electric Vehicle
(Mitsubishi Motors Corporation, i MiEV)

Fast Battery Charger

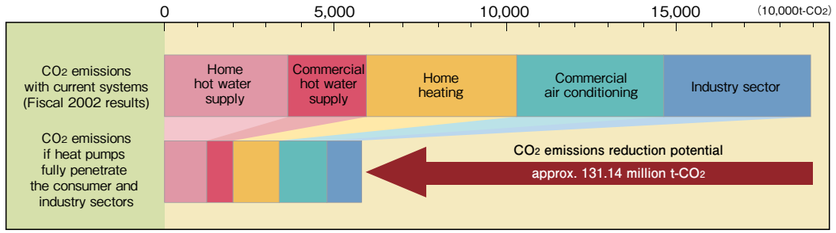
## EcoCute Hot Water Supply Structure: $CO_2$ Retrigerant Heat Pump Hot Water Heater




1 Electricity Energy + above2 Atmospheric Heat = above 3 Energy Obtained for Hot Water Supply

EcoCute Heat Pump Unit (left) and Hot Water Storage Tank

## $CO_2$ Reduction Effect of Heat Pump




Source: Calculations by The Heat Pump & Thermal Storage Technology Center of Japan





# Strengthening International Communication and Cooperation

Japan's electric power companies remain active on a worldwide basis. In order to cope with global warming and to ensure the safety of nuclear power generation, international cooperation is indispensable. Each of the electric power companies in Japan has individual agreements with overseas utilities in order to facilitate exchanges on a wide range of information such as power generation, customer relations, distribution and quality control. The industry's top executives actively participate in international meetings such as the International Electricity Summit and the World Association of Nuclear Operators (WANO) to exchange views, while we also accept trainees from overseas. We import most of our fuel such as oil and coal from overseas countries and also keep our doors open to foreign companies on the purchase of equipment such as generators.

## Overseas Offices

Please feel free to contact your nearest office.

### WASHINGTON, D.C.

**The Federation of Electric Power Companies of Japan, Washington Office**

The Federation's Washington Office was established in January 1994. Its principal objectives are to study U.S. energy policies and to exchange information with U.S. energy opinion leaders in order to promote a greater understanding of the Japanese electric power industry.

1901 L Street, N.W., Suite 600, Washington, D.C. 20036, U.S.A.
Tel: (202) 466-6781 Fax: (202) 466-6758
http://www.japannuclear.com/
Established in 1994

**Tokyo Electric Power Co., Inc., Washington Office**
1901 L Street, N.W., Suite 720, Washington, D.C. 20036, U.S.A.
Tel: (202) 457-0790 Fax: (202) 457-0810
Established in 1978

**Chubu Electric Power Co., Inc., Washington Office**
900 17th Street, N.W., Suite 1220, Washington, D.C. 20006, U.S.A.
Tel: (202) 775-1960 Fax: (202) 331-9256
Established in 1982

### LONDON

**Tokyo Electric Power Co., Inc., London Office**
Berkeley Square House, Berkeley Square, London W1J 6BR, U.K.
Tel: (020) 7629-5271 Fax: (020) 7629-5282
Established in 1982

**Chubu Electric Power Co., Inc., London Office**
Nightingale House, 65 Curzon Street, London W1J8PE, U.K.
Tel: (020) 7409-0142 Fax: (020) 7408-0801
Established in 1985

### PARIS

**Kansai Electric Power Co., Inc., Paris Office**
3, rue Scribe 75009, Paris, FRANCE
Tel: 01 43 12 81 40 Fax: 01 43 12 81 44
Established in 2008

### BANGKOK

**Chubu Elecric Power Co., Inc., Bangkok Office**
Unit 4, 18th Floor, M. Thai Tower, All Seasons Place,
87 Wireless Road, Phatumwan, Bangkok 10330, THAILAND
Tel: (02) 654-0688 Fax: (02) 654-0689
Established in 2006

### DOHA

**Chubu Elecric Power Co., Inc., Doha Office**
4th Floor, Al Salam Tower, Al Corniche P.O.Box 22470,
Doha, QATAR
Tel: (974) 4836-830 Fax: (974) 4834-841
Established in 2007


# Major Power Plants

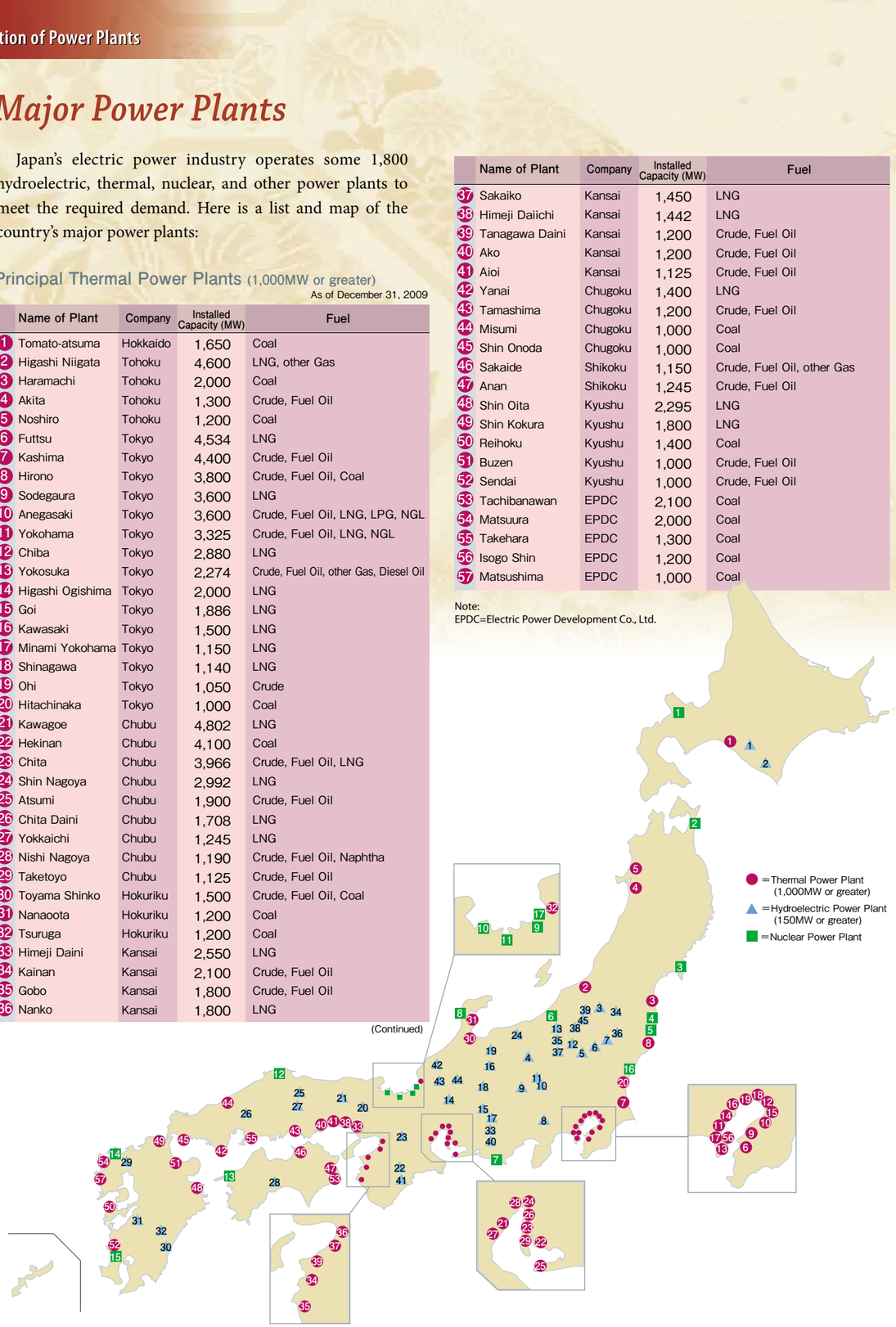
Japan's electric power industry operates some 1,800 hydroelectric, thermal, nuclear, and other power plants to meet the required demand. Here is a list and map of the country's major power plants:

## Principal Thermal Power Plants (1,000MW or greater)

As of December 31, 2009

| | Name of Plant | Company | Installed Capacity (MW) | Fuel |
|---|---|---|---|---|
| 1 | Tomato-atsuma | Hokkaido | 1,650 | Coal |
| 2 | Higashi Niigata | Tohoku | 4,600 | LNG, other Gas |
| 3 | Haramachi | Tohoku | 2,000 | Coal |
| 4 | Akita | Tohoku | 1,300 | Crude, Fuel Oil |
| 5 | Noshiro | Tohoku | 1,200 | Coal |
| 6 | Futtsu | Tokyo | 4,534 | LNG |
| 7 | Kashima | Tokyo | 4,400 | Crude, Fuel Oil |
| 8 | Hirono | Tokyo | 3,800 | Crude, Fuel Oil, Coal |
| 9 | Sodegaura | Tokyo | 3,600 | LNG |
| 10 | Anegasaki | Tokyo | 3,600 | Crude, Fuel Oil, LNG, LPG, NGL |
| 11 | Yokohama | Tokyo | 3,325 | Crude, Fuel Oil, LNG, NGL |
| 12 | Chiba | Tokyo | 2,880 | LNG |
| 13 | Yokosuka | Tokyo | 2,274 | Crude, Fuel Oil, other Gas, Diesel Oil |
| 14 | Higashi Ogishima | Tokyo | 2,000 | LNG |
| 15 | Goi | Tokyo | 1,886 | LNG |
| 16 | Kawasaki | Tokyo | 1,500 | LNG |
| 17 | Minami Yokohama | Tokyo | 1,150 | LNG |
| 18 | Shinagawa | Tokyo | 1,140 | LNG |
| 19 | Ohi | Tokyo | 1,050 | Crude |
| 20 | Hitachinaka | Tokyo | 1,000 | Coal |
| 21 | Kawagoe | Chubu | 4,802 | LNG |
| 22 | Hekinan | Chubu | 4,100 | Coal |
| 23 | Chita | Chubu | 3,966 | Crude, Fuel Oil, LNG |
| 24 | Shin Nagoya | Chubu | 2,992 | LNG |
| 25 | Atsumi | Chubu | 1,900 | Crude, Fuel Oil |
| 26 | Chita Daini | Chubu | 1,708 | LNG |
| 27 | Yokkaichi | Chubu | 1,245 | LNG |
| 28 | Nishi Nagoya | Chubu | 1,190 | Crude, Fuel Oil, Naphtha |
| 29 | Taketoyo | Chubu | 1,125 | Crude, Fuel Oil |
| 30 | Toyama Shinko | Hokuriku | 1,500 | Crude, Fuel Oil, Coal |
| 31 | Nanaoota | Hokuriku | 1,200 | Coal |
| 32 | Tsuruga | Hokuriku | 1,200 | Coal |
| 33 | Himeji Daini | Kansai | 2,550 | LNG |
| 34 | Kainan | Kansai | 2,100 | Crude, Fuel Oil |
| 35 | Gobo | Kansai | 1,800 | Crude, Fuel Oil |
| 36 | Nanko | Kansai | 1,800 | LNG |
| 37 | Sakaiko | Kansai | 1,450 | LNG |
| 38 | Himeji Daiichi | Kansai | 1,442 | LNG |
| 39 | Tanagawa Daini | Kansai | 1,200 | Crude, Fuel Oil |
| 40 | Ako | Kansai | 1,200 | Crude, Fuel Oil |
| 41 | Aioi | Kansai | 1,125 | Crude, Fuel Oil |
| 42 | Yanai | Chugoku | 1,400 | LNG |
| 43 | Tamashima | Chugoku | 1,200 | Crude, Fuel Oil |
| 44 | Misumi | Chugoku | 1,000 | Coal |
| 45 | Shin Onoda | Chugoku | 1,000 | Coal |
| 46 | Sakaide | Shikoku | 1,150 | Crude, Fuel Oil, other Gas |
| 47 | Anan | Shikoku | 1,245 | Crude, Fuel Oil |
| 48 | Shin Oita | Kyushu | 2,295 | LNG |
| 49 | Shin Kokura | Kyushu | 1,800 | LNG |
| 50 | Reihoku | Kyushu | 1,400 | Coal |
| 51 | Buzen | Kyushu | 1,000 | Crude, Fuel Oil |
| 52 | Sendai | Kyushu | 1,000 | Crude, Fuel Oil |
| 53 | Tachibanawan | EPDC | 2,100 | Coal |
| 54 | Matsuura | EPDC | 2,000 | Coal |
| 55 | Takehara | EPDC | 1,300 | Coal |
| 56 | Isogo Shin | EPDC | 1,200 | Coal |
| 57 | Matsushima | EPDC | 1,000 | Coal |

Note:
EPDC=Electric Power Development Co., Ltd.




(Continued)



## Nuclear Power Plants

### In Operation

As of January 31, 2010

| | Name of Plant | Unit Number | Company | Installed Capacity (MW) | Type of Reactor | Start |
|---|---|---|---|---|---|---|
| 1 | Tomari | 1 | Hokkaido | 579 | PWR | 1989.6 |
| | | 2 | | 579 | PWR | 1991.4 |
| | | 3 | | 912 | PWR | 2009.12 |
| 2 | Higashi-Dori | 1 | Tohoku | 1,100 | BWR | 2005.12 |
| 3 | Onagawa | 1 | Tohoku | 524 | BWR | 1984.6 |
| | | 2 | | 825 | BWR | 1995.7 |
| | | 3 | | 825 | BWR | 2002.1 |
| 4 | Fukushima Daiichi | 1 | Tokyo | 460 | BWR | 1971.3 |
| | | 2 | | 784 | BWR | 1974.7 |
| | | 3 | | 784 | BWR | 1976.3 |
| | | 4 | | 784 | BWR | 1978.10 |
| | | 5 | | 784 | BWR | 1978.4 |
| | | 6 | | 1,100 | BWR | 1979.10 |
| 5 | Fukushima Daini | 1 | Tokyo | 1,100 | BWR | 1982.4 |
| | | 2 | | 1,100 | BWR | 1984.2 |
| | | 3 | | 1,100 | BWR | 1985.6 |
| | | 4 | | 1,100 | BWR | 1987.8 |
| 6 | Kashiwazaki Kariwa | 1 | Tokyo | 1,100 | BWR | 1985.9 |
| | | 2 | | 1,100 | BWR | 1990.9 |
| | | 3 | | 1,100 | BWR | 1993.8 |
| | | 4 | | 1,100 | BWR | 1994.8 |
| | | 5 | | 1,100 | BWR | 1990.4 |
| | | 6 | | 1,356 | ABWR | 1996.11 |
| | | 7 | | 1,356 | ABWR | 1997.7 |
| 7 | Hamaoka | 3 | Chubu | 1,100 | BWR | 1987.8 |
| | | 4 | | 1,137 | BWR | 1993.9 |
| | | 5 | | 1,267 | ABWR | 2005.1 |
| 8 | Shika | 1 | Hokuriku | 540 | BWR | 1993.7 |
| | | 2 | | 1,206 | ABWR | 2006.3 |
| 9 | Mihama | 1 | Kansai | 340 | PWR | 1970.11 |
| | | 2 | | 500 | PWR | 1972.7 |
| | | 3 | | 826 | PWR | 1976.12 |
| 10 | Takahama | 1 | Kansai | 826 | PWR | 1974.11 |
| | | 2 | | 826 | PWR | 1975.11 |
| | | 3 | | 870 | PWR | 1985.1 |
| | | 4 | | 870 | PWR | 1985.6 |
| 11 | Ohi | 1 | Kansai | 1,175 | PWR | 1979.3 |
| | | 2 | | 1,175 | PWR | 1979.12 |
| | | 3 | | 1,180 | PWR | 1991.12 |
| | | 4 | | 1,180 | PWR | 1993.2 |
| 12 | Shimane | 1 | Chugoku | 460 | BWR | 1974.3 |
| | | 2 | | 820 | BWR | 1989.2 |
| 13 | Ikata | 1 | Shikoku | 566 | PWR | 1977.9 |
| | | 2 | | 566 | PWR | 1982.3 |
| | | 3 | | 890 | PWR | 1994.12 |
| 14 | Genkai | 1 | Kyushu | 559 | PWR | 1975.10 |
| | | 2 | | 559 | PWR | 1981.3 |
| | | 3 | | 1,180 | PWR | 1994.3 |
| | | 4 | | 1,180 | PWR | 1997.7 |
| 15 | Sendai | 1 | Kyushu | 890 | PWR | 1984.7 |
| | | 2 | | 890 | PWR | 1985.11 |
| 16 | Tokai Daini | | Japan Atomic Power Co. | 1,100 | BWR | 1978.11 |
| 17 | Tsuruga | 1 | Japan Atomic Power Co. | 357 | BWR | 1970.3 |
| | | 2 | | 1,160 | PWR | 1987.2 |
| Total | | 54 Units | | 48,847MW | | |

### Under Construction

(Estimated start)

| | | | | | |
|---|---|---|---|---|---|
| Shimane | 3 | Chugoku | 1,373 | ABWR | 2011.12 |
| Ohma | | EPDC | 1,383 | ABWR | 2014.11 |
| Total | 2 Units | | 2,756MW | | |

### End of Operation

| | | | | | |
|---|---|---|---|---|---|
| Hamaoka | 1 | Chubu | 540 | BWR | 2009.1 |
| | 2 | | 840 | BWR | 2009.1 |
| Tokai | | Japan Atomic Power Co. | 166 | GCR | 1998.3 |
| Total | 3 Units | | 1,546MW | | |

### Others

| | | | |
|---|---|---|---|
| Fugen | Japan Atomic Energy Agency | 165 | ATR(Prototype) |
| Monju | Japan Atomic Energy Agency | 280 | FBR(Prototype) |

## Principal Hydroelectric Power Plants (150MW or greater)

As of March 31, 2009

| | Name of Plant | Company | Installed Capacity (MW) | Type |
|---|---|---|---|---|
| 1 | Niikappu | Hokkaido | 200 | Pumped Storage |
| 2 | Takami | Hokkaido | 200 | Pumped Storage |
| 3 | Daini Numazawa | Tohoku | 460 | Pumped Storage |
| 4 | Shin Takasegawa | Tokyo | 1,280 | Pumped Storage |
| 5 | Tamahara | Tokyo | 1,200 | Pumped Storage |
| 6 | Imaichi | Tokyo | 1,050 | Pumped Storage |
| 7 | Shiobara | Tokyo | 900 | Pumped Storage |
| 8 | Kazunogawa | Tokyo | 800 | Pumped Storage |
| 9 | Azumi | Tokyo | 623 | Pumped Storage |
| 10 | Kannagawa | Tokyo | 470 | Pumped Storage |
| 11 | Midono | Tokyo | 245 | Pumped Storage |
| 12 | Yagisawa | Tokyo | 240 | Pumped Storage |
| 13 | Shinanogawa | Tokyo | 177 | |
| 14 | Okumino | Chubu | 1,500 | Pumped Storage |
| 15 | Okuyahagi Daini | Chubu | 780 | Pumped Storage |
| 16 | Takane Daiichi | Chubu | 340 | Pumped Storage |
| 17 | Okuyahagi Daiichi | Chubu | 315 | Pumped Storage |
| 18 | Mazegawa Daiichi | Chubu | 288 | Pumped Storage |
| 19 | Arimine Daiichi | Hokuriku | 265 | |
| 20 | Okutataragi | Kansai | 1,932 | Pumped Storage |
| 21 | Okawachi | Kansai | 1,280 | Pumped Storage |
| 22 | Okuyoshino | Kansai | 1,206 | Pumped Storage |
| 23 | Kisenyama | Kansai | 466 | Pumped Storage |
| 24 | Kurobegawa Daiyon | Kansai | 335 | |
| 25 | Matanogawa | Chugoku | 1,200 | Pumped Storage |
| 26 | Nabara | Chugoku | 620 | Pumped Storage |
| 27 | Shin Nariwagawa | Chugoku | 303 | Pumped Storage |
| 28 | Hongawa | Shikoku | 615 | Pumped Storage |
| 29 | Tenzan | Kyushu | 600 | Pumped Storage |
| 30 | Omarugawa | Kyushu | 600 | Pumped Storage |
| 31 | Ohira | Kyushu | 500 | Pumped Storage |
| 32 | Hitotsuse | Kyushu | 180 | |
| 33 | Shin Toyone | EPDC | 1,125 | Pumped Storage |
| 34 | Shimogo | EPDC | 1,000 | Pumped Storage |
| 35 | Okukiyotsu | EPDC | 1,000 | Pumped Storage |
| 36 | Numappara | EPDC | 675 | Pumped Storage |
| 37 | Okukiyotsu Daini | EPDC | 600 | Pumped Storage |
| 38 | Okutadami | EPDC | 560 | |
| 39 | Tagokura | EPDC | 390 | |
| 40 | Sakuma | EPDC | 350 | |
| 41 | Ikehara | EPDC | 350 | Pumped Storage |
| 42 | Tedorigawa Daiichi | EPDC | 250 | |
| 43 | Nagano | EPDC | 220 | Pumped Storage |
| 44 | Miboro | EPDC | 215 | |
| 45 | Otori | EPDC | 182 | |

### Preparing for Construction

(Estimated start)

| | | | | | |
|---|---|---|---|---|---|
| Namie-Odaka | | Tohoku | 825 | BWR | FY2020 |
| Higashi-Dori | 2 | Tohoku | 1,385 | ABWR | FY2020~ |
| Fukushima Daiichi | 7 | Tokyo | 1,380 | ABWR | 2015.10 |
| | 8 | | 1,380 | ABWR | 2016.10 |
| Higashi-Dori | 1 | Tokyo | 1,385 | ABWR | 2017.3 |
| | 2 | | 1,385 | ABWR | FY2019~ |
| Hamaoka | 6 | Chubu | 1,400 | ABWR | FY2019~ |
| Kaminoseki | 1 | Chugoku | 1,373 | ABWR | FY2015 |
| | 2 | | 1,373 | ABWR | FY2020 |
| Sendai | 3 | Kyushu | 1,590 | APWR | FY2019 |
| Tsuruga | 3 | Japan Atomic Power Co. | 1,538 | APWR | 2016.3 |
| | 4 | | 1,538 | APWR | 2017.3 |
| Total | 12 Units | | 16,552MW | | |

Note: PWR=Pressurized Water Reactor, BWR=Boiling Water Reactor, APWR=Advanced Pressurized Water Reactor, ABWR=Advanced Boiling Water Reactor, GCR=Gas Cooled Reactor, ATR=Advanced Thermal Reactor, FBR=Fast Breeder Reactor

# The Federation of Electric Power Companies

Electricity supply in Japan is carried out by privately-owned independent regional electric power companies and close cooperation among these companies is essential for efficient operations. In 1952, the nine electric power companies established the Federation of Electric Power Companies (FEPC) to promote smooth operations within the industry. Since then, FEPC has played an important role as a base for close communication between the electric power companies and as a forum for exchanging views to create the electric power industry of the future. Moreover, FEPC undertakes various activities to ensure stable operations of the electric power industry, with an awareness of its role in the energy industry of Japan.

With the return of Okinawa to Japan in 1972, the Okinawa Electric Power Company rejoined Japan's electric power industry, becoming an FEPC member in March 2000.

## Board of Directors

Chairman
**Masataka Shimizu**

Vice Chairman
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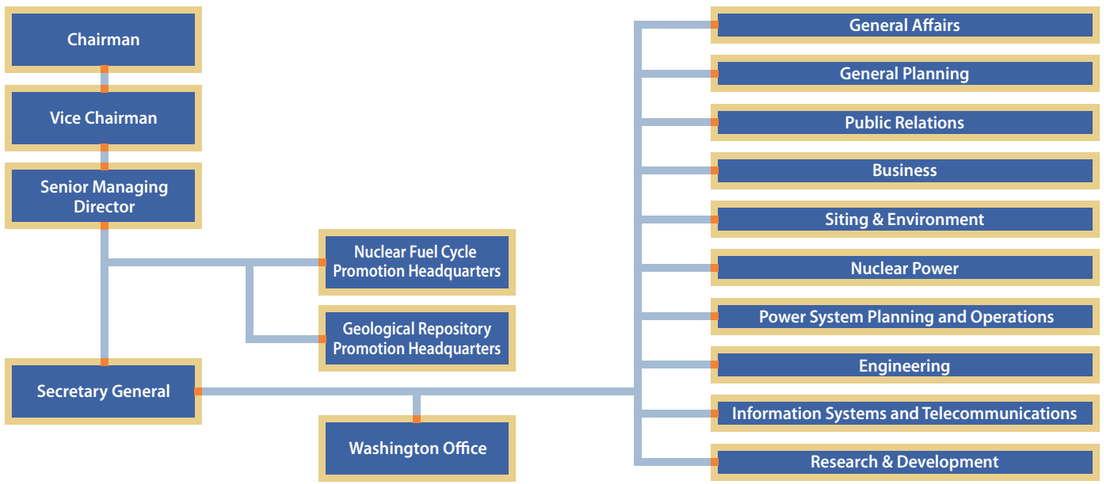




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