

# Initiatives to Support Lifestyles and Society with Environmentally Friendly Energy

Optimizing our power source mix to maintain energy security and tackle environmental issues



## The Energy Situation

We expect global energy demand to keep rising steadily in line with rapid economic progress, particularly in Asia. But at current consumption rates the world has only another 147 years of coal, 63 years of natural gas and 41 years of oil. New discoveries of energy reserves in the future would not significantly change those numbers.

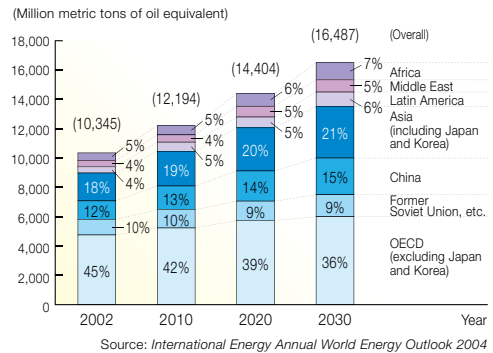
It is particularly important for Japan to address its vulnerability to global energy developments. This nation has to import 82% of its energy (or 96% if excluding nuclear power), far more than other major developed countries.

There is a growing risk of global warming due to greenhouse gases. In Japan, electricity generation accounts for around 30% of the nation's carbon dioxide output, so power companies must endeavor to limit their emissions.

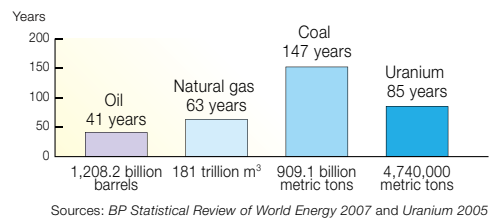
## Optimizing Our Energy Mix

It is vital for us to maintain energy security and comprehensively factor in economic and other considerations, optimally balancing power sources and generating techniques so we can disperse risks. Our energy mix centers on nuclear power, with contributions from thermal and hydroelectric sources.

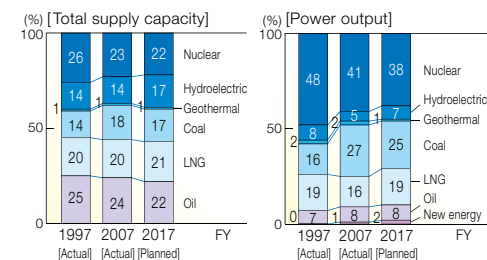
### ▼ Projected world energy demand



### ▼ Proven world reserves of energy



### ▼ Fuel source diversification plans (including power sourced from other companies)



### ▼ Optimal power mix

	Approximate percentage of total supply capacity	Approximate percentage of power output
Nuclear	30%	45–50%
Renewable energy (including geothermal and hydroelectric sources)	10%	10%
Pumped storage	10%	
Thermal (Coal, LNG and oil)	Around 16.66% according to fuel situations	According to fuel situations



## Nuclear Power Key to Resolving Energy Issues

Nuclear power accounts for 41% of the electricity we generate. It offers superior supply stability and contributes to energy security, while helping alleviate global warming because it is free of carbon dioxide emissions. We prioritize safety and stability, operate at the rated thermal output and plan to open new nuclear power facilities. Once a nuclear fuel cycle that uses reprocessed uranium is in place, we will be able to more efficiently harness this limited energy source. We thus consider it important to gradually deploy pluthermal generation.

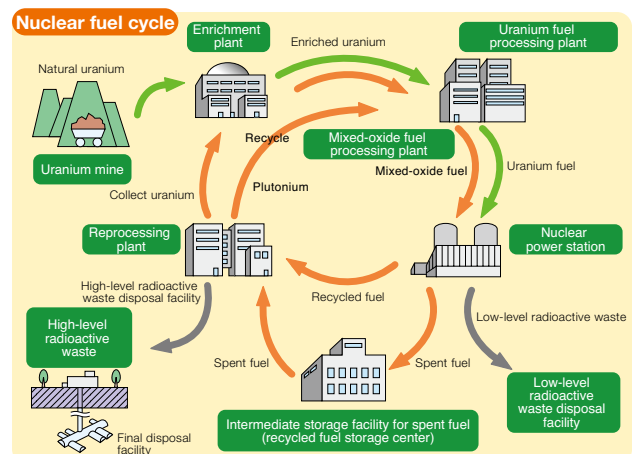
### ▼ Power source characteristics

Power source	Characteristics	Issues
Nuclear	<ul style="list-style-type: none"> <li>○ Stable fuel supplies and excellent economy</li> <li>○ Free of carbon dioxide emissions</li> </ul>	<ul style="list-style-type: none"> <li>○ Final disposal of high-level radioactive waste</li> <li>○ Cultivating social understanding</li> </ul>
Hydro-electric and geothermal	<ul style="list-style-type: none"> <li>○ Renewable energy</li> <li>○ Free of carbon dioxide emissions</li> </ul>	<ul style="list-style-type: none"> <li>○ Limited development sites (volume)</li> <li>○ Environmental impact of dam development</li> <li>○ Economy improvements</li> </ul>
Pumped storage	<ul style="list-style-type: none"> <li>○ Output adjustable in line with demand fluctuations</li> </ul>	
Wind and solar	<ul style="list-style-type: none"> <li>○ Renewable energy</li> <li>○ Free of carbon dioxide emissions</li> </ul>	<ul style="list-style-type: none"> <li>○ Small concentration as energy source</li> <li>○ Output fluctuates according to weather</li> </ul>
Coal-fired thermal	<ul style="list-style-type: none"> <li>○ Stable fuel supplies and excellent economy (broad distribution of suppliers)</li> </ul>	<ul style="list-style-type: none"> <li>○ Emits carbon dioxide and sulfur and nitrogen oxides</li> </ul>
LNG-fueled thermal	<ul style="list-style-type: none"> <li>○ Relatively stable fuel supplies (broad distribution of suppliers)</li> <li>○ Carbon dioxide emissions lower than from coal-fired generation</li> </ul>	<ul style="list-style-type: none"> <li>○ Contracts are long-term, making LNG a less flexible source than coal and oil</li> </ul>
Oil-fueled thermal	<ul style="list-style-type: none"> <li>○ Easier to transport and handle than coal and LNG</li> </ul>	<ul style="list-style-type: none"> <li>○ Reliance on the Middle East for most fuel oil</li> <li>○ Emits carbon dioxide and sulfur and nitrogen oxides</li> </ul>

## Pluthermal Generation Efforts

Japan needs to compensate for a lack of natural resources by deploying pluthermal power as a stable energy source. We plan to start pluthermal generation by 2010 at the No. 3 unit of the Genkai Nuclear Power Station.

- Use limited resources more efficiently  
We can more efficiently use uranium by reprocessing spent fuel to produce plutonium for power generation.
- Slash high-level radioactive waste  
Reprocessing and reusing spent fuel can greatly reduce high-level radioactive waste.
- Produce no more plutonium than needed  
Japan pledged internationally to produce only the plutonium it needs for electric power. The pluthermal generation process is crucial for harnessing plutonium for peaceful purposes.



**Our greatest social responsibility is to supply environmentally friendly energy that provides peace of mind. We are thus striving to optimize our power source mix.**



## Lowering the Environmental Impact of Thermal Power Generation

We use liquefied natural gas (LNG) coal and various other resources to ensure long-term access to thermal fuels. We are raising generating efficiency to lower environmental impact while using energy more effectively.

For example, we are maintaining high operating rates at the Shin Oita Power Station, an LNG combined-cycle facility, and at the Reihoku Thermal Power Station, which employs advanced systems. We are also increasing the generating efficiency at our thermal facilities. A good example is our plan to replace high-gas turbines at Unit No. 1 of Shin Oita Power Station between 2009 and 2012.

We will install four 400,000-kilowatt turbines featuring thermal efficiencies of 52% at the No. 3 Unit of Shin Oita Power Station in 2016.



LNG-fired Shin Oita Power Station



Coal-fired Reihoku Thermal Power Station

## Optimally Harnessing Renewable Energy

We are cultivating domestic renewable sources of energy that are environmentally friendly because they are free of carbon dioxide emissions, notably wind and solar power, biomass and hydroelectric power.

Kyushu has massive geothermal resources and accounts for around 40% of the nation's geothermal generating capacity. In April 2006, the Hatchobaru Geothermal Power Station started operating a 2,000-kilowatt geothermal binary generating facility. It was the first in Japan to tap low-temperature geothermal energy, which is impossible with conventional setups. The facility continues to operate efficiently. We are also surveying geothermal sites for potential development.

▼ Renewable energy production Millions of kWh

FY	2007	2017
New energy	1,200	2,800
Wind power	400	1,600
Solar power	200	600
Biomass, etc.	600	600
Hydroelectric power (except pumped storage)	4,600	5,700
Geothermal power	1,400	1,500
Total	7,200	10,000

Notes: 1. New energy figures for 2017 are targets for new facilities.  
2. Data includes supplies from excess power contracts with other companies.



We obtain wind power under an annual fixed purchasing plan. In August 2006, we announced that our facilities could accept 700,000 kilowatts from around Kyushu. We purchased about 200,000 kilowatts in FY 2008. We plan to buy more wind power after assessing its frequency and voltage impacts on our power grid.

Group member Nagashima Windhill Co., Ltd., is constructing the 50,400-kilowatt Nagashima Wind Power Station in Nagashima Town, Kagoshima Prefecture. That facility should go on line in October 2008.

We are looking into installing solar power systems at our facilities and idle properties. We are also researching sun-tracking techniques and new solar panels and are conducting R&D on a microgrid generating system that combines diesel, solar and wind power, and storage batteries.

The Group is working to deploy more facilities that reduce fossil fuel usage and carbon dioxide emissions. For example, Miyazaki Biomass Recycle Co., Ltd., maintains a 11,350-kilowatt plant that runs on poultry droppings. Fukuoka Clean Energy Co., Inc., has a 29,200-kilowatt waste-fueled facility.

We are developing and surveying regular hydroelectric sites and developing hydrokinetic river turbines. We are also evaluating potential sites for micro hydropower stations near consumption areas and are providing technical support for designing and installing these facilities.

We reached the Renewables Portfolio Standard's requirement of 630 million kWh in FY 2007.



Solar panels



Miyazaki Biomass Recycle Co., Ltd.



Fukuoka Clean Energy Co., Inc.

## Ensuring Stable Long-Term Supplies

In April 2008, we set up an office to evaluate socioeconomic and other trends and recommend a long-term optimal energy mix that reflects those factors.

The Kyushu Electric Power aims to fulfill our mission of consistently delivering environmentally friendly energy.

# Anti-Quake Measures Today and Tomorrow

Our Genkai and Sendai nuclear power stations began geological surveys to evaluate safety ahead of the September 2006 revision of seismic design guidelines. These facilities undertook the following tasks after the July 2007 Niigata Chuetsu Offshore Earthquake.

## New Geological and Ground Surveys and Assessments

### Geological and Ground Surveys

At the Genkai Nuclear Power Station, we are conducting geomorphological, ground surface and boring, and gravity surveys—the latter measuring slight differences in gravity between different locations to estimate the state of the deep subsurface structure. The facility is gathering more data by using the latest techniques in offshore ultrasonic surveys.

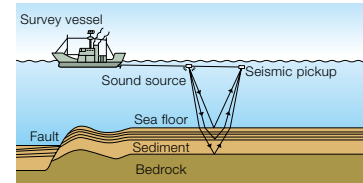
We are similarly doing geomorphological, ground surface and boring surveys at the Sendai Nuclear Power Station, and are profiling seismic reflections. The latter technique images the geological structure by bouncing sound waves off strata boundaries and fault planes and plotting the echoes. We are also conducting boring and offshore ultrasonic surveys.

### Earthquake Safety Assessments

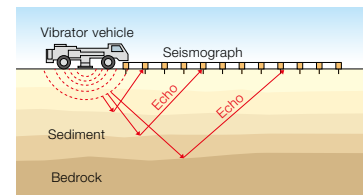
We are reassessing the earthquake safety of all six of our power plants based on the results of our geological and ground surveys. Seismic load evaluation for assessing structural reliability at the No. 3 Unit of the Genkai Nuclear Power Station and the No. 1 Unit of the Sendai Nuclear Power Station confirmed that the facilities met all key safety requirements, notably for reactor shutdowns and cooling and confining radioactive materials. We submitted an interim report on our findings to the Ministry of Economy, Trade and Industry in March 2008.

We will continue to carry out planned earthquake safety assessments and file final reports according to the schedule below. These documents will reflect any additional knowledge we gain from research into the Niigata Chuetsu Offshore Earthquake and other disasters.

▼ Examples of geological surveys around our power plants



Offshore ultrasonic survey



Profiling seismic reflections

Schedule	FY 2006	FY 2007	FY 2008	FY 2009
Genkai Nuclear Power Station	Geological and ground surveys	September 2007	Earthquake safety assessment	▼ Final report September 2009
	No. 1 & 2 units		▼ March 2008 (Interim report on No. 3 Unit)	
		No. 3 & 4 units	Earthquake safety assessment	▼ Final report March 2009
Sendai Nuclear Power Station	Geological and ground surveys	September 2007	Earthquake safety assessment	▼ Final report December 2008
	No. 1 & 2 units		▼ March 2008 (Interim report on No. 1 Unit)	

## Strengthening Our Firefighting Units

- We set up 10-person firefighting units at each of our nuclear power stations so we can respond more swiftly to disasters. Five of those people are on station around the clock, with another five ready to participate in emergency work.
- Each facility has a chemical fire engine and a truck with a portable motor pump.
- Satellite phones and other communications devices link these units directly with local fire brigades. Our units work closely with these fire brigades while conducting regular drills and other training.



Genkai Nuclear Power Station firefighting unit

## Establishing Swift Reporting Systems

- We have assigned personnel to measure radioactivity concentrations around the clock and swiftly report their findings.
- We equipped the central control rooms of our nuclear power stations with satellite phones to optimize communications with our Emergency Response Department and other bodies.