Ⅱ. Environmental Activities Status

1. Fiscal 2003 Environmental Activities Performance List

The main results of our environmental activities in fiscal 2003 are as followed.

Preventative Measures against Global Warming

Reference Page

●Reducing emission of greenhouse gases — P. 21～P. 30

- Average thermal efficiency of 40.3% (target of 40.0% or more) was accomplished in coal-fired thermal power station.
- Hydroelectric power stations are operated stably throughout the country. The Okutadami-Otori expanded Hydro electric power station started operation.
- The Matsuura Thermal Power Station conducted a co-firing test for an actual unit using biosolid (sewage sludge) fuel. A biomass power plant started operation up in Thailand, and another plant was planned.
- The Green Power Kuzumaki Wind Farm started operation in Kuzumaki Town, Iwate. The Tomamae/Nikaho/Tokyo Bay Wind power stations are operated stably. A wind power company in Spain was acquired. Setana, Tahara, Shikamachi and Nishihara sites are under construction.
- Based on the review of the deployment plan of the Oma Nuclear Power Station, application for nuclear reactor installation approval was submitted.
- The power usage in offices was reduced. (The power consumption of electric light in the head office building represented 179 kWh) (target of 190 kWh or less).
- SF_6 recovery rate of 98% (target of 98% or more) was accomplished.

●Efforts to the utilization of the Kyoto Protocol Mechanisms — P. 31～P. 32

- Promotion of the CDM project (7 projects for realization of CDM and 8 projects for implementation of a feasibility survey).

●Approaches to CO_2 absorption fixation and recovery — P. 32

- Trees were planted in the area of 2,200ha overseas (Australia and Ecuador) (Our target area was accomplished).

Efforts to Environmental Conservation

●Law compliance, environmental impact assessment/monitoring, reducing emissions of environmental loads — P. 33～P. 37

- SOx and NOx emissions intensity of 0.17 g/kWh and 0.49 kWh respectively (targets of SOx 0.25 or less and NOx 0.55 or less) were accomplished in coal-fired thermal power.
- We have no cases that violate environmental requirements, laws or ordinances. Efforts are being made to reduce the environmental impact of emissions.
- A communication system for environmental emergencies and anomalies is being established.

●Control of hazardous chemicals — P. 38

- Chemicals were properly controlled and reported under the Pollutant Release and Transfer Register (PRTR) Law and Law Concerning Special Measures against Dioxins.
- It was confirmed that our policy for a treatment plan on high-level PCBs was in line with large-scale, national treatment plans.

●Conservation of natural environment — P. 39～P. 40

- Initiatives were started for conservation of riverhead forest on company-owned land.

●Overseas transfer of environmental conservation technologies — P. 41～P. 42

- 16 overseas technological consulting activities were started. 25 overseas trainees were accepted.
- Promotion of IPP projects overseas. (15 projects for coal-fired thermal power, gas cogeneration, wind power, geothermal power and biomass are being promoted in 6 countries/areas.)

Numerical target. Since fiscal 2001, we have strengthened efforts for environmental conservation by setting numerical target for the following items:

Items		Unit	Fiscal 2003		
			Target	Performance	Evaluation
Reducing emission of greenhouse gases	①Average of gross thermal efficiency in coal-fired thermal power	%	40 or more	40.3	○
	②Power consumption of electric light in the head office building	GWh	Actively reduce (1.9 GWh or less)	1.79	○
	③Development of renewable and unutilized energy	MW	320 or more	320	○
	④Recovery rate of SF_6	%	98 or more	98	○
Efforts to absorption/fixation and recovery of CO_2	⑤Overseas afforestation project area	thousand ha	2.2 or more	2.2	○
Reducing of emission of environmental loads	⑥SOx emissions intensity	g/kWh	0.25 or less	0.17	○
	⑦NOx emissions intensity	g/kWh	0.55 or less	0.49	○
Reducing of waste based on recycling and re-use of resources	⑧Recycling rate coal ash	%	65 or more	76	○
	⑨Recycling rate gypsum	%	100	100	○
	⑩Recycling rate driftwood	thousand m^3	5 or more	9.4	○
	⑪Purchasing rate recycle papers	%	100	98.4	△
	⑫Generated amount of general waste such as paper waste in the head office building	ton	Actively reduce (50 or less)	30	○

Note: These numerical values are combined total values or average values relating solely to J-POWER, except for ② and ⑫ which are values from the headquarters' build and ③ and ⑤ which are combined total values from all projects in which J-POWER and its group of companies participated.

Recycling and Re-use of Circulating Resources

●Waste reduction and environmental recycling business P. 43～P. 46

- 76% of coal ash generated, or about 1.12 million t was recycled (target of 65% or more).
- 100% of desulfurized gypsum was recycled (The target was accomplished).
- Driftwood of about 9,400 m^3 was recycled (target of 5,000 m^3 or more).
- The purchasing rate of recycled papers was 98.4% (Target of 100%: Not accomplished).
- Waste paper and other waste were reduced in our national offices and plants. The amount generated in the head office building represented about 30 ton. (target of 50 ton or less).

Technological Research and Development

●Introduction of R&D results P. 47～P. 48

- With the introduction of the ultra super critical (USC) pressure generation technology into coal-fired generation, high-efficiency operation is now being maintained at the highest international level.
- A demonstration test on the world's first sea water pumped storage power generation was completed.

●Promotion of Engineering Research and Development in Progress P. 49～P. 50

- A pilot plant test is being carried out on technology for high-efficiency coal use, aimed at producing an Integrated Gasification Combined Cycle (IGCC) using fuel cells, gas and steam turbines.
- Technological development and proposals for cleaning the aquatic environment.

Environmental Communication

●Publication of environmental and social activities report P. 51

- The Environmental and Social Activities Report and its English version were continuously issued. The report was placed on our website.

●Promotion of public relations campaign and environmental conservation activities P. 51～P. 56

- An environmental public relations campaign was conducted. Environmental advertisements were released in newspapers, economic magazines, weekly magazines and subway platforms.
- The number of visitors to our PR facilities reached about 300,000.
- In response to the Environmental Month, cleanup activities were conducted around our offices and operating facilities.
- A green fair was held in the head office twice a year.

(Evaluation criteria ○100% target accomplishment △80% target accomplishment ×less than 80% target accomplishment)

Evaluation on fiscal 2003 efforts and future policies	Targets for fiscal 2004
High-efficient operation is maintained through the promotion of energy conservation and correct incineration control at each power plant.	40% or more
Energy-saving activities such as turning off the power during lunchtime are being encouraged.	Actively reduce (1.9 or less)
The Okutadami-Otori expanded power station, hydroelectric generation using river maintenance flow, Kuzumaki Wind Farm and biomass generation (Thailand) started operation. We aim at developing Shikamachi , Nishihara and Tahara wind power in fiscal 2004.	50 or more
Strict control of installment, inspection and removal of gas insulators and air conditioners is being implemented.	98 or more
Proper planting control was implemented with due attention to weather and noxious insects.	3.0 or more
Proper incineration control and environmental management measures are being implemented at each power station.	0.25 or less
	0.55 or less
The recycling rate is being improved by expanding supply to cement companies and using them for artificial upwelling projects.	65 or more
Efforts are being made to achieve 100% recycling.	100
Constant collection and reuse are being implemented.	9.0 or more
Work targets cannot always be accomplished due to outside circumstances. We requested understanding and cooperation with our efforts.	99 or more
More source segregation, such as the separate collection and recycling of mixed paper, is being ensured.	Actively reduce (40 ton or less in the head office building)

2. Preventative Measures against Global Warming

Global warming is one of the key concerns of our management and so we are voluntarily and actively promoting countermeasures.

Basic concept

Global warming is the most important issue to be tackled in the long term, since human beings cannot avoid to use fossil fuel as key energy resources throughout this century. As the cost to reduce greenhouse gas is expensive, it is desirable that more cost effective measures and actions should be adopted on a global scale, in order to reduce greenhouse gas emissions at lower cost and in order to realize sustainable development that protects both the environment and the economy.

Based on this concept, and in consideration of global cost efficiency, we continue to reduce CO_2 emissions (Note 1) (per power sales) by implementing the following four measures in combination:

(1) Maintenance and further improvement of efficient operation (such as the stable operation of hydroelectric power generation and efficiency improvement in thermal power generation).

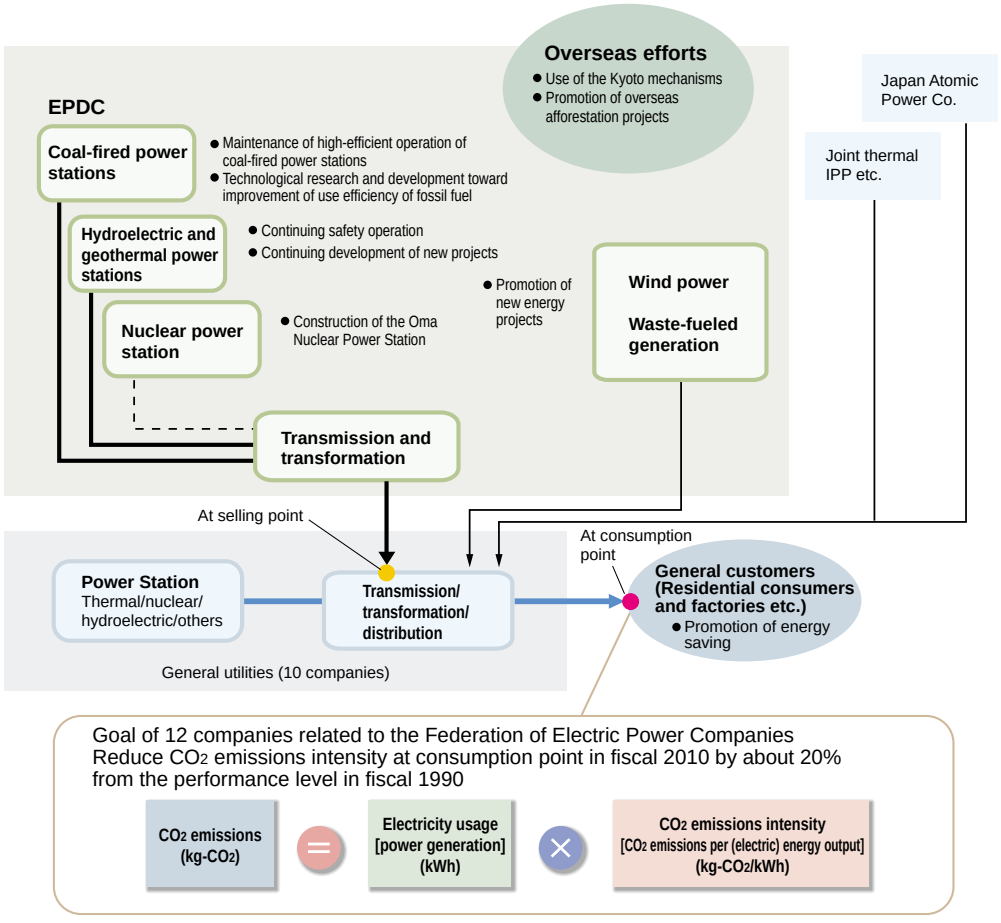
(2) Development of CO_2 lighter power sources (such as nuclear power and renewable energy sources).

(3) Development, transfer and diffusion of technologies (such as high-efficiency coal combustion)

(4) Use of the Kyoto Mechanisms under the Kyoto Protocol to address global warming efficiently on a global scale

In addition to these measures, we recognize that it will be necessary to remove and sequester the CO_2 from the flue gas of fossil fuel combustion within this century, in order to continue supplying energy to the world's people in a sustainable manner. We will make efforts to develop and demonstrate such technologies, setting "CO_2 Zero Emissions" as our ultimate goal.

Furthermore, as a collaboration of 12 electric utilities (Note 2) based on Federation of Electric Power Companies, we are addressing the challenging target of trying to reduce emissions intensity (emissions per unit of user end electricity) by approximately 20% from the fiscal 1990 level, by fiscal 2010. (Refer to p.77, "Environmental Action Plan by the Japanese Electric Utility Industry").

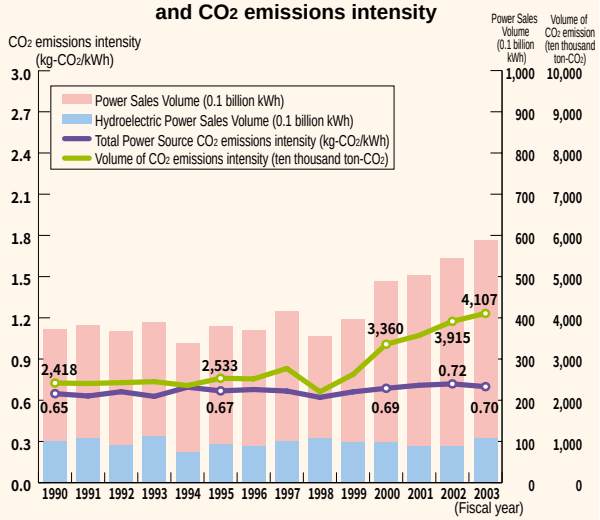


Actual CO_2 emissions

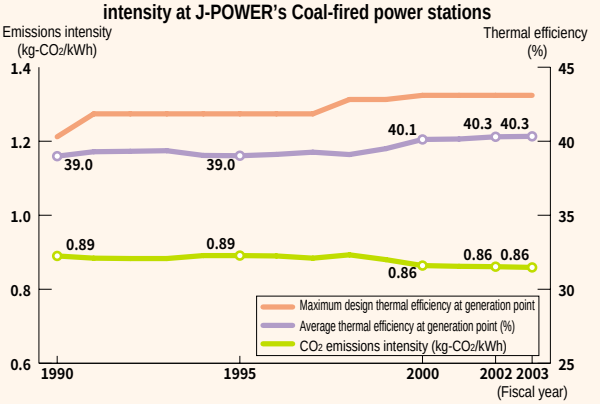
CO_2 emissions and CO_2 emission intensity of all power sources (Note 3) remained almost constant from fiscal 1990 to 1999.
CO_2 emissions have increased since fiscal 2000, with the startup of a new, large coal-fired thermal power station and high levels of operation in existing coal-fired thermal power stations.
As a result, in fiscal 2003 electric power sales reached about 58.8 billion kWh (about 8% up over the previous year). CO_2 emissions reached 41.07 million t (about 5% up over the previous year).
On the other hand, CO_2 emission intensity for all power sources dropped to 0.70 kg CO_2/kWh (about 3% down over the previous year) due to the high levels of operation of hydroelectric power stations.

Focusing on coal-fired thermal power generation, it can be seen that both designed maximum thermal efficiency and average thermal efficiency have been increasing with the construction of each new power station, rewarding our efforts to improve thermal efficiency. As thermal efficiency increases, the CO_2 emission intensity of coal-fired thermal power (Note 4) is gradually decreasing.
In fiscal 2003, the emission intensity dropped to 0.86 kg CO_2/kWh.

Actual CO_2 emissions at J-POWER's all electric power and CO_2 emissions intensity



Actual thermal efficiency and CO_2 emissions intensity at J-POWER's Coal-fired power stations



CO_2 emissions intensity was calculated based on emission coefficients for each fuel in the "Summary Report on the Review Results Concerning the Calculation of Greenhouse Gas" (August 2002) published by the Ministry of Environment.

Note 1: CO_2 emissions per power sales

CO_2 emissions from the use of electricity can be determined by multiplying the customers' power consumption by end-user CO_2 emission intensity. Since power consumption is increased or decreased in response to various circumstances beyond the electric utilities' direct control (such as weather conditions and the customers' electricity demand) the electric utilities employ an end-user CO_2 emission intensity target against which their efforts can be measured. Since our company is a wholesaler, we use of CO_2 emissions per power sales as our index.

Note 2: 12 companies related to the Federation of Electric Power Companies

10 members of the Federation of Electric Power Companies (Hokkaido Electric Power Co., Tohoku Electric Power Co., Tokyo Electric Power Co., Chubu Electric Power Co., Kansai Electric Power Co., Chugoku Electric Power Co., Shikoku Electric Power Co., Kyushu Electric Power Co., Okinawa Electric Power Co.,) +J-POWER+ Japan Atomic Power Co.

Note 3: CO_2 emissions intensity at all electricity power

CO_2 emissions intensity at all electricity power generation plants = CO_2 emission ÷ Power sales at all electricity power generation plants

Note 4: Coal-fired thermal CO2 emissions intensity

CO_2 emissions intensity = CO_2 emissions in coal-fired power stations ÷ Power sales in coal-fired power stations

Reducing Emissions of Greenhouse Gas

Maintaining highly-efficient operation of coal-fired power stations

Our coal-fired power stations have traditionally tried to improve their thermal efficiency through the promotion of energy savings and the introduction of new technologies such as USC (Ultra Super Critical Pressure technology). The thermal efficiency at generation point in fiscal 2003 reached 40.3% (the same point as in the previous fiscal year).
The improvement of thermal efficiency results not only in the reduction of fossil fuel but also leads to greater environmental conservation and accompanying economic effects such as reducing of CO_2, SOx and NOx emissions, reduction of waste and chemicals and reducing generation of coal ash and gypsum.

Share of our power stations introducing USC	
Unit number	4/14 (All units)
Rated power	47%
Power sales in fiscal 2003	57%

Isogo Thermal Power Station (Kanagawa Prefecture)

Audible inspection of pumps (Isogo Thermal Power Station)

Stable operation of hydroelectric power stations

Hydroelectric power is valuable as clean domestic energy for our country reducing harmful effects to the environment, for instance, no emission of CO_2. (See "Hydroelectric Generation and the Environment," p.5).
Our company has 59 hydroelectric generating facilities with a total electric energy output of 8,550,000 kW, and the hydroelectric energy output in fiscal 2003 reached 12,103 GWh. The effectiveness of hydroelectric generation (note) is equivalent to reduction of about 4.5 millions ton-CO_2 emission.

Sakuma Power Station (Shizuoka Prefecture)

Inspection of gas pressure of switches (Sakuma Power Station)

Note: The effectiveness of nuclear, hydro, geothermal and wind power on reduction of CO_2 emissions, in this section, is calculated by average intensity (kg CO_2/kWh) for all type of power resource, nationwide.

Stable operation of geothermal power stations

Geothermal power stations produce power by collecting and using huge thermal energy existing in volcanoes and underground around them as hot water and steam.
In spite of small power output, geothermal generation releases less CO_2, and is expected to play a vital role in producing renewable energy.
Our company has generated power in the Onikobe Geothermal Power Station (power capacity: 12,500 kW, Miyagi Prefecture) since 1975, and electric energy output of 105 GWh in fiscal 2003. The effectiveness of geothermal generation is equivalent to reduction of about 40,000 ton- CO_2 emissions.

Onikobe Geothermal Power Station (Miyagi Prefecture)

Efforts to generation using biomass fuel

Use of wood biomass

Our company has started the development of a co-firing technology for applying wood biomass to coal-fired power stations, in collaboration with Research Institute of Innovative Technology for the Earth (RITE).
Thinned wood is assumed as an object of this development. The promotion of recycling of the wood will lead to not only global environmental conservation but also revitalization of a forest industry.
Thus far, the amount of domestic wood biomass was investigated and its characteristics were analyzed. Furthermore, a basic test on mixed firing with coal in a small experimental apparatus as fuel was conducted, and it was confirmed that there ware no problems with co-firing biomass.
In May 2004, the Matsuura Thermal Power Station (Nagasaki) started a co-firing test for an actual unit that will continue for about 6 months.

Matsuura Thermal Power Station (Nagasaki Prefecture)

Wooden biomass chip

Use of biosolid (sewerage sludge) fuel

Biosolid fuel is produced by mixing waste cooking oil with sludge generated in waste water treatment plants, heating the mixture and removing water from it. And it has the same heat generation rate as that of coal. Our company is promoting co-firing this fuel, in addition to wood biomass.
Thus far, its fuel characteristics has been analyzed, and a basic test on mixed firing in a small experimental apparatus was conducted to identify its basic features when burning it with other coal fuel.
Since August 2003, we have continued to conduct a co-firing test for an actual unit in the Matsuura Thermal Power Station, Nagasaki. This is the first such trial in the country. After approx. 1 year's operation, this has confirmed that fuel can be successfully burnt at a maximum co-firing rate of 1%. If 1% biosolid fuel is co-fired in unit 1 at the Matsuura plant, CO_2 emissions could be reduced by about 50,000 t per year.

Appearance of biosolids

Storage silo

Kazuhiko Hayakawa

Engineering Group, Thermal Power Business Division

Biomass is expected to be a new energy source so it is important for not only our company but also our society to use it effectively. We will actively promote the effective use of biomass.

Power Generation project using biomass fuel in Thailand

Our company promoted the Power Generation IPP project using biomass fuel with EGCO, the largest private power generating company in Thailand which started commercial operations in May 2003.

Thailand is the 6th rice producing country in the world. The northeastern region of this country, particularly Roi-Et Province is a leading grain belt where rice husks after milling rice is burned in fields, and has had the problem of disposing the husks.

This project is intended to recycle about 76,000 ton of rice husks annually as fuel for power generation, and is our first biomass-fueled project at home and abroad. The annual electric energy output of this station (calculations) will reach 64.39 GWh on an annual basis, which represents the effectiveness of CO_2 reduction equivalent to about 30,000 ton.

The station has implemented measures for environmental conservation such as installment of electric precipitators and waster water treatment equipment, in order to give considerations to surrounding environment.

We are developing a biomass-fueled generation program (23MW) in which waste wood and chips from a sawmill for rubber trees are used as fuel to produce electricity in Yara Province, Thailand (about 1,000 km south from Bangkok) and supply power to the Electricity Generating Authority of Thailand (EGAT). This project allows EGAT to limit the fuel consumption of its thermal power stations and also to reduce annual CO_2 emissions of about 60,000 t.

Rice husk

Specifications of the Roi-Et Thermal Power Station	
Point	Roi-Et, Roi-Et Province, Thailand
Fuel	Rice hulls generated from rice milling plants
Power generating capacity	9,950 kW
Environmental equipment	Multi-cyclone Electric precipitator Waste water treatment equipment
Startup	May 2003

Specifications of the Yara Thermal Power Station	
Point	Yara Province, Thailand
Fuel	Rubber tree wastes from local sawmills
Power generating capacity	23,000 kW
Environmental equipment	Multi-cyclone Electrostatic precipitator Waste water treatment equipmet
Startup	Due August 2005

Promotion of wind power generation

In addition to the commercially operated Tomamae Winvilla and Nikaho Kogen Wind Power farms, the "Tokyo Bayside Wind Power Plant" (commonly known as Tokyo Kazaguruma) was established on a landfill on the central breakwater near Odaiba in March 2003. This was based on a pilot project for the prevention of global warming organized by the Tokyo Metropolitan Government. In December 2003, the Green Power Kuzumaki Wind Farm was completed in Kuzumaki Town, Iwate, and started commercial operation. Four more wind power plants are currently under construction. We acquired a business company from the Gamesa Group in Spain on March 2003 and are now operating its power stations.

The total annual power generation from operating power stations in Japan is planned to reach about 166.5 GWh, equivalent to a reduction in CO_2 emissions of about 70,000 t.

Tokyo Bayside Wind Power Plant (Tokyo)

Wind Farm (Galicia, Spain)

(Operating)

	Tomamae Winvilla Wind Farm (Tomamae Town, Hokkaido)	Nikaho Kogen Wind Farm (Nikaho Town, Akita)	Tokyo Bayside Wind Power Plant (Tokyo)	Green Power Kuzumaki Wind Farm (Kuzumaki Town, Iwate)	Monte Seiciocando, Cerradocando, Oteriodocto Wind Power Plant (Galicia Province, Spain)
Farm capacity	30,600 kW	24,750 kW	1,700 kW	21,000 kW	64,210 kW
Windmill generator	Single unit power generating capacity 1,650 kW 14 units Single unit power generating capacity 1,500 kW 5 units	Single unit power generating capacity 1,650 kW 15 units	Single unit power generating capacity 850 kW 2 units	Single unit power generating capacity 1,750kW 12 windmills	Single unit power generating capacity 660 kW 96 units Single unit power generating capacity 850 kW 1 units
Annual power generation (planned value)	About 59 GWh Residential customer (Approx. 17,000 households)	About 51 GWh Residential customer (Approx. 15,000 households)	About 2.5 GWh Residential customer (Approx. 800 households)	About 54 GWh Residential customer (Approx. 16,000 households)	About 180 GWh Residential customer (Approx. 55,000 households)
Startup	December 2000	December 2001	March 2003	Scheduled on December 2003	Scheduled on December 2003
J-POWER's stake share	100%	67%	50%	100%	50% (Funded through our subsidiary)

(Under construction)

	Tahara Bayside Wind Farm (Tahara City, Aichi)	Nagasaki Shikamachi Wind Farm (Shikamachi Town, Nagasaki)	Aso Nishihara Wind Farm (Nishihara Village, Kumamoto)	Setana Bayside Wind Farm (Setana Town, Hokkaido)
Farm capacity	22,000 kW	15,000 kW	17,500 kW	12,000 kW
Windmill generator	Single unit power generating capacity 2,000 kW 11 units	Single unit power generating capacity 1,000 kW 15 units	Single unit power generating capacity 1,750 kW 10 units	Single unit power generating capacity 2,000 kW 6 units
Annual power generation (planned value)	About 40 GWh Residential customer (Approx. 12,000 households)	About 28 GWh Residential customer (Approx. 8,000 households)	About 23 GWh Residential customer (Approx. 7,000 households)	About 35 GWh Residential customer (Approx. 10,000 households)
Startup	Due March 2005	Due end of February 2005	Due end of February 2005	Due Fiscal 2005
J-POWER's stake share	66%	70%	81%	100%

RPS system (Renewable Portfolio Standard)

A new law (the RPS system) was enforced in April 2003 obliging general electric utilities to use a set amount of new energy sources as a contribution towards both a constant supply of energy and environmental conservation.

New energy sources specified in the law include electricity obtained from wind, solar and geothermal power and from hydropower (conduit types of 1,000 kW capacity, or less) and biomass in facilities approved by the government.

Tomoaki Washio

Wind Power Development Group, New Business Division

Environmental surveys are also essential for wind power generation and the wind power generation that produces of clean energy without CO_2 emissions. We continue to seek the best windmill layout for each region, with the aim of ensuring harmonious coexistence with nature.

Construction of a nuclear power stations

We are planning the construction of a nuclear power plant (full MOX-ABWR: 1,383,000 kW) in Oma-machi, Aomori, aiming to use MOX fuel for the whole reactor core.
Application for nuclear reactor installation approval was submitted in March 2004. (Its start of operation is scheduled for March 2012). We promise to promote the construction plan for the reactor, paying the closest attention to safety measures, environmental conservation and its coexistence with local communities. Oma Nuclear Power Station has the merit of the reduction in CO_2 emissions estimated to be equivalent to about 3.3 million ton-CO_2, annually (assuming the capacity factor to be 80%).

Environmental Conservation Measures in Preparation for the Construction of Oma Nuclear Power Station

We are undertaking environmental conservation measures in preparation for the construction of Oma Nuclear Power Station in accordance with the procedures specified in the "Environmental Impact Evaluation on Oma Nuclear Power Station". We are also taking environmental considerations, improvement and enhancement activities into account by means of an environmental management system (established on October 17, 2000).

	Item	Details
Facility measures	Protection of land animals and vegetation	About 29 % of the site is designated as a non-alteration zone and is to be preserved in its natural state.
	Ensuring migration pathways for small animals	In the replaced national highway • Installation of conduit that small animals can move below the highway • Installation of inclined gutter to make it to climb up of small animals easily
Measures under construction	Measures to prevent water pollution	• Installation of pollution diffusion prevention sheets and execution of water quality monitoring in sea area • Neutralizing seawater in placing concrete in the sea • Draining water after leading and skimming water into settling pond in the site
	Measures to prevent noise and vibration	• Selection of machinery with low noise and vibration. • Implementation of measures necessary for noise prevention, following the assessment of noise levels
	Measures to dispose of soil and rock under construction	• Soil and rock by excavating and dredging are used for reclamation, backfill and fill. And the soil disposal area is planted after being filled with surplus soil.
	Measures to prevent dust	• Wash facilities for construction vehicles • Watering and cleaning construction routes • Installation of dust prevention fences and nets
	Measures to prevent road traffic noise	• Designation of routes to be used by construction vehicles • Reduction in road usage through the use of marine transport
	Disposal and effective use of Industrial waste	• Correct disposal in accordance with laws and regulations • Recycling of chipped timber and roots as seeding materials

Covered crossing conduits below the road (for small animals to move)

Protective barrier to prevent the spread of pollution

Survey of rare animals

As part of the environmental monitoring program, air quality, vibration, noise and water quality have all been constantly monitored since April 2000, when preparation for the construction started. All come from with recommended values as specified in the environmental impact evaluation.
Environmental surveys of rare animals and vegetation are conducted whenever appropriate in order to ensure the protection of animals and vegetation at planned power station sites.

Tsugu Iwaki
Civil and Architectural Engineering Group, Oma Nuclear Power Project Construction Preparation Office.

We monitor environmental impacts associated with preparation for the construction and strive to reduce these impacts, aiming at the construction of a power station that harmonizes with the rich natural resources facing the Tsugaru Strait.

Efforts to the reduction of environmental impacts in the transportation of raw materials

Reduction of Environmental Impacts through the Upsizing of Coal Carriers

Each year we import more than 10 million tonnes, or more, of coal from overseas (Australia, China, Indonesia etc.)
A coal carrier is usually a vessel with a capacity of around 60,000 dwt. We are promoting the upsizing of our bulk carriers.
Upsizing allows a reduction in the amount of fuel oil consumed per weight of coal.
Accordingly, environmental impacts associated with transportation (CO_2, sulfur oxides, nitrogen oxides etc.) will be reduced.

Coal carrier (BLUE ISLAND)

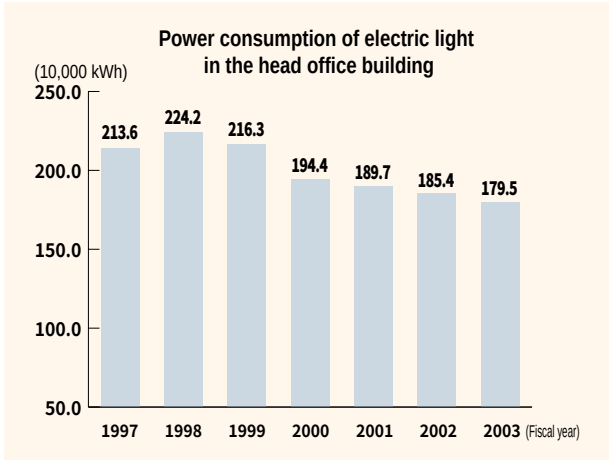
List of Our Dedicated Coal Carriers

Carrier name	Deadweight tonnes (movable capacity)	Built year
Soryumaru	86,868	1995
Shohomaru	87,996	1995
Kurotakisanmaru	87,890	1995
Suireimaru	89,000	1996
SOUTHERN CROSS	73,939	1997
BLUE ISLAND	152,398	2000
Tsunomine	152,400	2000

Promotion of energy saving

Energy saving in the head office building

The energy saving measures taken in the head office building based on EMS include utilization of cooling waste heat, combination of waste heat collection in computer rooms and load-level management by installment of regenerative heat pumps and complete extinction at the time of non-required light. Additional installment of inverters in lighting apparatus of the head office building in fiscal 1999 produced the effectiveness of energy saving equivalent to about 237,000 kWh (about 11% reduction) in fiscal 2000, in comparison with an average of energy consumption for three years from 1997 to 1999. In addition, as a result of energy saving efforts, electricity usage in fiscal 2003 reached 1.795 GWh, 3.2% decline from the previous year.



Solar panel for indoor hot-water supply (on the roof of the head office building)

Energy saving activities

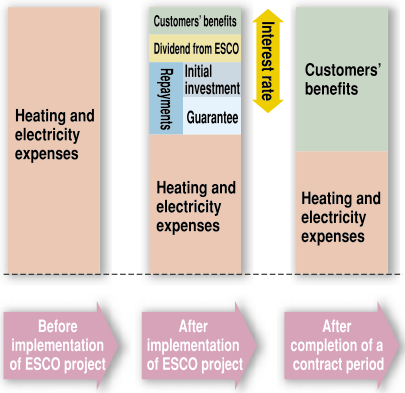
Our individual offices work on energy saving activities such as light extinction during lunch time and complete reduction of stand-by power based on EMS, as part of easy and immediate approaches to prevention of global warming. The power consumption in fiscal 2003 in the head office, our branches and construction sites reached 17.28 GWh (17.81 GWh in fiscal 2002), about 3% decline from the previous year.
Furthermore, efforts were made to economize in vehicle use. The amount of fuel (gasoline and light oil) used by our own cars reached about 557 kl in fiscal 2003, down by 15% from the 655 kl used the previous year.
The CO_2 emission from office power consumption and car use is equivalent to about 8,400 ton-CO_2.

Junichiro Hoshino
General Affairs Group, General Affairs Dept.

Head office supports the “survey on clarification by energy consumption and diagnosis on energy saving” carried out at the request of the Bureau of Environment, Tokyo Metropolitan Government. The results of this survey are used for data analysis and statistical processing, and as references to help promote an effective energy conservation system for the future.

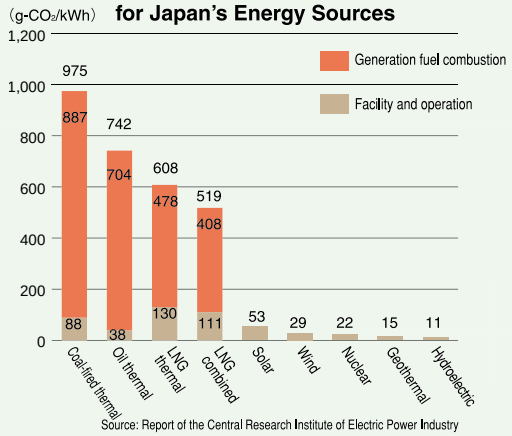
Promotion of energy saving projects

Our company not only promotes measures for main power supply but also invests in the First Energy Service Company, Limited (ESCO, established in March 1997), a first energy service company in Japan, with a deep understanding of the importance of energy saving.
In addition, we are working on selling energy saving equipment and consulting with our group companies. (Refer to p.74.)



Source: Energy Conservation Center “Recommendation of ESCO projects”

Lifecycle Assessment (LCA) of CO_2 Emissions Intensity for Japan's Energy Sources



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

Reference: Lifecycle Assessment (LCA) CO_2 Emissions Intensity for Japan's Energy Sources

CO_2 emissions over the entire lifecycle of different energy sources in Japan are indicated in the chart on the left side. In this chart, the CO_2 emissions are calculated for all energy consumed for material mining to construction of generating facilities, fuel transportation and refining, operation and maintenance of the facilities, in addition to combustion of generation fuel.
Our company participated in the LCA review committee of the Federation of Electric Power Companies consisting of electric utilities in order to examine LCA for CO_2 and other indicators.

Reducing emission of greenhouse gas except CO_2

The Framework Convention on Climate Change covers five types of greenhouse gas except CO_2. These types of greenhouse gases released from electric utilities affect global warming while their influence level is about 1/500 of that of CO_2 (Note).

SF6 of the greenhouse gas is not emitted during its use due to consumption in confined states, but some of it may be released during equipment check and removal. Our company collects and reuses the gas to ensure the reduction of SF_6 emissions with the aim of 98% or more collection rate. The collection rate of SF_6 in fiscal 2003 reached 98%.

Note: Based on the "Environmental Action Plan by the Japanese Electric Utility Industry", the Federation of Electric Power Companies of Japan (September 2003).

Measures for reducing emission of greenhouse gas except CO_2

Targeted gas	Measures for reducing emission
Sulfur hexafluoride (SF_6)	SF_6 is used as gas insulators for gas-insulated devices. SF_6 emissions are reduced through ensured collection and reuse of the gas while checking and removing the equipment.
Hydrofluorocarbon (HFC)	HFCs are used as refrigerants for air conditioners. The replacement of CFCs under regulation with HFCs is expected to proceed, but our company is working on emission reduction of HFCs, through leakage prevention, collection and reuse of the gas during installation and repair of equipment.
Perfluorocarbon (PFC)	Our company never emits PFCs.
Nitrous oxide (N_2O)	N_2O emissions are reduced to the maximum amount through improvement of thermal efficiency in coal-fired power stations.
Methane (CH_4)	The concentration of CH_4 in flue gas of coal-fired power stations falls under the level of air environmental concentration. The gas is not released substantially.

Possession and consumption of specific CFCs and halons

Category		2003-year end (t)	Applications
Specific CFCs	Possession Consumption	2.5 0.0	For refrigerant
Halons	Possession Consumption	3.9 0.0	Fire extinguisher
Other CFCs	Possession Consumption	9.5 0.1	For refrigerant
Total	Possession Consumption	15.7 0.1	
Alternative HFCs	Possession Consumption	1.4 0.0	Fire extinguisher

Protection of ozone ayer

The ozone layer, present in the upper stratosphere (at a height of 20-40 km height from the ground), is a great contributor to protection of every life by absorbing hazardous ultraviolet rays. Due to the fact that specific CFCs and halon gases may deplete the ozone layer and have serious effects on human health and ecosystem, it is mandatory to reduce the production and consumption of the gas on an international basis.

Our company is not subject to immediate regulation as being one of the users, but we identify the amount of possession and consumption of the gas on a regular basis and makes efforts to control it.

Reference

Substances depleting the ozone layer are chemically stable and contain chlorine or bromine within their molecules, for instance, specific CFCs and halons. This gas is an intense greenhouse gas, together with HFCs, PFCs and SF_6.

Under the Law concerning to Protection of the Ozone Layer (law concerning to protection of the ozone layer based on regulation of specific substances), control subjects based on the Montreal Protocol are defined as "specific substances" and the production and consumption of these substances are being phased out according to the regulation schedule.

As a result, the production and consumption of halons and specific CFCs were totally eliminated at the end of 1993 and 1995, respectively. The production of other substances depleting the ozone layer will be fully phased out.

Efforts to the Utilization of the Kyoto Protocol Mechanisms

Significance of the Kyoto mechanisms and J-POWER's policies for utilization of these mechanisms

The Kyoto mechanisms were introduced for enhancement of economic efficiency in order to accomplish the goals established by the Kyoto Protocol. (see p.76) Japan, which is said to have the highest cost for achieving its target, will receive great benefits from the Kyoto mechanisms.
Prior to the acceptance of the Kyoto Protocol in June 2002, the Japanese government revised the "Guideline for Measures to Prevent Global Warming" (refer to page 75) and characterized the use of the Kyoto mechanisms by companies as "effective measures for ensuring the reduction of CO_2 emissions from energy activities." Accordingly, we are now actively promoting the use of these mechanisms (JI, CDM and emission trading).

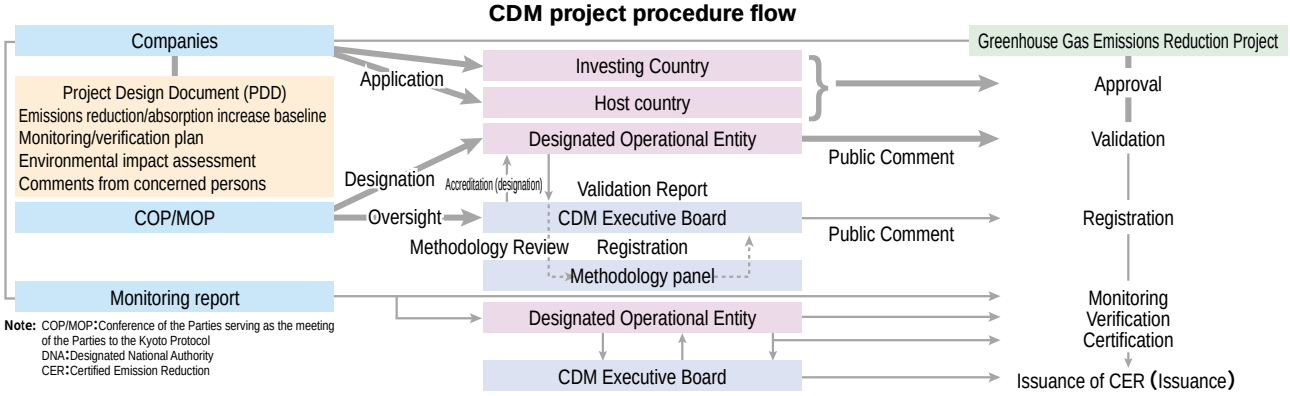
Discovery, cultivation and implementation of JI and CDM projects

We identify, develop and implement projects leading to the reduction of greenhouse gas emissions, utilizing both JI and CDM.
In fiscal 2003, we focused on the promotion of CDM projects. We developed our own CDM projects while participating in other companies' projects as an investor and CER (Certified Emissions Reduction) buyer, promoting CDM projects jointly.

The CDM Project Process

The procedure for obtaining credits on CDM projects is shown in the following flow chart.

CDM project procedure flow



Note: COP/MOP: Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
DNA: Designated National Authority
CER: Certified Emission Reduction

Our Own Development of CDM Projects

One of our CDM project was approved by the Japanese government in May 2003, in order to develop a biomass-fueled generation program (23MW) as a CDM project in Yara Province, Thailand in which waste wood and chips from a sawmill for rubber trees are used as fuel.
Focusing on greenhouse gases with larger greenhouse effect, we also promote projects for capture and treatment of those gases and conduct surveys on these projects. We are preparing for the commercialization of a project involving the capture and flaring of methane gas from landfills in Argentine and Chile.

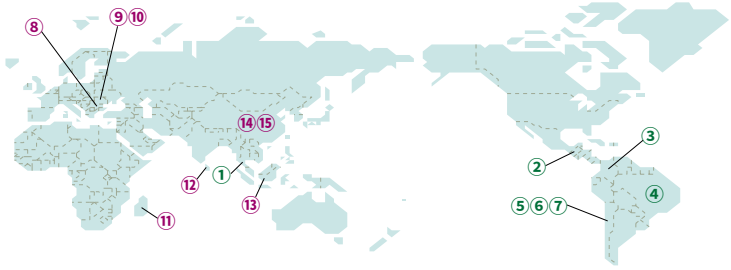
Development of CDM Projects with partners in Developing Countries

We identify potential CDM programs from among projects planned in developing countries and promote efforts for developing these CDM programs in association with local companies, acting as an investor and a CER buyer.
In fiscal 2003, we prepared and released 6 project design documents (PDD). Three small scale CDM projects and baselines and monitoring methodologies for 3 normal-scale CDM projects were submitted to the CDM Executive Board. One project was evaluated as category A (approved) and registered, while 2 other projects were evaluated as category B (further modification required).

Feasibility Studies

In order to identify potential JI/CDM projects, we conducted feasibility studies on wind power generation and district heat supply projects in Eastern Europe. We also conducted 6 surveys in cooperation with other companies including a project for the collection of mine methane gas and the production of electric power in China.

CDM projects under development and JI/CDM feasibility study implementation projects in fiscal 2003



CDM projects under development

① Biomass power generation project in Thailand
② Hydropower generation project in Guatemala
③ Hydropower generation project in Columbia
④ Small hydropower generation project in Brazil
⑤ Plant fuel switching project in Chile
⑥ Cogeneration project in Chile
⑦ City gas leakage prevention project in Chile

JI/CDM feasibility study implementation projects

⑧ District heat supply project in Bulgaria
⑨ Wind power generation in Rumania
⑩ Methane gas capture and utilization project in waste processing plants in Rumania
⑪ Abundant forest afforestation project in Madagascar
⑫ Hydropower generation project in Sri Lanka
⑬ LNG plant CO_2 separation and recoveryproject in Indonesia
⑭ Coal mine methane gas capture / cogeneration project in China
⑮ Coal mine methane gas capture / power generation project in China

Activities towards utilizationl of the Kyoto Mechanisms

Working in partnership with the Norwegian company Point Carbon (a world leader in analysis and forecast of emission trading markets) we began providing information to the experts in Japan in October 2003. In addition, we established “GHG Solutions”, focusing on web-based services that provide information to Japanese companies interested in addressing to global warming to find the solutions together.

Prior to these activities, we co-sponsored the Southeast Asian CDM Forum hosted by the Asian Development Bank (ADB) and the International Emissions Trading Association (IETA), in September.

Among our activities to promote efforts to acquire emission credits, we are participating in Dexia-Fondelec Energy Efficiency and Emissions Reduction Fund, together with the European Bank for Reconstruction and Development (EBRD), that is aiming at investment in energy conservation projects in Eastern Europe.

*Dexia-Fondelec Energy Efficiency and Emissions Reduction Fund

Approaches to CO_2 Absorption plus Sequestration, and Recovery

Promotion of overseas afforestation projects

Afforestation is an effective method for absorption and fixation of CO_2 in the air. Our company established joint ventures in Australia and Ecuador to promote planting projects with the aim of final afforestation area of 10,000 ha. Because planted trees are to be used for paper as raw materials in future, natural forest that is currently cut for paper materials can be protected.

Afforestation in Australia

Afforestation in Ecuador

Country name	Joint company name (constituent company name)	Initiation year	2003 afforestation area (accumulation)	CO_2 sequestration in fiscal 2003	Final target area
Australia	BPFL (note 1) (Oji Paper Co., Ltd., Itochu Corp., Kodansha Ltd. Publishers, EPDC Overseas Coal Co., Ltd., JP Resources Co., Ltd., Seihoku Co., Ltd. and J-POWER)	1998	About 1,100ha (6,100ha)	About 140,000 t CO_2	About 10,000ha
Ecuador	Eucalyptus Pacifico Co., Ltd. (WALTS INTERNATIONAL Co., Ltd., Mitsubishi Paper Mills, Ltd., Sumitomo Corp., EPDC Environmental Engineering Service Co., Ltd. and J-POWER)	2001	About 1,100ha (2,300ha)	About 70,000 t CO_2	About 10,000ha

Note 1: Brisbane Plantation Forest Company of Australia Pty., Ltd.

Research and development toward absorption and fixation of CO_2

Our company conducts Japan-Australia joint demonstration tests on a technology to develop forests that can fix a great amount of CO_2 in a short term in a site of the closed Ensham Coal Mine, Queensland Province, Australia.

In addition, we conduct research into the optimal location of monitoring points for the geological sequestration of CO_2. Started in fiscal 2002 under our three-year plan, this research is intended to predict the behavior of underground CO_2 reservoirs, using fluid flow simulations, and to optimize CO_2 monitoring. (Both projects were commissioned by the New Energy and Industrial Technology Development Organization.)

3. Efforts to Environmental Conservation

Law Observance

In fiscal 2003, we had no cases that violated environmental requirements, laws or ordinances. No instances occurred where agreement values on environmental conservation were exceeded.

Main environmental laws

Law name	Main business related with the laws
Environmental Impact Assessment Law Electricity Utilities Industry Law	Prediction and assessment of environmental impacts of power plant construction on surrounding regions
Air Pollution Control Law	Control of SOx, NOx and dust emissions resulting from operating power plants
Water Pollution Control Law	Control of waste water from power stations to public water areas
Noise Regulation Law	Control of noise from operation of power stations and substations and construction of facilities
Vibration Regulation Law	Control of vibration from operation of power stations and substations and construction of facilities
Offensive Odor Control Law	Control of offensive odor from operation of power stations and substations
Factory Location Law	Greening of sites such as power stations
Industrial Water Law	Pumping of underground water used as power generation
Natural Parks Law	Construction of power stations, substations, transmission facilities and communication equipment in national parks
River Law	Intake of water from rivers for power generation and construction of generating facilities in river areas
Pollutant Release and Transfer Register (PRTR) Law	Management of release to the environment of chemicals used in power stations
Waste Management and Public Cleansing Law	Proper management of waste generated from business activities
Law Concerning the Improvement of Pollution Prevention Systems in Specific Factories	Selection of manager in charge of pollution control in power plants

Conclusions of environment-related agreement

Environment-related agreements consist of the following measures and actions (although varying somewhat with site and regional characteristics). Quantitative standards on air and water quality are as specified.

- Air pollution control measures
- Noise and vibration control measures
- Water pollution control measures
- Accident actions
- Waste water treatment measures
- Offensive odor control measures
- Nature protection measures

Environmental agreements in our thermal power stations

Name	Targeted power stations	Counterpart
Memorandum of Environmental Conservation Agreement	Isogo Thermal Power Station	Yokohama City
Memorandum of Pollution Control Agreement	Takasago Thermal Power Station	Takasago City, Hyogo
Memorandum of Agreement Concerning to Environmental Protection	Takehara Thermal Power Station	Takehara City, Hiroshima
Environmental Conservation Agreement	Matsushima Thermal Power Station	Oseto Town, Nagasaki
Memorandum of Environmental Conservation Agreement	Matsuura Thermal Power Station	Matsuura City, Nagasaki, Imari City, Saga
Memorandum of Environmental Conservation Agreement	Ishikawa Coal-fired Power Station	Ishikawa City, Okinawa
Memorandum of Environmental Conservation Agreement	Tachibanawan Thermal Power Station	Anan City, Tokushima

With construction of a new No.2 unit (600,000 kW, scheduled to start up in 2009) in the Isogo Thermal Power Station, the agreement on environmental conservation was revised on March 31, 2004.

The 2002 case in which a standard value under a prefectural ordinance was exceeded.

In September 2002, the manganese concentration in effluent from the final landfill site for coal ash from the Isogo Thermal Power Station (Note) exceeded the allowable level specified by Kanagawa prefectural ordinances.
In order to ensure environmental conservation, we now treat manganese in penetrating water at a waste water treatment plant provided on-site and only release it after confirming that it has no quality problems. We also hold discussions with related administrative organizations, whenever necessary, and take the appropriate measures to remove the root causes of manganese contamination. We make earnest efforts promoting various surveys, including test bores and water-quality studies, in order to determine the cause and implement earth coverage as part of the preliminary countermeasures.

Note:
Excess over standard value:
On September 19, 2002, manganese concentrations in effluent reached 1.1 mg/l at the final landfill site in Chigasaki City, Kanagawa, exceeding the standard value of 1 mg/l or less, specified by the prefectural ordinance on environmental conservation in Kanagawa.

Environmental Impact Assessment and Monitoring

J-Power conducts environmental impact assessment (EIA) in advance of the establishing, modifying, and expanding of power stations. We survey the current situations of the surrounding natural (air, water, soil and ecosystem, etc.) and social (industry, land use, transportation etc.) environments, and then predict and assess in advance the impacts of the power projects. We open the results of EIA and obtain comments from the public and local governments to take proper measures.

In addition, under present environmental impact assessment system, we must continue environmental monitoring for a certain period after power stations start operation. Based on this rule, we continue the necessary surveys so as to confirm that the impacts on the environment fall within the range of original assessment. (See the “Outline of Environmental Impact Assessment Law”, p.79).

Environmental monitoring after startup of the power stations (sea area)

Air observing station near Tachibanawan Thermal Power Station (Anan City, Tokushima Prefecture)

Environmental monitoring after startup of the power stations (land area)

Telemeter display equipment (Health and Environment Center, Tokushima)

J-POWER s Environmental Impact Assessments

Date: Submission of the Environmental Impact Statement.

No.	Prefecture	Project	Date
1	Fukushima	Shimogo	Feb. 1974
2	Shizuoka	Sakuma No.2	Jan. 1978
3	Niigata	Aburuma River	Jun. 1978
4	Nagano	Hayakido	Aug. 1981
5	Fukushima	Tadami	Nov. 1981.
6	Gifu	Tokuyama	Dec. 1982
7	Hokkaido	Kumaushi	May 1983
8	Hokkaido	Satsunai	Aug. 1986
9	Shizuoka	Akiba No.3	Aug. 1987
10	Okinawa	Seawater Pumped Storage Project Demonstration Test	Jan. 1989
11	Fukushima	Kurotani	Feb. 1989
12	Iwate	Isawa Unit 2	Jun. 1991
13	Niigata	Okukiyotsu Unit 2	May 1992
14	Fukushima	Okutadami and Otori Expansion Projects	Sept. 1995
15	Nagasaki	Matsushima Unit 1 and 2	Jan. 1976
16	Hiroshima	Takehara Unit 3	Feb. 1980
17	Nagasaki	Matsuura Unit 1 and 2	Apr. 1981
18	Okinawa	Ishikawa Unit 1 and 2	Dec. 1982
19	Hiroshima	Takehara No.2 unit's Fuel Conversion	Feb. 1991
20	Tokushima	Tachibanawan Unit 1 and 2	Oct. 1994
21	Kanagawa	New Isogo Unit 1 and 2	Aug. 1996
22	Aomori	Oma	Sept. 1999
23	Okayama	Honshi Interconnection Line	May 1983
24	Gunma	Tadami Trunk Line, Phase III	Apr. 1995
25	Shizuoka	Sakuma Higashi Trunk Line	Nov. 1995
26	Aomori	Oma Trunk Line	Jun. 2000
27	Fukushima	Nunobiki Kogen	Jun. 2003

Hydroelectric Thermal Nuclear Power Transmission Lines Wind Power

This table includes not only the EIA based on EIA Law but also the EIA based on the other legal regulation such as Public Waters Reclamation Law, Forest Law, prefectural and municipal ordinances, etc.

Reducing Emissions of Environmental Loads

Air pollution control

Coal burning in coal-fired power stations brings about sulfur oxides, nitrogen oxides and soot. In order to remove these pollutants, combustion methods are improved while flue gas desulfurizer, flue gas denitrificator and electrostatic precipitator are installed. These equipments, whose performance depend on the dates they are installed, employed the latest technology at the time of installation thus removing the pollutants with higher efficiency.

The operation of the equipments is automatically controlled through installment of a measuring instrument that can continuously monitor the status of the flue gas. In addition, our operators watch the status around the clock and are prepared to respond to abnormal events immediately.

In fiscal 2003, emissions and emission intensity for these materials were almost the same as in the previous fiscal year.

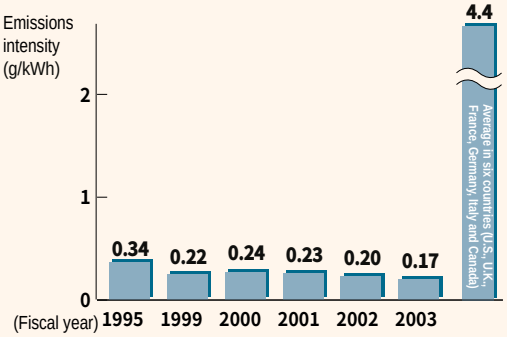
Emissions intensity per intensity Unit Output in our coal-fired power stations are significantly lower that those in the US and major European countries.

2003 Fiscal Year Results

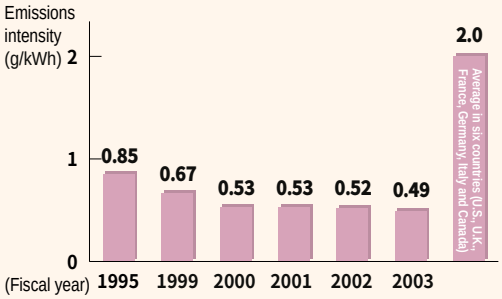
Items	(Removal) Efficiency of equipment	Emissions	Emissions intensity
SOx	67 - 99%	84,000 ton	0.17 g/kWh
NOx	68 - 87%	250,000 ton	0.49 g/kWh
Soot	99% (Design value)	1,000 ton	0.02 g/kWh

Note: A denominator of emissions intensity in texts and charts represents power generation in coal-fired power plants.

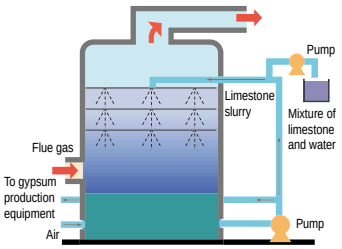
Trend and Comparison of SOx Emissions Intensity



Trend and Comparison of NOx Emissions Intensity



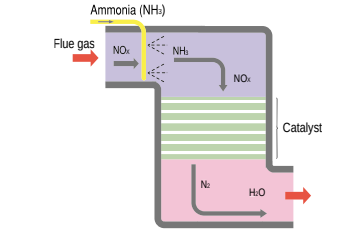
Note: The average in six countries was calculated based on OECD ENVIRONMENTAL DATA COMPENDIUM 1999 and ENERGY BALANCES OF OECD COUNTRIES 1994-1995, 1996-97. (Target: Thermal power stations)



Mechanism of wet type flue gas desulfurizer

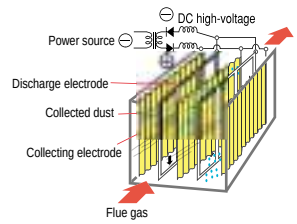
- Lime stone is pulverized to produce a mixture with water (lime stone slurry). Spaying the mixture into flue gas, the lime stone slurry reacts with sulfur oxides in flue gas and become gypsum.

For dry type flue gas desulfurizer units, refer to p.47.



Mechanism of flue gas denitrificator

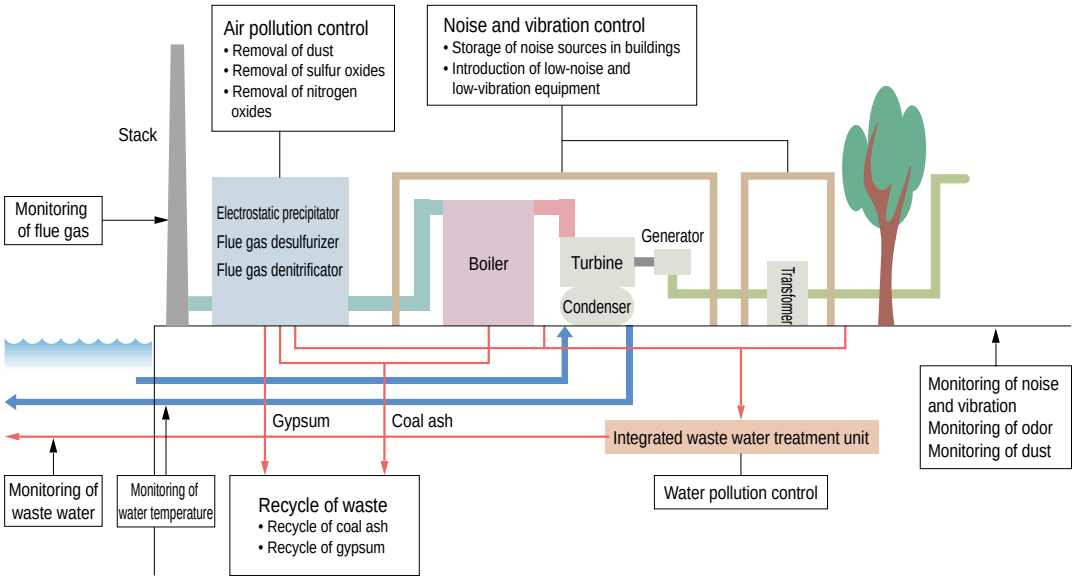
- Injecting ammonia to flue gas containing nitrogen oxides, bring flue gas into contact with metal-based catalyst (substance provoking chemical reaction).
- Nitrogen oxides in flue gas reacts chemically with the catalyst and decompose into nitrogen and water.



Mechanism of electrostatic precipitator

- When flue gas is passed between high voltage electrodes, soot is negatively charged and attached to the positive electrode. Dust that accumulates on the collecting electrode is removed by periodically tapping electrodes so that it falls to the bottom of the precipitator. This principle is the same one on which plastic sheet is charged with static electricity by rubbing it, to attach small paper and dust particles.

Environmental conservation measures in coal-fired power stations



Water pollution control

Waste water treatment equipments are installed in all coal-fired power stations to properly treat waste water from flue gas desulfurizers.
Metals and organics contained in wastewater are removed in an integrated waste water treatment plant through coagulation, sedimentation and filtration.
Treated water is properly monitored with continuous monitoring by an automatic measuring equipment and periodic analysis, and the pollution level of the water is confirmed to be well below the limits specified by the Water Pollution Control Law and environmental conservation agreements.

Noise and vibration control

In coal-fired power stations, there are noisy and vibrating equipments such as boilers, turbine and fans. We are making efforts to control noise and vibration by introducing low-noise and low-vibration machines inside buildings. In addition, we employ low-noise and low-vibration outdoor facilities in thermal and hydroelectric power stations and install sound-proof covers and walls on the facilities as required.
The levels of noise and vibration are periodically measured at the boundary of a power station site and confirmed to fall below the regulatory limit.

Greening measures

Specimen trees, evergreen trees, lawns and seasonal flowers are planted at coal-fired thermal power stations and 20% or more of the site is greened to provides habitats for wild birds, insects and small animals.

Offensive odor control

Flue gas denitrification units in coal-fired power stations use ammonia. So that ammonia may not affect surroundings, we take all possible measures such as periodic checks, performance tests and ordinary inspections on equipment using ammonia. Particular attention is paid to preventing leakage of ammonia when being received and stored.
The degrees of offensive odor are periodically measured at the boundary of a power station site and confirmed to fall below the regulatory limit.

Warm water discharge countermeasures

Coal-fired power stations intake sea water to cool steam used for power generation and discharge warm water. The warm water is properly controlled by using intake and release system appropriate for site conditions, so that it may not impact on marine life.
The temperature of warm water is monitored around the clock to observe the regulatory limits specified by the agreements.

Dust countermeasures

We install closed conveyors or indoor coal stockyards and provide wind shielding or water spraying as required by geometrical and meteorological conditions, so that dust may not fly during coal handling operations such as unloading, transporting and storing in coal-fired power stations.

Soil pollution control

Actual condition survey on soil pollution

Based on the Environmental Impact Assessment Law enforced in 1999 (Until that time, the Environmental Impact Assessment System in 1977 used to be conducted under the Ministry of Economy, Trade and Industry) and guidance of local governments, our company has implemented environmental impact assessments in advance before construction of power stations and other facilities for a long time, and conducts actual condition survey on soil pollution within construction sites as part of such assessments and confirm in advance that the sites have no pollution. (Refer to "Environmental Impact Assessment and Monitoring", p.34.)

Survey of soil pollution

Actual survey on soil pollution

- Point name: Tachibanawan Thermal Power Station (Anan City, Tokushima Pref.)
- Survey time: January 1992
- Survey place: Tree points within the planned construction site of the station
- Survey items: Mercury, Cadmium, Lead, PCB. Hazardous substances specified under the "Environmental Criterion on Soil Pollution"
- Survey results: All item results are confirmed to fall below the "Environmental Criterion on Soil Pollution" and show no problems.

Prevention of soil pollution

When preparing for construction of power stations, we implement equipment design in accordance with the Fire Defense Law and various laws, for instance, installing mounds around heavy oil and chemicals tanks and pipes in order to prevent their leakage or separating the hazardous substances to treat them in a waste water treatment unit, so that the substances could not spill to sea areas and surrounding areas if they should leak.

In terms of operation of power stations, in order to keep chemicals and hazardous substances used from leaking to surroundings, we take measures necessary for avoiding soil and underground pollution, defining handling methods and emergency cares regulated by EMS and strictly controlling them while providing educational training for plant staff.

When storing PCB waste, we also stringently control the waste to prevent any spillage from equipment using PCB and storage containers while storing it in an indoor facility sealed with concrete walls and floors so that it may not penetrate into soil should it leak.

Relation with laws

Based on increasing concerns about the effects of soil pollution on health and intensified social requirements for the establishment of soil pollution countermeasures, the "Soil Pollution Measures Law" was enforced in February 2003. Under the law, potentially polluted lands will be investigated at a certain time to identify soil pollution situations, and based on the survey results, sites of factories related to specific facilities using abolished hazardous substances will be specified as lands subject to the law.

Currently, we have no land at operational sites subject to the law, but are planning to survey potential soil pollution studies at all domestic organizations' sites, on a voluntary basis, from fiscal 2004 to 2005.

Control of Hazardous Chemicals

Pollutant Release and Transfer Register (PRTR) Law

The PRTR is "a system on which the amount of chemical substances released to the environment and the amount of substances transferred with waste are registered and disclosed." The law was established in 1999, and under the law, the identification of targeted chemicals was launched in fiscal 2001.

Our company use chemical substances for painting and feed water treatment in thermal power stations, and has traditionally properly controlled these substances, identifying and recording the amount of their purchase and use.

The release and transfer results of substances in fiscal 2003 are as follows.

We make efforts to aim at reducing their usage and properly control, complying with the specified procedures for their use. We also try to reduce the amount of dioxins released of through adequate control of incinerator.

Chemicals Release and Transfer Totals for Fiscal 2003

Chemicals	Purpose	Handled volume	Released to the environment	Transferred as waste
63: Xylene	Paint dilutions for machine and equipment	6.25 t/y	3,600 kg/y	0.0 kg/y
179: Dioxins	Iniciration of waste	—	0.19 mg-TEQ/y	2.1 mg-TEQ/y
253: Hydrazine	Treatment of boiler water for thermal power generation	4.80 t/y	0.0 kg/y	0.0 kg/y
307: Polyalkyl ether	Surface-active agent for coal-storage yards	3.00 t/y	0.0 kg/y	0.0 kg/y

- The amount of handling in offices 1t or more of specific chemicals for a year were counted.
- The amount released of dioxins from waster incinerators were totaled.
- The values, in accordance with the law, are a total of the results registered by each office.

Countermeasures against dioxins

We chip driftwood so that it can be reused. There are 3 sites with incinerators (corresponding to specified facilities for driftwood treatment as defined by the Special Law concerning Special Measures against Dioxins). At these specified facilities, driftwood and other wastes are separated and the correct combustion temperatures for each are controlled and maintained.

The law specifies that the concentration of dioxins in flue gas should be measured at least once a year and that the results must be reported to local governments. In fiscal 2003, the results from all our incinerators fell below the legal regulatory limit.

In addition, in order to reduce the emission of dioxins it is important to promote the reuse of waste and to reduce waste emissions.

Offices Possessing Incinerators
Koide Power Administration Office (Niigata Pref.), East Regional Headquarters
Kouchi Power Administration Office (Kouchi Pref.), West Regional Headquarters
Tachibanawan Thermal Power Station (Tokushima Pref.)

Control of PCBs

Due to their excellent heat resistance and insulation, PCBs used to be widely used in electrical equipment (such as insulation in transformers) but with increasing environmental concerns about their harmful effects their production and import were prohibited in 1974 and owners were obliged to strictly control their use and storage. We install storage warehouses for electrical equipment containing PCBs and implement strict storage and manage. In July 2001, Law concerning Special Measure against PCB Waste was enforced, necessitating the proper treatment of PCBs.

As of June, 2003, the amount of stored insulating oil (containing high-level PCBs) was equivalent to about 139 kl.

Storage site	Site number
Coal-fired power stations	3
Hydroelectric power stations (Including substations)	28
Others	2

Our Basic Policy for the PCB Treatment

- To conduct the treatment of PCB, a negative legacy, at an early date, and work for the environmental restoration.
- To carry out the PCB treatment on the basis of the national plan for the treatment in wide area.

Trace PCB Mixing Problems

After the prohibition on PCB use, trace amounts of PCBs (in about 60% of the cases detected the concentration is 5.0 ppm or less) were found accidentally mixed into heavy equipment. The national authorities informed the press of this in July 2002. We inspected all equipment using insulating oil and confirmed that some equipment contained traces of PCB. For this reason, such equipment is now strictly managed and reported to the authorities under the relevant law. A national review committee is currently considering the cause of PCB contamination and methods of tracing PCB pollutants. We take all measures necessary to avoid any risks associated with PCB contamination.

Conservation of Natural Environment

Harmonization with river environment in hydroelectric power stations

For our hydroelectric power stations, we are promoting construction of the stations harmonized with nature while also making efforts for harmonization with river environment.

Water quality control in dams

When typhoons and concentrated torrential rains cause landslide upstream, a large amount of muddy water will flow into a large water reservoir. For this reason, power generation discharge may prolong river turbidity.
In order to prevent the prolonged turbid water, we discharge turbid water early and also install “surface intake equipment” in a dam where turbid water may remain stored for a long term, one that can intake surface water at a relatively low turbidity.

- Dams where surface intake equipment has already been installed (Ikahara, Kazeya and Yanase Dams).
- Dam under construction (Sakamoto Dam: Scheduled to be completed in fiscal 2005)

Sakamoto Dam’s surface intake facilities under construction (Nara Prefecture)

Discharge for river maintenance flow

Downstream from a dam in a hydroelectric power station, due to the decline of river discharge from the dam to an outlet of the station, we discharge water for river maintenance in order to mitigate the effects after discussing with the organizations concerned including the Ministry of Land, Infrastructure and Transport. These discharge efforts were conducted in an area of 527km comprising 30 hydroelectric power station until the end of fiscal 2004.

Maintenance flow discharge from Nanairo Dam (Wakayama, Mie Prefecture)

Approaches to forest protection

Focusing on forest diversity, we decided to take measures to protect our own riverhead forest. On December 2002, we established “provisional guidelines for conservation of riverhead forest” and started conservation efforts in fiscal 2003.

Removal of sediment in reservoirs

A great amount of earth and sand flow into dam lakes and are deposited there every year. To control sedimentation and maintain adequate water storage capacity we therefore implement measures such as dredging, earth and sand removal from the lakes and earth and sand movement in the lakes. In fiscal 2003, we removed about 1,120,000 m^3 of silt from ten dams, about 50% of the earth and sand removed then being reused for aggregates and reclamation materials.

Removal of sedimentation in the Akiba Dam (Shizuoka Prefecture)

Manager for sediment control measures in the Sakuma water reservoir
Manabu Tanaka
Sakuma Power Administration Office, Chubu headquarter

Sakuma power station is the largest hydroelectric station about electric energy in Japan, must cope with sediment earth and sand flowing from an upstream basin into a water reservoir. For this reason, we endeavor to both prolong the life of the water reservoir and give special consideration to the natural environment.

Symbiosis with rare animals and vegetation

Being conscious of the needs to preserve biodiversity, we are working carefully on survey, planning, construction and operation so as to ensure coexistence with rare animals and plants.

Okutadami/Otori Expansion Project - Golden eagle

J-Power's expanded Okutadami-Otori Power Stations, which had been under construction since July 1999, entered into operation in June 2003.

This project is a re-powering project of existing power stations. Utilizing the existing Okutadami and Otori Dams, additional waterways and turbine-generators were constructed, adding about 290,000 kW to the existing power capacity.

In order to ensure the implementation of environmental conservation measures, we obtained ISO14001 certification of the project construction office. It was the first record of this certification of a construction office in Japan. We enhanced promotion of environmental morale of the office staffs and construction workers, elevation of the standard of environmental management and continuous reduction of environmental impacts. We thoroughly implemented the following environmental conservation measures:

- Minimization of modified area, utilization of existing dams
- Minimization of noise and vibration, consideration to lighting and color of the structures
- Reuse and recycling of construction by-products, complete proper treatment of waste
- Conservation of river water quality.

In order to protect the golden eagles (Aquila chrysaetos, one of the "Category I-B" endangered species in the "Red Data Book" issued by the Ministry of Environment), all construction works within a radius of 1.2 km from their nest were suspended during their nesting period (from November to next June). We established an advisory committee composed of experts of fauna and flora including predatory birds. Based on the advisory opinions of the experts, we implemented various measures for symbiosis with the nature such as monitoring and protection of the rare bird species and restoration of the wetland environment.

In 2003, in recognition of our environmental activities in this project, the Japan Society of Civil Engineers gave J-Power the "Technical Prize" entitled. "Preservation of the natural environment and technical challenges overcome in the process of redevelopment of a hydropower station (Okutadami-Otori Hydro Project Construction) with a view toward breeding and coexisting with golden eagles".

The young golden eagle (photographed on July 16, 2003, 30 days after leaving the nest)

Demonstration Test in a Sea Water Pumped Storage Power Generation in Okinawa – Protected Environment Area

From fiscal 1987 to 2003, in commission of METI, J-Power carried out the world's first demonstration test of sea water pumped storage generation in Kunigamison Village, Okinawa Is. Since many rare animal species endemic to this island were found around the project site, J-Power promoted the project so as to make the pilot plant friendly to the surrounding natural environment. For example, we tried to restore the environment of the spoil disposal area, of which capacity is 45,000 m^3 as a biotope. The topography was formed similar to the surrounding mountainous terrain, and about 30,000 native trees were planted on it.

Through subsequent environmental monitoring, it was confirmed that the natural environment was successfully restored. The results were documented ("From the forest of Yambaru - The record of endeavor for coexistence of development and nature") as a contribution to future environmental protection measures.

In fiscal 1999, in recognition of our accomplishments in this area, the Japan Society of Civil Engineers gave J-Power the "technical prize".

"From the forest of Yambaru"

The biotope on the spoil disposal area

Overseas Transfer of Environmental Conservation Technologies

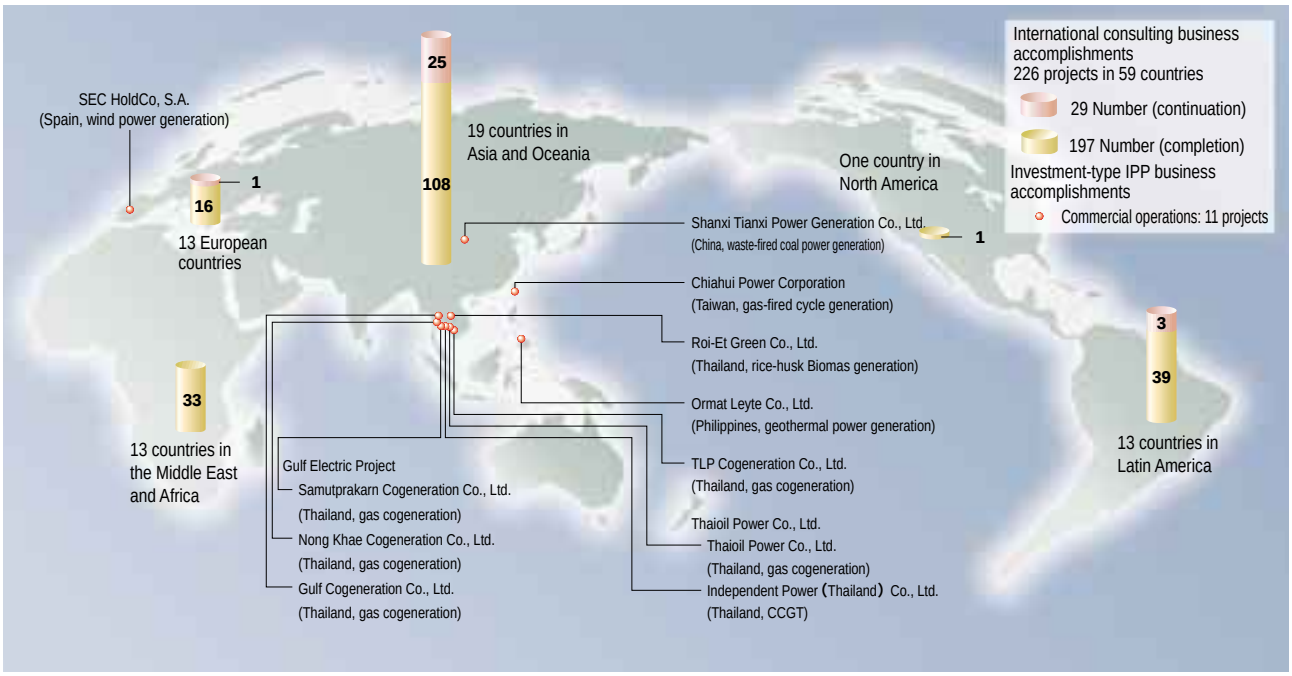
Our efforts to overseas technological cooperation projects

History and Accomplishments

Our international technological cooperation projects began in the early 1960s. Since then we have, through our overseas consulting business, been able to promote many international cooperation projects. Making use of our accumulated technical expertise, we have successfully dispatched governmental experts to counterpart organizations and received trainees from developing countries for 40 years.

As of the end of fiscal 2003, a total of 226 international consulting projects had been implemented in 59 countries.

International consulting and IPP projects implemented around the world



(As of the end of March, 2004)

Main international projects

As part of our program for the overseas transfer of environmental protection technologies for thermal power generation, we proposed SOx and NOx reduction technologies for EU countries and presented optical SOx reduction measures to East European countries suffering from acid rain. We also conducted tests on high-sulfur coal desulfurization technologies in China (commissioned by the Ministry of Economy, Trade and Industry).

Rehabilitation Project of the 4th Thermal Power Plant in Ulaanbaatar

Study on the Reuse of Methane Gas from a Waste Landfill Site in Rumania

Recent main international projects

	Project Name	Country Name	Project period	Project outline
Thermal power	Rehabilitation Project of the 4th Thermal Power Plant in Ulan Bator	Mongolia	Nov.2001～Oct.2006	Management of repair of power stations
Thermal power	Study on Prevention of the Release of Coal Dust at Janamanjung	Malaysia	Oct.2003～Dec.2003	Develop measures to control the release of coal dust from a coal-storage yard at a thermal power station.
Hydropower	Yuncan Hydroelectric Power Project	Peru	May1998～Sep.2004	Detailed design and management of construction of dams and power stations
Hydropower	Upper Kotmale Hydro Power Project	Sri Lanka	Nov.2003～Nov.2009	Tender support for the construction of dams, power stations and construction management
Transmission and distribution	Transmission and Distribution Development Project in Paraguay's Metropolitan Area	Paraguay	Aug.1996～Nov.2005	Detailed design and construction management for transmission lines, new substations and distribution grids
Technical standards	The Study for Establishment of Electric Power Technical Standards and Guidelines in Cambodia	Cambodia	Oct.2002～Jan.2004	Intellectual support on electric power technology upgrade and other development projects
Environmental management	Support for Preestablishment of EMS by Electricity in Vietnam	Vietnam	Nov.2003～Jan.2004	Support for establishing an environmental management system.
Waste	Feasibility Study on CHA Gas Extraction and Utilization from Landfill	Rumania	Oct.2003～Mar.2004	Develop measures for Utilization methane gas generated from a waste landfill site.
Solar power	Demonstration Research Project Dispersed Power Generation System Technologies Photovoltaic Wind Power and Advanced Storage Batteries	China	Oct.2003～Mar.2005	Conduct a demonstration test on wind power, advanced batteries and mini-grids.
Wind power	North Luzon Wind Power Generation Project	Philippines	Sep.2002～Jun.2004	Support for a tender for construction of a wind power plant
Energy conservation	Project for Establishing a System for the Diffusion and Promotion of Energy Conservation	Sri Lanka	Mar.2004～Oct.2004	Recommend optimal systems, organizations and policies for the promotion of energy conservation.

Promotion of overseas IPP projects

In response to the worldwide privatization and deregulation of electric utilities we have engaged in various overseas projects. As of the end of fiscal 2003, we were involved in 15 projects in 6 countries/regions with international IPP projects utilizing high-efficiency techniques developed for national thermal power stations and environmental preservation technologies aimed at striking a balance between the environment and the economy. We are working with local staff at the Bangkok office, established on September 2002, in order to develop a smooth and stable business operation for investment projects.

Roi-Et Hull-fired Thermal Power Station

Chiahui Gas-Fired Power Station

Future business and contributions to sustainable development

In our international consulting business, under difficult situations over ODA, we are working on entering into areas where our technologies such as water supply and irrigation, focusing on an electric power field using ODA, and also aiming at developing our business in non-ODA areas such as private development projects. In addition, we will address international investments under right portfolio strategies.
Our belief is that increasingly promoting this type of international technological cooperation through consultation and investment will contribute to sustainable development, worldwide.

Reception of overseas trainees

Fiscal year 2003: 25
Total: 2,005

Overseas trainees participating in workshops

Kazuyuki Yamada

Consulting Thermal G, International Business Division

Through my daily involvement with operations, I feel that the prospects for overseas environmental cooperation are wide open for the type of joint project involving a major player, a secondary partner, our staff and local staff.

4. Recycling and Re-use of Circulating Resources

Reduction of Waste

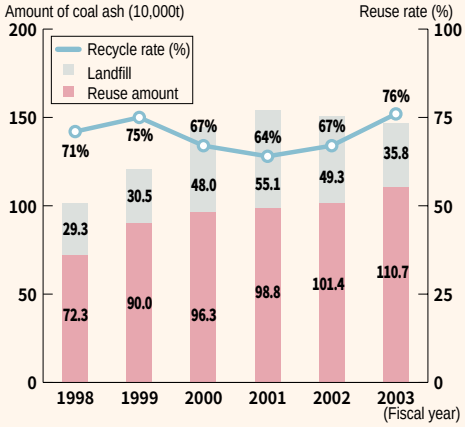
Recycle of coal ash

Our dominant waste is coal ash. The ash is generated as residue when coal is burned in coal-fired power stations. The amount of coal ash generated in fiscal 2003 reached 1,470,000t and 76% of the ash, 1,120,000t of the coal ash was recycled.

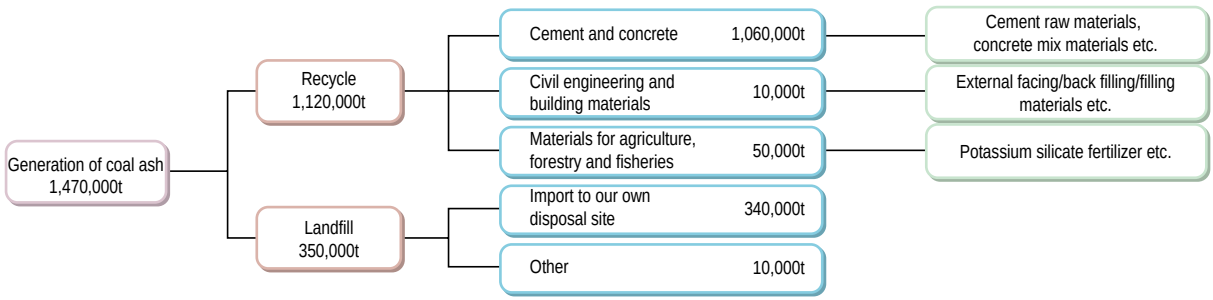
Coal ash is mainly recycled for use as cement raw materials and concrete mix materials and also for civil engineering and building materials and materials for agriculture, forestry and fisheries. In particular, in the area for agricultural and marine material, one of our group company produces silicate potassium fertilizers in its fertilizer mill and sells them.

Most of coal ash that cannot be recycled is reclaimed in our four disposal sites (Chigasaki City, Kitakyushu City, Matsuura City and Ishikawa City).

Trend of recycle of coal ash



Breakdown of recycle of coal ash (Fiscal 2003)



Coal Ash Used for Artificial Upwelling Projects

A first-ever national undersea artificial upwelling project (creating artificial submarine mountains) has started at two sites in Nagasaki.

As a means of recycling coal ash, large blocks have been used to construct artificial undersea mounds to promote upwelling and improve fisheries.

The mounds, each 10 meters or more length and height, have been constructed using ashcrete blocks (hardened coal ash) on the seabed at around 100 m depth. These "mountains" produce a current upwelling that raises minerals to a height where photosynthesis can occur so creating a food chain of "minerals phytoplankton-zooplankton-minerals" in the ocean. This can be expected to increase fish catches.

Based on the results of previous demonstration projects, construction of these artificial submarine mountains was started at two sites at Tsushima and Uku in Nagasaki in fiscal 2003, as part of a large fishing ground establishment project. This project is planned to last for three years, from fiscal 2003 to 2005. As part of this project, more than 20,000 t of coal ash will be used at each site. During fiscal 2003, about 15,000 tons of coal ash were delivered to the two sites from our Matsuura Thermal Power Station.

For reference, the Ashcrete Co., Ltd.*, provides the ashcrete mixing technology and leases construction equipment for this project.

*Joint venture by J-POWER, Hazama Corporation, SEIBU Construction Co., Ltd., Tokyo Electric Power Co., Inc. and Idemitsu Kosan Co., Ltd.

Recycle of gypsum

Our company recycles gypsum, by-products generated from operation of wet type flue gas desulfurization units in coal-fired power stations as raw materials for gypsum boards and cement. In fiscal 2003, it recycled about 320,000t of the by-products and maintained the rate of utilization of 100%.

Gypsum board

Reuse and recycle of construction by-products

Our company is promoting the use of construction by-products together with our contractors to recycle concrete blocks and cut trees and utilize soil generated from construction works.

For cut trees from the Sakuma Higashi Trunk Line Partial Reconstruction, all the tress are reused as follows:

① Trunks available for lumbers are shipped to the market.
② Trunks available for hurdle piles are used as earth retaining hurdles.
③ Trunks/branches/roots are chipped except the above, and the chipped materials are mixed with greening materials, used for prevention of flourishing and mulching of weeds.

Using greening mix materials produced, our company implements slope greening works.

"Trunk chipping and slope greening works",
Sakuma-Higashi Main-Transmission Line Construction Office (Shizuoka Prefecture)

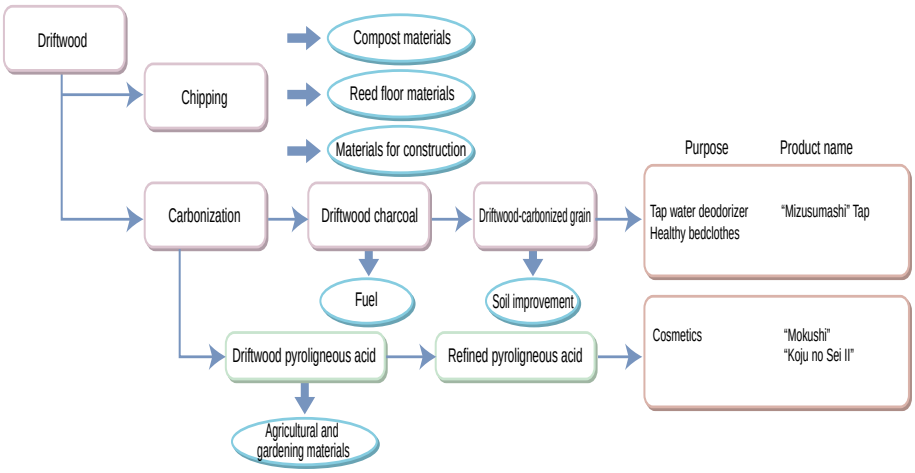
Recycle of driftwood

Our company collects driftwood flowed into dams of hydroelectric power stations for production of charcoal and acquisition of pyroligneous acid and reuse them as building materials and fertilizers by chipping.

In fiscal 2003, due to higher demand for road slope spraying materials, driftwood collected and stored in the previous year was processed, and 9,400 m^3 of the driftwood was recycled.

Driftwood entering the reservoir (Sakuma Dam)

Recycle of driftwood



Office efforts

Our company is working on versos of old paper, separate collection of paper, cans, bottles and plastics and reuse of envelopes on a company-wide scale in order to reduce general waste. We are promoting sorting of general waste such as paper by familiarizing ourselves, based on the head office's EMS. The amount of waste generated in fiscal 2003 reached 30 t: a 39% decline from the previous year brought about through the separate collection, sorting and recycling of mixed paper from the head office building.

Separate collection box

J-POWER Head Office

Green Purchasing

Purchasing green products

Our company is working to use of recycled hygienic paper and copy paper and employment of energy-saving OA equipment such as PCs and copying machine. With full enforcement of the Law on Promoting Green Purchasing, we developed the Green Purchasing Guidelines in order to promote the priority of purchasing more green products in fiscal 2001. In fiscal 2003, we purchased green products in 12 areas, and as a result, the purchasing rate of recycled paper for copying reached 98.4%.

Main green products purchased in fiscal 2003

Area	Item
Paper	Copy paper, hygenic paper (toilet paper)
Purchased print materials	Print materials (report documents etc.)
Stationary	Mechanical pencils, office envelope (bearing company name), ballpoint pens, highlighter pens, files, recycled boxes, etc.
OA equipment	Computers (PC, printer), copying machine
Public works	Low-noise construction machine (backhoe shovels, bulldozers, etc.)

Introduction of low-emission vehicles

For our company-owned cars, we are also promoting the purchase of low-emission vehicles designated as targeted items under the Green Purchasing Guidelines.
We have adopted 71 low-emission vehicles (about 20% of the company fleet) as of the end of fiscal 2003. When changing existing cars or purchasing new cars, we convert them to low-emission vehicles in principle (Note).

Note: Hybrid car, natural gas car, electric car, methanol car, certified fuel-efficient and low-emission gasoline-powered vehicle

Natural gas car

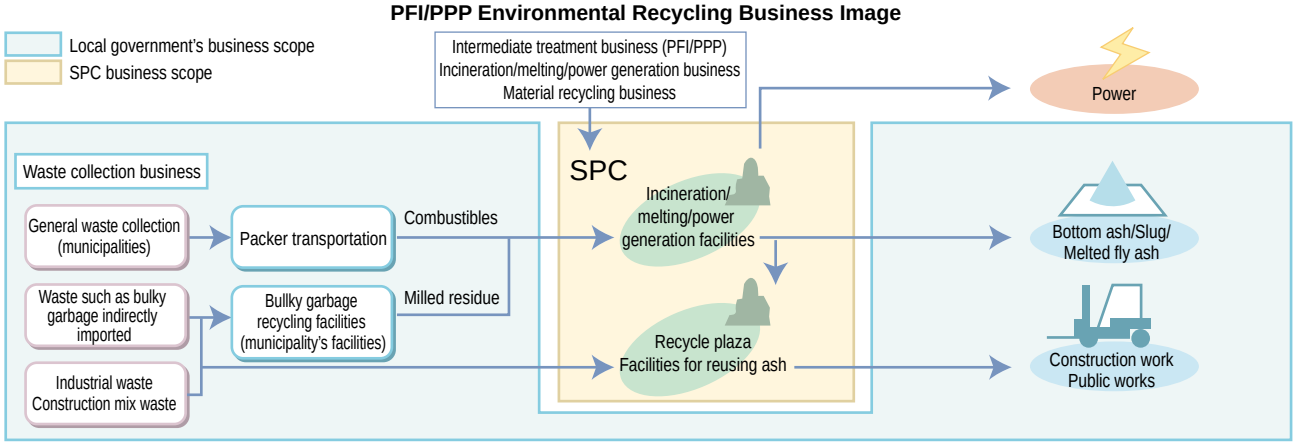
Environmental Recycling Business

Environmental recycling business

Our company is aiming at social contributions in terms of proper treatment of waste, environmental measures and promotion the use of unutilized energy. In particular, based on long-term contracts with regional EPCOs (Electric Power Companies), we have implemented a package of capital investment, design, construction, maintenance and management concerning to infrastructures such as power generation (transmission) facilities. Making full use of these experiences, we are actively working on development and operation of public infrastructures in environmental recycling areas through the PFI (Private Finance Initiative)/PPP (Public Private Partnership) projects.

Note: The PFI (Private Finance Initiative) and PPP (Public Private Partnership) are methods to implement business and projects on construction, maintenance, management and operation of public facilities by utilizing private resources, management capabilities and technological skills, etc.

PFI/PPP Environmental Recycling Business Image



●Examples

- Waste-fueled power generation/intermediate waste treatment project (participation in Omuta recycling generation and other PFI projects)
- Establishment and management project for a water purification plant's waste water treatment facility (participation in a specific project for the Samukawa water purification plant's waste water treatment facility and the increased reuse of soil generated by water purification)
- PFI advisory (PFI advisory activities for waste heat recovery facilities etc.)
- Study on PFI project contract and risk sharing
- Feasibility study on PFI projects

Development of simple and continuous dioxin measuring method

Our company has worked on the development of a simple measuring method for dioxins jointly with EPDC Environmental Engineering Service Co., Ltd. As a result, we were successful in continuously determining the concentration of dioxins in an indirect manner by measuring organic halogen compounds in flue gas of as incinerator. We commercialized this simple measurement method and started to sell the measuring unit (product name: OHC-201) on January 2002. This unit is expected to contribute to reduction of dioxin emissions.

OHC-201

Tsuyoshi Watabe (in charge of sales of OHC-201)
Recycle Business Marketing & Merchandising Group, Business Development Division

I consider that this product is useful for emission and effluent monitoring and also for operation control (such as cost and operation optimization by controlling the injection rate of activated charcoal used in the removal of dioxins). It is hoped that the adoption of this product will contribute to environmental protection.

5. Technological Research and Development

We have made efforts to develop a range of advanced techniques that have placed us in the forefront of electric power generation and have contributed to the development of electric power technology in Japan by applying them to our own facilities. We have continued to develop more efficient and economical power generating systems earnestly to create new business, aiming to be "Number One" in the fields of "Energy" and "Environment."

Introduction of Research and Development Results

The following is our recent main technological research and development results and their introduction in the areas of "Energy" and "Environment."

Coal-fired Thermal Power Generation

World's best generation efficiency

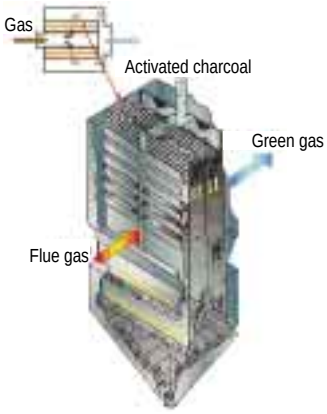
With the aim of achieving enhanced efficiency of thermal power generation, we have improved the steaming conditions (temperature and pressure) in thermal power stations step by step while ensuring reliability, safety and economy of heat resistant alloy materials for boilers and turbines. We firstly adopted the USC turbine into the Unit 2 of the Matsuura Thermal Power Station and then into our other generating facilities, and accomplished the world' top level of generation efficiency.
This remarkable efficiency provides less effect on the environment such as reduction of coal usage and reduced emissions of environmental load substances while contributing to economical power supply.

*Joint research companies
(Turbine) Mitsubishi Heavy Industries, Hitachi, Toshiba
(Boiler) Mitsubishi Heavy Industries, Babcock-Hitachi, Ishikawa-Harima Heavy Industries
*Awarded the 1999 Japan Society of Mechanical Engineers Prize

Matsuura Unit 2 USC Turbine

Substantial reduction of industrial water

A large amount of industrial water is used in wet type flue gas desulfurization units in coal-fired power stations. Since 1980, with the support of the government, we have promoted research and development into dry type flue gas desulfurization and introduced the first one into the new No.1 unit of Isogo Thermal Power Station. As a result, we have been able to reduce water consumption by 99% and power consumption by 44%, respectively, in comparison with those of wet type flue gas desulfurization units.



Dry type flue gas desulfurization unit (Desulfurization tower), Isogo Thermal Power Station

Hydroelectric Power Generation

Redevelopment of existing dams

We developed the new great deep-water provisional coffering method in which a new intake point is opened in a dam without lowering the level of storage water, in order to maintain dam capabilities and minimize environmental effects on surrounding areas when redeveloping existing dams, and applied the method to the Extension Construction of the Okutadami Power Station that boasts the highest storage water in Japan. The need for this type of technology is expected to increase now that the government has established a policy for the exhaustive utilization of existing dams.

*Joint development companies: Kajima Corp., Toyo Construction
* 2003 Japan Society of Civil Engineers "Technology Prize"

Provisional coffering, Okutadami Dam

Pumped storage power generation using sea

Our company is conducting a demonstration test on the world' first sea water pumped storage power generation facility (maximum capacity: 30,000 kW) in the main land of Okinawa, commissioned by the government.
Commissioned by the government, we conducted a demonstration test on the world's first sea water pumped storage power generation unit (maximum output: 30,000 kW) on the main island of Okinawa.
Seawater pumping provides much advantage in conditions of location but faces various challenges due to the use of salty water. In order to solve these problems, new technologies such as seawater lining by rubber sheets, seawater detection system, FRP water pressure pipelines and special stainless steel pumping turbines were developed and adopted. The effectiveness of these systems were proven through a 5-year commissioning process, starting from fiscal 1999.
We have continued these tests in conjunction with the Okinawa Electric Power Co., Ltd., since the start of fiscal 2004.

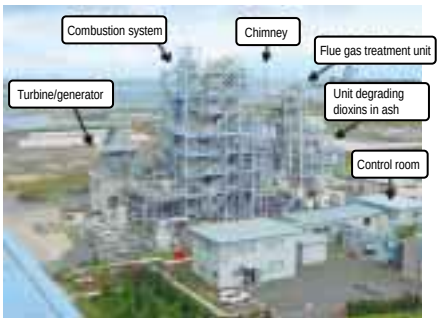
*1999 Japan Society of Civil Engineer "Technical Prize"

Demonstration test on sea water pumped storage power generation

Power Generation in Reuse Incinerator

Generation using waste

Our company established a waste-fuel generation system superior in economic and environmental characteristics with the use of "Refuse Derived Fuel (RDF)" made of general waste and introduced the RDF technology into the Omuta Recycle Power Station. In our demonstration test, we confirmed that the combustion of RDF restricted boiler corrosion and allowed for the higher efficiency of power generation, or 35% in refuse power generation, and furthermore, we developed an advanced flue gas treatment technology that can remove dioxins and heavy metals, in addition to soot, SOx and NOx.



Full view of test unit for power generation technology using RDF

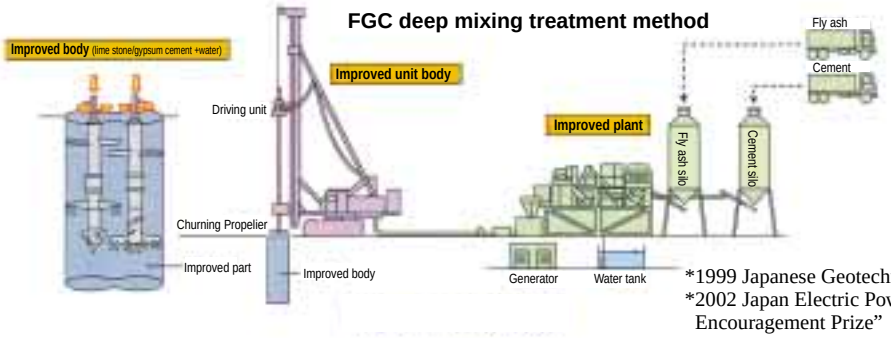
Recycling and Environment

Recycling of coal ash

Coal has an ash content of about 10%. About 1.5 million ton of coal ash is generated by us each year. We try to recycle the ash and reuse it, mainly as a raw material for cement production. As well as promoting this effective use we are actively working on the research and development of other applications for the ash.

● Application coal ash to civil engineering works

Our company has developed recycle technologies for coal ash through the application of the ash to construction of power stations. Currently, we offer consistent engineering services from survey, design to supply of coal ash and construction management.



*1999 Japanese Geotechnical Society "Technology Development Prize"
*2002 Japan Electric Power Civil Engineering Association "Technology Encouragement Prize"

● Application coal ash to agriculture (See p.74.)
● Application coal ash to fisheries (See p.43.)

Promotion of Engineering Research and Development in Progress

Here, an introduction is given to some representative examples of our engineering research and development programs in the fields of “Energy” and “Environment” in recent years. As to Biomass Fuels and CO_2 Absorption/fixation, please refer to their separate introductions in p.24 and p.32 respectively.

Energy Field

Coal gas production from coal

J-Power is proceeding the EAGLE project centered on Coal Gasification and Gas clean up as one of the Coal based High Efficiency Power Generation technologies. Full name of EAGLE is coal Energy Application for Gas, Liquid and Electricity, it is aimed to establish Integrated coal Gasification Fuel Cell (IGFC) combined with Fuel Cell, Gas Turbine and Steam Turbine. 150t/d EAGLE pilot plant test has been started on March 2002, it is scheduled to conduct Performance and Reliability test for 5 years.

Coal Energy Application for Gas, Liquid & Electricity pilot plant

Solid Oxide Fuel Cell (SOFC)

Solid Oxide Fuel Cell (SOFC) promises high-efficiency and reliability that utilizes wide variety of fuels in a wide range of capacity from dispersed to large-scale power generation as a substitute for thermal power plant.
SOFC can be expected to realize a combined cycle system that allows substantial reduction in CO_2 emissions by integrating coal gasification. A modular structure for the system is currently being scaled up after substantial revision. The system is being further developed with a view to verifying its long-term reliability and establishing a systematization technology.

Pressurized 10 kW module

Environmental Field

Sediment treatment technology

Reservoirs will silt up and reduce those capacity as soil flows in and sediments. On the other hand, soil is not supplied in sufficient quantities from the upper reaches to the downstream parts with devastating consequences: Deepening of the riverbed, erosion of the riverbanks, and changes in the riverside environment.
As the solution to this matter, new sediment management system has been developed that uses the soil sedimentation to form a banked-up terrace immediately below the dam and utilizes the dam’s discharge function to flush the soil terrace downstream in flood periods. This system is being developed through hydraulic model experiments, numerical fluid analysis and field observations.

* A joint research with Delft Hydraulics, Netherlands, and HR Wallingford, UK.

Bed-load transport experiment using hydraulic model

Technology development for cleaning the aquatic environment

J-POWER is in the process of developing and proposing a new technology for the purification of the aquatic environment. The technology is based on a novel concept that combines the solutions suggested on our Environmental Community Site[1)] and our Bed Material Purification Technique using natural materials[2)].

*1 This Internet site provides opportunities for promoting environmental protection by gathering and sending out information on the local environment via the Internet.
*2 Utilize natural porous materials (charcoal from drift wood, volcanic rubble, etc.) for improving the bed. This technique is expected to provide a natural cleaning effect by forming aerobic benthic life.

Experimental Cleaning Facilities on the Lake

Supercritical Water Utilization Technology Research

Supercritical water (374˚C, 22 MPa or more) is expected to be able to facilitate various chemical reactions such as hydrolysis and oxidation. Utilizing these characteristics, we are developing recycling technologies such as processing of biomass and high-performance waste water treatment.

Experimental apparatus for supercritical water reaction tests

Production of plastics from wood waste

This technology is intended to utilize lignin and cellulose that are extracted from the unused thinning woods and/or other woods wastes. Lignin and cellulose are the main components in wood. Lignin is used as raw materials for an alternative to oil based plastics (wood plastics). Moreover, cellulose is hydrolyzed into sugars that can ferment to lactic acid. Lactic acid is interesting as raw materials for biodegradable plastics. The demonstration plant was built by collaboration with 8 companies* in Wakamatsu Research Institute and has been tested to verify the process for extraction of lignin from wood waste.

*Collaboration companies: Functional Wood Material Research Association's members, Ebara Corporation, Taisei Corporation, Toyo Jushi Co., Ltd., Kokuyo Co., Ltd., Maruto Instrument Co., Ltd., Cosmo Engineering Co., Ltd., Nagoya Port Lumber Warehouse Inc.

Functional wood material production demonstration plant (supported by the Forestry Agency)

Production of plastics from food waste

Poly-lactic acid known as biodegradable plastics is manufactured by polymerization of lactic acid that produced by fermentation of food waste. (Food waste is discharged from food processing plants, hotels, department stores and so on). The demonstration plant was built by collaboration with 5 companies* in "Kita-kyushu Eco-town" Area and has been tested to verify the process for production of poly-lactic acid from food waste.

*Collaboration companies: Kitakyushu Foundation for the Advancement of Industry Science and Technology, Ebara Corporation, Organo Corporation, Musashino Chemical Laboratory, Ltd. and Environmental Technology Service Co., Ltd.

Food waste (oil alternative) plastics production demonstration plant (supported by the Ministry of Agriculture, Forestry and Fisheries)

Shozo Kawasaki　Environment Science Laboratory, Chigasaki Research Institute

J-POWER has applied and developed a lot of technologies for protecting the environment through the construction and operation of its power stations. We research and develop those technologies for realizing the society that is harmonized with the environment.

Toshinori Yasutomi　EAGLE Technology Development Group, Wakamatsu Research Institute

We are doing its research to establish the coal gasification technology acceptable for fuel cells with coal feed 150t/day pilot plant aiming to implement the IGFC system.

Number of Industrial Properties

	Power Generation Field	Recycling Technology Field	Environmental Technology Field	Others	Total
Sole Application	6	—	—	9	15
Joint Application	16	5	14	95	130
Total	22	5	14	104	145

6. Environmental Communication

It is our official policy to promote initiatives to improve environmental conservation and foster communication with local communities as a way of building trust and good community relations. Furthermore, as a wholesale electric utility, we endeavor to maintain good public relations with our electricity end users, with whom we might otherwise have little direct contact.

Publication of Environmental and Social Activities Report

We have issued the “Environmental Activities Report” annually, since fiscal 1998. This report’s title was changed to the “Environmental and Social Activities Report” in fiscal 2003 and is now in its seventh year of issue. In fiscal 2004, a digest version of this report was also released. Its English version has been issued since fiscal 2002.
The contents of this report are available on our website: http://www.jpower.co.jp

English version

PR Activities

Advertisement

Our corporate advertisement and many other ads are displayed in newspapers, economic magazines, weekly magazines and at transport facilities.
We have reported our active involvement in an endeavor to address global warming and other environmental issues in the “Re View Series” issued since February 2004. (Ad copy: “Think New, Think Renew”).

Advertisements on “Rice hull-fueled power generation,” “Afforestration Project,” “Bio solids” and “Coal gasification” have been published in newspapers.
A commercial emphasizing our commitment to environmental protection has been released through our sponsored TV program “Sound Sonority”(NTV).

Newspaper advertisement

Rice hull-fueled power generation (published in February 2004)

Afforestration project (published in March 2004)

Biosolids (published in March 2004)

Coal gasification technology (published in May 2004)

TVCM

Environmental "Giant Tree" Section

Main brochures

We are publishing "Corporate Brochure" and "Annual Report" every year, and distributing them to people for explanation of our activities. Our efforts in environmental conservation appear also in these brochures. Besides, "Oshiete 'J-POWER' (Tell Me About J-POWER)" explains our business, which is not well known to the public yet, in an easy-to-understand manner, and "J-POWER wa chikara mochi (My J-POWER, the Mighty)" for children are also published and distributed at power stations and various events.

Corporate Brochure

Annual report

"Tell Me About J-POWER" (in Japanese)

"My J-POWER, the Mighty" (in Japanese)

In-house Public Relations Magazine "J-POWERs"

Our public relations magazine "Dengen" was published as a J-POWER company magazine until March 2004. In April 2004, however, it was revised as the in-house public relations magazine "J-POWERs" for J-POWER Group employees. Since then, this new magazine has been published monthly with the objective of communicating the views of the top management from each of the Group's companies, sharing information within the group and ensuring good communications between employees.

J-POWER company magazine "Dengen"

In-house public relations magazine "J-POWERs"

PR Houses run by J-Power

We now have 15 PR facilities, which a total of about 300,000 people made use of in fiscal 2003.

Open-type Power Station

Okukiyotsu Pumped Storage Power Station No. 2 in Niigata Prefecture is an open-type power station, where visitors can see and touch hydraulic power generators and power distribution panel, with "OKKY," an exhibition facility built next to it (Visitors during the Fiscal 2003: 21,547).

Okukiyotsu exhibition facility "OKKY"

"Dam Side Park MIBORO"

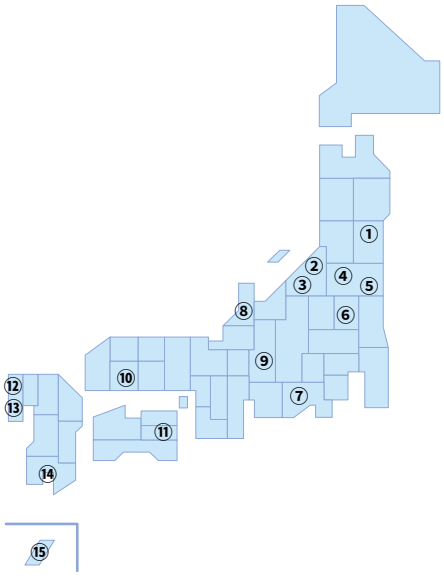
The "Dam Side Park MIBORO" in Gifu Prefecture was opened in April, 2001, with PR facility introducing the history of Miboro Dam construction and the dramatic story of the birth of "Syokawa Cherry Trees" and a restaurant where people can dine while enjoying the view of Mibora Dam (Visitors during the Fiscal 2003: 119,386).

"Dam Side Park MIBORO"

"J-POWER Yonden Wonderland"

J-POWER Yonden Wonderland was opened in December 2002, on the opposite shore of the Tachibanawan Thermal Power Station in Tokushima Prefecture. A former spoil disposal area for the construction of this station has become a recreation land for local people due to joint development by Shikoku Electric Power Co., Inc. and J-POWER (Visitors during the Fiscal 2003: 65,159).

"J-POWER Yonden Wonderland"



J-POWER's PR Facilities

Name	Address
①Onikobe Exhibition House	〒989-6941 2-5 Onikobe-aza-Arao-dake, Naruko Town, Tamatsukuri-County, Miyagi 986-6941
②Okutadami Electric Power House	〒946-0082 1317-3 Oaza-Imokawa-aza-Otori, Yunotani Village, Kita-Uonuma-County, Niigata 946-0082
③Okukiyotsu Exhibition Facility "OKKY"	〒949-6212 502 Oaza-Mikuni-aza-Tsuchibayama, Yuzawa Town, Minami-Uonuma-County, Niigata 949-6212
④Tadami Exhibition House	〒968-0421 2476-230 Oaza-Tadami-aza-Atoyama, Tadami Town, Minami-Aizu-County, Fukushima 968-0421
⑤Shimogo Exhibition House	〒969-5208 847-1 Oaza-Konumazaki-aza-Hanjo-otsu, Shimogo Town, Minami-Aizu-County, Fukushima 969-5208
⑥Numappara Exhibition House	〒352-0111 897-6 Itamuro-aza-Takinosawa, Kuroiso City, Tochigi 352-0111
⑦Sakuma Electric Power House	〒431-3901 2252 Sakuma, Sakuma Town, Iwata County, Sizuoka 431-3901
⑧Tedorigawa Dam Exhibition House	〒920-2336 18-1 Higashi-Niguchi-Ho, Oguchi Village, Ishikawa-County, Ishikawa 920-2336
⑨Dam Site Park MIBORO	〒501-5505 140-1 oaza-Maki, Shirakawa Village, Ono-County, Gifu 501-5505
⑩Takehara Thermal Power Exhibition House	〒729-2311 3035-13 Nishi-Nagahama, Tadanoumi Town, Takehara City, Hiroshima 729-2311
⑪J-POWER Yonden Wonderland	〒779-1620 1 Funabata, Fukui-Town Anan City, Tokushima 779-1620
⑫MATSUURA Energy Plaza	〒859-4506 458-1 aza-Sezaki, Shirahama-men, Shisa-Town, Matsuura City, Nagasaki 859-4506
⑬Matsushima Thermal Power PR Room	〒857-2531 2573-3 Matsushima-Uchigo, Oseto Town, Nishi-Sonogi-County, Nagasaki 857-2531
⑭J-POWER Fureai House (J-POWER Interaction House)	〒859-2101 3985-9 aza-Uchikomi, Kamiko, Tsuruta Town, Satsuma-County, Kagoshima 859-2101
⑮Teida Hall	〒904-1103 3-4-1 Akasaki, Ishikawa City, Okinawa 904-1103

Syokawa-Zakura (Syokawa Cherry Trees)

The two gigantic cherry trees standing at the observation terrace at lakeside of Miboro are Azuma-higan Cherry (Prunus subhirtella var.) said to be more than 450 year old. Formerly, they were in two temples, Shoren-ji and Korin-ji, in Nakano-area, now at the bottom of the lake, and have been loved by village people for centuries. The first president of our company when visited here in 1959 while the dam construction works were ongoing, felt the sorrow of getting these gigantic trees submerged, and asked Mr. Shintaro Sasabe, the late leading authority of cherry studies and known as "Doctor of Cherry," to transplant them. The grand-scale transplantation work without parallel in any other country and was seen as "impossible" by a number of specialists, completed in December, 1960. Then, they were named "Syokawa-Zakura (Syokawa Cherry Trees)." They are taken care of by our company and do not fail to bloom every spring offering grandiose scene to visitors.

Transplantation Work

Present view of Syokawa-Zakura

Development of Environmental Conservation Activities

Events during the Environmental Month

June of every year is the Environmental Month specified by the government. This month is especially dedicated to reviewing the way society and corporates are supposed to exist, thinking in workplaces and communities about how we can contribute to the environment, and moving on to take actions. In the fiscal 2003 too, we planned events to keep pace with this movement and performed diversified events including organizing lecture meetings at our head office and other offices, cleaning local beaches and roads, and participating in afforestration project events organized by local governments.

Event	Contents and number of offices participated
Lecture meeting, Speech, Exempla, etc.	Lecture meetings organized by J-POWER: 7; Speech/Exempla: 9; Study meetings: 8, Attending in Lecture meetings: 5
Environmental Fair, Environmental Panel Exhibition	Green Fair: 1; Environmental Panel Exhibitions: 3; Participation to Environmental Fair: 1
Photo Exhibition on Environmental Conservation, Competition of Slogans	Environmental Photo Exhibition: 1; Competitions of Slogan: 1
Environmental Video Show	Video Show for Environment Education: 16
Poster display, offering environmental information, etc.	Displaying the President's Message and Posters of Environment Month:
Forest volunteer and Nature Watching Excursions	At all the offices in Japan, Delivering Panphlets: 2; Display Theme of Environment Month: 1 Forest Volunteer: 5; Nature Watching Excursions: 2
Environmental beautification activities, etc.	Beach Cleaning: 10; Cleaning in the neighborhood areas: 33; Improvement of Workplaces: 30; Tree and Flower Planting, Distribution of seedlings, etc.: 21
Promotional activities for recycling	Promotional activities for recycling: 16
Activities for prevention of global warming	Promotional activities for energy-saving: 13; Stopping Vehicle Engine Instead of Idling at Stops Activities: 13; Implementation of 'No-Car-Day': 2
Office environment measuring	Illumination and other measurings:12
Tour in environment-related facilities	Tours in waste disposal facility, etc.: 13
Others	No-Smoking-Hour, etc.: 5, Implementations of Open House Events: 1

Display of the President's Message and Poster from the Ministry of the Environment.

In preparation for Environment Month, our president's message and a poster from the Ministry of the Environment are being displayed in all offices and plants to help improve the environmental awareness of all employees.

Scenes of events held during the Environment Month

Environmental lecture presentation by Mr. Eisuke Ishikawa (Head Office)

Iwaya coast clean up, Wakamatsu Operation & General Management Office (Fukuoka Prefecture)

Environmental Panel exhibition on Yokohama City, Isogo Thermal Power Station (Kanagawa Prefecture)

Holding of Green Fair

Twice in 2003, in June and October, at the place in front of our head office entrance, we held “Green Fair,” an exhibition and sale of environment-conscious products made from byproducts created from our power generation business. Through this event, we invited general public to see and touch directly the environment-conscious products our group companies are manufacturing and understand more about our environmental conservation activities. At the same time the local specialties displayed from those places where more our power stations are located enabled them to get information knowledge about those places.

"Green Fair" (Head office)

Holding of Green Fair

Date	Number of visitors	Raised donation (Japanese Yen)	Organizations to which donations were made
Jun. 2003	806	57,698	All amount donated to the Japan Fund for Global Environment (Japan Environment Corporation)
Oct. 2003	381	33,215	All amount donated to Green Fund (National Land Afforestation Promotion Organization)

Afforestration project’s activities with local people

Kitahon Power Administration Office (Hokkaido) has been participating in the “Full-of-Flowers Movement” organized by the local town community, in June every year, planting Salvia flowers (*Salvia splendens*) along the National Route 5 in cooperation with local primary school children since 1991.
A total of 50 people, including our employees, planted about 30,000 flowers.

Kitahon Power Administration Office (Hokkaido)

Kitahon Power Administration Office (Hokkaido)

Afforestration project activities with local people

Each organization promotes afforestation activities with the help of local people. Some of these activities are described.

- The Kitayamagawa Power Administration Office held a afforestration project ceremony in March 2004 as part of a joint effort with Owase City, the Owase Fisheries Cooperative's staff and the Mie Prefectural Fishery Cooperative.
  This ceremony started three years ago when, in discussions with the local fisheries cooperative and other concerned staff, the local community expressed the desire to help restore deteriorated mountain areas. About 40 of our employees participated in this, the fourth year of the ceremony, and planted 40 mountain cherry seedlings in the Owase city forest, at Tochikawara.

Afforestration project ceremony jointly carried out by Owase Fisheries Cooperative's staff and other concerned persons.
Kitayamagawa Power Administration Office (Mie Prefecture)

- 10 volunteers from the Chubu Regional Headquarters and the Sakuma Power Administration Office participated in a afforestration project ceremony held by the Tenryugawa Fisheries Cooperative in April 2003.
  On that day, 280 broad-leafed tree seedlings (mountain cherry, zelkova, white oak, maple, etc.) were planted at Kusakidani, on the Shinkaisawa headwaters flowing into the lake at Akiba Dam.

Afforestration project ceremony carried out by the Tenryugawa Fisheries Cooperative.
Sakuma Power Administration Office (Shizuoka Prefecture)

Participation and co-operation for the Totsugawa Village's Beautification Campaign
(Planting cherry nursery trees)
Totsugawa Power Station (Nara Prefecture)

Forest volunteers' participation in "Okayama's Coexistence Forest" activities.
Western Transmission Line Maintenance Center (Okayama Prefecture)

- A group of more than 30 volunteers from the "J-POWER Forest Club" (consisting of J-POWER Group's employees) supports the activities of the nature conservation committee of "Takao-no-morizukuri no kai (Association for fostering forest of Takao)", part of the Japanese Alpine Club, and participates in voluntary forestry activities as a member of this committee.
  The group fosters the national forest of Kogesawa at Uratakao, Hachioji City, Tokyo. J-POWER Group's employees are actively working to promote environmental conservation and health.

J-POWER Forest Club participation in the "Takao-no-morizukuri no kai" Afforestration project ceremony.