

# Efforts Relating to the Local Environment

From conducting power generation activities in various locales, the J-POWER Group has come to the understanding that a basic prerequisite for harmony with the local community is to ensure the safety and preserve the living environment of the people in that community. With this understanding we do our best to coexist harmoniously with the local community, above all by taking measures to minimize the impact of our activities on the environment.

## Reducing the Environmental Load

To minimize the impact of our activities on the air quality, water quality, and other aspects of the local environment, J-POWER implements environmental conservation measures against air and water pollution, noise and vibration, and other environmental problems at its coal-fired power stations and elsewhere, using the latest technology and know-how.

### Reducing Emissions from Thermal Power Stations

#### ◆ Air Pollution Control

Coal-fired thermal power stations generate sulfur oxides (SOx) ☹️, nitrogen oxides (NOx) ☹️, and soot and dust ☹️ as a result of coal combustion. To eliminate these emissions, J-POWER has worked to improve combustion methods and has installed flue gas treatment equipment such as desulfurization and denitrification systems and electrostatic precipitators. Although the performance of this equipment varies according to the era when it was installed, in each case we used the newest technology available to remove pollutants with maximum efficiency.

This equipment operates automatically with the aid of flue gas monitors that continuously measure the content of flue gas. In addition, human operators monitor the equipment 24 hours a day to ensure a swift response in the event of any malfunction.

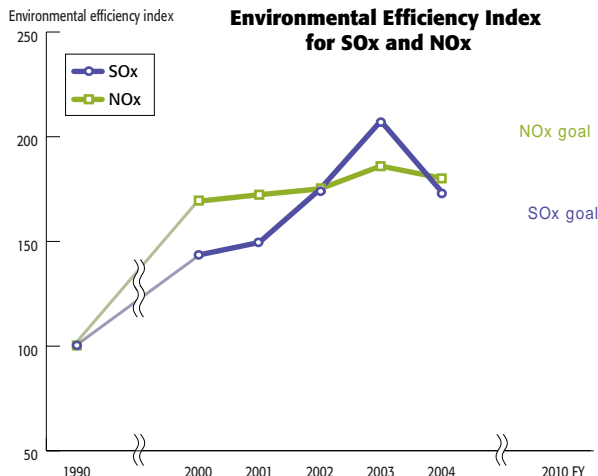
In fiscal 2004, the emissions intensity of NOx and soot and dust remained more or less constant compared with fiscal 2003. However, because the sulfur content of the coal burned in our power stations was higher than in the previous year, SOx intensity increased slightly in fiscal 2004, resulting in a decline in environmental efficiency ☹️.

#### FY 2004 Performance

Substance	Equipment efficiency (removal efficiency)	Emissions (tons)	Emissions intensity (g/kWh)
SOx	72%–99%	10,400	0.20
NOx	69%–90%	26,600	0.50
Soot and dust	99% (design value)	1,000	0.02

Notes: 1. Emissions intensity in the text of this report and accompanying charts has been calculated using the electric energy output of J-POWER's coal-fired thermal power stations as the denominator.

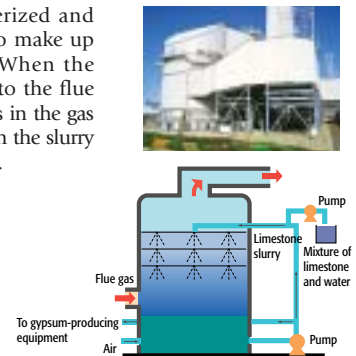
2. Emissions of dust are calculated on the basis of measurements taken monthly.



Note: For the environmental efficiency index, 100 = FY 1990 environmental efficiency (electric power sales volume ÷ SOx, NOx emissions).

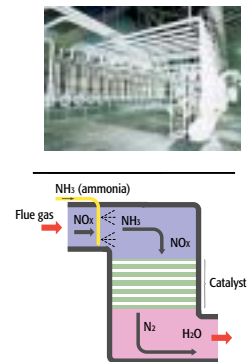
#### Mechanism of Wet-type Flue Gas Desulfurization System

Limestone is pulverized and mixed with water to make up limestone slurry. When the slurry is sprayed into the flue gas, the sulfur oxides in the gas react with the lime in the slurry and become gypsum.



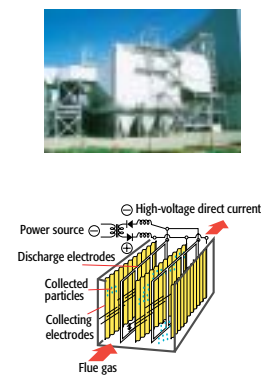
#### Mechanism of Flue Gas Denitrification Systems

Ammonia is added to flue gas containing nitrogen oxides, which is then passed through a metal-based catalyst (a substance that triggers a chemical reaction). The action of the catalyst causes a chemical reaction in which the nitrogen oxides break down into nitrogen and water.

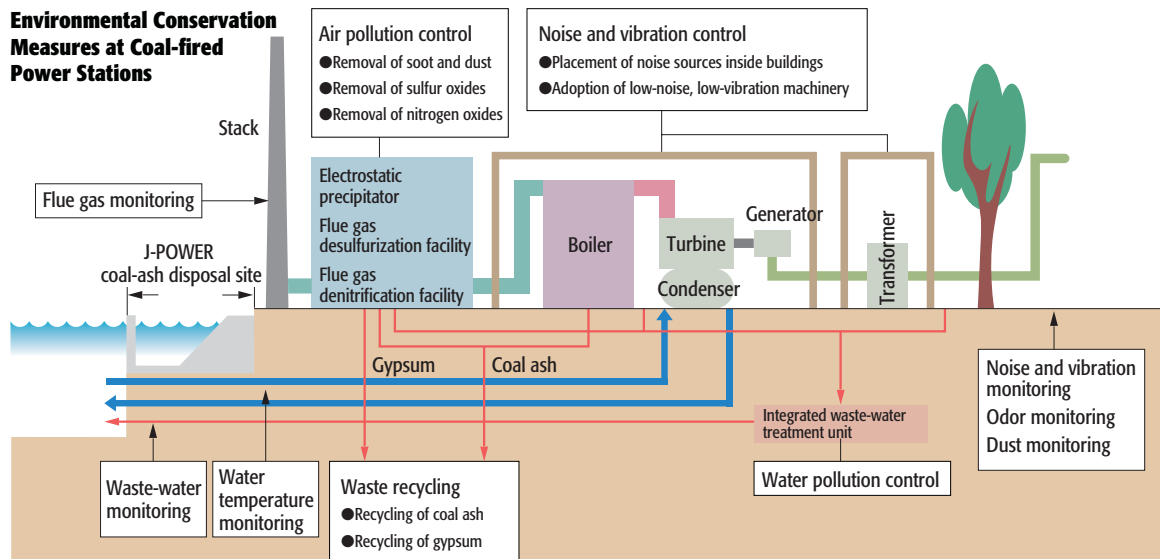


#### Mechanism of Electrostatic Precipitator

Flue gas is passed between high-voltage electrodes to give the dust a negative charge, and the negatively charged particles adhere to the positively charged collecting electrodes. Periodic rapping knocks the electrode and consequently the accumulated particles fall to the bottom of the precipitator and are removed. The underlying mechanism, static electricity, is the same principle that causes small paper or dust particles to adhere to a vinyl sheet that has been rubbed repeatedly.



### Environmental Conservation Measures at Coal-fired Power Stations



#### ◆Water Pollution Control

A waste-water treatment system is installed in all coal-fired power stations to ensure that water discharged from desulfurization units, waste water from offices, and other effluents are adequately treated.

Metals and organic substances contained in waste water are removed through coagulation, precipitation, filtration, and other methods in each facility's on-site integrated waste-water treatment unit.

Treated water is appropriately monitored through routine monitoring by automatic measuring equipment as well as periodic analyses to verify that all substances are well within the regulatory limits established under the Water Pollution Control Law and environmental conservation agreements.

(For information on incidents involving waste water, see p. 48, Environmental Incidents.)

#### ◆Noise and Vibration Control

J-POWER works hard to prevent undue noise and vibration from boilers, turbines, exhaust fans, and other equipment by installing low-noise, low-vibration machinery in its coal-fired power plants and by keeping such equipment inside of plant buildings.

With regard to outdoor equipment in our coal-fired and hydropower plants, in addition to using low-noise low-vibration equipment, we also install soundproof covers and walls as needed.

Noise and vibration levels are periodically measured at the boundaries of power station sites to ensure that they meet regulatory standards.

#### ◆Greening Measures

At its coal-fired power stations, J-POWER plants trees (primarily evergreen), grass, and seasonal flowers to cover 20% or more of the site area with greenery and provide habitats for birds, insects, and other small animals.

#### ◆Odor Control

Rigorous safeguards are in place to ensure that the ammonia used in denitrification units and other systems has no impact on the surrounding area. These include periodic inspection, performance testing, and routine checking of equipment that makes use of ammonia. In addition, care is taken to avoid leakage of ammonia from receiving or storage facilities.

Odor levels are periodically measured at the boundaries of power station sites to confirm that they meet regulatory standards.

#### ◆Measures against Thermal Water Discharge

Coal-fired power stations intake seawater to cool steam used for power generation and release it as thermal water discharge. To prevent any negative impact on marine life in the vicinity, each J-POWER plant controls thermal water discharge through an intake-discharge method adapted to the conditions of the plant site.

The temperature of warm water discharge is monitored around the clock to ensure that it remains within the limits established by environmental agreements.

#### ◆Measures against Coal Dust

J-POWER coal-fired power stations implement various measures to prevent scattering dust during coal unloading, transport, storage, and other operations by such means as the use of closed conveyor belts and indoor coal storage, as well as windshielding and spraying as dictated by topographical and weather conditions.

#### ◆Measures at Coal-Ash Disposal Sites

At the coal-fired power stations that are equipped with landfill disposal sites, soil is spread over the ground in such a way as to avoid dispersion of coal ash. Leachate treatment equipment is used to treat leachate as needed.

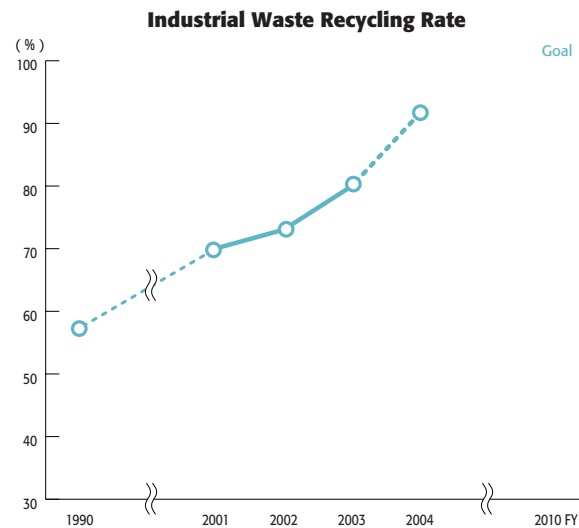
# Recycling and Reuse of Recyclable Resources

To help build a recycling-based society, J-POWER is working hard to reduce the amount of waste it generates and to properly treat and recycle the waste it does produce. We are also involved in a number of environmental recycling programs to promote appropriate waste management, environmental measures, and use of unutilized energy.

## Effective Use and Reduction of Waste

In fiscal 2004, the J-POWER Group as a whole generated 2.06 million tons of industrial waste, of which it was able to recycle or reuse 1.89 tons, or 92%.

Henceforth J-POWER has decided to promote more extensive recycling of coal ash and reduction of total industrial waste generated from the maintenance and operation of power generation stations, to "achieve a recycling rate of 97% within the J-POWER Group as a whole by the end of 2010, with the goal of zero emissions of industrial waste."



Note: The figure for FY 1990 represents the recycling rate for coal ash only; figures for FY 2001–FY 2003 represent the rate for all industrial waste produced by J-POWER; and the FY 2004 and the goal figure represent the recycling rate for all industrial waste generated by all companies of the J-POWER Group.

### ◆ Effective Use of Coal Ash

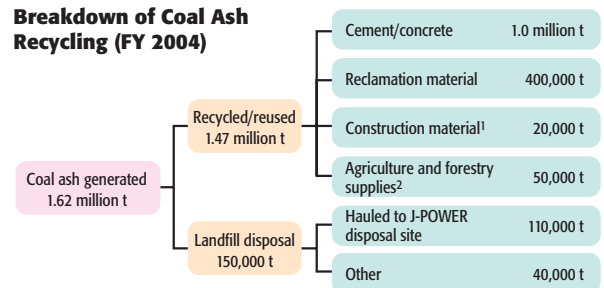
Coal ash, the residue left from the combustion of coal at coal-fired power stations, accounts for the largest volume of waste generated by J-POWER facilities.

In fiscal 2004, J-POWER generated 1.62 million tons of coal ash, of which it recycled or reused 1.47 million tons, or 91% (see graph at right).

Coal ash is used primarily for land reclamation material, construction material, and farming and forestry supplies; the bulk of it is recycled as raw material for cement or concrete admixture. In the area of agriculture and forestry, J-POWER sells potassium silicate fertilizer manufactured from recycled coal ash at fertilizer plants owned by companies of the J-POWER group.

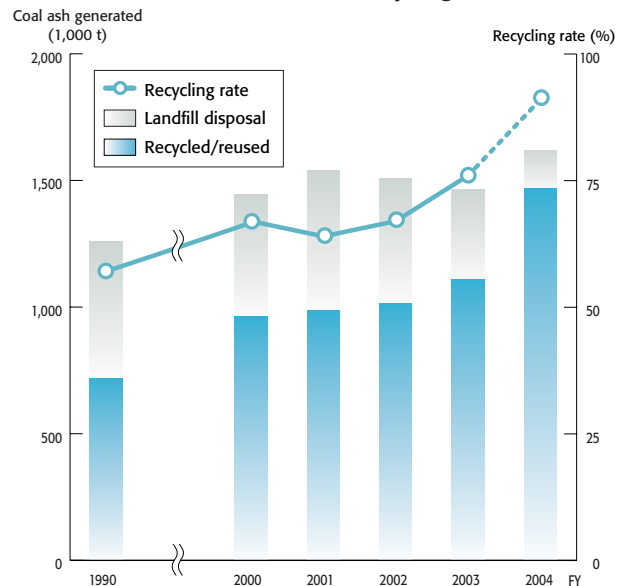
Most of the coal ash that cannot be recycled or reused is disposed of in a landfill at J-POWER's own disposal site (Matsuura-shi, Nagasaki Prefecture).

### Breakdown of Coal Ash Recycling (FY 2004)



1. Primarily facing and filling material  
2. Potassium silicate fertilizer, etc.

### Trends in Coal Ash Recycling



Note: In November 2004, the government issued an opinion regarding the provisions of the Law for Promotion of Effective Utilization of Recyclable Resources, stating that "coal ash provided by businesses belonging to the electric power industry for public water body reclamation projects in harbors and ports designated as important under the Harbor and Port Law or for such projects based on local harbor and port plans shall be regarded as land reclamation material." On the basis of this opinion, in FY 2004 coal ash used for land reclamation in the Port of Kitakyushu (Hibikinada, Kitakyushu-shi, Fukuoka Prefecture) and the Port of Kinwan (Ishikawa, Okinawa Prefecture) has been counted as recycled/reused.

### ◆ Effective Use of Gypsum

All gypsum generated as a by-product of wet-type flue gas desulfurization systems at J-POWER coal-fired power stations is recycled or reused as gypsum board and raw material for cement.

In fiscal 2004, the amount of gypsum recycled or reused was 370,000 tons, or 100% of the volume generated.



◆Effective Use of Driftwood

J-POWER voluntarily retrieves driftwood that collects in dam reservoirs at its hydroelectric power stations and recycles it by manufacturing charcoal, extracting pyrolygneous acid, or chipping the wood for use as building materials and mulch.

Because of high demand for road slope spraying materials in fiscal 2004, we were able to process much of the wood that had been collected and stored in fiscal 2003, with the result that 12,500 m<sup>3</sup> of driftwood was recycled.



Driftwood collecting in a dam reservoir (Sakuma Dam, Shizuoka Prefecture)

◆Effective Use of Construction By-products

J-POWER works with contractors to promote effective use of the by-products of new construction, expansion, and renovation of electric power facilities by a variety of means, including the recycling of concrete scrap and cleared trees and the use of loose earth generated during construction within the grounds of the facility.

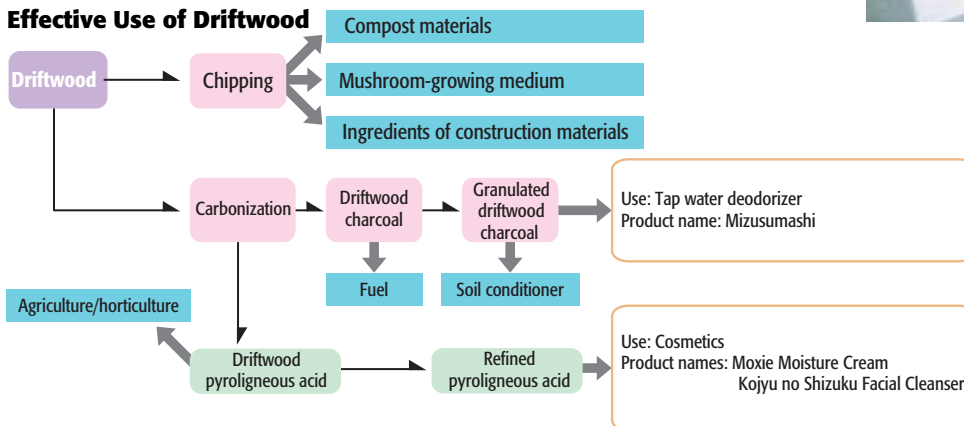
◆Office Recycling Efforts

J-POWER is working to reduce the amount of general waste its offices generate by using both sides of paper; sorting waste paper, bottles, cans, and plastics; reusing envelopes; and so forth.

In fiscal 2004, the head office familiarized itself with and instituted a new waste-sorting policy in keeping with its EMS and educated its employees about the desirable method for sorting. As a result of sorting and recycling different kinds of paper, the amount of general waste including paper generated by the head office in fiscal 2004 was 28 tons, a 6% reduction from the previous year.



Boxes for sorting waste

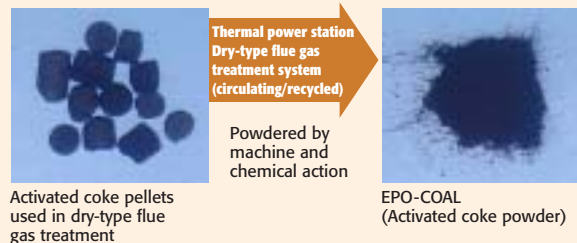


Marketing of "EPO-COAL" (Recycled Granulated Coke Powder) as Dioxin Remover

The powdered dioxin remover EPO-COAL for waste incinerators is made of recycled activated coke powder produced in and shipped from J-POWER's Takehara Thermal Power Station No. 2 unit (Hiroshima Prefecture) and Isogo Thermal Power Station No. 1 unit (Kanagawa Prefecture). Both of these plants are equipped with dry-type flue gas treatment systems, which make use of and recycle granulated activated coke.

Because the activated coke is reused, the CO<sub>2</sub> load of the manufacturing process is close to zero, as compared with that of most commercially available activated charcoal. EPO-COAL has received high marks for dioxin-adsorption performance equal to that of commercial activated charcoal at waste disposal facilities equipped with electrostatic precipitators and bag filters alike.

A waste disposal association in the Kyushu district has adopted EPO-COAL for dioxin removal beginning in fiscal 2005.



### ◆J-POWER's Environmental Recycling Programs

J-POWER is striving to contribute to society by promoting the appropriate treatment of waste, environmental measures, and the use of unutilized energy. Especially noteworthy is our active involvement in the creation and operation of public infrastructure for PFI/PPP\* environmental recycling programs, putting to use our extensive experience investing in, designing, building, maintaining, and managing such infrastructure as electric power generation and transmission facilities.

\* PFIs (private finance initiatives) and PPPs (public-private partnerships) are models for mobilizing private money, management know-how, and technical expertise for the construction, maintenance, management, and operation of public facilities.

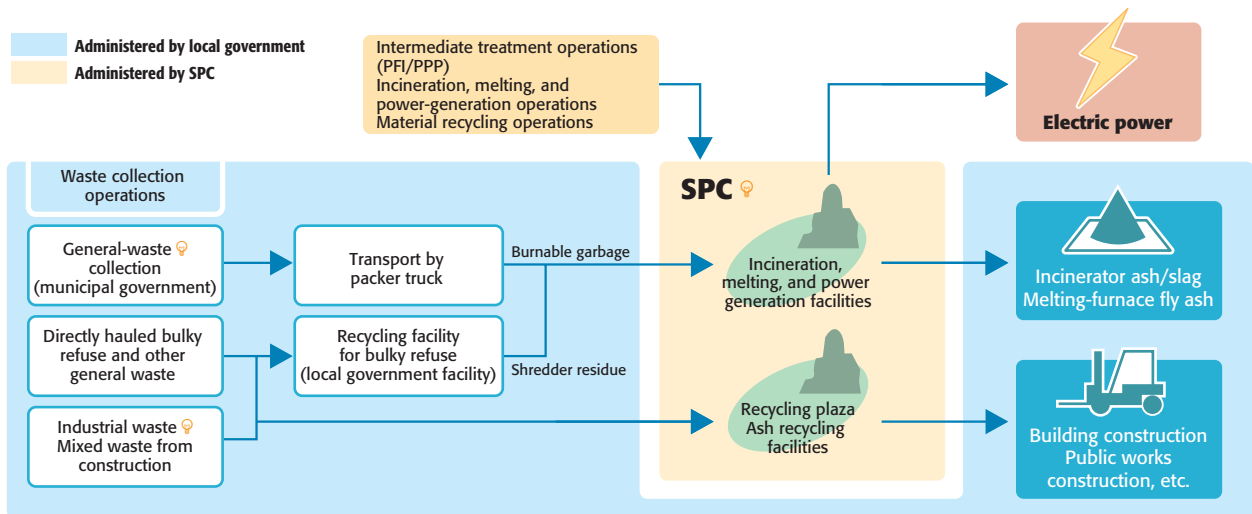
#### Toru Miyamoto

Recycling of sewage sludge as fuel  
Waste Energy Recycling Business Group  
Business Development Department



I am engaged in R&D to make use of dried or carbonized sewage sludge, an unutilized biomass resource, as fuel for co-firing in coal-fired thermal power stations. I am enthusiastic about my work because I know we can make a major contribution to the global environment through the use of unutilized resources if we can make this commercially practical.

### PFI/PPP Environmental Recycling Programs—Schematic Representation



### Examples of Activities

- Waste-fueled power generation/intermediate waste treatment project (participation in Omuta Waste Recycle Power Station, Narumi Waste Disposal Plant in Nagoya, and other PFI operations)
- Building and management of waste water treatment facilities for water purification plants (participation in the Samukawa Water Purification Plant Waste-Water Treatment Facility Specified Project and the Project for the Creation of the Edogawa Water Purification Plant Waste Water Treatment Facility; expanded recycling of soil generated by water purification)
- PFI consulting (PFI consulting on waste heat recovery facilities etc.)
- Test production of carbon fuel from general waste
- Development of technology for making fuel from sewage sludge




Carbon fuel from general waste  
Left: Carbon fuel made from general waste  
Right: Carbon fuel formed into briquettes for easy shipping and storage


## Management of Toxic Chemicals

J-POWER is committed to full legal compliance in its storage and management of toxic chemicals, which can have a major impact on the environment. With regard to PCBs, we carry out detoxification treatment in keeping with Japan's regional waste-management program.

### ◆PRTR (Pollutant Release and Transfer Register) Law

The PRTR  system is a mechanism for reporting and disclosing the level of chemical emissions and the transfer of chemicals to the environment through waste materials. The legislation was enacted in 1999, and monitoring and reporting of the targeted substances began in 2001.

While J-POWER uses chemical substances for painting and coating, treatment of intake water at thermal power stations, and other purposes, it has traditionally managed these substances prudently, as by monitoring and recording the quantities procured and used.


Henceforth we are committed to minimizing the use of such chemicals and to controlling and managing those we use appropriately, complying with all established procedures. With respect to dioxins , we are working hard to reduce emissions through appropriate management and oversight of facilities.

### ◆Measures to Reduce Dioxins

While J-POWER strives for effective use of waste through chipping of driftwood and other means, it also operates three incinerators ("specified facilities" under the Law Concerning Special Measures against Dioxins). At these specified facilities, we implement appropriate maintenance and management, such as sorting prior to treatment and combustion temperature control.

Under this law, incineration facilities must monitor the concentration of dioxin in flue gas at least once a year and report it to the local government. In fiscal 2004, all our incinerators met emissions standards. To reduce dioxin emissions, it is also important to promote the recycling of waste material and to reduce the amount of waste generated.

### ◆Management and Treatment of PCBs

PCBs  have been widely used as insulators in transformers and other electric devices because of their excellent heat-resistance and insulation properties. Because of their toxicity, however, manufacture and import were outlawed in 1974, and all those in possession of the material were required to observe stringent storage and management requirements.

In July 2001, moreover, the Law Concerning Special Measures against PCB Waste came into force, and appropriate treatment of waste containing PCBs became mandatory.

As of June 2004, J-POWER had approximately 139 kl of insulating oil (containing a high level of PCBs), which we store and manage under stringent conditions in 33 warehouses around the country. In February 2005, we began treatment of the substances based on the regional waste-management program.

### ◆Trace PCB Contamination

In July 2002, the Japanese government announced that extremely low levels of PCBs (under 5.0 ppm in about 60% of the cases) were detected in products that had been accidentally contaminated by heavy electrical machinery following the prohibition of PCB use.

J-POWER conducted a survey of machinery using insulating oil and notified the proper authorities of the results in accordance with relevant laws and regulations. We have also subjected machinery contaminating PCBs to strict controls. Meanwhile, a national commission has investigated the causes of the contamination and will be deliberating measures for treating PCB-contaminated material. We will continue to respond to this issue in a conscientious and appropriate manner.

### Total PRTR-Substance Release and Transfer Volumes (FY 2004)

Chemical	Use	Volume handled	Volume released	Volume transferred through waste
40: Ethyl benzene	Coating for machinery and equipment	2.14 t/y	2,100 kg/y	0.0 kg/y
63: Xylene	Coating for machinery and equipment	14.5 t/y	11,000 kg/y	0.0 kg/y
227: Toluene	Coating for machinery and equipment	1.0 t/y	1,000 kg/y	0.0 kg/y
253: Hydrazine	Additive for boiler water	4.0 t/y	0.0 kg/y	0.0 kg/y
179: Dioxins	Waste incinerators	—	0.11 mg-TEQ/y	1.5 mg-TEQ/y

Notes:

1. Figures represent total release and transfer volumes for all business units handling 1 ton or more of the specified substance annually.
2. For dioxins, figures represent total emissions from waste incinerators.
3. As stipulated by law, figures represent the total of the values reported by each business unit.



Machinery containing PCBs being shipped to treatment site (Wakamatsu Operations & General Management Office, Fukuoka Prefecture)

# Steps to Conserve the Natural Environment

When building new power stations, J-POWER works to preserve the natural environment and biodiversity of the area. We carry out environmental impact assessments and incorporate the views of the local residents as we work to minimize the facility's impact on the environment. During construction, we monitor construction activity and implement environmental conservation measures to ensure a harmonious balance with nature.

## Environmental Assessment and Monitoring

J-POWER carries out environmental assessments (environmental impact assessments) when planning for the construction of a new power facility or the expansion of an existing one. We make a survey of the current state of the area's natural environment (air quality, water quality, soil quality, ecology, etc.) and social environment (industry, land use, traffic, etc.) and predict and assess the impact the siting of a power facility will have on that environment. During the process, we listen to the views of local residents and incorporate them in our plan.

After the power plant starts operating, we continue monitoring the environment for a certain period of time to ensure that the impact on the environment falls within the parameters of our predictive assessment.

**Environmental Assessments for J-POWER Projects**  
(date: submission of environmental impact assessment document)

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

Note: Assessments listed include those carried out under not only the Environmental Impact Assessment Law but also the Public Waters Reclamation Law, the Forest Law, prefectural and municipal ordinances, and other statutes.

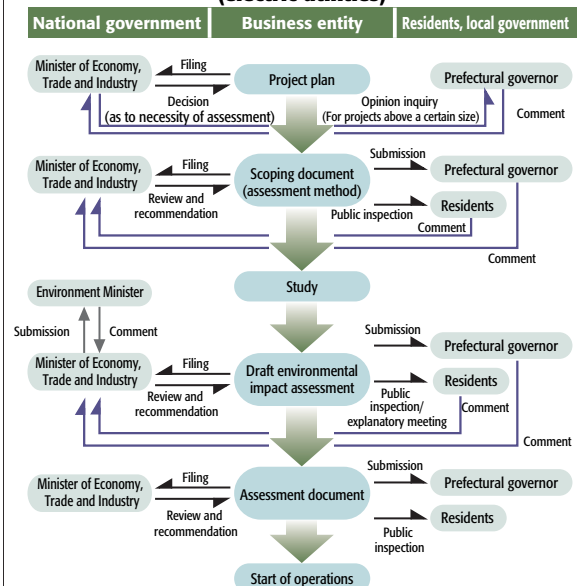
## Outline of the Environmental Impact Assessment Law

The Environmental Impact Assessment Law, which came into effect in June 1999, mandates that businesses planning large-scale projects with the potential to markedly affect the environment conduct studies and make predictive assessments concerning the impact on the environment. It also establishes procedures whereby the prefectural governor, the relevant state minister, the local residents, and others can offer comments on the assessment's methods and conclusions, and it requires businesses to establish a mechanism for incorporating the results of the assessment and the comments into their project.

In respect to electric power plants, for 20 years J-POWER carried out environmental impact assessments in accordance with the environmental assessment system adopted by a resolution of the former Ministry of International Trade and Industry. Currently environmental impact assessments are carried out in accordance with the Environmental Impact Assessment Law and with the Electricity Utilities Industry Law, which was amended to conform to the EIA Law.

In addition to these statutes, we have also carried out environmental assessments under the provisions of such national legislation as the Public Waters Reclamation Law, the Forest Law, and the Waste Management and Public Cleansing Law, as well as various local ordinances.

### Procedures under the Environmental Impact Assessment Law (electric utilities)



## Environmental Conservation Measures during Preparatory Work on the Oma Nuclear Power Station

J-POWER is taking appropriate measures to protect the environment in connection with the planned Oma Nuclear Power Station in accordance with the commitments outlined in the Oma Nuclear Power Station Environmental Impact Assessment. It has



Survey of rare species

### Seiya Yano

Civil & Architectural Engineering Group  
Oma Nuclear Power Project Construction Preparation Office



We monitor the environmental load accompanying preparatory construction and work to minimize it, aiming for a power plant that harmonizes with the rich natural environment along the coast of Tsugaru Strait.

also implemented an environmental management system (adopted October 17, 2000), under which it is engaged in efforts to protect, improve, and enhance the environment.

Type of measure	Content
Protection of terrestrial animals and vegetation	<ul style="list-style-type: none"> <li>● Preserving about 29% of site unaltered to protect rare species, etc.</li> <li>● Protecting small animals' migratory paths by constructing crossing tunnels under roads and gently sloping ditches along roads to allow animals to climb out</li> </ul>
During construction	<b>Noise/vibration measures</b> <ul style="list-style-type: none"> <li>● Installing sheets to prevent spread of pollution in coastal waters; water quality monitoring</li> <li>● Neutralizing seawater when concrete is placed in the sea</li> <li>● Channeling runoff into temporary settling ponds at construction site and releasing supernatant water</li> </ul>
	<b>Protection of terrestrial animals and vegetation</b> <ul style="list-style-type: none"> <li>● Selecting low-noise, low-vibration machinery</li> <li>● Implementing anti-noise/vibration measures as necessary</li> </ul>
	<b>Disposal/handling of loose earth and rock during construction</b> <ul style="list-style-type: none"> <li>● Using loose earth and rock generated by excavation and dredging for reclamation, backfill, and embankment; placing surplus earth in a land-waste disposal site in order to build a mound which will be incrementally greened</li> </ul>
	<b>Measures against dust scattering</b> <ul style="list-style-type: none"> <li>● Installing washing facilities for construction vehicles</li> <li>● Spraying and cleaning construction roads</li> <li>● Installing anti-dust barriers and nets</li> </ul>
	<b>Traffic noise</b> <ul style="list-style-type: none"> <li>● Designating routes for construction vehicles</li> <li>● Reducing road traffic through use of marine transport</li> </ul>
	<b>Industrial waste</b> <ul style="list-style-type: none"> <li>● Undertaking appropriate disposal in compliance with the law</li> <li>● Chipping and recycling cleared timber and roots as mulch, etc. for greening of site</li> </ul>

## Soil Pollution Measures

### ◆ Status Surveys Prior to Power Station Construction

For years J-POWER has carried out environmental assessments in advance of construction of power plants and other facilities, in conformance with the Environmental Impact Assessment Law that came into force in 1999 (and prior to that, in accordance with the environmental assessment system adopted by the former Ministry of International Trade and Industry in 1977), local ordinances, and other statutes. These assessments include status surveys of soil pollution within sites slated for construction to confirm the presence or absence of contamination prior to construction.

### ◆ Prevention of Soil Pollution

Prior to power plant construction, J-POWER designs the construction site in accordance with the Fire Prevention Law and other statutes by building banks around oil and chemical tanks and pipes and separating hazardous substances and treating them with on-site waste treatment units, to ensure that in the unlikely event of a leak, such substances do not pollute the coastal waters or surrounding area.

In the operation of our power stations we prevent

soil and groundwater pollution by following strict handling methods and emergency procedures detailed in our EMS to prevent leakage of chemicals and toxic substances and by providing training programs for plant staff where necessary.

### ◆ Studies to Identify Potential Soil Pollution

Although no J-POWER facilities require a soil contamination survey under the Soil Contamination Countermeasures Law, the company voluntarily drew up plans to check for contamination as part of its Environmental Action Guidelines. In fiscal 2004, studies were conducted at all domestic electric power facilities (218 facilities, including thermal power stations, hydroelectric power stations, and transmission facilities).

The studies determined that pollutants had been present at none of the sites before they came into the possession of J-POWER, that toxic chemicals presently handled at these facilities were being properly managed by means of storage and transfer facilities designed to prevent infiltration into the ground, and that consequently there was no worry of soil or groundwater pollution at these sites. (For information on environmental incidents relating to soil pollution at other sites, see p. 48, Environmental Incidents.)

## Hydroelectric Power and Harmony with the River Environment

### ◆Reservoir Water Quality

Typhoons or torrential rains can send large amounts of muddy water flowing into dam reservoirs, where it builds up. The release of water for power generation purposes can then lead to prolonged river turbidity.

At J-POWER, we monitor the water quality of reservoirs with turbidimeters and water quality analyses. Turbid water is discharged quickly, and at dams where turbidity threatens to become chronic, we install “surface water intake systems” that enable the intake of the relatively clear water at the surface (currently installed at the Ikehara, Kazaya, Yanase, and Sakamoto dams). At sites where the problem is severe, we are cooperating with the national and prefectural governments in forest-management and afforestation programs to reduce runoff.



Sakamoto Dam surface-water intake system under construction (Nara Prefecture)

### ◆Discharge to Preserve River Maintenance Flow

Because river flow falls off between the dam and the generator outlet, in consultation with the Ministry of Land, Infrastructure and Transport and other relevant agencies, J-POWER carries out river maintenance flow discharge to preserve a normal flow of water in rivers.

As of the end of fiscal 2004, such measures were being implemented at 30 power plants over 527 km of river.



Maintenance flow discharge (circled area) at Nanairo Dam (Wakayama Prefecture/Mie Prefecture)

### ◆Efforts to Preserve Our Forests

Recognizing the manifold value of our forests, J-POWER has decided to designate and preserve a portion of its own wooded land as riverhead forest. It has been working to conserve these forests in accordance with a set of “provisional guidelines for the conservation of riverhead forests” adopted in December 2002.

Since fiscal 2004, we have been at work on plans involving the designation of a tract of wooded company land situated on the border between Kawasaki-shi, Kanagawa Prefecture, and Machida-shi, Tokyo—the site of J-POWER Nishi Tokyo Power Administration Office—as a “forest shared with the community.” The purpose of this effort is to help in the restoration of the *satoyama* (village commons; communal forests) and to preserve the scenery for local residents and hikers on the historic Fudamichi road.

### ◆Control of Sediment in Reservoirs

Each year large quantities of earth flow into dams from upstream and are deposited there as sediment. To avoid resulting flood damage, J-POWER controls sediment by dredging to remove it or move it around the reservoir. In fiscal 2004, we moved or removed approximately 1.18 million m<sup>3</sup> of sediment at 13 dams. Of the roughly 650,000 m<sup>3</sup> of sediment removed from reservoirs, approximately 90% is recycled in the form of aggregate or cover soil.



Sediment dredging at Senbiri Dam (Hokkaido Prefecture)

#### Takahiro Nakagawa, in charge of sediment control measures at Horoka Dam

Kamishihoro Administration Office  
Hokkaido Regional Headquarters



Horoka Dam is in the Tokachi region of Hokkaido, an area rich in natural beauty, but even here we are plagued by the yearly buildup of sediment. We are working hard to control it with due attention to the environment, especially given our location in Daisetsusan National Park.

## Supporting Biodiversity

J-POWER is aware of the need to protect the diversity of wildlife, and we are striving toward coexistence with rare species through scrupulous study, planning, construction, and operation.

### ◆Japanese Golden Eagle

The Japanese golden eagle, listed as “endangered IB” in the Environment Ministry's Red Data Book, inhabits the area around Okutadami Dam and Otori Dam.

In the maintenance and operation of these dams, J-POWER does its utmost to avoid outdoor work during the Japanese golden eagle's nesting season.

In addition, if eagle nesting activity is confirmed in the nesting sites around the dam, any work that needs to be carried out in the vicinity of the nesting site is conducted in consultation with local ornithologists, with a minimum of vehicles and noise, to minimize the impact on the eagle's nesting activity.



A young Japanese golden eagle, 30 days after leaving the nest (July 16, 2003).

### ◆Blakiston's Fish Owl

Among the inhabitants of the Tokachi district of Hokkaido is Blakiston's fish owl, categorized as “endangered IA” (critically endangered in Hokkaido).

J-POWER is careful to plan and carry out its work in the area during times other than the nesting season to minimize the impact on the owl population.



Blakiston's fish owl  
(Photo: Kushiro Zoo)

### ◆Japanese Macaques (Shimokita-gun)

In Shimokita-gun, Aomori Prefecture, plans are underway to build a new transmission line extending a total of 60 km, from J-POWER's planned Oma Nuclear Power Station (Oma-machi) to the grounds of the Higashidori Nuclear Power Station (Higashidori-mura) planned by Tokyo Electric Power Company and Tohoku Electric Power Company (Oma Main Transmission Line Project).

The planned route for the line, for which survey construction is now underway, runs through a rich natural environment populated by various rare species of wildlife, including the northern Japanese macaque, which inhabits the northernmost region in Japan and has been designated as a protected species. Since 1997, we have been soliciting the opinion of experts, conducting a variety of studies and deliberations, and incorporating the results in our selection of the route and in other measures for protecting the macaques. In this way we are keeping the impact of power-line construction on the northern Japanese macaques to an absolute minimum.

In addition to Japanese macaques, the area around the planned route is known to be home to a number of endangered birds, including the northern goshawk and the mountain hawk-eagle. As with the Japanese macaque, we are taking precautions to minimize the impact on these rare species.



Northern Japanese macaque (April 18, 1999)

### ◆Re-creating an Environment Area as Biotope

From fiscal 1987 to fiscal 2003, J-POWER was commissioned by METI to conduct a demonstration test of pumped seawater storage generation at Kunigami-mura in Okinawa Prefecture. Because many rare animal species unique to the prefecture populate the area, we established a surplus soil disposal area of 45,000 m<sup>3</sup>, and worked to restore it to its natural state as a biotope 🌱 by building it up to resemble the topography of the surrounding area and planting it with approximately 30,000 trees of the same species found in the surrounding area. Since then we have been monitoring the area and have confirmed that the natural ecology is steadily returning to the site.



The created biotope

### Shokawa Cherries, Symbols of Harmony with the Environment

The two great cherry trees growing on the Nakano observation platform on the shores of Lake Miboro in Gifu Prefecture are Azuma-higan cherries said to be more than 450 years old. Beloved by the villagers for years, they were originally located on the grounds of the temples Shorenji and Korinji in the Nakano district of Shokawa-mura (currently Takayama-shi), now at the bottom of the lake.

Late in the autumn of 1959, the first president of our company visited the site during construction of the dam and was so saddened by the prospect of seeing these great trees submerged that he hired a leading authority on cherry trees, the late Shintaro Sasabe (affectionately known as Professor Cherry), to supervise their transplanting.

Although many experts insisted that it couldn't be done, the massive undertaking—the first of its kind in the world—was successfully completed in December 1960. Even today, the Shokawa cherry trees, under the care of J-POWER employees, bloom spectacularly every spring.

These trees embody J-POWER's corporate mission of developing energy sources in harmony with the environment. Recently, as one of the activities commemorating J-POWER's 50th anniversary, the company decided to present cuttings from the Shokawa cherry trees to elementary and middle schools in prefectures with close connections to the company. During fiscal 2003 and 2004, it gave away 177 of these second-generation Shokawa cherries.

J-POWER is also cooperating in the compilation of integrated-study materials built around the theme of the Shokawa cherry trees and designed to help elementary- and middle-school students learn simultaneously about the environment, energy, history and society, daily life, and human psychology.



**Top left:** Transplanting the cherry trees  
**Top right:** Donation of second-generation Shokawa cherries  
**Middle:** Integrated-study materials for elementary and middle school  
**Below:** The Shokawa cherry trees today (Gifu Prefecture)



### J-POWER Awarded 2004 Society of Engineers Environmental Award for Re-creation of Wetland in Power Station Expansion Project

J-POWER, JPec, and Taisei Corporation were joint recipients of the Japan Society of Civil Engineers environmental award for the wetland restoration carried out in conjunction with the Okutadami-Otori Hydro Project (Fukushima and Niigata prefectures; operation begun June 2003). The award is given for groundbreaking projects that contribute to conservation and creation of natural environments.

As part of the Okutadami-Otori Hydro Project, plans called for the rock generated from drilling during construction of an underground generator and aqueduct tunnel to be used to fill in a basin on the left bank downstream of the Okutadami Dam. However, because the ecosystem of the basin area provides habitat for rare wildlife species that inhabit wetland areas within a mountain environment, the project faced the challenge of filling in the basin while preserving the wetland ecology. The solution arrived at was to create another wetland to substitute for the area to be filled in. The aim was to re-create an environment equivalent to that lost and, by allowing both to exist side by side for an extended period, to conserve the wetland ecology.



Site of wetland re-creation, Okutadami-Otori Hydro Project

## Pursuing Technological Research and Development

In the course of the research and development activities fostered by J-POWER, ranging from such energy-focused efforts as the development of high-efficiency coal-use technology to research in the area of biotechnology, J-POWER researchers have uncovered yet other technologies that promise to open up new possibilities for the future, and we are actively promoting R&D in these new areas.

### Technologies under Development Reservoirs

#### ◆Technology for Flushing Reservoirs

Earth and sand flowing into a dam reservoir from upstream build up sediment that reduces the reservoir's capacity. At the same time, the lack of earth and sand reaching the river below the dam results in a deepening of the river bed. What is needed to solve these problems is an efficient, effective, and environmentally-friendly way to release the sediment to downstream rivers. J-POWER is currently working to develop a flushing technology through hydraulic experiments, numerical analysis, and field studies.

Collaborating institutions: Delft Hydraulics (Netherlands),  
HR Wallingford (UK)



Hydraulic model flushing experiment

#### ◆Production of Hydrogen from Organic Waste

With hydrogen at the center of attention as a clean energy source for the future, J-POWER is currently conducting R&D to develop a process for producing hydrogen from organic waste by extracting microorganisms that efficiently generate hydrogen from such waste material.

#### ◆Technology for Cleansing Aquatic Environments

J-POWER is working hard to develop technology for conserving the environment around hydroelectric power stations. It is currently at work on a technology and proposals for cleansing aquatic environments using a new concept combining the community environment website<sup>1</sup> and a bottom-mud cleansing technology using natural materials.<sup>2</sup>

1. Use of IT to create a website that permits local residents to exchange and share information on the environment.
2. A technology for purifying bottom mud by putting such porous materials like driftwood charcoal and volcanic pumice in the mud at the bottom of a lake or pond to promote the beneficial action of aerobic bacteria.



Demonstration test of technology to cleanse bottom mud.

#### Yasuhiko Nishimura

Biotechnology Laboratory Wakamatsu Research Institute



In my biotechnology research, I search for microorganisms that produce useful, high-value-added substances and work to develop commercial technologies from them.

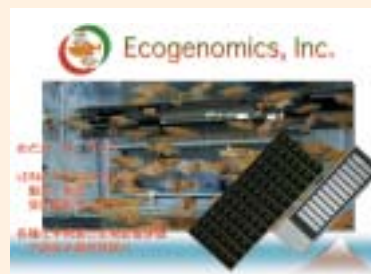
#### A Gene's-eye View of the Environment

##### Developing and Commercializing DNA Microarray Technology for Assessing the Effect of Chemicals on Organisms

In July 2003, J-POWER teamed with Transgenics Corp. (headquartered in Kumamoto Prefecture) to set up Ecogenomics Corp. (headquartered in Fukuoka Prefecture). Ecogenomics is working to develop and commercialize DNA microarray technology to assess the effect of endocrine disruptors and other chemicals on living organisms and the ecosystem by analyzing genetic changes in killifish and mice.

The first product of this research was a killifish microarray that US research facilities have already purchased and are currently using. We are now moving ahead with preparations to market it to Japanese universities and public research institutions as well. We are hoping that this gene's-eye view assessment technique will eventually be adopted as the standard method for screening substances under the Law Concerning the Examination and Regulation of the Manufacture etc. of Chemical Substances and be used as well in assessing the water quality of rivers and other bodies of water.

For more information, see the Ecogenomics website at <http://www.ecogenomics.co.jp/english/index.htm>



# Transferring Environmental Technology Overseas

J-POWER is applying the technology it has nurtured in its domestic programs and transferring that technology overseas as it expands its operations internationally. In our international consulting program we put our technological know-how to use for environmental impact assessments, transfer of desulfurization and denitrification technology, and so forth. In our IPP investment projects as well, we provide technological consulting to the biomass plants and other facilities in which we have invested and in other ways spread our accumulated environmental know-how.

## Electric Power Services Worldwide

J-POWER's overseas electric-power services, centered on international consulting, have received high marks since they were launched more than 40 years ago, at the beginning of the 1960s. We apply the technology and experience accumulated here in Japan, send government experts to agencies in the host country, and invite engineers from developing countries to train with us.

As of the end of fiscal 2004, we had been involved in a total of 248 international consulting projects in 60 countries.

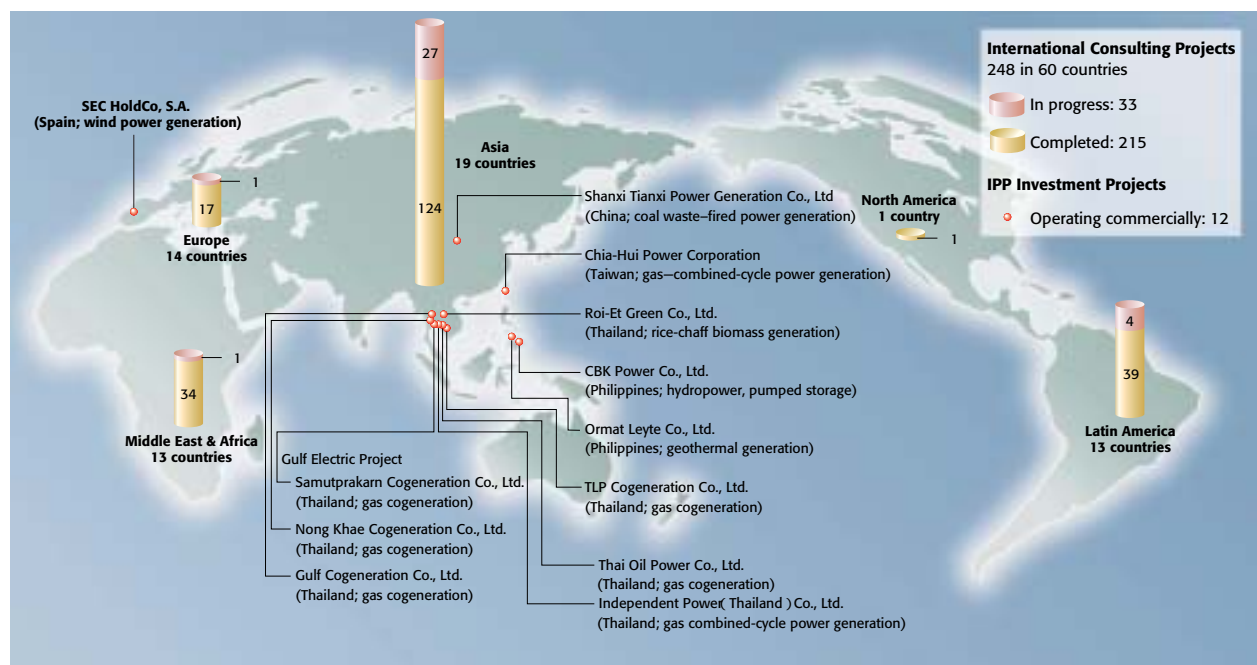
## ◆ International Consulting

Examples of J-POWER's environmental technology consulting in the area of coal-fired thermal power are the transfer of SOx and NOx emissions reduction technology to countries of the European Union, technological advice to East European countries plagued by acid rain on measures to reduce SOx emissions, and in China, a demonstration test of technology to desulfurize coal with high sulfur content (commissioned by METI).



Rehabilitation project, 4th Thermal Power Plant, Ulaanbaatar (Mongolia)

## J-POWER's International Consulting and IPP Investment Projects



(As of the end of March 2005)

## Major Recent Overseas Consulting Projects

Project type	Name	Country	Duration	Description
Thermal power	Rehabilitation Project of the 4th Thermal Power Plant in Ulaanbaatar	Mongolia	Nov. 2001 – Oct. 2006	Supervision of construction in high-efficiency rehabilitation of thermal power plant
Thermal power	Bakreshwar Coal-Fired Thermal Power 4 & 5 Units Extension Project	India	Aug. 2003 – Dec. 2007	Bidding support and supervision of construction of power plant
Thermal power	Tashkent Thermal Power Plant Modernization Project	Uzbekistan	Jan. 2005 – Dec. 2009	Support in bidding process and supervision of construction and O&M of high-efficiency gas cogeneration thermal power plant
Environmental management (thermal power)	Pilot Study for Project Formation for Installing Flue-Gas Measurement System at Ninh Binh Thermal Power Plant	Vietnam	Apr. 2005 – Oct. 2005	Study to determine feasibility of installing flue-gas measurement system in existing thermal power plant
Hydropower	Purulia Pumped-Storage Hydropower Project	India	Oct. 1995 – Feb. 2008	Detailed design, bidding support, and construction supervision
Hydropower	Yuncan Hydroelectric Power Project	Peru	May 1998 – Dec. 2005	Bidding support and construction supervision
Hydropower	Upper Kotmale Hydropower Project	Sri Lanka	Nov. 2003 – Nov. 2009	Bidding support and construction supervision
Hydropower	Dai Ninh Hydropower Project	Vietnam	May 2005 – Jul. 2007	Detailed design review, bidding support, and construction supervision
Micro-hydropower	Study for Detailed Design of Mondol Kiri Micro-hydropower Project	Cambodia	Oct. 2005 – Feb. 2006	Detailed design for independent micro-hydropower station
Power transmission	Transmission and Distribution Development Project in Paraguay's Metropolitan Area	Paraguay	Aug. 1996 – Jan. 2005	Detailed plan and supervision of construction of metropolitan power grid
Power transmission	Plan for Cebu-Negros-Panay Linked Transmission	Philippines	Jul. 2004 – Mar. 2006	Detailed plan and supervision of construction for project linking small islands with underwater cable
Water works	Plan for Improvement of Water Use in Zletovica	Macedonia	Mar. 2005 – Aug. 2010	Detailed plan and supervision of construction of multipurpose system to improve water supply
Solar power	Demonstration Research on Dispersed Power Generation System Technologies: Photovoltaic, Wind Power, and Advanced Storage Batteries	China	Oct. 2003 – Mar. 2006	Demonstration test of wind power, new storage battery, and minigrd

### ◆ International IPP Investment Program

In response to the worldwide trend toward privatization and deregulation of the electric power industry, J-POWER is taking part in a wide range of business undertakings overseas. In conjunction with these, it is applying the technologies for high-efficiency thermal power generation and environmental conservation developed domestically with the goal of reconciling economic growth with environmental conservation. As of the end of 2004, J-POWER was involved in 14 international IPP projects in five countries and territories.

We are working with local staff at the Bangkok office, which was established in September 2002, to ensure the smooth and stable operation of projects in which J-POWER has invested.



Roi-Et Rice-chaff-fired Thermal Power Generation Plant (Thailand)



Chia-Hui Gas Combined-Cycle Power Generation Plant (Taiwan)

### ◆ New Business Areas and Our Contribution to Sustainable Development

J-POWER's international consulting program, while focused on electric power projects using ODA, is also spreading out into new areas where we can apply our technological know-how, such as that involving water supply and irrigation. We are also aiming to expand our business operations to non-ODA areas, such as private development projects. With regard to our IPP investment program, we are striving to balance and diversify our overseas investment portfolio.

We believe that by continuing to promote overseas technology transfers through our consulting and investment programs, we can contribute to global sustainable development in the years ahead.



Calayan Pumped-water Power Generation Plant (Philippines)

#### Hiroya Naramoto

Business Development Office No. 2  
International Power Business Department



Of the new energy sources that contribute to the reduction of CO<sub>2</sub> emissions, biomass is one of the easiest for developing countries to put into commercial use. We are actively promoting this project using the knowledge and expertise that our company has accumulated through its past thermal and waste-power generation projects.