

Efforts Relating to Local Environmental Issues

The J-POWER Group recognizes that the foundation for harmonious coexistence with local communities and regions is in protection of the natural environment and ensuring the safety and preserving the living environment of local residents. We are, therefore, taking steps to address local and regional environmental problems, including measures to reduce the impact on the environment that accompanies business activities.

Environmental Measures at Coal-Fired Power Stations

Seeking to minimize impact on the local environment from the operation of our coal-fired power stations, the J-POWER Group employs the latest environmental technology and know-how to prevent air and water pollution, noise and vibration, and other harmful effects.

Measures to Control Noise and Vibration

We work to prevent noise and vibration pollution by keeping such noise- and vibration-emitting equipment as boilers, turbines, and exhaust fans inside buildings. For outdoor equipment, we install soundproof covers and sound barriers as needed. Noise and vibration levels are periodically measured at the boundaries of our sites to ensure that they meet regulatory standards.

Measures to Control Coal Dust

At our coal-fired power stations we implement various measures to prevent dispersal of dust during handling of coal and coal ash, including the use of closed conveyor belts and silos, as well as windshielding and spraying as dictated by topographical and weather conditions. At our coal-ash landfill disposal sites, soil is spread over the surface, and leachate is treated with appropriate treatment systems.

Measures to Control Thermal Water Discharge

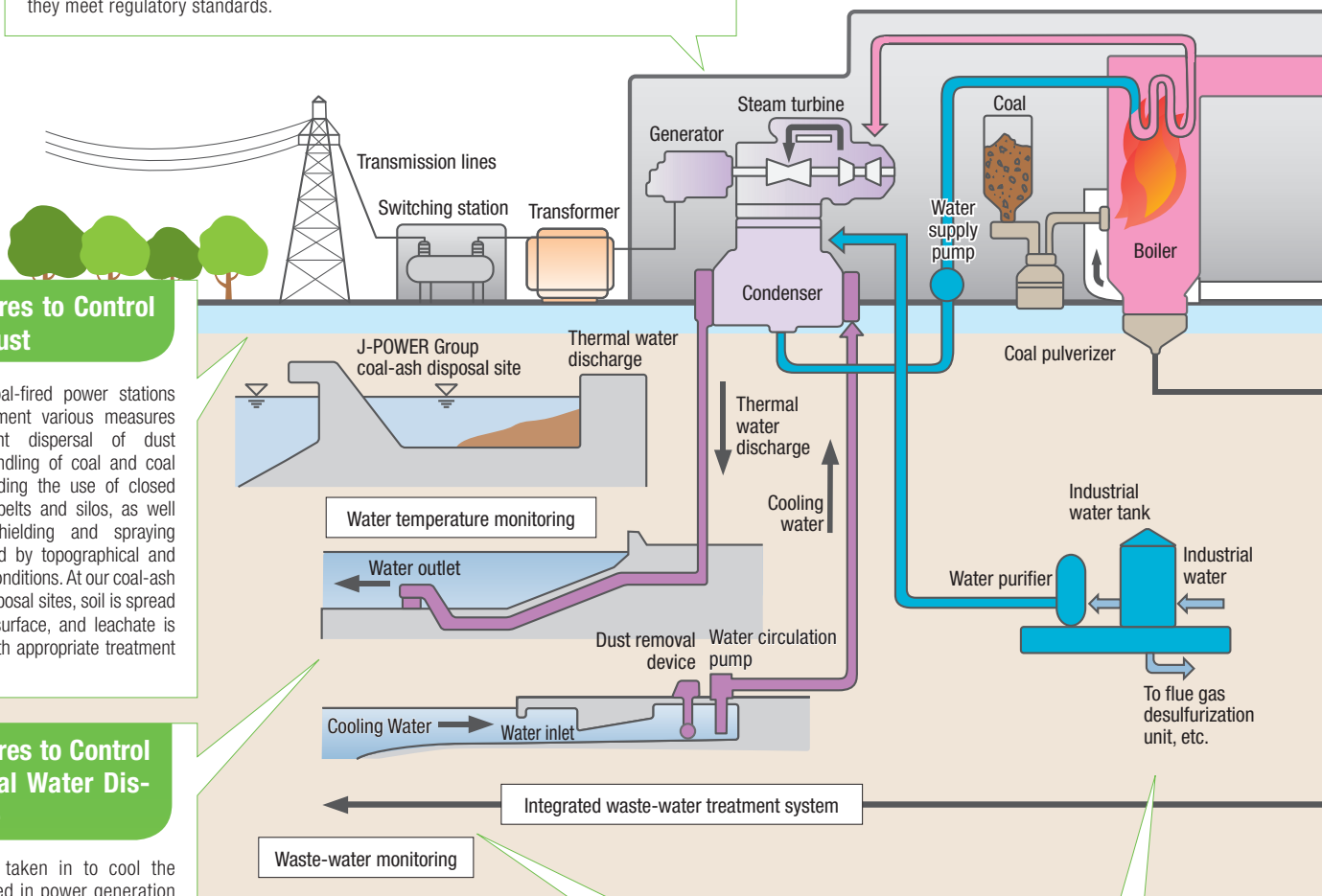
Seawater taken in to cool the steam used in power generation is released as thermal water discharge*1. We control intake and discharge properly to reduce their impact on marine life in the vicinity, and monitor the temperature of thermal water discharge on a 24-hour basis to ensure that it remains at or below the reference values established by environmental agreements.

Measures to Prevent Water Pollution

Waste water from such facilities as desulfurization units and offices is appropriately treated in integrated waste-water treatment systems, through coagulation, precipitation, filtration, and so forth. Treated water is routinely monitored by automatic measuring equipment and analyzed periodically to ensure that it meets the standards set under the Water Pollution Control Law and environmental conservation agreements.

Cutting Back on Industrial Water Use

Industrial water is used in such equipment as boilers, cooling systems, and wet-type desulfurization systems. Part of this water is released into the atmosphere as steam. We are working to reduce our consumption of industrial water through the recovery and reuse, as far as possible, of wastewater that is not released into the atmosphere.



Reference *1 Thermal water discharge

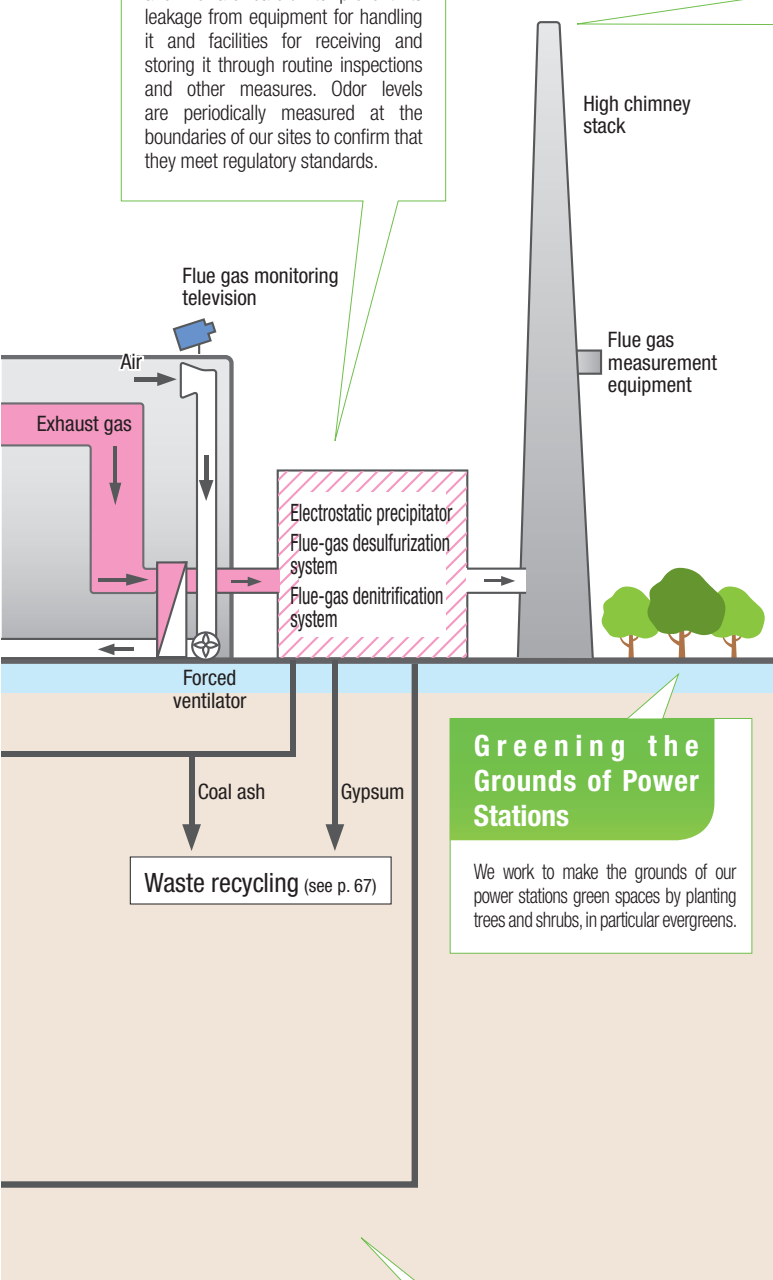
In thermal and nuclear power generation, the steam that powers the turbine is cooled and turned to water in a condenser so that it can be used again. In almost all Japanese power stations, seawater is used for cooling in the condensers. As the seawater passes through the condenser, its temperature rises. It is then returned to the ocean through the discharge outlet, at which point it is referred to as thermal water discharge.

Measures to Control Odors

Ammonia is used in such equipment as our flue-gas denitrification systems, and we are careful to prevent its leakage from equipment for handling it and facilities for receiving and storing it through routine inspections and other measures. Odor levels are periodically measured at the boundaries of our sites to confirm that they meet regulatory standards.

Measures to Prevent Air Pollution

Combustion of coal and other fuels can generate sulfur oxides (SO_x), nitrogen oxides (NO_x), and soot and dust. To reduce these emissions we have improved our combustion methods and installed such flue-gas treatment equipment as desulfurization and denitrification systems and electrostatic precipitators. Although the performance of equipment varies with its date of installation, at each facility we have installed the newest technology available at the time to remove pollutants with maximum efficiency. This equipment operates automatically with the aid of measurement devices that continuously monitor the content of flue gas. In addition, human operators monitor the equipment 24 hours a day and are able to mount a swift response in the event of any malfunction, ensuring that our emissions do not exceed the benchmark figures specified by the Air Pollution Control Act and environmental protection agreements.



Greening the Grounds of Power Stations

We work to make the grounds of our power stations green spaces by planting trees and shrubs, in particular evergreens.

Measures to Prevent Soil Pollution

From FY 2004 through FY 2006, we conducted studies at all J-POWER Group domestic sites and determined that they were free of soil or groundwater contamination. We will continue working diligently to ensure that no soil pollution occurs.

Measures to Prevent Oil Leaks

We implement various measures to prevent the leakage and dispersion of fuel oil, lubricating oil, and other such substances within power station grounds, to include keeping adsorbent materials constantly ready in our power stations.

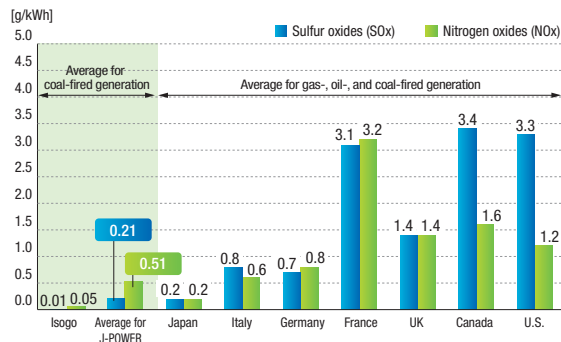
Flue-gas Emissions, FY 2012

Substance	Equipment efficiency (removal efficiency)	Emissions	Emissions intensity
SO _x	68-99%	12,300 tons	0.21g/kWh
NO _x	67-93%	30,300 tons	0.51g/kWh
Soot and dust	99% (as designed)	800 tons	0.01g/kWh

Notes:

1. Emissions intensity: Emissions per unit of electricity generated at thermal power stations.
2. Emissions of soot and dust are calculated on the basis of measurements taken monthly.

International Comparison of SO_x and NO_x Emissions Intensity for Thermal Generation



*Source: Overseas (Results for 2005) = Emissions volume: OECD Environmental Data Compendium 2006/2007
Volume of power generated: IEA Energy Balances of OECD Countries 2008 EDITION

Japan (Results for 2010) = Materials published by The Federation of Electric Power Companies of Japan
Figures for Isogo and J-POWER are formulated from results for 2012

Establishing a Sound Material-Cycle Society

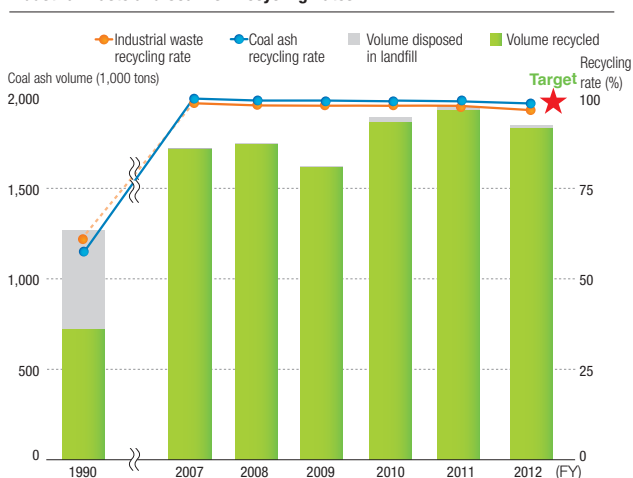
In order to help move toward achievement of a material-cycle society, the J-POWER Group will aim for zero emissions of industrial waste by curbing the generation of waste in conjunction with business activities, by utilizing resources effectively, by treating waste properly, and so on.

Reduce, Reuse, Recycle: 3R Measures

Reduction and Effective Utilization of Waste

Aiming to achieve zero emissions of industrial waste^{*1}, the J-POWER Group has set the industrial waste recycle rate of 97% as a Corporate Target. The total amount of industrial waste we generated in fiscal 2012 was 2.3 million tons, and we achieved a recycle rate of 98%.

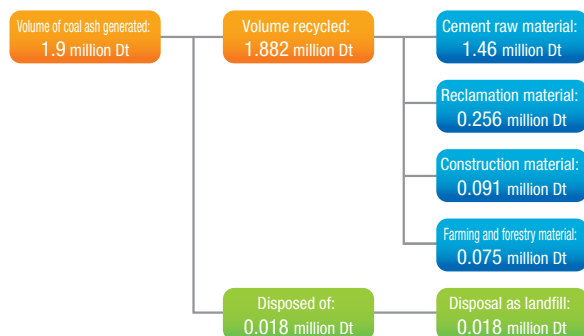
Industrial Waste and Coal Ash Recycling Rates



Making Effective Use of Coal Ash and Gypsum

The J-POWER Group's industrial waste consists of 98.0% coal ash and gypsum from coal-fired power stations. Coal ash, which is produced from the combustion of coal, is used primarily as a raw material for cement and as a land reclamation material, and 99.0% of it is put to effective use. Gypsum is produced in the process of flue gas desulfurization, and 99.9% is put to use, while 100% of the sulfuric acid is put to effective use.

Breakdown of the Coal Ash Recycle (displacement tons)



Reference

^{*1} Zero emissions of industrial waste

An initiative advocated by United Nations University to build a system of waste recycling through inter-industry partnerships and reduce the amount of waste (final disposal volume) to a level approaching zero.

^{*2} The 3Rs

The 3Rs are the first letters of the following three words that express the concept of reducing the amount of waste produced and building a recycling-oriented society: 1) Reduce: Curb the amount of waste produced 2) Reuse 3) Recycle: Treat as a recyclable resource

^{*3} Green purchasing

Placing priority on minimizing the environmental load in the purchase of goods and services by emphasizing the effect on the environment, as opposed to price, quality, convenience, or design.

COLUMN

Utilizing Coal Ash to Contribute to Agriculture

Kaihatahiryu Co., Ltd. is working on the effective utilization of coal ash, and it developed the world's first slow-release potassium silicate fertilizer using coal ash from coal-fired power stations. Since 1980, this has been sold to farmers throughout Japan as "Potassium Silicate Fertilizer" through the ZEN-NOH (JA-Group) cooperatives. We are committed to making a contribution to Japanese agriculture by continuing to provide superior fertilizer that is environmentally friendly.



Reduce, Reuse, Recycle: The 3R^{*2} in the Workplace

Every J-POWER Group business location is engaged in 3R (Reduce, Reuse, Recycle) activities. We are cutting back on chemicals, lubricating oil, photocopy paper, and other office materials and products in order to Reduce the production of waste, and we are separating and recovering paper, bottles, cans, plastics, and so on, in order to Reuse and Recycle waste materials.

Promotion of Green Purchasing

The J-POWER Group has enacted Green Purchasing^{*3} Guidelines and we are promoting the active procurement of environmentally friendly products. The Guidelines cover the entire range of products and services purchased by the J-POWER Group, and we are also encouraging our suppliers and subcontractors to follow environmentally friendly practices by such measures as stipulating specifications for active environmentally friendly implementation that must be built into construction and other contracts. We are also pressing for the use of low-pollution vehicles that emit less nitrogen oxides, particulate matter, and other such atmospheric pollutants for both company-owned and leased vehicles.



The J-POWER Group Green Purchasing Guidelines (Japanese only)

http://www.jpowers.co.jp/company_info/environment/kankyo04gl.html

Maintenance and Management of Landfill Sites

Following the amendment of laws relating to waste disposal and public cleaning, it has been obligatory since April 1, 2011 to publish maintenance and management information regarding waste disposal sites.

On the J-POWER website, we have published landfill maintenance and management plans, water quality information regarding groundwater and discharge water, information on inspections and related measures, information on industrial waste placed in landfill, and the remaining amount of landfill at disposal sites.

Management of Chemical Substances

The J-POWER Group is committed to thoroughgoing compliance with laws and regulations regarding chemicals and other such substances, and we conscientiously store and manage such substances.

Management of Chemical Substances

Appropriate Administration of the Pollutant Release and Transfer Register (PRTR) Law

The J-POWER Group practices appropriate management of chemical substances used in painting and coating, treatment of intake water at thermal power stations, and other such purposes. This includes our monitoring of the quantities purchased and used, and notifying the national government.

PRTR Substance Release and Transfer Volumes (FY 2012)

Substance	Use	Volume handled	Volume released	Volume transferred as waste
33: Asbestos	Insulation for equipment	4.75t/y	—	4,750kg/y
53 : Ethyl benzene	Coating for machinery	1.41t/y	1,412kg/y	—
71 : Ferric chloride	Wastewater treatment agents	16.28t/y	—	16,280kg/y
80 : Xylene	Coating for machinery	3.28t/y	2,940 kg/y	—
240 : Styrene	Coating for machinery	1.03t/y	1,032 kg/y	—
300: Toluene	Fuel for power generation (coal)	17.64t/y	17,583 kg/y	—
333 : Hydrazine	Boiler water treatment agents	2.16t/y	0kg/y	—
405 : Boron compounds	Manure additives	19.11t/y	1kg/y	—

Note:

Figures represent total release and transfer volumes for all business sites handling 1 ton or more per year of a Class 1 designated chemical substance or 0.5 ton or more per year of a Specific Class 1 designated chemical substance.

Measures to Reduce Dioxins

The J-POWER Group has incinerators at two hydroelectric power station locations to use for the carbonization of driftwood and other such purposes. We have suspended their use at present, and we are working to provide appropriate maintenance and management of the facilities in accordance with the Act on Special Measures Against Dioxins.

Management and Treatment of PCB Waste

The J-POWER Group has acted in accordance with the national government's regional treatment plan and processed 591 transformers, condensers, and other such devices (as of the end of March 2013) that contain high concentrations of PCBs in the insulating oil. We have devices such as transformers and condensers and small electrical devices such as ballasts that contain high concentrations of PCBs, as well as drums containing approximately 6 kL of insulating oil with high concentrations of PCBs, and we are storing and disposing of these appropriately.

Status of Disposal of Waste Products Containing High Concentrations of PCBs (As of the end of March 2013)

	Transformers and condensers
Units to be disposed of	887
Cumulative total of units disposed of to date	591

Trace PCB Contamination

The detection of extremely low levels of PCBs in transformers, condensers and other electrical equipment in which they should not be present – it is believed as a result of inadvertent mixing – has raised concerns. The J-POWER Group is analyzing the composition of insulating oils used in electrical equipment as necessary, applying stringent management procedures to any equipment using insulating oil in which traces of PCBs are found, and submitting all the paperwork required by the relevant laws and regulations. We are also appropriately storing and managing any waste products (cloths, tools, etc.) produced by our operations to which PCBs are adhering.

Measures to Reduce the Quantity of Toxic Chemical Substances Handled

In addition to our measures to reduce the quantity of toxic chemical substances we handle, the J-POWER Group is making every effort to manage them properly, for example by adhering to set procedures for their use.

Appropriate Responses to Asbestos Problems

The J-POWER Group has adopted an asbestos policy, under which we conduct health checks and surveys of asbestos use in our equipment and buildings, and undertaken appropriate countermeasures.

When it is confirmed that an item containing asbestos is in use, we systematically remove the asbestos or switch to an alternative item while managing the process appropriately to prevent dispersal. Items containing asbestos that have been removed are disposed of appropriately in accordance with the Waste Management and Public Cleansing Act.

Measures to Protect the Natural Environment

The J-POWER Group strives to harmonize energy concerns with the environment by protecting the environment at every stage of business. We promote environmental protection measures at each power station according to its environment, making efforts to show concern for biodiversity in light of the characteristics, rarity, and other aspects of the species concerned. With regard to protection of the aquatic environment, as appropriate for rivers and for oceans, this has been newly included in our Corporate Targets starting in fiscal 2013, and we are also making efforts for forest conservation and other such concerns.

▶ Consideration for Protecting the Natural Environment at Every Stage of Business

The J-POWER Group strives to protect the natural environment at each stage of business, ranging from the planning and design of power generation facilities to construction, operation, and maintenance.

When engaging in the new construction or expansion of power stations, in particular, we conduct environmental impact assessments and take action with appropriate consideration while incorporating the views of local residents and other parties concerned. We also implement full environmental protection measures in light of monitoring results.

▶ Consideration for Biodiversity

The J-POWER Group declared the protection of biodiversity to be one of the Corporate Targets in our Environmental Management Vision in fiscal 2011, and we are striving for the protection of biodiversity in our business activities.

Every business location sets goals for biodiversity as part of the environmental management system, and as appropriate for the environment, characteristics, etc. of the particular business location. They all engage in protection activities accordingly, and they also use e-learning and other such means to deepen their understanding of biodiversity.

We also take care not to affect the breeding of rare animal and plant species. Where there are endangered bird species, such as the Blakiston's fish owl (classified as Critically Endangered IA in the Japanese Environment Ministry's Red Data Book) that breeds

in the Tokachi district of Hokkaido, and the Japanese golden eagle (classified as Critically Endangered IB in the Japanese Environment Ministry's Red Data Book) that is found in the vicinity of Okutadami Dam and Otori Dam (Fukushima Prefecture and Niigata Prefecture, respectively), we take care not to affect their breeding, for example by making every effort to avoid outdoor work during their nesting seasons.

▶ Measures for Forest Conservation

The J-POWER Group has approximately 4,600 hectares of company-owned forests in the vicinity of hydroelectric power facilities throughout Japan. Most of that forest is located deep in the mountains. All of our company-owned forests are made up of forested land in very good, natural condition. Their highly natural condition is on a par with Japan's national parks and quasi-national parks. In view of our social responsibility to protect these precious forests that have been nurtured by their long history, the J-POWER Group has formulated Forest Protection Guidelines and is striving to carry on appropriate conservation activity.

Japan's forests also contain large amounts of forestry offcut material, such as branches and leaves, treetops, and other such material discarded after cutting for timber. The forestry offcut material can be used as biomass fuel for mixed combustion with coal at coal-fired power stations. In this way its dual roles, for its carbon neutral characteristic and as a precious, domestically produced sustainable energy source, can be maximized. The J-POWER Group is therefore promoting the conversion of forestry offcut material to fuel and the mixed combustion of that fuel at coal-fired power stations.

COLUMN

Restoration of Wetlands

In conjunction with the construction to expand Okutadami and Otori power generation facilities (implemented from 1999 to 2003), it became necessary to use the rock excavated during construction as landfill on the left bank downstream from Okutadami Dam. Since the scheduled landfill location was home to a mountain ecosystem that depends on a wetland environment, a replacement wetland was established. In this way, both landfill and wetland ecosystem protections were achieved.

Restoration of the wetland involved careful transplantation of plants and allowing the old and new wetlands to exist together for as long as possible to encourage living organisms to migrate naturally. The great care taken by the J-POWER Group in this initiative was recognized by the Japan Society of Civil Engineers Environment Award for 2004. Subsequent monitoring studies confirm that rare dragonfly species continue breeding there, and the harmonious coexistence of environmental and energy concerns continues to present its beautiful vistas.



An observation group in the Hassaki wetland, downstream from Okutadami Dam (Niigata Prefecture)

COLUMN

Forest Development Initiative in Umaji Village, Kochi Prefecture

The West Regional Headquarters of J-POWER's Hydropower Department and Umaji Village in Kochi Prefecture concluded a Yanase Watershed Forest partnership agreement in fiscal 2006 for a "cooperative forest development project with an environmentally advanced corporation." Together we have been continuing activities to protect and nurture forest in the vicinity of Yanase Dam.

The Yanase district of Umaji Village is the home of the Yanase Sugi, a famous variety of Japanese cedar that has also been designated the official tree of Kochi Prefecture. The project involves planting saplings and tree thinning by employees of the J-POWER Group companies and cooperating enterprises together with council members and employees from Kochi Prefecture and Umaji Village as well as Kitagawa Village and Nahari Town, which are municipalities in the Nahari River drainage basin, and other members of local communities, who are participating in project activities.

This program engages us with members of area communities in forest development activities that nurture bountiful forests and clean water. It also offers excellent opportunities to promote exchange with local residents.



The Yanase watershed forest program in action (Kochi Prefecture)

▶ Consideration for Aquatic Environments

▶ J-POWER's Conceptual Approach to Harmony with Aquatic Environments

The J-POWER Group has long pursued measures that took protection of river and ocean environments into consideration as part of our business activities. In light of the importance of such measures, "Protecting the Water Environment" was newly added to the Corporate Targets in the J-POWER Group Environmental Management Vision in fiscal 2013. Furthermore, where our Environmental Action Guidelines already contained an item titled "Consideration for Aquatic Environments," the item was revised to specify the river environment and ocean environment separately, and the item includes more specific measures accordingly.

▶ Measures to Alleviate Long-Term Turbidity in Dam Reservoirs

Because dams have a reservoir function, they can cause the turbidity that occurs during typhoons and rainstorms to be retained in their reservoirs over the long term. The J-POWER Group takes various actions to monitor water quality, including measurement of the turbidity in river and dam reservoir waters. We are also engaged in various measures matched to local circumstances to prevent long-term turbidity. These include dam operation to discharge turbid water from the dam reservoir at an early stage, cooperation with forest improvement programs, using surface water intake equipment to prioritize the use of comparatively less turbid surface water for power generation, and using clear water bypass equipment to enable clear water from upstream of the dam to be directly discharged downstream without being stored in the reservoir and used for power generation.



Surface water intake equipment (Yanase Dam, Kochi Prefecture)

▶ Sedimentation Control Measures

Each year large quantities of earth flow into dam reservoirs from upstream and accumulate there. That earth builds up as sediment in the reservoir, reducing the dam's reservoir capacity, and during periods of heavy runoff (when heavy rains increase the river water volume), this can cause flood damage in areas around the dam reservoir. The J-POWER Group therefore takes measures to control sediment and prevent those kinds of impact, to include surveying the amount of sedimentation in dam reservoirs and removing sediment as necessary.



Dealing with sediment (Setoishi Dam, Kumamoto Prefecture)

▶ Control of Wastewater Discharge into the Ocean

Wastewater discharged from thermal power stations into the nearby ocean needs to be managed in accordance with the

Water Pollution Control Law and environmental protection agreements with local government bodies in order to prevent a negative impact on the ocean where it is discharged.

Wastewater may include water that has been used for cooling, so that it becomes thermal water discharge with a higher temperature. For this wastewater, the water temperature near the discharge outlets is monitored on a 24-hour basis to make certain that it stays below a certain reference temperature.

Wastewater from flue gas desulfurization equipment and other such facilities is put through appropriate treatment before discharging it into the ocean. Automatic measurements and regular analysis are carried out to make certain that values stay below reference levels.

Environmental Protection Measures in Overseas Projects

The J-POWER Group also puts the technologies and knowledge regarding environmental consideration that were developed through projects in Japan to effective use on power generation projects in other countries. We work to take environmental concerns into consideration from the project planning and fund-raising stage by implementing environmental impact assessments and other such procedures in accordance with laws and regulations in the project country. We also strive to execute those procedures regularly through the construction and operation stages.

J-POWER Group Overseas Power Generation Projects Implemented Construction in FY 2012

Country	Project	Installed capacity (Owned capacity)
Thailand	IPP projects: 2	Total 3,200 MW (2,880 MW)
	SPP projects: 7	Total 790 MW (684 MW)
China	Hezhou Coal-Fired Thermal Power Station Project	Total 2,090 MW (355 MW)

Implementation of Accurate Environmental Impact Assessments

The J-POWER Group is currently performing the following environmental impact assessments:

Environmental Impact Assessments

Name of Project Designated for Assessment	Name of Operator	Project Implementation Area
Construction plan for oxygen-blown integrated coal gasification combined-cycle generation station for proving trial (IGCC proving trial*)	Osaki CoolGen Corporation	Osaki Kamijima Town, Toyotagun, Hiroshima Prefecture
Takehara Thermal Power Station New Unit No. 1 Facility Upgrade Plan	J-POWER	Takehara City, Hiroshima Prefecture
Wasabizawa Geothermal Power Station (Provisional Name) Siting Plan	Yuzawa Geothermal Co. Ltd.	Yuzawa City, Akita Prefecture

* Environmental impact assessment procedures for the IGCC proving trial have been completed, and we started construction of the power station on March 1, 2013.