Environment

Social

Governance

Environment

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For details about the J-POWER Group's environmental initiatives, please refer to the "Materials of Environmental Initiatives" on J-POWER's website.
▶ https://www.jpower.co.jp/english/ir/ir51000.html

The J-POWER Group's Environmental Initiatives

Based on our Corporate Philosophy—"We will meet people's needs for energy without fail, and play our part for the sustainable development of Japan and the rest of the world"—the J-POWER Group engages in business conduct aimed at harmonizing energy supply and the environment. Specifically, under our Corporate Conduct Rules and the J-POWER Group Environmental Management Vision, we regard contribution to the reduction of CO_2 emissions on a global scale and the preservation of local environments as important issues.

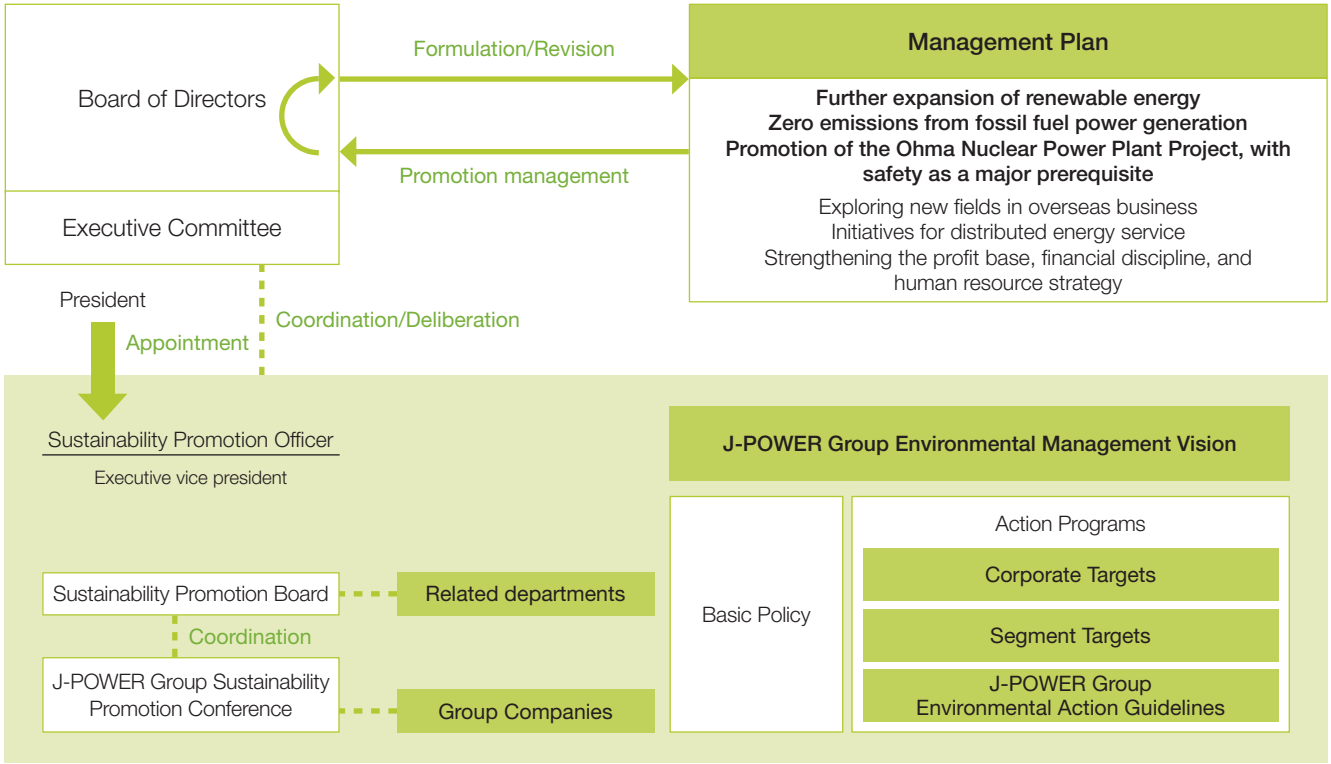
The J-POWER Group is implementing a medium-term management plan for the period leading up to 2025. Initiatives going forward under this plan include the expansion of renewable energy and achieving zero emissions from fossil fuel power generation as well as the promotion of the Ohma Nuclear Power Plant Project with safety as a major prerequisite.

In line with these policies, the J-POWER Group is promoting specific initiatives that address global environmental issues, including those concerning climate change, as well as initiatives directed at coexistence with the local environment.

Sustainability Promotion Structures

Appointed by the president, the Executive Vice President in charge of sustainability is responsible for environmental initiatives. We have established the Sustainability Promotion Board and the J-POWER Group Sustainability Promotion Conference to promote sustainability, including environmental initiatives.

Environmental Initiatives



J-POWER Group Environmental Management Vision

The J-POWER Group has established the J-POWER Group Environmental Management Vision, comprising the J-POWER Group Environmental Management Vision Basic Policy and Action Programs. The Action Programs are made up of Corporate Targets and Segment Targets as well as the J-POWER Group Environmental Action Guidelines formulated each year.

These are deliberated on at the Sustainability Promotion Board (and deliberated on by the Executive Committee* as required) and decided on by the President.

* Executive Committee: Please refer to page 55.

J-POWER Group Environmental Management Vision Basic Policy (Revised on May 14, 2020)

The J-POWER Group adheres to the following Basic Policy.

Basic Stance

As an energy supplier, we will contribute to the sustainable development of Japan and the rest of the world by harmonizing our operations with the environment and ensuring the constant supply of energy essential to human life and economic activity.

Addressing Global Environmental Issues

In addition to doing our utmost to ensure a stable energy supply, we will steadily advance initiatives toward the realization of zero emissions power supply both domestically and internationally and will contribute to the reduction of CO_2 emissions on a global scale.

To that end, aiming to expand CO_2-free power sources and achieve zero emissions from fossil fuel power generation by such means as the capture, utilization, and storage of CO_2 emitted from the combustion of fossil fuels, we will work from medium- and long-term perspectives, with technology as our central focus, to realize a stable energy supply and reduction in CO_2 emissions domestically and internationally.

Addressing Local Environmental Issues

We will seek to operate in harmony with local environments by adopting measures to reduce the environmental impact of our operations while working to save, recycle, and reuse resources in order to limit waste.

Ensuring Transparency and Reliability

We will ensure that our business activities comply with all applicable laws and regulations, disclose a wide range of environmental information, and enhance communication with stakeholders.

Corporate Targets and 2019 Achievements

The Action Programs for the J-POWER Group Environmental Management Vision set Corporate Targets, which are medium-term targets to be addressed by the Group as a whole.

The Corporate Targets and initiatives conducted in fiscal 2019 are as follows.

Item		Target	
Addressing Global Environmental Issues	Promoting technological development to reduce carbon emissions and achieve zero emissions from power generation	Steadily implement the following measures aimed at realizing a low-carbon society as well as contribute to the stable supply of energy and reduction of CO_2 emissions in Japan and around the world by achieving the targets of the Electric Power Council for a Low Carbon Society's Action Plan for Achieving a Low-Carbon Society.	
		1. Expansion of renewable energy	
		• Advance the new installation, upgrading, and equipment replacement of hydroelectric power plants in order to expand the use of hydroelectric power.	
		• Work to significantly expand wind power facilities, including offshore wind power generation.	
		• Work to develop new geothermal power projects in Japan.	
		2. Strive toward carbon reduction and zero emissions in coal use	
		• Advance the development of high-efficiency integrated coal gasification combined cycle (IGCC) technology with the aim of bringing it to practical use. Advance research and development of CO_2 capture, utilization and storage (CCUS) technology.	
		• Work to replace aging coal-fired thermal power plants with the world's leading high-efficiency coal-fired thermal power plants.	
		• Promote the mixed combustion of biomass fuels in coal-fired thermal power plants (effective exploitation of untapped resources).	
		• Contribute to the reduction of global CO_2 emissions and the adoption of advanced technologies by expanding the coal-fired thermal power generation business using J-POWER's advanced, high-efficiency power generation technologies, especially in Asia.	
		3. Promotion of the Ohma Nuclear Power Plant Project, with safety as a major prerequisite	
		• Advance construction of the Ohma Nuclear Power Plant, giving highest priority to safety and working to ensure the trust of the local community.	

Item		Target	Fiscal 2018 Performance	
Addressing Global Environmental Issues	Maintaining and improving thermal efficiency for thermal power (higher heating value (HHV) basis)	Maintain current level [about 40%]	40.6% (Reference: LHV* = 41.6%)	
	Reduction of sulfur hexafluoride (SF6) emissions; gas recovery rate during inspection and retirement of equipment	Inspection: at least 97% Retirement: at least 99%	Inspection: 99.1% Retirement: 99.3%	
Addressing Local Environmental Issues	Reducing sulfur oxide (SOx) emissions per unit of electric power generated by thermal power	Maintain current level [about 0.2 g/kWh]	0.21 g/kWh	
	Reducing nitrogen oxide (NOx) emissions per unit of electric power generated by thermal power	Maintain current level [about 0.5 g/kWh]	0.51 g/kWh	
	Increasing the recycling rate for industrial waste	Maintain current level [about 97%]	98.8%	
	Preservation of aquatic environments	Consider the protection of river and ocean environments in business activities	Practiced consideration for the protection of river and ocean environments	
	Preservation of biodiversity	Consider the protection of biodiversity in business activities	Practiced consideration for biodiversity	
Ensuring Transparency and Reliability	Improvement of environment management level	Continual improvement of EMS	Consistently implemented the PDCA cycle	

* LHV (lower heating value) is estimated from actual HHV (higher heating value) using conversion coefficients supplied in the Agency of Natural Resources and Energy's Comprehensive Energy Statistics (Fiscal 2004 edition)

	Main Fiscal 2019 Initiatives
	With regard to the expansion of hydroelectric power utilization, we began construction on the Shinkatsurazawa Hydroelectric Power Plant Project and the Ashoro Hydroelectric Power Plant Repowering Project in April 2019.
	In onshore wind power, in January 2020 we started operations at the Setana-Osato Wind Farm and Nikaho No. 2 Wind Farm. In addition, we advanced construction of the Kuzumaki No. 2 Wind Farm and Kaminokuni No. 2 Wind Farm as well as construction preparations for the Tomamae and Shimamaki replacement projects and the Minami Ehime No. 2 project. In offshore wind power, we are advancing business studies related to the Hibikinada Offshore Wind Farm. We also started development surveys for the Hiyama, Awara, and Saikai projects. In the overseas wind power business, in August 2018, we acquired a stake in the Triton Knoll Offshore Wind Power Project in the U.K., and construction of this project advanced.
	Looking at the development of new geothermal power projects in Japan, we started operations of the Wasabizawa Geothermal Power Plant in May 2019. We also started construction of the Appi Geothermal Power Plant in August 2019. In addition, at the Takahinatayama site in Osaki City, Miyagi Prefecture, in July 2019 we began small caliber well drilling surveys aimed at future geothermal power plant development. Furthermore, having shut down the Onikobe Geothermal Power Plant's existing facilities in April 2017, we began the construction of facility replacement in April 2019.
	At the Osaki CoolGen Project, we completed demonstration tests of oxygen-blown IGCC (Phase 1) in February 2019 and began demonstration tests of oxygen-blown IGCC with CO_2 separation and capture (Phase 2) in December 2019. We also started construction preparations for demonstration tests of IGFC with CO_2 separation and capture (Phase 3).
	Construction of the Takehara Thermal Power Plant Replacement Project progressed toward its June 2020 start of operations.
	At the Matsuura Thermal Power Plant, Takehara Thermal Power Plant, and Takasago Thermal Power Plant, we implemented mixed combustion using domestically-sourced biomass fuels (such as wood pellets and dried sewage sludge). To make effective use of unused wood and other materials from wooded areas in Japan, we advanced preparations toward 2021 for commercialization of wood pellets manufacturing and sales through SJ Wood Pellet Co., Ltd., which was jointly established with another company.
	In Indonesia, we advanced the construction of the Central Java Project toward a planned start of operations in fiscal 2020.
	For the Ohma Nuclear Power Plant Project, we carried out studies for safety enhancement measures and responded to the review of compliance with the new safety standards. We also implemented initiatives to gain the understanding and trust of local residents.

	Fiscal 2019 Performance	Fiscal 2019 Performance Evaluation
	40.8% (Reference: LHV* = 41.9%)	The J-POWER Group met its target for total thermal efficiency for thermal power thanks to efforts at existing thermal power plants to maintain high-efficiency operations and to adopt high-efficiency technologies when renovating facilities.
	Inspection: 99.9% Retirement: 99.3%	The target was met, with a recovery rate of 99.9% during inspections and 99.3% at retirement, thanks to efforts to curb emissions during equipment inspection through sound recovery and reuse.
	0.22 g/kWh	As a result of efforts including fuel management and the appropriate operation of flue gas desulfurization systems, we curbed our SOx emissions and achieved our target for emissions per unit of electric power generated.
	0.50 g/kWh	As a result of efforts including fuel management, combustion management and the appropriate operation of flue gas denitrification systems, we curbed our NOx emissions and achieved our target for emissions per unit of electric power generated.
	99.3%	We achieved our targets through efforts to promote the recycling of coal ash and to reduce industrial waste generated by the maintenance and operation of power plants.
	Practiced consideration for the protection of river and ocean environments	At operating power generation facilities that are involved with rivers, we implemented measures for the protection of the river environment appropriate to the conditions at each location. These included the implementation of sedimentation disposal measures and measures to mitigate the long-term persistence of turbidity. At operating power generation facilities that adjoin the ocean, we implemented precise control over effluent in compliance with environmental protection agreements and other such arrangements.
	Practiced consideration for biodiversity	We showed consideration for the protection of ecosystems and the diversity of species in conducting our business activities and worked to protect rare animal and plant species and their habitats.
	Consistently implemented the PDCA cycle	We implemented the PDCA cycle consistently and worked to raise the level of environmental management.

Addressing Global Environmental Issues

The J-POWER Group's main businesses are its domestic and overseas electric power generation businesses. Accordingly, addressing global environmental problems, especially climate change, is an extremely large factor in our management strategy.

Over the long-term, the J-POWER Group aims to provide a zero emission power supply and contribute to both global economic development and efforts to address climate change. We are implementing a variety of initiatives to this end.

For information on specific initiatives, please refer to the following pages about management strategy.

- ▶ Further expansion of renewable energy pp. 22–25
- ▶ Zero emissions from fossil fuel power generation pp. 26–29
- ▶ Promotion of the ohma nuclear power plant project, with safety as a major prerequisite pp. 30–31

Addressing Local Environmental Issues

The J-POWER Group seeks to reduce emissions of environmentally harmful substances, such as sulfur oxides (SOx), nitrogen oxides (NOx), soot and dust; to conserve resources; and to reduce waste.

Furthermore, aiming to promote environmental conservation, we take the natural environment into account at every stage of our businesses and give consideration to aquatic environments and biodiversity.

Reducing Emissions of Environmentally Harmful Substances

The J-POWER Group undertakes environmental preservation initiatives using the latest technologies and knowledge to reduce the environmental burden caused by its domestic and overseas electric power businesses.

Measures to Prevent Air Pollution at Coal-Fired Thermal Power Plants

To eliminate emissions of SOx, NOx, soot, and dust at thermal power plants and other such facilities, we take such measures as improving combustion methods and always making appropriate use of such flue gas treatment equipment as desulfurization and denitrification systems and electrostatic precipitators. In this way, we achieve highly efficient pollutant reduction. 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 abnormality, ensuring that our emissions do not exceed the benchmark figures specified by the Air Pollution Control Act and environmental protection agreements.

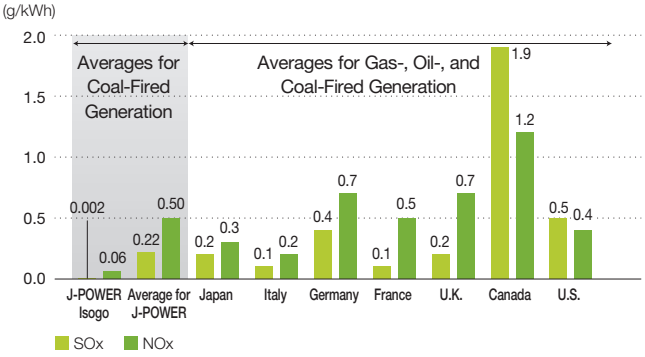
Our fiscal 2019 performance regarding SOx, NOx, and soot and dust emissions is shown in the below table. The figures obtained are quite low by international standards.

Fiscal 2019 SOx, NOx, and Soot and Dust Emissions

Substance	Emissions	Emissions Intensity[1]
SOx	11.9 thousand tons	0.22 g/kWh
NOx	27.5 thousand tons	0.50 g/kWh
Soot and dust[2]	0.6 thousand tons	0.01 g/kWh

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 monthly measurements.

International Comparison of SOx and NOx Emissions Intensity for Thermal Generation



Notes: 1. Emissions: OECD StatExtracts
Power generated: IEA "Energy Balances of OECD Countries 2019 Edition"
2. J-POWER and Isogo figures are fiscal 2019 results.

Promotion of the 3Rs (Reduce, Reuse, and Recycle) and Proper Disposal of Waste

Maintaining and Improving the Industrial Waste Recycling Rate

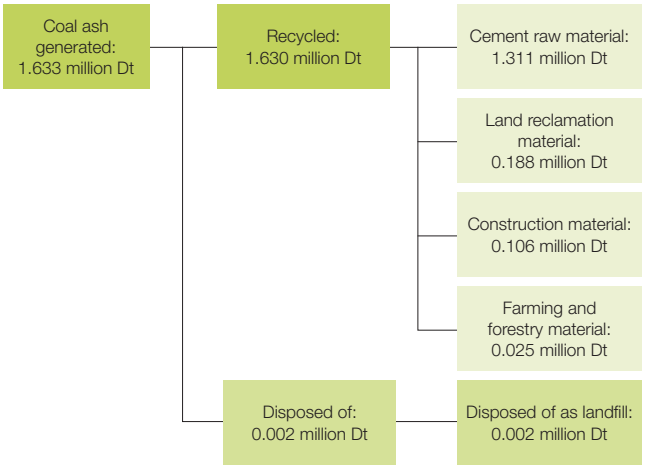
The J-POWER Group's target industrial waste recycling rate is 97%. The total amount of industrial waste we generated in fiscal 2019 was 2.00 million tons, and we achieved a recycling rate of 99.3%.

Making Effective Use of Coal Ash and Gypsum

The J-POWER Group's industrial waste consists of 97% coal ash and gypsum from thermal power stations.

We recycle 99.8% of coal ash produced in coal-fired thermal power generation, mainly as material for making cement and for land reclamation, as well as 100% of the gypsum and sulfuric acid produced as byproducts of emissions desulfurization.

Breakdown of Coal Ash Recycling (displacement tons)



Note: Sums of figures may not equal totals due to rounding.

Environmental Impact Assessment

Before building or expanding power plants, we conduct environmental impact assessments in accordance with applicable laws and regulations and implement adequate environmental preservation measures, taking the opinions of local residents into consideration. After a power plant becomes operational, we carry out ongoing monitoring in accordance with environmental protection agreements entered into with relevant local governments to ensure that our environmental preservation measures are effective. Currently, 21 projects are in the process of environmental impact assessment (as of July 31, 2020).

Preservation of Aquatic Environments

From fiscal 2013 onward, the preservation of aquatic environments has been designated as one of the Corporate Targets under the J-POWER Group Environmental Management Vision with the aim of reinforcing our environmental preservation initiatives regarding rivers and the seas.

We undertake environmental preservation measures based on the specific regional environment and characteristics of each business site. For example, at hydroelectric power stations, we take measures regarding water quality and the accumulation of silt in dam lakes and downstream areas, while at thermal power stations we manage effluent emitted into nearby oceans in accordance with applicable laws and regulations.

Preservation of Biodiversity

During the planning and design stages of power generation facilities, we incorporate environmental preservation measures to mitigate the impact on habitats, breeding environments and ecological systems based on the results of environmental impact assessments that look at the wildlife and ecological systems of the surrounding land and marine areas. We strive to preserve wildlife living in the vicinity of operating power plants, particularly rare species, and their habitats.

These measures are tailored to local environments and characteristics. For example, every effort is made to avoid outdoor work during the nesting season of the Japanese golden eagle and other endangered birds that live in the vicinity of the Okutadami Dam and Otori Dam. Another example is the restoration, maintenance, and management of marshes that became landfill areas when the Okutadami Dam was expanded.

The J-POWER Group owns forests in areas near its hydroelectric power facilities throughout Japan. We appropriately maintain these valuable forests in accordance with the Forest Protection Guidelines (formulated in 2007). Furthermore, the Group contributes to forest preservation as well as the reduction of CO_2 emissions through efforts to combust biomass fuel pellets made from forestry offcuts and other materials along with coal at coal-fired thermal power stations.

Ensuring Transparency and Reliability

The J-POWER Group conducts environmental preservation activities in accordance with its corporate philosophy. To this end, the Group utilizes environmental management systems (EMSs) at all its business sites in order to advance measures to enhance environmental management and to ensure thoroughgoing compliance with all applicable laws, regulations, and agreements.

Furthermore, we proactively engage in environmental communication activities.

Improvement of Environmental Management Level

On the basis of the J-POWER Group Environmental Action Guidelines, reviewed annually by management, each executive unit draws up its own Environmental Action Plan. Each executive unit periodically reviews and evaluates its initiatives and revises the measures to be taken, following the PDCA cycle. In this way, we work to constantly enhance environmental management.

In addition, the J-POWER Group plans and implements environmental education, using such means as group classes and e-learning, to foster a deeper awareness of environmental issues and sense of personal responsibility among employees.

Full Compliance with Laws, Regulations, Agreements, and Other Rules

In order to reduce the impact of business activities on the surrounding environment, we take appropriate steps to implement the laws, regulations, agreements, and other such rules applicable to our business activities and make them widely known. We are also engaged in ongoing efforts to improve our facilities and operations.

In order to dispose of waste properly, we take measures to maintain and improve the disposal capabilities of waste disposal operators, employing waste disposal consulting firms to directly confirm the status of waste disposal by local organizations.

In terms of responding to environmental incidents, based on our environmental management systems, we make every effort to prevent environmental incidents before they occur and to minimize harm if they do occur. We have in place a notification framework for when an environmental incident occurs, based on which we notify the local agencies concerned as well as the J-POWER Headquarters Emergency Response Team and related departments.

The J-POWER Headquarters Emergency Response Team promptly notifies top management and, in the interest of information disclosure, provides information on emergencies to the media and other relevant parties for publication. We also devise measures to prevent recurrences. In fiscal 2019, there were no environmental incidents that required reporting through the mass media.

Environmental Data

Business Activities and the Environment

The charts below detail the resource consumption and environmental load of the fiscal 2019 J-POWER Group operations within Japan.

Note: The scope of applicability includes J-POWER and its 25 consolidated domestic subsidiaries, which are engaged in the electric power business, electric power related business, and other business. The amounts attributed to consolidated subsidiaries are based on percentages corresponding to J-POWER's equity share.
Note that equity method affiliates (one company in Japan) are included in the calculation of CO_2 emissions from thermal power stations.

INPUT

Thermal Power Generation

- **Fuel**

Coal (wet)	19.50 million tons
Heavy oil	31 thousand kl
Light oil	31 thousand kl
Natural gas	96.1 million Nm^3
Biomass	28 thousand tons

- **Industrial-use water** ..... 10.01 million m^3
- **Major chemicals (undiluted equivalents)**

Limestone ($CaCO_3$)	158 thousand tons
Ammonia (NH_3)	13 thousand tons

Hydroelectric Power Generation

- **Power for pumped storage** ..... 1.2 TWh

Internal Use at Business Sites and Offices

- **Electricity (purchased)**

Business sites	105.80 GWh
Offices	14.29 GWh

- **Fuel (gasoline equivalent)**

Business sites	9,636 kl
Offices	1,274 kl

- **Clean water**

Business sites	87 thousand m^3
Offices	215 thousand m^3

- **Copy paper**

Purchased (A4 equivalent)	50 million sheets
(Green procurement	99%)

Notes: 1. Other than that discharged as wastewater, almost all industrial-use water used in thermal power stations is released into the atmosphere as steam.
2. River water used in hydroelectric power stations is not included in the input figures, as all such water is returned to the river after power generation.

Business Activities

Electric Power Generated 65.7 TWh

Thermal

Hydroelectric

Wind

Auxiliary power for operation and transmission loss

Electric Power Sales 61.3 TWh

Major Resources Recycled

Coal ash	1,630 thousand tons	[99.8%]
Sludge (excluding gypsum)	14 thousand tons	[72.7%]
Gypsum (desulfurization byproduct)	304 thousand tons	[100.0%]
Sulfuric acid (desulfurization byproduct)	24 thousand tons	[100.0%]
Other industrial waste	31 thousand tons	[85.3%]
Wastepaper	292 tons	[91.6%]
Driftwood caught in dam reservoirs	23 thousand m^3	[90.8%]

Note: Percentages indicate recycling rate.

Effective Utilization (at cement plants, etc.)

OUTPUT

Thermal Power Stations

- **Emissions into the atmosphere**

CO_2	43.84 million t-CO_2
SOx	12 thousand tons
NOx	28 thousand tons
Soot and dust	1 thousand ton

- **Emissions into bodies of water**

Wastewater	3.70 million m^3
Wastewater COD	12 tons

CO_2 Emissions from Business-Site and Office Activities

- **Business sites** ..... 74 thousand t-CO_2
- **Offices** ..... 10 thousand t-CO_2

Waste

Industrial waste	13 thousand tons
(Of which, coal ash	2 thousand tons)

- **Specially controlled industrial waste** ..... 0.4 thousand tons
- **Non-industrial waste**

Wastepaper	27 tons
Driftwood caught in dam reservoirs	0.8 thousand m^3