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# Environment

Fiscal 2008 Highlights

Startup of Isogo Thermal Power Station new No. 2 unit

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Under construction since October 2005, the new No. 2 unit at the Isogo Thermal Power Station began operating in July 2009.

# 1 Environmental Management in the J-POWER Group

The J-POWER Group believes that energy production and the environment can coexist in harmony. In light of this corporate philosophy, our environmental management aims to promote greater environmental responsibility while enhancing the economic value of our operations in order to further contribute to the development of a sustainable society.

## J-POWER Group Environmental Management Vision

In keeping with the Basic Policy of the J-POWER Group Environmental Management Vision, which was formulated in 2004, the J-POWER Group has adopted an Environmental Action Program laying out specific tasks and goals and the means to achieve them. The Group as a whole is working to achieve these environmental goals, guided by Corporate Targets<sup>\*1</sup> that outline midterm targets for our efforts and Environmental Action Guidelines that clarify the focus of our efforts for each fiscal year.

Note: Figures for CO<sub>2</sub> emissions per unit of electric power sold refer to all J-POWER Group power generation operations in Japan and overseas (see p. 55).

### Environmental Management Vision

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.	Item	Base-year performance, etc	FY 2007 performance
Part 2 Efforts Relating to Global Environmental Issues	In accordance with the principles of the United Nations Framework Convention on Climate Change, we will cost-effectively address issues relating to climate change on a global scale. We will continue to reduce CO <sub>2</sub> emissions per unit of electric power sold through an economically rational combination of measures including maintenance and improvement of the efficiency of energy use; development of low CO <sub>2</sub> emission power sources; development, transfer, and dissemination of new technologies; and utilization of the Kyoto Mechanisms. Furthermore, we will continue to work toward our ultimate goal of achieving zero emissions through the capture and storage of CO <sub>2</sub> .	· Reduce CO <sub>2</sub> emissions per unit of electric power sold (domestic and overseas operations)	FY 2002 0.72 (kg-CO <sub>2</sub> /kWh)	0.70 (kg-CO <sub>2</sub> /kWh)
		· Maintain/improve thermal efficiency of thermal power stations (HHV [higher heating value])	—	40.3 (Reference: LHV <sup>2</sup> = 41.4)
		· Reduce SF <sub>6</sub> emissions; increase recovery rate during inspection and retirement of equipment	—	Inspection: 99% Retirement: NA
		· Reduce electric power consumption at offices	FY 2006 22.82 (GWh) <sup>*3</sup>	22.23 (GWh)
		· Reduce fuel consumption by offices (gasoline equivalent)	FY 2006 1,644 (kl)	1,339 (kl)
Part 3 Efforts Relating to Local Environmental Issues	We will take measures to reduce the environmental impact of our operations by saving, recycling, and reusing resources to limit the generation of waste and foster good community relations.	· Reduce SO <sub>x</sub> emissions per unit of electric power generated (point of generation, thermal power stations)	—	0.20 (g/kWh)
		· Reduce NO <sub>x</sub> emissions per unit of electric power generated (point of generation, thermal power stations)	—	0.50 (g/kWh)
		· Increase recycling rate for industrial waste	—	98%
		· Increase paper recycling rate	FY 2006 87%	86%
		· Increase rate of green purchasing of office supplies (stationery, etc.)	—	69%
		· Increase percentage of recycled copy paper purchased	FY 2006 95%	95%
		· Increase percentage of low-emission vehicles	—	87%
Part 4 Ensuring Transparency and Reliability	We will ensure that our business activities comply with all laws and regulations, disclose a wide range of environmental information, and enhance communication with stakeholders.	· Raise level of environmental management	—	Adoption of EMSs at all consolidated subsidiaries completed by the end of FY 2007 as planned.

\*1 In addition to Group-wide corporate targets, business divisions and affiliates set their own targets tailored to their operations.



Koriyama-Nunobiki Kogen Wind Farm (Fukushima Prefecture)

Action Program

Corporate Targets

Fiscal Year Guidelines

	FY 2008 performance	Target	FY 2008 evaluation and next steps	Further Information
	0.68 (kg-CO <sub>2</sub> /kWh)	Approx. 10% reduction from FY 2002 level (in FY 2010)	CO <sub>2</sub> emissions fell about 2% from the previous fiscal year owing mainly to a decrease in the operating rate of thermal power stations, while power sales increased 1% over the previous year, reducing emissions intensity to 0.68 kg-CO <sub>2</sub> /kWh, roughly 5% below the FY 2002 level. We will continue to strive to meet our 2010 target.	p. 55
	40.1 (Reference: LHV = 41.1)	Maintain current level (about 40%) (FY 2008 and each FY thereafter)	The J-POWER Group maintained a total thermal efficiency of 40.1% (HHV) for thermal power generation in FY 2008 thanks to efforts to maintain highly efficient operation in existing thermal power stations and adopt high-efficiency technologies when upgrading facilities. We will continue working to maintain and improve efficiency of energy use in our thermal power stations.	p. 52
	Inspection: 99% Retirement: 99%	Inspection: at least 97% Retirement: at least 99% (FY 2008 and each FY thereafter)	The FY 2008 target was met, with a recovery rate of 99.1% during inspections and 99.6% at retirement, thanks to efforts to curb emissions during equipment inspection through careful and consistent recovery and reuse. We will continue to stress careful and consistent recovery and reuse to curb atmospheric emissions of SF <sub>6</sub> from gas insulation equipment.	p. 55
	21.86 (GWh) 2% annual decrease	At least 4% reduction from FY 2006 (in FY 2010) At least 1% annual reduction	Thanks to such energy-saving efforts as keeping lights off during lunch break, reducing power supply to equipment on standby, and turning down air conditioner settings, the FY 2008 target was achieved with an annual reduction of approximately 2%. We will continue our energy conservation efforts with the help of office energy-saving checklists and other tools.	p. 56
	1,251 (kl) 7% annual decrease	At least 4% reduction from FY 2006 (in FY 2010) At least 1% annual reduction	Energy-conservation initiatives resulted in a reduction of 7% from the previous fiscal year, meeting the FY 2008 target. We will continue working to reduce fuel consumption by making maximum use of public transportation, making more efficient use of company vehicles, using green driving techniques, etc.	p. 56
	0.20 (g/kWh)	Maintain current level (about 0.2 g/kWh) (FY 2008 and each FY thereafter)	Thanks to combustion control and correct operation of flue gas desulfurization systems, we were able to curb SO <sub>x</sub> emissions to maintain the level of emissions per unit of power generated. We will continue our efforts to curb emissions through good management practices.	p. 60
	0.50 (g/kWh)	Maintain current level (about 0.5 g/kWh) (FY 2008 and each FY thereafter)	Thanks to combustion control and proper operation of flue gas desulfurization systems, we were able to curb NO <sub>x</sub> emissions to maintain the current level of emissions per unit of power generated. We will continue our efforts to curb emissions through good management practices.	p. 60
	98%	97% (by the end of FY 2010)	The target for fiscal 2010 was exceeded thanks to steps to promote recycling of coal ash and reduce industrial waste generated by maintenance and operation of power stations. We will continue working to maintain our high recycling rate.	p. 61
	91% 5-point annual increase	At least 85% (by the end of FY 2010) At least 1-point annual increase	The FY 2008 target was achieved thanks to conscientious sorting and recycling of paper. We will continue to promote recycling to reduce disposal of non-industrial waste.	p. 62
	73%	At least 80% (by the end of FY 2010)	Thanks to efforts to promote green purchasing in accordance with the J-POWER Group Green Purchasing Guidelines, the rate rose by 4% from the previous fiscal year. We will intensify our efforts and continue working toward the FY 2010 target.	p. 62
	98% 3-point annual increase	At least 99% (by the end of FY 2010) At least 1-point annual increase	The FY 2008 target was met thanks to efforts to maximize use of recycled copy paper. We will continue to promote such efforts to further boost the percentage of recycled paper used.	p. 62
	91%	At least 90% (by the end of FY 2010)	Thanks to efforts to promote green purchasing in accordance with the J-POWER Group Green Purchasing Guidelines, the rate rose by 4% from the previous fiscal year, exceeding the FY 2010 target. We will continue such efforts so as to maintain this level and meet our target.	p. 62
	Consistent use of PDCA cycle	Continuous improvement of EMSs (FY 2008 and each FY thereafter)	Efforts were made to raise the level of environmental management through consistent implementation of the PDCA cycle. We will remain diligent in striving for continual improvement.	p. 65

Environmental Action Guidelines, p. 74 (Reference Data)

<sup>2</sup> LHV (lower heating value) estimated from actual HHV (higher heating value) using conversion coefficients supplied in the Agency of Natural Resources and Energy's Comprehensive Energy Statistics (2004 edition).

<sup>3</sup> Figures are adjusted to compensate for changes in the scope of available data.

# Business Activities and the Environment (Fiscal 2008)

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

Note: Figures represent the aggregate of all J-POWER Group companies (J-POWER and consolidated subsidiaries); in the case of joint investments, figures are prorated according to the ratio of capital contribution.

## INPUT

Thermal Power Generation		Major Chemicals Consumed (undiluted equivalents)		Internal Use at Business Sites and Offices	
<b>●Fuel</b>		<b>●Limestone (CaCO<sub>3</sub>)</b>	<b>221,000 tons</b>	<b>●Electricity (purchased)</b>	
Coal (wet)	19.58 million tons	Ammonia (NH <sub>3</sub> )	12,000 tons	Business sites	54.28 GWh
Heavy oil	38,000 kl			Offices	17.82 GWh
Light oil	29,000 kl			<b>●Fuel (gasoline equivalent)</b>	
Natural gas	99 million Nm <sup>3</sup>			Business sites	13,407 kl
Biomass (dried sewage sludge)	3,000 tons			Offices	1,251 kl
<b>●Industrial-use water</b>	<b>9.57 million m<sup>3</sup></b>			<b>●Drinking water</b>	
				Business sites	110,000 m <sup>3</sup>
				Offices	500,000 m <sup>3</sup>
				<b>●Copy paper (A4 equivalent)</b>	<b>56 million sheets</b>




Hydropower Generation	
<b>●Power for pumped storage</b>	<b>1,300 GWh</b>

Geothermal Power Generation	
<b>●Steam</b>	<b>780,000 tons</b>
<b>●Hot water</b>	<b>3.81 million tons</b>

Notes:  
 1. Apart from waste water, almost all industrial-use water used in thermal power stations is released into the atmosphere as steam.  
 2. River water used in hydroelectric stations is not included in the input figures, as all such water is returned to the river after power generation.  
 3. While steam is used in geothermal power stations, hot water is returned underground after power generation via an injection well.

## Business Activities

Electric Power Generated		
		
Thermal	Hydroelectric	Geothermal/Wind
53,600 GWh	9,500 GWh	400 GWh

Major Resources Recycled	
Coal ash	1.74 million tons (99.4%)
Sludge (excluding gypsum)	5,000 tons (40.3%)
Gypsum (desulfurization byproduct)	330,000 tons (100%)
Sulfuric acid (desulfurization byproduct)	14,000 tons (100%)
Other industrial waste	29,000 tons (67.0%)
Waste paper	437 tons (91.3%)
Driftwood from dam reservoirs	39,000 m <sup>3</sup> (95.5%)

Percentages indicate recycling rate.

Auxiliary power for operation and transmission loss	
	3,700 GWh

Note: Due to rounding, figures may not add up to totals.

Volume of electric power sold	
	58,800 GWh
Pumped storage hydroelectric power output	900 GWh
<b>Total</b>	<b>59,700 GWh</b>

Supply ↓

The electricity generated at our power stations is supplied through regional power companies to end users throughout Japan. The 58,800 GWh of wholesale electric power we sold last year is equivalent to approximately 7 percent of total electric power sold by regional power companies.\*

\* Total electric power sold in FY 2008 was 888,900 GWh, according to confirmed figures on electricity demand published by the Federation of Electric Power Companies of Japan.

## OUTPUT

Thermal Power Stations		Geothermal Power Station		Waste	
<b>●Emissions into the Atmosphere</b>		<b>●Hot water</b>	<b>4.07 million tons</b>	<b>●Industrial waste</b>	
CO <sub>2</sub>	43.47 million t-CO <sub>2</sub>			Coal ash	11,000 tons
SO <sub>x</sub>	11,000 tons	<b>CO<sub>2</sub> Emissions from Business-Site and Office Activities</b>		Other	22,000 tons
NO <sub>x</sub>	27,000 tons	<b>●Business sites</b>	<b>59,000 t-CO<sub>2</sub></b>	<b>●Specially controlled industrial waste</b>	
Soot and dust	1,000 tons	<b>●Offices</b>	<b>11,000 t-CO<sub>2</sub></b>	Specially controlled industrial waste	2,000 tons
<b>●Emissions into Bodies of Water</b>				<b>●Non-industrial waste</b>	
Waste water	3.47 million m <sup>3</sup>			Waste paper	42 tons
Waste water COD	15 tons			Driftwood from dam reservoirs	1,900 m <sup>3</sup>

# Environmental Accounting and Eco-efficiency

The J-POWER Group regards environmental accounting as an important tool for environmental management. Through ongoing disclosure of environmental accounting data, we aim to further enhance the reliability and adequacy of information on cost and effectiveness. Improving eco-efficiency (production per environmental load) is one of the goals outlined as part of our basic stance in the Basic Policy section of the J-POWER Group Environmental Management Vision.

Note: Additional data provided on p. 79, Reference Data.

## Environmental Accounting

To calculate the costs and benefits of the J-POWER Group's environmental conservation activities in fiscal 2008 in keeping with the nature of our business, we referred to the Environmental Accounting Guidelines 2005 issued by the Ministry of the Environment (see p. 79).

### ● Environmental Conservation Cost and Benefit

Total costs for fiscal 2008 were approximately 43.0 billion yen, with pollution control costs for preventing contamination of the air, water, etc., accounting for about 40 percent of the total.

When looking at environmental load, the nature of our business requires that, instead of tabulating total emissions, we assess the overall environmental conservation benefit of our conservation measures on

the basis of emissions intensity, thermal efficiency, and reuse/recycling rate, comparing these levels with the fiscal 2004 benchmarks.

### ● Economic Benefit

Efforts contributing to earnings and cost reductions were calculated to have had an economic benefit of approximately 8.1 billion yen.

### >>> Economic Benefits Unit: billion yen

Category	Details	Benefit
Revenue	Sales of marketable commodities from coal ash, gypsum, and sulfuric acid	0.4
Cost reduction	Reduction in fuel costs due to improved coal-fired thermal efficiency (introduction of USC)	3.5
	Reduction in disposal costs due to coal ash, gypsum, and sulfuric acid recycling	4.2
Total		8.1

### >>> Conservation Costs and Benefits

Category	Major measures and efforts	Cost (billion yen)	Environmental conservation benefit	FY 2004	FY 2008
Pollution control	Air pollution control (desulfurization/denitrification, soot and dust treatment), water pollution control (waste-water treatment), etc.	17.3	SOx emissions intensity (g/kWh)	0.20	0.20
			NOx emissions intensity (g/kWh)	0.50	0.50
			Soot and dust emissions intensity (g/kWh)	0.02	0.02
Global environmental conservation	Measures to reduce greenhouse gas emissions (maintaining high-efficiency operation of thermal power stations, developing renewable and untapped energy sources, maintaining energy-saving equipment, curbing of greenhouse gas emissions other than CO <sub>2</sub> )	1.7	CO <sub>2</sub> emissions intensity (kg-CO <sub>2</sub> /kWh)	0.69	0.68
			Average coal-fired thermal efficiency (%)	40.4	40.1
Resource recycling	Waste reduction through reuse and recycling, treatment and disposal of waste	12.3	Coal ash recycling rate (%)	91.0	99.4
			Industrial waste recycling rate (%)	92	98
			Gypsum recycling rate (%)	100	100
			Volume of driftwood recycled (1,000 m <sup>3</sup> )	—	39
Other	Research and development, social activities, etc.	11.7			
Total		43.0			

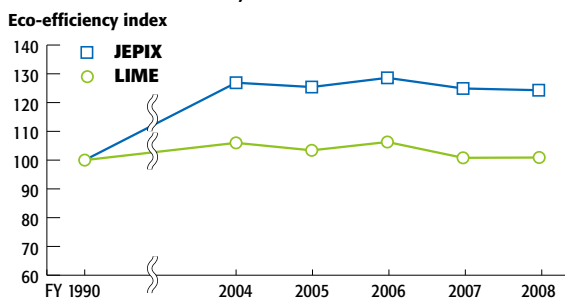
Note: For detailed data regarding each category, see pp. 75–76, Fiscal Year Data, in the Reference Data section.

## Eco-efficiency

In the J-POWER Group, we have used JEPIX<sup>1</sup> and LIME<sup>2</sup> to evaluate the efficiency of our efforts to this point. Although the two methods assign different coefficients to various aspects of the environment, both indicate an overall trend of improving eco-efficiency since fiscal 1990.

As our medium- to long-term tasks henceforth, we are working to reduce the environmental load by improving the efficiency of energy use, which is closely tied to increased eco-efficiency, and developing renewable energy sources.

### >>> Integrated Index of Eco-efficiency (electric power sold per environmental load)



Notes:  
 1. Eco-efficiency: 100 = FY 1990 integrated index (electric power sold per environmental load).  
 2. FY 2004 data is for J-POWER only, on a non-consolidated basis.

<sup>1</sup> JEPIX (Environmental Priorities Index for Japan)

An index that calculates a single score for overall environmental impact using the Ecopoints system, which assigns weights to more than 300 environmental pollutants according to their impact on water and air quality.

<sup>2</sup> LIME (Life-cycle Impact assessment Method based on Endpoint modeling)

An integrated environmental impact assessment method that assigns weights to potentially harmful substances by scientifically analyzing their contribution to such environmental problems as global warming and destruction of the ozone layer and calculating their damage to human health, ecosystems, etc.