Efforts to Combat Climate Change

With humanity obliged to continue relying on fossil fuels as its primary energy source through this century, the problem of global warming is the most serious issue to be tackled over the long term. The J-POWER Group regards measures to combat global warming as a top management priority and is pursuing such actions vigorously.

CO_2 Emissions

Japan's total annual CO_2 emissions were approximately 1.28 billion t-CO_2 in fiscal 2004 (actual emissions for that period), of which about 30% was generated by power stations. Emissions from J-POWER Group companies (in Japan) account for about 3% of Japan's total.

We take this situation seriously, and to respond to it, we have compiled our Action Program (see p. 22 and pp. 81–82), which systematizes our efforts heretofore, with the focus on maintaining and improving efficiency of energy use; developing lower-CO_2-emissions power sources; utilizing the Kyoto Mechanisms; and developing, transferring, and disseminating technologies. Through this program, J-POWER has committed itself to "work to achieve around a 10% reduction from the fiscal 2002 level of annual CO_2 emissions per unit of electricity sold by J-POWER Group electric power businesses in Japan and overseas by fiscal 2010."

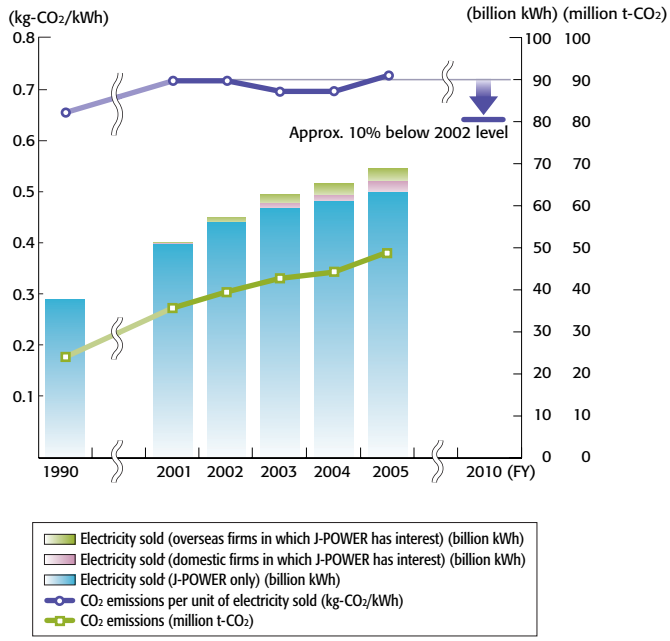
◆ CO_2 Emissions by J-POWER Group Companies (Domestic and Overseas)

In fiscal 2005, electricity sold by the J-POWER Group as a whole—including that of all domestic and overseas subsidiaries and unconsolidated affiliates in which J-POWER has a stake, prorated according to J-POWER's holding ratio—was approximately 68.7 billion kWh, an increase of about 6% over the previous year. Owing to the increased utilization rate for coal-fired power plants resulting from growing domestic electricity demand and other factors, CO_2 emissions rose to 49.13 million t-CO_2, an increase of about 10% from the previous year.

At the same time, CO_2 emissions per unit of electricity sold rose approximately 4% from the previous year, to 0.72 kg-CO_2/kWh, owing to a drop in the amount of hydropower electricity sold as a result of drought conditions and the rising utilization rate for thermal power plants. This represents an increase of about 1% from fiscal 2002, when emissions per unit of electricity sold were 0.71 kg-CO_2/kWh.

We will continue to strive to reach our targets under

J-POWER Group (Japan and Overseas) CO_2 Emissions



Scope of Companies Included in the Calculation of CO_2 Emissions and Electricity Sold

Inasmuch as our focus is on global environmental problems, we have made an effort to include all energy-producing businesses in which J-POWER has a stake, both domestically and overseas, when calculating CO_2 emissions per unit of electricity sold (CO_2 intensity), the measure on which our corporate targets are based.

To this end, we have calculated the electricity sold and the CO_2 emissions of each of the Japanese and overseas companies in which J-POWER has a stake, including nonconsolidated affiliates, and prorated their figures in accordance with J-POWER's holding ratio.

CO_2 Emissions from Domestic Wholesale Power Supply (J-POWER Only)

With regard to the domestic wholesale power supply (J-POWER only) that was covered before fiscal 2005, CO_2 emissions increased 9% over the previous year to 46.09 million t-CO_2, reflecting such factors as the rising utilization rate for coal-fired power plants owing to the increase in electricity demand (electricity sold rose about 3% from the previous year to approximately 62.6 billion kWh) in fiscal 2005.

Meanwhile, CO_2 emissions per unit of electricity sold rose about 5% from the previous year to 0.74 kg-CO_2/kWh owing to a drop in the amount of hydropower electricity sold as a result of drought conditions and the rising utilization rate for thermal power plants.

* In the data pertaining to "Business Activity and the Environment (FY 2005)" on pp. 23–24, under "Outputs," the figure for CO_2 emissions from thermal power stations (46.84 million t-CO_2) includes emissions from three domestic thermal power companies that are consolidated subsidiaries of J-POWER, with figures prorated in accordance with J-POWER's stockholding ratio in each company.

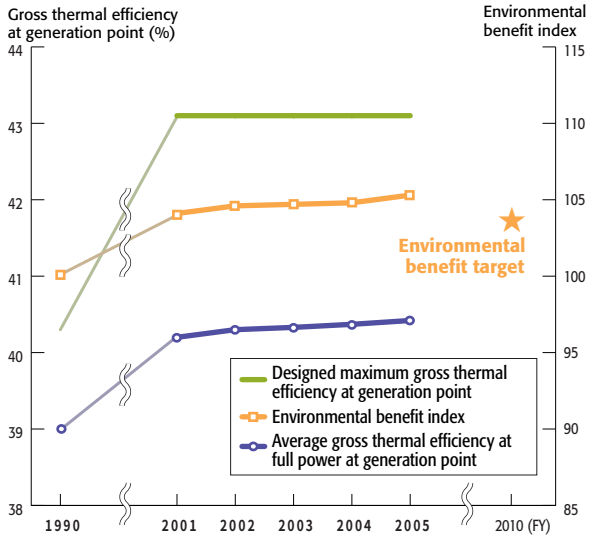
Maintaining and Improving Efficiency of Energy Use

The energy-use efficiency of J-POWER's coal-fired power-generating facilities is among the highest in the world, thanks to the company's efforts to develop and actively incorporate its own cutting-edge technology. In its hydropower and other facilities as well, J-POWER strives for stable operations and works to further improve equipment efficiency when upgrading them. In addition, the Group as a whole is continually working to devise energy-saving measures.

Maintaining Efficient Operation of Coal-Fired Power Stations

J-POWER is taking measures to reduce auxiliary power for operations in its coal-fired power stations, while working to maintain high-efficiency operation through the introduction of new technologies, such as ultra super critical (USC) technology. In fiscal 2005, our gross thermal efficiency (at point of generation) was 40.5% (as compared with 40.4% in FY 2004). Although thermal efficiency of coal-fired power generation equipment declines with age, J-POWER is working to maintain and improve efficiency of energy use by installing high-efficiency equipment in our new plants and minimizing the aging process in existing equipment.

J-POWER Coal-Fired Power Stations: Thermal Efficiency and Environmental Benefit



Note: Environmental benefit index: 100 = FY 1990 environmental benefit (electricity sold ÷ energy input)

Stable Operation of Geothermal Power Stations

In fiscal 2005, the electricity sold from the Onikobe Geothermal Power Station (Miyagi Prefecture; capacity 12,500 kW) was 94 million kWh, resulting in a CO_2 emissions reduction benefit* of approximately 40,000 t-CO_2.

Stable Operation and Measures to Improve Facilities of Hydroelectric Power Stations

In fiscal 2005, hydropower electricity sold by J-POWER totaled 8.583 billion kWh, resulting in an emissions reduction benefit* of approximately 3.6 million t-CO_2. We are working hard to ensure stable operation of our hydroelectric power stations by improvements in machinery efficiency, as well as proper maintenance and operation of facilities. For example, the aging main generating facilities at Tagokura Power Station are being replaced to prolong the life of the power station and improve the reliability of the facility. In the process the latest technology has been adopted to improve power generation efficiency and raise generating capacity by 5%.

Work continues on total replacement of main facilities at Tagokura Power Station (Fukushima Prefecture)

Kensuke Hamauzu,
Operating Group,
Tachibanawan Thermal Power Station

Power Employee

Hamauzu has worked at power stations ever since he joined the company 25 years ago, and he has been at Tachibanawan Thermal Power Station for the past 10 years. Since June 2006 when he became chief operator, he has supervised and managed the station's electric power operations, which are carried out in three shifts. His most important goal is to ensure a stable power supply, and that is also the most rewarding part of his job. Where machines are involved, trouble inevitably occurs. Hamauzu is in a key position in this re-gard, as he must decide on the spot whether to temporarily halt power generation to address equipment issues. Hamauzu's mission henceforth is to work proactively to generate electricity efficiently and safely while abiding by all environmental agreements with the localities where power plants are situated.

* For purposes of this report, CO_2 emissions-reduction benefit is calculated by comparing the emissions intensity for nuclear power, hydropower, geothermal power, or wind power with the average emissions intensity for electricity from all power sources in Japan (kg-CO_2 ÷ kWh).

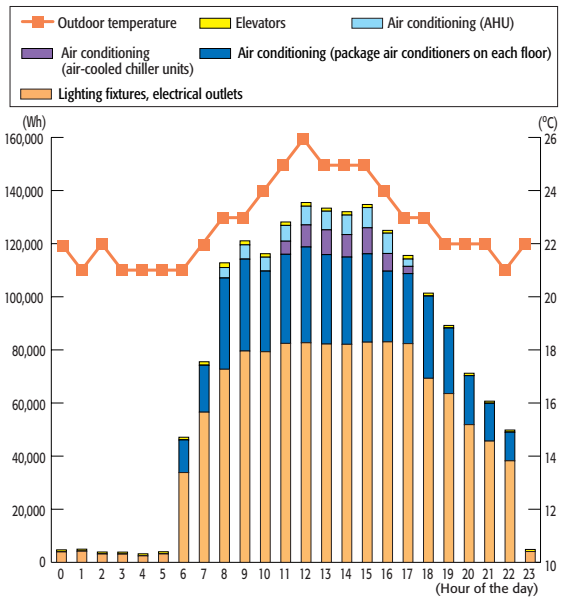
Promoting Energy Conservation

◆ Energy Conservation Activities

As part of our effort to prevent global warming, in each of our offices we rigorously implement such energy-saving policies as lights off during lunch break and reducing power supply to equipment on standby. In addition, we are actively installing energy-saving devices in every new office we build.

Beginning in fiscal 2005, in order to meet our office CO_2 emissions reduction goal under the Action Plan for the J-POWER Group Environmental Management Vision (annual reduction of 1%–2% at each company), we will have energy conservation audits carried out by J-POWER Group specialists at each of the major offices of each member company to further cut back on energy consumption through equipment upgrades as well as operating procedures. In fiscal 2005, audits were performed at five offices, and plans call for systematic implementation henceforth.

Results of Energy Conservation Audit at a Group Company's Head Office (September 16, 2005)



◆ Energy Conservation at J-POWER's Head Office

In accordance with our EMS, J-POWER has developed an energy conservation policy for its head office involving the use of exhaust heat from air conditioners and the recovery of exhaust heat from computer rooms, together with installation of regenerative heat pumps and strict enforcement of the "lights off when not in use" policy.

As a result of these energy-conservation efforts, only 1.80 million kWh of electricity were consumed for lighting purposes at the head office in fiscal 2005.

◆ Energy Conservation Services

Although our energy conservation activities center on supply-side measures, we are also keenly aware of the importance of demand-side efforts. For this reason, J-POWER group companies offer energy auditing and consulting services, as well as sales and installation of energy-saving equipment, both domestically and overseas.

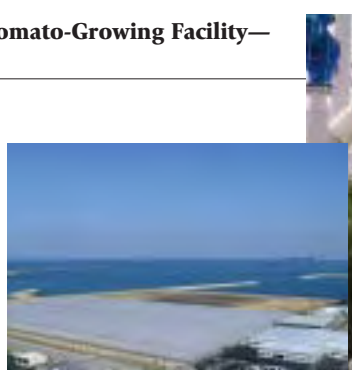
Domestically, J-POWER has offered energy audits and implemented certain types of energy-saving renovations for national and local government, national universities, elementary, middle, and high schools, hospitals, office buildings, home improvement centers, and so on. As of the end of fiscal 2005, we had performed about 75 energy audits. In addition, we provide performance evaluation and sales support for quality energy-saving products (including the EcoSylphi for ensuring even indoor temperatures, high-efficiency capacitors and light bulbs, etc.).

As one aspect of our energy-conservation business, a member of the J-POWER Group (JPHYTEC Co., Ltd.) carries out energy-conservation audits and installs a variety of energy-saving products, such as EcoSylphi and NeoLux.

Earth-Friendly Measures at Hibikinada Greenfarm Tomato-Growing Facility—An Application of Our Energy-Saving Technology

J-POWER and Kagome Inc. are working together to establish a tomato-growing operation on a section of reclaimed land belonging to J-POWER in the Hibikinada district of Wakamatsu Ward in Kitakyushu in Fukuoka Prefecture. On March 31, 2006, construction was completed on one of two planned greenhouses.

The temperature, humidity, and sprinkling system in the new greenhouse are all computer controlled. The shell is made of a special, highly light-permeable film to enhance the greenhouse effect. The greenhouse is also equipped with earth-friendly features, including a mechanism for recovering CO_2 generated in heating the facility and circulating it within the greenhouse, allowing tomato plants to use the CO_2 for their photosynthesis.



Hibikinada Greenfarm

Interior of the tomato greenhouse

Efforts Relating to Transport of Raw Materials

◆ Reducing Environmental Load by Enlarging Coal Carriers

In fiscal 2005, approximately 20 million tons of coal were imported to Japan from overseas (Australia, China, Indonesia, etc.).

While typical coal carriers have a carrying capacity of about 60,000 t, we have contracted with shipbuilders to build larger dedicated bulk carriers (90,00–150,000 t). Two new coal carriers were completed in fiscal 2005. The use of larger coal carriers cuts back on the amount of fuel oil consumed per unit of coal transported and reduces the environmental load of transport (emissions of CO_2, sulfur oxides, nitrogen oxides, etc.).

◆ Reducing Environmental Load through Marine Transport of Coal Ash

Coal ash is the residue generated when coal is burned in coal-fired thermal power stations.

In fiscal 2005, J-POWER shipped some 1.7 million tons of coal ash from its power stations to cement plants and other locations around the country, so that it could be put to use as a raw material for cement, concrete admixture, land reclamation material, and so on.

Approximately 90% of this coal ash is transported over water by dedicated carriers and other ships. The use of maritime transport reduces the environmental load of shipping, such as CO_2 emissions, as compared with truck or train transport.

Dedicated coal carrier *JP Magenta*

Dedicated coal-ash carrier *Seisho-maru*

Power Employee

Master of the Art of Reading Coal Markets and Scheduling Shipments

Hideyuki Ishizu
Fuel Group, Energy Business Department

The J-POWER Group is a wholesale electric utility that derives most its electricity from coal-fired power stations. As there is little fuel-grade coal to be found within Japan, we import much of the coal we use from Australia and Southeast Asia. Ishizu is involved in the crucial job of procuring that coal.

Shipping of coal depends on marine transport using dedicated bulk carriers as well as Panamax ships (the largest ships that will fit through the locks of the Panama Canal; 60,000–70,000 t deadweight capacity). We strive for maximum efficiency so as to transport the most coal possible with each shipment. In this way we are able to limit the number of ships used, which not only cuts expenses but also helps reduce CO_2 emissions from the heavy oil used to fuel the ships.

The price of coal and shipping costs are both determined by supply and demand, and prices may be surging just when J-POWER needs the coal. In addition, as we charter a ship each time one is needed during the demand season, they are not always available. For this reason, arranging the timing of shipments can be a very tricky job. Ishizu directs the scheduling and booking of shipments single-handedly, with consummate skill.

Aware that J-POWER is one of the world's biggest coal users, Ishizu takes pride in his work, and this pride is doubtless a large part of what makes his job worthwhile.

Somewhere on the great blue expanses, a coal-laden ship secured for J-POWER by Ishizu is ploughing its way toward Japan.

Developing Low-CO_2-Emission Power Sources

The J-POWER Group is moving forward with the construction of a nuclear power station as a low-CO_2-emissions power source. While promoting the use of such alternative energy sources as wind power and biomass power, we are also working to develop micro-hydropower, one of the few natural resources remaining in Japan. In addition, we are moving forward with the construction of gas-turbine combined-cycle power stations, characterized by highly efficient energy use.

Construction of a Nuclear Power Plant

We are currently working on the construction of a nuclear power plant (full MOX-ABWR; 138.3 million kW) in Ohma-machi, Aomori Prefecture, designed to use MOX fuel for the entire reactor core (scheduled to begin operation in March 2012).

In our construction plan we have paid close attention to rigorous safety measures, environmental conservation, and coexistence with local communities. Ohma Nuclear Power Station is expected to have an annual emissions-reduction benefit of approximately 3.2 million t-CO_2 (assuming a utilization rate of 80%).

Moving Forward with Wind Power

In fiscal 2005, with the launch of commercial wind power generation at Setana Seaside Wind Farm (Hokkaido), the installed capacity of J-POWER's domestic wind power facilities reached approximately 140,000 kW. Another wind power plant is currently under construction in Japan. Overseas, J-POWER has been operating windfarms in Spain, following the acquisition of an operating company from the Gamesa Group in March 2003.

The total planned annual output from our domestic wind power facilities is approximately 290 million kWh, representing an emissions-reduction benefit of approximately 120,000 t-CO_2.

Yohei Toriumi
Wind Power Development Group (Business Development Department)

Power Employee

"I do feel the weight of my personal responsibility, but it's a real thrill to be able to see through one aspect of the process leading to a plant's start-up, from beginning to end," says Yohei Toriumi, whose job involves choosing development sites for wind power facilities, steering such projects, and overseeing construction.

Because wind power projects have a direct impact on the local community, they involve a huge amount of negotiation and discussion with people outside the company. Even today Toriumi spends much of his time flying from one place to another as a spokesman for the company.

J-POWER Group Wind Power Facilities

Power station	Start-up date	Generating capacity (planned annual generation)
Tomamae Winvilla Wind Farm (Tomamae, Hokkaido)	Dec. 2000	30,600 kW (59 million kWh)
Nikaho Highland Wind Farm (Nikaho, Akita)	Dec. 2001	24,750 kW (51 million kWh)
Tokyo Bayside Wind Power Plant* (Tokyo)	March 2003	1,700 kW (2.5 million kWh)
Monte Sexio-Cando, Serra Do Cando, and Outeiro Do Coto Wind Farm (Galicia, Spain)	March 2003	64,210 kW (180 million kWh)
Green Power Kuzumaki Wind Farm (Kuzumaki, Iwate)	Dec. 2003	21,000 kW (54 million kWh)
Nagasaki-Shikamachi Wind Farm (Shikamachi, Nagasaki)	Feb. 2005	15,000 kW (28 million kWh)
Aso-Nishihara Wind Farm (Nishihara, Kumamoto)	Feb. 2005	17,500 kW (23 million kWh)
Tahara Bayside Wind Farm (Tahara, Aichi)	March 2005	22,000 kW (40 million kWh)
Setana Seaside Wind Farm (Setana, Hokkaido)	Dec. 2005	12,000 kW (35 million kWh)
Koriyama Nunobiki Kogen Wind Farm (Koriyama, Fukushima)	Under construction; commencement scheduled for FY 2006	65,980 kW (124.8 million kWh)

* Unconsolidated affiliate.

Gas-Turbine Combined-Cycle Generation

Gas-turbine combined-cycle power generation combines gas turbines and steam turbines to achieve high generation efficiency, in the area of 50%.

We have established Ishihara Power Co., Ltd. (a joint venture between Mitsui Engineering & Shipbuilding Co., Ltd. and J-POWER) and Bay Side Energy Co., Ltd., which are working on gas-turbine combined-cycle power generation using natural gas as fuel.

Power Station	Capacity	Start-up date
Ichihara Power Station of Ichihara Power Co., Ltd. (Ichihara-shi, Chiba Prefecture)	110,000 kW	October 2004
Ichihara Power Station of Bay Side Energy Co., Ltd. (Ichihara-shi, Chiba Prefecture)	107,650 kW	April 2005

Efforts toward Power Generation Using Biomass Fuel

◆ Utilization of Woody Biomass (Co-firing with Coal)

From fiscal 2001 to 2004, J-POWER was involved in a joint project with the Research Institute of Innovative Technology for the Earth (RITE) to develop technology for the co-firing of woody biomass fuel—specifically, wood from the thinning of forests—in coal-fired power stations.

Co-firing experiments were carried out in the No. 2 unit at the Matsuura Thermal Power Station (Nagasaki Prefecture) in 2004. Their results found that co-firing at a ratio of 0.5% was technically feasible. Based on this finding, we intend to study the feasibility of co-firing biomass fuel in each of J-POWER's thermoelectric power stations.

Woody biomass chips

◆ Utilization of Sewage Sludge (Biosolid) Fuel (Co-firing with Coal)

Biosolid fuel is produced by mixing sludge from sewage treatment plants with discarded cooking oil and heating the mixture to remove the moisture from it (oil-heat depressurization drying method). The resulting fuel has approximately the same heat value of combustion as coal. From August 2003 to March 2006, in the first such attempt in Japan, we conducted test co-firing in actual power generation equipment at the Matsuura Thermal Power Station (Nagasaki Prefecture) and determined that the biosolid fuel can be burned at a maximum co-firing ratio of 1%. Encouraged by these results, we began co-firing biosolid fuel with coal at the Matsuura Thermal Power Station in fiscal 2006. If biosolid fuel is mixed with coal at a ratio of 1% in the No. 1 unit of the Matsuura Thermal Power Station (1 million kW), it should yield an annual emissions reduction benefit of approximately 50,000 t-CO_2.

In addition to the oil-heat depressurization drying method, we are working on the development of various other technologies for producing fuel from sewage sludge.

Biosolid fuel

◆ Development of Biomass Fuel Manufacturing Technology

In addition to biomass co-firing technology, we are working to develop technologies for manufacturing a variety of biomass fuels. For example, we are developing technology to produce fuel from sewage sludge using low-temperature carbonization technology. By utilizing lower temperatures than standard carbonization processes, we have been able to boost the heating value by about 40%. We now plan to build test facilities to carry out production trials.

We are also developing a process for manufacturing carbonized fuel from combustible MSW (municipal solid waste). In fiscal 2005 we carried out production trials using test facilities at the Matsushima Thermal Power Station (Nagasaki Prefecture) in cooperation with Saikai City, Nagasaki Prefecture, and the New Energy and Industrial Technology Development Organization (NEDO).

◆ Biomass Power Project in Thailand (Dedicated Biomass Power Generation)

J-POWER has been working with the Thai private electric utility EGCO on a power generation IPP project using biomass fuel, which launched commercial operations in Thailand in May 2003. This system utilizes about 76,000 tons of rice chaff each year as power-generator fuel and has an annual output of 64.39 million kWh (calculated), representing a CO_2 emissions reduction benefit of about 30,000 t-CO_2 for Thailand.

We are also involved in a plan that would use waste from rubber-wood sawmills as fuel. This would help reduce fuel consumption at the Thai Electricity Generation Authority's thermal power stations and enable reduction of CO_2 emissions on the order of 60,000 t-CO_2 annually.

Biomass Power Stations in Thailand

	Roi-Et Rice Chaff Thermal Power Station	Yala Biomass Power Station
Location	Roi-Et, Thailand	Yala, Thailand
Fuel	Chaff from rice-milling plants	Rubber-wood residue from local sawmills
Capacity	9,950 kW	23,000 kW
Start-up date	May 2003	Late September 2006 (scheduled)

Efforts Involving Micro-Hydropower Generation

J-POWER is working to utilize untapped energy sources through the development of a "hydro-agri" system, a micro-hydropower generation system that makes use of small waterfalls in existing irrigation channels. In addition, we were contracted to provide technical assistance for construction of the Taio Mini Hydropower Station (operated by Nakatsue-mura, Hita-shi, Oita Prefecture; start-up April 2004), which makes use of an existing erosion control dam. J-POWER was involved in each stage of the project, from planning through oversight of construction.

Utilization of Kyoto Mechanisms and Other Approaches

The J-POWER Group has been making proactive use of the Kyoto Mechanisms, particularly the development of CDM projects that can generate emissions credits even before the first commitment period (2008–12) of the Kyoto Protocol. In addition, we are actively supporting other companies' efforts to utilize the Kyoto Mechanisms.

Overview of CDM Development

The Kyoto Protocol went into effect in February 2005, and detailed rules governing application of the Kyoto Mechanisms were formally adopted at the COP 11 and COP/MOP 1 meetings held in Montreal in November and December 2005. Even before the Kyoto Protocol went into effect, however, the J-POWER Group had been moving proactively to take advantage of the Clean Development Mechanism (CDM). The reason for the focus on CDM is that while carbon credits will not be issued until 2008 under the other two Kyoto Mechanisms—Joint Implementation (JI) and emissions trading—credits can be issued before then under the CDM, which applies to activities undertaken from 2000 on.

In order to accumulate experience, we began by participating in a large number of small projects and assisting in activities that need to be carried out in order for a project to be registered as a CDM project, focusing on receptive Central and South American countries. As the date of the protocol's enforcement neared, we began to participate in large-scale projects as well.

Today the J-POWER Group is participating in 12 CDM projects in Central and South America. As the number of CDM projects registered with the CDM Executive Board mounts, we have been applying ourselves diligently to the registration process. For six of the 12 projects, it was necessary to begin by developing methodologies, and three of these methodologies have been successfully registered with the CDM Executive Board. In July 2005 the Graneros Plant Fuel Switching Project at Nestle's plant in Chile was registered as the J-POWER Group's first CDM project, and in March 2006 the Caieiras Landfill Gas Emission Reduction Project in Brazil was registered as well. Thus, as of the end of July 2006, the J-POWER Group was involved in two registered CDM projects.

J-POWER Group Projects Oriented to Utilization of Kyoto Mechanisms

Country	Project Name	Description	Notes
Chile	(1) Nestle Graneros Plant Fuel-Switching Project	Switch to natural gas in conjunction with renovation of facilities	1, 2, 3
	(2) Metrogas Package Cogeneration Project	Introduction of cogeneration for improved energy-use efficiency	1
	(3) Metrogas Pipeline Rehabilitation	Rehabilitation of facilities for improved energy-use efficiency	
Columbia	(4) La Vuelta and La Herradura Hydroelectric Projects	Use of renewable energy sources	1
	(5) El Henequen Landfill Gas Project	Combustion of landfill gas to reduce greenhouse gases	
Guatemala	(6) Candelaria Hydroelectric Project	Use of renewable energy sources	
Argentina	(7) PFC[a] Emissions Reduction at ALUAR Aluminio Argentino	PFC emissions reduction through improved aluminum production methods	2
Brazil	(8) Aquarius Hydroelectric Project	Use of renewable energy sources	1, 2, 3
	(9) Caieiras Landfill Gas Emission-Reduction Project	Combustion of landfill gas to reduce greenhouse gases	
Mexico	(10) Petrotemex Energy Integration Project	Improving energy-use efficiency through energy conservation, etc.	
	(11) FIDE[b] Electric Motor Replacement Program	Switch to high-efficiency motor for energy conservation	
Peru	(12) Fuel Conversion at Alicorp and SdF Corp.	Switch to natural gas in conjunction with renovation of facilities	

a. PFC: Perfluorocarbon, a type of CFC gas
b. FIDE: Mexico's Trust for Electric Energy Saving

Notes: 1. Approved by host country
2. Approved by Japanese government
3. Project registered

Major Activities in FY 2005

◆ Involvement in CDM Projects

In fiscal 2005, two CDM projects were registered with the CDM Executive Board: the Nestle Graneros Plant Fuel Switching Project in Chile and the Essencis Caieiras Landfill Gas Emission Reduction Project in Brazil.

In addition, we participated in two other projects, the El Henequen Landfill Gas Project (Colombia; combustion of landfill gases to reduce greenhouse gases) and the Alicorp/SdF Fuel Conversion Project (Peru; conversion to new power source at a food-processing plant and a textile factory to reduce CO_2 emissions).

◆ Participation in Carbon Funds

As part of our ongoing effort to secure emissions credits efficiently through CDM and JI, the J-POWER Group contributes to the following funds:

- Japan Greenhouse Gas Reduction Fund (JGRF)
- Dexia-FondElec Energy Efficiency and Emissions Reduction Fund

◆ Feasibility Studies

With a view to identifying new JI and CDM projects, we have carried out feasibility studies for a biomass power project in Czech Republic, a waste power project in Poland, and landfill gas emissions-reduction projects in China and Latin America. We have also conducted joint feasibility studies with other companies on a project to save energy at beer-brewing plants in Mexico.

◆ International Conferences

In fiscal 2005 we co-sponsored Carbon Market Insights, an international conference on the subject of emissions trading held by Point Carbon (February 2006).

In addition, we took part as an exhibitor in the Carbon Expo held by the International Emissions Trading Association (IETA) in May 2005.

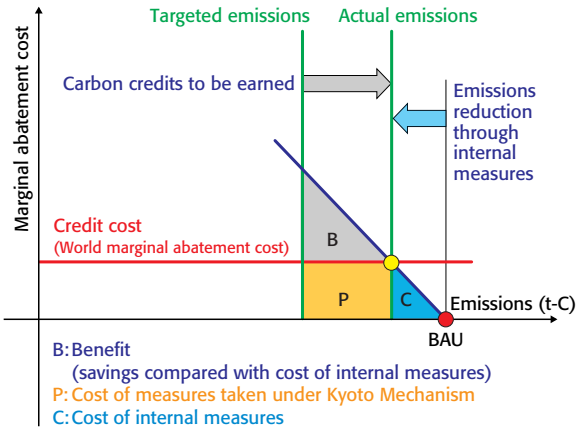
Activities to Support Utilization of the Kyoto Mechanisms

The J-POWER Group is engaged in various activities to support utilization of the Kyoto Mechanisms by other Japanese businesses. For example, as the exclusive agent in Japan for the Norwegian firm Point Carbon, a world leader in information, analysis, and forecasts concerning the emissions trading market, we offer information services targeted to specialists. We also operate a web-based service called GHG Solutions, which offers information and solutions targeted to Japanese businesses interested in global warming issues.

Utilization of the Kyoto Mechanisms

The diagram on the right illustrates the basic concept for selecting an approach to emissions reduction. First a company considers a number of measures for curbing emissions internally and compares their costs with the cost of earning carbon credits through the Kyoto Mechanisms. If internal measures are judged more economical, they are implemented beginning with the least costly. If earning carbon credits is deemed less costly than internal measures, the company takes action to earn credits until the reduction target is achieved. In the diagram, the costs of achieving the target through internal measures alone are represented by the combined area of B, P, and C, while the costs when utilizing the Kyoto Mechanisms are the combined area of P and C. Following this method, one reaches the target at the lowest cost possible.

If the Kyoto Mechanisms function as they are intended to, and the world adopts such rational behaviors, then not only companies that apply the mechanisms but the entire world should be able to meet its emissions-reduction targets at minimum cost.



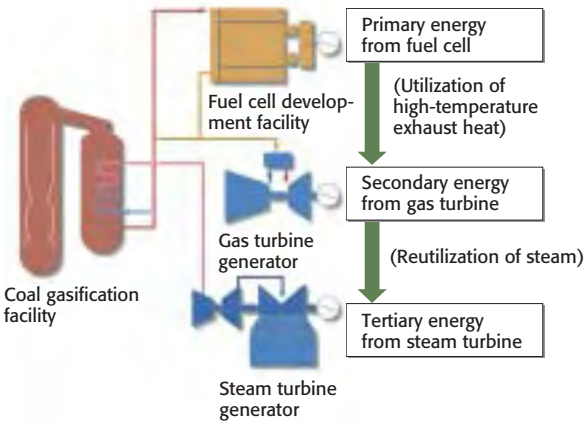
Developing, Transferring, and Disseminating New Technologies

Aiming for dramatic improvement in the efficiency of coal use, the J-POWER Group is pushing forward with the development of coal gasification technology, which can be effectively combined with CO_2 capture technology. We are also cooperating in research on CO_2 geological sequestration and experiments on recovery of CO_2 from coal-fired thermal power plants.

◆ Integrated Coal Gasification Combined Cycle (IGCC)/ Integrated Coal Gasification Fuel Cell Combined Cycle (IGFC)

Gasification of coal allows for far greater generation efficiency than thermal power generation using pulverized coal. In pulverized coal-fired power stations, electricity is generated by steam turbines alone, but an IGCC system uses two types of generator, gas turbines and steam turbines, resulting in a combined power generation system. Moreover, an IGFC system adds a fuel cell to this mix to yield a triple combined system. IGFC is considered the ultimate coal-use technology, and the J-POWER Group is leading the world in its development. If it succeeds, it should be possible to improve generation efficiency by as much as 60% while reducing CO_2 emissions by approximately 30% compared with conventional coal-fired power generation. With this goal in mind, the J-POWER Group is currently conducting research to develop a technology for producing coal gas for use in fuel cells (EAGLE) and a solid oxide fuel cell (SOFC).

●IGFC System



◆ Technology for Producing Coal Gas for Use in Fuel Cells (EAGLE)/Large-Scale Testing of Oxygen-Blown Coal Gasification

In order to use coal as fuel in fuel cells, it is necessary to convert the coal to gaseous fuel and purify it by removing dust and sulfur content.

Through a joint research project with the New Energy and Industry Development Organization (NEDO), we are conducting the EAGLE pilot test (March 2002–March 2007) to obtain the experimental data we need to carry out testing on a larger scale.

The oxygen-blown coal gasification process is advantageous in terms of achieving zero emissions because it yields a gas with high concentrations of CO_2, which is easily captured.

As the next step toward the development of a commercially viable system, study has begun on the construction of a large-scale oxygen-blown coal gasification demonstration system. The primary objective is to develop a large-scale coal gasifier with the immediate goal of commercializing an IGCC system. We view this as an important step toward an IGFC system and eventual achievement of higher efficiency and zero CO_2 emissions that can offer a solution to global warming.

◆ Solid Oxide Fuel Cells (SOFC)

In fuel cell power generation, hydrogen produced from gasified fuel reacts electrochemically with the oxygen in the air to produce electricity. Unlike conventional power generation processes, in which the heat generated by burning fuel is converted to electrical energy, this process generate electrical energy directly from the feedstock, resulting in little energy loss and high generation efficiency.

The SOFC under development by the J-POWER Group, which is made of an ion-conductive ceramic, produces high heat of 900°C–1,000°C during the electrochemical reaction, permitting combined generation using a gas turbine. This allows it to achieve higher generation efficiency than other fuel cells.

Currently preparations are under way for testing of a normal-pressure 150 kW-class SOFC system, scheduled to begin in January 2007.

◆ Study of CO_2 Geologic Storage

In a two-year project beginning in fiscal 2005 (joint project commissioned by the Ministry of Economy, Trade and Industry), we are conducting research on the behavior of CO_2 in aquifers after CO_2 injection using a numerical simulation technology. A natural analogue study including reactive geochemical transport simulation is performed to predict CO_2 behavior underground and to establish monitoring guidelines for CO_2 storage. In addition, we are involved in a three-year project beginning in fiscal 2005 to study the geological formation of an area near a source of large-scale CO_2 emissions in order to design survey and assessment methods to estimate the amount of CO_2 that can be geologically stored there (commissioned by the Engineering Advancement Association of Japan).

◆ J-POWER's Patents and Other Industrial Property Rights (including those secured from research on local environment)

	Power Generation Technology	Recycling Technology	Environmental Technology	Other	Total
Filed individually	6	1	18	8	33
Filed jointly	30	7	21	91	149
Total	36	8	39	99	182

Note: Includes only patents currently held. Pending or surrendered patents are not included.

Reducing Emissions of Gases Other than CO_2

The Kyoto Protocol of the Framework Convention on Climate Change covers six types of greenhouse gases. The J-POWER Group is working to ensure adequate controls not only on CO_2 but also on the other greenhouse gases (SF_6, HFC, PFC, N_2O, and CH_4) and is doing its utmost to reduce emissions. We are also taking appropriate steps to control specified CFCs and halons that deplete the ozone layer.

◆ Measures for Reducing Emissions of Other Greenhouse Gases

The greenhouse gases covered by the Kyoto Protocol include five types in addition to CO_2. With respect to emissions by the electric power industry, the contribution of these gases to global warming is about 1/400 that of CO_2.*

Sulfur hexafluoride (SF_6) is used in a confined state and is therefore not released into the atmosphere during use. However, partial release can occur when equipment is inspected or discarded. We are working to minimize emissions through consistent recovery and reuse. In fiscal 2005, our recovery rate for SF6 was 98%.

* The Federation of Electric Power Companies of Japan, Electric Power Industry Environmental Action Plan (September 2005).

Measures for Reducing Emissions of Other Greenhouse Gases

Gas	Applications and measures for reducing emissions
Sulfur hexafluoride (SF_6)	Used for insulation in gas insulation equipment. The J-POWER Group works to reduce emissions by rigorously applying recovery and reuse methods during inspection and disposal. In fiscal 2005, our rate of recovery and reuse was
Hydrofluorocarbons (HFCs)	Used as refrigerant in air-conditioning equipment, etc. Their use is expected to increase as they are adopted to replace government-regulated CFCs. The J-POWER Group works to reduce emissions through cooperative efforts to recover and reuse such gases, as well as preventing leaks during installation and repair.
Perfluorocarbons (PFCs)	Not stocked by J-POWER Group companies.
Nitrous oxide (N_2O)	The J-POWER Group is working to keep emissions to a minimum by improving thermal efficiency of coal-fired power stations. (In fiscal 2005, emissions of N_2O totaled approximately 1,670 t.)
Methane (CH_4)	As CH_4 concentrations in flue gases from coal-fired power stations are below average atmospheric concentrations, emissions are effectively zero.

◆ Protection of the Ozone Layer

The ozone layer in the upper stratosphere (about 20 km–40 km above the earth) plays an important role in protecting life by absorbing harmful ultraviolet rays. There are concerns that specified chlorofluorocarbons (CFCs) and halons can destroy the ozone layer, resulting in serious damage to human health and to the ecosystem. For this reason reductions in the production and consumption of these substances have been mandated internationally.

As a user of these substances, we are not subject to direct regulation. Nevertheless, we periodically monitor our stocks and consumption and work hard to maintain appropriate controls and to limit emissions.

Stocks and Consumption of Specified CFCs and Halons

Category	At year-end, 2005 (t)		Application
Specified CFCs	Stock 1.8	Consumption 0.0	Refrigerant
Halons	Stock 3.9	Consumption 0.0	Fire extinguisher
Other CFCs, etc	Stock 15.8	Consumption 0.3	Refrigerant
Total	Stock 21.5	Consumption 0.3	
CFC substitutes (HFCs)	Stock 7.7	Consumption 0.1	Refrigerant

About Specified CFCs and Halons

Ozone-depleting substances, such as specified CFCs and halons, are chemically stable compounds that contain chlorine or bromine. Like HFCs, PFCs, and SF_6, they also have a powerful greenhouse effect.

Under the Ozone Layer Protection Law (Law Concerning the Protection of the Ozone Layer through the Control of Specified Substances and Other Measures), the production and consumption of substances targeted for regulation under the Montreal Protocol, referred to as "specified substances," is being phased out according to a regulatory schedule. As a result, halon production had completely halted by the end of 1993, and production of specified CFCs had stopped by the end of 1995. The production of other ozone-depleting substances is also being phased out.