



J-POWER Group  
SUSTAINABILITY REPORT  
2016

**Harmonizing energy supply with the environment**

**SUSTAINABILITY REPORT**

# J-POWER Group Overview (As of the end of March 2016)

Company name	Electric Power Development Co., Ltd.
Communication name	J-POWER
Date of incorporation	September 16, 1952
Headquarters address	6-15-1 Ginza, Chuo-ku, Tokyo, 104-8165 JAPAN
President	Toshifumi Watanabe (from June 22, 2016)
Capital	¥180.502 billion
Employees	J-POWER: 2,360 J-POWER Group: 7,225
Business category	Electric Utility

## Overview of facilities (As of the end of March 2016)

● Power generation facilities <small>(includes equity method affiliates, but percentage ownership is not taken into account.)</small>		
Thermal power stations	12	9.11 GW
Hydroelectric power stations	60	8.57 GW
Geothermal power stations	1	0.015 GW
Wind farms	20	0.4 GW
Other power generation facilities	2	0.033 GW
	Total 95	18.13 GW

● Transmission lines		
AC power transmission lines		2,408 km
DC power transmission lines		2,141 km
Substations (output)	4	4.30 million kVA
Frequency converter station (output)	1	0.3 GW
AC/DC converter stations (output)	4	2 GW



## List of Main Group Companies

\* Percentage figures in parentheses are J-POWER equity shares (including indirect investments)

Scope of environmental data:

J-POWER and 25 domestic consolidated subsidiaries

Scope of domestic and overseas CO<sub>2</sub> emissions volume data:

J-POWER, 11 domestic and 32 overseas electricity business companies



### Electric power-related business

• JPec Co., Ltd.	(100%)
• JPHYTECH Co., Ltd.	(100%)
• JP Business Service Corporation	(100%)
• J-POWER RESOURCES Co., Ltd.	(100%)
• J-POWER EnTech Co., Inc.	(100%)
• Kaihatsu Denshi Gijutsu Co., Ltd.	(100%)
• J-Wind Service Co., Ltd.	(100%)
• Kaihatsu Sekkei Consultant Co., Ltd.	(100%)
• JP Enterprise Co., Ltd.	(100%)
• Miyazaki Wood Pellet Co., Ltd.	(98%)
• JM Activated Coke, Inc.	(90%)



### Electricity business

• Bay Side Energy Co., Ltd.	(100%)
• Mihama Seaside Power Co., Ltd.	(100%)
• J-Wind Co., Ltd.	(100%)
• Japan Clean Energy Development Co., Ltd.	(100%)
• J-Wind OOMA Co., Ltd.	(100%)
• Minami Kyushu Wind Power Co., Ltd.	(99%)
• ITOIGAWA POWER Inc.	(80%)
• Nagasaki-Shikamachi Wind Power Co., Ltd.	(70%)
• Nikaho-Kogen Wind Power Co., Ltd.	(67%)
• TOSA POWER Inc.	(45%)
• GENEX COMPANY, LIMITED	(40%)



### Other

• Kaihatsu Hiryo Co., Ltd.	(100%)
• Japan Network Engineering Co., Ltd.	(100%)
• OMUTA PLANT SERVICE Co., Ltd.	(100%)
• Biocoal Osaka-Hirano CO.,LTD.	(60%)
• Greencoal Saikai Co., Ltd.	(60%)



### International business

• Gulf Cogeneration Co., Ltd.	• Elwood Energy, LLC	• Shoreham Energy, LLC	• Gulf JP NK2 Co., Ltd.
• Nong Khae Cogeneration Co., Ltd.	• Gulf Power Generation Co., Ltd.	• Orange Grove Energy, L.P.	• Gulf JP NS Co., Ltd.
• Samutprakarn Cogeneration Co., Ltd.	• Green Country Energy, LLC	• Gulf JP KP1 Co., Ltd.	• Gulf JP UT Co., Ltd.
• EGCO Cogeneration Co., Ltd.	• Birchwood Power Partners, L.P.	• Gulf JP KP2 Co., Ltd.	• ROI-ET Green Co., Ltd
• ShanXi TianShi Power Generation Co., Ltd.	• Pinelawn Power, LLC	• Gulf JP TLC Co., Ltd.	• CBK Power Co., Ltd
• China Resources Power (HeZhou) Co., Ltd	• Equus Power I, LP	• Gulf JP NNK Co., Ltd.	• Gulf Yala Green Co., Ltd.
• Chiahui Power Corporation	• Tenaska Virginia Partners, L.P.	• Gulf JP NLL Co., Ltd.	• Shaanxi Hanjiang Investment & Development Co., Ltd
• Tenaska Frontier Partners, Ltd.	• Edgewood Energy, LLC	• Gulf JP CRN Co., Ltd.	• Zajackzowo Windfarm Sp. z o.o.

# Contents

1	J-POWER Group Overview / Contents / Editorial Policies
3	Message from the President
4	J-POWER Group's Corporate Social Responsibility (CSR)
6	J-POWER Group's Medium-Term Management Plan
7	<b>Initiatives for a Stable Supply of Electricity and Reduced CO<sub>2</sub> Emissions</b>
9	Hydroelectric power
11	Thermal Power
13	Clean Coal Technology Contributes to Global Reduction of Carbon Emissions
14	Coal-Fired Power and the Role of J-POWER
15	Promoting Reduction of Carbon Emissions by Coal-Fired Power
17	Research and Development of Next-Generation Low-Carbon Technologies
19	Renewable Energy
21	Power Transmission, Substation, and Communications Facilities
22	Overseas Business



## 23 [Report] The Ohma Nuclear Power Plant



## 27 Business Operations That Fulfill Social Responsibility

27	Foundations of Business Operations
30	Recruiting and Developing Human Resources and Creating a Workplace that Provides Job Satisfaction
33	Coexistence with the Community and Society
37	Environmental Management



## 52 External Evaluation and Outside Opinions

### Editorial Policies

- The J-POWER Group operates under its corporate philosophy of playing our part for the sustainable development of Japan and the rest of the world. Accordingly, this report is titled Sustainability Report to express our intention of achieving sustainable growth and development of both the Group and society. It summarizes and reports on the Group's corporate activities under the headings of Governance, Social Responsibilities, and Environment.
- This report includes all consolidated subsidiaries and is representative of the entire J-POWER Group.
- To ensure objective credibility, this report has been independently assured by Ernst & Young Sustainability Co., Ltd. Guaranteed data (Refer to the Websites indicated at the bottom right) calculated according to calculation standards\* is indicated by a star (★). (For details, see p. 52)
- A questionnaire survey was conducted to obtain opinions from readers of the FY 2015 Report, and we have made use of the results in our editing. (A summary can be found on p. 52)
- The opinions of experts outside the company have been sought regarding issues and expectations in relation to the J-POWER Group, and we have made use of the results in our editing. (See pp. 53-54)

#### Period covered:

April 2015 - March 2016  
(January - December 2015 for those companies with a January - December fiscal year. Also, some articles may include content from April 2016 or thereafter.)

#### Scope:

J-POWER and the J-POWER Group companies (consolidated subsidiaries)  
Note: If other than above, this is indicated in the appropriate place.

#### Guidelines referred to:

Ministry of the Environment, Environmental Reporting Guidelines: FY 2012  
Version

**Published in:** September 2016

#### Note concerning forecasts:

The plans, strategies, and forecasts set out in this report have been formulated based on currently available information. Unforeseeable changes in various factors may cause results to differ from projections.



This report is also available at the J-POWER's website as "J-POWER Group Sustainability Report 2016."  
[http://www.jpowers.co.jp/english/company\\_info/environment/index.html](http://www.jpowers.co.jp/english/company_info/environment/index.html)

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## Message from the President

With the aim of “harmonizing energy supply with the environment” by putting the corporate philosophy into practice, we constantly take up the challenge of developing new technologies and aim for sustained growth as a global electric power company that contributes to a sustainable society.

The circumstances of energy and the environment in Japan today are growing increasingly complicated, and in fact are caught up in a vortex of unprecedented, drastic change. Even under these circumstances, however, the concept of “Harmonizing energy supply with the environment” that forms the subtitle of this Sustainability Report states the unalterable philosophy that sustains the core of our business in the J-POWER Group. Going forward, we will continue taking measures toward the realization of this philosophy.

Specific measures with regard to coal-fired power generation include our measures to achieve a balance between reducing environmental impact with regard to global warming and other such problems and providing a stable supply of energy by means of the world's highest level of clean coal technology, which we have been developing over many years and disseminating in Japan and other countries. We have also been promoting the new or expanded construction of higher-efficiency coal-fired power stations, the replacement of coal-fired facilities, and the development of technology for long-term reduction of carbon emissions.

As another initiative to cut carbon emissions, there are the measures we are promoting to expand the introduction of renewable energy. We are making every effort to use diverse forms of renewable energy, including hydroelectric, wind and geothermal power, so as to reduce CO<sub>2</sub> emissions from power generation.

Furthermore, we strive to contribute to the sustainable development of society by conducting business operations that fulfill our corporate social responsibility including enhancing corporate governance, conducting strict compliance, ensuring safety,

reinforcing crisis management and accident responses, maintaining harmony with local communities and society and implementing environmental management.

The J-POWER Group will continue to carry out its missions of providing stable supplies of electricity and harmonizing energy supply with the environment on even higher levels than in the past and will address new challenges to contribute to the sustainable development of Japan and the world.

We thank everyone sincerely for their continuing support.

August 2016



President

渡部 肇史

Toshifumi Watanabe

# J-POWER Group's Corporate Social Responsibility

In keeping with the J-POWER Group's corporate philosophy that "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," we are working to provide stable supply of electric power while preserving the environment.

It is this corporate philosophy that forms the basis of the J-POWER Group's social responsibility, and all Group members make every effort to conduct business based on this corporate philosophy while keeping it in mind at all times.

The J-POWER Corporate Conduct Rules set forth standards for carrying this out, and the J-POWER Group Environmental Management Vision Basic Policy is a statement of our action policies.

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## J-POWER Group Corporate Philosophy (Established September 11, 1998)

### Our Mission

**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 energy of electricity is essential in people's lives and crucial for economic activity. The J-POWER Group is an energy company and our mission is to continue working day and night to create and transmit this power. In this field of business, our greatest pleasure is to go on meeting the expectations of people by mobilizing our highly experienced personnel and our technology anywhere, in Japan or other countries, as long as there are people who need electricity.

This Earth where we live generously holds all of the economic activity of humankind, which seeks to live more prosperously, and it bears the brunt of all the energy that people produce and consume. As a company

that provides electricity and other energy, the J-POWER Group considers the coexistence of the global environment and the human race to be the issue of greatest importance. Our mission is to contribute to realization of sustainable growth within the global environment by Japan and the world by continuing to provide energy that enables coexistence with the environment.

The energy that people are seeking differs in its quality and price according to the times, according to local conditions, and according to the use that energy is put to. The J-POWER Group wants to be a corporation that responds flexibly to this diversity of people's needs while we go on ceaselessly providing the energy that they rely on.

### Our Credo

- We value integrity and pride, which drive everything we do.
- We pursue harmony with the environment, and thrive in the trust of communities where we live and work.
- We regard profits as the source of our growth, and share the fruits with the society.
- We refine our knowledge constantly, to be the pioneering leader in technologies and wisdom.
- We unite diverse personalities and passions as one, and dare create a better tomorrow.

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## J-POWER Corporate Conduct Rules (Established January 1, 2001)

### **Reliable supply of energy**

We will put forth every effort to reliably supply energy both in Japan and abroad utilizing our experienced personnel and cutting-edge technology.

### **Safety assurance**

In conducting operations we will constantly work to raise safety awareness and give the highest priority to public and worker safety.

### **Environmental conservation**

Based on an awareness that our business operations are deeply linked with the environment, we will actively engage in environmental conservation activities.

### **Communication with society**

To establish communication with society we will conduct information disclosure and public relations activities in a fair and transparent manner.

### **Contribution to society**

Aiming to be a good corporate citizen we will undertake activities to contribute to society and assist in the development of local communities both in Japan and abroad.

### **Creation of a rewarding corporate culture**

In addition to providing safe and comfortable work environments, we will respect the individuality of our employees and endeavor to establish a rewarding corporate culture that encourages them to take on new challenges.

### **Compliance with laws, regulations, and corporate ethics**

We will conduct business in good faith and in a fair manner with a strong commitment to compliance and ethics. We will stand firm against anti-social forces that undermine the order and security of civil society.

### **Role of top management**

Recognizing their responsibility in putting into practice the spirit of these Corporate Conduct Rules, our top management must set an example for others and work to spread awareness of these Rules.

Should an event occur that violates the spirit of these Rules, top management must take the initiative in dealing with the problem to determine the causes and prevent recurrence. Top management must also identify and take disciplinary action against those responsible, including themselves.

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## Basic Policy (Revised on July 1, 2011)

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.

As an energy supplier, the J-POWER Group will strive to bring together its expertise and its technologies in the utilization of a wide variety of energy sources, including fossil fuels, nuclear power, and renewable energies, to ensure the efficient and uninterrupted supply of the power essential to human life and economic activity.

We will contribute to sustainable development in Japan and the rest of the world as a whole by minimizing the environmental impact of our business activities, reducing environmental risks such as global warming, and improving eco-efficiency by achieving higher productivity with lower environmental load, thus promoting greater environmental responsibility while enhancing economic value.

### **Efforts Relating to Global Environmental Issues**

Directing our most intensive efforts towards the provision of a stable energy supply, we will also steadily advance initiatives towards the realization of low carbon technologies both domestically and internationally, and will contribute to the reduction of CO<sub>2</sub> emissions on a global scale.

To that end, we will work from mid- and long-term perspectives with technology as our central focus to realize a stable supply of energy and reduce CO<sub>2</sub> emissions domestically and internationally through measures including reducing CO<sub>2</sub> emissions from coal-fired power, conducting research and development of next-generation low-carbon technologies, and expanding CO<sub>2</sub>-free power generation facilities. Our ultimate aim will be the achievement of zero emissions by means of measures including CO<sub>2</sub> capture and storage.

### **Efforts Relating to Local Environmental Issues**

In addition to adopting measures to reduce the environmental impact of our operations, we will seek to operate in harmony with the local environments in which our facilities are located by working to save, recycle and reuse resources in order to limit the amount of waste that we produce.

### **Ensuring Transparency and Reliability**

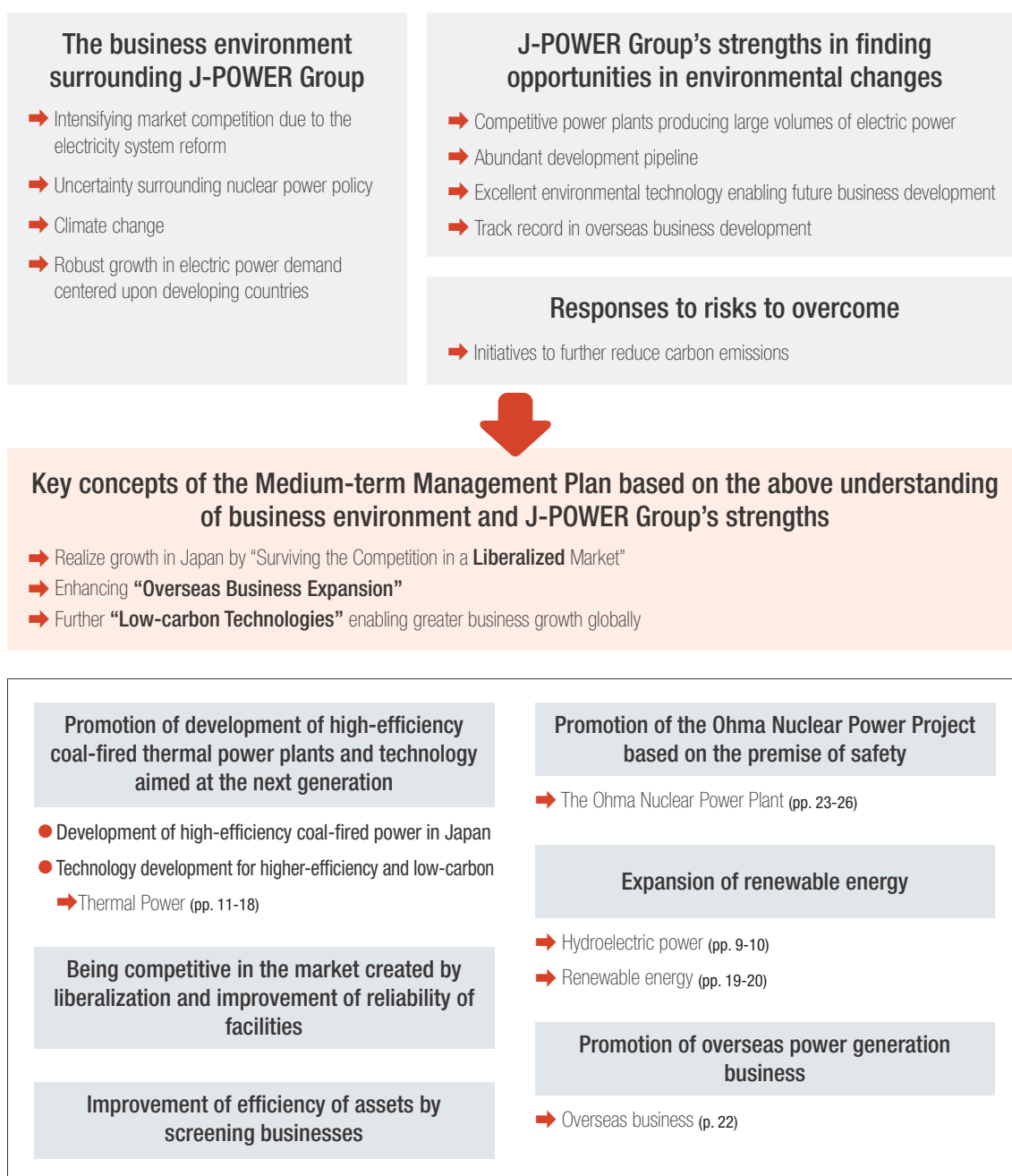
We will ensure that our business activities comply with all laws and regulations, disclose a wide range of environmental information, and enhance communication with stakeholders.



# J-POWER Group's Medium-Term Management Plan

The Japanese energy industry has emerged from an extended period of uncertainty regarding energy policy following the March 2011 earthquake and is entering an era of new challenges. The Long-Term Energy Supply and Demand Outlook up to 2030, which was adopted in July 2015, indicates a composition of electrical sources that include renewable energy, nuclear power, coal-fired power and other forms of energy, and also sets new CO<sub>2</sub> reduction goals geared towards international society. The liberalization of the electricity business was finalized with the adoption in June 2015 of the amended Electric Power Business Law, which provides for separation of the electric power generation and distribution businesses, followed by complete deregulation of retail electricity and elimination of regulations on wholesale electricity in April 2016.

In response to these developments, the J-POWER Group formulated a Medium-Term Management Plan for addressing the challenges of further growth in the coming 10 years. The figure below shows the relationship between the J-POWER Group's measures outlined in the Medium-Term Management Plan and the content of this report.

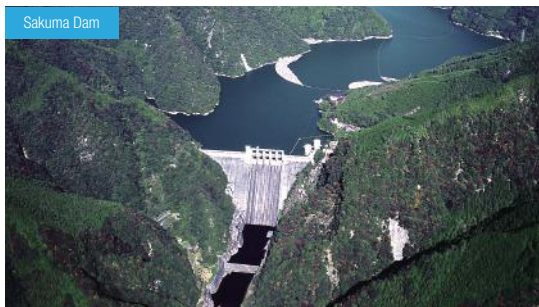


# Initiatives for a Stable Supply of Electricity and

Since the founding of J-POWER in 1952, we worked to resolve the nationwide power shortages in postwar Japan by developing large-scale hydropower locations. After the experience of two oil shocks in the 1970s, we moved forward with construction of large-scale coal-fired power stations fueled using imported coal, which has abundant reserves. As a result, the J-POWER Group has a well-balanced composition of facilities with hydroelectric power facilities, which are CO<sub>2</sub>-free power sources, and coal-fired power generation facilities, which provide outstanding economy and stability of supply, produce about the same amount of power.

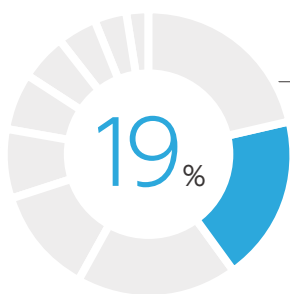
Since the year 2000, we have also been pressing forward vigorously with development of wind power and other types of renewable energy. Going forward, the J-POWER Group will continue further development of hydropower, wind power, and geothermal power which are CO<sub>2</sub>-free power sources. At the same time, we will move ahead with coal-fired power generation with lower CO<sub>2</sub> emissions. We take these measures to move toward a balance between providing a stable supply of electricity and reducing CO<sub>2</sub> emissions.

## From the 1950s Development of Large-scale Hydroelectric Power Stations



Up to this point, we built large-scale dams and hydroelectric power stations such as those as Sakuma, Tagokura, Okutadami, and Miboro. This approach both contributed to the effective utilization of water resources and the stable supply of electric power and, as a method of CO<sub>2</sub>-free power generation, has also been contributing to global warming countermeasures.

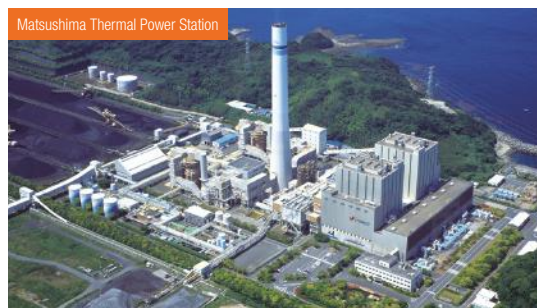
Since then we have continued developing new hydroelectric power stations while taking steps for shared existence and shared prosperity with local environments. At present we own hydroelectric power facilities at 60 locations in Japan (the second-largest share in the country).



J-POWER Share of Output from Japan's Hydroelectric Power Facilities (as of the end of March 2016)

Source: Agency for Natural Resources and Energy, "Electric Power Statistics"

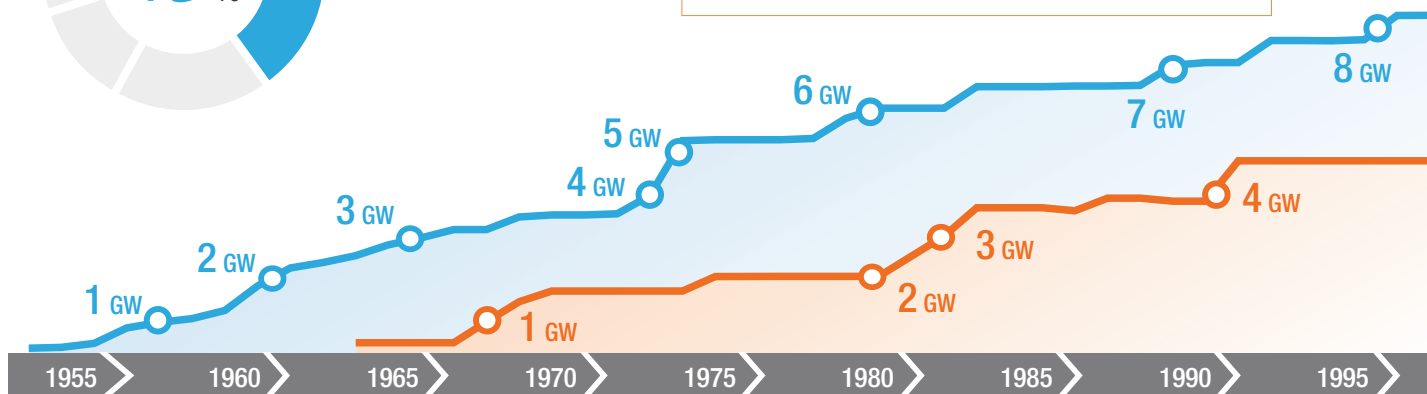
## From the 1980s Measures for Thermal Power using Imported Coal



Matsushima Thermal Power Station was the first power plant in Japan to use imported coal. J-POWER plans to develop thermal power using imported coal continued to be realized, and Takehara Thermal Power Station Unit No. 3, Ishikawa Coal Thermal Power Station, and Matsuura Thermal Power Station appeared in succession. Over the period of a half-century, we made every effort to reduce the environmental impact of these facilities by increasing efficiency and taking environmental protection measures while contributing to the stable supply of electric power.

## 1975 Onikobe Geothermal Power Station Enters Operation

We built this power station within the class 1 special district of a quasi-national park, taking steady measures to maintain the scenic appearance of the grounds as well as to preserve the surrounding natural environment.





# Reduced CO<sub>2</sub> Emissions

## From the 2000s Development of Wind Power Stations

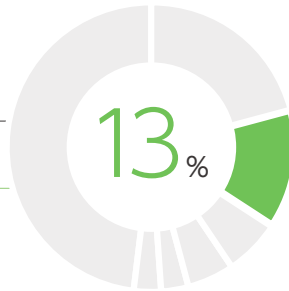
Tomamae Winvilla Wind Farm



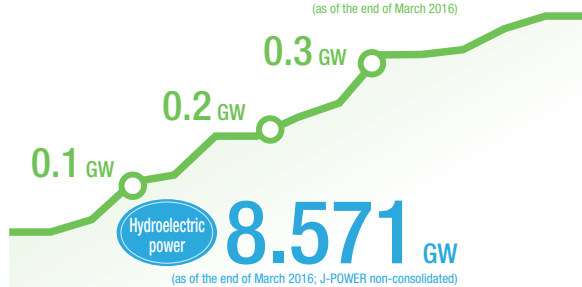
The J-POWER Group was an early participant in the wind power business. We started in 2000 with the Tomamae Winvilla Wind Farm, in Tomamae-cho, Hokkaido, and have been going ahead with development of wind power stations ever since. As of March 2016, our wind power facilities number 229 units in 20 wind farms around Japan, giving us the second largest share in the country.

**J-POWER Share of Output from  
Japan's Wind Power Facilities**  
(as of the end of March 2016)

Source: Compiled from Japan Wind Power Association and other information materials

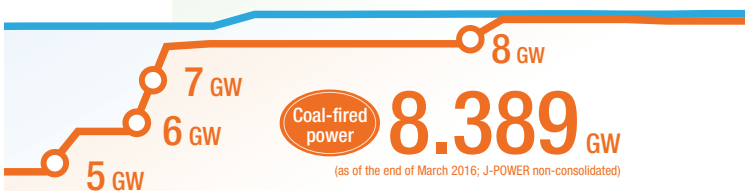


**Wind power**  
0.389 GW  
(as of the end of March 2016)



**Hydroelectric power**  
8.571 GW  
(as of the end of March 2016; J-POWER non-consolidated)

**Coal-fired power**  
8.389 GW  
(as of the end of March 2016; J-POWER non-consolidated)



2000 2005 2010 2016

## Coal-Fired Power Initiatives

### Promoting reduction of carbon emissions

The J-POWER Group is making every effort to maintain high thermal efficiency at our coal-fired power stations by conducting appropriate operations and maintenance and upgrading facilities. We have also been promoting the mixed combustion of biomass fuel such as sewage sludge and wooden biomass as a way to further the reduction of carbon emissions at existing coal-fired power stations. At older power stations where thermal efficiency is lower, we are pursuing possibilities for replacement of existing facilities and construction of new power plants. We are implementing measures for the reduction of carbon emissions from coal-fired power stations by introducing coal-fired power at the world's highest levels of efficiency.

### Development of technology for reduction of carbon emissions

The J-POWER Group is making a practical reality of coal-fired power at the world's highest levels of efficiency. We will conduct further research and development, however, to achieve still greater reduction of carbon emissions from coal-fired power. Specifically, we will implement development and trials of oxygen-blown integrated coal gasification combined-cycle power generation as next-generation technology, and will pursue research and development of CO<sub>2</sub> separation and capture technology.

## Renewable Energy Initiatives

Renewable energy is not only a precious domestic source of energy. It is also a form of CO<sub>2</sub>-free power generation, and as such has value as a power source in terms of global warming countermeasures, as well. The J-POWER Group is making full use of the know-how and technology developed over many years to promote the expanded use of hydroelectric, wind, geothermal, and other sources of renewable energy.

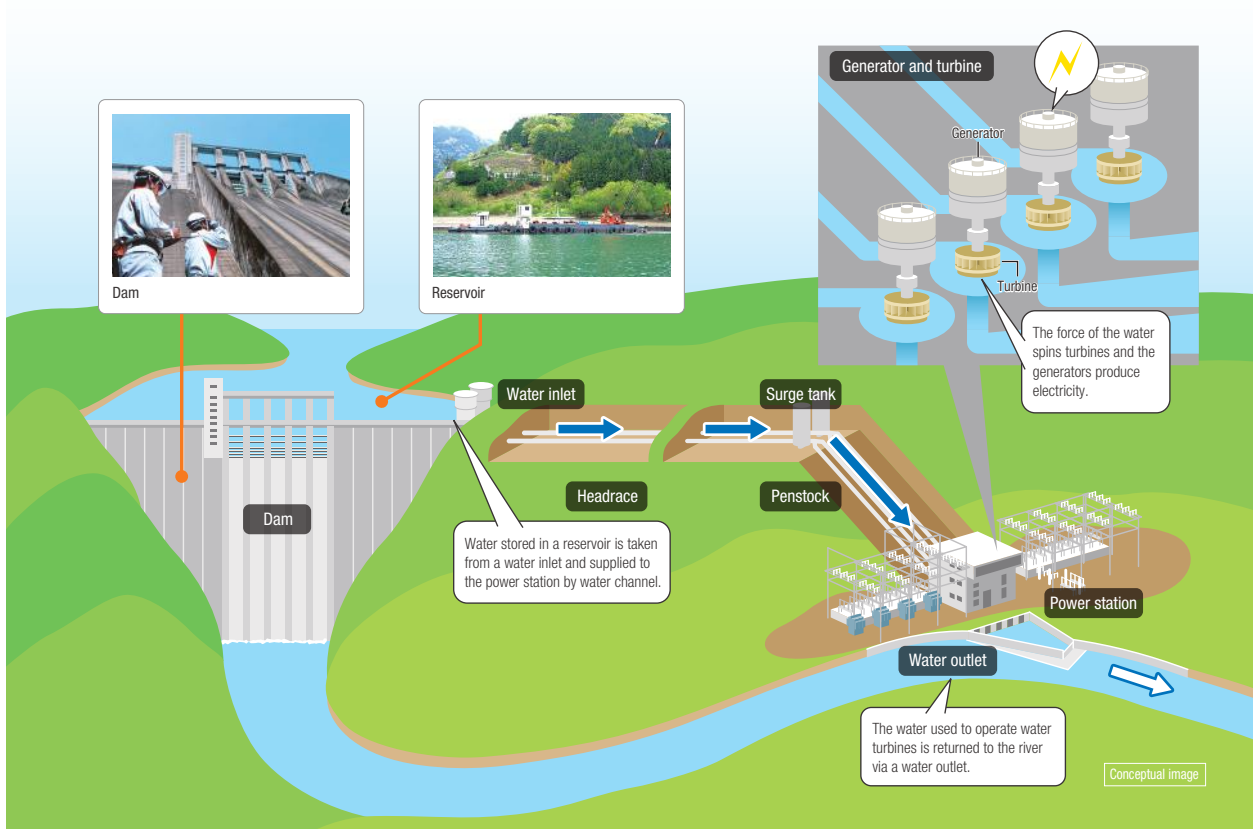
## Ohma Nuclear Power Plant Initiatives

For the island country of Japan, with its limited natural resources, nuclear power is an essential and indispensable energy source from the perspective of providing a stable supply of energy. It is also an effective power source in terms of dealing with the problem of global warming. J-POWER will steadily take safety countermeasures and implement measures to build power plants that earn the trust of local and regional communities.



# Hydroelectric power

The J-POWER Group has 60 locations throughout Japan with a total output of 8.57 GW, the second-largest share of hydroelectric power facilities in the country. J-POWER's Group hydroelectric power facilities are able to respond rapidly to changes in electricity demand and have high output per power station. For these reasons, they make significant contributions to electricity supplies in various regions around Japan as peak power supplies that can respond to daily and seasonal peak demand periods. In addition, hydroelectric power is a valuable, entirely domestic energy source and accounts for the J-POWER Group's largest renewable energy generation facilities, comprising 14% of Japan's total renewable energy capacity. As a result, hydroelectric power is a core presence for ensuring stable electricity supplies and reducing CO<sub>2</sub> emissions.



## VOICE

### Facility Maintenance and Management and Consideration for the River Environment

Kouchi Power Administration Office operates three power plants on the Naharigawa River water system, and the Civil Engineering Section carries out maintenance and management of the civil engineering facilities involved in generating power. Among other things, this involves handling facilities that have been in operation for 50 years and, in this rainy region that has average annual rainfall of approximately 4,000 mm, it faces the major issues of safely carrying out dam discharges in times of flooding and measures against turbidity following flooding. We also act to obtain the understanding of local residents as we implement measures to maintain and improve the river environment. These measures include restoring dam sediment to the rivers and improving sweetfish spawning grounds.

For the future, the entire Group will act as one in the effort to earn the trust of local residents as we engage in facility maintenance and management to provide for stable operation while also implementing measures that take the river environment into consideration.



West Regional Headquarters,  
Kouchi Power  
Administration Office  
**Yuuji Fukushima**

## VOICE

### Continuing Use of Power Generation Facilities

The Electric Power Group of East Regional Headquarters engages in a variety of different operations necessary for the maintenance and management of hydroelectric power stations. One of the important operations we perform is formulating long-term plans for maintaining the various component equipment of the hydroelectric power stations and for upgrading facilities. Fifty or more years have passed since many of the J-POWER hydroelectric power stations entered operation, and in order to keep the aging facilities ready for continuing effective use, we formulate plans in cooperation with related companies to see that maintenance and facility upgrades are carried out at the appropriate times.



East Regional Headquarters,  
Electrical Engineering Group  
**Yasuomi Watanabe**

The J-POWER Group implements measures on a daily basis to increase the reliability and efficiency of its existing hydroelectric power facilities. To use hydroelectric resources, a CO<sub>2</sub>-free, renewable energy source, we are actively developing small and medium-sized hydroelectric power stations, one of the policies set forth in Fourth Energy Basic Plan, and taking measures to increase generating capacity including installing new facilities and replacing facilities at existing dams to enhance use of facilities and resources.

## Stable Operation of Hydroelectric power Facilities

The J-POWER Group operates 60 hydroelectric power stations located throughout Japan and monitors and controls each power station under a 24-hour system with three regional control centers located in Hokkaido, Saitama Prefecture, and Aichi Prefecture. At each power station, we conduct daily inspections to detect any abnormalities in facilities early and prevent accidents before they can occur so that J-POWER can provide stable power to the entire country. If a facility abnormality occurs, maintenance personnel immediately go to the site and work to restore the facility at the earliest possible time and use their knowledge to investigate and implement measures to prevent reoccurrence. To raise facility reliability even further, we will continue to undertake facility maintenance measures suitably adapted to accidents and environmental needs while working to maintain harmony with local communities.



North Regional Control Center (Hokkaido)

## Measures for New Hydroelectric power Facilities

The J-POWER Group is pursuing various measures to enhance the reliability and efficiency of existing hydroelectric power facilities. One such measure is the complete overhaul of principal electrical equipment at hydroelectric power stations that are becoming obsolescent. The complete overhaul of Akiba No. 2 Power Station that has been underway since 2015 was completed in May 2016. By using the latest analysis and design technology, we increased the power output by 400 kW. Overhauls are scheduled for Akiba No. 1 Power Station starting in 2016, and Ashoro Power Station starting in 2019.



Rotor being lifted into place at Akiba No. 2 Power Station (Shizuoka Prefecture)



A rendering on Konokidani Power Station (Fukui Prefecture)

Hydroelectric power is a valuable, wholly domestic energy source for Japan, which is resource-poor, and to maximize the use of this valuable resource, the J-POWER Group is actively developing small and medium-sized hydroelectric power stations that utilize unused water resources. Construction of Konokidani Power Station was started in October 2014, utilizing an unused drop from the Konokidani water intake of the existing Kuzuryu Dam reservoir. A dam is being constructed near the intake and a water turbine generator will generate a maximum of 199 kW. Construction is scheduled to be completed during the 2016 fiscal year. Since this is a region that experiences considerable snowfall, the highest priority is being placed on safety during the work.

Through measures such as these, the J-POWER Group is working to maximize hydroelectric power and the efficient use of water resources in order to ensure the stable supply of electric power.



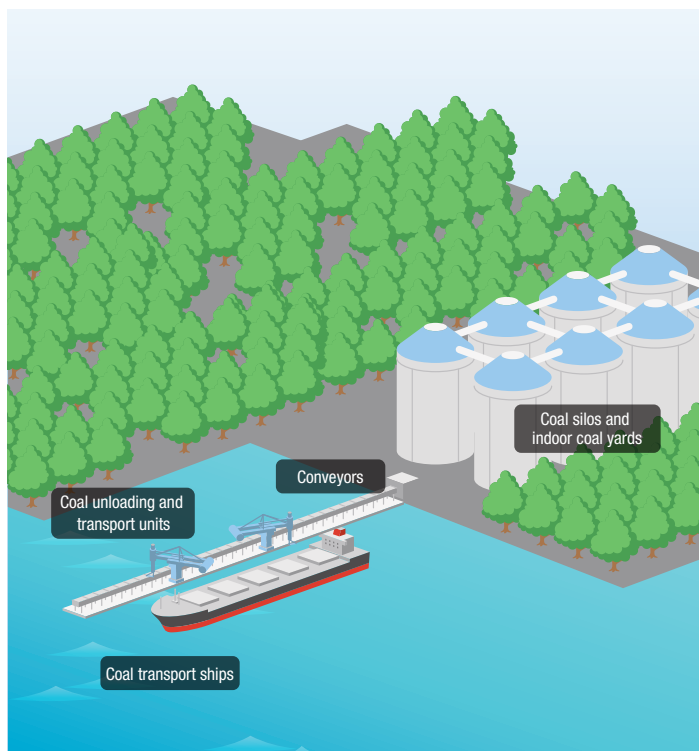
## Thermal Power

The J-POWER Group has nine locations throughout Japan with a total output of 8.55 GW, the largest share of coal-fired power generation facilities in the country. The J-POWER Group also has 310 MW of gas-fired thermal power.

The J-POWER Group's coal-fired power generating facilities maintain high use rates as economical and stable base power supplies. To achieve this, appropriate maintenance of generating facilities is reliably conducted and we make efforts to limit declines in thermal efficiency in conjunction with aging and the occurrence of problems with facilities and to maintain and enhance facility reliability.

### Stable Operation of Coal-Fired Power Station

In order to provide for the stable operation of its coal-fired power stations, the J-POWER Group is involved in the entire value chain for coal, including procurement, transport, and receiving. We are acting globally to build a system that enables the stable procurement of coal.



#### Procurement

##### Coal Mine Project in Australia

The J-POWER Group began its participation in the Blair Athol Coal Mine, in the state of Queensland, in 1982. We have been investing in coal mining interests since that time, and as of the end of fiscal 2015, we own coal mining interests in the states of Queensland and New South Wales, Australia. For the future, we will be scrutinizing trends in coal supply-and-demand balance and among competing companies for stable procurement of the coal as we examine new, cost-competitive projects, and as we pursue participation in new coal mine projects.



#### Transport

##### Stable Transport of Coal

The J-POWER Group uses approximately 22 million tons of coal per year. Transporting this coal to the various power stations requires 200 or more ship voyages per year. We will introduce dedicated vessels\* and so on for this purpose as part of our measures to provide stability in the transport of coal.



\* **Dedicated Vessel:** A ship that is built and owned by a shipping company for the special purpose of carrying cargo exclusively under a long-term contract.

#### Receiving

##### Management of Coal at Power Stations

On-site at the power stations, the coal that has been received needs to be managed according to its particular characteristics. In order to control coal temperatures in the coal yard, we use infrared cameras and install water sprinkler systems in addition to enacting 24-hour systems of control.



#### VOICE

##### Weather is the Natural Enemy

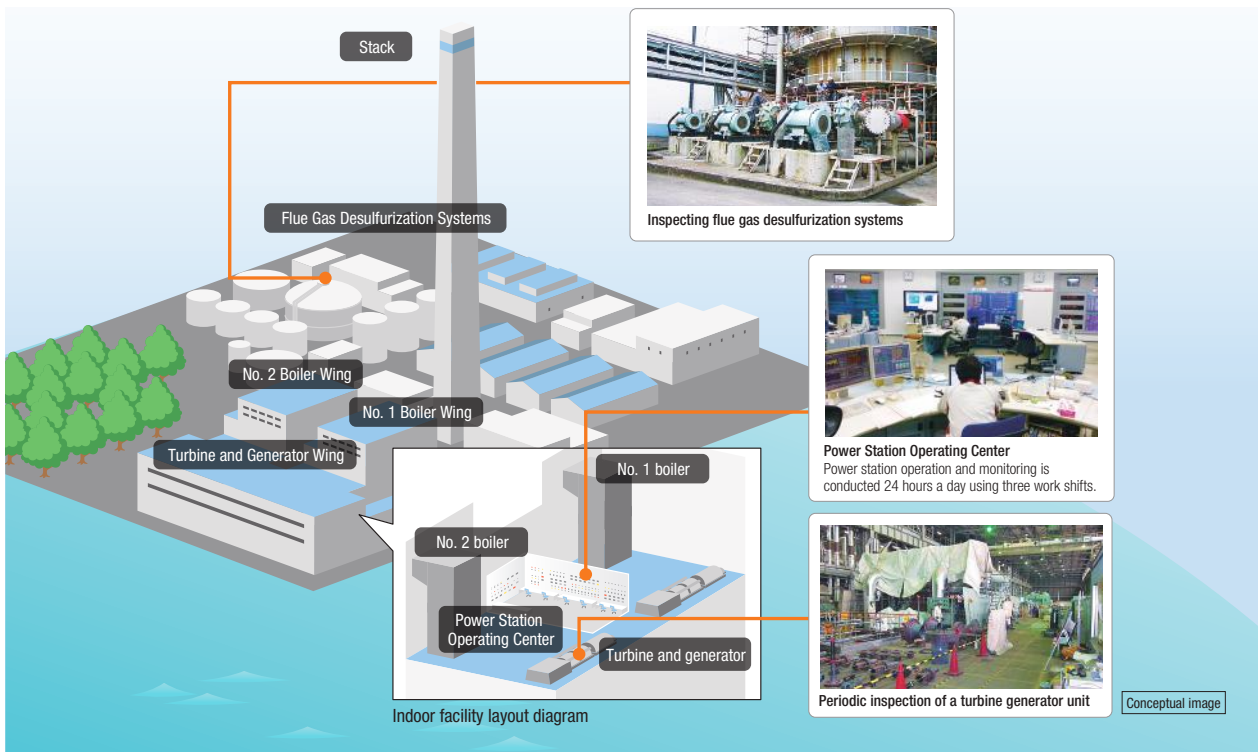
As the person in charge of fuel for a coal-fired power station, I work mainly on coal receiving and delivery operations. The coal that makes its way to us across the oceans from foreign countries is first received at outdoor coal yard on the power station grounds. After that we send it on to the power station main building for combustion. In my private life, I'm the kind of person who leaves home without looking at the weather report and gets rained on. In my work, however, I am constantly paying attention to the state of the weather. If there is a heavy rain, the piles of coal may collapse and make it difficult to transfer the coal. If there are strong winds, then there can be delays in unloading the coal. Also, in early

summer there is the monsoon, followed by the typhoon season, while in winter the coal storage piles have to be watched for rising temperatures, so there is no time throughout the year when we can let down our guard. Matsuura Thermal Power Station has outdoor coal yard facilities so it is a power plant that is particularly susceptible to the influence of weather. Weather is difficult to predict, and in its fickleness the weather can go on the rampage, so this is the greatest natural enemy for the person in charge of fuel. We will continue our struggle with the weather as we go forward and make our contribution to the stable supply of electric power.



Matsuura Thermal Power Station  
Operating Group  
**Miho Nomachi**





### Combustion

#### Creating Steam

Coal stored in the coal yard is finely ground into a powder by a coal pulverizer. The powdered coal is combusted by burners and water is heated in a boiler to generate high-temperature, high-pressure steam.



### Power generation

#### Generating Electricity

The high-temperature, high-pressure steam spins a turbine. The high-speed turbine generates electricity by spinning a generator.



### Environmental preservation

#### Effective Use of Ash

The coal ash produced from burning coal is effectively used as a raw material in cement and other applications (see p. 40).



## VOICE

### “Pointing and Calling” is the Basis for Operation

I am involved in operation (third shift) of Tachibanawan Thermal Power Station as an operator of outdoor environmental equipment. Operators work in the power station operating center using large 100-inch screens to track the status of every device, monitor it, and operate it. Since we use a mouse to operate the equipment, we rigorously implement “pointing and calling” during operation as a measure to prevent operating error. When we change the configuration of instruments and other such equipment, we do cross-checking with two or more personnel. We

make every effort to reduce human error as close to zero as possible. The operators also consider it important to have the awareness and the mindset of acting for the stable operation of the plant. When we conduct on-site patrols in this frame of mind, we are able to detect small problems early on, and we can prevent trouble before it happens. Going forward, all of us in the Group will work as one to address the various issues that come up and make every effort for the stable operation of the plant.



Jpec Co., Ltd.  
Tachibanawan Company  
Operating Group  
**Takahisa Masuda**



# Clean Coal Technology Contributes to Global Reduction of Carbon Emissions

The Long-Term Energy Supply-Demand Outlook formulated by the national government in July 2015 sets the goal of establishing a power source composition that balances renewable energy, nuclear power, coal-fired power and other such sources of power by the year 2030. Of these sources, coal-fired power is slated to account for one-fourth of the power source composition (approximately 26% of the volume of power generated). The stated policy is to continue using coal while achieving a balance with reduction of environmental impact.

Meanwhile, the electricity utilities as a whole are being required to achieve CO<sub>2</sub> reduction targets and further increase thermal power plant efficiency in accordance with the amended Energy Conservation Act with a view to meeting the greenhouse gas reduction objectives for 2030 determined by the government.

For our part, the J-POWER Group intends to take measures to reduce the carbon emissions from coal-fired power generation. We are doing this by the new construction of highly efficient coal-fired power stations that adopt the world's highest levels of technology, as introduced in this report, by the replacement of existing plants, and by the development of next-generation clean coal technology.

As the leading company in coal-fired power, we will also take the clean coal technology that we have cultivated in Japan and deploy it in countries around the world where the demand for electric power is anticipated to grow in the future. In this way we will contribute to global economic growth and CO<sub>2</sub> reduction, thereby realizing the J-POWER philosophy of "Harmonizing energy supply with the environment" both in Japan and in the world at large.



Executive Managing Officer

Hideki Tsukuda

- Advance Replacement Plan
- Maintain high operating efficiency and reduce CO<sub>2</sub> emissions at existing thermal power plants
- Transfer and promote the widespread application of clean coal technologies overseas

Reducing CO<sub>2</sub> emissions from coal-fired power (pp. 15-16)

Conducting research and development of next-generation low-carbon technologies (pp. 17-18)



- Implementation of the Osaki CoolGen Project
- Proceed with development of CCS (CO<sub>2</sub> capture and storage) technologies



Expanding CO<sub>2</sub>-free power generation facilities



- Measures under the Ohma Nuclear Power Plant Plan (pp. 23-26)
- Expand use of renewable energies (pp. 9-10, 19-20)

Making efforts to reduce CO<sub>2</sub> Emissions



## Coal-Fired Power and J-POWER's Role

In Japan, a country poor in natural resources, it is necessary to employ a balanced mix of various different energy sources, including coal.

Coal is more economical than oil or natural gas, which are also fossil fuels. There are also abundant reserves of coal distributed widely around the world. These are outstanding factors in terms of energy security. Coal is consequently used as the main fuel for power generation that supports the stable supply of electricity in countries everywhere. In Japan, too, coal has a very high utilization rate as a baseload power source for generating electricity, while coal-fired power generation accounts for 40% or more of electric power supplied worldwide. According to the national government's Long-Term Energy Supply-Demand Outlook, coal-fired power is supposed to make up 26% of the volume of power generated in Japan in the year 2030.

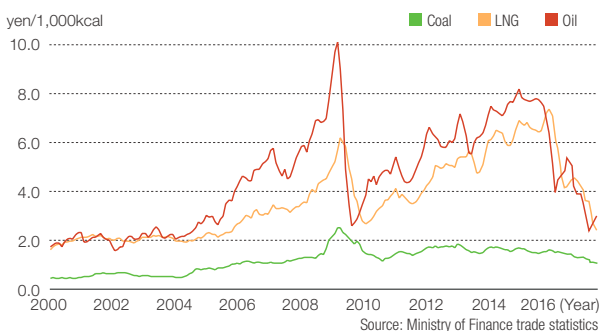
However, coal is high in CO<sub>2</sub> emissions per volume of power generated relative to other fossil fuels, which means that it is necessary to work on

lessening its environmental impact as we go on using it. The J-POWER Group is working toward the further development and introduction of still higher efficiency coal-fired power generation as a way of reducing CO<sub>2</sub> emissions. We are also pressing forward with research and development of further low-carbon technologies.

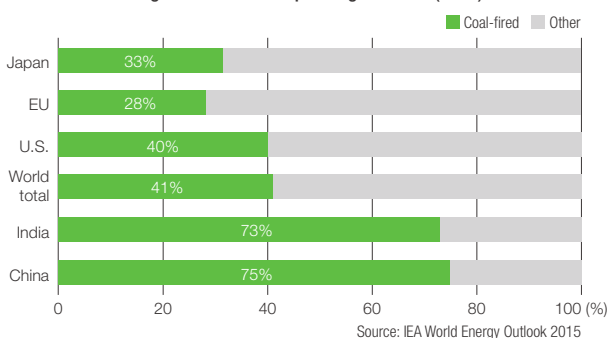
For the purpose of economic growth in the newly emerging countries, as well, where electric power demand is expected to rise in the future, the use of economically advantageous coal-fired power will be essential for the time being. The J-POWER Group will proceed with implementation of measures for CO<sub>2</sub> reduction on a global scale by disseminating the higher-efficiency coal-fired power generation technology (clean coal technology) that we have been cultivating in Japan.

Approximately 50% of the world's current CO<sub>2</sub> emissions come from China, India, and the United States. It has been estimated that if all the coal-fired power stations in those countries were to be given the power generating efficiency of the Isogo Thermal Power Station, which is at the world's highest level as shown in the below figure, then the CO<sub>2</sub> reduction impact would be approximately 1.51 billion tons, which is equal to or greater than the total annual emissions of Japan.

### Trends in Fuel Prices

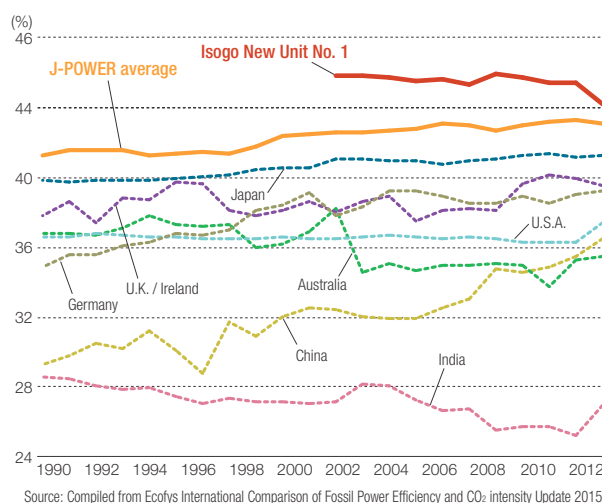


### Ratio of coal-fired generation in total power generation (2013)



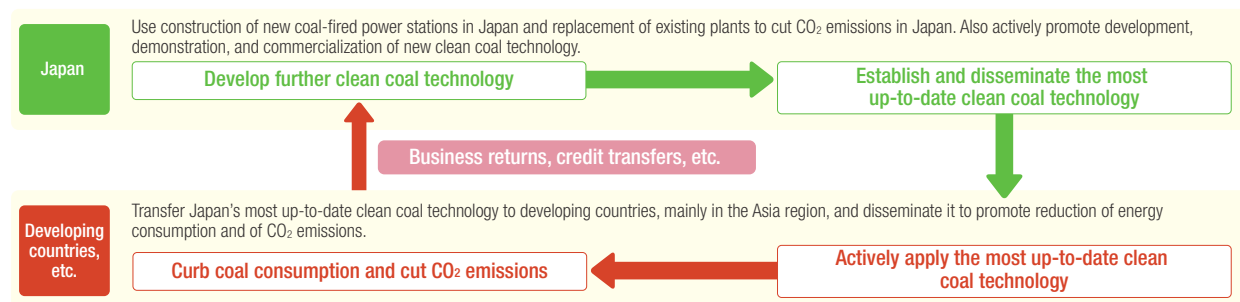
### Comparison of thermal efficiency of coal-fired power around the world (at generation point, LHV\*)

\* See note on p. 15.



### Cycle of CO<sub>2</sub> reduction on a global scale by means of higher-efficiency coal-fired power technology

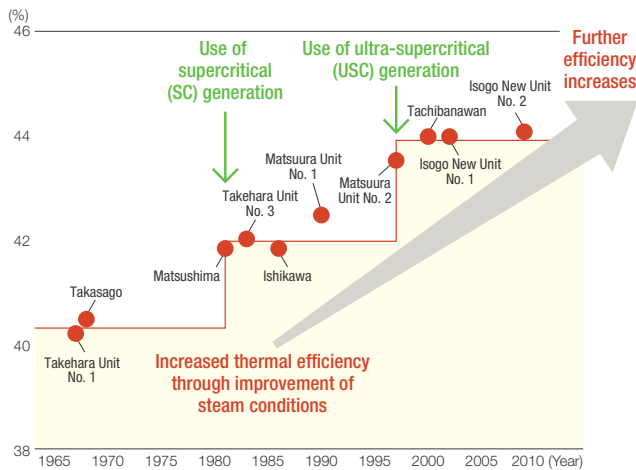
Within Japan, promote development, demonstration, and commercialization of clean coal technology. Disseminate results overseas by technology transfer and cut global CO<sub>2</sub>.



# Promoting Reduction of Carbon Emissions by Coal-Fired Power

Even since the J-POWER Group started operating Matsushima Thermal Power Station using imported coal, a first in Japan, in 1981, we have developed a number of large-scale thermal power stations using imported coal while improving power generation efficiency and reducing carbon emissions by enhancing steam conditions and increasing station size. Going forward, we will aim for further efficiency improvements by means of the introduction of high-efficiency power generation technology and the development of technology.

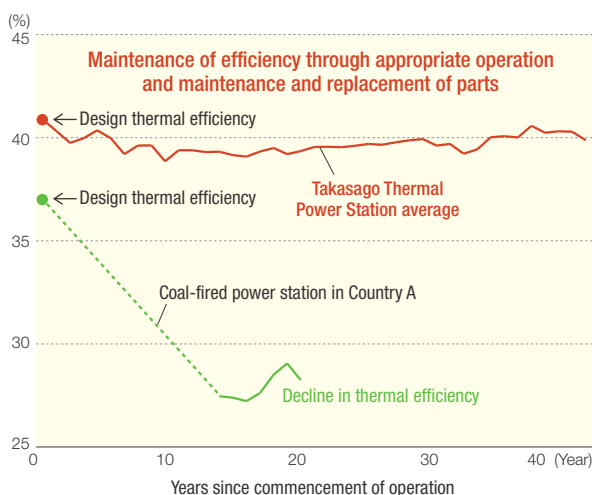
## History of improvements in generating efficiency of J-POWER coal-fired power stations (at generation point, LHV\*)



## Maintaining High-Efficiency Operation

The J-POWER Group's coal-fired power stations play an important role as economical and stable baseload power supplies. Thermal efficiency declines as generating facilities age. Operating management and facility

## Changes in thermal efficiency of Takasago Thermal Power Station (at generation point, LHV\*)



Source: Compiled by J-POWER with reference to Federation of Electric Power Companies of Japan information materials

updates make it possible to continue operating with high levels of thermal efficiency. One example of this is Takasago Thermal Power Station, which even now, maintains nearly the same power generation efficiency more than 40 years after it began operating.

## Replacement Plans and Promotion of New Power Plant Construction

The replacement of aging power stations leads to higher power generation efficiency and environmental preservation through the introduction of the latest technologies. Isogo Thermal Power Station, which underwent replacement, now has the latest ultra-supercritical (USC) generating technologies and boasts power generation efficiency at the world's highest levels. Sulfur oxide, nitrogen oxide, soot and dust have been reduced to levels far below those of thermal power stations in other leading developed countries, becoming the world's cleanest coal-fired power station. (see p. 16)

The J-POWER Group is implementing replacement of existing facilities, following work on Isogo Thermal Power Station with work on Takehara Thermal Power Station. At Takasago Thermal Power Station, we are carrying out the procedure for an environmental impact evaluation in preparation for replacement work.

We will also engage in construction of new coal-fired power stations, introducing high-efficiency power generation technology and making use of operations and maintenance methods cultivated in Japan, to contribute to the reduction of carbon emissions from coal-fired power generation. At present, we are undertaking two joint projects with other companies, and the plans for Kashima Thermal Power Station Unit No. 2 and Nishiokinoyama Power Station (provisional name) are undergoing the procedure for environmental impact assessment. (see p. 43.)



Takasago Thermal Power Station (Hyogo Prefecture)

\* At generation point: the power generation efficiency calculated by using the amount of electric power at the point of generation (amount of electric power at the time of generation by the generator).  
 \* At transmission point: the power generation efficiency calculated by using the amount of electric power at the point of transmission (amount of electric power at point of generation minus internal power (power used in the generation process)).  
 \* The amount of generated heat calculated as the state of the water included in the combustion gases is referred to as the higher heating value (HHV), and the amount of generated heat calculated as the state of the steam that water evaporates into is referred to as the lower heating value (LHV). At the LHV, the heat to vaporize water is consumed, and therefore the amount of heat generated is lower than HHV by that amount.

## Takehara Thermal Power Station Replacement Plan:

Pursuing the World's Highest Levels as USC Technology

The J-POWER Group is carrying out a plan to replace Takehara Thermal Power Station Units No. 1 (250 MW) and No. 2 (350 MW), which went into operation some 40 years ago, with a New Unit No. 1 (600 MW). The environmental assessment procedures have been completed, and construction began in March 2014, with operations scheduled to begin in 2020.

By introducing the latest power generation technologies and environmental pollution control equipment, we will create a coal-fired power station with the world's highest-level ultra-supercritical (USC) technologies.

### New Unit No. 1 Facilities

- 1 Boiler Building
- 2 Flue-gas denitrification system
- 3 Electrostatic precipitator
- 4 Flue-gas desulfurization system
- 5 Chimney stack
- 6 New indoor coal yard
- 7 Existing indoor coal yard
- 8 New Unit No. 1 and Unit No. 3 coal unloading and transport units



Rendering of completed Takehara Thermal Power Station Replacement Project (Hiroshima Prefecture)

### World's Most Efficient Power Generation Technologies

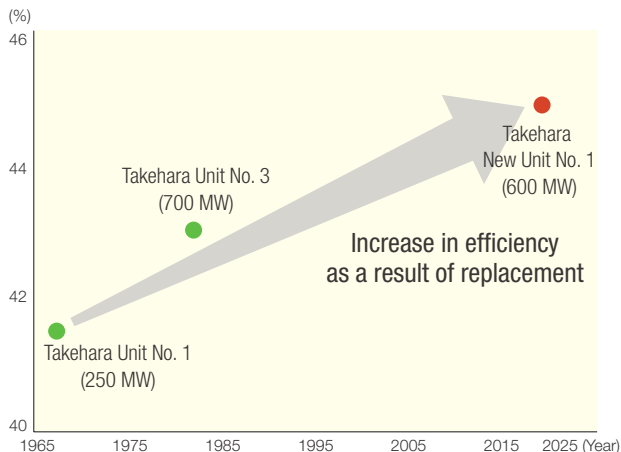
The new Unit No. 1 at Takehara Thermal Power Station will produce steam conditions at the world's highest level and will be one of Japan's most efficient power stations. Raising power generation efficiency will reduce the consumption of coal, the station's energy source, making it possible to curtail CO<sub>2</sub> emissions and substantially reduce carbon.

### Clean Environmental Technology at the World's Highest Level

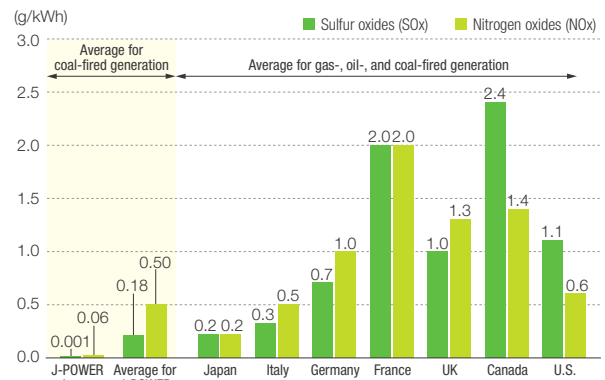
The new Unit No. 1 at Takehara Thermal Power Station has been upgraded with state-of-the-art flue-gas denitrification system, flue-gas desulfurization, and electrostatic precipitator. This gives it the capability to greatly reduce emissions of nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), and soot and dust. Isogo Thermal Power Station, which is already equipped with similar equipment, boasts emissions that are extremely low compared to other thermal power plants in Europe, the U.S., and Japan.

#### Comparison of Power Generation Efficiency after Replacement (at generation point, LHV\*)

\* See note on p. 15.



#### International Comparison of SO<sub>x</sub> and NO<sub>x</sub> Emissions Intensity for Thermal Generation



Overseas: Emissions volume: OECD StatExtracts

Volume of power generated: IEA Energy Balances of OECD Countries 2014 Edition

Japan: Materials published by The Federation of Electric Power Companies of Japan (10 electric power company and J-POWER)

Figures for Isogo and J-POWER are formulated from results for 2015

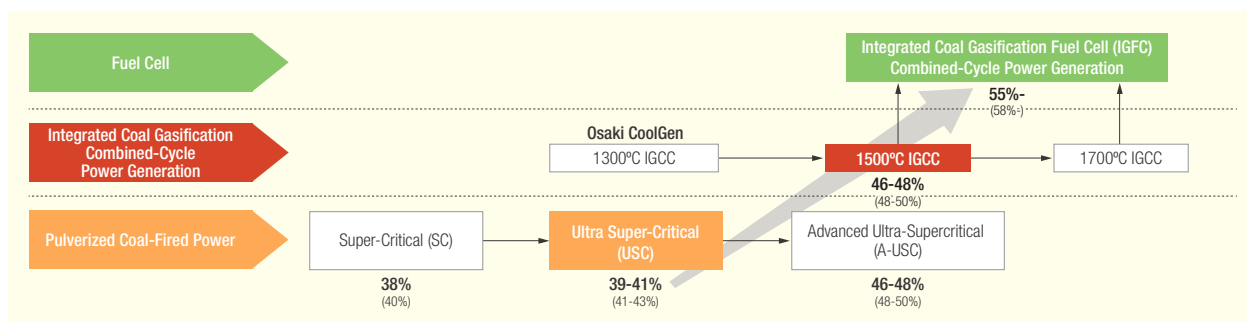


# Research and Development of Next-Generation Low-Carbon Technologies:

For the Sake of the Earth's Future

The J-POWER Group is pursuing cutting-edge clean coal technologies and employing USC power generation at the world's highest levels, and by conducting further research and development, we are promoting additional reductions in carbon from coal-fired power. We are committed to continuing active research and development in Japan and overseas on next-generation, higher-efficiency coal-fired power generation that can reduce CO<sub>2</sub> emissions through even higher power generation efficiency, CCS to capture and store CO<sub>2</sub> produced by power generation so it is not released into the atmosphere, and other technologies.

**Thermal Efficiency Improvement by Technical Development (At transmission point; upper row is HHV\*, lower row is LHV\*)** \* See note on p. 15.



## Higher-Efficiency Coal-Fired Power Generation Technologies

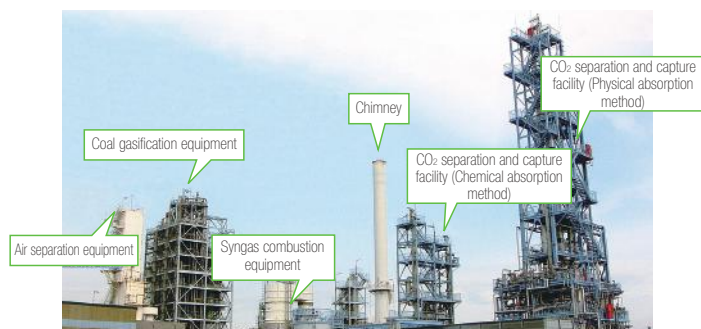
The higher-efficiency coal-fired power generation technologies on which the J-POWER Group is conducting R&D include integrated coal gasification combined-cycle (IGCC) power generation, which combines conversion of coal into a flammable gas for combustion in a gas turbine with a steam turbine that uses the waste heat; integrated coal gasification fuel cell (IGFC) combined-cycle power generation, which adds triple-combined-cycle generation to fuel cell power generation using IGCC; and advanced ultra-supercritical power generation, which improves USC steam conditions even further. With regard to IGCC, which has the closest affinity with CO<sub>2</sub> separation and recovery, trial operations at a pilot plant facility were conducted for more than 10 years starting in 2002 under the EAGLE Project in collaboration with the New Energy and Industrial Technology Development Organization (NEDO) (the project ended in June 2014). The knowledge and results obtained from the project will be used, and the technology is entering the testing phase under the Osaki CoolGen Project.

## CO<sub>2</sub> Capture and Storage (CCS) Technology

CO<sub>2</sub> capture and storage (CCS) separates and collects CO<sub>2</sub> produced from the combustion of coal and other fossil fuels without releasing it into the atmosphere and transports the CO<sub>2</sub> for storage deep in the earth. R&D on CCS is being conducted around the world as a promising technology for achieving substantial reductions in CO<sub>2</sub> emissions.

At this time, there are issues of lower power generation efficiency during the separation and collection phase as well as securing suitable sites and creating infrastructure and legal systems in the transport and storage phases, and as a result, CCS is not in practical use anywhere in the world. The J-POWER Group is making preparations for a separation and collection technology demonstration as a part of the Osaki CoolGen Project based on the results from the EAGLE Project.

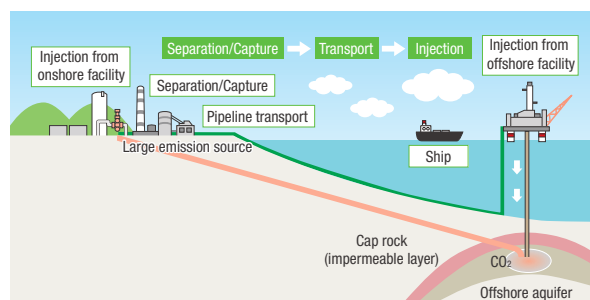
J-POWER participated in the Callide Oxyfuel Combustion Project, a joint Japanese-Australian public and private sector initiative. As part of this project, oxyfuel combustion tests and CO<sub>2</sub> storage tests were conducted at the Callide A Coal-Fired Power Station, and in light of those tests, we will go on taking steps to accumulate further technology and knowledge.



External view of EAGLE Pilot Plant test facility (Kitakyushu City)

The EAGLE Project tested a physical collection method and a chemical collection method for separating and collecting CO<sub>2</sub>, and information was gained on the properties of each.

### CCS Concept





## Osaki CoolGen Project: Seeking IGCC at the World's Highest Levels

In order to curtail CO<sub>2</sub> emissions from coal-fired power generation beyond what is possible with current clean coal technologies, the Energy Basic Plan expresses expectations for development and application of next-generation, higher-efficiency coal-fired power generation technologies such as IGCC as well as research and development in the pursuit of application of CCS technologies.

The J-POWER Group is conducting the Osaki CoolGen Project in collaboration with Chugoku Electric Power Co., Inc. to test these advanced clean coal technologies. For the project, an oxygen-blown IGCC trial power station with output of 166 MW is being built at the Chugoku Electric Power Osaki Power Station, and tests will be conducted in three phases.

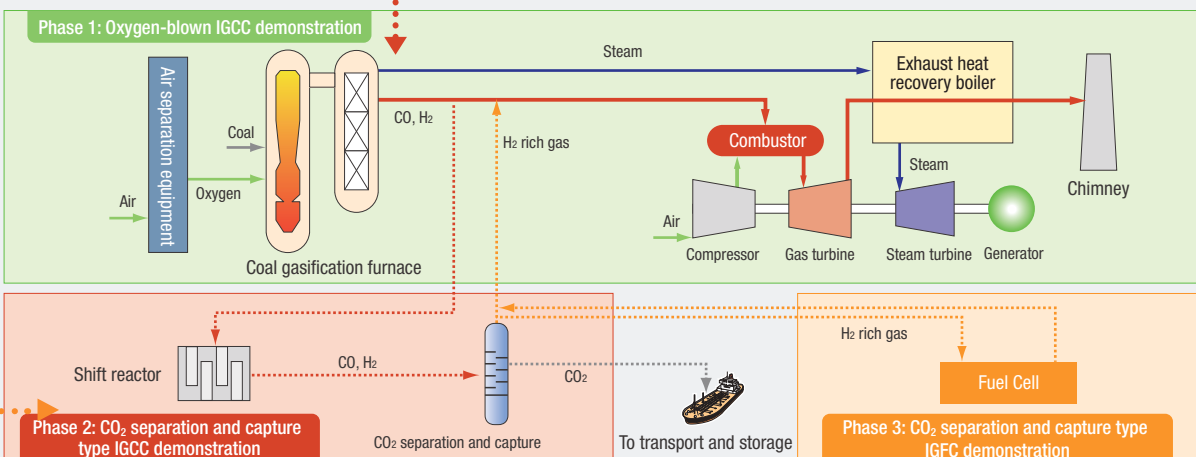
### Osaki CoolGen Project Schedule

		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Phase 1	Oxygen-blown IGCC demonstration	Design, manufacture, installation					Proving trials					
Phase 2	CO <sub>2</sub> separation and capture type IGCC demonstration					Design, manufacture, installation			Proving trials			
Phase 3	CO <sub>2</sub> separation and capture type IGFC demonstration							Design, manufacture, installation		Proving trials		

J-POWER and Chugoku Electric Power established Osaki CoolGen Corporation in 2009 to carry out the project. The "CoolGen" name is derived from the Cool Gen Plan proposed to carry out the Japanese government's Cool Earth-Innovative Energy Technology Program and was created from "cool" and "generation." At present we are running operational trials of equipment to prepare for the start of the first phase of testing in the 2016 fiscal year. We also started on the second phase CO<sub>2</sub> separation and capture type IGCC demonstration in April 2016, and we will move steadily forward on the project with a view to starting trials during the 2019 fiscal year.



Planned Completion of Testing Facilities (Osakikamijima-cho, Hiroshima Prefecture)



# Renewable Energy

We are actively taking measures concerning renewable energy under the Energy Basic Plan, which positions renewable energy as a promising domestic energy source that contributes to ensuring energy security. The J-POWER Group's renewable energy initiatives are diverse and include contributing to stable electricity supplies through existing hydroelectric power, wind power, and geothermal power stations, for which we have the second-highest shares among each type of domestic generation facilities; developing new power sources such as wind and geothermal power; and conducting research and development on offshore wind power. Renewable energy is a CO<sub>2</sub>-free energy source that does not produce greenhouse gases such as CO<sub>2</sub> at the time of generation. The J-POWER Group is moving forward with the Ohma Nuclear Power Plant plan and expanding the use of renewable energy with the aim of increasing CO<sub>2</sub>-free energy sources.



## Wind Power

The J-POWER Group made an early entry into the wind power business with the start of operation of the Tomamae Winvilla Wind Farm in December 2000. We currently have 21 wind farms, total number of 241 units, with a total generating capacity of approximately 430 MW located nationwide (as of June 2016).

We are conducting our business by making full use of the technology and know-how we have cultivated to date in carrying out construction, operation, and maintenance of the hydroelectric and thermal power stations located in every region of Japan as well as of transmission lines. The strengths of our business are in using integrated implementation systems that cover everything from wind surveys to planning, construction, operation, and maintenance. In future, we will continue promoting the new development of wind power stations while also making every effort for safe operation and increased operating rates in those wind power stations that are in operation.

There are high expectations for offshore wind power in Japan, which is surrounded by seas on all four sides. J-POWER is conducting a demonstration project relating to offshore wind power in waters off Kitakyushu City in Fukuoka Prefecture (outsourced and joint research for NEDO\*) and consistently conducting research, deepening our technical knowledge regarding offshore wind power generation.

\* The New Energy and Industrial Technology Development Organization.



Kaminokuni Wind Farm (Hokkaido)



Assembling a wind turbine (the vane portion)

### VOICE

#### Working to Enhance Maintenance Skills at Wind Power Stations

At wind power stations, we periodically shut down the turbines to perform inspections and repairs from the perspective of preventive maintenance. If inspections and repairs are performed on a windy day, not only do we lose power generating opportunities but the work is dangerous, so we plan inspections and repairs for periods when the winds tend to be weak. On workdays we monitor wind conditions and coordinate processes such as turbine shutdown times and the number of units to be worked on so we can maximize power generation by the wind.

A large turbine with individual generating capacity of 2.4 MW, a first for J-POWER, was installed at the Kaminokuni Wind Farm,

which went online in 2014. Responding to a breakdown required us to make repairs in locations where we had no experience, but the maintenance workers combined their knowledge to complete the repairs.

Now, two years after the start of operations, the turbine is steadily generating power. I will continue the daily process of repeated trial and error to acquire worksite knowledge and enhance my maintenance skills so that the wind farm, which has established deep local ties, can continue operating long into the future.



J-Wind Service Co., Ltd.  
Manager, Kaminokuni Office

**Koji Mima**



## Geothermal Power

Geothermal power is a CO<sub>2</sub>-free power source that emits almost no CO<sub>2</sub> at the time of generation and is also a renewable energy source capable of providing a stable supply of electricity throughout the year without being affected by weather. For these reasons, there are high expectations for the future development of geothermal power.

The J-POWER Group joined with Mitsubishi Materials Corporation and Mitsubishi Gas Chemical Company, Inc. to establish Yuzawa Geothermal Power Corp. with the aim of building the Wasabizawa Geothermal Power Stations in Yuzawa City, Akita Prefecture in April 2010. Construction is currently under way with commercial operations scheduled to begin in May 2019. We are also addressing the age-related deterioration of facilities at the existing Onikobe Geothermal Power Station in Osaki City, Miyagi Prefecture (output: 15 MW) by planning facility updates (23 MW-class output) within the same grounds.



Onikobe Geothermal Power Station (Miyagi Prefecture)








## Promoting the Biomass Mixed Combustion

Wooden biomass and sewage sludge are carbon neutral biomass that absorb and release equal amounts of CO<sub>2</sub> over their life cycles, but in Japan, much of these resources remains unused.

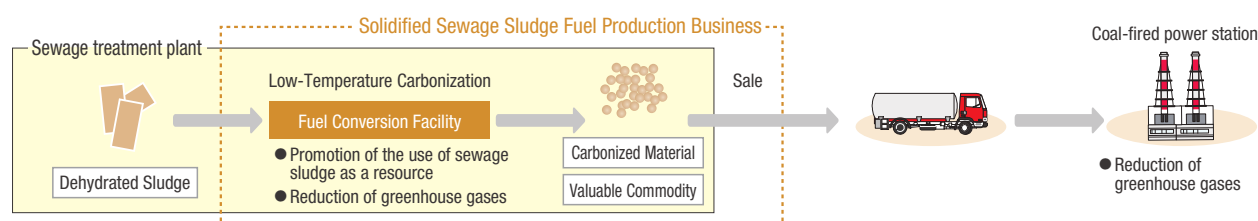
The J-POWER Group is reducing the carbon emissions of coal-fired power stations by utilizing unused biomass for mixed combustion at power stations.

### Status of biomass mixed combustion initiatives

Biomass resources	Wood		Sewage sludge		Carbonization of ordinary waste for use as fuel
	Chips	Pellets	Low-temperature carbon fuel	Oil-desiccated fuel	
Examples of biomass fuels					
Characteristics of biomass fuels	Scrap construction timber is chipped and used. Comprise 50 to 70% of the calorific value of coal.	Forest outcut is dried, ground, and formed into pellets. They have about 70% of the calorific value of coal.	Sewage sludge is carbonized at a lower temperature than the incineration temperature used in conventional processing in order to manufacture fuel that produces less N <sub>2</sub> O, a greenhouse gas, than conventional processing. The fuel produces little odor and has 50-70% of the calorific value of coal.	Sewage sludge and waste cooking oil are mixed and heated to remove the water content and produce fuel. This fuel has a calorific value about the same as that of coal.	General waste is carbonized to create a fuel able to be stored for long periods. It has about half the calorific value of coal.
Sites for the production of biomass fuel	Nagasaki City, Nagasaki Prefecture	Kobayashi City, Miyazaki Prefecture*	(1) Hiroshima City, Hiroshima Prefecture* (2) Kumamoto City, Kumamoto Prefecture* (3) Osaka City, Osaka Prefecture*	Fukuoka City, Fukuoka Prefecture	Saikai City, Nagasaki Prefecture*
Mixed combustion in coal-fired power stations	Matsuura Thermal Power Station	Matsuura Thermal Power Station	(1) Takehara Thermal Power Station (2) Matsuura Thermal Power Station (3) Takasago Thermal Power Station	Matsuura Thermal Power Station	Under consideration

\* Sites at which J-POWER is also involved in the manufacture of biomass fuel.

### Conceptual diagram of the biomass fuel business (using the solidified sewage sludge fuel production business as an example)







# Power Transmission, Substation, and Communications Facilities

J-POWER's transmission facilities do more than just send electricity to where there is demand within each power utility's business area. They also utilize extra-high-voltage AC and DC transmission lines to link Honshu with Hokkaido, Shikoku, and Kyushu, interconnecting the electrical grids of different regions. The Sakuma Frequency Converter Station, which enables the transmission of electricity between the different frequencies of eastern and western Japan, and the Hokkaido-Honshu Electric Power Interconnection Facility, which links Honshu with Hokkaido via DC transmission lines, support power interchange over wide areas of Japan and contribute to reducing needed spare electric power and maintaining frequencies.

J-POWER has also constructed a nationwide high-reliability information and telecommunications network that uses microwave radio circuits, optical lines, and other communications lines operated by the Group to operate the electric power grid and conduct centralized, remote control of unmanned hydroelectric power stations and dams. These facilities are installed in various environments including mountainous regions and urban areas and are exposed to extreme weather conditions including wind, snow, lightning, and seawater. Consequently, we conduct daily patrols and regular inspections to discover irregularities at an early stage and prevent facility accidents before they can occur.



**Honshu-Shikoku Interconnection** (Okayama and Kagawa Prefectures)  
500,000-volt transmission lines across the Seto Inland Sea to connect Honshu and Shikoku. These transmission lines are connected to backbone transmission lines in Honshu and Shikoku, contributing to stable electric supplies in western Japan.



**Sakuma Frequency Converter Station** (Shizuoka Prefecture)  
This converter station enables the transmission of electricity between the different frequencies of eastern Japan (50 Hz) and western Japan (60 Hz). It is the world's first electricity business frequency converter station built to support efficient electric power operations.



**Takatsue Radio Relay Station** (Fukushima Prefecture)  
A microwave radio relay station that links power stations, transformer stations, and other facilities. The station is located on the top of a mountain, where environmental conditions are extreme, but it is highly reliable in order to ensure uninterrupted communications even in the event of a disaster.

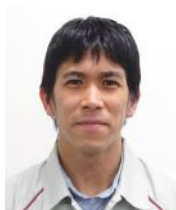
## VOICE

### Providing for a Stable Supply of Electricity by Extensive Construction of Power Transmission Facilities

At this location, we manage Hokkaido-Honshu HVDC interconnection Line, which is the only inter-area connection line linking Honshu and Hokkaido. Since Hokkaido-Honshu HVDC interconnection Line has been in operation for approximately 40 years, and since the line passes through coastal areas, some spans have seen deterioration of the wire so that construction for wire replacement is necessary. This involves construction over a wide area and by a wide range of people, which requires drafting plans with an awareness of scheduling, requesting landowner cooperation, going through authorization procedures, and so on. The result of obtaining the understanding and cooperation of the people concerned without delays is that construction can proceed according to plan, and we contribute to the stable supply of power.

Transmission System & Telecommunications Department  
North Regional Transmission System & Telecommunications Center  
Mutsu Transmission Line Engineering Office

**Masayoshi Nakajima**



## VOICE

### Maintaining and continuing stable operation of the Hokkaido-Honshu Electric Power Interconnection Facility and related facilities

This Substation Group was newly established as part of the separation of power generation and transmission. We do maintenance on the transmission facilities at the Hakodate AC/DC Converter Station, and carry out outage coordination and other such dispatching services on the Hokkaido-Honshu Electric Power Interconnection Facility and Tokachi Trunk Line. In order to maintain and continue the stable supply of electric power, it is also necessary to respond rapidly and flexibly to changes in the environment or other conditions, and for that, teamwork is essential. We make a regular practice of caring for the communication with members and other concerned people and we make every effort toward the stable operation of the Hokkaido-Honshu Electric Power Interconnection Facility.

Transmission System & Telecommunications Department  
North Regional Transmission System & Telecommunications Center  
Substation Engineering Group

**Yuuichi Ishida**



## VOICE

### Securing propagation paths in demanding environments

J-POWER's wireless and optical communication circuits are indispensable facilities for the maintenance and operation of power generation plants, substations, and transmission lines. The maintenance area covered by this group extends from mountainous areas to urban areas. In mountainous areas it is mature trees and in urban areas it is high-rise buildings and other such structures that may block wireless propagation paths. Therefore we trim trees, conduct studies at high-rise building construction locations, and so on in our efforts to secure propagation paths. In doing so, we show care for the surrounding environment and do our work in ways that will minimize the impact as much as possible.

Transmission System & Telecommunications Department  
East Regional Transmission System & Telecommunications Center  
Telecommunication Engineering Group

**Mai Satou**





## Overseas Business

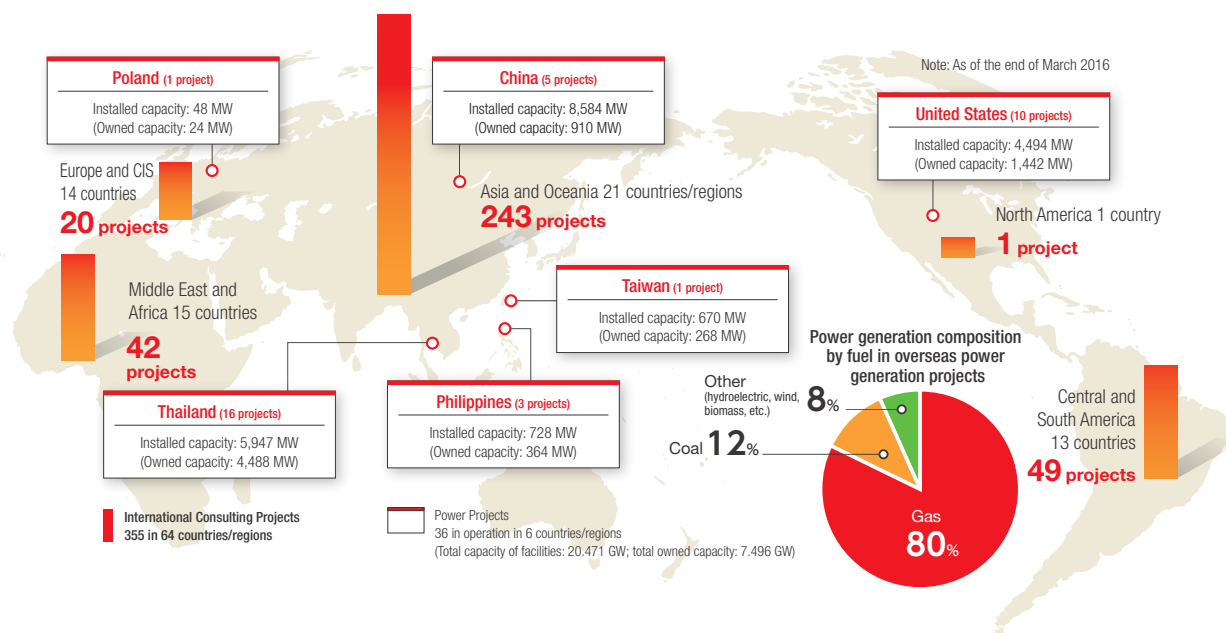
The J-POWER Group's corporate philosophy calls on us to "play our part for the sustainable development of Japan and the rest of the world." Taking this as our basic approach, and leveraging the accomplishments and know-how we have acquired through a half-century of overseas operations, we are engaging in international consulting projects, which involve technical cooperation to develop power sources and protect the environment, and in overseas power generation projects, which involve our participation in businesses through the investment of capital and technology.

### Overseas Business Initiatives

The purpose of the J-POWER Group's overseas consulting business is to provide cooperation on electric power generation technology to emerging countries and so contribute to the international community. Since implementing our first project in 1962, we have been involved in 355 projects in 64 countries (as of the end of March 2016). In the overseas power generation business, we have 36 electric power generation facilities in six countries and regions with a total output of 20.47 GW. Our owned share of this output amounts to 7.50 GW (as of the end of March 2016). We are implementing numerous projects in Thailand in particular. With

U-Thai Power Station No. 2 system initiation of operation in December 2015, the J-POWER's owned share of Thailand's electric power supply came to approximately 10%. In Indonesia, we are building a power plant (1.00 GW × 2) with ultra super critical (USC) power generation technology, which has a low environmental impact.

The J-POWER Group will aim to use the clean coal technology we have in Japan to simultaneously achieve a contribution to growth primarily in Asia and to reduction of environmental burden.



### VOICE

#### Importance of Quality and Safety Management

J-POWER has been engaging in overseas consulting business in various different countries over a half-century so far. In executing these projects in other countries, it is imperative not only that we conduct quality management of the equipment, but also that we pay the greatest attention to safety management during construction. However, Japanese approaches do not necessarily work in other countries, and there are even some countries where, as a matter of the national character, no interest whatsoever is shown in worker safety. Under circumstances like these, the engineers working on a site carry out their assigned duties in ways

that implicitly exercise leadership so that the importance of quality management and safety management become thoroughly familiar on the local scene. We consider it the mission of our engineers to make the J-POWER spirit a pervasive presence in those other countries.

Project Development & Engineering Office,  
International Business Development Department  
**Kazuyuki Yamada**





Report

# The Ohma Nuclear Power Plant

## Seeking Trusted Power Plants

### Introduction

The J-POWER Group is engaged in construction of the Ohma Nuclear Power Plant in Ohma-machi, Shimokita-gun, Aomori Prefecture.

From the perspective of steady energy supply, nuclear power is an essential and indispensable source of energy for our island country with poor natural resources. It is also a source of energy that provides an effective countermeasure to global warming.

Furthermore, nuclear power is expected to continue fulfilling a constant role in Japan's electric power supply because nuclear power can be an effective source of energy with adequate safety management measures, needless to say, should be taken.

We have proceeded with the Ohma Nuclear Power Plant project in accordance with national government policy, with the understanding and cooperation of Aomori Prefecture and the local residents of Ohma-machi, Kazamura-mura and Sai-mura, and with the necessary permits and approvals in hand. It is a key power plant that will perform crucial roles both in the stable provision of a highly safe and reliable supply of electric power

achieved through the use of cutting-edge technology and the nuclear fuel cycle for reuse of plutonium and uranium obtained through reprocessing of spent fuel.

J-POWER has taken the lessons of the accident at the Fukushima Daiichi Nuclear Power Station to heart. We will proceed with steady implementation of safety measures and practices in light of the new safety standards, making the fullest use of the experiences and the latest technical findings. In this way, we will build power plant that earns the trust of local and regional communities.

#### Plan Overview

Location		Ohma-machi, Shimokita-gun, Aomori Prefecture
Construction begins		May 2008
Commercial operation begins		To be determined
Output		1,383 MW
Reactor	Type	Advanced boiling water reactor (ABWR)
	Fuel: Type	Enriched uranium and uranium-plutonium mixed oxide (MOX)
	Fuel assembly	872 elements

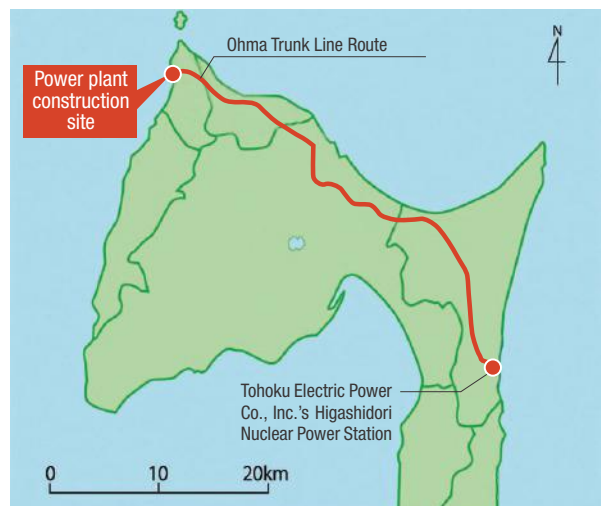


Diagram of Ohma Nuclear Power Plant location (Aomori Prefecture)



Panoramic view of construction work on Ohma Nuclear Power Plant (Aomori Prefecture)

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## Review of Compliance with New Safety Standards

In December 2014, J-POWER submitted an application for permission for alternation of reactor installment license and an application for construction plan approval to the Nuclear Regulatory Authority at the Ohma Nuclear Power Plant. The application is under review by the authority.

These applications are procedures pursuant to The Law on the

Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (Nuclear Reactor Regulation Law) and are part of the safety review process for the Ohma Nuclear Power Plant.

Going forward, we will exert our maximum effort to obtain the necessary permissions.

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## Pursuing Safety Improvements

We are reinforcing safety measures at the Ohma Nuclear Power Plant based on the latest knowledge including lessons learned from the accident at the Fukushima Daiichi Nuclear Power Station and the results of the geological investigations of the plant site and neighboring areas that have been conducted continuously since permission to build this nuclear reactor was obtained in April 2008.



Operation training simulator

We are strengthening earthquake and tsunami countermeasures and taking measures to prevent any damage to the reactor core and reactor vessel even in the case of a severe accident. We are also implementing all measures in current construction in anticipation of a terrorism incident such as the intentional crash of an aircraft.

Meanwhile, J-POWER have initiated full-scale operation of the simulator for plant operators trainings. We have been skilled up operational ability, and acquired knowledge of accident management by simulated trainings.

Moreover, we are conducting programs to raise awareness of safety (activities to foster safety culture) with "raising awareness of each individual to consider safety" as their theme, including issuing messages from the president, holding presentations and discussions of best practices and providing opportunities for executives to exchange opinions.

Going forward, we will not allow ourselves to be satisfied with simply complying with regulatory requirements, but will undertake voluntary safety measures and strive tirelessly to enhance safety.

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## Harmony with the Local Community

We are pursuing a variety of initiatives at the Ohma Nuclear Power Plant construction site to deepen the understanding of the Ohma Nuclear Power Plant and energy and to foster a greater sense of familiarity with J-POWER by members of the local community.

We issue monthly newsletters to all households in the region, conveying information on local issues as well as the construction plan, status of construction and measures to reinforce safety. In addition, all plant personnel make individual visits to local residences twice each year. We sponsor science classes and cooperate with schools to conduct field trips of geology for elementary and junior high school students and conduct energy education for high school students, providing continuous support for education.

As a member of the local community, we participate in local festivals and other events and conduct programs such as cleanup campaigns

in towns. Going forward, we will continue to engage in a wide range of activities while placing particular importance on our relationships with local residents.



Tour for local high school students on Ohma Nuclear Power Plant construction site

# Measures to Reinforce Safety for Ohma Nuclear Power Plant (Overview)

To confirm compliance with the new safety standards, in December 2014 J-POWER submitted an application for permission for alteration of reactor installment license and an application for construction plan approval to the Nuclear Regulatory Authority summarizing the details of measures to reinforce the safety of the Ohma Nuclear Power Plant.

We will implement all measures during construction to ensure that we build a safe power plant.

## Measures to Reinforce Safety

### 1 Measures to Design Basis Accidents

#### Earthquake Proofing

We adopted a new standard seismic motion based on the latest findings and other factors. The adopted standard seismic motion is a maximum acceleration of 650 cm/s<sup>2</sup> (previously 450 cm/s<sup>2</sup>). Earthquake-proof designs for building and other structures were adopted based on this standard seismic motion.

#### Tsunami Countermeasures

We also adopted the following design basis tsunami based on the latest findings. We estimated that the maximum height of a tsunami at the site based on the following design basis tsunami is T.P. +6.3 m (previously +4.4 m), but the elevation of the power plant site is T.P. +12 m, and

consequently, there is no likelihood of a tsunami reaching and following into the site. From the perspective of enhancing confidence even further, we will implement independent measures including construction of seawalls and installation of waterproof exterior doors and so on.

### Measures to Prevent Damage from External Impact

- (1) We assessed the impact of natural phenomena (volcanic eruptions, tornados, external fires, etc.) on the nuclear power station.

#### Fire Protection

- (2) We will enhance fire protection measures including use of fire-resistant cables and construction of firewalls.

#### Internal Flooding Resistance Measures

- (3) We will reinforce resistance measures against leaks to protect facility functions in anticipation of damage to pipes within the facility.

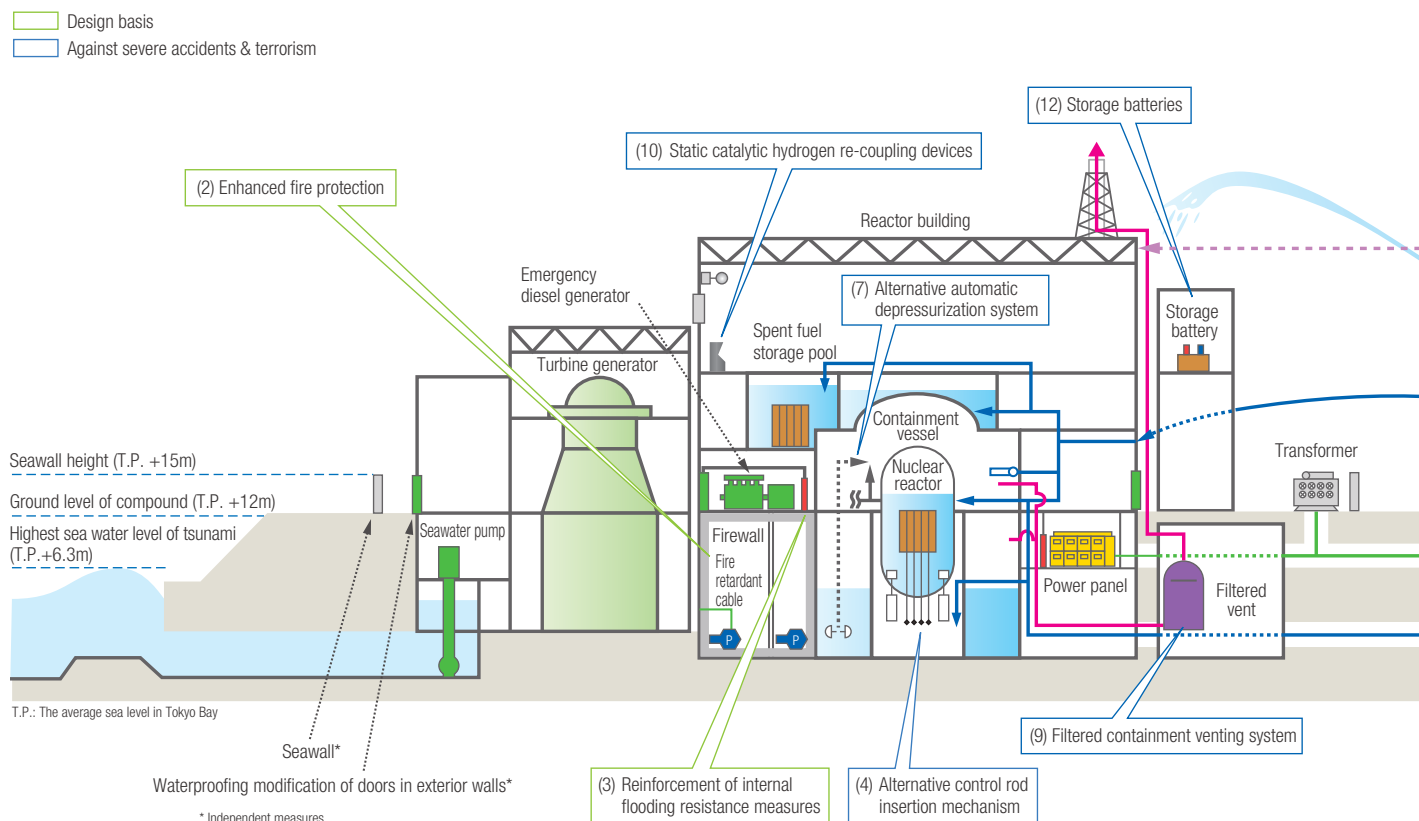
### 2 Against Severe Accidents & Terrorism

To prevent damage to the nuclear reactor and containment vessel, we will implement the following measures.

#### Measures to Prevent Core Damage and Containment Vessel Failure

- (4) Even in the case where nuclear reactor emergency shutdown equipment does not operate, an alternative control rod insertion mechanism that can be operated by separate circuits or manually will be installed to enable shutdown of the nuclear reactor.

### Image of Measures to Reinforce Safety at Ohma Nuclear Power Plant



- (5) Permanent alternative water injection facilities will be installed to cool the nuclear reactor, containment vessel, and spent fuel storage pool.
- (6) Mobile alternative water injection pumps will be available to cool the nuclear reactor, containment vessel, and spent fuel storage pool.
- (7) An alternative automatic depressurization system will be installed to reduce pressure in the nuclear reactor.
- (8) Heat exchanger units will be installed to release generated heat.
- (9) A filtered containment venting system\*<sup>1</sup> will be installed to prevent damage from excess pressure in the containment vessel.
- (10) Static catalytic hydrogen re-coupling devices\*<sup>2</sup> will be installed to prevent damage from hydrogen explosions in the reactor building.
- (11) Water spraying facilities will be installed to control the dispersion of radioactive material outside the power station.

### Reinforcement of Power and Water Supplies

- (12) To ensure power supplies, air-cooled emergency generator and gas turbine generator will be installed, the capacity of existing storage batteries will be increased, additional batteries will be installed, and a power supply vehicle will be made available.
- (13) Water storage tanks will be installed to secure a water source necessary for resolution of severe accidents.

### Insuring Support Functions of the Control Room

- (14) An emergency response office will be created to respond to severe accidents.
- (15) Communications facilities will be reinforced to ensure communications with necessary locations inside and outside the power station.
- (16) Mobile monitoring posts will be established to monitor, measure and record the concentration and radioactivity of radioactive material in the vicinity of the power station.

### Countermeasures against Intentional Aircraft Crashes

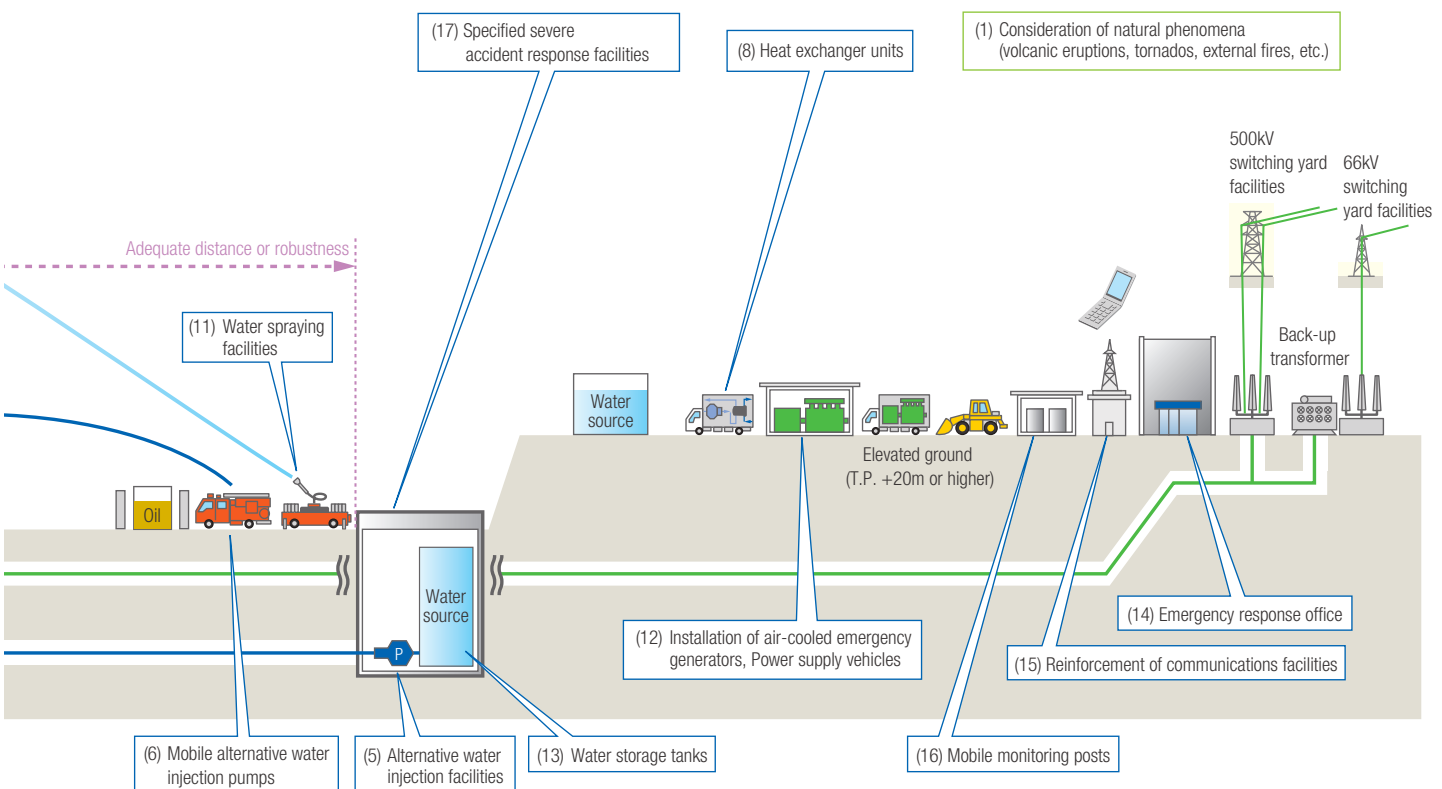
- (17) Specified severe accident response facilities will be established to control the abnormal external release of radioactive material in the event of the intentional crash of a large aircraft into the reactor buildings or other terrorist attacks.

#### \*1. Filtered containment venting system:

A system that controls the release of radioactive material and releases steam from the containment vessel into the atmosphere in order to prevent damage to the containment vessel in the event of an excessive increase in pressure inside the nuclear reactor containment vessel.

#### \*2. Static catalytic hydrogen re-coupling devices:

A system that uses a catalyst to cause a chemical reaction between hydrogen molecules and oxygen molecules to generate water vapor in order to prevent an increase in hydrogen concentration that could result in a hydrogen explosion in the event that damage to the reactor core occurs, causing hydrogen to leak inside the reactor building and the concentration of hydrogen to increase.



# Business Operations That Fulfill Social Responsibility



The J-POWER Group undertakes business operations that fulfill our corporate social responsibility (CSR) by continuously reinforcing the foundations of business operations including management and human resources and efforts to achieve mutual benefit with local communities and society as well as environmental management in accordance with our corporate principle of contributing to the sustainable development of Japan and the rest of the world in response to changes in social conditions and the business environment.

## Foundations of Business Operations

### Corporate Governance

On October 30, 2015, J-POWER established a Basic Policy on Corporate Governance that prescribes specific measures with respect to the Corporate Governance code. We will engage in continuing measures to further improve our corporate governance with the aim of achieving sustainable growth and medium to long-term increase in corporate value.

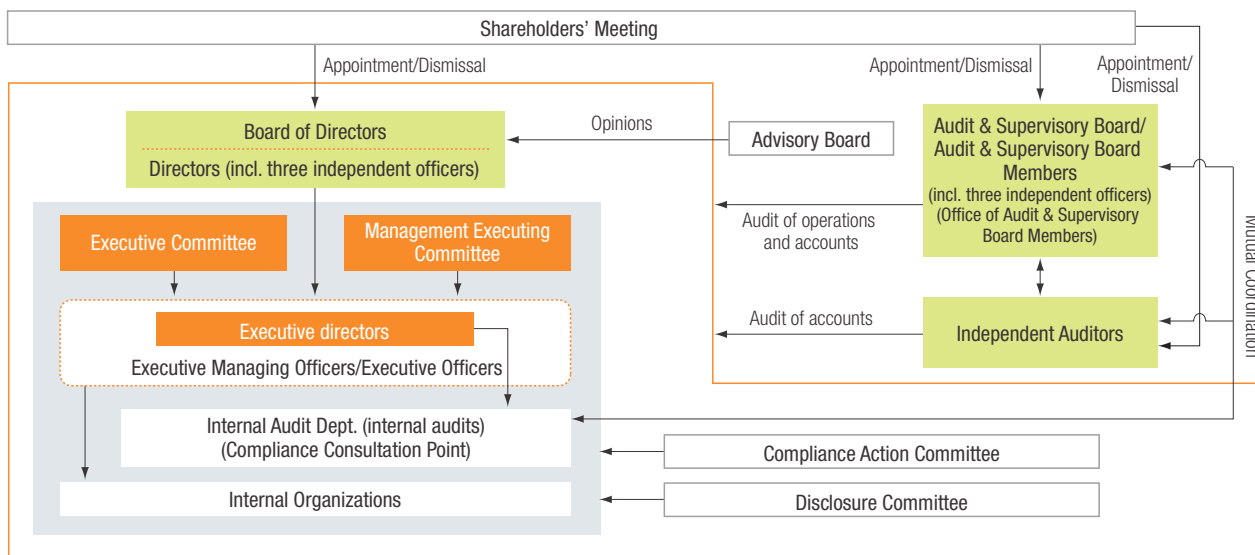


Basic Policy on Corporate Governance  
[http://www.jpowers.co.jp/annual\\_rep/pdf/cg\\_houshin1510.pdf](http://www.jpowers.co.jp/annual_rep/pdf/cg_houshin1510.pdf)

### Officers and Management Council System

At J-POWER, members of the board focus on supervisory functions while executive directors, executive managing officers, and executive officers perform executive functions. In addition, an independent director participates in management decision-making from outside directors based on specialized knowledge and experience. Under the Management Council System, J-POWER established an Executive Committee, which deliberates on matters that are of importance to the company as a whole, and a Management Executing Committee, which handles important matters relating to specific aspects of business execution. The system facilitates appropriate and timely decision-making and efficient corporate operations.

J-POWER Group's Corporate Governance Framework (as of the end of June 2016)





### System of Audits and Supervision

J-POWER's Audit & Supervisory Board comprises five Audit & Supervisory Board Members, of which three are Outside Audit & Supervisory Board Members including one fulltime member, enhancing the oversight functions of the Audit & Supervisory Board. Separate from the audits conducted by the corporate auditors, the Internal Audit Department, which is independent from J-POWER's other internal organizations, conducts internal audits, and individual organizations also perform periodic voluntary audits.

### Group Internal Controls

To implement internal controls in accordance with the Financial Instruments and Exchange Act, J-POWER creates internal regulations to ensure the reliability of financial reporting and operates internal control systems. In FY 2015, we confirmed the status of development of internal control systems and their operational status, determined that they are effective, and reported the results to the Prime Minister in the form of an internal control report.

### Information Disclosures

With regard to the outside disclosure of information, the Disclosure Committee chaired by the president makes active, fair, and transparent disclosures of corporate information.

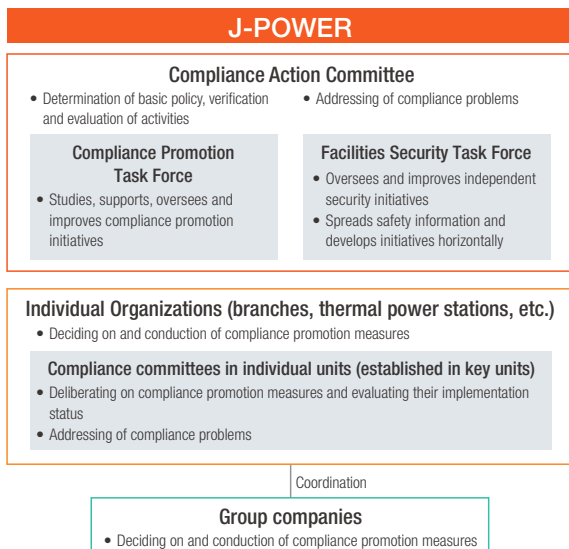
The J-POWER Advisory Board was established in September 2008 to receive advice and proposals concerning corporate management from outside experts in a wide range of fields.

## Compliance Initiatives

### Implementation Measures

In accordance with its corporate philosophy, J-POWER adopted Corporate Conduct Rules and a Compliance Code. To ensure compliance, J-POWER

#### J-POWER Group Compliance Promotion Structures



established the Compliance Action Committee and other organizations shown below and takes Group-wide action with the participation of Group companies.

We also established compliance consultation hotlines staffed by internal and external experts to prevent and quickly identify violations of laws and regulations and breaches of corporate ethics. To raise awareness of compliance, we conduct training and hold lectures on compliance topics, create opportunities for officers and employees to exchange views and for personnel responsible for compliance matters to exchange information, and conduct compliance-related questionnaires, e-learning, and other programs.

 **Outline of the Compliance Code**  
[http://www.jpowers.co.jp/annual\\_rep/ann14000.html](http://www.jpowers.co.jp/annual_rep/ann14000.html)

## Information Security

### Basic Policy

As advanced computerization and the use of information technology by businesses advances, instances of cyber terrorism and attacks targeting specific companies have increased, making information security more important than ever. The J-POWER Group, a key infrastructure business responsible for stable electric supplies and construction of nuclear power plants in Japan and other countries, must ensure higher levels of information security.

J-POWER adopted a Basic Policy on Information Security and publicizes Group-wide information security countermeasures on its website.

### Specific Measures

Each year, we formulate and implement an annual plan setting forth specific information security countermeasures based on the status of activities in the preceding year. The main measures are described on the J-POWER website.

To rapidly and appropriately respond to IT harm to important systems relating to electric power operations, we are reinforcing collaborative systems with relevant government ministries and agencies and the electric power industry as a whole and contributing to the IT aspects of stable electric power supplies. With regard to construction of the Ohma Nuclear Power Plant, IT divisions are working with nuclear power divisions to implement robust security measures.

 **Basic Policy on Information Security**  
[http://www.jpowers.co.jp/english/privacy/privacy\\_003\\_e.html](http://www.jpowers.co.jp/english/privacy/privacy_003_e.html)

 **Information Security Countermeasures**  
[http://www.jpowers.co.jp/english/privacy/privacy\\_004\\_e.html](http://www.jpowers.co.jp/english/privacy/privacy_004_e.html)

## Emergency Management

### Crisis Management Measures

The J-POWER Group recognizes a variety of events as emergencies, and as an electric power supplier, the greatest emergency would be an impairment to the production and distribution of electricity, our product, that prevented the supply of electric power. We take the following measures to prevent such an occurrence.

- (1) Installation of appropriate facilities and development of disaster recovery systems in preparation for natural disasters including earthquakes, typhoons, lightning strikes, and tsunami.
- (2) Enhanced security to prevent malicious and violent conduct.
- (3) Ongoing enhancement of facility inspections to prevent major impediments to electric power supply and appropriate repairs and upgrades in response to deterioration, decline of function, and breakdowns.
- (4) Preparation of action plans for responding to pandemics and other events that could have a major impact on business operations.

The J-POWER Group has established the following systems to accurately forecast and prevent accidents, facility incidents, and other crisis events and to respond promptly and appropriately if such events occur and manage them.

### Emergency Management Systems

#### (1) Emergency Response Team

A permanent organization at the J-POWER Headquarters. The Team oversees immediate responses and emergency management operations in the event that an emergency occurs.

#### (2) Emergency managers and emergency duty personnel

Emergency managers and personnel are appointed at the Headquarters and Regional Headquarters with relevant local units to take first-response action and report information.

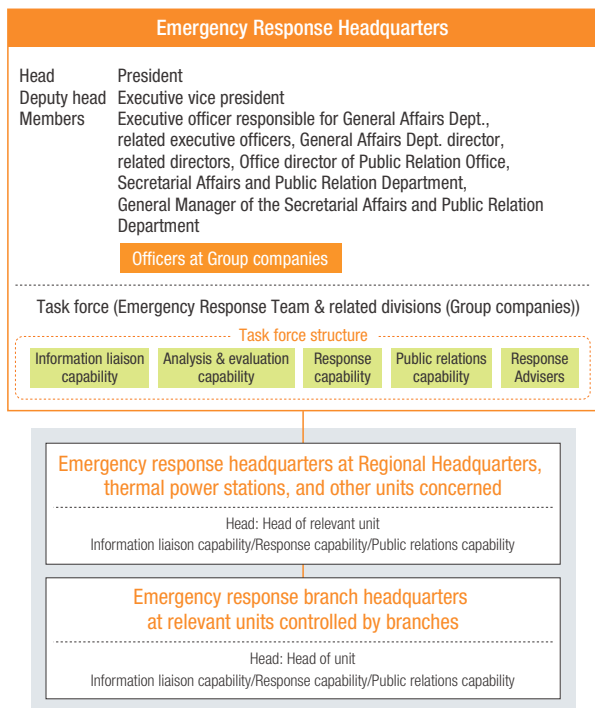
#### (3) Emergency Response Headquarters and branches

When an emergency is predicted to occur or occurs and the seriousness warrants emergency countermeasures, the Emergency Response Headquarters (and branches) are established.



Disaster preparedness training underway

### Emergency Countermeasures (after establishing Emergency Response Headquarters)



### Disaster Response and Business Continuity Measures

As an electric power supplier with responsibility for vital lifelines, J-POWER has been designated a designated public institution under the Disaster Countermeasures Basic Act.

To carry this out, we actively implement physical measures in anticipation of a large-scale natural disaster as well as non-physical measures including the formulation of various rules relating to the occurrence of accidents and establishing systematic disaster response systems that cover the entire organization from the head office to local bodies. We are also reinforcing disaster response systems to ensure business continuity even in the event of damage that exceeds expectations.

With regard to business continuity, considering the importance of immediately shifting to an emergency structure following the occurrence of an emergency and undertaking recovery operations, we have determined the minimum necessary actions to maintain business during an emergency. In order to heighten the effectiveness of this framework, we are conducting periodic disaster preparedness training and other preparation, as well as confirming the effectiveness of manuals and the status of emergency stores. In accordance with Tokyo Metropolitan ordinances, the J-POWER Headquarters is preparing for a Tokyo Inland Earthquake by increasing its stores of emergency foodstuffs and taking other measures.

# Recruiting and Developing Human Resources and Creating Dynamic Workplaces

The J-POWER Group strives to provide safe, comfortable working environments for every one of our employees. We consider human resources to be valuable assets upholding our fundamental sustainability as a corporation. At the same time, we endeavor to create a corporate culture that respects the character and individuality of our employees and makes them feel it worthwhile to constantly take on new challenges.

The J-POWER Group positions human resource recruitment and development as crucial policy measures for the company's sustainable growth. We are reinforcing the foundation for career development, with a focus on CDP (the Career Development Program), establishing workplace environments and systems that make advantageous use of diversity, and promoting work-life balance in order to improve individual skills and workforce productivity.

## Developing Group Human Resources and Creating Dynamic Workplaces



## Recruiting and Making Use of Human Resources

### The J-POWER Group's Conceptual Approach to Human Resource Recruitment

The J-POWER Group approach is to conduct stable hiring in the interest of sustainable growth, and also to seek human resources from people in a wide range of fields and age groups to whom we provide opportunities to take an active part. With regard to personnel hiring and utilization, the J-POWER Compliance Code stipulates respect for individuality and human rights and prohibits discrimination. We are also conducting awareness-raising on these matters in human rights training. We are currently creating systems and working environments that enable our diverse personnel to fully demonstrate their capabilities, without regard for gender, age or other such distinctions.

#### Employment of New Graduates (J-POWER)

	FY 2014	FY 2015	FY 2016
Men	59	60	<b>66</b>
Women	5	2	<b>3</b>
Total	64	62	<b>69</b>

### Measures to Promote Diversity

As a measure to further increase the hiring of elderly people, we have reviewed the continuing employment system. This is a system for employment of people who have passed retirement age, and it allows those who desire employment to continue working until the age of 65. In combination with the personnel registration system (which can be used up to age 70), which introduces job opportunities in the Group, we will harness the experience, technology, and motivation to work possessed by older people in the Group and make use of it for the sustained growth of our business. As of the end of March 2016, 113 employees (J-POWER)

had taken advantage of the continuing employment system and related programs.

The employment rate for persons with disabilities was 1.95% as of June 1, 2016. A "consultation desk to provide employment assistance and information on working environments to employees with disabilities" having been established, we will continue to take measures to enhance working environments and promote understanding through such initiatives as making office buildings barrier-free. In the future, we will continue striving to raise the employment ratio.

We will also take steps to improve our management training with a view to building a workplace where diverse human resources can take active part.

## VOICE

### Aiming to Build a Workplace Where Diverse Human Resources Can Take Continuously Active Parts

The J-POWER Group operates in a changing business environment, and in order to make maximum use of the human resources in future business operations to create new corporate value and grow, we are striving to create workplaces and an organizational atmosphere where a diverse workforce that includes recently hired employees to veterans with various individual attributes can work with enthusiasm and display their skills as a single team.

To support worksite on-the-job training, which is the key to human resource development, we are working to enhance training for leaders while pursuing effective collaboration between on-the-job and off-the-job training including updating training programs based on changes in the workforce age composition and work styles.



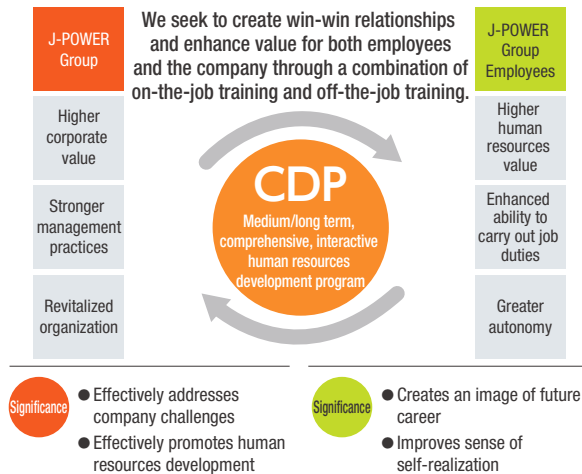
Human Resource Development Office,  
Personnel and Employee Relations  
Department  
**Yuuichirou Horiike**

## Human Resources Development

### Human Resource Development Programs

Our aim in the J-POWER Group is to develop all our employees into independent, talented, professional human resources who contribute to the organization with a multiplicity of specialized knowledge and a broad perspective. We are adopting the Career Development Program (CDP) as a measure to achieve that aim.

#### CDP Overview



### Evaluation and Assessment System

The J-POWER Group established an evaluation system in 2004 that is based upon a goal management system. Through initiatives aimed at achievement of specific goals, the system encourages every employee to perform work autonomously, heighten his or her achievement motivation, and improve his or her work performance. We also seek to realize our organizational strategies by having employees engage in mutual collaborative action that is based upon organizational goals.

### Various Training Programs

The J-POWER Group is conducting various kinds of training as Off-JT, including level-specific training, career training, objective-specific training, and divisional training. These programs are conducted to develop human resources in line with CDP. We have also established training facilities for the technical divisions (civil engineering and architectural engineering divisions; hydroelectric power, transmission and substation, and telecommunications divisions; and thermal power divisions). Systematic development for engineers is conducted at these facilities.

### Helping Employees Voluntarily Develop Their Careers and Abilities

J-POWER is introducing a self-assessment system for employees to convey their career planning hopes and intentions to the company once a year and discuss them with their immediate superiors. We are also introducing a voluntary training incentive program and an academic training program to support employees developing their abilities on their own initiative.



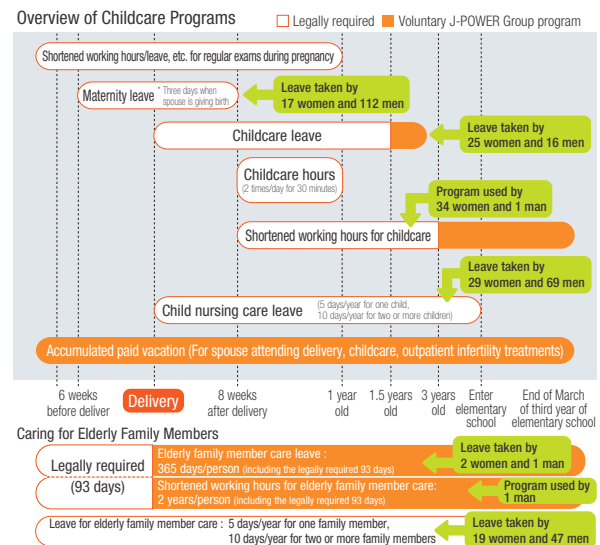
A level-specific training session for employees in their fifth year

## Developing Environments to Create Dynamic Workplaces

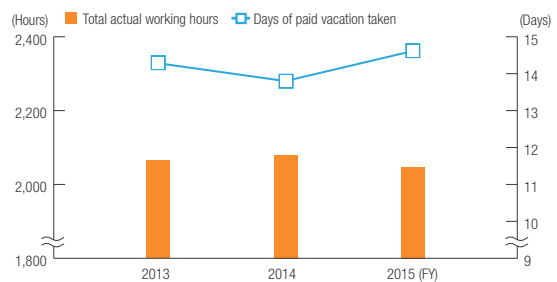
### Toward Realization of a Work-Life Balance

We are actively developing working environments and cultures that enable every employee to autonomously enhance their work and personal life and focus on highly creative work. We are taking measures to help employees achieve a good work-life balance including enhancement of childcare and nursing care support programs, encouraging their use and normalizing working hours.

#### Overview of the Childcare and Nursing Care Support Programs and Results in FY 2015 (J-POWER Group)



#### Change in Total Actual Working Hours and Paid Vacation Taken (J-POWER)



### “Platinum Kurumin” Special Certification Mark

As a corporation that supports childcare, J-POWER received “Kurumin” certification. We also received the special “Platinum Kurumin” mark certification, which is awarded only to corporations with measures that have met an even higher standard. We will continue making improvements for an even better work environment in the future so that all employees will be able to harmonize their work and their personal life, and exercise their abilities fully.





### Consultation Desk

We are working to build a work-friendly environment in the workplace by establishing a consultation desk where employees can discuss working hours, the workplace environment, sexual harassment, and power harassment. We have also developed in-house regulations, manuals, and other such resources related to harassment, and we are implementing education for increased awareness in level-specific training courses, posters, and other such measures to resolve problems as well as to prevent them. Our goal is a working environment where human rights and individuality are respected and where diverse personnel are completely at ease in going about their work.

#### VOICE

#### I am Grateful for Our Support Programs

After receiving my second maternity leave and childcare leave, I returned to work in April 2016. Right now I am benefiting from the reduced hours (shortened working hours) program. Every day is busy for me, taking care of an infant and a three-year-old, so I am really grateful to have the reduced hours program. Shortening my hours at work gives me the feeling that I can cope with things. I can make the time to spend with my children, so I can read a picture book with them before bedtime, or talk with them in the morning while I'm getting ready, and hunt for insects on the way back from daycare. Everybody in the workplace offers some kind of support, as well, and all this fills me with feelings of gratitude. I will be in the position of needing support for some time yet, but when my turn to give support comes, I hope to give good help to my colleagues and juniors.



Project Promotion Office,  
International Business  
Development Department  
**Mina Yamazaki**

## Safety and Health Management

### J-POWER Group's Health and Safety Measures

The J-POWER Group's health and safety measures are intended to create safe and healthy workplaces that provide meaningful work as the foundation of our business activities. J-POWER and Group companies each have roles and responsibilities and collaborate on implementing health and safety management to prevent workplace accidents and maintain and improve the health of our employees.

### Measures Pursuant to the Group Occupational Safety and Health Plan

The J-POWER Group established a Group Occupational Safety and Health Plan that organizes common issues that the Group needs to address and set subsequent priority topics. Based on the plan, individual Group companies formulate their own occupational health and safety plans and take measures in cooperation with the Group.

#### Safety Priorities

- (1) Promoted Communications through Collaboration among Personnel at Different Worksites and Offices
- (2) Prevention of repetitive-pattern accidents

- (3) Prevent traffic accidents resulting in injury or death and other commuting-related accidents

#### Health Issues

- (1) Measures against lifestyle-related disease
- (2) Measures to promote mental health

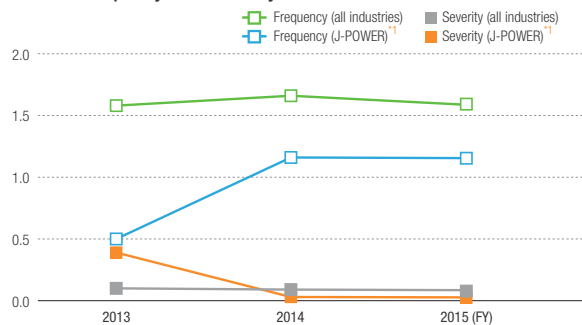
### Initiatives for the Prevention of Workplace Accidents

In recent years, many occupational accidents have been work accidents relating to construction and other work, and consequently, it is important to conduct unified safety activities that include cooperating companies. As a result, we are taking measures to invigorate communications throughout the workplace and raise safety awareness while taking ongoing measures to prevent the occurrence of all types of occupational accidents and traffic accidents including repetitive-pattern accidents.

#### Incidence of workplace accidents\*1 ★

	FY2013	FY2014	FY2015
Deaths	1	—	—
Serious Injury	2	9	8
Minor Injury	7	12	13

#### Accident Frequency\*2 and Severity\*3



\*1 Accidents involving J-POWER employees and accidents involving contractors (principal contractors and subcontractors) doing construction and other work ordered by J-POWER

\*2 Frequency: Index of the frequency of accident occurrence. (Number of deaths or injuries caused by occupational accidents per one million working hours. Covers accidents causing loss of one day or more of work. Does not include accidents of employees on temporary transfer.)

\*3 Severity: Index of accident severity. (Number of days of work lost per 1,000 working hours. Does not include accidents of employees on temporary transfer.)

### Maintaining the Health of Employees and Their Families

To maintain and improve the health of employees and their families, we encourage them to receive health checks, health maintenance guidance, and infectious disease prevention measures. In addition, we place priority on the prevention of lifestyle-related disease and mental health disorders. In order to support good physical and mental health, therefore, we conduct special health checks and designated health guidance as well as THP activities\*, and we have adopted a stress check system, as well.

#### \* THP Activities:

Activities aimed at total health, both physical and mental, based on Ministry of Health, Labour and Welfare guidelines on Total Health Promotion Plans.

# Coexistence with the Community and Society

The J-POWER Group rolls out business based on harmonious coexistence with local communities and society as an electric power company with power generation and power transmission and substation facilities throughout Japan and overseas. Going forward, we will perform business that centers on “Communication with society” and “Contribution to society” as advocated in the J-POWER Corporate Conduct Rules as a means to drive advancement in local communities and society.

## Communication with Society

The J-POWER Group implements fair and transparent public relations (PR) activities and information disclosure in order to secure good lines of communication with many stakeholders in different communities and in society. We are committed to making pinpoint response when it comes to PR in light of the characteristics of the stakeholders and our relationship with them, including local residents, shareholders, investors and society at large. We also promote stakeholder dialog, cognizant of the importance of two-way communication. In terms of information disclosure, we distribute information through our PR activities and respond to inquiries while also disclosing IR information via the Disclosure Committee.

### PR and IR Activities

#### PR Activities

PR activities aim to enhance awareness of J-POWER as widely as possible, beginning with people in local communities. With this in mind, our basic policy is to distribute corporate information accurately and in a timely manner through all of our business activities and respond to inquiries concerning J-POWER sincerely and respectfully. With regard to reporting, we strive to distribute appropriate information at appropriate timing, including through press releases and notifications. We also utilize TV commercials and magazines for advertising and do our best to gain broad understanding of our business. J-POWER provides the opportunity for face-to-face contact with stakeholders as well as through events that include tours of power stations by each business unit, so that stakeholders can track our business activities with peace of mind.

#### IR Activities for Investors and Individual Shareholders

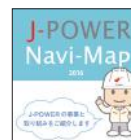
For institutional investors, we hold presentation briefings related to management plans and financial results around twice a year and actively convene meetings in Japan and overseas as the need arises. For individual investors, we hold corporate presentation briefings several times a year and provide opportunities for them to talk directly with J-POWER members, including management.

For individual shareholders, we issue a biannual shareholder newsletter (Kabunushi Tsushin) and actively disclose information on management activities and the overall condition of the company by giving tours of our power stations and other facilities twice a year.

We're working to enhance information disclosures through these types of communications activities on our website and by publishing annual

reports and other documents. We also use communications tools such as Navi-Map and dam cards to conduct public relations in an accessible and user-friendly manner.

#### Navi-Map



We use friendly, approachable promotional characters to introduce the J-POWER business activities.

#### Dam cards



We have made cards showing the J-POWER dams and introducing them in a readily understandable form.

### Information Disclosure

J-POWER endeavors to disseminate appropriate information on its PR and IR activities in a timely manner to stakeholders through press releases and notifications on its website.

In particular, we comply with all pertinent laws and regulations such as the Financial Instruments and Exchange Act and securities listing regulations for information related to the J-POWER Group business, operations or results that may have a significant impact on the investment decisions of stakeholders. We also formulated internal disclosure regulations for IR information and instituted a basic policy to actively disclose information in a fair and transparent manner.

J-POWER established the Disclosure Committee, chaired by the president, to investigate and set up a system for disclosing IR information and also to examine and make judgments on information that ought to be disclosed with the aim of establishing a reputation in the market and gaining the trust of society.

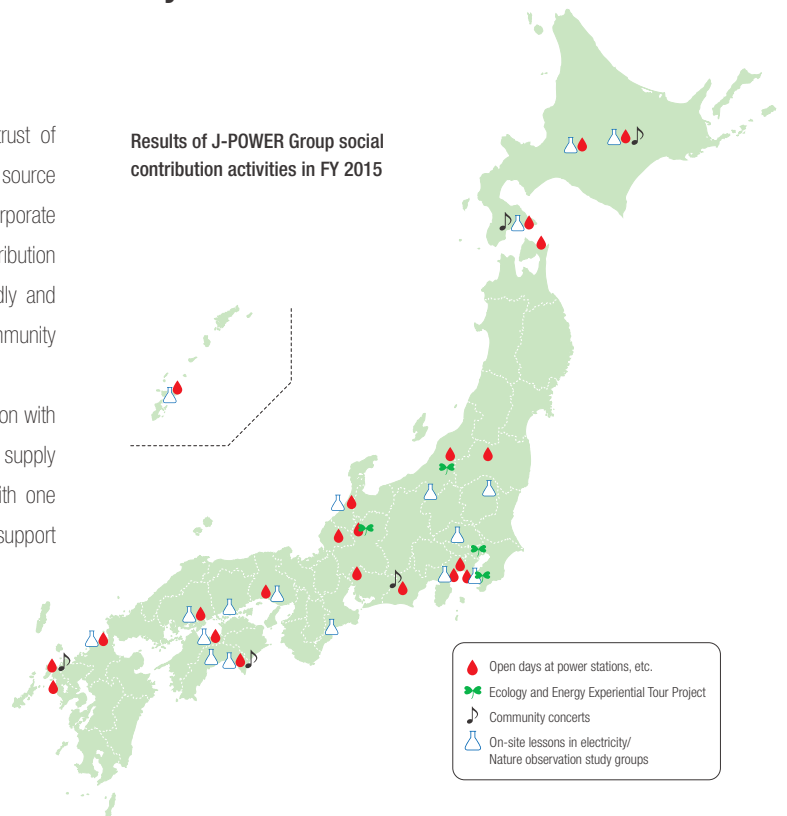
# Contribution to the Community and Society

## J-POWER Group Approach to Social Contribution Activities

“We pursue harmony with the environment, and thrive in the trust of communities where we live and work. We regard profits as the source of our growth, and share the fruits with the society.” Under this corporate philosophy, the J-POWER Group has long engaged in social contribution activities as a member of society to help society develop soundly and sustainably. Our activities largely fall into two categories: community involvement and harmonizing energy supply with the environment.

The J-POWER Group places high value on open communication with local community members and people working to harmonize energy supply with the environment and on sharing knowledge and learning with one another. We will steadily engage in activities on this basis as well as support the volunteer activities of our employees.

Results of J-POWER Group social contribution activities in FY 2015



- Open days at power stations, etc.
- Ecology and Energy Experiential Tour Project
- Community concerts
- On-site lessons in electricity/ Nature observation study groups

### Nagasaki | Heliport clean-up activity

Matsushima Thermal Power Station is located on the island of Matsushima, which lies approximately 1 km off the coast of the Nishisonogi Peninsula in Nagasaki Prefecture. There is no general hospital on the island, nor is there any connecting bridge, so we started providing space for a heliport on company property in 2007. This provided access to an emergency and critical care center by air ambulance not only to our employees, but also to island residents. Every year since then, we have worked together with island residents on clearing weeds from around the heliport, and we will continue this activity in the future as a member of the local community.



Participants did a thorough job of clearing away weeds

### Kanagawa | Workshops for local junior high schools

In the J-POWER Group's Chigasaki District, we have been holding workshops on request from community elementary schools and junior high schools. We also give tours of the facilities at other power stations and research centers and other related activities to deepen the participants' understanding of J-POWER Group businesses. In combination with that, our members have been making individual efforts to have direct contact with local residents in order to enhance our social quality as a member of the local community.



Explanations are made readily understandable, of course, but they also convey the speaker's feelings about the technology

### Nagano | Community mini concerts

We have been holding concerts, mainly of classical music, to express our everyday feelings of gratitude to local residents in areas around our business locations and power plants all across Japan. These concerts were started in 1992 to commemorate the 40th anniversary of the company's founding. Now, in addition to holding the events in large concert halls, we visit schools, social welfare institutions, and other such locations that bring us closer to the community to hold mini concerts, as well. In the 2015 fiscal year, we held the 160th of these events.



Scene of a concert held in the village of Tenryumura

## Community Involvement

The corporate activities of the J-POWER Group are supported by power station personnel and other members of local communities. Business sites in each region strive to be good corporate citizens and a useful presence in the community and society so that each employee can be a valued resident of their community. By conducting activities that are trusted and familiar to local residents, the J-POWER Group seeks to live in harmony with communities and grow with society.

Wakayama

### Program to deliver supplies to a mountain pilgrimage lodge on the Omine Okugakemichi route of the Kumano pilgrimage routes, a World Heritage site

At the Hashimoto Transmission Line Maintenance Office in Wakayama Prefecture, we have been implementing a twice-yearly program since 2002 of transporting food supplies to a mountain lodge for pilgrims on the Omine Okugakemichi, which is one of the routes for Shugendo practitioners on the Kumano pilgrimage routes. The J-POWER Kumano Trunk Line (a transmission line) runs parallel to the Omine Okugakemichi route. We use part of that route for maintenance access, so we have been continuing this program out of the desire to be of even some help to Shugendo practitioners and mountain climbers who travel that way.



Heading for the mountain pilgrimage lodge, stepping with care on a path lightly covered with snow

Nagasaki

### Matsuura Navy Festival

Matsuura Thermal Power Station is located in the city of Matsuura, Nagasaki Prefecture, which was the birthplace of the Matsuura-to, a warrior band that earned fame leading a powerful naval force against invading Mongols. The Matsuura Navy Festival is a major event that highlights the distinctive characteristics of Matsuura City, and volunteers from the Matsuura District of the J-POWER Group took part in the mass festival dancing that all the citizens join in. The community as a whole enjoys the Matsuura Navy Festival together, and we will make every effort to sustain our good relationship with the people of this community.



Doing very well in holding the vigorously outstretched arm pose in unison

## Harmonizing Energy Supply with the Environment

In order for people to lead enriching lives, both energy, which supports enriching lives, and a better environment are needed. Leveraging environmental knowledge acquired through our business activities to date, we partner with people seeking to harmonize energy supply with the environment and conduct activities to raise awareness and develop technologies for energy and the environment in an effort to facilitate the sustainable development of Japan and the rest of the world.

Fukui

### 10-Day Campaign for Getting to Know the Forests and Lakes

The J-POWER Group Kuzuryu District holds tours of its facilities during the 10-Day Campaign for Getting to Know the Forests and Lakes that is held by the Forestry Agency and the Ministry of Land, Infrastructure, Transport and Tourism. The participants were fascinated to see the place where energy is made, where they are usually not able to enter. We explained things clearly, and also did other things, such as handing out dam cards, to make us feel more approachable.



The children who took part were given a thorough explanation of how electricity generation works



## For the Benefit of Broader Society

The J-POWER Group undertakes social contribution initiatives not just for the benefit of local communities, but also for the benefit of broader society and each region of the world where it operates. Described below are some of the measures taken to support the future generations that will create the society of tomorrow. In addition to these programs, we will continue cooperating with volunteer activities targeting disaster areas including areas struck by the Great East Japan Earthquake as well as children suffering from malnutrition in various parts of the world, providing work training at power plants in Asia and support to persons affected by flooding.

Personnel Office

### Internships

J-POWER, JPHYTEC Co., Ltd., and Jpec Co., Ltd. offered summer internships to science students in graduate school, university, or technical college. The internships provide experience in certain operations at power stations and other facilities with the aim of helping the interns' studies and support them in making future occupation choices. In FY 2015, 36 interns from various areas of Japan took up the challenge of practical training in the maintenance and operation of electric power facilities.



First-hand experience of accident handling simulation

Public Relation  
Department

### Experimental Learning Project for Ecology and Energy Thermal power session tour of Isogo for university students

The Experimental Learning Project for Ecology and Energy is a J-POWER Group measure to contribute to society according to our aim of "Harmonizing energy supply with the environment." At Isogo Thermal Power Station, which is sited in Isogo Ward of Yokohama City, Kanagawa Prefecture, we held an experiential energy and environment educational program for university students on their spring break between school years. There were 33 university student participants from 25 universities located all around Japan. The students naturally gained detailed knowledge about thermal power generation and energy, but their dialogues with responsible working members of society also gave the students new awareness, and they were able to establish connections among each other, as well.



Participants hear explanations from employees who actually work in the power plant

### VOICE

#### We Participated in the Experimental Learning Project for Ecology and Energy!

On this tour, I was able to learn many things that I couldn't learn just by studying at a university. For instance, about CO<sub>2</sub> reductions that Japan has to make under international agreements, what has to be done at power plants for that purpose, how the type of power plant makes a difference in how many jobs are created, what the best energy mix might be for Japan's overall benefit as a nation from a comprehensive perspective, and what national policies should be adopted for that purpose. I thought about these and other such things relating to the optimal use of energy, the future of energy,

and so on. As to the answers to these questions, that is something I will want to look for, but the energy problem really has a large variety of different factors involved, and this made me feel that I want to increase the breadth and depth of my knowledge.



University of Tsukuba  
Masato Funahashi

# Environmental Management

Based on its corporate principle of achieving harmony between energy and the environment, the J-POWER Group undertakes environmental management intended out, we undertake various measures pursuant to the J-POWER Group Environmental Management Vision, a statement of internal and external Group initiatives, and laws, regulations, and agreements from the perspective of ensuring transparency and trust.

## Corporate Target and FY 2015 Results

The Action Programs for the J-POWER Group Environmental Management Vision define Corporate Targets\*, which are mid-term targets that the Group as a whole

\* In addition to Group-wide Corporate Targets, business divisions and affiliates formulate their own targets tailored to their operations.

	Item	Target		
Efforts Relating to Global Environmental Issues	Reducing CO <sub>2</sub> Emissions from Power Generation and Promoting Technological Development	As an electric utility, in addition to continuing to contribute to the Environmental Action Plan by the Japanese Electric Utility Industry, looking towards 2020 we are working to provide a stable supply of energy and reduce CO <sub>2</sub> emissions in Japan and overseas by promoting the following measures.		
		<ul style="list-style-type: none"> <li>Work to replace aging coal-fired power stations with new facilities with higher efficiency at the world's highest levels.</li> </ul>		
		<ul style="list-style-type: none"> <li>Promote mixed combustion of biomass fuels in coal-fired power stations (Effective exploitation of untapped resources).</li> </ul>		
		<ul style="list-style-type: none"> <li>Contribute to the reduction of CO<sub>2</sub> emissions and technology transfer on a global scale by promoting the overseas expansion of coal-fired power using J-POWER's advanced, high-efficiency power generation technologies, in particular in the Asian region.</li> </ul>		
		<ul style="list-style-type: none"> <li>Promote the development of higher-efficiency oxygen-blown integrated coal gasification combined-cycle (IGCC) technology through the realization of the Osaki CoolGen Project. In addition, we are taking the results from trial operations under the EAGLE Project and the Callide Oxyfuel Combustion Project in Australia into consideration in our promotion of research and development on CO<sub>2</sub> capture and storage (CCS) technology.</li> </ul>		
		<ul style="list-style-type: none"> <li>In relation to the Ohma Nuclear Power Plant Plan, we will respond appropriately to the assessment for conformance with new safety standards that we applied for in December 2014. We will do our utmost to ensure the construction of a safe and trusted nuclear facility, taking the accident at the Fukushima Daiichi Nuclear Power Station into serious consideration, going forward with voluntary safety measures and other such steps, and at the same time maintaining the approval of residents of the region in which the station is located.</li> </ul>		
		<ul style="list-style-type: none"> <li>Build new hydroelectric power facilities, expand, upgrade and replace existing facilities, and expand the use of hydroelectric power.</li> </ul>		
		<ul style="list-style-type: none"> <li>Significantly expand domestic wind power facilities and advance research and development towards the realization of ocean-based wind power generation technologies.</li> </ul>		
Efforts Relating to Local Environmental Issues	<ul style="list-style-type: none"> <li>Total thermal energy efficiency (HHV, at generation point)</li> </ul>	Maintain current level [about 40%]	FY 2008 40.1% (Reference: LHV*1=41.1%)	40.3% (Reference: LHV = 41.4%)
	<ul style="list-style-type: none"> <li>Reduce SF<sub>6</sub> emissions; increase recovery rate during inspection and retirement of equipment</li> </ul>	Inspection: at least 97%; Retirement: at least 99%	FY 2008 Inspection: 99% Retirement: 99%	Inspection: 99% Retirement: 99%
	<ul style="list-style-type: none"> <li>Reduce SO<sub>x</sub> emissions per unit of electric power generated (point of generation, thermal power stations)</li> </ul>	Maintain current level [about 0.2 g/kWh]	FY 2008 0.20g/kWh	0.17 g/kWh
	<ul style="list-style-type: none"> <li>Reduce NO<sub>x</sub> emissions per unit of electric power generated (point of generation, thermal power stations)</li> </ul>	Maintain current level [about 0.5 g/kWh]	FY 2008 0.50g/kWh	0.51 g/kWh
	<ul style="list-style-type: none"> <li>Increase recycling rate for industrial waste</li> </ul>	Maintain current level [about 97%]	—	99%*2
<ul style="list-style-type: none"> <li>Protection of the Water Environment</li> </ul>	Consider protection of river and ocean environments in business activities	—	Practices of consideration for protection of river and ocean environments	
<ul style="list-style-type: none"> <li>Protect biological diversity</li> </ul>	Consider the protection of biological diversity in relation to business activities	—	Efforts to Preserve Biodiversity	
Ensuring Transparency and Reliability	<ul style="list-style-type: none"> <li>Improvement of Environmental Management Level</li> </ul>	Continuous improvement of EMS	—	Consistent use of PDCA cycle

to achieve improvements in both environmental considerations and economic value so that it can contribute to the development of a sustainable society. To carry this strive to enhance the disclosure of information relating to environmental programs and environmental management levels while maintaining strict compliance with

is expected to work towards. As shown below, all of the items included in the Corporate Targets for FY 2015 were achieved.

Main results for FY 2015		
	<ul style="list-style-type: none"> <li>Construction work proceeded under the Takehara Thermal Power Station Replacement Project. Environmental impact assessment procedures for the Takasago Thermal Power Station Replacement Project were started.</li> </ul>	
	<ul style="list-style-type: none"> <li>Mixed combustion according to target fuels was conducted at Matsuura Thermal Power Station, Takehara Thermal Power Station and Takasago Thermal Power Station.</li> </ul>	
	<ul style="list-style-type: none"> <li>Preparatory measures for construction work conducted for the Central Java Project in Indonesia.</li> </ul>	
	<ul style="list-style-type: none"> <li>The Osaki CoolGen Project is making progress in construction and trial operation of a power plant intended for trials of oxygen-blown IGCC (first phase). We are also making preparations with a view to initiating trials of CO<sub>2</sub> separation and capture IGCC (second phase).</li> </ul>	
	<ul style="list-style-type: none"> <li>For the Ohma Nuclear Power Plant Plan, we are making progress in examining measures to reinforce safety and related matters, and an assessment of conformance with new regulatory standards is underway. All in all, we are implementing initiatives to obtain the trust and understanding of the local community.</li> </ul>	
	<ul style="list-style-type: none"> <li>To expand the use of hydroelectric power, operation of Kuttari Power Station was started. As to Konokitani Power Station, work on construction is advancing.</li> </ul>	
	<ul style="list-style-type: none"> <li>With regard to land-based wind power, construction of wind power stations on the Yurihonjo Coast has begun. Also, we conducted trials of offshore wind power off the coast near Kitakyushu (a joint project with NEDO) as well as other activities.</li> </ul>	
	<ul style="list-style-type: none"> <li>Environmental impact assessment procedures regarding the Wasabizawa Geothermal Power Station have been completed and construction to develop this as a new domestic geothermal power plant site has started.</li> </ul>	
FY 2015 performance	Fiscal 2015 Evaluation and Next Steps	Page Reference
★ 40.4% (Reference: LHV = 41.5%)	<ul style="list-style-type: none"> <li>The J-POWER Group met its target for total thermal energy efficiency thanks to efforts to maintain high-efficiency operation in existing thermal power stations and to adopt high-efficiency technologies when upgrading facilities.</li> </ul>	P50
★ Inspection: 99% Retirement: 99%	<ul style="list-style-type: none"> <li>The FY 2015 target was met, with a recovery rate of 99% during inspections and 99% 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.</li> </ul>	P49
★ 0.18 g/kWh	<ul style="list-style-type: none"> <li>Efforts including the application of fuel control and the appropriate operation of flue gas desulfurization systems saw us curb our SO<sub>x</sub> emissions and achieve our target for emissions per unit of power generated. We will continue our efforts to curb emissions through good management practices.</li> </ul>	P42
★ 0.50 g/kWh	<ul style="list-style-type: none"> <li>Efforts including the application of fuel control and the appropriate operation of flue gas denitrification systems saw us curb our NO<sub>x</sub> emissions and realize our emissions target per unit of power generated. We will continue our efforts to curb emissions through good management practices.</li> </ul>	P42
★ 99%*2	<ul style="list-style-type: none"> <li>We achieved our targets for the fiscal year through efforts to promote the recycling of coal ash and to reduce industrial waste generated by the maintenance and operation of power stations. We will go on working to maintain this level.</li> </ul>	P50
Practices of consideration for protection of river and ocean environments	<ul style="list-style-type: none"> <li>When operating power generation facilities that involve rivers, we implemented measures for protection of the river environment according to the conditions at each location, sedimentation control measures and measures to mitigate the long-term persistence of turbidity.</li> <li>When operating power generation facilities adjacent to the ocean, we exercised precise control over the discharge of wastewater in compliance with environmental protection agreements and other such arrangements.</li> </ul>	P43
Efforts to Preserve Biodiversity	<ul style="list-style-type: none"> <li>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.</li> </ul>	P43
Consistent use of PDCA cycle	<ul style="list-style-type: none"> <li>The PDCA cycle was implemented consistently and measures were taken to raise the level of environmental management through.</li> </ul>	P44

\*1: 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 (FY 2004 edition). \*2: Sulfur excluded

# Business Activities and the Environment

The charts below detail the resource consumption and environmental load of the FY 2015 J-POWER Group operations within Japan.

Note: The scope of applicability will include J-POWER and its 25 consolidated domestic subsidiaries, such as electric power businesses and ancillary businesses related to electric power. The amounts attributed to consolidated subsidiaries are based on percentages corresponding to J-POWER's equity share.

## INPUT

### Thermal Power Generation ★

**Fuel**

Coal (wet)	21.74 million tons
Heavy oil	45,000 kl
Light oil	22,000 kl
Natural gas	115.8 million Nm <sup>3</sup>
Biomass	29,000 tons

**Industrial-use water** ..... 9.22 million m<sup>3</sup>

**Notes:**

- Apart from waste water, almost all industrial-use water used in thermal power stations is released into the atmosphere as steam.
- 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.
- While steam is used in geothermal power stations, hot water is returned underground after power generation via an injection well.

**Major Chemicals Consumed** (undiluted equivalents)

Limestone (CaCO <sub>3</sub> )	210,000 tons
Ammonia (NH <sub>3</sub> )	15,000 tons

### Hydroelectric power ★

Power for pumped storage ..... 600 GWh

### Geothermal Power ★

Steam	0.33 million tons
Hot water	1.88 million tons

### Internal Use at Business Sites and Offices ★

**Electricity** (purchased)

Business sites	41.63 GWh
Offices	15.60 GWh

**Fuel** (gasoline equivalent)

Business sites	7,971 kl
Offices	1,198 kl




**Drinking water**

Business sites	66,000 m <sup>3</sup>
Offices	216,000 m <sup>3</sup>

**Copy paper** (A4 equivalent) ..... 55 million sheets

## Business Activities

### Electric Power Generated ★

<p>Thermal</p> <h1>59,900</h1> <p>GWh</p> 	<p>Hydroelectric</p> <h1>11,000</h1> <p>GWh</p> 	<p>Geothermal/Wind</p> <h1>800</h1> <p>GWh</p> 
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**Major Resources Recycled ★**

Coal ash ..... 1.839 million tons (99.3%)	Sulfuric acid ..... 25,000 tons (100%) <small>(desulfurization byproduct)</small>
Sludge ..... 10,000 tons (63.8%) <small>(excluding gypsum)</small>	Other industrial waste ..... 45,000 tons (76.8%)
Gypsum ..... 318,000 tons (100.0%) <small>(desulfurization byproduct)</small>	Waste paper ..... 330 tons (91.2%)
	Driftwood from dam reservoirs ..... 27,000 m <sup>3</sup> (79.4%)

Percentages indicate recycling rate.

Auxiliary power for operation and transmission loss  
4,500 GWh

Volume of electric power sold  
**Total 67,200** GWh

\* Sums of figures may not equal totals in some cases due to rounding.

The electricity generated at our power stations is supplied through regional power companies to end users throughout Japan. The 67,200 GWh of wholesale electric power we sold last year is equivalent to approximately 8% of total electric power sold by regional power companies.\*

\* Total electric power sold in FY 2015 was 797,100 GWh, according to confirmed figures on electricity demand published by the Federation of Electric Power Companies of Japan.

## OUTPUT

### Thermal Power Stations ★

**Emissions into the Atmosphere**

CO <sub>2</sub>	48.20 million t-CO <sub>2</sub>
SOx	11,000 tons
NOx	30,000 tons
Soot and dust	1,000 tons

**Emissions into Bodies of Water**

Waste water	3.72 million m <sup>3</sup>
Waste water COD	15 tons

### Geothermal Power Station ★

Hot water ..... 1.97 million tons

### CO<sub>2</sub> Emissions from Business-Site and Office Activities ★

Business sites	42,000 t-CO <sub>2</sub>
Offices	11,000 t-CO <sub>2</sub>

### Waste ★

**Industrial waste**

Coal ash	13,000 tons
Other	20,000 tons

**Specially controlled industrial waste**

Specially controlled industrial waste	200 tons
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**Non-industrial waste**

Waste paper	32 tons
Driftwood from dam reservoirs	7,100 m <sup>3</sup>



# Proper Management and Disposal of Waste Material and Chemical Substances

## Waste

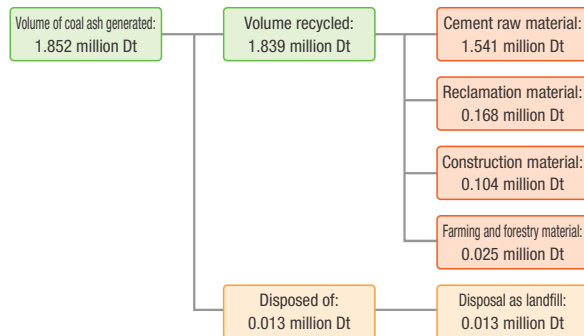
### Reduction and Effective Utilization of Waste

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 2015 was 2.25 million tons, and we achieved a recycle rate of 99%.

### 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.

#### Breakdown of the Coal Ash Recycle (displacement tons) ★



• Sums of figures may not equal totals in some cases due to rounding.

### Information on Maintenance and Management of Industrial Waste Final Disposal Sites

The J-POWER Group discloses on its website its maintenance and management plan for waste final disposal sites, the results of groundwater and discharge water quality analyses, inspection results, the volume of landfill waste, and other maintenance and management information.

## Chemical Substances

### Management of Chemical Substances

The J-POWER Group complies with applicable laws and regulations and properly and rigorously uses, stores, controls, and treats chemical substances regulated by the PRTR Law that are used in electric power generation or are included in equipment or machinery, dioxins, PCB waste material (including equipment that contains trace amounts of PCB), and materials that contain asbestos and other substances.

#### PRTR Substance Release and Transfer Volumes (FY 2015) ★

Substance	Use	Volume handled	Volume released	Volume transferred as waste
33: Asbestos	Insulation for equipment	11.31 t/y	—	11,131 kg/y
71 : Ferric chloride	Wastewater treatment agents	14.80 t/y	—	14,800 kg/y
80 : Xylene	Coating for machinery	3.82 t/y	3,819 kg/y	—
300: Toluene	Fuel for power generation (coal)	18.58 t/y	18,576 kg/y	
405 : Boron compounds	Manure additives	13.62 t/y	0.4 kg/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.

## VOICE

### Engaging in environmental protection activities as a member of the community

Takasago Thermal Power Station is a very old facility that started operation in 1968 in the Harima Coastal Industrial Zone, which is located on the Harima Plain in south-central Hyogo Prefecture. The Seto Inland Sea that spreads out before it is a famous scenic location offering beautiful natural views as well as a treasure house of fishery resources that has been used since ancient times. Around 1965, however, when this power station was entering operation, the waters of the Seto Inland Sea were so seriously polluted that people called it the Dead Sea. Therefore a variety of measures have been implemented, including water use regulations, to restore the Seto Inland Sea to its original state. Ever since this power station started operating, we have also been taking corresponding action, for instance by introducing the latest

equipment for environmental measures as the occasion arose. The measures taken by the entire region acting together as one did manage to improve the water quality, but new problems have emerged, such as declining fish catches. In future, therefore, the aim of these measures will shift to restoring the bounty of the sea. At this power station, too, we are proceeding with plans to upgrade to the latest equipment in order to realize the aim of "Harmonizing energy supply with the environment" at higher levels.

In future, we will continue to make use of the experience we have accumulated over our many years in this area, and go on engaging in environmental protection activities as a member of the local community.



Takasago Thermal Power Station  
Siting & Environment Group and Planning & Administration Group  
**Takashi Sakamoto**

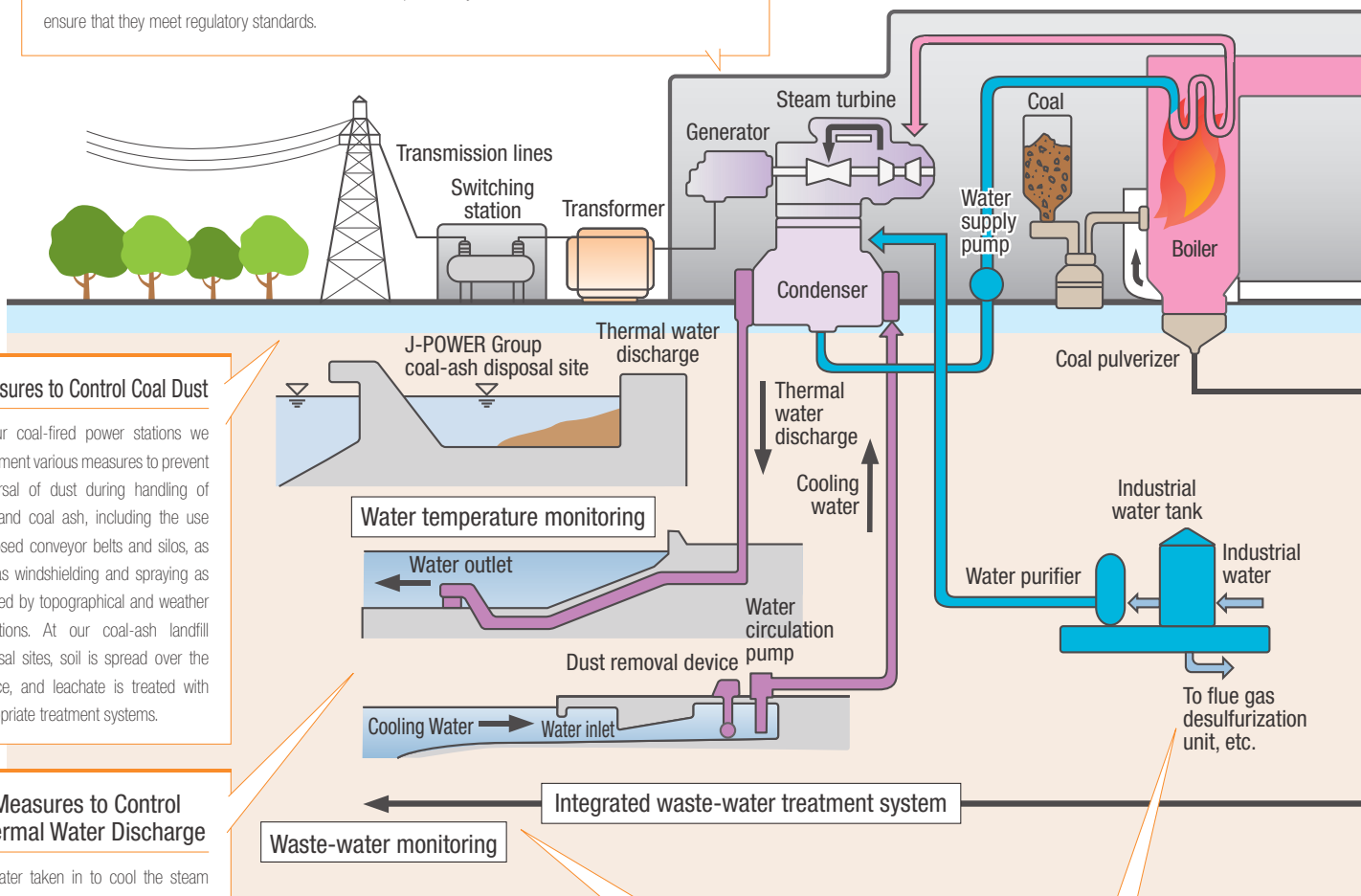
# Initiatives for Environmental Preservation

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

## Environmental Measures at Coal-Fired Power

### 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\*. 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.

**\* 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 (SOx), nitrogen oxides (NOx), 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.

Our performance for the 2015 fiscal year in SOx, NOx, and soot and dust emissions is shown in the below table. The figures obtained are quite low by comparison with other countries.

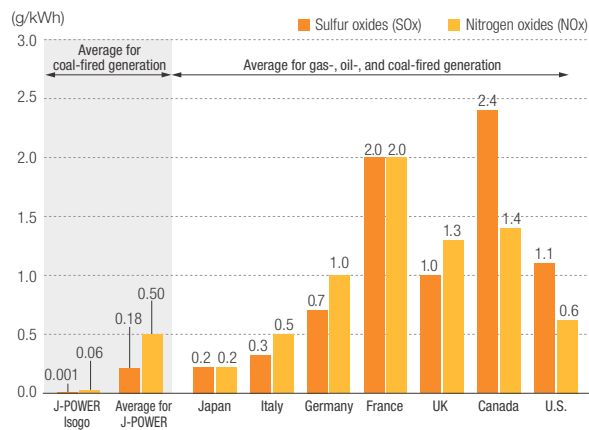
FY 2015 SOx, NOx, and soot and dust emissions performance ★

Substance	Emissions	Emissions intensity
SOx	10,700 tons	0.18 g/kWh
NOx	29,800 tons	0.50 g/kWh
Soot and dust	800 tons	0.01 g/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 SOx and NOx Emissions Intensity for Thermal Generation



Overseas: Emissions volume: OECD StatExtracts

Volume of power generated: IEA Energy Balances of OECD Countries 2014 Edition

Japan: Materials published by The Federation of Electric Power Companies of Japan (10 electric power company and J-POWER)

Figures for Isogo and J-POWER are formulated from results for 2015

High chimney stack

Flue gas measurement equipment

Flue gas monitoring television

Exhaust gas

Air

Electrostatic precipitator  
Flue-gas desulfurization system  
Flue-gas denitrification system

Forced ventilator

Coal ash

Gypsum

Waste recycling (see p. 40)

### 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.

## Preservation of the Natural Environment

### Environmental Impact Assessment

Before expanding power plant facilities, we conduct environmental impact assessments in accordance with applicable laws and regulations and adequately take the environment into consideration while listening to the opinions of local residents during the planning stages. After a power plant becomes operational, we take environmental preservation measures based on the results of monitoring performed pursuant to environmental preservation agreements entered into with relevant local governments.

#### Environmental Impact Assessments conducted in the 2015 fiscal year (Projects conducted after submission of an environmental impact assessment report are included)

Project	Operator	Implementation area	Implementation status
The No.1 and 2 units renewal project at Takasago Thermal Power Station	J-POWER	Takasago City, Hyogo Prefecture	Environmental impact assessment report review completed (as of July 2015)
The No.1 unit renewal project at Onikobe Geothermal Power Station	J-POWER	Osaki City, Miyagi Prefecture	Planning stage environmental impact statement under review (as of July 2016)
The new No.2 unit installation project at Kashima Thermal Power Station	Kashima Power Co., Ltd.	Kashima City, Ibaraki Prefecture	Environmental impact assessment undergoing inspection (as of July 2016)
The new No.1 and No.2 units installation project at Nishi-Okinoyama Thermal Power Station	Yamaguchi-Ube Power Co., Ltd.	Ube City, Yamaguchi Prefecture	Environmental impact assessment report review completed (as of April 2016)
Setana Osato Wind Power Farm Project	J-Wind SETANA Co., Ltd.	Setana-cho, Kudo-gun, Hokkaido	Environmental impact assessment procedure completed (as of July 2015) November 2015 Preparatory construction work started
Shin-nikaho Wind Farm Project (provisional name)	J-POWER	Nikaho City, Akita Prefecture	Environmental impact assessment procedure completed (as of April 2016) April 2017 Construction work on main unit scheduled to start
Shin-kuzumaki Wind Farm Project and Kuzumaki Wind Farm Project (provisional name)	J-Wind KUZUMAKI Co., Ltd.	Kuzumaki -machi, Iwate-gun, Iwate Prefecture Iwaizumi-cho, Shimohei-gun, Iwate Prefecture	Environmental impact assessment procedure completed (as of January 2016) April 2017 Construction work on main unit scheduled to start
Minami Ehime No. 2 Wind Farm Project	J-POWER	Uwajima City, Ehime Prefecture	Environmental impact assessment report review completed (as of January 2016)

### Preservation of the Water Environment

In FY 2013, the J-POWER Group made preservation of the water environment a corporate target for its environmental management vision with the aim of reinforcing its 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 such as taking measures to maintain water quality and prevent the accumulation of silt in dam lakes and downstream areas in the case of hydroelectric power station, and managing the discharge of wastewater into nearby bodies of water in accordance with applicable laws and regulations in the case of thermal power stations.

### Forest Conservation

J-POWER owns approximately 4,600 hectares of forests in the areas near its hydroelectric power facilities located throughout Japan. We appropriately maintain these valuable forests in accordance with the J-POWER Group Forest Protection Guidelines (formulated in 2007).

Japan's forests are falling into ruin because of inadequate management caused by slumping forestry markets, but the J-POWER Group is contributing to forest conservation and reduction of CO<sub>2</sub> emissions through efforts to burn biomass fuel pellets made from forestry offcuts and other materials in coal-fired power stations along with coal (see p. 20).

### Preserving Biodiversity

To reinforce its measures in light of the Basic Law on Biodiversity, in FY 2011, the J-POWER Group made preserving biodiversity a corporate target for its environmental management vision.

During the power generation facility planning and design stages, we implement environmental preservation measures taking into consideration the impact on the natural environment and ecological systems based on the results of wildlife and ecological assessments in the land and ocean areas surrounding the facility. We strive to preserve wildlife, particularly rare species, living in the vicinity of operating power plants and other facilities and their habitats.

These measures are tailored to local environments and characteristics such as making every effort to avoid outdoor work during the nesting season of the Japanese golden eagle and other endangered birds in the vicinity of the Okutadami Dam and Otori Dam and restoring, maintaining, and managing wetlands that became landfill areas when the Okutadami Dam in Niigata Prefecture was expanded.



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



## Ensuring Transparency and Reliability

The J-POWER Group conducts environmental preservation activities in accordance with corporate principles, and the introduction of environmental management systems (EMS) at all J-POWER business sites was completed in 2002. The introduction of EMS at J-POWER subsidiaries and affiliates and at subsequently established business sites is also proceeding, and we are continuing our efforts to enhance environmental preservation measures.

### Improvement of Environmental Management Level

On the basis of the J-POWER Group Environmental Action Guidelines, reviewed annually by management, each J-POWER Group draws up its own Environmental Action Plan. They periodically review and evaluate their initiatives and revise the measures to be taken, following the PDCA cycle.

### Raising Employee Awareness of Environmental Problems

The J-POWER Group puts efforts into environmental training for employees to deepen their awareness of environmental issues and instill a sense of personal responsibility.

#### In-House Environmental Training, FY 2015

Media	Type	Training category	Results	Main content for ensuring strict compliance with environmental laws and regulations
General	Environmental management in general	Environmental management briefing	Approximately 629 persons	Information regarding group environmental management initiatives and amendment of environmental laws and regulations
		Lecture presentations on the environment	Approximately 100 persons	An outside lecturer was invited to talk on the topic of "oceans"
	E-learning	Basic knowledge regarding environmental issues	87.3%	Acquiring basic knowledge regarding environmental issues
Advanced and specialized training	EMS implementation	Internal environmental auditor training	43 persons	Intended to foster auditors with the knowledge necessary to conduct internal audits under the EMS
		Follow-up training for internal environmental auditors	25 persons	Intended to foster human resources who can oversee audit teams conducting internal audits under the EMS
	Environmental laws and regulations	Skill enhancement training for waste-processing operations	56 persons	Explanation of the key points of the Waste Disposal Law
		Waste-processing risk assessment	Four locations	Checking provisions of agreements and manifests specified by law
		Training on environmental laws and regulations	121 persons	Explanation of environmental laws and regulations
	E-learning	EMS course	Continuously conducted	Basic knowledge on the EMS

### Full Compliance with Laws, Regulations, Agreements, and other Rules

In order to reduce the impact on the surrounding environment due to business activities, 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 and other personnel involved, and we employ waste disposal consulting firms to directly confirm the status of waste disposal by local organizations.

### Responding to Environmental Problems

We make every effort to prevent environmental problems before they occur. When problems arise that require emergency handling, however, we promptly take whatever measures are required to contain the damage and we notify the local agencies concerned as well as the J-POWER Headquarters Emergency Response Team and departments.

The J-POWER Headquarters Emergency Response Team promptly notifies top management and, in the interest of information disclosure, provides information on the emergency to the media and other interested parties for publication. We also devise measures to prevent recurrence of the problem. Of the incidents impacting the environment that occurred within the J-POWER Group in FY 2015, one incident was reported by the mass media.

#### Status of Environmental Incidents

Location	Situation and Countermeasures
Ishikawa Coal Thermal Power Station No. 1 Unit (Uruma City, Okinawa Prefecture)	On April 22, 2015, the condenser interior and the collector vessel for sponge balls used to clean the narrow pipes in the condenser were checked for obstructions by feeding in sponge balls made of natural rubber, and due to a malfunction of the ball collector vessel, sponge balls were washed out into the ocean. The sponge balls that had been washed out were recovered, a screen to prevent balls being washed into the ocean was newly installed on the downstream side of the ball collector vessel, and measures are being taken to prevent recurrence.

## Environmental Accounting/Eco-Efficiency

### Environmental Accounting

To calculate the costs and benefits of the J-POWER Group's environmental conservation activities in FY 2015 in keeping with the nature of our business, we referred to the Environmental Accounting Guidelines 2005 issued by the Ministry of the Environment.

### Environmental Conservation Cost and Benefit

Total costs for FY 2015 were approximately 46.3 billion yen, with pollution control costs for preventing contamination of the air, water, etc., accounting for about 42% of the total.

#### Environmental Conservation Cost

Category	Main measures and efforts	Cost (unit: billion yen)
Pollution control	Air pollution control (desulfurization/denitrification, soot and dust treatment), water pollution control (wastewater treatment), etc.	19.3
Global environmental conservation	Measures to reduce greenhouse gas emissions (maintaining high-efficiency operation of coal-fired power stations, developing renewable and unutilized energy sources, maintenance costs for energy-saving equipment, emission control of greenhouse gases other than CO <sub>2</sub> )	1.8
Resource recycling	Waste reduction through reuse and recycling; treatment and disposal of waste	18.4
Management activities	Monitoring and measurement of environmental load, labor costs for environmental conservation organizations, costs for environmental education, etc.	2.4
Research and development	High-efficiency power generation, use of fuel cells, CO <sub>2</sub> capture and fixation, recycling of coal ash and gypsum, etc.	0.5
Social activities	Tree-planting, environmental advertising, environmental beautification, membership in environmental groups, preparation of sustainability report, etc.	1.9
International projects	Overseas cooperation projects for environmental conservation technologies	0.4
Other	Pollution load levy	1.6
<b>Total</b>		<b>46.3</b>

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

#### Environmental conservation benefit

Environmental conservation benefit	FY 2015
SO <sub>x</sub> emissions intensity (g/kWh)	0.18
NO <sub>x</sub> emissions intensity (g/kWh)	0.50
Soot and dust emissions intensity (g/kWh)	0.01
CO <sub>2</sub> emissions intensity (kg-CO <sub>2</sub> /kWh)	0.72
Average coal-fired power efficiency (%)	40.4
Coal ash recycling rate (%)	99.3
Industrial waste recycling rate (%)	99
Gypsum recycling rate (%)	100
Volume of driftwood recycled (1,000 m <sup>3</sup> )	27
Employees completing internal environmental auditor training	68
Sustainability report (copies published)	6,000
Overseas consulting projects (cumulative total)	355

\* Note: For detailed data on each item, see pp. 49-50, Environment-Related Data.

When considering 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.

### Economic Benefit

Efforts contributing to earnings and cost reductions were calculated to have had an economic benefit of approximately 11.1 billion yen.

#### Economic Benefits

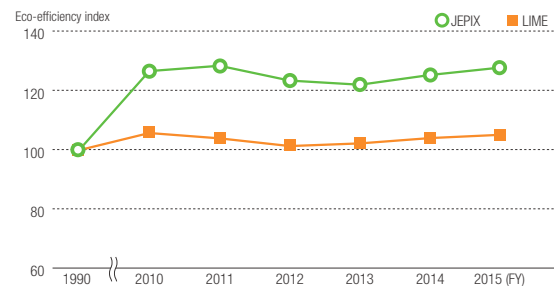
(unit: billion yen)

Category	Details of main measures and initiatives	Benefit
Revenue	Sales of marketable commodities from coal ash, gypsum, and sulfuric acid	0.5
Cost reduction	Reduction in fuel costs due to improved coal-fired power efficiency (introduction of USC)	3.4
	Reduction in disposal costs due to coal ash, gypsum, and sulfuric acid recycling	7.2
<b>Total</b>		<b>11.1</b>

### Eco-Efficiency

J-POWER initiatives to date have been evaluated by the JEPIX\*<sup>1</sup> and LIME\*<sup>2</sup> methods. These two approaches assign different coefficients to environmental loads (coal, CO<sub>2</sub>, SO<sub>x</sub>, NO<sub>x</sub>, coal ash), and the resulting recent trends in eco-efficiency are as shown in the graph below.

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



\* Note: Eco-efficiency: 100 = FY 1990 integrated index (electric power sold per environmental load).

#### \*1 JEPIX (Japan Environmental Policy Index)

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.

#### \*2 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.

## Corporate Targets for FY 2016

### Efforts Relating to Global Environmental Issues

Item	Target
<ul style="list-style-type: none"> <li>Reducing CO<sub>2</sub> Emissions from Power Generation and Promoting Technological Development</li> </ul>	<p>As an electric utility, in addition to continuing to contribute to the Environmental Action Plan by the Japanese Electric Utility Industry, looking towards 2020 we are working to provide a stable supply of energy and reduce CO<sub>2</sub> emissions in Japan and overseas by promoting the following measures.</p> <ul style="list-style-type: none"> <li>We will replace aging coal-fired power stations with new facilities with higher efficiency at the world's highest levels.</li> <li>Promote mixed combustion of biomass fuels in coal-fired power stations (Effective exploitation of untapped resources).</li> <li>Contribute to the reduction of CO<sub>2</sub> emissions and technology transfer on a global scale by promoting the overseas expansion of coal-fired power using J-POWER's advanced, high-efficiency power generation technologies, in particular in the Asian region.</li> <li>Promote the development of higher-efficiency oxygen-blown integrated coal gasification combined-cycle (IGCC) technology through the implementation of the Osaki CoolGen Project. In addition, advance research and development regarding CO<sub>2</sub> capture and storage (CCS) technologies based on the result of the trail of the EAGLE Project and the Callide Oxyfuel Combustion Project in Australia.</li> <li>In relation to the Ohma Nuclear Power Plant Plan, respond appropriately to the review of compliance with the new regulatory standards, an application for which was submitted in December 2014. Do our utmost to ensure the construction of a safe and trusted nuclear facility, taking voluntary safety measures based on serious consideration of the accident at the Fukushima Daiichi Nuclear Power Station and obtaining the understanding of residents near the plant site.</li> <li>Build new hydroelectric power facilities, expand, upgrade and replace existing facilities, and expand the use of hydroelectric power.</li> <li>Significantly expand domestic wind power facilities and advance research and development towards the realization of ocean-based wind power generation technologies.</li> <li>Work to develop new geothermal power sites in Japan.</li> </ul>
<ul style="list-style-type: none"> <li>Maintain/improve thermal efficiency of thermal power stations [HHV (higher heating value)]</li> </ul>	Maintain current level [about 40%] (FY 2008 and each FY thereafter)
<ul style="list-style-type: none"> <li>Reduce SF<sub>6</sub> emissions; increase recovery rate during inspection and retirement of equipment</li> </ul>	Inspection: at least 97%; Retirement: at least 99% (FY 2008 and each FY thereafter)

### Efforts Relating to Local Environmental Issues

Item	Target
<ul style="list-style-type: none"> <li>Reduce SO<sub>x</sub> emissions per unit of electric power generated (point of generation, thermal power stations)</li> </ul>	Maintain current level [about 0.2 g/kWh] (FY 2008 and each FY thereafter)
<ul style="list-style-type: none"> <li>Reduce NO<sub>x</sub> emissions per unit of electric power generated (point of generation, thermal power stations)</li> </ul>	Maintain current level [about 0.5 g/kWh] (FY 2008 and each FY thereafter)
<ul style="list-style-type: none"> <li>Increase recycling rate for industrial waste</li> </ul>	Maintain current level [about 97%] (FY 2011 and each FY thereafter)
<ul style="list-style-type: none"> <li>Protect the water environment</li> </ul>	Consider the protection of the river and ocean environment in business activities (FY 2013 and each FY thereafter)
<ul style="list-style-type: none"> <li>Protect biological diversity</li> </ul>	Consider the protection of biological diversity in relation to business activities (FY 2011 and each FY thereafter)

### Ensuring Transparency and Reliability

Item	Target
<ul style="list-style-type: none"> <li>Improvement of Environmental Management Level</li> </ul>	Continuous improvement of EMSs (FY 2008 and each FY thereafter)

# FY 2016 J-POWER Group Environmental Action Guidelines

## 1. Efforts Relating to Global Environmental Issues

### Reducing CO<sub>2</sub> Emissions from Coal-fired Power

- Maintain high-efficiency operation at existing thermal power stations
- Promote biomass mixed combustion in existing thermal power stations
- Implementation of replacement plans for existing thermal power stations
  - The Takehara Thermal Power Station Units No. 1 and 2 and the Takasago Thermal Power Station Units No. 1 and 2 will be replaced with the newest USC plants, greatly increasing efficiency.
- Transfer high-efficiency coal-fired power generation technologies overseas and promote their diffusion
  - Contribute to the reduction of CO<sub>2</sub> emissions and technology transfer on a global scale by promoting the overseas expansion of coal-fired power using J-POWER's advanced, high-efficiency power generation technologies, in particular in the Asian region.

### Conducting Research and Development of Next-generation Low-carbon Technologies

- Proceed with large-scale proving trials of oxygen-blown integrated coal gasification combined-cycle (IGCC)
  - Proceed with the Osaki CoolGen Project to develop high-efficiency IGCC generation technologies.
- Proceed with development of CO<sub>2</sub> capture and storage (CCS) technologies
  - The second phase of the Osaki CoolGen Project is progressing steadily, making use of the results of pre-combustion CO<sub>2</sub> capture technology from the EAGLE Project.
  - Accumulate further technology and knowledge based on the oxygen combustion tests and CO<sub>2</sub> storage tests conducted under the Callide Oxyfuel Combustion Project in Australia.
- Proceed with research and development of ocean-based wind power generation technologies
  - We will promote proving trials of maritime wind power generation systems (in joint research with NEDO) in waters off Kitakyushu City.

### Expanding CO<sub>2</sub>-free Power Generation Facilities

- Work to realize the Ohma Nuclear Power Plant Plan, with safety as the top priority
  - In relation to the Ohma Nuclear Power Plant Plan, respond appropriately to the review of compliance with the new regulatory standards, an application for which was submitted in December 2014. Do our utmost to ensure the construction of a safe and trusted nuclear facility, taking voluntary safety measures based on serious consideration of the accident at the Fukushima Daiichi Nuclear Power Station and obtaining the understanding of residents near the plant site.
- Expand use of renewable energies
  - Maintain stable operation of existing hydroelectric, geothermal, wind power and recycle power stations.
  - Increase efficiency through upgrades of existing hydroelectric power facilities.
  - Proceed with new hydroelectric, geothermal and wind power developments. Proceed with development towards the significant expansion of power stations, particularly in the case of wind power.
  - Conduct development and support of renewable energy in emerging-market countries.

### Other

- Promote energy saving
  - Promote reduction of internal consumption rate at power stations.
  - Take the initiative in energy conservation in the offices throughout the Group in view of the current state of the power supply and demand situation.
    - Promote energy conservation measures in offices with consideration of criteria for judgment stipulated for businesses by the Energy Use Law.
    - Work to conserve energy at our Headquarters towards compliance with the Tokyo Metropolitan Ordinance on Environmental Protection.
  - Reduce environmental load by promoting increased efficiency when transporting raw materials, etc.
  - Reduce environmental load through measures including use of public transportation, increased operation efficiency of company vehicles, and promotion of eco driving.
  - Promote energy and resource-conserving measures in employees' households, such as use of the Household Eco-Account Book.
  - Support measures to promote the spread of energy conservation.
- Utilization and promotion of the offset credit mechanism
- Control release of GHGs other than CO<sub>2</sub>
  - Curtail emissions of greenhouse gases other than CO<sub>2</sub> such of SF<sub>6</sub> (sulfur hexafluoride), CFCs (chlorofluorocarbons), HCFCs (hydrochlorofluorocarbons), HFCs (hydrofluorocarbons) and N<sub>2</sub>O (nitrous oxide).

## 2. Efforts Relating to Local Environmental Issues

### Reduction of Environmental Load

- Continue to reduce emissions
  - Properly manage waste incineration and environmental equipment in order to control emissions of SO<sub>x</sub>, NO<sub>x</sub>, and soot.
  - Properly manage wastewater treatment facilities to control discharges of substances causing water pollution.
  - Properly manage facilities to prevent noise, vibration and odors.
  - Properly manage facilities to prevent pollution of soil and groundwater.
- Strengthen measures to prevent oil spills from equipment, etc. and be prepared so that emergencies can be dealt with in an appropriate and timely manner
- Design and introduce efficient and environmentally friendly station and equipment when constructing or renovating facilities

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

- Recycle and reuse recyclable resources and make efforts toward zero emission production
  - Promote reduction of waste from construction, upgrading and demolition work, and reuse and recycling of materials and equipment.
  - Work to reduce quantities used of water, chemicals, lubricating oil, etc.
  - Work to curb volume of office waste (copy paper, etc.) and promote reuse.
  - Rigorously collect and separate paper, bottles, cans, plastic and other waste, and promote reuse and recycling.
- Maintain and continue green purchasing efforts in line with the J-POWER Group Green Purchasing Guidelines
  - Maintain and continue green purchasing of office goods.
  - Maintain and continue the use low-pollution vehicles, etc.
- Properly maintain and manage landfill sites and implement closing procedures

### Management of Chemicals

- Fully comply with the Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (PRTR Law)
  - Survey and manage the amounts of chemical substances subject to the PRTR Law that are emitted and transported, notify the appropriate authorities and publish this information.
- Take appropriate measures to deal with dioxins
  - Appropriately manage waste incinerators, and survey and report on exhaust gases and ash in accord with the Act on Special Measures concerning Countermeasures against Dioxin.
  - Observe the stipulations of the Waste Disposal and Public Cleansing Act and the Act on Special Measures concerning Countermeasures against Dioxin when waste incinerators are scrapped.
- Properly manage and dispose PCBs
  - Appropriately store and manage substances based on the stipulations of the Waste Disposal and Public Cleansing Act, the Law concerning Special Measures for Promotion of Proper Treatment of PCB Wastes, the Electricity Business Act, and the Fire Service Act.
  - Progressively treat waste products containing high concentrations of PCBs in accord with the J-POWER Group's Basic Policy for the Treatment of PCBs (based on the government's PCB Wide Area Treatment Plan).
  - Appropriately manage and store waste products containing trace amounts of PCBs, including wiping cloths, tools, etc. with PCBs adhering, until a scheme for the effective and rational treatment of such waste products comes into effect. (Appropriately manage and reduce the risk of PCB leakage in the case of devices still in use containing trace amounts of PCBs.)



- Strive to reduce volumes of hazardous chemicals handled
- Respond appropriately to asbestos-related issues
  - Adopt appropriate measures to prevent the dispersal of asbestos based on the J-POWER Group's Basic Policy concerning Asbestos, while systematically removing asbestos and replacing it with alternative substances.

### Measures to Protect the Natural Environment

- Take the natural environment and biodiversity into account in the various stages of business
  - Recognizing that the blessings of the natural environment support a rich and secure lifestyle, conduct surveys, measurements and assessments as necessary of the effect of business activities on the natural environment, and work to protect the natural environment and biological diversity at each stage of the business process, including the planning, design, construction and operation of power stations.
- Consideration for Aquatic Environments
  - In operating power generation facilities that are involved with rivers, we will steadily promote measures for protection of the river environment. These include the implementation of sedimentation control measures according to the conditions at each location and measures to mitigate long-term persistence of turbidity.
  - In operating power generation facilities that adjoin the ocean, we will implement precise control over the discharge of wastewater in compliance with environmental protection agreements and other such arrangements.
- Showing Consideration for Biodiversity
  - We will show consideration for the protection of ecosystems and the diversity of species in conducting our business activities, and we will strive to protect rare animal and plant species and their habitats.
- Implement forest conservation initiatives
  - Institute appropriate protections for company-owned forests based on the J-POWER Group Forest Protection Guidelines.
  - Promote the use of unexploited offcuts in forests.

### Environmental Conservation Initiatives in Overseas Projects

- Promote overseas transfer of environmental protection technologies
  - Promote transfer of environmental technologies for thermal and hydroelectric power stations.
- Incorporate environmentally friendly initiatives when formulating development plans and considering investment in projects, and ensure that those initiatives are carried out

### Implementation of Accurate Environmental Impact Assessments

- Conduct surveys, measurements and assessments of environmental impact of business activities on the basis of the applicable laws and regulations, reflect the results in the details of business activities, and consider environmental protection.

## 3. Ensuring Transparency and Reliability

### 1. Continual Improvement of Environmental Management (Greater Reliability)

#### Improvement of Environmental Management Level

- Continue to enhance operation of the environmental management system (EMS) at all J-POWER Group companies
  - Assess the actual status of environmental burden and set targets and formulate plans for the protection of the environment.
  - Systematically conduct internal environmental audits and periodically evaluate and improve details of environmental activities in order to meet targets.
  - Take measures to enhance check functions with the aim of maintaining and improving internal environmental audits.
  - Make improvements at business sites that have acquired ISO 14001 certification through their activities.
- Raise employee awareness of environmental issues
  - Systematically conduct education and training programs regarding environmental laws and regulations applicable to business activities.
  - Promote environmental education using e-learning, etc.
- Utilize environmental accounting and eco-efficiency indicators
- Request cooperation of business partners in environmental activities
- Strengthen risk management
  - Work to implement measures to prevent environmentally harmful incidents and ensure essential communication and appropriate responses in an emergency.

#### Full Compliance with Laws, Regulations, Agreements, and other Rules

- Identify applicable laws, regulations, agreements, and other rules, and work to raise awareness and ensure compliance
  - Accurately identify laws and regulations, agreements, etc. applicable to business activities, and work to respond effectively, educate employees, and ensure appropriate operation and verification.
- Fully comply with environment-related laws, regulations, agreements, and other rules
  - Make precise improvements to equipment and operations in order to prevent pollution of the surrounding environment.
  - Conduct risk diagnoses in relation to waste products and education programs for employees responsible for waste disposal in order to ensure appropriate disposal of waste. In addition, apply the J-POWER Group Guidelines for the Selection of Industrial Waste Disposal Contractors and expand use of electronic manifests.

### 2. Communication with Society (Greater Transparency)

#### Publication of Environmental Information

- Formulate environmental reports
  - Report on environmental measures taking into consideration such social requirements as environmental reporting guidelines for Sustainability Reports.
  - Work to increase reliability and transparency by having environmental data published in Sustainability Reports checked by third parties.

#### Increased Engagement in Environmental Communication

- Carry out environmental communication
  - Conduct publicity programs via website, internal Group publications, etc.
  - Conduct publicity programs targeting visitors to offices, PR centers, etc.
  - Communicate with experts and other third parties.
  - Receive external assessments such as environmental ratings.
  - Conduct environment-related social contribution activities such as providing support for environmental education.
- Carry out regional environmental conservation activities
  - Independently implement regional environmental protection activities.
  - Participate in clean-up events, beautification activities, tree planting events and similar activities organized by small cities, towns and villages, neighborhoods, etc.

## Environment-Related Data

The following data represent annual values or year-end values in each fiscal year. Unless specifically noted, includes data for Group companies\*1.

\*1: J-POWER and its 25 consolidated domestic subsidiaries, such as electric power businesses and ancillary businesses related to electric power. The amounts attributed to consolidated subsidiaries are based on percentages corresponding to J-POWER's equity share. For information on companies included in the statistics, see the list of main Group companies on page 1. (However, the Power Facilities (maximum output), the Usage of Specified CFCs, and the SF<sub>6</sub> emissions and handled amount in Greenhouse Gas Emissions aggregate amounts from consolidated subsidiaries in the totals.)

• Figures may not add up to totals because of rounding.

### Power Facilities (maximum output)

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Hydroelectric	GW	8.56	8.56	8.56	8.56	8.57	8.57
Thermal	GW	8.79	8.79	8.79	8.85	8.27	8.74
Coal-fired	GW	8.55	8.55	8.55	8.51	7.93	8.51
Natural gas	GW	0.22	0.22	0.22	0.32	0.32	0.21
Geothermal	GW	0.02	0.02	0.02	0.02	0.02	0.02
Wind power	GW	0.35	0.35	0.35	0.38	0.40	0.40
Total	GW	17.69	17.69	17.69	17.78	17.24	17.71

### Electricity Output

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Hydroelectric	GWh	11,301	11,557	10,330	9,708	9,628	10,997
Thermal	GWh	58,511	58,522	59,303	59,456	57,706	59,966
Coal-fired	GWh	58,084	57,624	58,377	58,423	56,701	59,304
Natural gas	GWh	355	862	898	1,007	977	639
Geothermal	GWh	72	36	29	25	28	23
Wind power	GWh	458	590	620	638	733	760
Total	GWh	70,271	70,669	70,253	69,801	68,067	71,723

### Electric Power Sold

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Hydroelectric (excluding pumped storage)	GWh	10,267	10,318	9,033	8,760	9,029	10,322
Thermal	GWh	54,786	54,777	55,577	55,697	53,992	56,124
Coal-fired	GWh	54,388	53,946	54,722	54,730	53,058	55,511
Natural gas	GWh	327	803	836	952	916	599
Geothermal	GWh	71	28	19	15	18	14
Wind power	GWh	442	562	596	614	706	730
Total	GWh	65,495	65,657	65,206	65,071	63,726	67,176

### Fuel Consumption

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Coal (dry coal 28 MJ/kg equivalent)	million t	18.51	18.04	18.49	18.61	18.10	18.83
Use intensity (coal-fired)	t/GWh	340	338	338	340	341	342
Natural gas	million m <sup>3</sup> N	60	142	148	172	173	116
Heavy oil	million kl	0.04	0.04	0.05	0.06	0.04	0.05
Diesel	million kl	0.03	0.03	0.02	0.02	0.02	0.02
Biomass	million t	0.01	0.02	0.02	0.03	0.02	0.03

Note: Denominator for use intensity represents electric power sold by coal-fired power stations.

### Greenhouse Gas Emissions\*\*2

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
CO <sub>2</sub> emissions (domestic and overseas power generation)*3	million t-CO <sub>2</sub>	52.54	52.24	54.09	56.33	55.77	59.11
CO <sub>2</sub> emission intensity	kg-CO <sub>2</sub> /kWh	0.67	0.67	0.67	0.68	0.67	0.64
CO <sub>2</sub> emissions (domestic power generation)	million t-CO <sub>2</sub>	47.01	46.77	47.56	47.84	46.49	48.20
CO <sub>2</sub> emission intensity	kg-CO <sub>2</sub> /kWh	0.72	0.71	0.73	0.74	0.73	0.72
SF <sub>6</sub> emissions	t	0.1	0.1	0.1	0.0	0.0	0.1
Handled	t	12.0	11.1	6.5	7.7	7.5	11.0
Recovery rate	%	99	99	99	99	99	99
HFC emissions*4	t	0.1	0.1	0.2	0.2	0.1	0.1
N <sub>2</sub> O emissions	t	1,650	1,660	1,362	1,553	1,576	1,715

Note: Denominators for emission intensity represent electric power sold.

\*\*2: CO<sub>2</sub> is calculated based on fuel combusted in conjunction with electric power generation. Other greenhouse gases (PFC, CH<sub>4</sub>, and NF<sub>3</sub>) are effectively not emitted. Calculation of CO<sub>2</sub> emissions is performed in accordance with the Act on Promotion of Global Warming Countermeasures for both Japan and overseas.

\*3: This covers J-POWER and consolidated subsidiaries, such as electric power businesses and overseas businesses, as well as equity method affiliates (11 domestic and 32 overseas companies). The portions attributed to consolidated subsidiaries and equity method affiliates are based on the percentage of J-POWER's equity share. For information on companies included in the statistics, see the list of main Group companies on page 1.

\*4: The same tabulation as for Usage of Specific CFCs was used.

## J-POWER Group total thermal energy efficiency (at generation point)

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Total thermal energy efficiency (at generation point) based on HHV	%	40.5	40.6	40.5	40.3	40.2	40.4

## Usage of Specified CFCs

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Specified CFCs	Stocked	t	1.0	1.0	1.0	1.0	1.0
	Consumed	t	0.0	0.0	0.0	0.0	0.0
Halons	Stocked	t	4.6	4.6	4.6	4.6	4.7
	Consumed	t	0.0	0.0	0.0	0.0	0.0
Other CFCs	Stocked	t	11.9	11.4	10.8	10.8	10.4
	Consumed	t	0.2	0.2	0.1	0.1	0.1
HFCs (CFC alternatives)	Stocked	t	12.0	12.0	12.9	13.3	14.4
	Consumed	t	0.1	0.1	0.2	0.2	0.1

## SOx, NOx, and Soot and Dust Emissions

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
SOx emissions	1,000 t	10.1	12.1	12.3	10.7	9.8	10.7
Intensity (thermal)	g/kWh	0.17	0.21	0.21	0.18	0.17	0.18
NOx emissions	1,000 t	28.0	28.5	30.3	31.1	29.1	29.8
Intensity (thermal)	g/kWh	0.48	0.48	0.51	0.52	0.51	0.50
Soot and dust emissions	1,000 t	0.8	0.7	0.8	0.8	0.8	0.8
Intensity (thermal)	g/kWh	0.01	0.01	0.01	0.01	0.01	0.01

• Soot and dust emissions are calculated from monthly measurements.

• Denominators for emissions represent the electricity output of thermal power stations (excluding geothermal stations).

## Industrial Waste Recycling

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Volume generated*5	million t	2.34	2.38	2.30	2.32	2.14	2.25
Volume recycled*5	million t	2.26	2.33	2.26	2.27	2.11	2.22
Recycle rate*5	%	97	98	98	98	99	99

\*5: Sulfur excluded

## Coal-Ash and Gypsum Recycling

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Coal-ash created	1,000 t	1,936	1,957	1,900	1,928	1,773	1,852
Volume recycled	1,000 t	1,900	1,939	1,882	1,906	1,760	1,839
Recycle rate	%	98.1	99.0	99.0	98.9	99.2	99.3
Gypsum created	1,000 t	320	362	352	322	304	318
Recycle rate	%	100	99.8	99.9	100	100	100

## Office Power Consumption

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Power consumed by offices (company total)	GWh	21.39	19.40	19.48	19.04	19.51	19.61
Head office*6 power consumption	GWh	8.22	7.31	6.99	6.94	6.39	6.41
Lighting/power sockets	GWh	1.65	1.25	1.33	1.29	1.26	1.25

\*6: J-POWER head office building

• Figures have been adjusted in accordance with the expansion/contraction of the range of data available for compilation.

## Fuel Consumption in Offices (Gasoline Equivalent)

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Consumption	kl	1,289	1,299	1,290	1,293	1,252	1,198

• Corrected for expansion, contraction, etc. of the range of data available for compilation.

## Rate of Procurement of Recycled Copy Paper

	Unit	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 ★
Copy paper*7 purchased	million sheets	56.77	58.77	61.50	61.79	58.53	55.30
Recycled copy paper*7 purchased	million sheets	56.38	58.14	61.25	61.45	57.85	54.76
Recycled copy paper*7 purchase rate	%	99	99	99	99	99	99

\*7: A4 paper-size equivalent

## Measures Addressing Global Climate Issues in the Electric Power Business

### Establishment of the Electricity Business Council for a Low-Carbon Society

(Excerpted from Federation of Electric Power Companies of Japan press release dated February 8, 2016)

The member companies\*<sup>1</sup> of the Federation of Electric Power Companies, J-Power, The Japan Atomic Power Company, and cooperating power producers and suppliers (PPSs) today established an electricity business, the Electricity Business Council for a Low-Carbon Society ("the Council"), aiming to steadily encourage efforts to meet the targets of the Action Plan for the Electricity Business for Achieving a Low-Carbon Society.

In July 2015, the electric companies formulated the Action Plan for the Electricity Business for Achieving a Low-Carbon Society ("the Action Plan") to organize industry-wide efforts to achieve a low-carbon society, in addition to the framework of voluntary efforts by the electricity business. (Announced July 17, 2015)

The Council will promote and support the individual measures that the member companies formulate and implement based on their respective business situations, and ensure that the Council's efforts for achieving the target will be effective. To ensure even greater effectiveness, the Council will check and evaluate the progress of the members' efforts and implement a Council-wide PDCA cycle.

### Establishment of an Action Plan for the Electricity Business for Achieving a Low-Carbon Society\*<sup>2</sup>

(Excerpted from a July 17, 2015 Federation of Electric Power Companies of Japan press release.)

The ten member companies of FEPC, together with J-Power, JAPC and 23 power producers and suppliers (PPSs)\*<sup>3</sup> (hereinafter referred to as "the participating companies" have established a new voluntary framework for achieving a low-carbon society, and formulated the Action Plan for the Electricity Business for Achieving a Low-Carbon Society.

The participating companies have all positioned global warming as an important business challenge, and have been working on both the supply and demand sides of electricity, based on their own action plans for achieving a Low-Carbon Society.

Meanwhile, for the electricity industry to orchestrate collective action for achieving a low-carbon society and jointly tackle the expected changes in environment, the participating companies set up a study group in March 2015, and have considered specific plans.

With the announcement of the government's energy supply-demand outlook for FY 2030 and the draft GHG reduction target, the participating companies together decided to set a new target based on their integrated action plans, as described below.

#### Action Plan for the Electricity Industry to Achieve a Low-Carbon Society

- Reduce the user-end emission intensity to approximately 0.37 kg-CO<sub>2</sub>/kWh.
- Utilize the best available technology (BAT) affordable in new thermal power plants to secure a maximum reduction potential of approx. 11 million t-CO<sub>2</sub>.

Going forward, the participating companies will enhance their efforts to achieve a low-carbon society by steadily taking actions to achieve these targets, and following up on the progress each year.

\*1: Hokkaido Electric Power Co., Inc., Tohoku Electric Power Co., Inc., Tokyo Electric Power Company Holdings, Inc., Chubu Electric Power Co., Inc., Hokuriku Electric Power Company, Kansai Electric Power Co., Inc., Chugoku Electric Power Co., Inc., Shikoku Electric Power Co., Inc., Kyushu Electric Power Co., Inc., Okinawa Electric Power Co., Inc.

\*2: After the Electric Power Council for a Low Carbon Society was established, the name was changed to the Electric Power Council for a Low Carbon Society Action Plan for Achieving a Low-Carbon Society

\*3: There are 42 participating companies in all as of July 13, 2016.



# External Evaluation and Outside Opinions

## The Accuracy of This Report


To ensure the accuracy and comprehensiveness of important environmental and societal data as well as performance indicators (hereinafter “sustainability information”) contained in the J-POWER Group Sustainability Report 2016, the sustainability information herein has been independently reviewed and certified by Ernst & Young Sustainability Co., Ltd. in accord with the sustainability report review and registration system of the Japanese Association of Assurance Organizations for Sustainability Information (J-SUS). As a result of this review, an “Independent Assurance Report” has been received. Guaranteed data calculated according to calculation standards\* is indicated by a star (★).



\* List of calculation standards  
[http://www.jpower.co.jp/english/company\\_info/environment/index.html](http://www.jpower.co.jp/english/company_info/environment/index.html)



Power plant inspection during a review  
 (Matsushima Thermal Power Station, Nagasaki Prefecture)



**Translation**

The following is an English translation of an independent assurance report prepared in Japanese and is for information and reference purposes only. In the event of a discrepancy between the Japanese and English versions, the Japanese version will prevail.

**Independent Assurance Report**

August 5, 2016

Mr. Toshifumi Watanabe  
 President  
 Electric Power Development Co., Ltd.

Masahiko Tsukahara Representative Director  
 Kenji Sawami Executive Officer  
 Ernst & Young Sustainability Co., Ltd.  
 Tokyo

We, Ernst & Young Sustainability Co., Ltd., have been commissioned by Electric Power Development Co., Ltd. (hereafter the “Company”) to provide limited assurance on the Key Environment Performance Indicators (hereafter the “Indicators”) of the Company and its major subsidiaries for the year ended March 31, 2016 included in the Company’s Sustainability Report 2016 (hereafter the “Report”). The scope of our work was limited to assurance over the information marked with the symbol “★” in the Report.

- The Company’s Responsibilities**  
 The Company is responsible for preparing the Indicators in accordance with the Company’s own criteria determined in consideration of Japanese Environmental Laws. The criteria represent the Company Information, Environmental Activities, Calculation Standards ([http://www.jpower.co.jp/english/company\\_info/environment/ie/2016index.html](http://www.jpower.co.jp/english/company_info/environment/ie/2016index.html)) of the Report. Greenhouse gas (GHG) emissions are estimated by using emission factors, which are uncertain because the scientific ground of the factors are not established and different instruments for measuring GHG emissions have different characteristics in terms of functions and presumed parameters.
- Our Independence and Quality Control**  
 We have complied with the independence requirement defined in the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants in March 2013, which is based on the fundamental principles of integrity, objectiveness, professional competence and due care, confidentiality, and professional behavior. In addition, as a member of Ernst & Young ShinNihon LLC, our parent company, we maintain a comprehensive quality control system, including documented policies and procedures for compliance with ethical rules, professional standards, and applicable laws and regulations in accordance with the International Standard on Quality Control 1 issued by the International Auditing and Assurance Standards Board in April 2009.
- Our responsibilities**  
 Our responsibility is to express a limited assurance conclusion on the Indicators included in the Report based on the procedures we have performed and the evidence we have obtained. We conducted our limited assurance engagement in accordance with the International Standard on Assurance Engagements (ISAE) 3000 (Revised) - Assurance Engagements Other than Audits or Reviews of Historical Financial Information, issued by the International Auditing and Assurance Standards Board in December 2013, Practical Guidelines for the Assurance of Sustainability Information, revised in December 2014 by the Japanese Association of Assurance Organizations for Sustainability Information and, in respect of GHG emissions, the International Standard on Assurance Engagements (ISAE) 3410, Assurance Engagements on Greenhouse Gas Statements, issued by the International Auditing and Assurance Standards Board in June 2012. The procedures, which we have performed according to professional judgment, include inquiries, inspecting documents, analytical procedures, agreeing with records of basic information on the indicators, as well as the following:
  - Inquiries about the Company’s own criteria determined in consideration of Japanese Environmental Laws and evaluating their appropriateness;
  - Inspecting relevant documents with regard to the design of the Company’s internal controls of the Indicators and inquiring of personal responsible thereof at the headquarters and sites visited (1 sites);
  - Performing analytical procedures on the indicators at the headquarters and sites visited (1 sites) and
  - Agreeing to supporting documents and re-calculating with part of the Indicators at the headquarters and sites (1 sites) visited on a test basis.
 The procedures performed in a limited assurance engagement are more limited in nature, timing or extent than a reasonable assurance engagement. As a result, the level of assurance obtained in a limited assurance engagement is not as that obtained if we had performed a reasonable assurance engagement.
- Conclusion**  
 Based on the procedures we have performed and the evidence we have obtained, nothing has come to our attention that caused us to believe that the indicators included in the Report have not been measured and reported in accordance with the Company’s own criteria determined in consideration of Japanese Environmental Laws.

Independent third-party certification of J-POWER Group Sustainability Report 2016

## Readers’ Opinions

We received many comments from readers in response to the J-POWER Group Sustainability Report 2015 (published August 2015). We consider these valuable comments to be important guidelines for compiling subsequent reports and for the future initiatives of the J-POWER Group, and intend to put their lessons to use in our corporate activities.

### Expectations for the J-POWER Group

Typical Comments	Typical Comments
Coal is high in CO <sub>2</sub> emissions, and I want you to give an easily understandable explanation of measures for development of the technology to overcome that issue.	This report has special features that introduce measures for reduction of carbon emissions from coal-fired power. We will continue to carry readily understandable articles about measures for reduction of carbon emissions, including development of technology. Please refer to “Thermal Power” on pp. 11-18 of this report.
Renewable energy is going to take on importance in the times ahead. I hope you will take active measures to expand renewable energy even more than you have so far.	In this report, we introduce not just the reduction of carbon emissions from coal-fired power, but also carbon emissions reduction that includes renewable energy. We are implementing a variety of measures with regard to renewable energy in particular, including hydroelectric power, wind power, geothermal power, and biomass. We will continue taking measures for expanded use in the future, as well. Please refer to “Hydroelectric Power” on pp. 9-10, and “Renewable Energy” on pp. 19-20 of this report.

## Third-Party Opinion

To help us meet society's expectations regarding our corporate social responsibility (CSR) and play our part in the sustainable development of Japan and the world the J-POWER Group asked outside experts who specialize in energy, the environment, and CSR to give their opinions concerning the Group's business efforts and the disclosure of information through this sustainability report from the perspective of achieving harmony between energy and the environment.



Chuo University  
Faculty of Science and  
Engineering, Department  
of Integrated Science and  
Engineering for Sustainable  
Society  
Laboratory of conservation  
ecology, professor and doctor  
of science

### Izumi Washitani

Recent years have brought greater changes in the natural environment than we had imagined, as witnessed by giant typhoons and "hit-and-run" rainstorms. Consequently, corporations will need to revise the yardsticks they have had for safety so far and secure the safety of their facilities while also making improvements.

The complete deregulation of retail electricity, the expanded introduction of renewable energy, and other such measures also show how greatly the societal environment of the electricity utilities has changed. It is becoming conceivable that in the future not just the value of electricity itself, but also the value of the method of generating electricity will be evaluated. Therefore J-POWER should also aim to achieve a proper power source composition that is not simply economical, but that gives full consideration to the social and ethical consequences and to the environmental impact, as well.

There is something more required in order for energy enterprises to respond precisely to these kinds of changes in the natural environment and societal environment. They must

have the vision to see ahead, beyond the changes, and it is crucial that they develop and secure human resources with the ability to make analyses, make evaluations, and make judgments scientifically and objectively.

In the field of biodiversity, which is my own specialization, I feel that there are still only few corporations taking measures for essential biodiversity protection. In fact, the number of specialists is still small, and corporate interest is not yet adequate, so in some sense this can't be helped, but I think that it is necessary first to thoroughly address the matters that are prescribed by legal statute, such as environmental assessment, and deal with them seriously. By means such as these, corporations must reach a profound awareness of the substance and the extent of the environmental impact that results from their own business. Then they should use technology and intelligence to accurately mitigate that environmental impact. I expect this is what it means for energy enterprises to coexist with the environment and society.



Journalist, Environmental  
Counselor  
NPO Genki Net for Creating a  
Sustainable Society  
Director

### Yuko Sakita

I have sensed that the importance of reducing the carbon emissions from coal-fired power, which J-POWER had already been working toward, has grown even greater since the conclusion of the Paris Agreement at COP21 (21st session of the Conference of the Parties to the Framework Convention on Climate Change) last year. One method of approaching the reduction of carbon emissions from coal-fired power is by measures for the mixed biomass fuel combustion. It is necessary, however, to procure large quantities of fuel in a stable manner over the long term, so the recent increase in plans to build coal-fired power stations on the premise of biomass fuel imported from other countries seemed like a major issue. It is also important to promote the development of forests and the effective utilization of natural resources here in Japan, and I think that the measures taken by J-POWER, which has been manufacturing, procuring, and co-combusting biomass fuels domestically, can be rated highly from that perspective, as well.

It should go without saying that implementing measures to strengthen safety in compliance with new safety standards is a way of addressing the risk of nuclear power plants. At the same time, however, it is also necessary to establish good communication with local and regional communities. It is

important for operators to engage in repeated dialogue with residents, to deal politely with their unsophisticated questions, and to take a sincere and receptive attitude toward local feelings. It is also desirable for the employees who are in charge of dealing with matters on-site to blend into the local community so that business goes forward with the company and the local community working as a single entity.

Recently there seems to be an increase in the occasions when I hear the key expression, "hydrogen-based society." Development of various different technologies for realizing a hydrogen-based society, including products, power generation, and elimination of CO<sub>2</sub> emissions, is presently underway, but it seems to me that the dissemination of information to society regarding the use of hydrogen has not caught up with this development. Given also the concern that the low level of acceptance in society may impede the popularization of hydrogen in the future, it seems necessary not only to take measures for hydrogen safety and for the effective reduction of environmental impact, but also to engage in vigorous public information activities regarding the changes and the benefits that will be brought to people's lives by the realization of a hydrogen-based society.



Associate Professor and  
Doctor of Engineering  
Graduate Course of  
Technology Management  
for Innovation, School of  
Engineering,  
The University of Tokyo

## Gento Mogi

In thinking about Japan's future supply of energy, a balanced use of energy is necessary from the perspectives of energy security and economic efficiency. For that purpose, it is also necessary to expand the introduction of renewable energy that is considerate to the surrounding environment, and it is important to make efficient use of nuclear power, with safety management as the major premise, as well as of fossil fuels, and particularly coal, which is very economical and which has a relatively manageable distribution of supply sources. J-POWER possesses advanced technologies relating to coal-fired power, and it is committed to measures for further increasing the efficiency of coal-fired power and to advancing the development of technology in the future. I think that J-POWER should make more vigorous efforts to communicate the significance of using coal.

Compared to other methods, however, coal-fired power generates a larger volume of carbon dioxide emissions during power generation. In this sense, therefore, coal also presents a major risk from the perspective of the global warming problem. The movement toward decarbonization will no doubt become unavoidable in future, but that is not something that is possible to address immediately. It will have

an impact so great that it brings major change to the very framework of the corporation, and so it is crucial to have a plan for dealing firmly with such movements in the future.

For example, J-POWER has technology and knowledge relating to hydroelectric power, wind power, and other such renewable energy. Perhaps J-POWER should make use of this to deploy renewable energy not only in Japan, but globally to those places suited to it, and so orient itself toward reducing carbon dioxide emissions in the world as a whole.

When expanding business into other countries, the diversity of human resources becomes more important. Recent years have seen a rising number of university students from other countries who want to take long-term internships in Japanese corporations. Addressing needs like these should provide good opportunities for employees to think about diversity. When J-POWER develops business in other countries, it becomes a receptacle for university students from Japan and overseas who are interested in doing global work, and this will probably make it possible to secure a diversity of human resources over the long term.

## A Response to Opinions

I would like to thank everyone for their valuable opinions regarding the environmental management of the J-POWER Group.

As everyone indicated, ensuring the stable supply of energy while working to steadily reduce carbon is one of the top management priorities of the J-POWER Group. As discussed in this report, we will steadily take various actions in Japan and overseas with a focus on technology.

We will also disclose information through means such as this report and improve communication with all concerned parties in order to increase transparency and raise confidence with regard to the Group's business activities.

Each member of the J-POWER Group is committed to raising awareness regarding the increasing importance of environmental preservation as well as the diversifying and deepening responsibility of companies expected from society, and to directly addressing the issues that we are confronting one by one.

I request your continued guidance and support.



Executive Vice President  
Chairman of J-POWER Group  
Environmental Management  
Promotion Board

## Shuji Eto



**Electric Power Development Co.,Ltd.**

**Environmental Management Promotion Board Office:  
Business Research Office,  
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