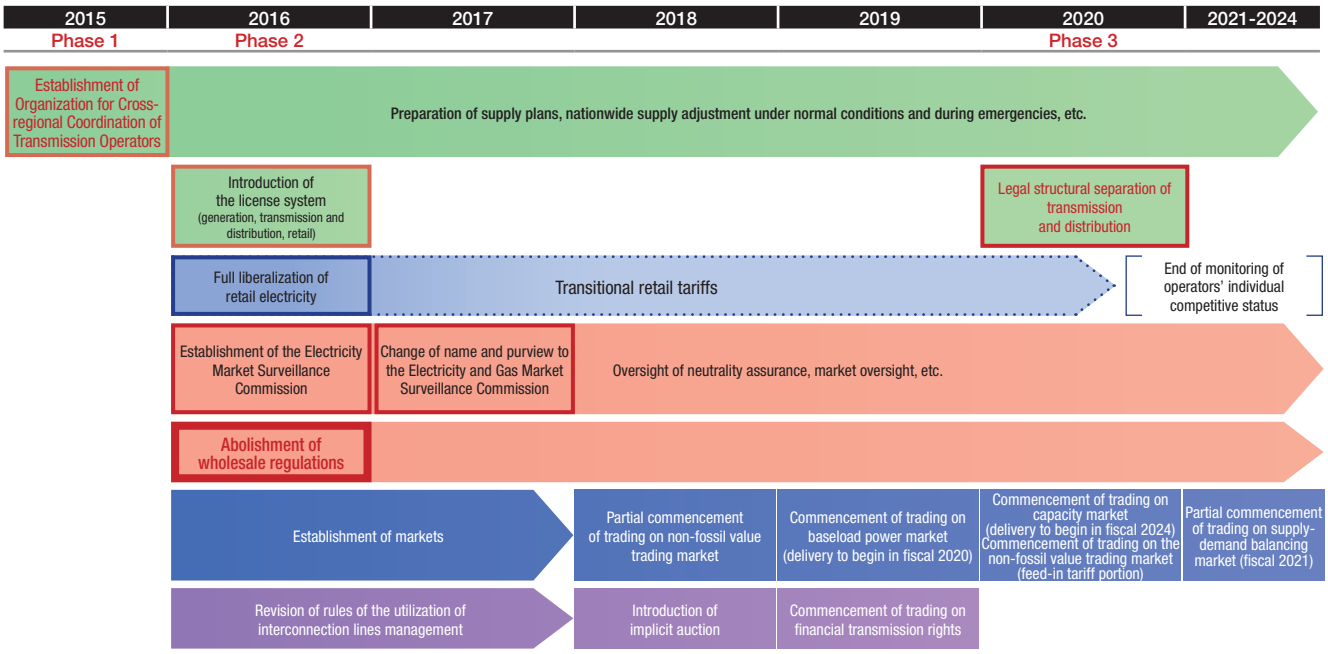
Electricity System Reform

Due in part to the Great East Japan Earthquake and the accident at TEPCO's Fukushima Daiichi Nuclear Power Plant, electricity generation costs have been rising, and the balance of electric power supply and demand in Japan is tightening. In response, the government is advancing electricity system reform as part of efforts to rebuild its energy policy. The three goals of the reform are securing a stable supply of electricity, keeping electricity rates as low as possible, and providing consumers with choices and business operators with opportunities to expand their businesses. To achieve these goals, the Organization for Cross-regional Coordination of Transmission Operators (OCCTO) was established in April 2015, and entry into the retail market was fully liberalized and electricity wholesale regulations abolished in April 2016. In 2020, the transmission/distribution sector will be legally unbundled. After 2020, upon confirmation by the government that conditions are sufficiently competitive, transitional retail tariffs will be removed.

Furthermore, based on the proposals of the February 2017 Interim Report of the Policy Subcommittee for Acceleration of Electricity System Reform, to further stimulate competition, the interconnecting line usage rules were revised. In 2019, trading began on a baseload power market, and a number of other new markets, including a capacity market, non-fossil value trading market, and supply-demand balancing market, are planned going forward. The detailed design of these systems is now being worked out.

Electricity System Reform Schedule



In the midst of intensified competition as a result of deregulation, the J-POWER Group works to maximize its corporate value by enhancing the competitiveness of its generating assets while taking advantage of newly established markets and diversifying sales methods.

Intensifying competition due to deregulation

The J-POWER Group's Initiatives

Strengthening production functions

- With the stable supply of power and ensuring safety as the foremost prerequisites, strengthen cost competitiveness by such means as utilizing digital technologies
- Improve the flexibility of operations and optimize maintenance to meet market needs

Diversifying sales channels

- Adapt to market competition brought about by deregulation and maximize corporate value by diversifying sales channels, for example, investing in Suzuyo-Power Co., Ltd. and ENERES Co., Ltd., and taking advantage of newly established markets, including the baseload power market and capacity market

Enhancing reliability and the nationwide improvement of the power grid

- Enhance the reliability of interconnecting lines, such as the Hokkaido-Honshu HVDC Interconnection Line, and major transmission and transformation facilities that J-POWER owns
- While expanding the Sakuma Frequency Converter Station and related facilities, contribute to the stability and resilience of the electric power supply as well as the nationwide improvement of the power grid

Overview of Existing Businesses

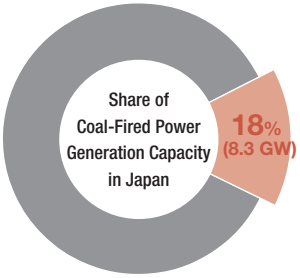
1. Thermal Power Business

Coal-fired thermal power accounts for the majority of the J-POWER Group's thermal power plants in Japan. In 1963, the Company's first coal-fired thermal power plant commenced operations in line with Japan's policy at the time of using domestically produced coal. Following the oil shocks of the 1970s, the Company responded to government plans to diversify the mix of power sources, which had been centered on oil-fired thermal power generation. In 1981, the Company began operations at the Matsushima Thermal Power Plant, the first in Japan fueled with imported coal. The Company went on to develop a series of large-scale coal-fired thermal power plants that run on imported coal, increasing the scale of its business. The Company has continued to improve power generation efficiency by enhancing steam conditions and scaling up plants in its efforts to improve competitiveness and decrease environmental impact. Providing an economical and stable baseload source of electricity, the Company's coal-fired thermal power plants maintain high load factors.

However, as coal-fired thermal power accounts for a large portion of our business, we see reducing CO_2 emissions from coal use as a material issue. Accordingly, we are advancing the mixed combustion of biomass fuels in coal-fired thermal power generation and pursuing research and development aimed at realizing and commercializing zero emissions technologies, including oxygen-blown integrated coal gasification combined cycle (IGCC) and CO_2 capture, use, and storage (CCUS) (please refer to pages 23–24).

Going forward, while taking steps to address global warming and other environmental problems, the Company will continue to build, operate, and maintain coal-fired thermal power facilities to serve as an economical and reliable baseload power source, thereby contributing to the stable supply of electricity in Japan.

The J-POWER Group operates coal-fired thermal power plants with world-leading efficiency and environmental performance



Sources: Compiled from Surveys and Statistics of Electricity (Agency for Natural Resources and Energy)
(owned capacity basis, as of March 31, 2019)

Social Issues

- Stable supply of power in light of Japan's low energy self-sufficiency rate
- Environmental problems
- Global warming

Value That the J-POWER Group Provides

- Contributes to the stable supply of power in Japan as an economical and stable baseload power source
- Uses high-efficiency, environmentally friendly coal-fired thermal power to reduce environmental impact
- Advancing biomass fuel mixed combustion initiatives and technological development aimed at achieving zero emissions in coal use in order to reduce CO_2 emissions

Replacement and New Capacity Projects

To contribute to the stable supply of electricity in Japan over the medium-to-long term, the J-POWER Group is promoting new coal-fired thermal power projects to replace aging thermal power plants and develop new power plants. These projects will commence operations after the abolition of wholesale regulations being implemented as part of Japan's electricity system reform. As a result, unlike the coal-fired thermal power plants the Company has developed in the past, the new plants' business contracts will no longer contain restrictive terms limiting who they may sell to and at what rates.

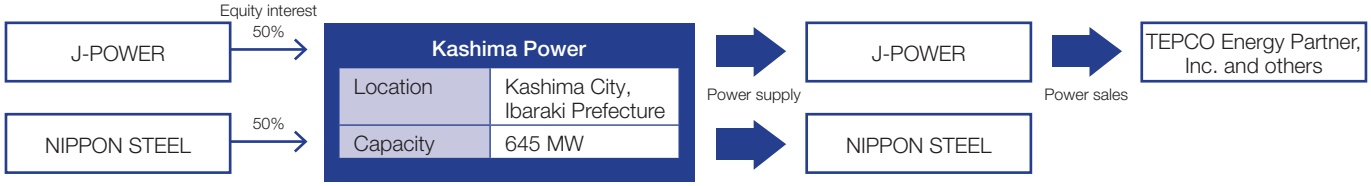
Takehara Thermal Power Plant Unit New No. 1
(post-completion rendering)

New Coal-Fired Power Projects in Japan

Takehara Thermal Power Plant Unit New No. 1 (Replacement)

Location	Takehara City, Hiroshima Prefecture
Status	Under construction for replacement
Start of operations	Scheduled for June 2020
Capacity	600 MW→600 MW (Replacement at the same capacity)
Steam conditions	Sub-critical→Ultra-supercritical

Kashima Power (New Capacity) ✓Status: Under construction (construction started November 2016) ✓Start of operation scheduled for July 2020



Yamaguchi Ube Power (New Capacity) ✓Status: Changes in plan under review

2. Transmission/Transformation

The J-POWER Group is an electricity transmission utility that owns and operates approximately 2,400 km of transmission lines and nine substations and converter stations throughout Japan. In addition to transmitting electric power generated by its own power plants to demand areas, the Company provides sections of the grids of the electric power companies and connects them to one another, fulfilling a major role in the nationwide operation of Japan's overall power grid.

In particular, we operate critical facilities that support wide-area power interchange in Japan, such as interconnection lines (Hokkaido-Honshu HVDC Interconnection Line, Honshu-Shikoku Interconnection Line, Kii Channel HVDC Interconnection Line and Kanmon Interconnection Line) connecting Honshu with Hokkaido, Shikoku, and Kyushu as well as the Sakuma Frequency Converter Station, which connects the different frequencies of eastern Japan (50 Hz) and western Japan (60 Hz). The Company's transmission/transformation facilities helped alleviate the strained regional electricity supply conditions that followed the Great East Japan Earthquake. The Company will maintain the reliability of facilities and focus efforts on ensuring stable operations. The Company also maintains a communications network throughout Japan that is used for facility protection, monitoring, and control as well as operational management to contribute to the operation of the power plants and the power grid.

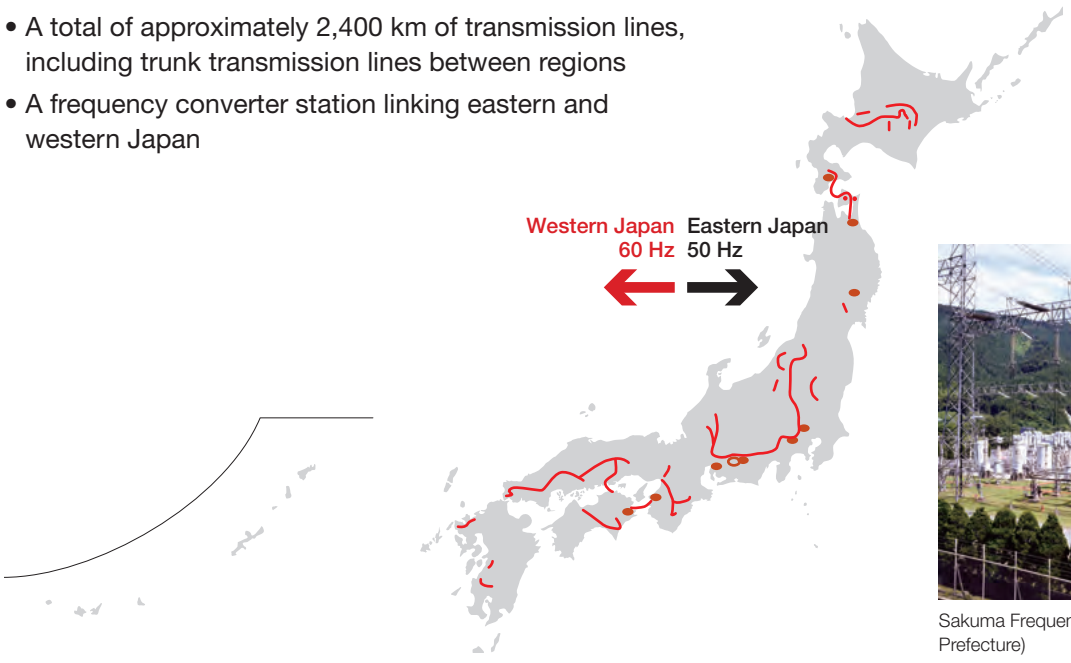
Social Issues

- Securing a stable power supply and demand balance over broad areas of Japan in light of the geographic separation of regions and differing frequencies of the eastern and western parts of the country

Value That the J-POWER Group Provides

- The Group's trunk transmission lines that connect regions, interconnecting line facilities, and frequency converter station that links eastern and western Japan contribute to the operation of Japan's broad-area power network.

- A total of approximately 2,400 km of transmission lines, including trunk transmission lines between regions
- A frequency converter station linking eastern and western Japan



Sakuma Frequency Converter Station (Shizuoka Prefecture)

Cross-Regional Network Development Plan on Tokyo-Chubu Interconnection Facilities

In June 2016, the Organization for Cross-regional Coordination of Transmission Operators published its Cross-regional Network Development Plan, which includes plans for the development of the New Sakuma Frequency Converter Station and for rebuilding the Sakuma East Trunk Line to increase its capacity. The J-POWER Group has been chosen to implement this plan. Accordingly, in line with government policy requirements and the purpose of the plan—to ensure the stable supply of electric power—the Company is advancing detailed examinations in preparation for construction.

Initiative	Capacity	Remarks
Construction of the New Sakuma Frequency Converter Station and replacement and expansion of related transmission lines	New Sakuma Frequency Converter Station: 300 MW Sakuma East Trunk Line: Approx. 125 km Sakuma West Trunk Line: Approx. 14 km	Undergoing detailed review in preparation for construction Expansion scheduled for completion at the end of fiscal 2027

3. Electric Power-Related Business

The J-POWER Group operates electric power-related businesses that support the smooth and efficient implementation of its electric power business. Specifically, these businesses are required for the operation of power generation, transmission, and transformation facilities and include the design, construction, inspection, and maintenance of said facilities as well as the import of coal. J-POWER maintains the power generation facilities of its domestic wholesale electric power business in close partnership with its subsidiaries.

Coal Procurement

The J-POWER Group procures fuel coal primarily from Australia and Indonesia. In Australia, the Company owns interests in three coal mining projects through subsidiaries.

Global supply and demand in the coal market can vary greatly due to demand from developing countries, including China and India, trends related to energy resources other than coal, such as liquefied natural gas (LNG), and other geopolitical factors. In view of this, the Company maintains an upstream presence, namely the ownership of coal mines, and secures diversified procurement sources, thereby ensuring the stable procurement of coal as fuel for thermal power generation over the long term.

Social Issues

- Stable power supply
- Fuel procurement in Japan, an island nation with a low energy self-sufficiency rate

Value That the J-POWER Group Provides

- Contributes to stable power supply through the stable operation of power plants, supported by long-term operation and maintenance technologies
- Conducts stable fuel procurement based on diversified sources, supporting coal-fired thermal power as a baseload power source

Coal Mining Projects (As of June 30, 2019)

Mine Name	Location	Loading Port	2018 Sales Volume	Investment Ratio*	Beginning of Commercial Production
Clermont	Queensland	Dalrymple Bay	11.51 million t	15%	2010
Narrabri	New South Wales	Newcastle	4.74 million t	7.5%	2012
Maules Creek	New South Wales	Newcastle	9.34 million t	10%	2014

* Investment through a subsidiary, J-POWER AUSTRALIA PTY. LTD.

4. Other Business

Aiming to fully utilize the management resources and know-how at its disposal, the J-POWER Group operates multifaceted businesses, including environment-related businesses involving the production of solid fuel from sewage sludge for use as biomass fuel at coal-fired thermal power plants. In addition, the Company is active in innovative power businesses, such as waste power generation and cogeneration systems, and provides technical consulting services in Japan.

Social Issues

- Global warming

Value That the J-POWER Group Provides

- Contributes to reducing CO_2 emissions by utilizing such environmental recycling technologies as biomass fuel production, waste-fueled power generation and cogeneration systems that employ sewage sludge and unused forestry products

Main Projects under Other Business (As of June 30, 2019)

Project Name	Location	Business	Ownership	Year Operation Commenced
Kanamachi Filtration Plant PFI[1] Business	Tokyo metropolitan area	Cogeneration at Kanamachi Filtration Plant of Tokyo metropolitan government's bureau (Gas turbine generator, capacity: 12.28 MW)	20%	2000
Narumi Plant PFI[1] Business	Aichi Prefecture	Maintenance and operation at Narumi Plant in Nagoya (General waste processing capacity: 530 t/day)	11%	2009
Miyazaki Wood Pellet Project	Miyazaki Prefecture	Demonstration business of an integrated system from manufacturing wood pellets from unused forest offcut, including construction of manufacturing facilities, up to the use of pellets for mixed combustion in J-POWER's coal-fired thermal power plants (Pellet production capacity: 25,000 t/year)	98.3%	2011
Hiroshima City Seibu Water Reclamation Center/Sewage Sludge Fuel Project	Hiroshima Prefecture	Integrated DBO-type[2] sewage sludge-based biofuels recycling project, from the construction of biofuel manufacturing facilities to mixed combustion in J-POWER's coal-fired thermal power plants (Sludge processing capacity: 100 t/day)	33.8%	2012
Kumamoto Sewage Sludge Solid Fuel Project	Kumamoto Prefecture	Integrated DBO-type[2] sewage sludge-based biofuels recycling project, from the construction of biofuel manufacturing facilities to mixed combustion in J-POWER's coal-fired thermal power plants and others (Sludge processing capacity: 50 t/day)	44%	2013
Osaka City Hirano Sewage Treatment Plant/ Sludge Solid Fuel Project	Osaka Prefecture	Integrated PFI-type1 sewage sludge-based biofuels recycling project, from the construction of biofuel manufacturing facilities to mixed combustion in J-POWER's coal-fired thermal power plants and others (Sludge processing capacity: 150 t/day)	60%	2014
Omuta Waste-Fueled Power Plant	Fukuoka Prefecture	Recycling power generation using solid fuel (RDF: Refuse derived fuel) made by compressing and forming general waste (Generating capacity: 20.6 MW, RDF processing capacity: 315 t/day)	45.2%	2002
Katsuragawa Right Bank Regional Sewerage/ Rakusai Sewage Treatment Plant/Sewage Sludge Solid Fuel Project	Kyoto Prefecture	Integrated DBO-type[2] sewage sludge-based biofuels recycling project, from the construction of biofuel manufacturing facilities to mixed combustion in J-POWER's coal-fired thermal power plants and others (Sludge processing capacity: 50 t/day)	49%	2017
Mikasagawa-Nakagawa Regional Sewerage/ Mikasagawa Sewage Treatment Plant/Sewage Sludge Solid Fuel Project	Fukuoka Prefecture	Integrated DBO-type[2] sewage sludge-based biofuels recycling project, from the construction of biofuel manufacturing facilities to mixed combustion in J-POWER's coal-fired thermal power plants and others (Sludge processing capacity: 100 t/day)	44%	2019

1. PFI (Private Finance Initiative): The method of conducting public-sector projects from construction through the operating stages by drawing on private-sector funding, management know-how, technology, and other resources
2. DBO (Design, Build, Operate): A system whereby the public sector finances projects and then commissions the private sector to undertake their design, building, and operation

2018 Initiatives

In July 2018, J-POWER and Sumitomo Forestry Co., Ltd. jointly established a wood pellet manufacturing and sales company. The new company will use domestic unused wood and other materials as fuel for power generation and is advancing deliberations with regard to creating the largest wood pellet supply system in Japan, aiming for commercialization in 2021.

Name	Ownership	Business Activities
SJ Wood Pellet Co., Ltd.	Sumitomo Forestry Co., Ltd.: 51% J-POWER: 49%	Manufacture and sale of wood pellets using domestic unused timber from forests, etc.