Special Feature

The Effects of the Great East Japan Earthquake and J-POWER Group's Responses

Areas of east Japan suffered massive damage as a result of the Tohoku-Pacific Ocean Earthquake and the subsequent tsunami, which struck on March 11, 2011.

The disaster-hit areas have received a great deal of support both from within Japan and overseas, and progress has been made in reconstruction and recovery measures, but there has been a significant loss of electricity supply capacity, and areas across east Japan have experienced scheduled blackouts or have been subject to measures to save energy.

At present, with the extension of the period for shutdown of nuclear power stations undergoing periodic inspections in west Japan, in addition to the decline in power supply capacity in east Japan due to the earthquake and tsunami disaster, power supply capacity has declined across the entire country. Against this background, J-POWER Group is implementing the initiatives discussed below.

Effect on J-POWER Group and Power Supply Capacity in Japan as a Whole

The Tohoku-Pacific Ocean Earthquake, which struck on March 11, and the tsunami that followed in its wake caused significant damage to power stations and other facilities within the area of operation of Tohoku Electric Power Co., Inc. and Tokyo Electric Power Company. Due to measures such as emergency shutdown and the rapid implementation of inspections and recovery work, J-POWER Group power facilities in the same region, with the exception of the Numappara Power Station (a pumped-storage hydroelectric power station located in Tochigi Prefecture), did not suffer any damage that affected generation capacity. (Parts of the Numappara Power Station facilities were damaged, but the station was able to recommence operation on July 17, following the completion of repair work.)

Against the background of a significant decline in power supply capacity on the part of Tohoku Electric Power Co., Inc. and Tokyo Electric Power Company, J-POWER Group is working as an electric power wholesaler to make up the shortfall by maintaining stable operation of power stations with an output of approximately 7 GW in the region of operation of both power companies. The Group is also seeking to ensure supply capacity by revising the details of its periodic inspections at the Isogo Thermal Power Station (Kanagawa Prefecture) in order to respond to the emergency situation, attempting to reduce the length of time required for procedures. We also contributed to electricity interchange by supplying 300 MW of power from west Japan to east Japan via the Sakuma Frequency Converter Station (Shizuoka Prefecture), and 600 MW of power from Hokkaido to Honshu via the Kitahon DC trunk line.

Preparing for the increase in electricity demand over the summer period, the government has placed restrictions on power use in the areas of operation of Tohoku Electric Power Co., Inc. and Tokyo Electric Power Company. Supply has been further restricted by a decline in supply capacity across the entire country due to the extension of the periods of shutdown of nuclear power stations undergoing periodic inspections.

In response to an unprecedented energy crisis, as an electric power wholesaler operating throughout the country J-POWER Group remains firm in its mission of supporting the stable supply of power. Extending from Hokkaido to Okinawa, J-POWER Group's hydroelectric facilities generate a total output of approximately 8.6 GW, its thermal facilities a total of approximately 8.4 GW, and its wind power facilities a total of approximately 350 MW. The Group also maintains approximately 2,400 km of transmission lines linking it to the power network across the entire country, in addition to frequency converter stations and other facilities. All of these facilities play a significant role in wide-area power interchange in Japan.

J-POWER Group takes meticulous care in maintaining these country-wide facilities, working to further increase the stability of power supply.

Support for Recovery and Responses to the Disaster

The provision of support to the disaster-hit regions by fulfilling our essential mission - doing our utmost to ensure a stable supply of power - is a fundamental goal for J-POWER Group. We are also contributing relief funds to support recovery, and our employees are donating to the Japanese Red Cross Society.

Even before the March earthquake and tsunami, the Group already had a volunteering leave system in place. This system enables us to support employees wishing to assist in volunteer activities for the recovery of the regions struck by the disaster. In addition, we also provide information to our employees, for example concerning calls for participation in volunteer activities by businesspeople.

A great deal of time and effort will be required to achieve recovery and reconstruction in the areas affected by the disaster, and J-POWER Group's efforts to support the people of these regions will not be set aside as temporary measures, but will be ongoing as we seek to make a genuine contribution.

J-POWER Group has made preparations for unforeseen contingencies such as fire, earthquakes and other natural disasters, formulating regulations and providing training to enable response to emergencies, and maintaining a disaster prevention system under which we stockpile emergency supplies and make other preparations. Since the Niigata Chuetsu Earthquake of 2004, we have focused particular efforts on measures to safeguard our facilities, and we continue to work to enhance our disaster prevention system.

In order to respond in an appropriate manner to any unforeseen events that may occur in future, we will treat the recent earthquake and tsunami disaster as a lesson, working to further bolster our disaster prevention system, all the while maintaining close attention to our contribution to local communities. (See p. 17)

Performing volunteer activities

Generation and transmission facilities that support the stable supply of power across Japan

Generation facilities supplying power across a wide area

Acting as an electric power wholesaler supplying power across a wide area, we operate hydroelectric, thermal and wind power facilities throughout Japan

- Hydroelectric power facilities
  59 facilities throughout Japan, with a total output of 8.6 GW. This represents approximately 20% of all hydroelectric facilities in Japan
- Thermal power facilities
  Seven facilities throughout Japan, with a total output of 8.41 GW. This gives us the number one share of Japan's thermal power facilities
- Wind power facilities
  18 facilities in Japan, with a total output of approximately 350 MW, giving us the number two share of Japan's wind power facilities
- Other
  We have been operating the Onikobe Geothermal Power Station (output: 15 MW), which uses geothermal energy, since 1975

Immediately following the Great East Japan Earthquake, we supplied 600 MW through the Kitahon DC trunk line as a backup power interchange (See p. 26)

Introduced as a new technology – Japan's first ultra-high-voltage DC transmission line – the Kitahon HVDC Link commenced operation in 1979 as Japan's only power interconnection system (transmission capacity: 600 MW) connecting the power networks of Hokkaido and Honshu. Power is converted from AC to DC at a converter station, and sent via the Kitahon DC trunk line to a converter station on the opposite side, where it is converted back to AC. By this means, the line enables mutual power interchange between Hokkaido and Honshu, contributing to effective wide-area power management.

Main facilities

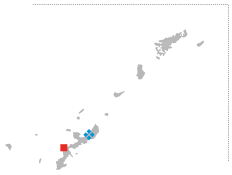
- Hydroelectric power stations
- Thermal power stations (including geothermal)
- Wind farms
- Independent power producers (IPP)
- Power generation for competitive market
- Transmission lines
- Substations (including converter stations)
- Research institutes, etc.
- Planned, under construction
- Thermal power stations
- Hydroelectric power stations
- Nuclear power stations
- Transmission lines

● In addition, dedicated Group communications facilities and facilities owned by affiliated companies.

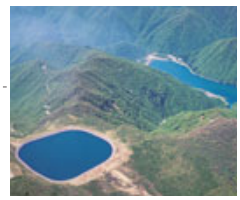
Okutadami Power Station

Matsuura Thermal Power Station

Tachibanawan Thermal Power Station



Nikaho Kogen Wind Farm



Numappara Power Station

Isogo Thermal Power Station

Immediately following the Great East Japan Earthquake, we supplied 300 MW through the Sakuma Frequency Converter Station as a backup power interchange (See p. 26)

Because of differences in power generation technologies introduced in the Meiji Period, Japan's power system uses two frequencies: 50 Hz to the east of the Fuji River in Shizuoka Prefecture, and 60 Hz to the west of the river. The Sakuma Frequency Converter Station was constructed in 1965 to enable efficient management of backup power by converting power between these two frequencies. Power is converted to DC and then converted back to AC at its destination in order to link the 50 and 60 Hz systems.

Transmission lines and frequency conversion facilities enabling power supply across a wide area

Acting as an electric power wholesaler supplying power across a wide area, we operate transmission and conversion facilities throughout Japan

- Connecting regions to enable comprehensive management of Japan's entire power network
- Wide-area power interconnection facilities linking Honshu with Hokkaido, Shikoku and Kyushu (Kitahon HVDC Link, Honshi Interconnecting Line, Anan Kihoku DC Trunk Line, Kanmon Interconnecting Line) and the Sakuma Frequency Converter Station, which enables power interchange between 50 Hz east Japan and 60 Hz west Japan, contribute to power interchange across a wide area
- 2,400 km of transmission lines and eight substations and other facilities

Status of Ohma Nuclear Power Station (Report)

Introduction

During the Tohoku-Pacific Ocean Earthquake, tremors measuring four on the Japanese scale were recorded in Ohma-machi (Shimokita-gun, Aomori Prefecture), where J-POWER is proceeding with the construction of its Ohma Nuclear Power Station, and a tsunami reaching a maximum height of 0.9 m occurred in Ohma Bay. The earthquake and tsunami did not cause any damage at the construction site, but due to the effect of power outages caused by the earthquake and restrictions on fuel for power sources, heavy machinery and other vehicles, on the transportation of equipment, and on other construction-related necessities, in addition to the prioritization of relief for the disaster-hit regions, work on the facility other than work essential for environmental protection and the maintenance of equipment was suspended from March 11.

In the future we intend to work together as one, with the understanding of the local community, towards the construction of a safe facility that is trusted by all, while continuing in our examination of enhanced safety measures in response to the accident at the Fukushima Daiichi Nuclear Power Station, as shown below, in addition to appropriately incorporating the necessary measures based on government guidelines and other instructions and recommendations.

The Accident at the Fukushima Daiichi Nuclear Power Station

Overview of the Accident

The Fukushima Daiichi Nuclear Power Station lost three functions as a result of the tsunami that occurred in the wake of the Tohoku-Pacific Ocean Earthquake – the functioning of all equipment for the supply of AC power, the function of cooling the reactors using seawater, and the function of cooling the spent fuel storage pools.

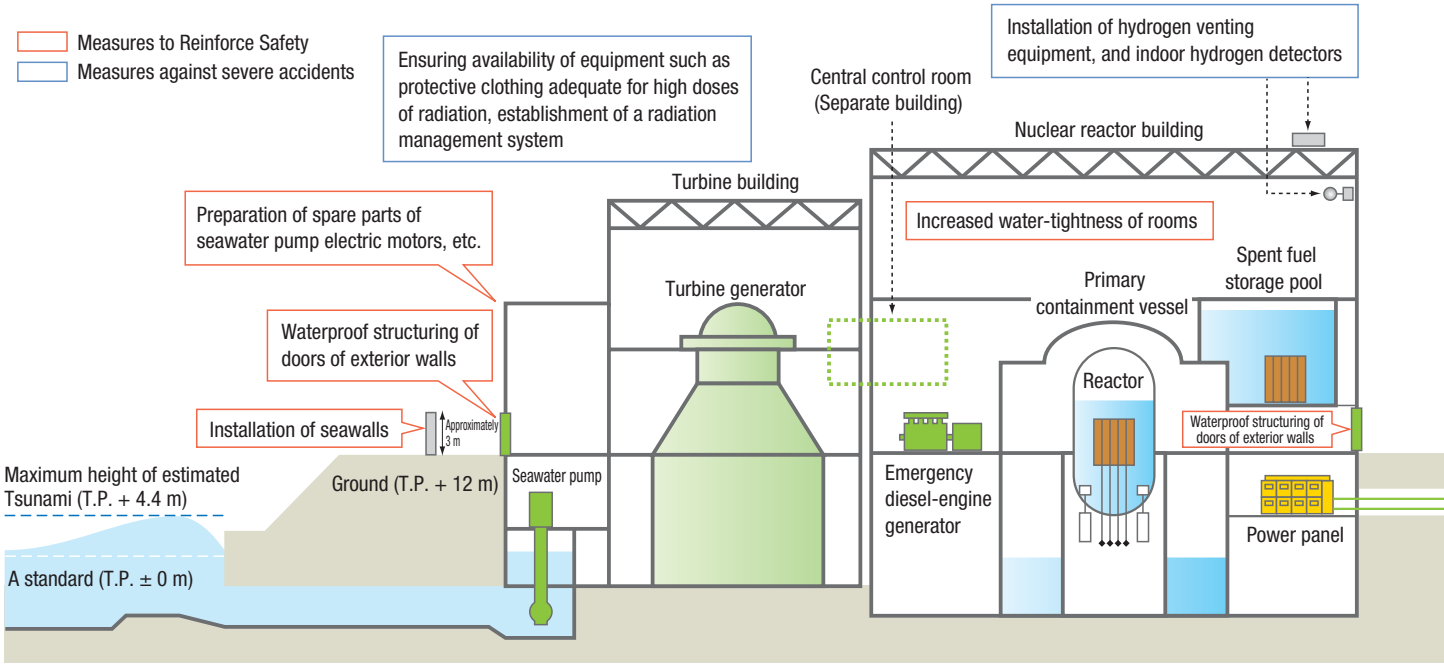
Instructions, etc. from the Nuclear and Industrial Safety Agency

On March 30, the Nuclear and Industrial Safety Agency (NISA) issued instructions to power utilities and other companies operating nuclear power stations to put in place emergency safety measures to prevent damage to reactor cores and spent fuels and to restore reactor cooling functions while controlling the release of radioactive substances, even in the event of the above three functions being lost, and to establish safety-related rules based on the revisions to the ministerial ordinance.

On June 7, NISA issued instructions to power utilities and other companies operating nuclear power stations concerning measures to enable rapid response in case a severe accident (serious damage to the reactor core, etc.) should occur, based on the lessons learned through the intense efforts undertaken to restore the situation at the Fukushima Daiichi facility.

In addition, on July 22, NISA instructed power utilities and other companies operating nuclear power stations to conduct assessments (stress tests) of the safety margins (ultimate limitations of strength) of nuclear reactor facilities by evaluating the scale of events that on NPS can withstand without significant damage to the fuel, assuming the occurrence of events beyond the design basis.

Image of measures to reinforce safety, etc. at Ohma Nuclear Power Station



T.P.: An altitude from sea level of Tokyo Bay

Measures to Reinforce Safety, etc. for Ohma Nuclear Power Station

1. Measures against tsunami

J-POWER is evaluating the tsunami safety of the Ohma Nuclear Power Station by means of numerical simulations of past tsunami believed to have affected the site of the station and projected future tsunami. Specifically, we have projected earthquakes in the eastern margin of the Japan Sea, along the Japan Trench, and offshore from Chile. Of these, the earthquake at the eastern margin of the Japan Sea (magnitude 7.85) gave the highest water level. Synodic mean high tide (0.6 m) was added to the maximum increase in water level due to this earthquake (approximately 3.8 m) to give T.P. + 4.4 m as the maximum height of a tsunami at the Ohma site. (T.P. is an altitude from sea level of Tokyo Bay.)

Given that the elevation of the site for the main buildings including the nuclear reactor buildings is T.P. + 12 m, a sufficient safety margin exists. However, the tsunami that followed the Tohoku-Pacific Ocean Earthquake left traces on the Fukushima Daiichi Nuclear Power Station at a height of 14 – 15 m. Taking into consideration the potential occurrence of a tsunami of around 15 m in height at the Ohma Nuclear Power Station, we plan to add flood prevention barriers of a further 3 m in height to the T.P. + 12 m site.

In addition, as measures to prevent the infiltration of seawater into the main buildings, we are using waterproof structures for the doors of the main buildings, and increasing the water-tightness of buildings housing equipment that is particularly important to safety.

2. Ensuring power sources

We have established 500 kV and 66 kV transmission lines as external power sources. In addition, we are planning to install three emergency diesel generators in the nuclear reactor buildings (ground floor), which are located at T.P. + 12 m.

We are also installing emergency generators at an elevation of T.P. + 20 m or more, where they will be safe from the effects of a tsunami, to ensure power sources for the operation of pumps and other equipment for the cooling of the reactors and the spent fuel storage pools, even if these other power sources are not functioning.

We will also set up generator trucks to ensure that a flexible response can be mounted, even if the permanent power panels or cables are damaged by a tsunami or other contingency.

3. Ensuring ultimate heat removal functions

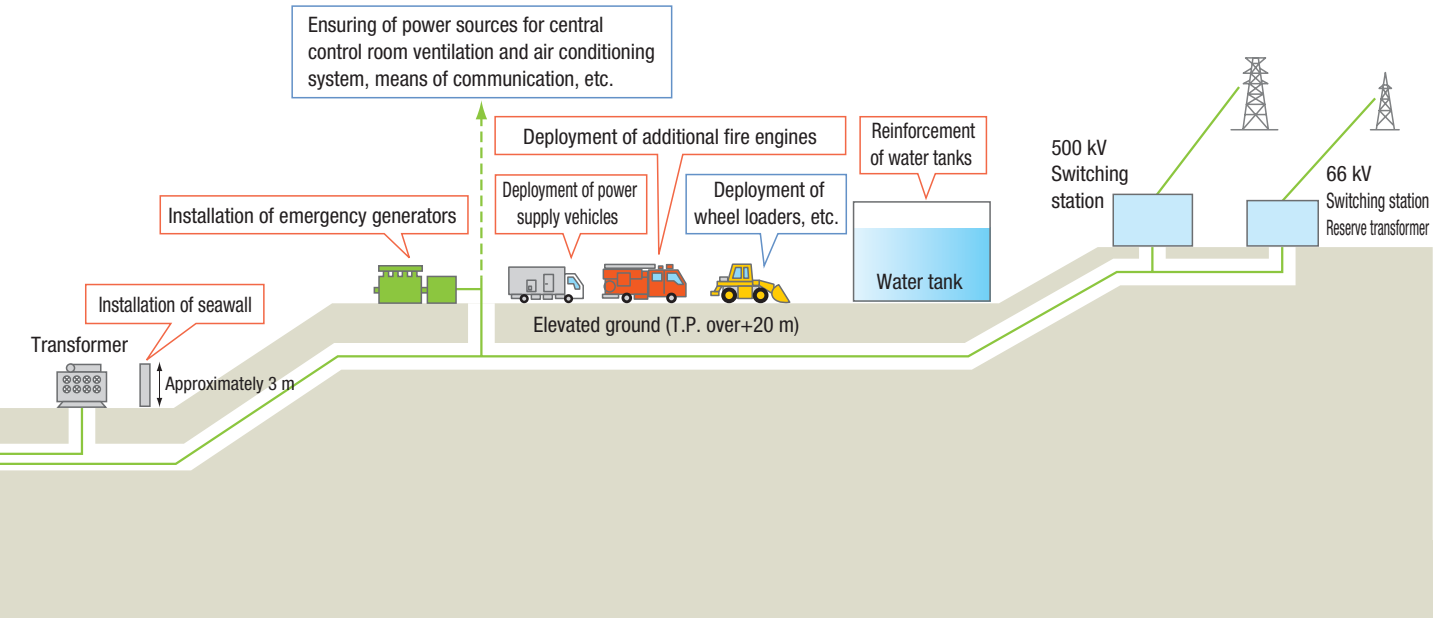
To ensure that functions necessary for the cooling of the reactors and the spent fuel storage pools are maintained even if the ordinary seawater pumps cannot be used, in addition to deploying portable power pumps and additional fire engines as alternative measures for pumping water where it is needed, we will also reinforce water tanks to increase the reliability of water sources for these measures.

While we believe that the seawater pumps will not be affected by a tsunami because of their location in the turbine buildings, in order to respond rapidly should any flooding of the facilities or similar problems occur, we will maintain reserve motors and other equipment for seawater pumps.

4. Measures for response to severe accidents

We are adopting the following measures to enable a rapid response in the event of a severe accident.

- We will establish the necessary power supply system from the emergency power sources to ensure the maintenance of an adequate working environment in the central control room.
- We will establish fixed-line telephones, transceivers and satellite-based mobile phones to ensure means of communication within the facility in an emergency.
- We will prepare equipment such as protective clothing for high doses of radiation and establish a radiation management system to enable work to proceed smoothly following an accident.
- We will install equipment to release hydrogen and hydrogen detectors in the nuclear reactor buildings as measures to prevent the occurrence of hydrogen explosions.
- We will deploy to heavy machinery such as wheel loaders to enable rapid removal of flotsam and rubble strewn around the facility following a tsunami.



5. Assessment of safety margins (ultimate limitations of strength): Stress tests

We will conduct assessment of the safety margins of the Ohma Nuclear Power Station prior to commencement of operation of the reactor.

The latest information concerning these safety enhancement measures and other measures will be published on the nuclear power page of the J-POWER website.

• Measures to Reinforce Safety, etc.
http://www.jpower.co.jp/bs/field/gensiryoku/index.html (Japanese only)

Plan and Background of the Ohma Nuclear Power Station

J-POWER Group has been carrying out surveys and studies concerning nuclear power development since 1954, and since 1976 it has been pursuing plans to build the Ohma Nuclear Power Station in Ohma-machi, Shimokita-gun, Aomori Prefecture. The Ministry of Economy, Trade and Industry (METI) granted permission to build this nuclear reactor in April 2008. Construction began in May of that year, and is proceeding with a view towards the commencement of commercial operation in November 2014.

We believe that nuclear power is an important energy source that is indispensable from the perspective of combating global warming and securing resources, and one that, with appropriate management, can be exploited as an effective energy supply. It is therefore essential that nuclear power should continue to represent a specific ratio of the energy sources in Japan's energy portfolio.

We further believe that the Ohma Nuclear Power Station is an essential facility for Japan in terms of the provision of a stable supply of power mainly in east Japan and measures to reduce carbon emissions.

Overview of the Ohma Nuclear Power Station

Location		Ohma-machi, Shimokita-gun, Aomori Prefecture
Construction begins		May 2008
Commercial operation begins		November 2014 (scheduled)
Electricity Output		1,383 MW
Reactor	Type	Advanced Boiling Water Reactor (ABWR)
	Fuel: Type	Enriched uranium and uranium-plutonium mixed oxide
	Fuel assembly	872 elements

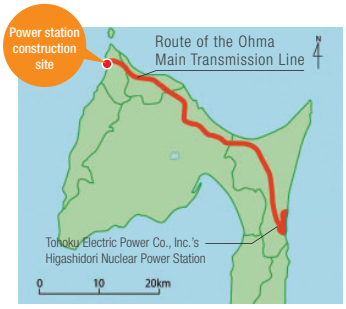


Diagram of Ohma Nuclear Power Station position (Aomori Prefecture)


Artist's rendering of completed Ohma Nuclear Power Station


Status of construction of Ohma Nuclear Power Station (March 2011)