Hokkaido Electric Power Co., Inc. × MHI

Supplying electricity in Hokkaido is Hokkaido Electric Power Co., Inc. In order to stably respond to the ever-increasing demand for electric power, a third nuclear power plant manufactured by MHI commenced operation at the Tomari Power Station, located on the Shakotan Peninsula, in December 2009.

Supporting our day-to-day lives with CO_2-free electricity

While we have used electricity every day with hardly a second thought, it is indispensable in our modern lives, providing convenience and a higher standard of living. But how is electricity generated and supplied? Recently your reporter, Noriko Matsuba, visited Hokkaido Electric Power Co., Inc., Hokkaido's only nuclear power station, to take a look at Tomari Power Station Unit No. 3, which commenced operation in December 2009.

Hokkaido Electric Power Co., Inc. (HEPCO)'s Tomari Power Station is located in Tomari-mura, a village on the Shakotan Peninsula facing the Sea of Japan roughly two and a half hours from Sapporo by car.

I was greeted by Yoshihiro Akiyama, the Public Relations Section Manager of the HEPCO Tomari Nuclear Power Office.

"The Tomari Power Station has a total of three nuclear power plants," he explained, "Today I'll be showing you Tomari Power Station Unit No. 3, which just commenced operation in December 2009."

HEPCO generates electricity using a variety of methods, a good balance between thermal, hydroelectric and geothermal power, and it supplies power throughout Hokkaido. Unit No. 3 was built here as part of a larger plan to meet continued increasing demand for electric power.

"The basic principle of rotating a turbine using steam power is the same as that used in thermal power generation. The difference is in the fuel used, which is uranium in the case of nuclear power generation," said Mr. Akiyama, answering my first question about how nuclear power generation works.

The pellets of fire-hardened uranium are small – roughly the size of a pea – but just one pellet generates enough electricity to power one household for approximately eight months, so the scope of their power is surprising.

"Nuclear power generation can produce a large amount of electric power from a small amount of fuel," he continued, "Another major feature is that it also enables stable supply without emitting CO_2 during the generation process."

Guided by Mr. Akiyama, I passed through a number of strictly controlled gates, reminiscent of airport security checks, before finally reaching the inside of the power station.

"Nuclear power plants can be roughly divided into three areas: the nuclear reactor building, turbine building and central control room. I'll show you the central control room

(Bottom) The central control room where all equipment, including the nuclear reactor, turbines and power generators, are operated, monitored, and controlled.
(Right) Turbine inspections involve meticulous checking down to the fine details.

(Top) Mr. Akiyama explained how "water is changed into steam by heat from the nuclear reactor, and that steam rotates the turbine to generate electricity."
(Bottom) In front of a steam turbine with 54-inch blades, among the largest class blades in Japan.

first."

Arriving in front of the central control room, I looked through the glass into a room filled with a great number of large liquid-crystal displays (LCD) and PC monitors – making it look like the command room of a spaceship.

"This is where the whole power station is controlled," he said. "Can you see those four LCD monitors right at the front? You can tell the current state of the power station with just one glance at those monitors."

"Units No. 1 and 2 are monitored from a standing position and operated by switches, with their status constantly updated on the monitors," he added, "But Unit No. 3 is fully-digitalized, with touch panels to operate instead of switches, and enables monitoring and operation from the seat."

Next we visited the turbine building. A wave of heat crowded in upon us as we opened the heavy door to enter, gradually creating a film of sweat upon our foreheads. This is where the turbines are rotated by the steam produced by the heat from the nuclear reactor to produce electricity.

"The length of the blades on these turbines is 54 inches (approximately 1.4 meters), among the largest class blades in Japan," said Mr. Akiyama, "Turbine efficiency has also been improved by a large margin because their shape makes use of the latest technology."

Seeing the insides of a power station for the first time, I was overwhelmed by the size of the turbines, which were larger than I had imagined. Thinking about it makes you realize that there is something deeply impressive about electricity generated in this way being delivered to our houses and supporting convenient, comfortable lives with lights, televisions, refrigerators and washing machines.

"Now that Unit No. 3 has commenced operation, the Tomari Power Station has become the largest power station in Hokkaido," he said. "Together with Units No. 1 and No. 2, we supply approximately 40% of Hokkaido's electric power. Moreover, with the introduction of Unit No. 3, we have curbed our company's overall CO_2 emissions by 20 to 30%."

Nuclear power generation: meeting the ever-increasing demand for electric power, as well as reducing CO_2 emissions; but what about safety? Mr. Akiyama put my concerns about the safety measures to rest as we took in the entire power station from an elevated viewing platform.

"The building with that round dome-like roof is the nuclear reactor building of Unit No. 3. Inside is a reactor vessel containing the uranium fuel, and the radioactive material in it is shut in behind five layers of walls. Also, the system can be shut down quickly so that even earthquakes or similar emergencies do not lead to accidents."

There are also numerous other safety measures in place at the Tomari Power Station, including periodic training and skill acquisition for staff members involved in the production of nuclear power, as well as routine inspections and regular examinations.

"It is our company's mission to stably deliver electricity to people's homes every day," he said.

Nuclear power generation supports our standard of living while preventing global warming and is full of future promise for Japan and the rest of the world.

(Left) On the way to Tomari Power Station is the Nuclear Power PR Center "Tomarin-kan," where visitors learn how nuclear power generation works. (Middle left) Actual-size turbine; this huge gear wheel drives the power generator, producing electricity. (Middle right) Video presentation of reactor vessel, showing how heat is generated by nuclear fission of uranium. (Right) Children visit from all over the country on summer vacations and school excursions.

FROM MHI

"Our 24th nuclear power plant featuring a variety of the most advanced technologies"

**Group Manager, Water Reactor Plant Planning Group,
Water Reactor Project Department, Nuclear Energy Systems Headquarters**

Hidehiko Mizuta

MHI was in charge of the Tomari Power Station Unit No. 3 project from the start of the design process in 1999 until the commencement of operation in 2009. It marked the 24th nuclear power plant that we have worked on.

Unit No. 3 saw the introduction of many state-of-the-art technologies. Included here was the utilization of steam turbines with 54 inch blades, the largest of their kind in Japan, which enabled us to realize an improvement in heat efficiency when generating electricity.

Moreover, it was the first time we employed a method for mounting the upper spherical portion of the 76-meter high containment vessel in one piece. Conventional methods normally involve the welding of steel plates from the bottom-up to gradually create layers, but for this project the 40-meter diameter upper spherical portion and the matching cylindrical portion were assembled separately in parallel. The upper spherical portion was lifted in one piece using an ultra-large 1200-ton crane and then welded to the cylindrical portion. This new method reduced the construction time and enabled us to complete the work before the harsh winter weather characteristic to Hokkaido set in to cover everything in snow.

MHI's advantages stem from its ability to become involved in the basic planning stage onward and its capability to consistently supply such equipment as nuclear reactors and steam turbines, essential to the construction of nuclear power stations. As an integrated nuclear power plant supply company, we will continue to support your lifestyle with our power plants.