Yasumasa Matsui Explores

the Frontlines of Nuclear Energy

Interpreting the Future of Energy Through Dialogues in the Field

HITACHI

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Part 7 | Charting A New Chapter in the History of Safety and Trust Beginning With the Restart of the Kashiwazaki-Kariwa Nuclear Power Station

■ Safety measures underpinning the restart of Unit 6

Owned and operated by Tokyo Electric Power Company Holdings, the Kashiwazaki-Kariwa Nuclear Power Station is a vast site approximately 4.2 million square meters in size (approximately the size of 90 Tokyo Domes) facing the Sea of Japan, with seven reactors spanning two municipalities, Kashiwazaki City and Kariwa Village, in Niigata Prefecture. It has a total output of 8,212 megawatts, boasting the world's largest installed electric output for a single nuclear power station. All of seven reactors had been shut down in the wake of the Great East Japan Earthquake. However, on April 16, 2026, commercial operation of Unit 6 resumed.

In this installment of the Energy Highlights series, Yasumasa Matsui visits the site of Unit 6, currently operational, as well as Unit 7, which is undergoing preparations for a restart, to report on safety equipment that is designed to comply with new regulatory requirements.

Matsui first went inside the Kashiwazaki-Kariwa Nuclear Power Station for a tour in 2011, and the location represents a point of origin from which he took his first steps as a journalist focusing on nuclear energy. Visiting the site again for the first time in 15 years, for Matsui it was a journey to view first-hand how the power station has changed in significant ways in pursuit of greater safety, and to reaffirm the enduring commitments of the people who uphold the site's safety and trust.

Kashiwazaki-Kariwa Nuclear Power Station Units 5 - 7 (photo courtesy of Tokyo Electric Power Holdings, Incorporated)

The Kashiwazaki-Kariwa Nuclear Power Station, supporting the electricity demand of the Tokyo metropolitan area

The Kashiwazaki-Kariwa Nuclear Power Station is situated approximately 10 km from central Kashiwazaki City, a car ride of about 20 minutes. Arriving at the site, Matsui first heads to the Service Hall, a PR facility in front of the power station, where he receives explanations about the history, overview and safety measures of the power station construction from Mr. Masaki Daito, Deputy Superintendent of the Kashiwazaki-Kariwa Nuclear Power Station.

Niigata Prefecture has long been known as a crude oil production region, and from the Meiji era to the beginning of the Showa era, the area around Kashiwazaki greatly prospered from the oil industry. Out of the local community's desire to continue to support Japan's energy needs as oil production in the region declined over time, in 1969 the Kashiwazaki City Council and Kariwa VIllage Council passed a resolution to welcome construction of the nuclear power station by Tokyo Electric Power. In response, construction of the Kashiwazaki-Kariwa Nuclear Power Station began in 1978.

Commercial operation of Unit 1 started in 1985. Construction proceeded apace thereafter, culminating in 1997, when Unit 7 commenced commercial operation. The power generated by the facility was sent to the Tokyo metropolitan area, a major hub of power consumption, and this stable supply of power has supported the development of the Japanese economy and industry, and the daily lives of people over the years.

Of the power station facility's seven reactors, Units 1 through 5 are boiling water reactors (BWRs), while Units 6 and 7 are advanced boiling water reactors (ABWRs), the first of their kind in the world to be constructed and enter operation. (*1)
All seven reactors had been shut down since March 2012, following the Great East Japan Earthquake. However, on April 16, 2026, Unit 6 resumed commercial operation and has been steadily operating since. While Unit 7 has already passed reviews by regulatory authorities, construction including a Specialized Safety Facility (*2) is still underway, and the restarting of the unit is expected to take some more time.

Mr. Masaki Daito (left), Deputy Superintendent of the Tokyo Electric Power Holdings Kashiwazaki-Kariwa Nuclear Power Station, providing an overview of the facility in the Service Hall, and Yasumasa Matsui (right), visiting for the first time in 15 years.

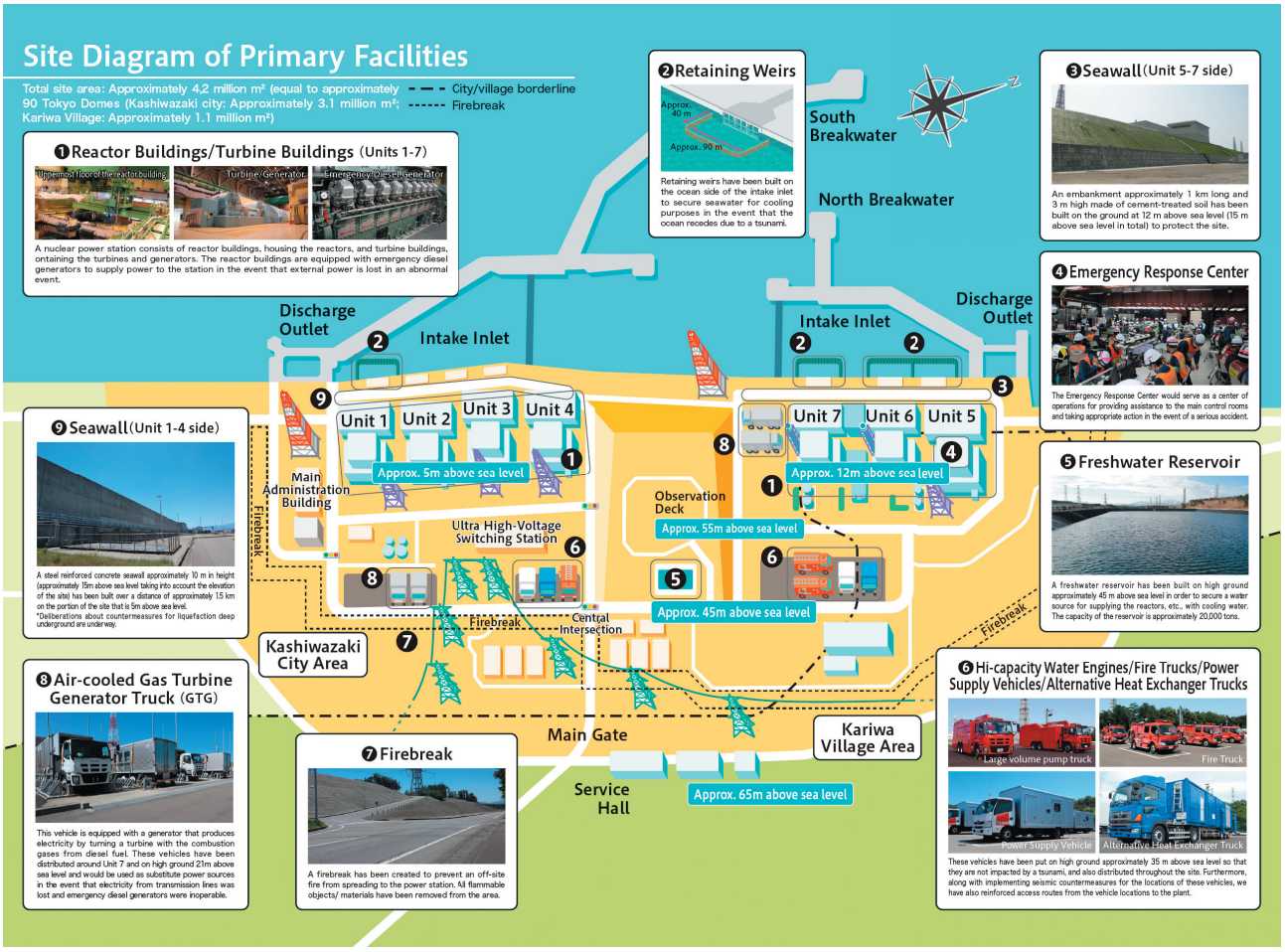
Four pillars of safety measures implemented at the Kashiwazaki-Kariwa Nuclear Power Station to comply with new regulatory requirements

Deputy Superintendent Daito explains how safety measures at the site have been strengthened to comply with new regulatory requirements that were developed based on the lessons learned from the accident at the Fukushima Daiichi Nuclear Power Station. The measures are broadly classified into four pillars. The first pillar is “measures to protect against tsunamis.” This included erecting seawalls, approximately 15 m above sea level taking into account the elevation of the site as well as making critical areas watertight, and sealing pipe penetrations to prevent water ingress.

Under the second pillar, “measures to ensure a continuous power supply,” in addition to emergency diesel generators, three units of which were already in place for each power generation facility, four sets of air-cooled gas turbine generator trucks and 18 power supply vehicles were newly deployed.

For the third pillar, “measures to continuously cool the nuclear reactor,” 30 fire trucks for water injection and 9 alternative heat exchanger trucks (*3) were deployed, while inside the reactor building, a high-pressure alternate cooling system (HPAC), which will be described later, was installed. A new freshwater reservoir with a capacity of approximately 20,000 tons was also newly constructed, ensuring that over a week’s worth of fresh water for injection can be supplied.

The fourth pillar is “measures to prevent the release of radioactive materials,” and involved the installation of a filter vent system and hydrogen treatment equipment. When an accident occurs and accumulated gas is purged from inside the reactor containment vessel to prevent a rise in pressure, the purged gases are passed through this filter vent system to reduce the amount of radioactive materials released to around one-thousandth. (The hydrogen treatment equipment will be explained later)



Site Diagram of Primary Safety Facilities (photo courtesy of Tokyo Electric Power Holdings, Incorporated)

The efforts of people complement the equipment to further enhance safety

In addition to these safety facilities, site-wide comprehensive drills are conducted at least once a month, and have taken place more than 200 times since the 2011 earthquake. A cumulative total of more than 34,000 drills covering individual elements have also been conducted, putting in place systems to ensure that only on-site personnel at the power station can carry out an initial response in the event of an emergency.

The briefing also went over initiatives being promoted to revitalize communication and “value people.” This included a greeting campaign instituted at the suggestion of Superintendent Takeyuki Inagaki, who was involved in bringing the situation under control during the accident at the Fukushima Daiichi Nuclear Power Station as head of the recovery team, along with an effort to hand over greeting cards containing messages of thanks. Counting the employees of Tokyo Electric Power and its affiliates, approximately 6,600 people (as of June 2026) work at the Kashiwazaki-Kariwa Nuclear Power Station. It was explained that a key to ensuring safety lies in efforts reflecting Superintendent Inagaki’s strong commitment to developing an environment in which everyone can work with a sense of pride and vitality.

Scale model showing the entire Kashiwazaki-Kariwa Nuclear Power Station site on display in the Service Hall

Passing through several levels of checks before entering the reactor building

Once the briefing concludes, Deputy Superintendent Daito finally guides Matsui into the power station. This time, the tour will focus on the newly added safety facilities.

The inside of the site is divided into zones according to security level, and strict security checks are carried out at gates when entering each zone. When Matsui enters the reactor building, he is first guided to the main control room for Units 6 and 7. “When I enter this room, I feel a sense of calm tension, just as I did on my previous visit,” remarks Matsui. “Operators are monitoring Unit 7 as well, which is not currently operational. I suppose they are watching over its shut-down state.”

Main Control Room. The main control room is where the status of the nuclear reactors, turbines and generators, etc. are monitored, and their operation is controlled (photo courtesy of Tokyo Electric Power Holdings, Incorporated)

New measure using blowout panels to prevent hydrogen explosions

Next, Matsui heads to an observation room that looks out on the operating floor situated directly above the Unit 6 reactor. The walls of the operating floor are fitted with 56 hydrogen treatment equipment in anticipation of the generation of hydrogen in the event of an accident. These equipment use palladium-based catalysts with the capacity to absorb over 900 times their volume of hydrogen at room temperature. The equipment prevents hydrogen explosions by reacting hydrogen with oxygen and reverting it to water without the use of power, thereby keeping the concentration of hydrogen within the reactor building below 4%, the lower limit in the concentration range at which combustion or explosion can occur.

Looking out at the Unit 6 operating floor

There are also blowout panels installed in the upper part of the floor. Previously, the panels were designed so that if there was an abnormal increase in pressure within the reactor building due to a pipe rupturing or other issue, they would automatically detach to relieve the pressure and protect the building from damage. In light of the lessons learned from the accident at the Fukushima Daiichi Nuclear Power Station, equipment was added so that when the concentration of hydrogen within the building increases and there is a risk of explosion, connected wires are wound with a winch from the outside to force the panels open and release the hydrogen. To prepare for a situation in which the hydrogen concentration still increases, top vent equipment to release hydrogen from the top of the building was installed as an additional measure.

Additional equipment was also installed to allow the blowout panel openings to be closed as necessary once they have been opened. These are designed for basic motorized operation, but can also be manually opened and closed. From outside the building, the large winch of the forced-opening equipment and the massive door of the closure equipment could be seen up-close.

Heading outside the reactor building, Matsui is next guided to the Unit 6 turbine building.

Blowout panels and large winch of the forced-opening equipment

Feeling the power station operating through vibrations and sound

When entering the turbine building, the atmosphere changes completely. The large amount of noise generated by the equipment for operating Unit 6 fills the interior, and the vibrations produced can be felt in one's feet through the floor. The electricity produced here is stepped up to 500,000 volts through the main transformer, and then sent to the Tokyo metropolitan area. From the transformer outside the building, a continuous low hum is produced by the iron core inside.

"This is the sound of electricity being transmitted," explains Deputy Superintendent Daito. Matsui responds with awe, "from the vibrations and sounds, you can really get a sense that the power station is actually operating."

Unit 6 has an output of 1,356 megawatts (the same output as Unit 7), and the turbine building generates large amount of power equal to that consumed by 450,000 average households.

Towards the restart of Unit 7 - work on the HPAC and improved safety

Next, Matsui visited Unit 7. Due to the work that was underway, the interior of the building is filled with scaffolding, supporting work to further enhance safety and upgrade equipment to enable stable operation. Matsui is first shown the high-pressure alternate cooling system (HPAC). The HPAC uses steam generated by the decay heat continuously produced inside the reactor even after shutdown to run a small turbine. This power is used to continuously inject water into the reactor even in the event of power loss. The system was installed in a small space previously used for other purposes, in order to comply with new regulatory requirements.

"To incorporate new safety measures into an existing power station, you not only need to find the space, but you also have to carry out painstaking new construction work, and this introduces many difficult challenges on the technical side," explains Deputy Superintendent Daito. Supports have been welded on to each of the densely packed pipes underneath the reactor to improve their earthquake resistance. Hearing that welds in places that cannot be directly viewed are made with the use of mirrors, Matsui got a strong sense of the challenges the engineers have faced and the pride they must feel from seeing the difficult work through to completion.

The high-pressure alternate cooling system (HPAC). The system is able to inject water into the reactor without using electricity during an emergency.

Handles in various locations are coated with phosphorescent paint to make identification easier in the dark.

When exiting the radiation control zone, workers and their belongings are checked for contamination, and radiation levels are also checked based on dosimeter readings. After confirming that the contamination checks showed no issues and that the dosimeter is at 0.00 millisieverts, Matsui has left Units 6 and 7 and sums up his feelings at the end of the visit.

“The blowout panel closure device and forced-opening equipment are designed so that they can ultimately be operated manually even if power is lost, instead of relying on complex mechanisms. Even the measures to prevent hydrogen combustion involve multiple layers of backups, and this gives me a renewed appreciation for the importance of the lessons learned from the Fukushima Daiichi Nuclear Power Station accident. I was also impressed by how no compromises have been made even down to the finest details, like wrapping cables in coverings that are highly fire-resistant, and coating valves with phosphorescent paint so that they can be manually operated even in the dark. Seeing these improvements, I get a strong sense that a lot of careful thought has gone into not only preventing an accident, but stopping the spread of damage if an accident does occur.”

■ Hitachi's field manager talks about the 15-year path to restart

At the end of his visit, Matsui interviews Katsuhiro Ohira, the Manager of Hitachi's Kashiwazaki-Kariwa Regional Office. Ohira has been in charge of construction management at the Kashiwazaki-Kariwa Nuclear Power Station since 2011. The Great East Japan Earthquake occurred shortly thereafter.

At the time, many of the personnel in Hitachi's nuclear energy division had been dispatched to Fukushima to help with the response to the accident at the Fukushima Daiichi Nuclear Power Station. Ohira was among those who volunteered, believing that "as someone involved with nuclear energy, I had to do something." He arrived at the site a week after the accident. He was tasked with laying temporary cables to restore the external power supply to the site. As the thick cables used for power transmission cannot be carried by a person on their own, large groups of workers lined up at one-meter intervals to carry the cables on their shoulders.
The work took three to four hours to complete, as the workers wore full face masks over their protective clothing, and were also subject to dose limitations. The experience further strengthened Ohira's commitment to the safety of nuclear energy.

Katsuhiro Ohira, Manager of the Hitachi GE Vernova Nuclear Energy Kashiwazaki-Kariwa Regional Office

Following the Great East Japan Earthquake, construction work to comply with new regulatory requirements began at the Kashiwazaki-Kariwa Nuclear Power Station. However, designs and construction work had to be repeatedly redone to accommodate detailed rule changes and other developments. Work to strengthen earthquake resistance in particular involved a large number of locations, and when there are existing facilities in the area to be reinforced, analysis would have to be performed again. As a result, the construction schedule had to be repeatedly reworked.

"But we knew this was necessary for safety. Together with the customer, we've worked with the single-minded determination that whatever it takes, we will restart the power station safely," explains Ohira.

■ "Restart is not the end goal" - The ongoing challenge with Unit 7

When asked about how he felt after the successful restart of Unit 6, Ohira replies with a smile. "To be honest, I was delighted." "This was the first restart of a TEPCO BWR since the accident at the Fukushima Daiichi Nuclear Power Station. The site had long been stuck consuming electricity, and it finally returned to being a power station. That's why I see the restart not as the end goal, but as the starting point."

Work is currently proceeding toward the restart of Unit 7 step by step, including the construction of a Specialized Safety Facility and preventive maintenance work. During the long period of work for the restart, many employees reached mandatory retirement age while still saying “maybe it will restart next year,” and there were times when it was difficult to keep workers motivated. Despite these challenges, Ohira kept telling his colleagues to think positively, encouraging them to avoid thinking something “cannot be done,” and instead think of “what can we do to make it happen?”

“Our job doesn’t end with the delivery of the equipment. As the plant manufacturer, we are also responsible for upkeep and maintenance, and providing support for stable operation. We are working on co-creation activities with the customer to develop and implement ways to perform the work more efficiently with fewer people by leveraging digital technologies and AI in the future. At the same time, we are working with a sense of urgency and positive thinking to return Unit 7 to operational status as a power station as soon as possible.”

Even though Unit 6 and Unit 7 are both ABWRs, there are differences in terms of the manufacturers of various pieces of equipment, and the fine details. As a result, the work does not proceed in the same way. The necessary adjustments and checks are expected to continue for a while longer.

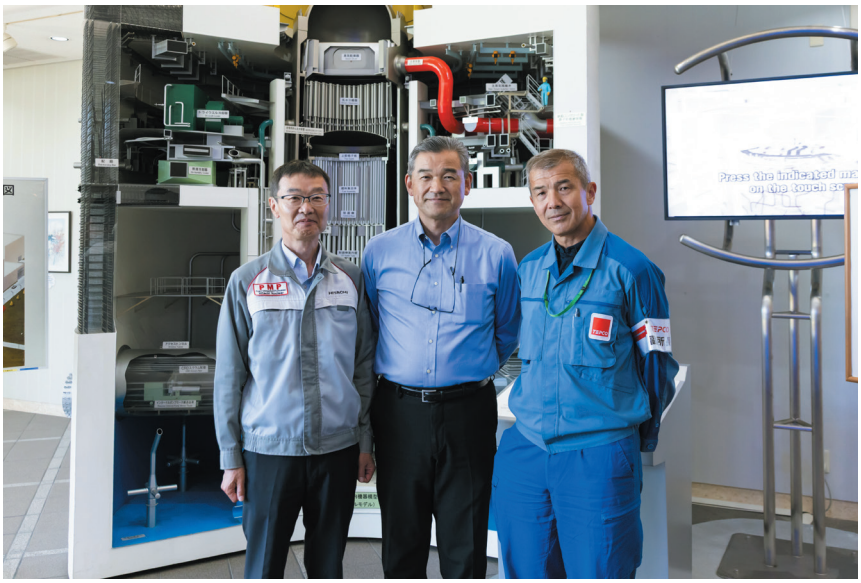
■ Ultimately, safety comes down to people

His reporting duties complete, Matsui summed up his feelings. “When I visited 15 years ago, I got a sense that there was a lot of space, but now the area is packed with additional safety equipment, which has changed things quite a lot.” In 2011, Matsui took it upon himself to study nuclear energy on his own, out of a concern that the television station where he was working at the time lacked anyone with specialist knowledge on the subject. Utilizing a connection from his university days, he arranged a visit to the Kashiwazaki-Kariwa Nuclear Power Station. It was just a week later that the Great East Japan Earthquake struck. This was the start of Matsui’s career as a journalist specializing in nuclear energy.

“Given the personal connection I have to this place, Ohira’s comments about it finally returning to being a power station really touched me. I can understand how people would lose heart after working year after year only on countermeasure work without the restart in sight. Even so, they saw the work through. That would make the joy of seeing it finally start to supply power again all the greater. Seeing Deputy Superintendent Daito speak about the vibrations of the turbine and the sound of the transformer with such obvious delight gave a strong sense of the pride people working in the energy industry have.”

Matsui also shared his surprise upon hearing that more than 6,000 people work at the site. In fact, during the tour he passed by many field personnel. He was impressed by how they cheerfully greeted him each time.

“I had the same experience of being warmly greeted when I visited here 15 years ago. The facilities may have changed, but the people are the same. Being able to see that was another takeaway from this visit. Whatever measures you implement on the equipment side, ultimately, safety comes down to people. A site where people make a point of greeting one another and achieve mutual trust must be one with a strong awareness of safety. Under Superintendent Inagaki’s vision for a ‘good power station,’ I look forward to seeing Hitachi unleash the power of its people and technologies to open a new chapter in the history of safety and trust with Unit 6, as well as Unit 7.”



From left: Katsuhiro Ohira, Manager of the Hitachi GE Vernova Nuclear Energy Kashiwazaki-Kariwa Regional Office, Yasumasa Matsui, and Mr. Masaki Daito, Deputy Superintendent of the Kashiwazaki-Kariwa Nuclear Power Station

(*1) A nuclear power station that significantly improves upon the safety, operability and economy of a conventional boiling water reactor (BWR).

(*2) This is a backup facility designed to prevent rupture of the containment vessel and the release of large amounts of radioactive material even in the event of a serious accident, such as the intentional crashing of a large aircraft or a terrorist attack that damages the reactor. All nuclear power stations are required to install such facilities based on new regulatory requirements instituted by Japan’s Nuclear Regulation Authority.

(*3) Mobile emergency cooling equipment that exchanges heat between high-temperature water in the nuclear reactor or containment vessel and seawater to release heat to the outside when the existing heat exchange (heat removal) equipment can no longer be used.

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Born in Inami, Nanto City, Toyama Prefecture. Graduated from Toyama Prefectural Takaoka High School. Graduated from the Department of Chemical Engineering, School of Engineering, Tokyo Institute of Technology (now Institute of Science Tokyo). In 1986, he joined TV Asahi as an announcer. He co-hosted Music Station with Tamori, served as a sportscaster on News Station, and worked as a news and information anchor on programs such as Station Eye, Wide Scramble, and Yajiuma Plus. In 2008, he became the principal of TV Asahi's announcer school, Ask. During his two years in this role, he trained over 100 announcers who went on to work nationwide. In March 2011, following the 2011 Great East Japan Earthquake (and subsequent Fukushima Daiichi Nuclear Power Station accident), he transferred from the announcer department to the news department as a reporter covering the nuclear power plant accident. He later served as a reporter covering the Imperial Household Agency and weather-related disasters, and worked as a commentator. In 2023, after leaving TV Asahi, he established his own agency, OFFICE Yuzuki. He also serves as a plastic model history research advisor for Tamiya Inc., ambassador for Nanto City, Toyama Prefecture, and media advisor for sake company, DASSAI Inc.

• This article is published on Hitachi's energy portal site.

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