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The Severe Contaminated Water Situation at Fukushima Daiichi Nuclear Power Station

Fukushima Daiichi Nuclear Power Station is currently facing severe problems with the leakage of water contaminated with radioactive substances. The reality on the site is that there is no quick-fix countermeasure for this contaminated water leakage and the situation appears to be deteriorating into confusion. This article is an attempt to take a straight look at the problems and uncover the fundamental issues involved.

Storage tanks at Fukushima Daiichi, Photo by TEPCO

The contaminated water leakage problem

On April 2, 2011, around 520 m^3 of water containing radioactive substances leaked into the sea from an electrical cable pit in the area of the Unit 2 water intake. A coagulant was poured into the pit to stem the flow of water. This contaminated water had leaked from the reactor building into the turbine building. In a public announcement, TEPCO gave only the values of Iodine and Cesium, although the water would have naturally contained Strontium and various other nuclides. On May 11, 2011, 250 m^3 of water also leaked from a pit in the area of the water intake of Unit 3, the pit being closed off to prevent further leakage.

At present, a coolant recycling system has been constructed and a large portion of the radioactive substances in the water used to cool the reactors is being removed before returning the cooling water to the reactors (there are problems with this, as will be noted below), but there has been a series of leaks of contaminated water from the coolant recycling system; leakages from pipes and from the joints within the contaminated water treatment equipment. To date, more than 60 of these incidents have occurred.

In April 2013, contaminated water was found to be leaking from underground water pools used to store the contaminated water (see NIT 154). TEPCO abandoned the use of the seven underground pools and decided to store the water in above-ground storage tanks. Because of this problem, it became impossible to gain the agreement of local fishing people to the "groundwater bypass," which would have allowed groundwater to be pumped up before being contaminated and then released into the ocean.

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This failure to reach agreement left TEPCO with no option but to stop the oparation of groundwater bypass.

In later negotiations, just as agreement was being reached on the groundwater bypass, 300m^3 of contaminated water was discovered to have leaked from one of the storage tanks (August 19) causing the negotiations to be aborted. 1,000 mSv/h of total beta and gamma radiation was measured at 50 cm above ground in the vicinity of this tank. Since TEPCO had vowed not to operate the bypass without the agreement of the fishing people, for the time being the only countermeasure remaining for the situation was to increase the number of storage tanks.

Further, on August 31, 1,800 mSv/h of total beta and gamma radiation was measured at 5 cm above ground among a different group of storage tanks, and leakage of contaminated water was discovered. The gamma radiation level was 1 mSv/h. This indicates the presence of nuclides such as Strontium, which emit only beta radiation.

As we can see from the above, the contaminated water leakage troubles can be classified into three types,

1. Leakage from the turbine buildings,
2. Leakage from the underground storage pools,
3. Leakage from the above-ground storage tanks.

Of these, the outflows of contaminated water from the turbine buildings and the contaminated water leaks from the above-ground storage tanks will be dealt with in detail below.

Outflow of contaminated water from the turbine buildings to the ocean

At the Fukushima nuclear power plant site, a large number of observation holes have been dug to check the contaminated water leakage situation, and the water pumped up is being tested for levels of radioactive substances. On June 19, TEPCO announced that high levels of Tritium and Strontium had been detected in the observation holes between Units 1 and 2. 460,000 to 500,000 Bq/l of Tritium had been detected in samples taken on May 24, 31 and June 7. 1,000 Bq/l of Strontium-90 were also detected in the sample taken on May 24, and in the sample collected on July 8, 630,000 Bq/l of Tritium was detected, the highest level up to that time. Levels higher than those detected in the observation holes between Units 1 and 2 were indicated in the observation holes on the ocean side of the turbine buildings. This appears to be related to contaminated water outflows to the ocean from fissures in the electrical cable pit that was blocked in April 2011. At this point, TEPCO closed off the discharge end (on the ocean side) of the pit. TEPCO also planned to close off the inlet (at the turbine building end), but the radiation level appears to have been too high to allow work to begin. The fact that high levels of radiation were detected in May suggests the possibility that deterioration has caused new fissures to appear over time and that the radioactive water has leaked out and contaminated the groundwater.

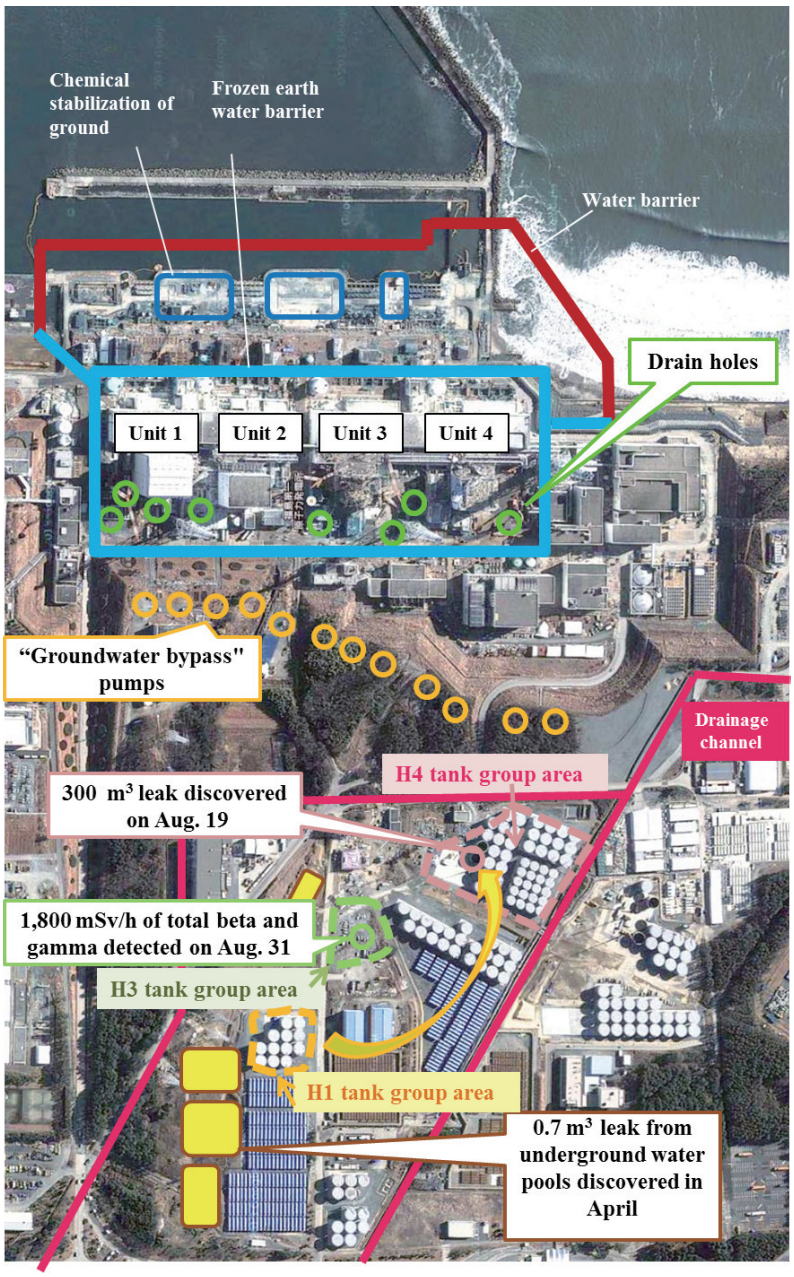
TEPCO has attempted to stem the outflow of contaminated water by chemical stabilization of the ground directly between Units 1 and 2 and the ocean, but this resulted in the groundwater level rising until it flooded above the level of the surface of the stabilized ground and simply drained into the ocean. TEPCO has thus taken the measure of pumping up the groundwater and returning it to the turbine building, and it appears that there is little option but to continue to do this for the time being. Looking at the developments thus far of the groundwater influx into the buildings and the outflow through the pits, it is hard to deny the unpleasant possibility that contaminated water is leaking out into groundwater through fissures in the buildings.

Storage tank leaks

The tank that leaked was tank I-No.5 in the H4 tank group area. The tank has no level gage and it was only possible to calculate the leaked amount of 300 m^3 by measuring the level of the remaining contaminated water from the top of the tank.

The tank is a cylindrical shape, 11 m in height and 12 m in diameter, capable of storing 1,000 m^3 of water. These are flange type tanks bolted together in sections using a silicon gasket in the joints. The tank material is normal general construction SS400 rolled steel, not quench hardened, that is often used in bridges, ships, vehicles, and so on. The thickness of the steel is 6 mm for the lid, 12 mm at the side and 16 mm for the base. It is likely that this type of tank was chosen for speed of construction and cost. Differing press reports have stated that the tanks have a serviceable life of three to five years or perhaps only about two years, and that there were concerns about leakage from the joints from the outset.

According to TEPCO's announcement concerning the analysis of the nuclides contained in the leaked water, Cesium-134 was 46,000 Bq/l, Cesium-137 was 100,000 Bq/l, Cobalt-60 was 1,200 Bq/l. Manganese-54 was 1,900 Bq/l, Antimony-125 was 71,000 Bq/l, and the total beta radiation was 80,000,000 Bq/l. The chlorine concentration was 5,200 ppm. No measured data has been released for Tritium content. Tritium cannot be removed by the multi-nuclide removal equipment (ALPS) and has become a problem since it is included in the water that has been targeted for ocean release.



Current state of the leakage of comtaminated water and contermeasures at Fukushima Daiichi
(Prepared by CNIC based on a report by the Ministry of Economy, Trade and Industry. Image ©2013 DigitalGlobe, ©2013 ZENRIN)

TEPCO's countermeasure has been to pump the contaminated water out of tank I-No.5 and transfer it to tank B-No.10 in the same area.

The tanks are surrounded by a 30 cm barrier and each tank group is fitted with drain valves to release rainwater through a rainwater collection box. Since having accumulated rainwater in the collection box would make it impossible to tell if leakage were occurring from the tanks, the drain valves are said to have been left open at all times. Perhaps because a large leak was not foreseen, the position of the valves was set as a measure for dealing with rainwater, not to prevent leakages. There is evidence that contaminated water flowed out through the drain valves, the surface of the valves themselves showing high radioactivity at 20 to 30 mSv/h. There is a rainwater outlet nearby and it is surmised that some of the contaminated water flowed into this channel and out into the ocean, but the amount is unknown. Part of the contaminated water has led to the pollution of groundwater.

TEPCO has opened observation holes in the area surrounding the leaky tank to test for possible pollution of groundwater. Groundwater sampled from an observation hole in the vicinity of the leaky tank on September 8 showed Cesium-134 at 2.5 Bq/l, Cesium-137 at 5.1 Bq/l, total beta radiation at 3,200 Bq/l, and Tritium at 4,200 Bq/l, indicating that groundwater has indeed been tainted with radioactivity.

TEPCO thus closed all the drain valves. The rainwater outlets have all been converted to underground drains and the barrier height has been increased. The top 20 to 40 cm of the polluted soil has also been removed. Tank patrols have been boosted by increasing the total number of personnel involved from 10 to 60 and increasing the number of patrols to six per day. The strengthened patrol regime may lead to the early discovery of problems, but it will also result in higher exposures for the personnel. The introduction of automatic monitoring of the dosage rate, the installation of surveillance cameras, and so on should be expedited.

It is also reported that the tank that leaked was one that had been disassembled and transferred to the H4 tank group area from H1 tank group area. The reason for the transfer was because the tank had tilted due to land subsidence and had therefore been disassembled and transferred to the current location. Two further tanks in the H4 area have also been relocated from other area. Leakages have not thus far been confirmed from the other two tanks, but TEPCO is taking the step of transferring the contaminated water to other tanks.

TEPCO had completed visual inspections of all 305 of the same type of tank by August 22 and had implemented measurements for radioactivity. The total number of storage tanks are approx. 930, containing welded tanks (as of August 23). Two tanks in the H3 area had shown high levels of radioactivity, but TEPCO reported, on August 23, that there had been no change in the water level inside the tanks. On August 31, a maximum of 1,800 mSv/h was measured from

these two tanks. TEPCO therefore transferred the contaminated water from these two tanks to other tanks. At present, no obvious leakage has been observed, but cases of high dose rate measurements have increased. In the first place, due to their structural characteristics, it would be no surprise to find leakages from any of the flange type tanks, and further leakage problems are probably just a matter of time.

Two-and-a-half years have passed since the accident. If the installation of large and robust tanks had been planned at the outset, it is possible that this current state of affairs could have been avoided. Why was this not done? It is clear that this culture of leaving responses till the last minute is a problematic feature of the organizational system involved in the post-accident cleanup.

The fundamental groundwater problem at Fukushima Daiichi

The Fukushima Daiichi nuclear power plant has been dogged by groundwater problems from the beginning, long before the accident occurred. To suppress the buoyancy acting on the reactor buildings due to groundwater flowing toward the ocean from the inland side of the site, 23 drain holes had been dug around the reactor buildings and 850 m^3 of water pumped out and released into the ocean each day. These drain holes became unusable after the earthquake and later explosions in the plant. It has proven impossible to restore them due to high radiation levels and they are still unusable today. According to an evaluation by TEPCO in August, 800 m^3 of groundwater per day is flowing towards the ocean from the inland side of the buildings, of which around 400 m^3 is flowing into the buildings and the remaining 400 m^3 is draining into the ocean.

400 m^3 of circulating coolant water is being pumped into the reactor buildings each day, and it is the excess of 400 m^3 of groundwater flowing into the buildings that is being stored in tanks. The fact that the water influx and the circulated water have the same volume is to prevent contaminated water flowing out of the buildings through the influx routes (and so strictly the volume is not exactly the same; the circulating coolant water is of a slightly smaller volume). If the groundwater flowing into the buildings were reduced, the circulating coolant water would also have to be reduced. If not, the contaminated water would likely flow out of the buildings (and it has not been possible to identify where the influx routes are).

TEPCO now plans to install a water barrier around the buildings. Originally, this was a plan to construct a single linear water barrier on the ocean side of the buildings. This construction work began in April 2012 and is still continuing today. It is scheduled for completion in mid-2014. It has now been decided that the water barrier will adopt a frozen earth method. According to the materials submitted by the proposing construction company, Kajima Corporation, an example is that freezing tubes would be inserted into the ground at one-meter intervals, freezing the earth by circulating coolant at -40℃. Fourteen 400 kW refrigeration machines would be required to maintain the earth in a frozen state. The length of the barrier surrounding the buildings will be 1400 m and the construction will take between 18 months and two years to complete. Although Kajima Corporation has experience in the construction of tunnels, there is no precedent for maintaining earth in a frozen state over a long period and for long distances. The conceptual design is now being prepared and a feasibility study carried out. Construction will begin next year and is expected to cost 150 billion yen with running costs said to be in the region of several billion yen per year.

The frozen earth water barrier will carry a massive price tag for construction, running costs and maintenance, but it is as yet unclear for how long it is intended to be used. Will it be used until it is possible to air-cool the molten fuel debris, or until the removal of the molten debris is completed?

TEPCO claims that over the next ten years, the amount of contaminated water accumulating will be held down to around 800,000 m^3 by the groundwater suppression measures (twice as much if the measures are not taken). However, the premises for this 800,000 m^3 figure are that the groundwater bypass, the frozen earth barrier and so on are all implemented within the next few years and experience trouble-free operation thereafter. Since TEPCO holds to the policy of diluting the Tritium-contaminated water remaining after treatment in the multi-nuclide removal equipment to below the legally-permitted government standard and then releasing it into the ocean, it appears that the company believes the stored volume of water will reach a peak at some point, after which it will decrease.

Despite the adoption of unproven technologies, it seems that TEPCO firmly believes that everything will go according to plan. Surely this posture of refusing to consider unforeseen possibilities is making the contaminated water problem even more serious than it should be.

TEPCO and the government have brought about severe radioactive pollution that is causing untold suffering to the people of Fukushima and the adjacent prefectures, but appear to be unable to empathize with this suffering from the way they formulate policies that allow for the dilution of the radioactive contaminated water to below the standard for subsequent release into the ocean. Is it not true to say that the essence of this problem lies in their inability to understand the pain of local residents and their posture of the continual use of ad hoc measures without ever attempting to reach a fundamental resolution to the accident?

(Hideyuki BAN, Co-Director of CNIC)

Post-accident Cleanup Process at TEPCO Fukushima Daiichi Nuclear Power Station (April to June 2013)

Situation at the Plant

Many of the instruments in the measuring systems at the Fukushima Daiichi Nuclear Power Station (FDNPS) suffered breakdowns due to the accident. There is doubt about the accuracy of the values being currently measured, but taking these values as a premise it is possible to estimate from the containment temperature and releases of Xenon-135 gas that the reactors are stable. Even now, however, radioactive materials are continually being released and the situation does not allow for much optimism (Figure 1).

Post-accident Cleanup Process

1. Molten Nuclear Fuel

Decommissioning work is progressing on the basis of the "Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4" drawn up by the government and TEPCO on December 21, 2011 (amended on July 30, 2012 and June 27, 2013. Hereafter known as the "Roadmap").

The Roadmap indicates that the plan for removing the molten nuclear fuel will be implemented in approximately the following nine stages.

1. Decontamination of reactor buildings,
2. Inspection of the lower part of the containment,
3. Waterproofing of the lower part of the containment and the reactor building,
4. Partial filling of the containment with water,
5. Inspection and sampling of the interior of the containment,
6. Repair of the upper part of the containment,
7. Filling of the containment and reactor pressure vessel with water,
8. Opening of the upper lid of the reactor pressure vessel and inspection of the interior of the reactor,
9. Removal of the molten nuclear fuels.

At present, inspections are being implemented for all units to confirm the status of each of them in the moves toward the decontamination of the buildings and to determine the locations of leaks in the containments.

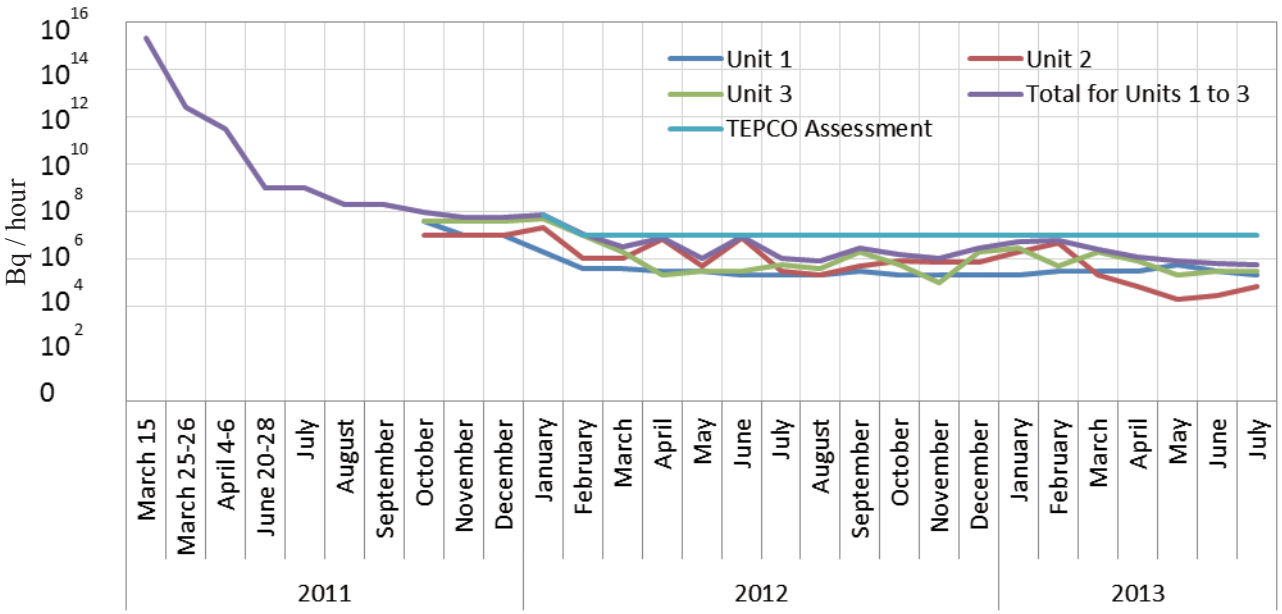


Figure 1; Releases of radioactivity from Units 1 to 3 of Fukushima Daiichi Nuclear Power Station
From materials prepared and submitted by the secretariat to the Government and TEPCO's Mid-to-Long Term Countermeasure Meeting and Secretariat of the Council for the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station. (However, this was for assessing leakage from exhaust outlets and gaps in building covers and does not include leakage to groundwater, etc.)

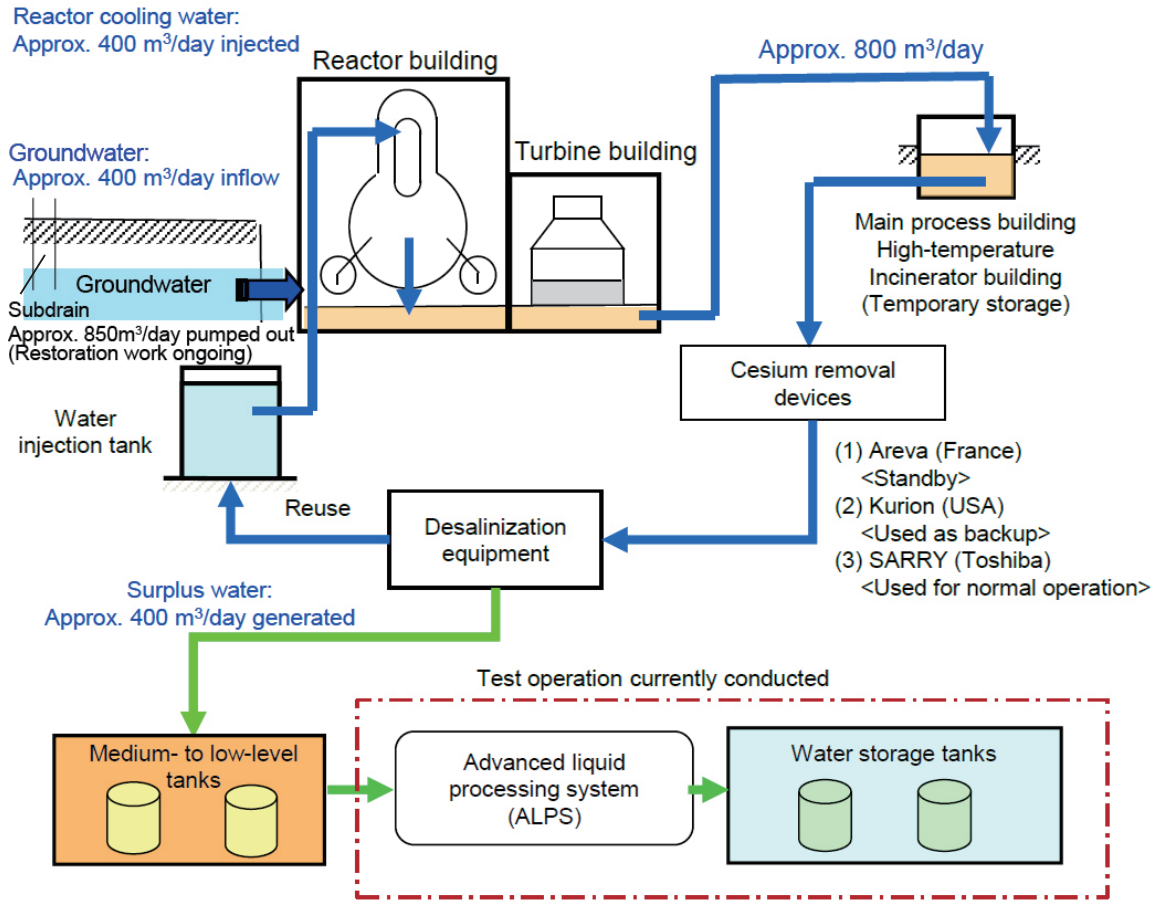


Figure 2; Diagram of current water regime at Fukushima Daiichi Nuclear Power Station
TEPCO Fukushima Daiichi Nuclear Power Station, June 27, 2013, Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4, figure on p.40 partially amended

2. Spent Nuclear Fuel

The Roadmap states that the spent nuclear fuel removal plan will be implemented approximately according to the following stages.

1. Removal of rubble and wreckage,
2. Construction of covers and cranes,
3. Design and manufacture of transport containers and canisters,
4. Securing of capacity in the common pool and remodelling of equipment,
5. Removal, storage and management, and transport away from site of the spent nuclear fuel in the cooling pools.

By December 2012, Stage 1 had been completed at Unit 4. At present the construction for Stage 2 is in progress and Stage 5 is scheduled to begin in November 2013. Stage 1 is progressing at Unit 3, and the measures for reducing radiation are due to be implemented on the operating floor, the fifth floor of the reactor building, before long. In order to carry out the work for Stage 1 in Unit 1 in mid-2013, initiation of work to demolish the current reactor building cover has been scheduled, but there is concern over increased releases of radioactive substances after the demolition. For Unit 2, high radiation has made it impossible to confirm the situation in the interior of the building.

Several problems exist in the eventual removal of the spent nuclear fuel. For example, concerns over the possibility of corrosion by seawater and damage due to wreckage, the possibility of accidents due to falling fuel during removal, and damaged fuel that has been in the spent fuel pool for some time, even since before the accident.

3. The Problem of Contaminated Water

At FDNPS, in order to prevent the plant buildings rising due to seepage of groundwater and rising of the water table, roughly 850 m^3/day of water was being pumped out of the subdrains (pump wells) of Units 1 to 4 and allowed to flow into the ocean.

Following the accident, the subdrains became unusable and the water table has risen. According to an estimate by TEPCO,

approximately 800 m^3/day are flowing into the buildings. All 400 m^3 of groundwater flowing into the reactor buildings, if TEPCO estimates are correct, is being treated as contaminated water (see Figure 2). Part of the remaining 400 m^3 is coming into contact with the highly radioactive contaminated water that has accumulated in the many trenches (underground conduits for pipes and electrical cables) onsite and is currently flowing out into the ocean. There is also the possibility that this highly radioactive contaminated water is leaking into the surrounding soil through the bottom of the trenches.

The Roadmap shows the following as countermeasures for groundwater problems.

1. On the upper inland side of the plant, a “groundwater bypass” has been constructed to pump up groundwater and release it into the sea in order to lower the water table and reduce the amount of water flowing into the reactor buildings. (The construction is complete, but the consent of local people has not been obtained and the bypass is therefore not in operation.)
2. Restoration of the subdrains for management of the water table (scheduled to be operational in mid-2014).
3. Construction of an inland frozen earth water barrier (an ice barrier created by burying refrigeration pipes at set intervals around Units 1 to 4 – scheduled to begin operation in the first half of FY2015).
4. Preventing the draining of water from the buildings of Units 1 to 4 through the (roughly 880) holes, etc. in the outer walls of the buildings.
5. Reduction of soluble content of contaminated water using the Advanced Liquid Processing System (ALPS) to separate other nuclides from the "treated water" still containing Tritium* (scheduled to be fully operational in mid-2013),
6. There are plans to increase the number of tanks and so on, and an ocean-side water barrier is scheduled to be constructed by September 2014 as a countermeasure against groundwater outflow into the ocean.

The Roadmap also states that holding capacity for contaminated water will be approximately 800,000 m^3 in January 2021, following which a state of equilibrium will be reached. The premises for this, however, are that water from the ground water bypass and water pumped out from the subdrains is released into the ocean and that all the other measures are successful. In addition, TEPCO also considers that release of the Tritium-containing water arising from 5. into the ocean is one possible option.

Please also see the article on p.1 for more information on the many contaminated water leakage problems that are occurring in the meantime.

(Hajime MATSUKUBO, CNIC)

** Releases weak beta-particles (max. 18.6, average 5.7keV) and no gamma radiation. Often said to have little impact on the human body, but caution is necessary. If Tritium-containing water taken into the human body replaces hydrogen atoms that make up DNA, there is a risk of beta-particles damaging surrounding genes. Genetic disorders, neonatal deaths and infant leukemia have been reported in Canada.*

Efforts to settle the nuclear accident in Fukushima continue to hit snags

Japanese Prime Minister Shinzo Abe assured the International Olympic Committee (IOC) on September 8, 2013 that radiation leaks at the Fukushima Daiichi Nuclear Power Station were under control and did not pose any health risks.

Speaking to the IOC meeting prior to the vote to decide on the 2020 Olympics host city, Abe referred to this major issue that had raised doubts about Tokyo's chances of holding the event.

"Let me assure you the situation is under control. It has never done and will never do any damage to Tokyo," he stressed.

Meanwhile, the crippled Fukushima Daiichi Nuclear Power Station is producing massive amounts of radioactive water that are flowing into the ocean every day. The plant operator, Tokyo Electric Power Company (TEPCO), has also admitted that the radiation leaks are not fully contained within the nuclear power plant harbor.

The nuclear power plant workers, local fishermen and many other citizens were shocked to hear the prime ministers' totally groundless comment, voicing criticisms and anger. In addition to the buildup of contaminated water, troubles have emerged one after another on the plant premises, such as sudden rises in radiation level in some places and many incidents of workers receiving exposure to high-level radiation.

Did removal of rubble and wreckage cause worker body contamination?

It has been confirmed that the heads and hands of ten TEPCO employees were exposed to radioactive substances when they were leaving the Fukushima Daiichi Nuclear Power Station on August 12. They were sprayed with water from the mist generator installed at the plant for prevention of heat stroke. At first, the mist generator or the water from the device was thought to be the source of the contamination.

On August 19, radiation levels of up to 13.3 Bq/cm^2 (the government's exposure criterion is 40 Bq/cm^2) were detected from the heads of two workers who had finished work and boarded a bus outside the main earthquake-proof building. An examination of dust collected from the air in front of the building indicated that the radioactive cesium level had increased there.

TEPCO announced on August 29 that the radiation exposure of the 12 workers waiting for a bus in front of the earthquake-proof building on August 12 and 19 is believed to have been caused by scattered radioactive substances generated by two operations being carried out on top of the Unit 3 reactor building, some 400 meters southeast of the earthquake-proof building. One of the operations was the removal of a bridge-type crane for carrying nuclear fuel, which was conducted on August 12, and the other was the rubble and wreckage removal operation carried out at the same location on August 19. On both days, winds were blowing from the reactor building toward the earthquake-proof building. It is said that the removal operations were being carried out while the alarm was sounding. In addition, while the workers were waiting for the bus, the alarm on the radiation counter installed in front of the earthquake-proof building was also said to have been sounding, indicating that the radiation levels in those places were high.

Internal exposure levels of plant's workers engaged in emergency operations

Pressed by international organizations, the health ministry has re-evaluated worker internal exposure levels

The Ministry of Health, Labor and Welfare (MHLW) announced on July 5 that it had revised the internal exposure records for 479 workers engaged in emergency operations at the plant. According to the ministry, some of the data recorded in TEPCO's reports were not correct. The reports were compiled based on data from the plant makers and other subcontractors.

The ministry said it had checked closely the FY2011 and FY2012 reports on the internal exposure levels of the workers which were submitted to the ministry by TEPCO at the end of April, and discovered that there were some discrepancies between the exposure levels assessed by the subcontractors and those provisionally assessed by the utility company. The ministry, therefore, launched a re-assessment of the records in May.

Of the 19,592 workers engaged in the emergency operations at the plant between March 11 and December 2011, 452 were exposed to higher amounts of radiation than recorded levels, with the largest gap reaching 48.9 millisieverts (mSv), the ministry said.

After the correction was made by the end of March 2013, the number of workers whose total dosage topped 50 mSv increased by 24 (of these, six were exposed to more than 100 mSv).

Although the official limit of the plant worker's five-year exposure to radiation is set at 100 mSv, at least two of the above-mentioned workers were confirmed to have continued to work after that period without knowing that their total dosage had exceeded the limit.

Immediately after the nuclear accident, there was a serious shortage of whole body counters for measuring internal exposure to radiation, and many workers were unable to check their dosage for several months. In such cases, the calculation of the total internal exposure is generally done by taking into account the current dose and the length of time since the worker began absorbing radiation.

The ministry's investigation has revealed many questionable cases. For example, a case in which the exact time when the worker began absorbing radiation was not known, but was recorded as the middle of the March-December period. The general rule is to regard the starting time as the time when the worker began working in a radioactive environment.

In other cases, input errors of the data for 29 workers, mixed-up data, and other types of mistakes were discovered. As a result, a total of 479 errors and mistakes were found in the records for a total of 19,346 workers, the ministry said.

In July 2011, the Nuclear and Industrial Safety Agency ordered TEPCO to clarify the dosage calculation rules but the plant operator failed to fully comply with the order. Later, some scholars and intellectuals warned that the dosage calculation would be made inappropriately if TEPCO did nothing about it, but the utility completely failed to look into the matter.

Pressed by the international organizations probing into the harmful effects of radiation exposure, TEPCO submitted data on age-specific doses of the workers with distribution charts of their internal-exposure and thyroid equivalent doses to the World Health Organization in March 2012. Earlier this year, some of the international organizations posed questions about data in the report, which prompted MHLW to launch its investigation into the matter.

Most of the internal exposure of the workers was thyroid exposure to radiation suffered immediately after the nuclear accident. Concerning the thyroid equivalent doses, TEPCO reported the data for 522 workers calculated with the use of their actual measurements of exposure to iodine 131. Of these workers, the doses of 178 workers exceeded 100 mSv, the report said.

This time, TEPCO expanded the scale of its survey, and when the worker's exposure to iodine 131 was not clear, it calculated their doses based on the worker's exposure to cesium. The result of this survey showed that as many as 1,973 workers suffered high-level exposure of more than 100 mSv.

Since March 11, 2011, CNIC has been holding negotiations with the government's ministries and agencies concerned through various channels, in cooperation with many other organizations, such as the Japan Occupational Safety and Health Resource Center and Radiation Exposure Opposition Campaign.

As for the issue of nuclear power plant workers' exposure to radiation, we negotiated with the government officials for the tenth time on June 20.

Since the outset of the negotiations, we have maintained that TEPCO conducted appropriate dosage assessments only for its own heavily-exposed employees, but did not do so for heavily-exposed workers hired by its subcontractors and cooperating firms.

We have repeatedly demanded during the past two years that the ministry clarify the methods of dose calculations adopted by TEPCO's subcontractors and cooperating firms. The ministry finally launched its action to investigate the matter, not in response to our demand, but in surrender to pressure from the international organizations. Their stance concerning this problem is, therefore, questionable.

The recent re-investigation of internal exposure has covered the workers of plant makers and companies specializing in nuclear

plant work, as well as temporary officials employed by TEPCO. However, there were other workers engaged in emergency operations who were exposed to high-level radiation, such as the security guards who continued to guard the front gate immediately after the outbreak of the nuclear accident and at the time of the explosion in the reactor buildings. They probably had no time to take rests or eat meals in other places for several days. The ministry should conduct sufficient hearings on such people and re-assess their doses correctly.

TEPCO's policy of recording only doses above 2 mSv in the radiation exposure management notebook and omitting smaller doses is not justifiable.

An official of the Industrial Health Division of MHLW's Labor Standards Bureau in charge of health protection measures for workers exposed to ionizing radiation said the ministry is conducting assessments of worker internal exposure levels once every three months, screening doses of more than 1 mSv to find out if the total exposure level exceeds 20,000 cpm. The exact number of counts is actually kept, but counts of less than 2 mSv are recorded as "zero" in the official radiation-exposure management notebook, he said. "In the International Commission on Radiation Protection's general rules concerning protection of workers from radiation, entitled ICRP pub.75, there is a rule that excludes counts of less than the designated level, and we are following the rule."

Published in 1997, the ICRP pub.75 did not foresee disastrous accidents at nuclear power plants that could not be settled for several years, such as the one that has occurred in Fukushima.

It is extremely important to have a correct record of internal exposure levels of the workers engaged in various operations at the plant where radiation leaks continue. The internal exposure problem is becoming more and more serious for the workers engaged in the tasks of decontamination and disposal of radioactive wastes.

Management of radiation exposure data for decontamination workers

There is also the deplorable situation where the employers of decontamination workers are not sending worker radiation exposure data to the Radiation Effects Association (REA) Radiation Dose Registration Center (RADREC), a public interest incorporated foundation for registration and management of exposure doses. This means that the decontamination workers working under new employers are not informed of their cumulative doses. Some exposure-dose records can be lost if an employer goes bankrupt. Without such data, decontamination workers will have difficulties in applying for workers' compensation.

The seventh negotiation with the government was held on June 24 jointly with eight other organizations and groups, such as the Radiation Exposure Opposition Campaign. The discussion was based on the statement calling for "the protection of health and lives of workers and residents, and compensation for health damages caused by radiation exposure."

In this negotiation, MHLW expressed its position that it is desirable for decontamination business operators to promptly register their worker radiation exposure data with the RADREC, a private database, as soon as their doses are confirmed, though it is not mandatory. The ministry said this in response to the question raised prior to the negotiation about the unified management of exposure data for emergency operation workers at the Fukushima nuclear power plant.

In this negotiation, the Environment Ministry official said, "After five years, the dosage data can be handed over to the designated organization. In this case, the employers will be released from the duty to keep the data for the remaining 25 years." "However, in the case of the Decontamination Ionizing Radiation Ordinance, there are no such rules and the employers cannot hand over their workers' dosage data to other organizations. If MHLW, which has expertise in the Industrial Safety and Health Act, makes such rules, we will follow them," said the ministry official.

We feel that MHLW should take the initiative in safety management of decontamination workers.

(Mikiko WATANABE, CNIC)

Japan Congress against Atomic and Hydrogen Bombs holds international conferences in Fukushima, Hiroshima and Nagasaki

The Japan Congress against Atomic and Hydrogen Bombs (Gensuikin) organizes international conferences every year in August around the dates when the atomic bombs were dropped in 1945. In 2013, the conference opened in Fukushima on July 28, followed by conferences held in Hiroshima on August 4–6 and in Nagasaki on August 7–9. The Fukushima conference has been organized since 2011, the year when the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station accident occurred.

The opening plenary meeting in Hiroshima started with a silent prayer for the many lives lost due to nuclear technology, including atomic bombs and nuclear power stations. When an atomic bomb survivor started to talk about her experience of an atomic bomb attack, the audience became silent. Many participants seemed to be concentrating hard on what she was saying, as if trying not to miss even one word of her testimony. The following is a brief summary of Yoshiko Yanagawa's talk on her experience of an A-bomb attack:

"It was when I was a student. I was in the school building when the atomic bomb exploded. The blast of the bomb caused the building to collapse, and I was immediately buried in darkness under the wreckage of the building. In the dark world where no light could be seen, I felt pain all around my body. I could not move. I was alone. I thought I might die. When I was thinking this, I noticed a glimmer overhead. I struggled hard toward the faint light. I finally succeeded in getting out of the darkness, finding that my arm was dangling from my torso, with the bone broken. I walked desperately and finally arrived at my relatives' house. I then slept for a few days, as if I were dead. There were insufficient medical facilities, and no medicines were available. All they could do for me was just put on bandages, apply a mixture of ash and oil, and have me lie down."

The keynote speech declared that nuclear technology and humankind cannot live together, and criticized the Japanese government for refusing to sign the anti-nuclear statement at the United Nations General Assembly on October 22, 2012. The statement includes the sentence, "All States must intensify their efforts to outlaw nuclear weapons and achieve a world free of nuclear weapons." The conference also criticized Prime Minister Shinzo Abe, who is attempting to export Japanese nuclear technology despite the fact that the Fukushima Daiichi Nuclear Power Station accident has not yet been resolved.

Atomic Bomb Dome in Hiroshima

A session of the Nagasaki Conference entitled "Japan's mass abduction and the victims of radiation exposure" emphasized that atomic bomb victims are not limited to Japanese people. When the bombs were dropped in Hiroshima and Nagasaki, there were also Koreans and Chinese who had been forcibly relocated to Japan living in those cities. Among the many hibakusha victims resulting from the bombings, Japanese nationals have been generously compensated while foreign nationals have not. Korean hibakusha victims also presented testimonies at the conference.

The international conferences of the Japan Congress against Atomic and Hydrogen Bombs are gatherings of those who are fighting to abolish atomic and hydrogen bombs around the country. They provide forums for people to share the latest news and problems, and refresh and strengthen mutual ties. Members of the general public are also free to participate in the conferences. A wide variety of learning sessions are held on nuclear issues, as well as excursions visiting areas contaminated by the nuclear plant disaster or sites where nuclear power plants are planned. For more information, please visit the website of the Japan Congress against Atomic and Hydrogen Bombs (*http://www.gensuikin.org/* - in Japanese).

(Nobuko TANIMURA, CNIC)

Who's who

Yasuko Yamaguchi, *Former delegate of the Women's Democratic Club*

From the elimination of synthetic detergent to the anti-nuclear power movement – fighting against dangerous causes that threaten our lives

TOMIYAMA Yoko*

The first time I became acquainted with the name Yasuko Yamaguchi was at the beginning of the 1970s. I remember that it was at a consumers conference, when she was bringing the dangers of synthetic detergents to the attention of the participants from the floor of the big assembly hall. Listening to her well-composed and persuasive speech, I became deeply aware of the fact that I had a lot to learn from this great senior activist.

Appeal for the abolition of the reprocessing of spent nuclear fuels
Ms. Yamaguchi is on the right and the author, Ms. Tomiyama, is on the left.

When Ms. Yamaguchi was married in 1952 and started her life in Asagaya in Tokyo's Suginami Ward, she learned about the "Women's Democratic Journal" (now the "Femin Women's Democratic Journal"). Seeing this as an opportunity, she joined Asagaya's "Women's Democratic Club" (now the "Femin Women's Democratic Club").

Before long, Ms. Yamaguchi gave birth to a child. At the same time, Kaoru Yasui, director of the Suginami Ward Community Center, started a petition for the abolition of nuclear weapons. Ms. Yamaguchi, with her child in a baby carriage, went to meetings of the Community Center, collected signatures and actively took part in the campaign. The signature campaign gained momentum and expanded nationwide when in 1954 the Japanese fishing boat Daigo Fukuryū Maru was exposed to and contaminated by nuclear fallout from H-bomb tests in the Bikini Atoll. Subsequently, Suginami became known as the birthplace of the movement to ban the atomic and hydrogen bombs.

When Japan lost the war, Ms. Yamaguchi was a 4th year student at a girls' high school. With the post-war reform of the school system, she became a 2nd year high school student. She explains: "What happened was that the general worker's strikes were suspended under orders from General MacArthur. I cannot forget how one of our high school teachers, who was the chairman of the teacher's union, stood lamenting in front of the whole school. I also became familiar with magazines such as "Sekai" ("The World") brought home by my older brother, who was a university student at that time, and for some reason started taking an interest in social issues."

The Women's Democratic Club, founded in 1946, cherishes democratic values, aims for a war-free society and shares the idea and a way of living that "each individual should pursue what they want to do." Ms. Yamaguchi became especially concerned with environmental problems that affected people's everyday lives, such as the elimination of synthetic detergents and pesticides, and also actively joined the anti-nuclear power movement. These kinds of topics are also connected to peace and women's issues. Ms. Yamaguchi emphasizes that the source of her motivation has been that she wanted to fight one-by-one the dangerous causes which threaten our lives. Today she is playing an active role in the secretariat of the "10 Million People's Action to say Goodbye to Nuclear Power Plants".

I will do my best to put myself in the place of those whose lives have been driven into disadvantageous positions, and with my head held high, will continue to walk down the path laid down by Yasuko Yamaguchi and her fellow leaders.

*Former representative of the administration committee of the Consumers Union of Japan

Magazine "Sekai" ("The World"): A general magazine first published in 1945, which published articles on topics such as politics, economy, security, society, education, and so on. (Iwanami Shoten Publishers)

NEWS WATCH

The four Fukushima NPP host towns demand decommissioning of all reactors

The Association of Fukushima Municipalities with Atomic Power Stations, which consists of the four local Fukushima municipal governments of Ōkuma and Futaba Towns, where the Fukushima Daiichi Nuclear Power Station is located, and Tomioka and Naraha Towns, where the Fukushima Daini Nuclear Power Station is located, held an extraordinary general meeting on August 9, 2013, where the mayors of the four towns and the chairpersons of their assemblies confirmed the Association's policy of requesting the Japanese government and Tokyo Electric Power Company (TEPCO) to decommission all ten nuclear power reactors in Fukushima Prefecture.

Of the ten reactors, TEPCO took the decision on April 19, 2012 to decommission Fukushima Daiichi Units 1 to 4 (BWRs, 2,812 MW in total). However, the power company has ignored the request from Fukushima Prefecture to decommission Fukushima Daiichi Units 5 and 6 (BWRs, 1,884 MW in total) and Fukushima Daini Units 1 to 4 (BWRs, 4,400 MW in total), on the excuse that the company will comply with the judgment of the national government.

On September 19, Prime Minister Abe inspected Fukushima Daiichi nuclear power plant and requested that TEPCO also decommission Units 5 and 6 of the plant. TEPCO president Naoki Hirose replied that the company would make a decision before the end of the year.

Compensation negotiations ongoing for Monju in-vessel transfer machine accident

Concerning the Monju reactor accident that occurred in August 2010, during which an in-vessel transfer machine for fuel replacement fell into the reactor (see NIT 138 and 139), JAEA, the operator of the reactor, filed a petition for conciliation under the Civil Conciliation Act with the Tokyo District Court on August 9, 2013, to negotiate with Toshiba, which produced the device, concerning responsibility and compensation for the accident. JAEA claims that the cost of production, installation, and a functional check test of a substitute device totaled about 2.4 billion yen. Strange to say, the substitute device is also a Toshiba product.

Basic policies proposed for the Children and Victims Protection Law

On August 30, 2013, Japan's Reconstruction Agency released a draft of basic action policies on the implementation of the Statute on Protection and Support for the Children and other Victims of Tokyo Electric Power Company Nuclear Power Plant Disaster (Children and Victims Protection Law). The draft limits the areas to be supported by the law to 33 cities and towns in Fukushima Prefecture, and specifies that the other areas that would require those actions should be designated as secondary support areas for each action. Radioactivity measurements of school lunches is planned to be carried out in 11 prefectures, including Fukushima as well as Iwate, Miyagi, Niigata and Nagano.

The Children and Victims Protection Law was established in June 2012 on the initiative of lawmakers. It was passed unanimously in both the House of Representatives and House of Councilors. However, although more than a year has passed since its passage, the basic government policies have not been established and no specific actions have been taken to implement the law. This draft appeared immediately after the victims filed a lawsuit demanding early implementation of the law on August 22.

On August 30, the victims and supporters organized a press conference and released a joint statement demanding reflection of their views in the basic action policies. The statement also demands that all areas where the annual radiation dose exceeds 1 millisievert should be designated as areas to be supported under the law.

Basic directions for restructuring JAEA released

The Ministry of Education, Culture, Sports, Science and Technology is planning to restructure the Japan Atomic Energy Agency (JAEA) after it was revealed that the agency failed to inspect more than 10,000 components in the Monju prototype fast-breeder reactor (280 MW), which the agency operates. On August 8, the Ministry's JAEA Restructuring Head Office released a document named "Basic Directions for Restructuring JAEA." The document says that, as the only comprehensive nuclear power research and development organization in Japan, the activities of JAEA should be reviewed in consideration of its social missions and responsibilities, and that its current all-inclusive operations should be streamlined, indicating that the particle beam research operation and atomic fusion research and development operation, both of which are part of the current agency, should be separated and might possibly be transferred to other research organizations. JAEA's functions likely to be emphasized instead include:

1. Handling of the Fukushima Daiichi Nuclear Power Station accident,
2. Research into safer nuclear power generation,
3. Basic and fundamental research on nuclear power generation and the development of personnel to support such research, and
4. Research and development of the nuclear fuel cycle project with Monju as its focus.

The Ministry says that it plans to propose a new law that will drastically renovate the organization, including a change of the name JAEA. More specific renovation plans will be released from JAEA this autumn.

Concerning the administration of Monju in Tsuruga City, Fukui Prefecture, the present JAEA Tsuruga Head Office will be abolished and the prototype fast-breeder reactor (FBR) will be placed under the direct control of the JAEA President with top officers in charge of safety stationed in Tsuruga. Along with these changes, the current FBR Research and Development Center will be restructured to form the Monju Power Generation Plant (provisional name). The Monju plant as an organization will exclusively handle the operation and control of the prototype FBR, and contract duties and public communications concerning the prototype reactor are to be handled by the newly established "Monju Plant Support Office" (provisional name). The officers in charge of safety stationed in Tsuruga are to be designated from among those who have experience of serving in plant-manager class positions at private power companies. The division managers and deputy division managers, who have conventionally been staffed by JAEA personnel, are to be replaced by employees of private power companies.

Concerning these basic directions, Fukui Prefecture and Tsuruga City are strongly concerned, indicating that the position of the prototype FBR as a base for world-leading research and development will be tarnished. The local municipal governments have also expressed their discomfort about the expected organizational shift that will place the prototype FBR under the direct control of the president of JAEA, saying that the shift is disrespectful of the local communities. Nuclear Regulation Authority Chairman Shunichi Tanaka also expressed criticism about the planned JAEA changes at a regular gathering of the Authority on August 14, saying: "It is no good to expect power companies to administrate or direct the organization. Concerning the FBR, power companies are amateurs and know nothing about it at all. As a research organization, JAEA should come up with better measures."

Construction of sodium engineering research facility begun in earnest

Although the JAEA restructuring plan has not been established (see above article), JAEA began the full-scale construction of its sodium engineering research facility on August 6, 2013. The agency held a ceremony to set up a column at the construction site adjacent to the Monju prototype FBR in Tsuruga City, Fukui Prefecture, on that day. The purpose of the facility is to assist the safe and stable operation of the reactor. The facility is scheduled to start operation in FY2014. It will have about six tons of sodium onsite as well as testing equipment, such as pipes and tanks, in which the sodium will be circulated.

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