Summary of Decommissioning and Contaminated Water Management

29 May, 2014

Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment

Main works and steps for the decommissioning

Fuel removal from Unit 4 SFP is underway. Preparatory works for fuel removal from Unit 1-3 SFP and fuel debris removal are ongoing.

Fuel Removal from SFP

Unit 1&2 / Unit 3: Rubble removal & dose reduction → Installing FHM* → Unit 4: Fuel removal → Storage and handling

Fuel Debris (Corium) Removal

Unit 1-3: Dose reduction & leakage identification → Stop leakage → Fuel debris removal → Storage and handling

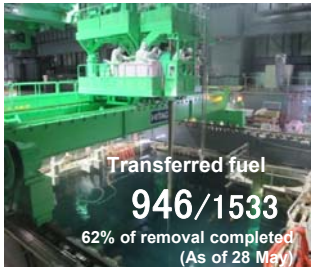
Dismantling Facilities

Scenario development & technology consideration → Design & Manufacturing of devices/ equipment → Dismantling

FHM*: Fuel Handling Machine

Fuel removal from SFP

Fuel removal from Unit 4 SFP has been underway since Nov. 18, 2013.
The work at Unit 4 will be accomplished around the end of 2014.



(Fuel removal operation)

Three principles for contaminated water countermeasures

Contaminated water countermeasures are implemented with the following three principles:

1. **Eliminate** contamination sources

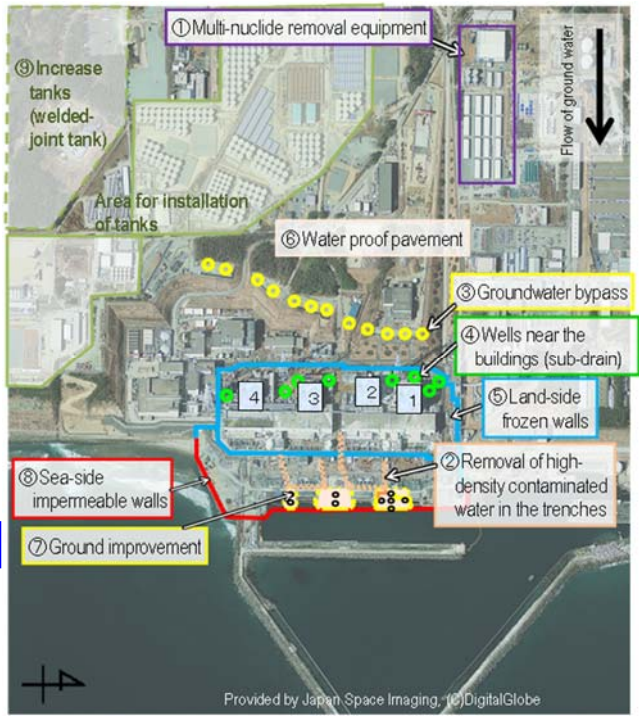
① Multi-nuclide removal equipment
② Remove contaminated water in the trench

2. **Isolate** water from contamination

③ Pump up ground water for bypassing
④ Pump up ground water near buildings
⑤ Land-side frozen walls
⑥ Waterproof pavement

3. **Prevent leakage** of contaminated water

⑦ Soil improvement by sodium silicate
⑧ Sea-side impermeable walls
⑨ Increase tanks (welded-joint tanks)



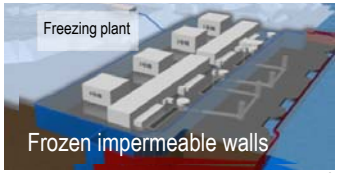
Multi-nuclide removal equipment (ALPS)

This equipment removes radionuclides from the contaminated water in tanks, and reduces risks.
It aims to reduce the levels of 62 nuclides in contaminated water to the legal release limit or lower (tritium cannot be removed).

(Installation status of the facility that absorbs radioactive materials)

Land-side impermeable walls with frozen soil

The walls surround the buildings with frozen soil and reduce groundwater inflow into the same.
Test on the site have been conducted since last August. Construction work will start soon and the freezing operation will start in FY 2014.



(Length: approx. 1,500m, frozen soil: approx. 70,000m^3)

Sea-side impermeable walls

The walls aim to prevent the flow of contaminated groundwater into the sea.
Installation of steel sheet piles is almost (94%) complete.
Operation is scheduled to commence from this September.

(Installation status)

Progress status

◆The temperatures of the Reactor Pressure Vessel (RPV) and the Primary Containment Vessel (PCV) of Units 1-3 have been maintained within the range of approx. 15-40℃*1 for the past month. There was no significant change in the density of radioactive materials newly released from Reactor Buildings in the air*2. It was evaluated that the comprehensive cold shutdown condition had been maintained.

*1 The values vary somewhat depending on the unit and location of the thermometer.

*2 The radiation exposure dose due to the current release of radioactive materials from the Reactor Buildings peaked at 0.03 mSv/year at the site boundaries. This is approx. 1/70 of the annual radiation dose by natural radiation (annual average in Japan: approx. 2.1 mSv/year).

Operation of groundwater bypassing

The groundwater bypassing is a measure to reduce the volume of groundwater flowing into the buildings. Groundwater is pumped up on the mountain side of buildings before it flows into them, and is released into the sea after confirming its quality. This operation was conducted on May 21 and 27(561 and 641m^3 respectively) after confirming the quality was within the strict operational targets.

For each future release, TEPCO and third-party organizations will confirm whether the quality of groundwater pumped up is within the operational targets. If necessary, release will be made in the presence of the government officials. To avoid harmful rumors, analytical results continue to be disclosed.

<Water release through the groundwater bypass>

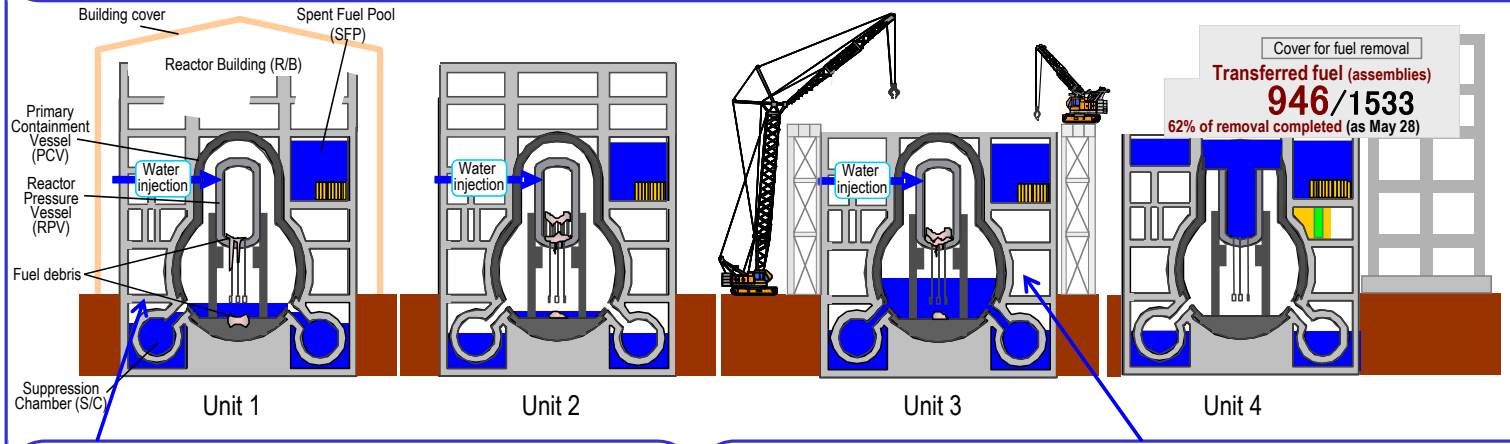
As tritium exceeding the operational target was detected from one pumping well on May 27, water pumping from that well was suspended immediately and monitoring is underway in accordance with the prepared response plan .

<Detailed analysis of groundwater of the storage tanks>

Unit: Bq/L

Sampling date (Release date)	2014/4/15 (2014/5/21)			2014/5/19 (2014/5/27)		operational target	(Reference) WHO Guideline of Drinking Water Quality	(Reference) Announcement density limit
Analysis organization	JAEA	Japan Chemical Analysis Center	TEPCO	Japan Chemical Analysis Center	TEPCO			
Cesium 134	0.015	0.022	0.016	ND (0.67)	ND (0.49)	1	10	60
Cesium 137	0.044	0.039	0.047	ND (0.51)	ND (0.38)	1	10	90
Gross α	ND (0.057)	ND (3.1)	ND (2.5)	-	-	-	-	-
Gross β	ND (0.10)	ND (0.61)	ND (0.88)	ND (0.55)	ND (0.89)	5 (1)*	-	-
Tritium	240	230	220	150	150	1,500	10,000	60,000
Strontium 90	0.013	0.011	0.013	-	-	-	10	30

* operational target of gross β is set to 1Bq/L in the inspection per 10 days.



Operation of multi-nuclide removal equipment (ALPS)

Regarding ALPS System B, the treatment has been suspended since March 18 due to radiation degradation of the filter gasket*. Treatment resumed from May 23 after completing replacement with improved filters, which resist radiation.

Regarding Systems A and C, following measures to detect filter degradation at any early stage, treatment was suspended without spreading contamination. After replacing with improved filters, treatment will resume in early June for System A and mid-June for System C.

* A gasket is used for the filling clearance by sandwiching to prevent leakage

Investigation in the upper part of Unit 1 Suppression Chamber (S/C)* detected leak point

An investigation in the upper part of Unit 1 S/C from May 27 detected a leak from one expansion joint cover among the lines installed there. Specific methods will be examined to halt the flow of water and repair the PCV.

<Leak point>

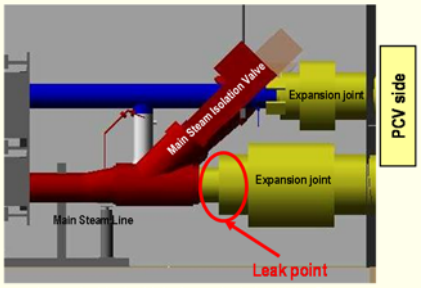
* Suppression Chamber (S/C): A large donut-shaped container to condense steam blowing into the PCV in water in case of an accident and suppress pressure increase in the PCV

Leak was detected at Unit 3 PCV

On May 15, a camera inserted into the Unit 3 Main Steam Isolation Valve*1 Room detected water flow from the expansion joint of one Main Steam Line*2.

This was the first leak from PCV detected in Unit 3. Specific methods will be examined to halt the flow of water and repair the PCV.

* Main Steam Isolation Valve: A valve to shut off the steam generated from the Reactor in an emergency
Main Stream Line: A line to transfer the stream generated from the reactor to the turbine



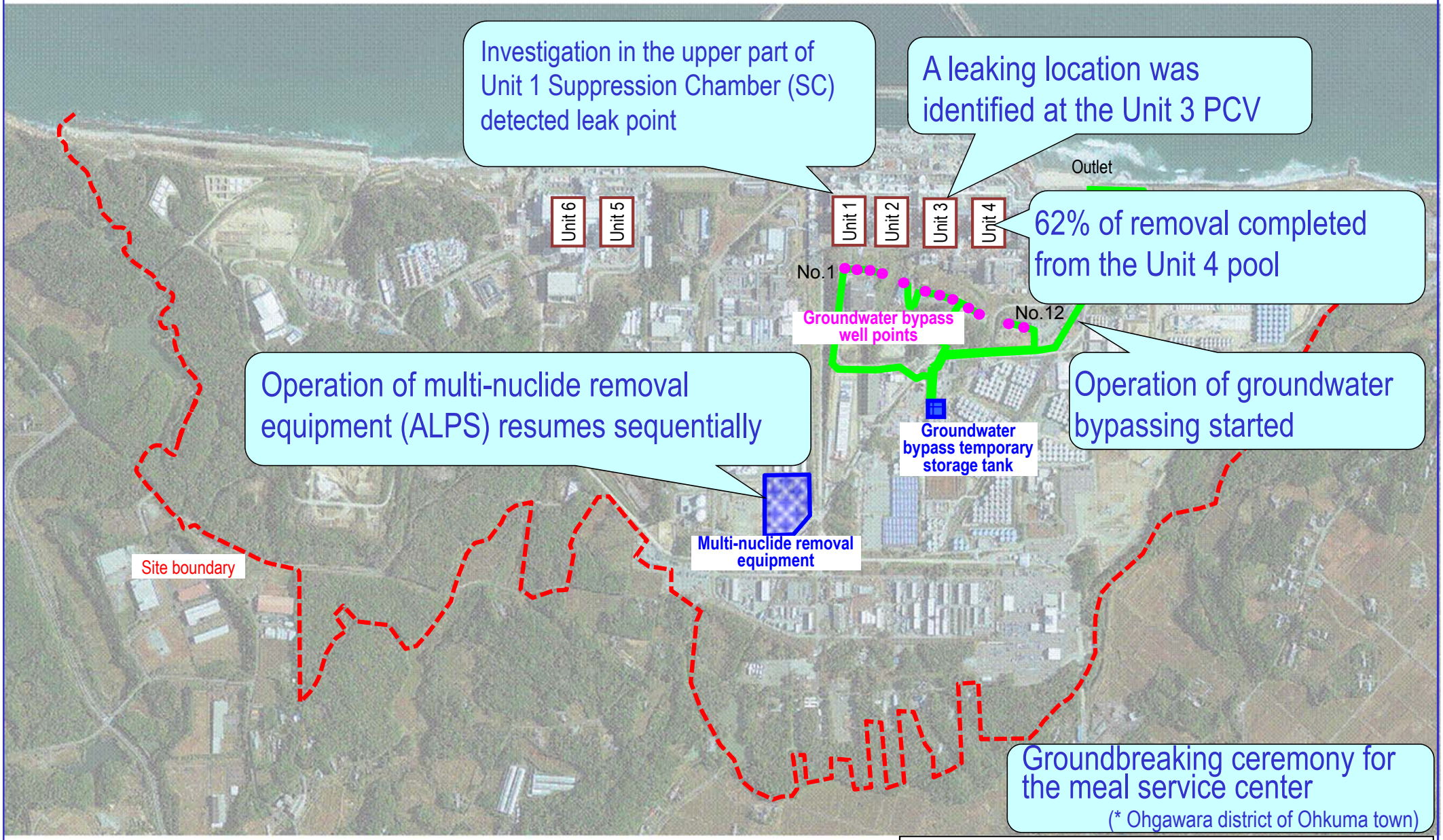
<Image inside the Main Steam Isolation Valve Room>

Fukushima meal service center

Aiming to improve and enhance workers' diets, a Fukushima meal service center will be built in Ohgawara District of Ohkuma Town by the end of fiscal 2014. On May 29, a groundbreaking ceremony for the center was held.

<Image of the Fukushima meal service center>

Major initiatives – Locations on site

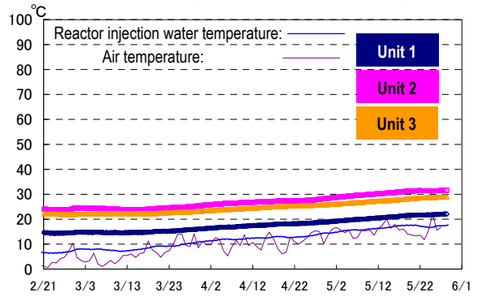


Provided by Japan Space Imaging, (C) DigitalGlobe

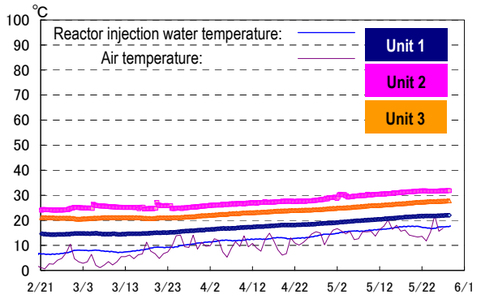
I. Confirmation of the reactor conditions

1. Temperatures inside the reactors

Through continuous reactor cooling by water injection, the temperatures of the Reactor Pressure Vessel (RPV) bottom and the Primary Containment Vessel (PCV) gas phase have been maintained within the range of approx. 15 to 40℃ for the past month, though they vary depending on the unit and location of the thermometer.



RPV bottom temperatures (recent quarter)

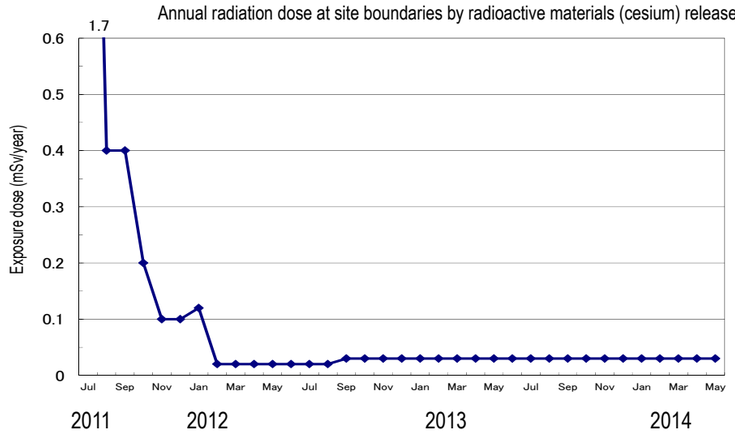


PCV gas phase temperatures (recent quarter)

* The trend graphs show part of the temperature data measured at multiple points.

2. Release of radioactive materials from the Reactor Buildings

The density of radioactive materials newly released from Reactor Building Units 1-4 in the air measured at site boundaries was evaluated at approx. 1.3×10^{-9} Bq/cm^3 for both Cs-134 and -137. The radiation exposure dose due to the release of radioactive materials was 0.03 mSv/year (equivalent to approx. 1/70 of the annual radiation dose by natural radiation (annual average in Japan: approx. 2.1 mSv/year)) at the site boundaries.



(Reference)

* The density limit of radioactive materials in the air outside the surrounding monitoring area:
[Cs-134]: 2×10^{-5} Bq/cm^3
[Cs-137]: 3×10^{-5} Bq/cm^3

* Dust density around the site boundaries of Fukushima Daiichi Nuclear Power Station (actual measured values):
[Cs-134]: ND (Detection limit: approx. 1×10^{-7} Bq/cm^3)
[Cs-137]: ND (Detection limit: approx. 2×10^{-7} Bq/cm^3)

(Note) Different formulas and coefficients were used to evaluate the radiation dose in the facility operation plan and monthly report. The evaluation methods were integrated in September 2012. As the fuel removal from the spent fuel pool (SFP) commenced for Unit 4, the radiation exposure dose from Unit 4 was added to the items subject to evaluation since November 2013.

3. Other indices

There was no significant change in indices, including the pressure in the PCV and the PCV radioactivity density (Xe-135) for monitoring criticality, nor was any abnormality of cold shutdown condition or sign of criticality detected. Based on the above, it was confirmed that the comprehensive cold shutdown condition had been maintained and the reactors remained in a stabilized condition.

II. Progress status by each plan

1. Reactor cooling plan

The cold shutdown condition will be maintained by cooling the reactor by water injection and measures to complement status monitoring will continue to be implemented

➢ Commencement of work to shorten the circulation loop

- Regarding the work to shorten the circulation loop, the operation of which is scheduled for the end of FY2014, as the facility design was completed, the preparatory work will commence from June.

➢ Reinstallation of supervisory instrumentation for Unit 2 PCV

- Some of the supervisory instrumentation (thermometer and water-level gauge) for PCV could not be installed in the planned locations during the work in August 2013 due to interference with existing grating. Reinstallation after resolving the twisted cables from May 20-22 failed and these instruments were removed on May 27. New instruments will be installed in June.

➢ Replacement of the thermometer at the bottom of Unit 2 RPV

- Removal and replacement of the thermometer installed at the bottom of Unit 2 RPV, which was broken in February 2014, failed in April and the operation was suspended. The estimated cause was fixing or added friction due to rust having formed. To help remove the thermometer, tests to check rust formation and fixing are underway (from May 12).

2. Accumulated water-treatment plan

To tackle the increase in accumulated water due to groundwater inflow, fundamental measures to prevent such inflow into the Reactor Buildings will be implemented, while improving the decontamination capability of water-treatment facilities and preparing facilities to control the contaminated water

➢ Preventing groundwater inflow to the Reactor Buildings

- From April 9, operation of 12 groundwater bypass pumping wells commenced sequentially and pumping of groundwater commenced. Regarding the groundwater stored in tanks, detailed analysis by TEPCO and third-party organizations (Japan Chemical Analysis Center and Japan Atomic Energy Agency) confirmed that the water met the operational targets. Release commenced from May 21 in the presence of the officials from the Intergovernmental Liaison Office for the Decommissioning and Contaminated Water Issue of the Cabinet Office. As of May 28, 1,202 m^3 of groundwater had been released. The pumped up groundwater has been temporarily stored in tanks and released after TEPCO and the third-party organization (Japan Chemical Analysis Center) confirm that its quality meets the operational targets. Regarding the pumping wells, a weekly analysis has been conducted by TEPCO. As tritium exceeding the operational target was detected from the sampled water from the No. 12 pumping well on May 26, water pumping from that well was suspended on May 27 and monitoring is underway.
- To facilitate the installation of frozen impermeable walls surrounding Units 1-4 (a subsidy project of the Ministry of Economy, Trade and Industry), a freezing test of small-scale impermeable walls (approx. 10 x 10m) is underway. The freezing status of the small-scale impermeable walls was disclosed to the press on the site (May 16). Preparatory work for frozen impermeable walls is underway and placement of frozen pipes will commence from the point at which preparation is complete.
- To facilitate the installation of the sub-drain facility (by the end of September), drilling in 11 of 15 new pits was completed as of May 28. Regarding the sub-drain treatment facility, construction of the building from March 12 and installation of equipment inside the building from March 19 are underway.

➢ Operation of multi-nuclide removal equipment

- Hot tests using radioactive water are underway (System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013). To date, approx. 86,000 m^3 has been treated (as of May 27, including approx. 9,500m^3 stored in J1(D) tank, which contained water with a high density of radioactive materials at the System B outlet).
- Regarding System B, as the density of radioactive materials in the system outlet water increased on March 18 due to a defect in the filter, treatment was suspended. An overhaul of the defect filter revealed that the Teflon-coated gasket* was likely embrittled due to radiation degradation and carbonate coprecipitation, including radioactive materials (mainly strontium) to be filtered by this filter, having passed through the same. After improving the structure of the filter gasket and replacing it with improved filters made of rubber, which resists radiation, operation resumed from May 23.

  * Gasket is used for filling clearance by sandwiching to prevent leak
- Regarding Systems A and C, targeting early detection and prevention of contamination expansion at the time of the same filter defect detected in System B, the radiation density before transferring to storage tanks and the calcium density at the absorption vessel outlet are measured daily. Though the same defect as detected in System B was also detected in Systems A and C, the early detection of carbonate slurry outflow from the filter meant operation was suspended without any expansion in contamination (System A: March 27 [calcium density: 11ppm], May 17 [calcium density: 11ppm], System C: May 20 [calcium density: 6.2ppm]).
- Regarding Systems A and C, operation will resume after replacing with improved filters (System A: early June, System C: mid-June). Regarding System C, an inspection to verify the effectiveness of anti-corrosion measures will be conducted during suspension.
- To facilitate the installation of additional multi-nuclide removal equipment, removal of obstacles, drilling, ground improvement, and foundation construction have been underway since March 17.

- To facilitate the installation of high-performance multi-nuclide removal equipment, a subsidy project of the Ministry of Economy, Trade and Investment, work to remove obstacles, drill, improve the ground, and construct foundations has been underway since March 12. From May 15, the electrical and electronic works will commence. The implementation plan for test equipment that verifies the ability to reduce the density of radioactive materials was submitted on May 23.

➢ Measures to reduce the risks of RO concentrated salt water

- To reduce RO concentrated salt water, by installing mobile strontium-removal equipment and applying absorbent material while simultaneously removing cesium and strontium to the second cesium absorption vessel, measures to reduce strontium 90 in RO concentrated salt water will be implemented. To facilitate efforts to commence the treatment in August, an implementation plan for mobile strontium-removal equipment was submitted on May 22.

➢ Rainwater prevention measures inside tank area fences

- Regarding rainwater in the contamination water tank area accumulated inside the fences, rainwater which did not meet the temporary discharge standard was stored in tanks, while some was transported to the Turbine Building and treated as highly concentrated contaminated water. From May 21, after removing radioactive materials using rainwater-treatment equipment, the rainwater was sprinkled on site (as of May 27, a total of 395m^3).

➢ Increased water level in the trench connecting to HTI

- When drilling grout injection holes to facilitate the closure of trenches in the work for water stoppage of the High Temperature Incinerator (HTI) Building, groundwater flowed in from some of the drilling holes (May 19). The groundwater inflow was stopped by installing packers into the holes and injecting chemicals.

➢ Overturning of a crane in the external material storage area

- During the work to install the J1 tank in the external material storage area (Naraha town), the 100t crane overbalanced and overturned due to caved-in concrete ahead of the crane on the left. This had no major influence on the tank installation work.

➢ Treatment and removal of contaminated water from the Main Trenches

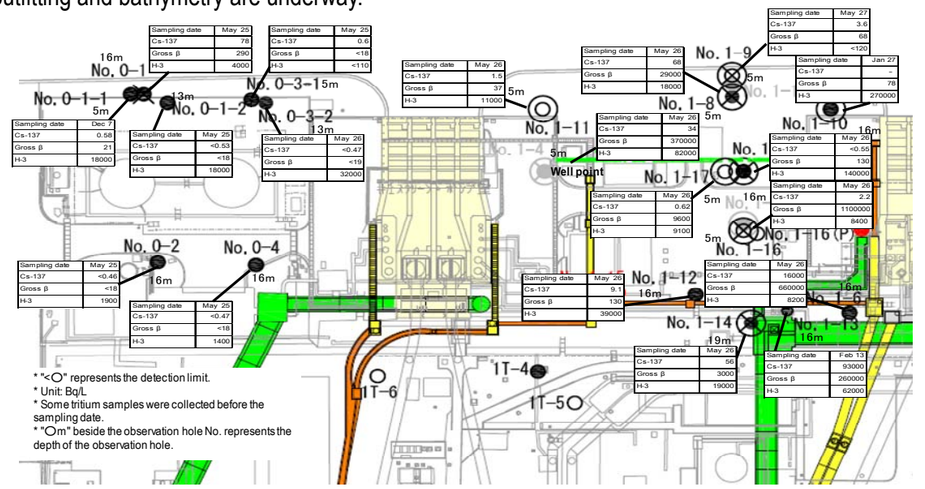
- As for the Main Trench Unit 2, treatment of contaminated water using mobile treatment equipment is underway (Cesium: from November 14, 2013 to April 10, 2014, strontium: from April 10 to 25). Positional adjustment of the pump for pumping up contaminated water is underway.
- As for the Main Trench Unit 3, removal of cesium in contaminated water using mobile treatment equipment is underway (from November 15, 2013). It was confirmed that the density of radioactive cesium was reduced.
- To facilitate the removal of contaminated water in the Main Trench Unit 2, water stoppage by freezing between the trench and Reactor Building is scheduled. Regarding Vertical Shaft A, installation of frozen ducts and temperature measurement ducts was completed and the freezing of all frozen ducts commenced from April 28. Regarding the open-cut duct, drilling of holes to install frozen ducts and temperature measurement ducts is underway (drilling of 21/24 holes was completed (as of May 26)).
- To facilitate the removal of contaminated water from the Main Trench Unit 3, water stoppage by freezing between the trench and Reactor Building is scheduled. Drilling of holes to install frozen ducts and temperature measurement ducts is underway (from May to June 2014).

3. Plan to reduce radiation dose and mitigate contamination

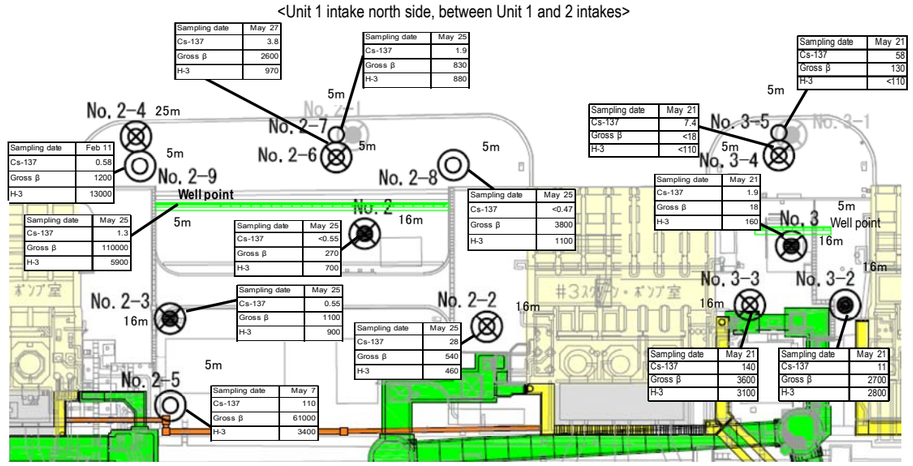
Effective dose-reduction at site boundaries and purification of the port water to mitigate the impact of radiation on the external environment

➢ Status of groundwater and seawater on the east side of Turbine Building Units 1 to 4

- Regarding the groundwater near the bank on the north side of the Unit 1 intake, the tritium density at all Observation Holes has been declining since March. The density at Observation Hole No. 0-3-2, the highest of all the holes, decreased to approx. 3 x10^{-4} Bq/L (see Figure 1). From the same Observation Hole No. 0-3-2, pumping of 1 m^3/day of water continues.
- Regarding the groundwater near the bank between the Unit 1 and 2 intakes, both densities of tritium and gross β radioactive materials in water pumped from the well point were maintained at around several 10^{-5} Bq/L. Although the gross β radioactive material density increased to 3.1 x 10^{-6} Bq/L at groundwater Observation Hole No. 1-16 on January 30, it has been maintained below 1 x 10^{-6} Bq/L recently (see Figure 1). Water pumping from the well point (approx. 40 m^3/day) and the pumping well No. 1-16 (P) (1m^3/day) installed near the Observation Hole No. 1-16 continues.
- Near the bank between the Unit 2 and 3 intakes, paved concrete to prevent the ingress of rainwater was completed (May 2). Regarding the groundwater, the gross β radioactive material density is high on the north (Unit 2) side of the area. At the groundwater Observation Hole Nos. 2-7 and 2-8, the gross β radioactive material density increased and remained at around several 10^{-3} Bq/L. Water pumping from the north side of the well point continues (4m^3/day).
- Near the bank between the Unit 3 and 4 intakes, paved concrete to prevent the ingress of rainwater was completed (May 2). At the new groundwater Observation Hole Nos. 3-2 and 3-3 installed near the seaside trench, both densities of gross β radioactive materials and tritium were maintained at around several 10^{-3} Bq/L (see Figure 1).
- With the future in mind, to examine measures to prevent rainwater on the east side of the 10M aquifer and over the roof of the Turbine Building, the water quality was conducted on Unit 1-3 discharge channels was investigated at points of rainwater ingress from these places. Though the analytical results confirmed contamination, the density was much lower than that of accumulated water of the building and seawater pipe trenches. To check major causes of contamination, additional investigation on the route and quality of the water inflow will be conducted.
- Regarding the seawater near the Unit 1 to 4 intakes (inside the seaside impermeable walls), both densities of tritium and gross β radioactive materials were slowly increasing. The estimated causes were the reduction in seawater volume inside the impermeable walls and transfer of seawater on the Unit 1 and 2 sides to those of Units 3 and 4 due to rainfall. The density of radioactive materials in seawater on the north side of the east breakwater (open channel between Units 1 and 2, outside the seaside impermeable walls) have been slightly decreasing since last autumn.
- Regarding the radioactive material density in seawater near the north and south discharge outlets and around the port, no significant change has been detected.
- In response to the progress in constructing impermeable walls on the sea side, placement of concrete in water and landfill are underway inside the impermeable walls. Alongside these works, sampling points inside the impermeable walls (“Unit 3 intake”) were abolished and a new sampling point (“Unit 1 intake (in front of impermeable walls)”) was added (see Figure 2).
- As preparation for coverage over the sea bottom soil inside the port, composition tests for coverage materials, hull outfitting and bathymetry are underway.



<Unit 1 intake north side, between Unit 1 and 2 intakes>



<Between Unit 2 and 3 intakes, between Unit 3 and 4 intakes>

Figure 1: Groundwater density on the Turbine Building east side

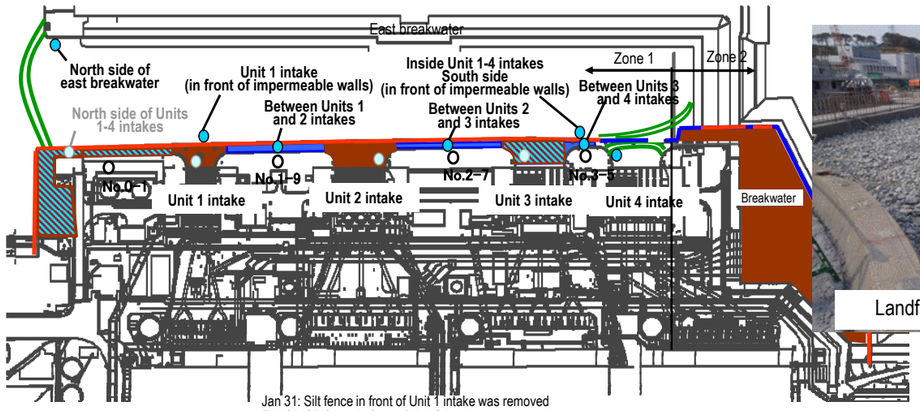


Figure 2: Progress status of impermeable walls on the sea side

4. Plan to remove fuel from the spent fuel pools

Work to help remove spent fuel from the pool is steadily progressing while ensuring seismic capacity and safety. The removal of spent fuel from the Unit 4 pool commenced on November 18, 2013 and efforts are being made to complete the process by around the end of 2014

➢ Fuel removal from the Unit 4 spent fuel pool

- Fuel removal from the spent fuel pool (SFP) commenced on November 18, 2013.
- As of May 28, 924 of 1331 spent fuel assemblies and 22 of 202 non-irradiated fuel assemblies had been transferred to the common pool. More than 62% of the fuel removal was completed.
- To reconfirm that there were no outstanding issues concerning fuel soundness and handling, channel boxes of the four fuel assemblies removed from the Unit 4 spent fuel pool were dismounted to inspect their external appearance (on April 22 and 25). It was confirmed that there were no issues from these perspectives.

➢ Main works to help remove spent fuel at Unit 3

- The removal of rubble is underway (from December 17). From April 19, removal of the fuel-handling machine commenced. In May, a supplementary traveling hoist frame and handrails on the hoist were removed.
- Measures to reduce the radiation dose (decontamination and shielding) on the Reactor Building 5th floor (operating floor) have been underway since October 15, 2013.

➢ Main works to help remove spent fuel at Unit 1

- To help remove rubble from the Reactor Building 5th floor prior to fuel removal, dismantling of the building cover will commence from early June.

➢ Replacement of fuel rack for common pool

- To store fuel assemblies in the spent fuel pool, which may be distorted or damaged before or during the earthquake, in the common pool, replacement of the existing spent fuel storage rack (with capacity to store 90 sound fuel assemblies) with a new rack (with capacity to store 49 fuel assemblies potentially distorted/damaged) is planned. The implementation plan was submitted on May 29.

➢ 5. Fuel debris removal plan

➢ *In addition to decontamination and shield installation to improve PCV accessibility, technology was developed and data gathered as required to prepare to remove fuel debris (such as investigating and repairing PCV leak locations)*

➢ Contamination status survey and decontamination of Reactor Building Units 1 to 3

- To examine methods to reduce the radiation dose on the 2nd and 3rd floors of the Reactor Building Units 1 to 3, measurement of the radiation dose rates and investigation using gamma cameras with remote-control robots are underway on the 2nd and 3rd floors of Units 1 and 2, and the 2nd floor of Unit 3. (Unit 1: from April 28 to May 22, Unit 2: from May 28; scheduled for completion mid-June, Unit 3: scheduled to commence from mid-June; scheduled for completion late June)
- To investigate areas significantly contributing to radiation dose rates (hot spots) on the 1st floor of the Reactor Building Units 1 to 3, an investigation using gamma cameras mounted on the remote-control robot (crawler crane: see Figure 3) is underway in the upper areas of the relevant floors. (Unit 1: May 9-29 and scheduled for mid-June, Unit 2: scheduled for late June, Unit 3: from June 2 and scheduled for completion in mid-June)

Crawler crane

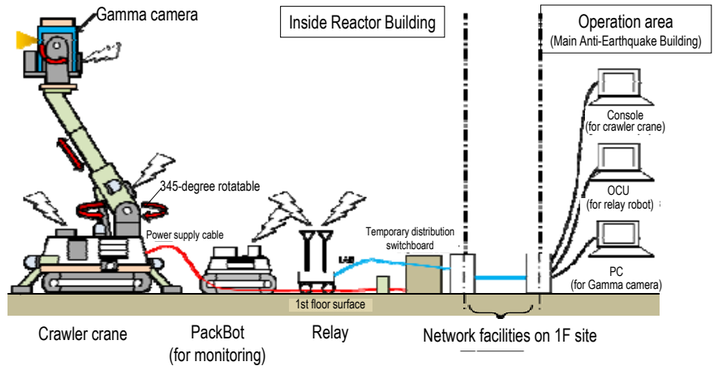


Figure 3: Remote-control robot to investigate the contamination status of 1st floor upper

➢ Demonstration of Unit 1 Suppression Chamber (S/C) upper part investigation

- To check for any leak from the structure around the upper part of the point where water flow outside S/C was detected in the investigation using a surface boat in November 2013, and to investigate the current status of the flow of accumulated water from the Reactor Building to the Turbine Building, the demonstration of the S/C upper part investigation equipment being developed in the subsidy project of the Ministry of Economy, Trade and Industry "Investigation and development of repair (water-stoppage) technology to facilitate water filling of primary containment vessels" is underway (from May 27 and scheduled for completion in late June). From the expansion joint cover of the vacuum break line, a leak was detected at two points (May 27) (see Figure 4).

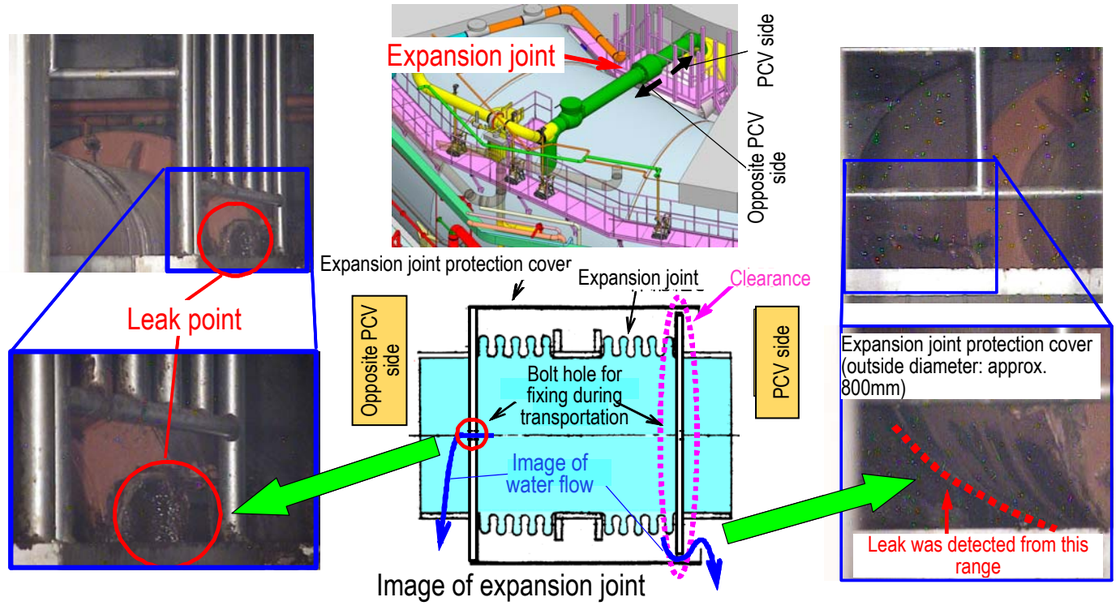
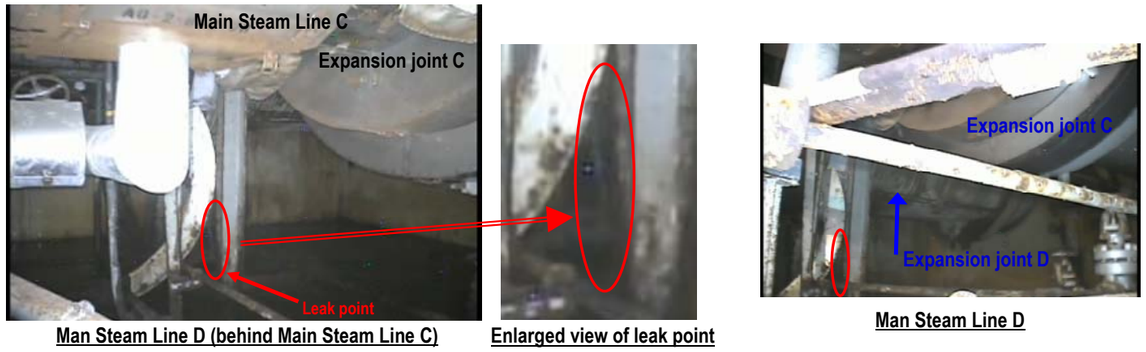


Figure 4: Investigation of leak points from the expansion joint of the vacuum break line in Unit1 Suppression Chamber (S/C) upper part

➢ Investigation on water flow parts of the Unit 3 Main Steam Isolation Valve Room

- An investigation to identify the cause of the water flow from the Main Steam Isolation Valve Room in the Unit 3 Reactor Building 1st floor northeast area detected on January 18 is underway (from April 23 to May 15). The investigative results confirmed water flow from the expansion joint of the Main Steam Line D (May 15) (see Figure 5). Based on images collected in this investigation, the leak volume will be estimated and the need for additional investigations will be examined. The investigative results will also be utilized to examine water-stoppage and PCV-repair methods.



Man Steam Line D (behind Main Steam Line C) | Enlarged view of leak point | Man Steam Line D

Figure 5: Investigation of the Unit 3 Main Steam Isolation Valve Room

6. Plan to store, process and dispose of solid waste and decommission reactor facilities

Promoting efforts to reduce and appropriately store waste generated and R&D to facilitate adequate and safe storage, processing and disposal of radioactive waste

➢ Status of management of rubble and trimmed trees

- As of the end of April, the total storage volume of concrete and metal rubble was approx. 105,300m^3 (+10,000m^3 compared to at the end of March, area occupation rate: 78%). The total storage volume of trimmed trees was approx. 73,100m^3 (-6,200m^3 compared to at the end of March, area occupation rate: 57%). The increase in rubble is mainly attributable to the removal of scrapped vehicles to install tanks and construction to install additional multi-nuclide removal equipment. The decrease in trimmed trees is mainly attributable to the volume reduction by chipping dried leaves accumulated outdoors before transporting them to the temporary trimmed trees storage pool.

➢ Status of management of secondary waste from water treatment

- As of May 27, the total storage volume of waste sludge was 597 m^3 (area occupation rate: 85%). The total number of stored spent vessels and high-integrity containers (HIC) of multi-nuclide removable equipment was 910 (area occupation rate: 36%).

7. Plan for staffing and ensuring work safety

Securing appropriate staff long-term while thoroughly implementing workers' exposure dose control. Improving the work environment and labor conditions continuously based on an understanding of workers' on-site needs

➢ Staff management

- The monthly average number of people registered for at least one day per month to work on site during the past quarter from January to March was approx. 9,800 (TEPCO and partner company workers), which exceeds the monthly average number of workers (approx. 7,500). Accordingly, sufficient people are registered to work on site.
- It was confirmed with the prime contractors that the estimated manpower necessary for the work in June (approx. 4,450 per day: TEPCO and partner company workers)* would be secured at present. The average numbers of workers per day for each month of last fiscal year (actual value) were maintained with approx. 3,000 to 4,500 per month since August (See Figure 6). * Workers with whom contract procedures had not yet been completed were excluded from the total for each month.
- As of April, the local employment ratio (TEPCO and partner company workers) was approx. 50%.

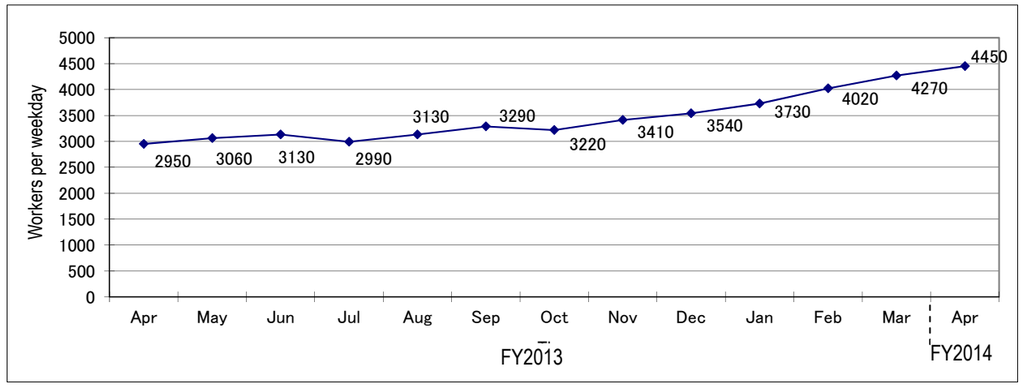


Figure 6: Changes in the average number of workers per day for each month in fiscal 2013 (actual values)

➢ Outbreak status of influenza and norovirus

- In response to the reduction in influenza infections, infection-control measures were terminated on May 23. During this season (2013-2014), 254 persons were infected with influenza and 35 with norovirus. The accumulated totals for the previous season (2012-2013) were 205 for influenza and 43 for norovirus patients respectively.
- Compared to the previous season, an additional 49 patients were infected with influenza, while 8 fewer patients were infected with norovirus. While measures to address the increased influenza infection were extended this season in late March, no major change was detected from the previous year regarding norovirus infection.

➢ Expansion of full-face mask unnecessary area

- In the J tank installation area to the south of the Fukushima Daiichi Nuclear Power Station site, as decontamination (tree trimming and removal of surface soil) was completed (May 10) and it was confirmed that the density of radioactive materials in the air was below the standard for wearing full-face masks (particle Cs: 2×10^{-4} Bq/cm^3), the area will be set as full-face mask unnecessary area (from May 30), where for works not handling contaminated water, wearing disposable dust-protective masks will be deemed sufficient (see Figure 7).

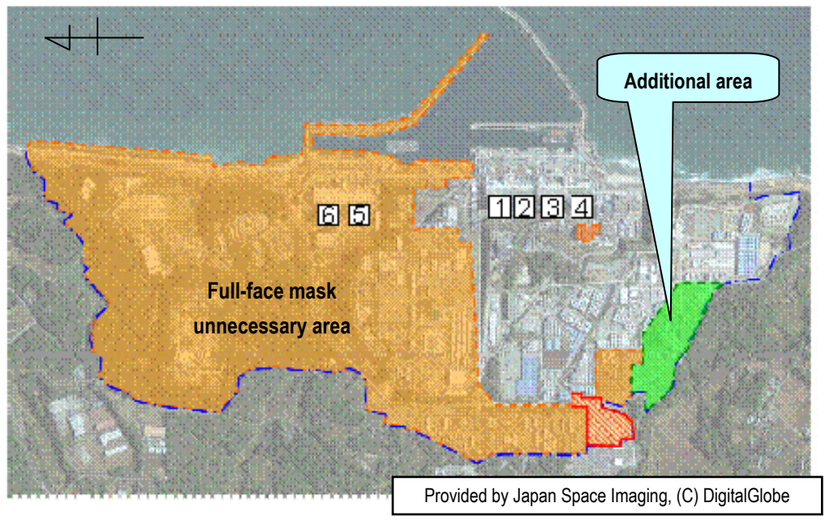


Figure 7: Full-face mask unnecessary area

➢ Efforts to improve the labor environment

- To maintain vehicles used within the site, a vehicle maintenance site was established (operation will commence from June 1) (see Figure 8).
- Aiming to improve and enhance workers' diets, a Fukushima meal service center capable of serving 3,000 meals will be built in the Ohgawara district of Ohkuma town by the end of fiscal 2014. On May 29, a groundbreaking ceremony for the center was held (see Figure 9).

Figure 8: External appearance of the vehicle maintenance site

Figure 9: Groundbreaking ceremony for the meal service center

➢ Measures to prevent heat stroke

- Continued from last year, measures to prevent heat stroke were commenced from May to cope with the hottest season.
- Using WBGT (*), work time, the frequency and timing of breaks, and work intensity were altered.
- Work under the blazing sun is prohibited in principle from 14:00 to 17:00 in July and August.
- Appropriate rest and frequent intake of water and salt are encouraged.
- Physical management using check sheets and wearing of cool vests.
- A workplace environment where workers are allowed to claim poorly conditions is established and early diagnosis at the emergent medical room is encouraged.

WBGT: Index using three perspectives of humidity, radiation heat, and temperature which significantly impact on the heat balance of human bodies

8. Others

➢ Public offering of the contaminated water-treatment technology verification project (tritium-separation technology verification test project) commenced

- This project is conducted to collect the latest insights concerning tritium-separation technology as of today. Specifically, it aims to verify (1) the separation performance related to tritium-separation technology and (2) if the equipment is installed in the Fukushima Daiichi Nuclear Power Station, the construction and running costs of the equipment required to treat water after treatment by the multi-nuclide removal equipment, which is actually generated. This does not constitute confirmation that separation and treatment of tritium will commence.
- The term of public offering is from Thursday, May 15 to noon Japan time on Thursday, July 17, 2014.
- A briefing session is scheduled from 13:00 to 15:30, Tuesday, June 3, 2014 (planned), at the hall on the 1st floor of Bellesalle Onarimon-ekimae. This briefing session will be simultaneously delivered via the Internet on the dedicated website of the Mitsubishi Research Institute, which serves as secretariat of this project. Following the briefing session, a video of the session will also be available.

Status of seawater monitoring within the port
(comparison between the highest values in 2013 and the latest values)

Appendix 1

"The highest value" → "the latest value (sampled during May 19-26)"; unit (Bq/L); ND represents a value below the detection limit

【In front of Unit 6 intake】

Cesium-134: 3.3 (2013/10/17) → ND (1.0) Below 1/3
Cesium-137: 9.0 (2013/10/17) → ND (1.2) Below 1/7
Gross β: 74 (2013/ 8/19) → ND (15) Below 1/4
Tritium: 67 (2013/ 8/19) → ND (1.9) Below 1/35

【North side in the port】

Cesium-134: 4.4 (2013/12/24) → ND (1.3) Below 1/3
Cesium-137: 10 (2013/12/24) → 1.2 Below 1/8
Gross β: 60 (2013/ 7/ 4) → ND (15) Below 1/2
Tritium: 59 (2013/ 8/19) → 36 Below 7/10

【In front of shallow draft quay】

Cesium-134: 5.0 (2013/12/ 2) → ND (1.3) Below 1/3
Cesium-137: 8.4 (2013/12/ 2) → ND (1.3) Below 1/6
Gross β: 69 (2013/ 8/19) → ND (15) Below 1/4
Tritium: 52 (2013/ 8/19) → ND (1.9) Below 1/27

【West side in the port】

Cesium-134: 2.8 (2013/12/ 2) → ND (2.1) Below 8/10
Cesium-137: 5.8 (2013/12/ 2) → ND (2.2) Below 1/2
Gross β: 46 (2013/ 8/19) → ND (17) Below 1/2
Tritium: 24 (2013/ 8/19) → 5.9 Below 1/4

【Port entrance】

Cesium-134: 3.3 (2013/12/24) → ND (1.3) Below 1/2
Cesium-137: 7.3 (2013/10/11) → ND (1.1) Below 1/6
Gross β: 69 (2013/ 8/19) → ND (15) Below 1/4
Tritium: 68 (2013/ 8/19) → ND (1.9) Below 1/35

【East side in the port】

Cesium-134: 3.5 (2013/10/17) → ND (1.1) Below 1/3
Cesium-137: 7.8 (2013/10/17) → ND (1.3) Below 1/6
Gross β: 79 (2013/ 8/19) → ND (15) Below 1/5
Tritium: 60 (2013/ 8/19) → ND (1.9) Below 1/30

【South side in the port】

Cesium-134: 32 (2013/10/11) → 2.8 Below 1/11
Cesium-137: 73 (2013/10/11) → 9.2 Below 1/7
Gross β: 320 (2013/ 8/12) → 31 Below 1/10
Tritium: 510 (2013/ 9/ 2) → 280 Below 6/10

Sea side impermeable wall

Silt fence

Cesium-134: 89 (2013/10/10) → 14 Below 1/6
Cesium-137: 190 (2013/10/10) → 41 Below 1/4
Gross β: 1,400 (2013/11/ 7) → 200 1/7
Tritium: 4,800 (2013/11/ 7) → 630 Below 1/7
(As measurement was terminated due to landfill, values are as of March 2014)

Cesium-134: 5.3 (2013/ 8/ 5) → ND (2.3) Below 1/2
Cesium-137: 8.6 (2013/ 8/ 5) → 2.5 Below 1/3
Gross β: 40 (2013/ 7/ 3) → ND (17) Below 1/2
Tritium: 340 (2013/ 6/26) → 8.1 Below 1/40

Unit 5

	Legal discharge limit	WHO Guidelines for Drinking Water Quality
Cesium-134	60	10
Cesium-137	90	10
Strontium-90 (strongly correlate with Gross β)	30	10
Tritium	60,000	10,000

Summary of TEPCO data as of May 28

Source: TEPCO website
Analysis results on nuclides of radioactive materials around Fukushima Daiichi Nuclear Power Station
http://www.tepco.co.jp/nu/fukushima-np/f1/smp/index-j.html

Status of seawater monitoring around outside of the port
(comparison between the highest values in 2013 and the latest values)

(The latest values sampled during May 14-26)

Unit (Bq/L); ND represents a value below the detection limit; values in ( ) represent the detection limit; ND (2013) represents ND throughout 2013

	Legal discharge limit	WHO Guidelines for Drinking Water Quality
Cesium-134	60	10
Cesium-137	90	10
Strontium-90 (strongly correlate with Gross β)	30	10
Tritium	60,000	10,000

【Northeast side of port entrance(offshore 1km)】

Cesium-134: ND (2013) → ND (0.66)
Cesium-137: ND (2013) → ND (0.79)
Gross β: ND (2013) → ND (18)
Tritium: ND (2013) → ND (1.7)

【East side of port entrance (offshore 1km)】

Cesium-134: ND (2013) → ND (0.66)
Cesium-137: 1.6 (2013/10/18) → ND (0.69) Below 1/2
Gross β: ND (2013) → ND (18)
Tritium: 6.4 (2013/10/18) → ND (1.7) Below 1/3

【Southeast side of port entrance(offshore 1km)】

Cesium-134: ND (2013) → ND (0.68)
Cesium-137: ND (2013) → ND (0.58)
Gross β: ND (2013) → ND (18)
Tritium: ND (2013) → ND (1.7)

Cesium-134: ND (2013) → ND (0.60)
Cesium-137: ND (2013) → ND (0.59)
Gross β: ND (2013) → ND (18)
Tritium: 4.7 (2013/ 8/18) → ND(1.7) Below 1/2

【North side of north breakwater(offshore 0.5km)】

【Port entrance】

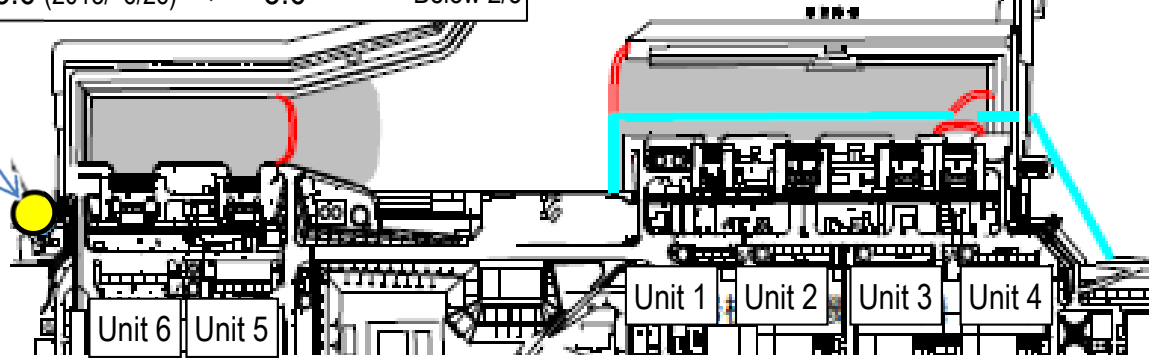
Cesium-134: 3.3 (2013/12/24) → ND (1.3) Below 1/2
Cesium-137: 7.3 (2013/10/11) → ND (1.1) Below 1/6
Gross β: 69 (2013/ 8/19) → ND (15) Below 1/4
Tritium: 68 (2013/ 8/19) → ND (1.9) Below 1/35

【South side of south breakwater(offshore 0.5km)】

Cesium-134: ND (2013) → ND (0.68)
Cesium-137: ND (2013) → ND (0.58)
Gross β: ND (2013) → ND (18)
Tritium: ND (2013) → ND (1.7)

【North side of Units 5 and 6 discharge channel】

Cesium-134: 1.8 (2013/ 6/21) → ND (0.87) Below 1/2
Cesium-137: 4.5 (2013/ 3/17) → ND (0.71) Below 1/6
Gross β: 12 (2013/12/23) → 9.5 Below 8/10
Tritium: 8.6 (2013/ 6/26) → 5.6 Below 2/3



Cesium-134: ND (2013) → ND (0.75)
Cesium-137: 3.0 (2013/ 7/15) → ND (0.72) Below 1/4
Gross β: 15 (2013/12/23) → 9.5 Below 2/3
Tritium: 1.9 (2013/11/25) → 5.6

Sea side impermeable wall

Silt fence

【Around south discharge channel】

Summary of TEPCO data as of May 28

Source: TEPCO website, Analysis results on nuclides of radioactive materials around Fukushima Daiichi Nuclear Power Station, http://www.tepco.co.jp/nu/fukushima-np/f1/smp/index-j.html

Appendix 2

May 29, 2014

TEPCO Fukushima Daiichi Nuclear Power Station Site Layout

- Rubble storage area
- Rubble storage area (planned)
- Trimmed trees area
- Trimmed trees area (planned)
- Mid-/ low-level contaminated water
- Mid-/ low-level contaminated water tank (planned)
- High-level contaminated water tank
- High-level contaminated water tank (planned)
- Multi-nuclide removal equipment
- Treatment facility for sub-drain water (planned)
- Dry cask temporary storage facility

Inside the rubble storage tent

Rubble (container storage)

Rubble storage tent

Temporary soil cover type storage

Rubble (outdoor accumulation)

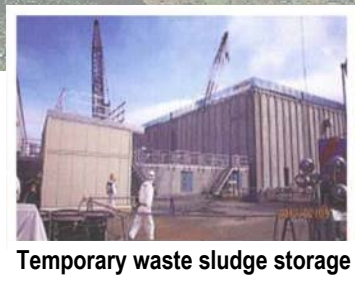
Solid waste storage

Rubble (outdoor accumulation)

Temporary trimmed trees storage pool

Trimmed trees (outdoor accumulation)

Tank installation status



Temporary waste sludge storage

Futaba town

Ohkuma town

Unit 1

Unit 2

Unit 3

Unit 4

Unit 5

Unit 6

MP-1

MP-2

MP-3

MP-4

MP-5

MP-6

MP-7

MP-8

Temporary trimmed trees storage pool

Rubble

Trimmed trees

Miscellaneous Solid Waste Volume Reduction Treatment Building (planned)

Vehicles maintenance site (planned)

Frozen soil impermeable wall demonstration test

Town boundary

Mega float

Chiller for reactor water injection facility

Treatment facility for sub-drain water

Dry cask temporary storage facility

Main Anti-Earthquake Building

Multi-nuclide removal

High-performance multi-nuclide removal equipment (planned)

Additional multi-nuclide removal equipment (planned)

Pumping pipe route

Spent absorption vessel temporary storage

Vehicle screening and decontamination site

Underground reservoirs

Land-side impermeable walls with frozen soil (planned)

Temporary Administration Office Building (planned)

Groundwater bypass temporary storage tank

Sea side impermeable wall (under construction)

Administration Office Building (planned)

Cesium absorption apparatus (Incineration Workshop Building)

Temporary rest house outside the site

Common pool

Decontamination instruments (Process Building)

2nd cesium absorption apparatus (HTI Building)

Large rest house (planned)

Access control facility

Water desalinations (evaporative concentration)

Water desalinations (RO)

Cesium absorption vessel temporary storage

Water discharge pipe route

Temporary waste sludge storage

High-level accumulated water reception tank (emergency reception)

Mid-/ low-level fresh water tank

Spent absorption vessel temporary storage

Spent absorption vessel temporary storage (multi-nuclide removal equipment, etc.)

Site boundary

H1 H2 H3 H4 H5 H6 H8 H9 D E F G G3・G4・G5 G6 B C J

Provided by Japan Space Imaging Corporation, (C)DigitalGlobe

0m 100m 500m 1000m

Status of efforts on various plans (Part 1)

Attachment 3

: Main processes
: Sub-main processes
: Field work
: R&D
: Review
: Plan until last month
Green frame: Change from last month

▼As of May 29, 2014

Challenges	Phase 1 (no later than 2 years after the completion of the current efforts)		Phase 2 (Early period)	
	2012	2013	2014	2015

Reactor cooling plan

- Maintenance and monitoring of the cold shut down condition of nuclear reactor (by continuous monitoring on the continuation of water injection and parameters including temperature etc., preservation and improvement of reliability through maintenance and management)
- Narrowing-down of candidate systems for inserting alternative thermometer in Unit 1 RPV → Review on the method for inserting alternative thermometer in Unit 1 RPV*
  *The time for executing the installation work will be determined after on-site studies etc., on the basis of the status of environmental improvement by means of decontamination/shielding.
- Installation of thermometer in Unit 2 RPV (including inspection in nuclear reactors)
- Narrowing-down of candidate systems for inserting alternative thermometer in Unit 3 RPV → Review on the method for inserting alternative thermometer in Unit 3 RPV*
- Partial observation of the PCV
- Remote visual check of the PCV, direct measurement/evaluation of temperature etc.
- ▽Objective: Completion of switching to the equipment for water intake from the reactor building (or from the bottom of the PCV)
- Improvement of the reliability of the circulating water injection cooling system (water intake from the turbine building) (Review/implement measures to strengthen some materials for pipes, etc./improve earthquake resistance)
- Water source: Treated water buffer tank → Water source: Condensate water storage tank for Units 1 to 3
- Reliability improvement measures for the lines taking water supplies from the condensate water storage tanks of Units 1 to 3
- The circulating injection cooling system (water intake from the reactor building (or the lower part of the reactor containment vessel))
- Review on water take from reactor building (or from the bottom of the PCV) - Construction work → Switching among the water intake equipment (sequential)
- Inspection/review for early construction of the circulation loop in the building → Construction of circulation loop in the building (for Units 1 to 3)

Plan for retrieving fuel from spent fuel pool

Unit 1

- HP 1-1
- Review on fuel removing method → Selection of a fuel/fuel debris removing plan
- Dismantling of building cover
- Removal of debris, decontamination and shielding
- Modification/recovery of building cov
- * Reviewed based on the actual situation
- Pool circulation cooling (preservation/improvement of reliability by maintenance management and facility update etc.)

Unit 2

- HP 2-1
- Consideration/preparation for the decontamination and shielding in the building → Selection of a fuel/fuel debris removing plan
- Decontamination/shielding, restoration of fuel handling equipment
- Pool circulation cooling (preservation/improvement of reliability by maintenance management and facility update etc.)

Unit 3

- HP 3-1
- Preparatory work/debris removing work
- Removal of debris, decontamination and shielding in the
- Selection of a fuel/fuel debris removing plan
- Construction of fuel removal cover/installation of fuel handling equipment
- Removal of debris In the pool/fuel check
- Design and manufacturing of fuel removal cover
- Design and manufacturing of crane/fuel handling machines
- Consideration, design and manufacturing of on-site shipping containers
- Fuel removal
- Pool circulation cooling (preservation/improvement of reliability by maintenance management and facility update etc.)

Unit 4

- Construction of fuel removal cover/installation of fuel handling equipment
- Removal of debris In the pool/fuel check etc.
- Fuel removal
- Pool circulation cooling (preservation/improvement of reliability by maintenance management and facility update etc.)

Status of efforts on various plans (Part 2)

: Main processes
: Sub-main processes
: Field work
: R&D
: Review
:Plan until last month
Green frame: Change from last month

As of May 29, 2014

Challenges	Phase 1 (no later than 2 years after the completion of the current efforts)	Phase 2 (Early period)
	2012	2013	2014	2015

Fuel debris removal plan

Decontamination of the inside of the building
- Review on decontamination technology/development of remote decontamination equipment
- Development of remote contamination investigation technologies (1)
- Development of remote decontamination technologies (1)
- Site survey and on-site demonstration
- ▽Objective: Establish decontamination robot technology
- Decontamination, shielding, etc. in the building (Work environment improvement (1))
- First floor of the reactor building
- To be continued

Measures to reduce overall dose
- Formulation of a comprehensive plan for exposure reduction
- Grasping of the situation of work area
- Formulation of work plan in the reactor building
- Formulation of work plan on the floor with damage from explosion

Inspection/repair of leaking locations of the PCV
- R&D for inspection/repair of leaking locations of the PCV (including stop leakage between buildings).
- Design, manufacturing and testing etc. of the equipment for inspecting the PCV (2)
- Design, manufacturing and testing etc. of the equipment for inspecting the PCV (3), (6)
- [Units 1 and 3] Inspection of the basement of the nuclear reactor building, Inspection of leaking locations☆
- [Unit 2] Inspection of the basement of the nuclear reactor building, Inspection of leaking locations☆
- ☆: Including on-site demonstration

Fuel debris removal
- R&D toward the removal of fuel debris (to be continued to address long-term challenges including internal R&D of equipment etc.)
- Design, manufacturing and testing etc. of the equipment for inspecting the inside of the PCV (5)
- Inspection from outside the PCV (including on-site demonstration of development results)

Stable storage, processing/disposal of fuel debris after removal
- Development of storage cans (surveys on existing technologies, review on storage systems/development of safety evaluation technique etc.)
- Research on/development of mock-up processing/disposal technologies
- Establishment of nuclear material accountancy and control measures for the fuel debris

Others
- Development of criticality evaluation and detection technologies

Status of efforts on various plans (Part 3)

: Main processes
: Sub-main processes
: Field work
: R&D
: Review
:Plan until last month
Green frame: Change from last month

As of May 29, 2014

Challenges	The Phase 1 (no later than 2 years after the completion of the current efforts)		The Phase 2 (Early period)	
	2012	2013	2014	2015

Plan for maintaining and continuing the steady state of plant

Retained water treatment plan

- Objective: Implement the measures to improve the reliability of the current facilities
- Retained water treatment by means of existing treatment facilities
- Improving the reliability of the current facilities, etc. (improve the reliability of transfer, processing, and storage facilities).
- Treatment of retained water by water treatment facilities with improved reliability
- Replacement of branch pipe pressure hoses with PE pipes
- Measures to prevent the expansion of tank leakage (Reinforced concrete dam/embankment/replacement by closed conduits), to be taken sequentially along with the installation of tanks
- * Reviewed based on the actual situation
- Consideration of reducing the circular lines
- Review on sub-drain recovery methods
- Sub-drain restoration work
- Restore sub-drain facilities, reduce the amount of groundwater inflow (reduction in retained water)
- Review on sub-drain and other purification facility → Installation work
- * Operation start
- Drawdown of groundwater in the building
- Groundwater bypass installation work
- Groundwater inflow is reduced (Retained water is decreased).
- Installation of multi-nuclide removal equipment
- Consider and implement measures to increase the processing amount
- Purification of on-site reservoir water
- Preparation work for frozen soil impermeable walls
- Installation work
- Reduce groundwater inflow rate (Reduce accumulated water)

Plans toward the reduction in the radiation dose and prevention of the spread of contamination in the entire power plant

Plan for preventing the spread of marine pollution

- Construction of sea side water barrier wall
- Landfilling etc. in the harbor area
- Objective: Reduction of the risk of spreading marine contamination during the leakage of contaminated water
- Installation of steel pipe sheet pile
- Consideration of technologies for decontaminating radioactive strontium (Sr)
- Objective: Reduction of the concentration of radioactive substances contained in the seawater of the harbor (to less than the notified concentration)
- Seawater circulation purification
- Sea water purification by fibrous adsorbent material (ongoing)
- Decontamination of Radioactive strontium (Sr)
- Covering etc. of dredge soil over sea routes and berths
- Monitoring of ground water and seawater (implemented on an ongoing basis)

Gas/liquid waste

- Operation of the gas management system of Units 1 to 3 PCVs
- Installation of ventilation equipment/closure of the opening of blow-out panel for Unit 2
- Measurement of dust concentration at the opening of buildings etc., on-site survey
- Improve the accuracy of gas monitoring
- Land and marine environmental monitoring (implemented in an ongoing basis)

Reduction in radiation dose at the site boundary

- Objective: Control the radiation dose at the site boundaries caused by radioactive substance etc. additionally released from the entire power plant at 1mSv/year or less
- Reduction of radiation dose by shielding, etc.
- Reduction of radiation dose by the purification of contaminated water etc.
- Land and marine environmental monitoring (implemented in an ongoing basis)

Site decontamination plan

- Objective: Reduction to average 5 μSv/hour in the South side area on site except for around Units 1-4.
- Systematic implementation of decontamination in the site of power generation plant

Status of efforts on various plans (Part 4)

: Main processes
: Sub-main processes
: Field work
: R&D
: Review
:Plan until last month
Green frame: Change from last month

As of May 29, 2014

Challenges		The Phase 1 (no later than 2 years after the completion of the current efforts)		The Phase 2 (Early period)	
		2012	2013	2014	2015
Plan for retrieving fuel from spent fuel pool	Cask for both transport and storage	Cask manufacturing			
	Dry storage cask	Cask manufacturing			
	Harbor	Wharf restoration work			
		Carrying-in of empty casks (sequential)			
	Common pool	Already carried-in	Sequential carrying-in		
		Inspection of existing dry storage casks (9 pieces)		Retrieval of fuel from the common pool	
		Design/manufacturing of damaged fuel racks		Fixation	
		Storage of fuel retrieved from spent fuel pool (storage and management).			
	Temporary cask storage facility	Design and production			
		Installation	Acceptance and interim storage of casks		
	R&D	Evaluation of long-term integrity of fuel retrieved from spent fuel pool			
		Examination of the processing method of damaged fuel etc. retrieved from spent fuel pool			
Fuel debris removal plan	Installation of reactor building				
	Preservation of the integrity of RPV/PCV	Development of evaluation technology for integrity against corrosion of RPV/PCV			
		Corrosion protection (Reduction in dissolved oxygen contained in reactor cooling water by means of nitrogen bubbling)			
Plan for management and processing/disposal of solid radioactive waste, and the decommissioning of reactor facilities	Storage and management plans for solid wastes	Continuation of secure storage equipped with adequate shielding and scattering prevention measures			
		Development of storage management plans (Reduction in generation amount/optimization of storage)	Evaluation of waste prevention measures		Improvement of waste reducing management policy
			Establishment of vehicle maintenance shops		
			Update the storage management plan		Improvement of waste storage management policy
			Establishment of drum storage facility		
		Design and manufacturing of incineration plants for miscellaneous solid wastes			
		Installation of incineration plants for miscellaneous solid wastes			
		Transfer of debris to the soil-coveried temporary storage facility			
		Soil covering work for felled trees			
		Reduction of radiation dose from stored secondary wastes from water treatment through shielding etc.			
		Evaluation of secondary wastes from water treatment and lifespan of storage containers		Facility renewal plan development	
	Processing/ disposal plans for solid wastes	Development of R&D plan for safety processing/disposal	Verification of applicability of processing/disposal technologies in Japan and foreign countries		
			Waste characterization (radiochemistry analysis, assessment of volume etc.)		
	Decommissioning plans for reactor facilities	Development of feasible and rational decommissioning scenarios			
				Establishment of decommissioning scenarios	
Implementation system and personnel procurement plan		Systematic cultivation/deployment of personnel, including the cooperative companies, and implementation of measures to stimulate motivation etc.			
Plan to ensure the safety of work		Continuation of safety activities, maintenance and enhancement of radiation management, continuous ensurement of medical services, etc.			
		Reduction of radiation dose in the rest area of the main office building, rest area in front of the important quake-proof building, and the important quake-proof building			

HP
ND-1

Progress toward decommissioning: Fuel removal from the spent fuel pool (SFP)

Immediate target Commence fuel removal from the Spent Fuel Pool (Unit 4, November 2013)

Unit 4

In the Mid- and Long-Term Roadmap, the target of Phase 1 was to commence fuel removal from inside the spent fuel pool (SFP) of the 1st Unit within two years of completion of Step 2 (by December 2013). On November 18, 2013, fuel removal from Unit 4, or the 1st Unit, commenced and Phase 2 of the roadmap started.
In the SFP, 1,533 fuel assemblies (1,331 of which spent and 202 new) were then stored. The removed fuel will be transferred to the common pool and completion is scheduled for around the end of 2014. To date, 62% or 946 fuel assemblies (924 of which spent and 22 new) have been transferred to the common pool (as of May 28)

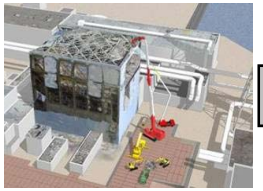

Fuel removal status

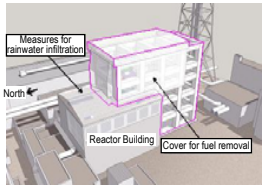

Loading the transportation container onto the trailer

* Some portions of these photos, in which classified information related to physical protection is included, were corrected.

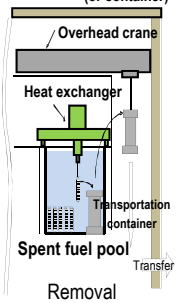
Work is proceeding with appropriate risk countermeasures, careful checks and safety first

Steps toward fuel removal


Removal of rubble from the roof of the Reactor Building
Completed in Dec. 2012



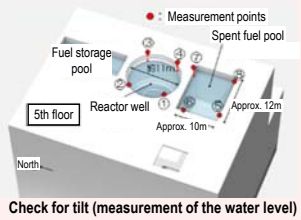
Installation of cover for fuel removal
From Apr. 2012, completed in Nov. 2013



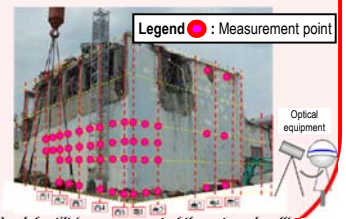
Removal
Commenced in Nov. 2013

Check of the soundness of the Reactor Building

Since May 2012, regular quarterly inspections have been conducted, which have confirmed that the soundness of the Reactor Building has been maintained.



Check for tilt (measurement of the water level)



Check for tilt (measurement of the external wall)

Unit 3

To facilitate the installation of a cover for fuel removal, installation of the gantry was completed (March 13, 2013). Removal of rubble from the roof of the Reactor Building was completed (October 11, 2013). Currently, toward the installation of a cover for fuel removal and the fuel-handling machine on the operating floor (*1), measures to reduce the radiation dose (decontamination and shielding) have been started (from October 15, 2013). Removal of large rubble from the SFP is underway (from December 17, 2013).

Before removal of the large rubble

After removal of the large rubble

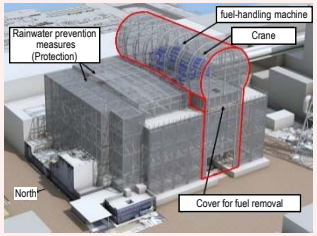


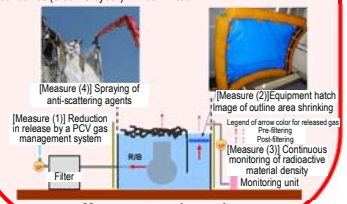
Image of the cover for fuel removal

Units 1 and 2

- Regarding Unit 1, to remove rubble from the top of the operating floor, there are plans to dismantle the cover over the Reactor Building is planned. Prior to dismantling, the ventilation system of the cover was suspended (September 17, 2013).
  The area around the Reactor Building will be cleared and leveled for operation of heavy machines, and dismantling of the cover will commence when preparation is completed.
- Regarding Unit 2, based on the progress of decontamination and shielding within the Reactor Building, the facilities will be inspected and a concrete plan examined and prepared.

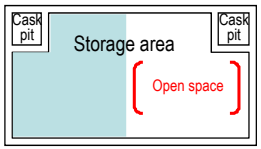
Dismantling of the cover over Reactor Building Unit 1

To facilitate the early removal of fuel and fuel debris from the SFP, the cover over the Reactor Building will be dismantled to accelerate the removal of rubble on the operation floor. The radiation dose on the site boundaries will also increase compared to before the dismantling. However, through measures to reduce the release, the estimated impact of the release from Units 1 to 3 on the site boundaries (0.03mSv/year) will be limited.



Measures to reduce release

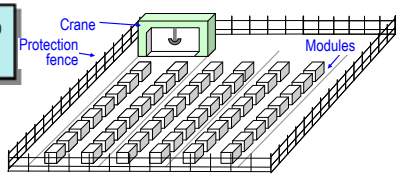
Common pool



An open space will be maintained in the common pool (Transfer to the temporary dry cask storage facility)

Progress to date
- The common pool has been restored to a condition allowing it to re-accommodate fuel to be handled (November 2012)
- Loading of spent fuel stored in the common pool to dry casks commenced (June 2013)
- Fuel removed from the Unit 4 spent fuel pool began to be received (November 2013)

Temporary dry cask (*3) storage facility



Spent fuel is accepted from the common pool

Operation commenced on April 12, 2013; from the cask-storage building, transfer of 9 existing dry casks completed (May 21); fuel stored in the common pool sequentially transferred.

<Glossary>
(*1) Operating floor: During regular inspection, the roof over the reactor is opened while on the operating floor, fuel inside the core is replaced and core internals are inspected.
(*2) Equipment hatch: A through-hole used to carry equipment in and out of the PCV.
(*3) Cask: Transportation container for samples and equipment including radioactive materials.

Progress toward decommissioning: Works to identify the plant status and toward fuel debris removal

May 29, 2014
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment

Immediate target	Identify the plant status and commence R&D and decontamination toward fuel debris removal

Demonstration of decontamination equipment

(1) Demonstration of suction and blast decontamination equipment
- Demonstration was conducted on the 1st floor of Unit 1 Reactor Building (from January 30 to February 4).
  The result showed that the β ray dose rate was reduced by removing dust through aspiration decontamination and the coated surface was shaved by the following blast decontamination.

(2) Dry ice-blast decontamination equipment
- A demonstration was conducted on the 1st floor of Unit 2 Reactor Building (from April 15-21).

(3) High-pressure water decontamination equipment
- A demonstration was conducted on the 1st floor of Unit 1 Reactor Building (from April 23-29).


Aspiration and blast decontamination equipment


Dry ice blast decontamination equipment


High-pressure water decontamination equipment

* Blast decontamination: A method to shave the surface by injecting polygonal steel grains into the object to be decontaminated (floor surface)

Investigation at upper part of Unit 1 Suppression Chamber (S/C)(*1) detected leak point

- Investigation in the upper part of Unit 1 S/C from May 27 detected leak from one expansion joint cover among the lines installed there. Specific methods will be examined to halt the flow of water and repair the PCV.

Leak point

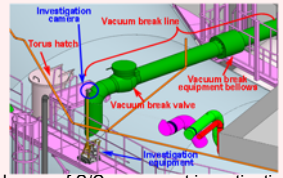
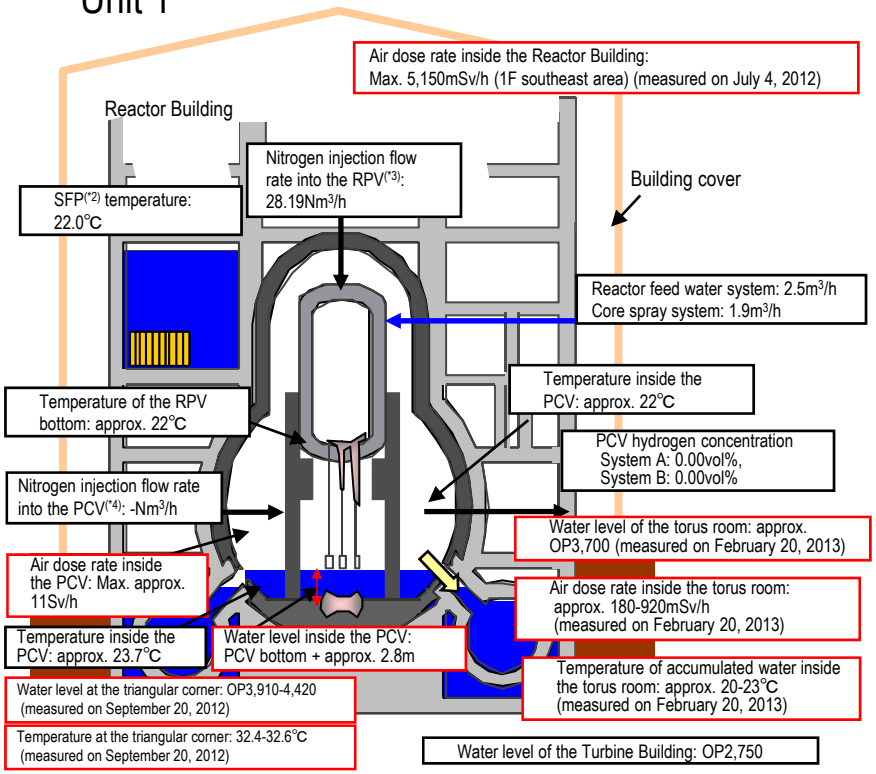


Image of S/C upper part investigation

Unit 1



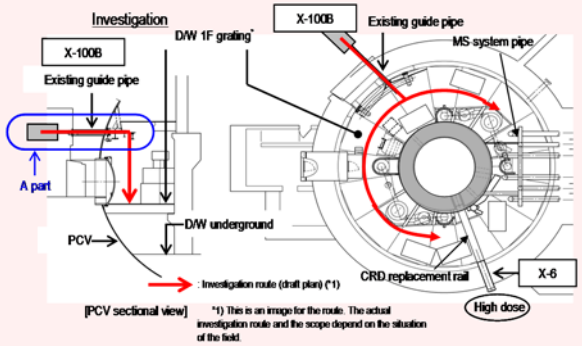
* Indices related to the plant are values as of 11:00, May 28, 2014

Status of equipment development toward investigation inside the PCV

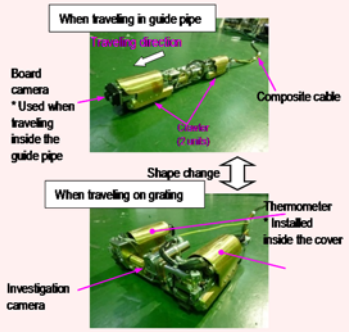
Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigation inside the PCV is scheduled. For Unit 1, where fuel debris may spread outside the pedestal, an investigation of the external side will commence.

[Investigative outline]
- Inserting equipment from Unit 1 X-100B penetration(*5) to investigate in clockwise and counter-clockwise directions.

[Status of investigation equipment development]
- Crawler-type equipment with a shape-changing structure which allows it to enter the PCV from the narrow access entrance (bore: φ100mm) and stably move on the grating is currently under development. A field demonstration is scheduled for the 2nd half of FY2014.



Investigation route inside the PCV (draft plan)



<Glossary>
(*1) S/C (Suppression Chamber): Suppression pool, used as the water source for the emergent core cooling system.
(*2) SFP (Spent Fuel Pool):
(*3) RPV (Reactor Pressure Vessel)
(*4) PCV (Primary Containment Vessel)
(*5) Penetration: Through-hole of the PCV

Progress toward decommissioning: Works to identify the plant status and toward fuel debris removal

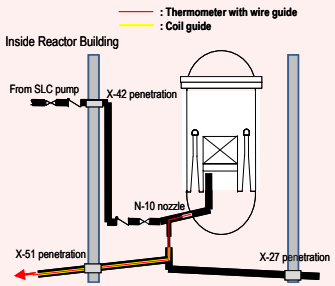
May 29, 2014
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
3/6

Immediate target	Identify the plant status and commence R&D and decontamination toward fuel debris removal

Installation of an RPV thermometer and permanent PCV supervisory instrumentation

(1) Replacement of the RPV thermometer
- As the thermometer installed at the Unit 2 RPV bottom after the earthquake had been broken, it was excluded from the monitoring thermometers (February 19).
- On April 17, removal of the broken thermometer failed and was suspended. To facilitate removal, tests to check rust formation and fixing are underway (from May 12).

(2) Reinstallation of the PCV thermometer and water-level gauge
- Some of the permanent supervisory instrumentation for PCV could not be installed in the planned locations due to interference with existing grating (August 13, 2013).
- Reinstallation after resolving the twisted cables from May 20-22 was failed and these instruments were removed on May 27. New instruments will be installed in June.



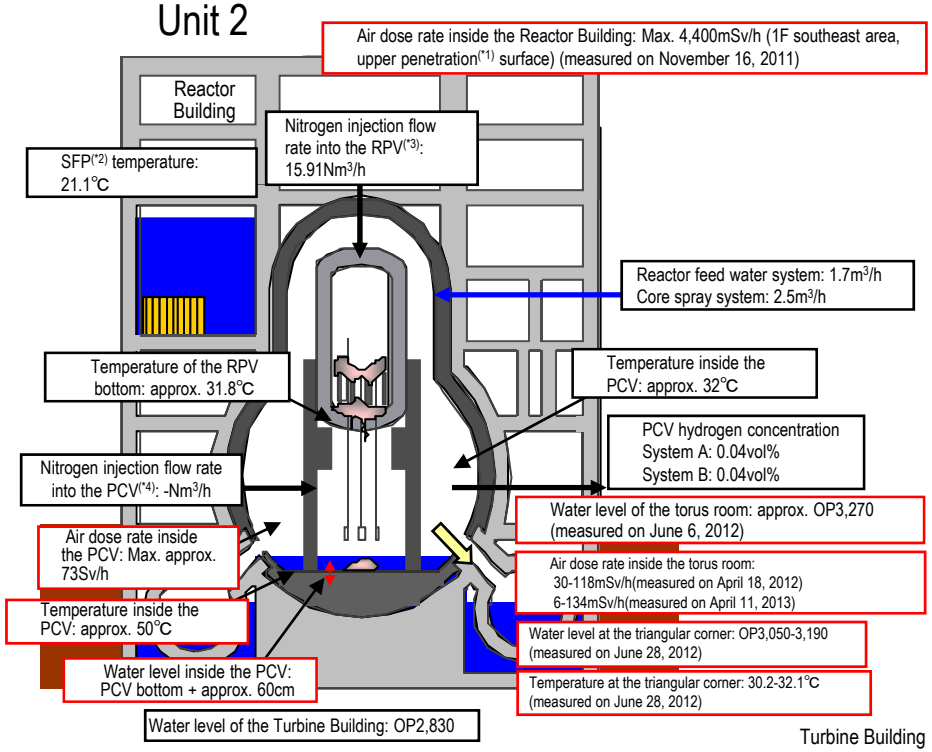
Status of thermometer installation at the Unit 2 RPV bottom

Investigation of the contamination status of the Reactor Building 5th floor

- To investigate the contamination status of the Reactor Building 5th floor, investigative equipment (gamma camera, radiation dose gauge, optical camera) will be suspended through holes drilled in the building roof. In addition, core samples on the 5th floor are collected using a remote-control robot.
- To ensure the operation route of the robot used to collect floor core samples, fences on the operating floor (*6) were removed using the remote-control robot (March 13 and 14).
- As the robot fell while in operation and the battery became low, the robot could not be collected. Removal of fences was completed and the core was collected within the accessible range (from March 20-26).

Status of remote-control robot falling down

Unit 2



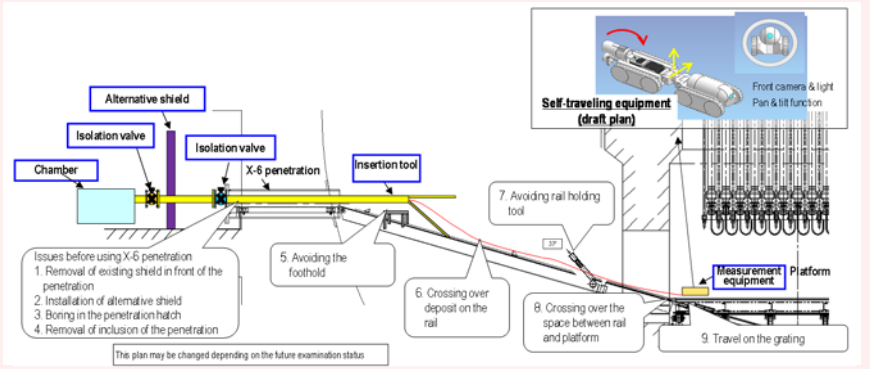
* Indices related to plant are values as of 11:00, May 28, 2014

Status of equipment development toward investigation inside the PCV

Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigations inside the PCV are scheduled. For Unit 2, where fuel debris is unlikely to have spread outside the pedestal is low, the focus will be placed on investigating the inside.

[Investigative outline]
- Inserting the equipment from Unit 2 X-6 penetration(*1) and accessing the inside of the pedestal using the CRD rail to conduct investigation.

[Status of investigative equipment development]
- Based on issues confirmed by the CRD rail status investigation conducted in August 2013, the investigation method and equipment design are currently being examined. A demonstration is scheduled in the field in the 2nd half of FY2014.



Issues of investigation inside the PCV and equipment configuration (draft plan)

<Glossary>
(*1) Penetration: Through-hole of the PCV (*2) SFP (Spent Fuel Pool)
(*3) RPV (Reactor Pressure Vessel) (*4) PCV (Primary Containment Vessel)
(*5) S/C (Suppression Chamber): Suppression pool; used as the water source for the emergency core cooling system.
(*6) Operating floor: During regular inspection, the roof over the reactor is opened while on the operating floor, fuel inside the core is replaced and core internals are inspected.

Progress toward decommissioning: Works to identify the plant status and toward fuel debris removal

May 29, 2014
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
4/6

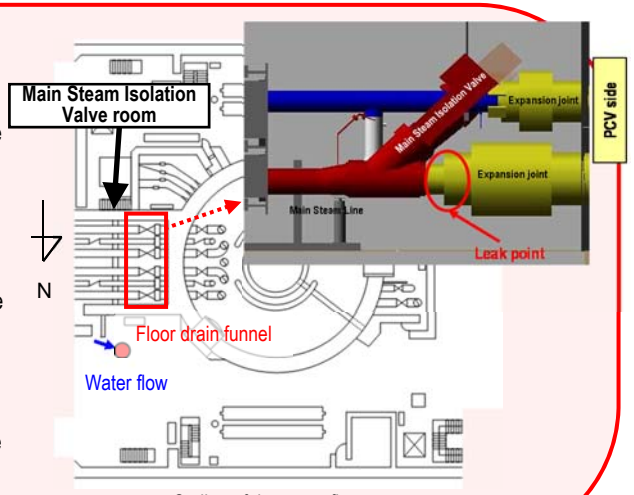
Immediate target	Identify the plant status and commence R&D and decontamination toward fuel debris removal

Water flow was detected from the Main Steam Isolation Valve* room

On January 18, the flow of water flow from around the door of the Steam Isolation Valve room in the Reactor Building Unit 3 1st floor northeast area to the nearby floor drain funnel (drain outlet) was detected. As the drain outlet connects with the underground part of the Reactor Building, there is no possibility of outflow from the building.

From April 23, image data has been acquired by camera and the radiation dose measured via pipes for measurement instrumentation, which connect the air-conditioning room on the Reactor Building 2nd floor with the Main Steam Isolation Valve Room on the 1st floor. On May 15, water flow from the expansion joint of one Main Steam Line was detected.

This is the first leak from PCV detected in Unit 3. Based on the images collected in this investigation, the leak volume will be estimated and the need for additional investigations will be examined. The investigative results will also be utilized to examine water stoppage and PCV repair methods.



Outline of the water-flow status

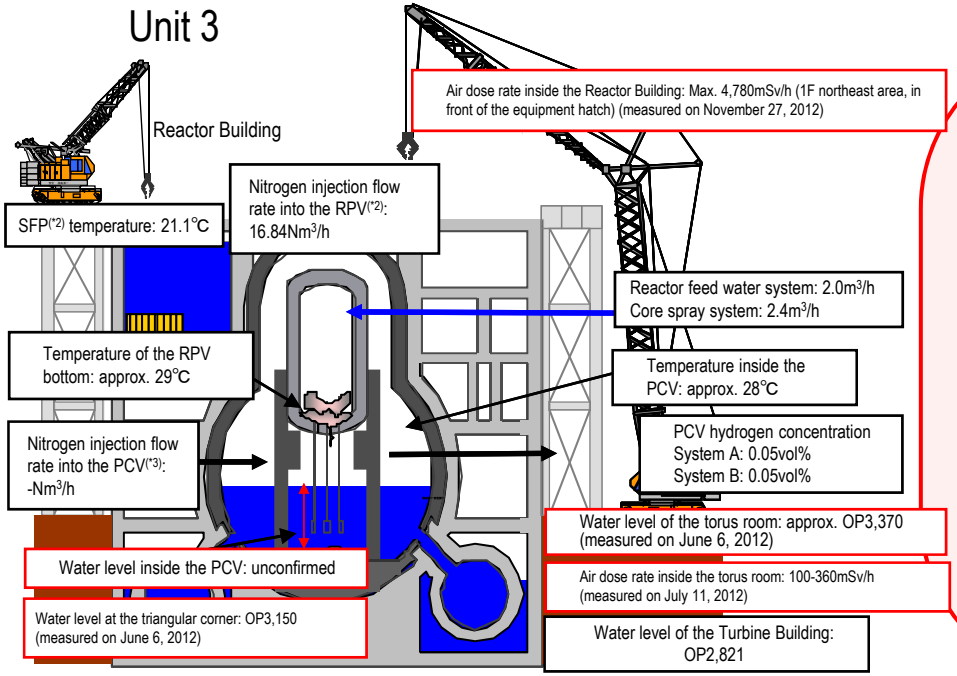
* Main Steam Isolation Valve: A valve to shut off the steam generated from the Reactor in an emergency

Decontamination inside R/B

- The contamination status inside the Reactor Building (R/B) was investigated by a robot (June 11-15, 2012).
- To select an optimal decontamination method, decontamination samples were collected (June 29 to July 3, 2012).
- To facilitate decontamination inside the Reactor Building, removal of obstacles on the 1st floor was conducted (from November 18, 2013 to March 20, 2014).

Robot for investigating the contamination status (gamma camera mounted)

Unit 3



* Indices related to plant are values as of 11:00, May 28, 2014

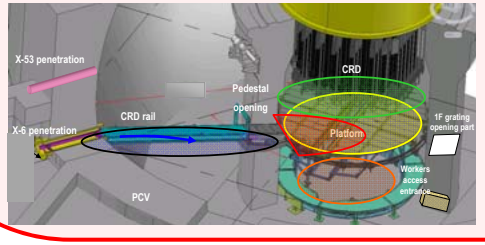
Status of equipment development toward investigation inside the PCV

Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigation inside the PCV is scheduled. For Unit 3, where the possibility of fuel debris spreading outside the pedestal is low, the focus will be placed on investigating the inside. As the water level inside the PCV is high and the penetration which is scheduled for use in Units 1 and 2 may decline in the water, another method needs to be examined.

[Steps for investigation and equipment development]

(1) Investigation from X-53 penetration
- Following decontamination, a field investigation is scheduled in the areas around X-53 penetration to determine the plan for conducting the inside investigation and equipment specifications.

(2) Investigation plan following the investigation of X-53 penetration
- Based on the measurement values of hydraulic head pressure inside the PCV, X-6 penetration may decline. It is estimated that access to X-6 penetration is difficult.
- For access from another penetration, approaches such as “further downsizing the equipment” or “moving in water to access the pedestal” are necessary and will be examined.



<Glossary>
(*1) SFP (Spent Fuel Pool)
(*2) RPV (Reactor Pressure Vessel)
(*3) PCV (Primary Containment Vessel)
(*4) TIP (Traversing Incore Probe System)
Measures neutrons by moving the detector up and down inside the core.

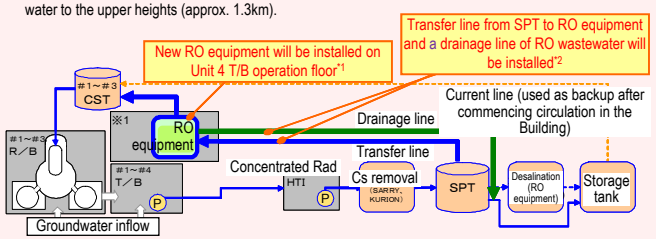
Progress toward decommissioning: Work related to circulation cooling and accumulated water treatment line

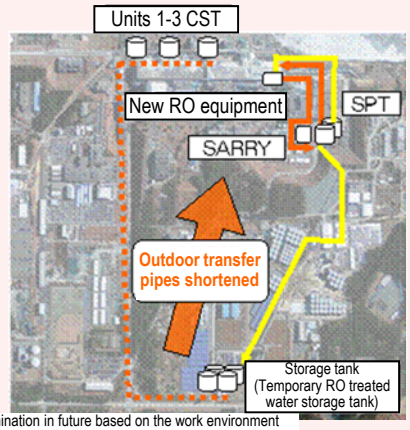
Immediate target	Stably continue reactor cooling and accumulated water treatment, and improve reliability

Work to improve the reliability of the circulation water injection cooling system and pipes to transfer accumulated water.

- Operation of the reactor water injection system using Unit 3 CST as a water source commenced (from July 5, 2013). Compared to the previous systems, in addition to the shortened outdoor line, the reliability of the reactor water injection system was enhanced, e.g. by increasing the amount of water-source storage and enhancing durability.
- By newly installing RO equipment inside the Reactor Building by the end of FY2014, the reactor water injection loop (circulation loop) will be shortened from approx. 3km to approx. 0.8km*.

* The entire length of contaminated water transfer pipes is approx. 2.1km, including the transfer line of surplus water to the upper heights (approx. 1.3km).

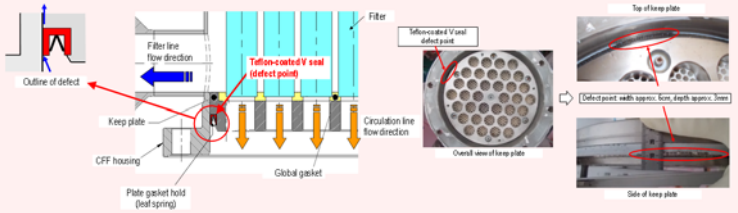




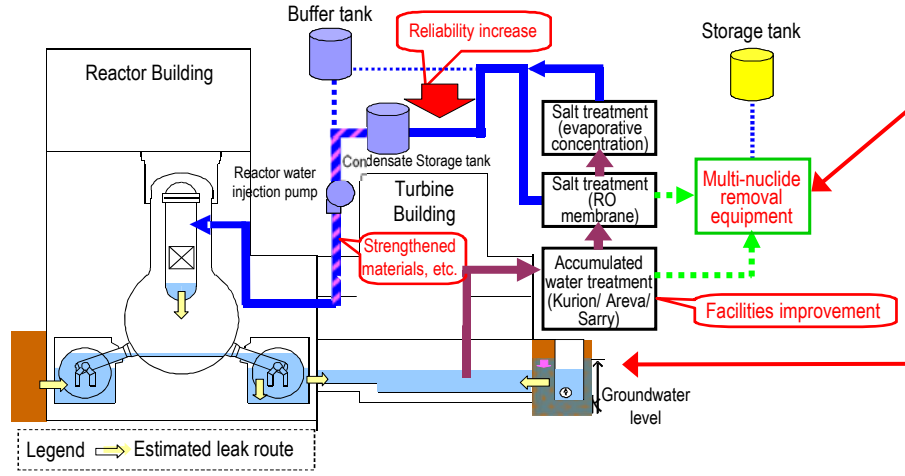
*1 Unit 4 T/B operation floor is one of the installation proposals, which will be determined after further examination in future based on the work environment
*2 A detailed line configuration will be determined after further examination in future

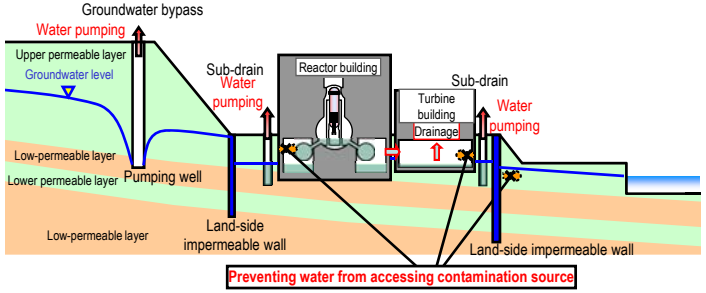
Status of multi-nuclide removal equipment

- Hot tests using radioactive water are underway (System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013).
- Regarding System B, as the density of radioactive materials in the system outlet water increased on March 18 due to a defect in the filter, the treatment was suspended. An overhaul of the defective filter revealed that the Teflon-coated gasket* was likely to have embrittled due to radiation degradation. After replacing with improved filters, operation resumed from May 23.
- Regarding Systems A and C, following a measure for early detection of the same filter defect in System B, treatment was suspended without spreading contamination. After replacing with improved filters, treatment will resume (System A: early June, System C mid-June).
- To facilitate installing additional and high-performance multi-nuclide removal equipment, work to remove obstacles, drill, improve the ground, and construct foundations is underway.

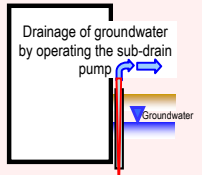


Status of filter overhaul of Multi-nuclide removal equipment System B



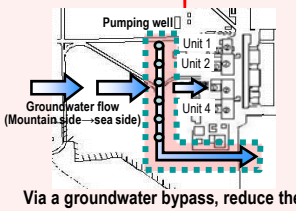


Preventing groundwater from flowing into the Reactor Buildings



To reduce groundwater level by sub-drain water pumping, treatment tests were conducted for some sub-drain pits of Units 1-4. The next stage will involve scheduled examination of the sub-drain recovery method.

Reducing groundwater inflow by pumping sub-drain water



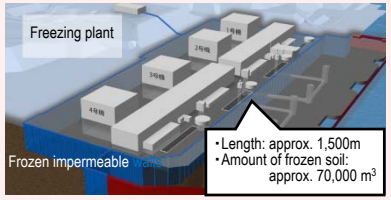
Measures to pump up groundwater flowing from the mountain side upstream of the Building to reduce the groundwater inflow (groundwater bypass) have been implemented.

Release of pumped groundwater began from May 21.

The pumped up groundwater is temporarily stored in tanks and released after TEPCO and the third-party organization confirm that its quality meets the operational targets.

Through periodical monitoring, pumping of wells and tanks is operated appropriately.

Via a groundwater bypass, reduce the groundwater level around the Building and groundwater inflow into the Building



To prevent the inflow of groundwater into the Reactor Buildings, installation of impermeable walls surrounding the buildings on the land side is planned.

The freezing test of small-scale impermeable walls on site confirmed the feasibility of freezing.

Placement of frozen ducts will begin after preparation is complete.

Installing frozen impermeable walls around Units 1-4 to prevent the inflow of groundwater into R/B

<Glossary>
(*1) CST (Condensate Storage Tank)
Tank for temporarily storing water used in the plant.

Progress toward decommissioning: Work to improve the environment within the site

Immediate target	・Reduce the effect of additional release from the entire power station and radiation from radioactive waste (secondary water treatment waste, rubble, etc.) generated after the accident, to limit the effective radiation dose to below 1mSv/year at the site boundaries. ・Prevent contamination expansion in sea, decontamination within the site

Expansion of full-face mask unnecessary area

Operation based on the rules for mask wearing according to radioactive material density in air and decontamination/ ionization rules was defined, and the area is being expanded.

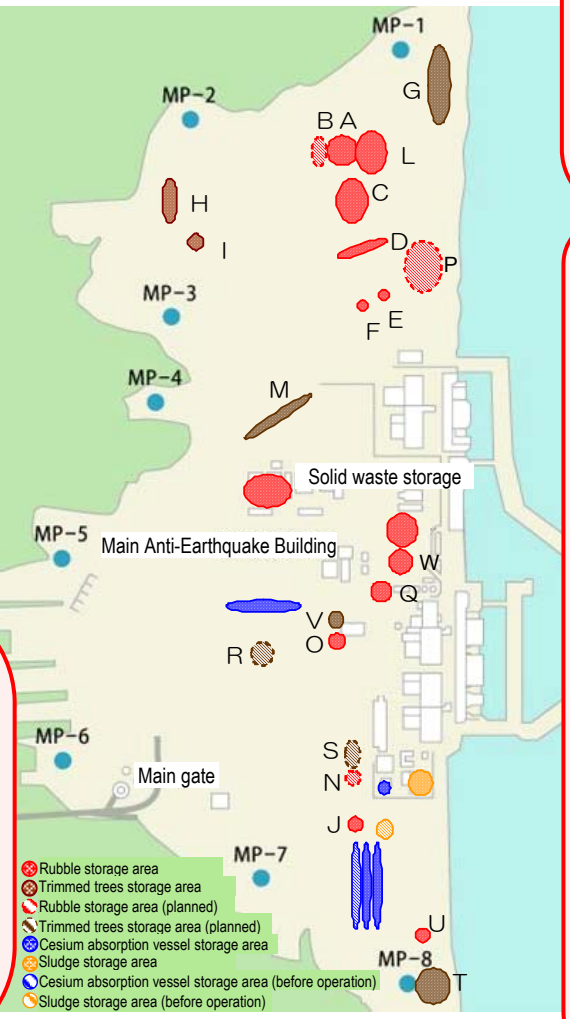
In the J tank installation area on the south side on the site of the site, as decontamination was completed, the area will be set as full-face mask unnecessary area (from May 30), where for works not handling contaminated water, wearing disposable dust-protective masks will be deemed sufficient .

Full-face mask unnecessary area

Establishment of ceremony for the meal service center

Aiming to improve and enhance workers' diets, a Fukushima meal service center capable of serving 3,000 meals will be built in the Ohgawara district of Ohkuma town by the end of fiscal 2014. On May 29, a groundbreaking ceremony for the center was held.

Image of the Fukushima meal service center



Installation of impermeable walls on the sea side

To prevent contamination expansion into the sea when contaminated water leaks into groundwater, impermeable walls are being installed (scheduled for completion in September 2014).

Installation of steel pipe sheet piles temporarily completed by December 4, 2013 except for 9 pipes.

The next stage will involve installing steel pipe sheet piles outside the port, landfilling within the port, and installing a pumping facility to close before the construction completion.

Installation status of impermeable walls on the sea side
(Landfill status on the Unit 1 intake side)

Reducing radioactive materials in seawater within the harbor

- The analytical result for data such as the density and level of groundwater on the east (sea) side of the Building identified that contaminated groundwater was leaking into seawater.
- No significant change has been detected in seawater within the harbor for the past month, nor was any significant change detected in offshore measurement results as of last month.
- To prevent contamination expansion into the sea, the following measures are being implemented:

(1) Prevent leakage of contaminated water
- Ground improvement behind the bank to prevent the expansion of radioactive materials.
  (Between Units 1 and 2: completed on August 9, 2013;
  between Units 2 and 3: from August 29 and completed on December 12, 2013;
  between Units 3 and 4: from August 23, 2013 and completed on January 23, 2014)
- Pumping groundwater in contaminated areas (from August 9, 2013, scheduled to commence sequentially)

(2) Isolate water from contamination
- Enclosure by ground improvement on the mountain side
  (Between Units 1 and 2: from August 13, 2013 and completed on March 25, 2014;
  between Units 2 and 3: from October 1, 2013 and completed on February 6, 2014;
  between Units 3 and 4: from October 19, 2013 and completed on March 5, 2014)
- To prevent the ingress of rainwater, the ground surface was paved with concrete (commenced on November 25, 2013 and completed on May 2)

(3) Eliminate contamination sources
- Removing contaminated water in branch trenches and closing them (completed on September 19, 2013)
- Treatment and removal of contaminated water in the main trench
  Unit 2: Treatment commenced on November 14, 2013, freezing toward water stoppage commenced on April 2
  Unit 3: Treatment commenced on November 15, 2013