Summary of Decommissioning and Contaminated Water Management

December 25, 2014

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

Main works and steps for decommissioning

Fuel removal from Unit 4 SFP has been completed. Preparatory works to remove fuel from Unit 1-3 SFP and fuel debris (Note 1) removal are ongoing.

(Note 1) Fuel assemblies melted through in the accident.

Fuel Removal from SFP: Rubble removal & dose reduction (Unit 1&2, Unit 3) → Installing FHM* → Fuel removal (Unit 4) → Storage and handling

FHM*: Fuel-Handling Machine

Unit 1: FY2017 Fuel removal will start (under consideration)
Unit 2: After FY2017 Fuel removal will start (under consideration)
Unit 3: FY2015 Fuel removal will start (planned)
Unit 4: 2014 Fuel removal will be completed

Fuel Debris (Corium) Removal: Dose reduction & Leakage identification (Unit 1-3) → Stop leakage → Fuel debris removal → Storage and handling

After FY2017 Water stoppage of PCV lower part (under consideration)

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

Fuel removal from SFP

On December 22, 2014, all fuel removal from Unit 4 was completed.

Fuel removal from Unit 4 SFP commenced on November 18, 2013. Removal of spent fuel assemblies was completed on November 5, 2014, and removal of non-irradiated fuel assemblies was completed on December 22, 2014.

(Fuel-removal operation)

Three principles behind contaminated water countermeasures

Countermeasures for contaminated water (Note 2) are implemented with the following three principles:

(Note 2) The amount is decreasing due to measures such as groundwater bypass and water-stoppage of the buildings.

1. **Eliminate** contamination sources

(1) Multi-nuclide removal equipment

(2) Remove contaminated water in the trench (Note 3)

(Note 3) Underground tunnel containing pipes.

2. **Isolate** water from contamination

(3) Pump up ground water for bypassing

(4) Pump up ground water near buildings

(5) Land-side frozen walls

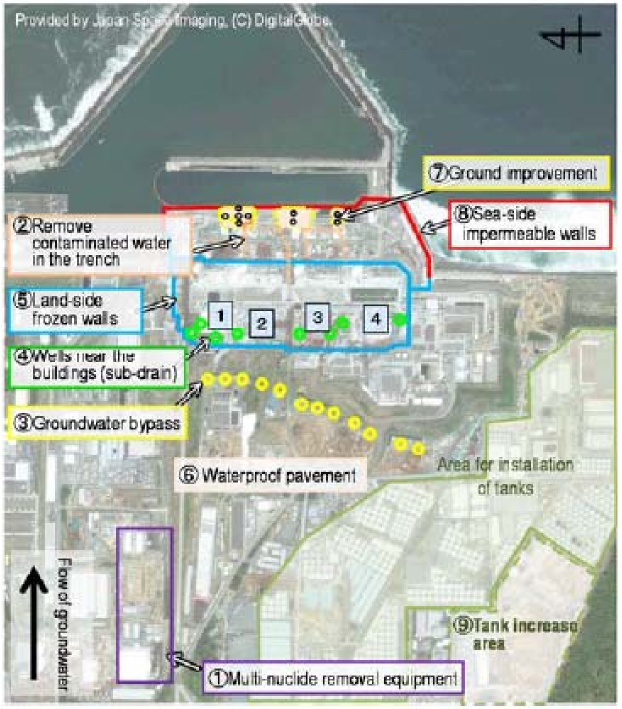
(6) Waterproof pavement

3. **Prevent leakage** of contaminated water

(7) Soil improvement by sodium silicate

(8) Sea-side impermeable walls

(9) Increase tanks (welded-joint tanks)



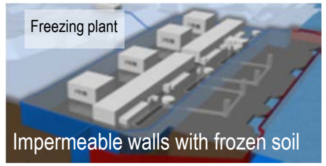
Multi-nuclide removal equipment (ALPS)

- 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.)
- Furthermore, additional multi-nuclide removal equipment is installed by TEPCO (operation started September 2014) as well as a subsidy project of the Japanese Government (operation started October 2014.)

(Installation status of high-performance multi-nuclide removal equipment)

Land-side impermeable walls with frozen soil

- The walls surround the buildings with frozen soil and reduce groundwater inflow into the same.
- On-site tests have been conducted since last August. Construction work started in June and the freezing operation will start within FY2014.



(Length: approx. 1,500m)

Sea-side impermeable walls

•The walls aim to prevent the flow of contaminated groundwater into the sea.

•Installation of steel sheet piles is almost (98%) complete. The closure time is being coordinated.

(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. 15-45°C*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).

Fuel removal from the Unit 4 spent fuel pool completed

Fuel removal from the Unit 4 spent fuel pool (SFP) commenced on November 18, 2013. On November 5, within a year since this work commenced, the transfer of spent fuel assemblies in the pool to the common pool was completed.

The transfer of non-irradiated fuel assemblies to the Unit 6 SFP was also completed on December 22.

This marks the completion of all fuel removal from the Unit 4. Based on this experience, fuel assemblies will be removed from the Unit 1-3 pools.

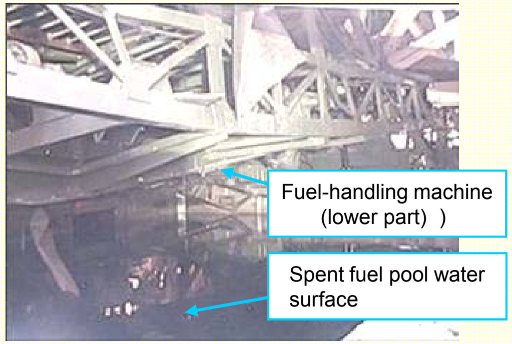
<Work conditions for transfer of the final fuel transportation container>

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

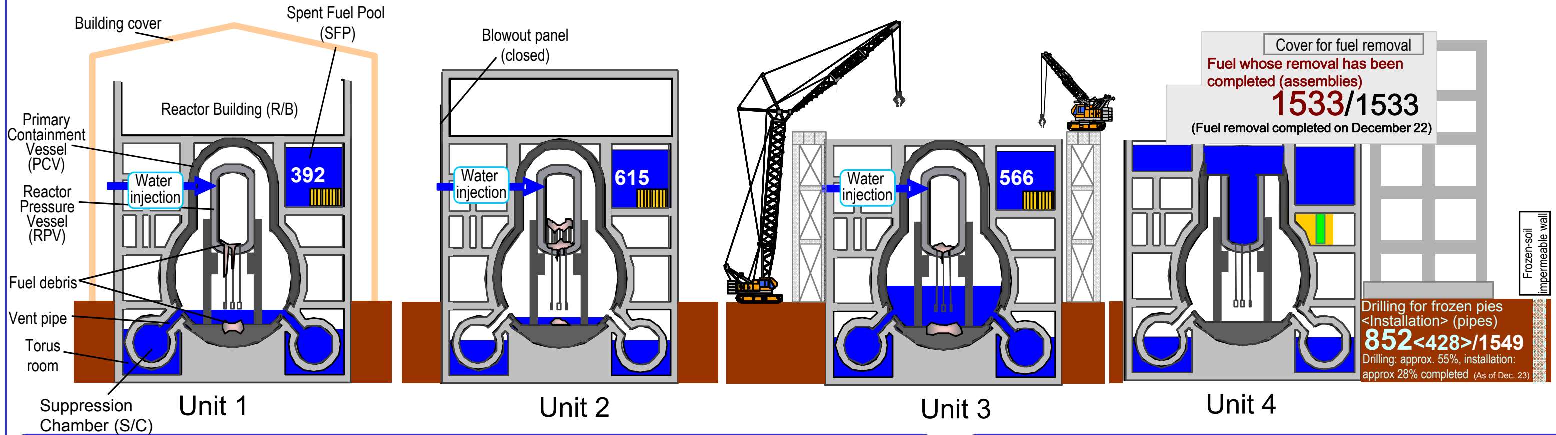
Investigation into the status of rubble and dust on the Unit 1 R/B top floor

Two roof panels of the Unit 1 Reactor Building (R/B) cover were removed, investigations into the status of rubble and the concentration of dust on the R/B top floor (operating floor) were conducted, and the roof panels were put back on December 4. A hole used for spraying of anti-scattering agents that had been expanded in October was also covered at that time.

The result of these investigations confirmed that no scattering of dust or conditions that would cause immediate damage to the fuel assemblies in the SFP were detected. It is scheduled for the roof panels to be removed once again after March, and for careful work to dismantle the roof covers to proceed.



<Status of rubble at the upper part of the Unit 1 spent fuel pool>



Leakage of water treated by multi-nuclide removal equipment

On December 17, a leakage of water that had undergone treatment by multi-nuclide removal equipment (ALPS) occurred due to the water being mistakenly sent to piping whose installation had not been fully completed. The leaked water and soil from the areas surrounding the leak have been recovered, and there was no outflow to the ocean.

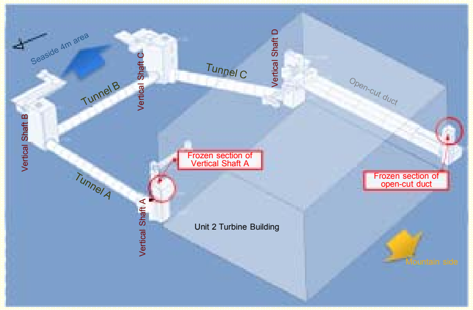
The cause of this incident was operation using an incorrect procedure document. From here on, whenever valves connected to newly-installed piping are to be operated, the connection status of the piping will be confirmed with the work site prior to their operation.

Filling of Unit 2 seawater-pipe trench tunnel sections completed

Filling of the seawater-pipe trench(Note) which leads from the Turbine Building of Unit 2 on the sea side, with cement-based materials, commenced on November 25, and on December 18 the filling of the tunnel sections was completed.

After water is pumped up from the Vertical Shafts and the filling status of the tunnel sections is confirmed, preparations for filling the Vertical Shaft sections will proceed.

Note: The term 'trench' means an underground tunnel containing pipes



<Image of Unit 2 seawater-pipe trench>

Toward risk reduction of contaminated water

In addition to multi-nuclide removal equipment (ALPS), the installation of multiple purification systems to remove strontium is also proceeding.

The contaminated water in the initial group of tanks was treated using mobile strontium-removal equipment that circulates contaminated water in tanks and removes strontium from it.

The cesium absorption apparatus (KURION) and secondary cesium absorption apparatus (SARRY), which remove cesium from contaminated water transferred from the buildings, were modified to commence their operation with the added operation of the removal of strontium from the end of December.

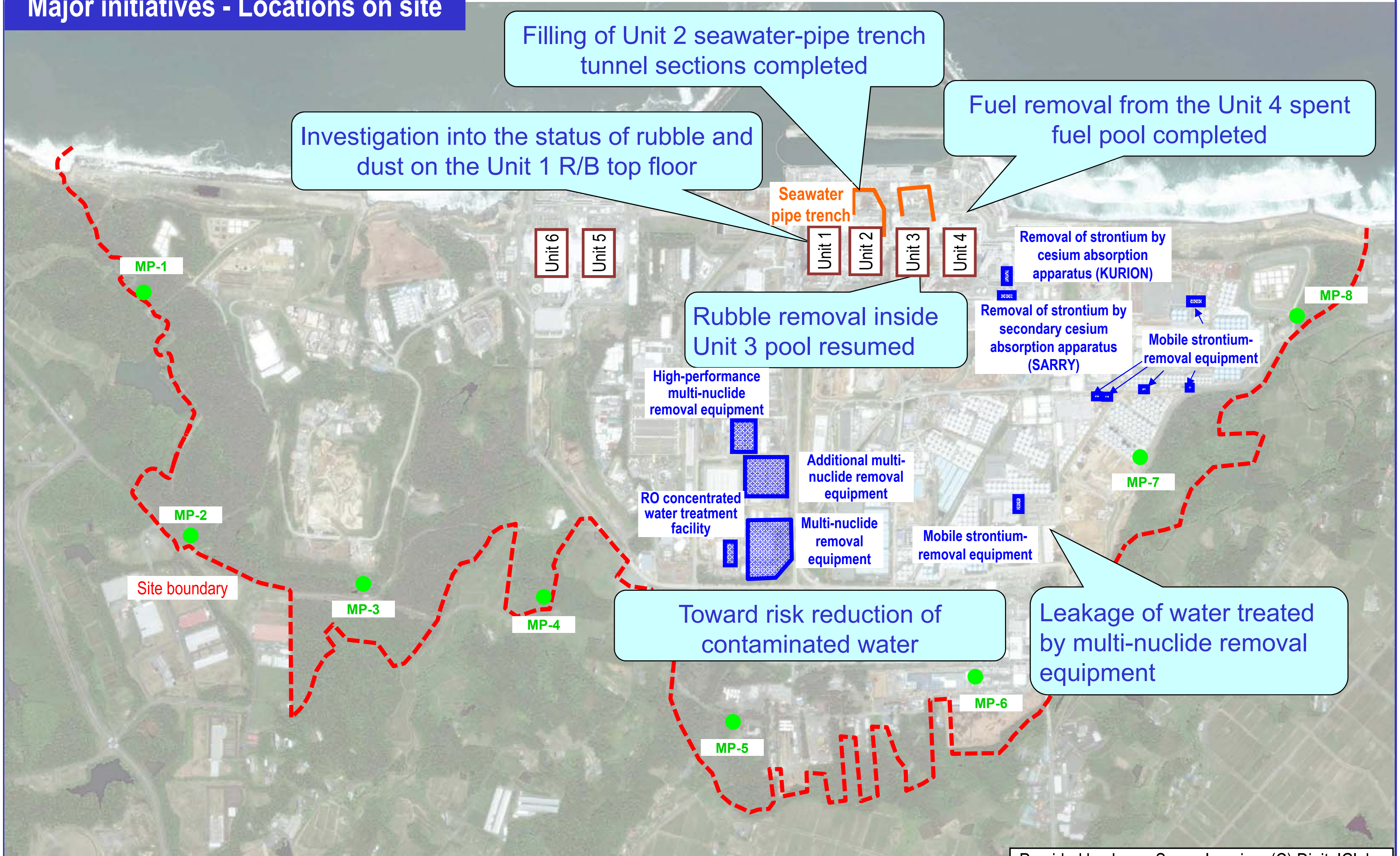
Preparations are also proceeding on RO concentrated water treatment equipment to treat contaminated water in tanks, and treatment will commence from January.

Rubble removal inside Unit 3 pool resumed

Although a console of a fuel-handling machine and other objects fell into the spent fuel pool during rubble removal work inside the pool, causing this work to be suspended, the rubble removal work was resumed on December 17, and the fallen console was removed from the spent fuel pool on December 19.

From early January, cover plates will be added as a measure to prevent falling objects such as in this case.

Major initiatives - Locations on site

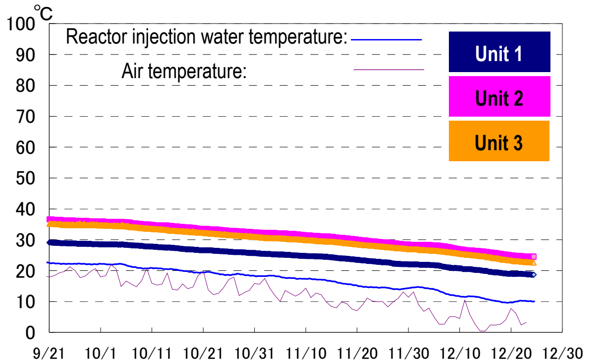


* Data of Monitoring Posts (MP1-MP8.)
Data of Monitoring Posts (MPs) measuring airborne radiation rate around site boundaries show 1.100 - 4.033μSv/h (November 26 - December 23, 2014.)
We improved the measurement conditions of monitoring posts 2 to 8 for precise measurement of air dose rate. Construction works such as tree-clearing, surface soil removal, and shield wall setting were implemented from Feb 10 to Apr 18, 2012.
Therefore monitoring results at these points are lower than elsewhere in the power plant site.
The radiation shielding panel around the monitoring post No. 6, which is one of the instruments used to measure the radiation dose of the power station site boundary, were taken off from July 10 to July 11, 2013, since the surrounding radiation dose has largely fallen down due to further cutting down of the forests etc.

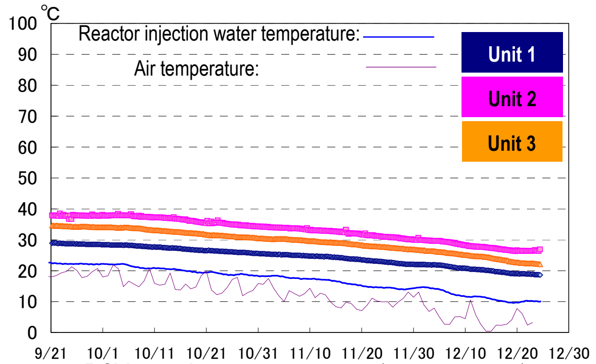
I. Confirmation of the reactor conditions

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 45°C for the past month, though they vary depending on the unit and location of the thermometer.



RPV bottom temperatures (recent quarter)



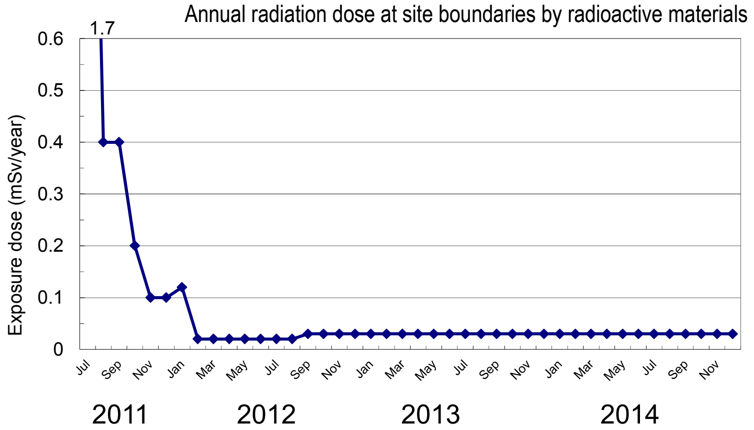
PCV gas phase temperatures (recent quarter)

* 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. 1.4 x 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.

Annual radiation dose at site boundaries by radioactive materials (cesium) released from Reactor Building Units 1-4



(Reference)

* The density limit of radioactive materials in the air outside the surrounding monitoring area:
  [Cs-134]: 2 x 10^{-5} Bq/cm^3
  [Cs-137]: 3 x 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 x 10^{-7} Bq/cm^3)
  [Cs-137]: ND (Detection limit: approx. 2 x 10^{-7} Bq/cm^3)
* Data of Monitoring Posts (MP1-MP8).
  Data of Monitoring Posts (MPs) measuring airborne radiation rate around site boundaries showed 1.100 - 4.033μSv/h (November 26 - December 23, 2014)
  To measure the variation in the airborne radiation rate of MP2-MP8 more accurately, environmental improvement (tree trimming, removal of surface soil and shielding around the MPs) has been completed.

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

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

- In April, attempts to remove and replace the thermometer installed at the bottom of the RPV, which had broken in February 2014, failed and the operation was suspended. The estimated cause was fixing or added friction due to rust having formed.
- It was confirmed with full-scale piping that it is possible for wire guides to be drawn out if rust-stripping chemicals that do not generate hydrogen are used (December 5). After training the workers involved, it is scheduled for the elimination to be implemented in January 2015.

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 and preparing facilities to control the contaminated water

➢ Operation of groundwater bypass

- From April 9, the operation of 12 groundwater bypass pumping wells commenced sequentially to pump up groundwater. Release commenced from May 21 in the presence of officials from the Intergovernmental Liaison Office for the Decommissioning and Contaminated Water Issue of the Cabinet Office. As of December 24, 64,048 m^3 of groundwater had been released. The pumped up groundwater has been temporarily stored in tanks and released after TEPCO and a third-party organization (Japan Chemical Analysis Center) confirmed that its quality met operational targets.
- It was confirmed that the groundwater inflow into the buildings had decreased by 100m^3/day based on the evaluation data by now through measures such as the groundwater bypass and water stoppage of the High Temperature Incinerator Building (HTI) (see Figure 1).
- It was confirmed that the groundwater level at the observation holes had decreased by approx. 10-15cm compared to the level before pumping at the groundwater bypass started.
- Due to a decrease in the flow rate of pumping well No.11 from around mid-September, water pumping was stopped on October 15. Confirmation of the situation revealed that existence and adhesion of bacteria (iron-oxidizing bacteria, etc.). Chemicals for sterilization of bacteria were fed into the well and pumping was resumed on December 9. Cleaning was also performed on pumping well Nos.10 and 12, at which similar decreased flow rates were detected (No.10: from early January 2015, No.12: from December 12).

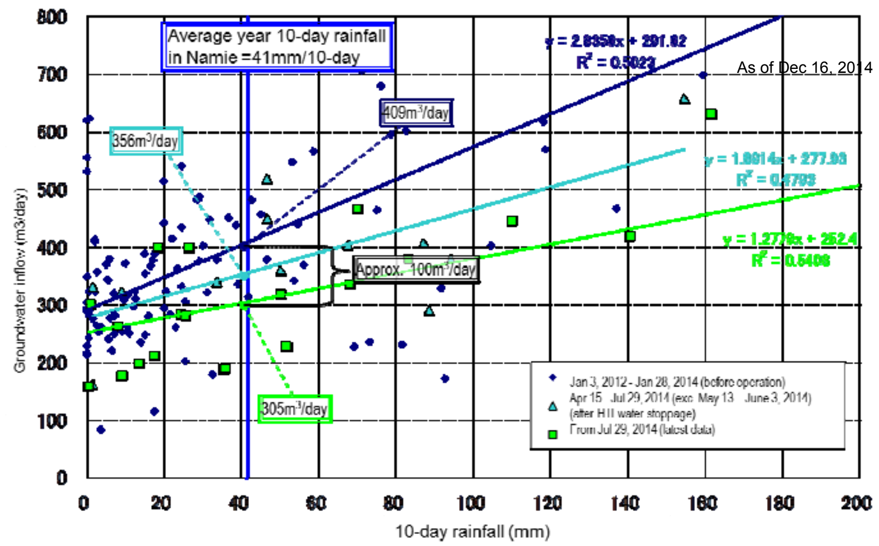


Figure 1: Analytical results of inflow into buildings

➢ Construction status of impermeable walls with frozen soil

- To facilitate the installation of frozen-soil impermeable walls surrounding Units 1-4 (a subsidy project of the Ministry of Economy, Trade and Industry), drilling to place frozen pipes commenced (from June 2). As of December 24, drilling at 1,030 points (for frozen pipes: 852 of 1,549 points, for temperature-measurement pipes: 178 of 317 points) and installation of frozen pipes at 428 of 1,549 points had been completed (see Figure 2).

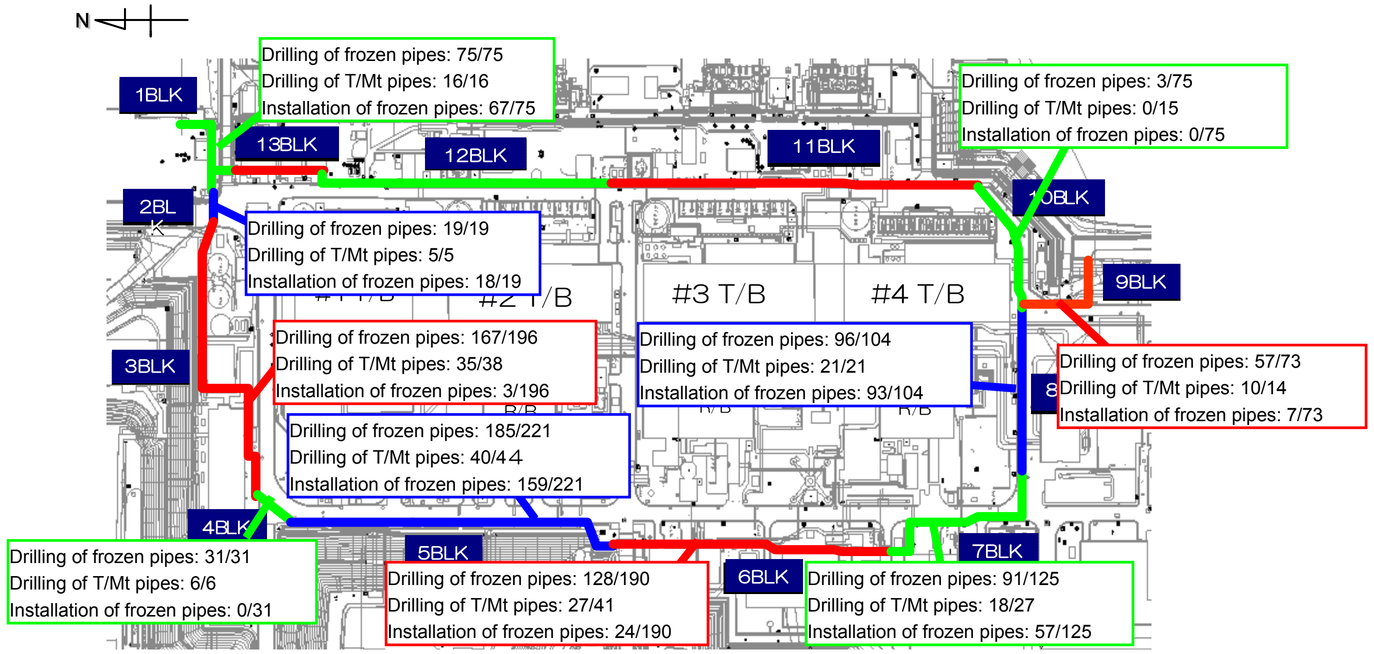


Figure 2: Drilling status for frozen-soil impermeable walls and installation of frozen pipes

Closure of trench connecting to High Temperature Incinerator Building

- The trench connecting to the High Temperature Incinerator Building was closed off with grout as part of the work for water stoppage of the High Temperature Incinerator Building (October 29 to December 20). The volume of groundwater inflow into the building will be measured during planned shutdowns of the cesium absorption apparatus and secondary cesium absorption apparatus.

Status of the subdrain system

- Though an increase in radioactive material density was detected in subdrain pit Nos. 18 and 19 (October 22), the density drastically declined after this. It was estimated that as those pits connect with pit Nos. 15 to 17, which could not be recovered due to high radiation level, via horizontal pipes, radioactive material was gradually drawn into them by pump operation. Pit No. 17 was blocked with filling material from November 14 to 21, and unrecovered pit Nos. 15 and 16 were separated from recovered pit Nos. 18 and 19. After blocking up pit No. 17, since there was no decrease in the water level of pit No. 17 even when groundwater was drawn from pit Nos. 18 and 19, and since there were no significant changes in radioactive material density in pit Nos. 18 and 19, it was confirmed that separation had been achieved successfully.

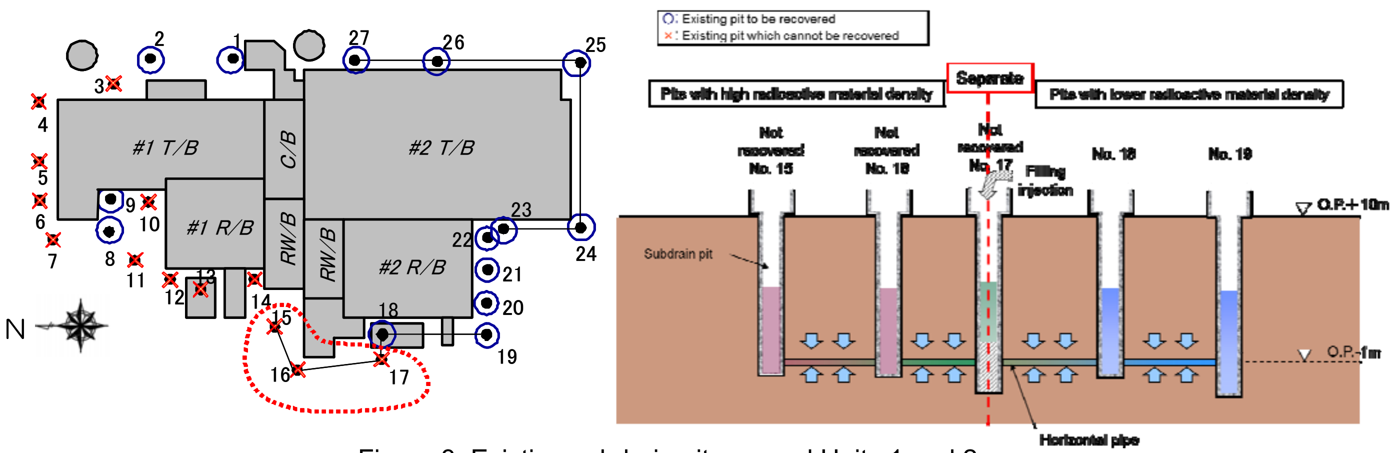


Figure 3: Existing subdrain pits around Units 1 and 2

Operation of multi-nuclide removal equipment

- Regarding multi-nuclide removal equipment (existing, additional and high-performance), hot tests using radioactive water are underway (for existing equipment, System A: from March 30, 2013, System B: from June 13, 2013, System C: from September 27, 2013; for additional equipment, System A: from September 17, 2014, System B: from September 27, 2014, System C: from October 9, 2014; for high-performance equipment, from October 18, 2014). To date, approx. 181,000 m³ at the existing, approx. 47,000 m³ at the additional and approx. 10,000 m³ at the high-performance multi-nuclide removal equipment have been treated (as of December 23, including approx. 9,500m³ stored in J1(D) tank, which contained water with a high density of radioactive materials at the System B outlet).
- With the objective of detection at early stages if there is an increase in the radioactive material density of multi-nuclide removal equipment outlet water, continuous β-radiation monitors were installed at the absorption vessel outlets (existing: December 9 to 14, additional: November 30 to December 3, high-performance: scheduled for late December).

Toward risk reduction of contaminated water stored in tanks

- To purify RO concentrated salt water stored in tanks, mobile strontium-removal equipment started operation in the G4 south area (from October 2). Treatment of contaminated water in the initial group of tanks (approx. 4,000m³) will be implemented by December 22.
- The number of mobile strontium-removal units will be increased (implementation plan approved on December 12) to purify RO concentrated salt water stored in tanks in the H5 north area (scheduled to commence in mid-January). Secondary mobile strontium-removal equipment will also be installed to purify RO concentrated salt water in tanks in the C and G6 areas (scheduled to commence in late January).
- In addition to multi-nuclide removal equipment (existing, additional, and high-performance) and mobile strontium-removal equipment, treatment measures consisting of removal of strontium by cesium absorption apparatus (KURION) and secondary cesium absorption apparatus (SARRY) (implementation plan approved on December 10) are scheduled to commence at the end of December. These measures, which furthermore include contaminated water treatment (scheduled to commence in January) by RO concentrated water treatment equipment (implementation plan approved on December 22), are intended to reduce the risks of contaminated water via multiple approaches.

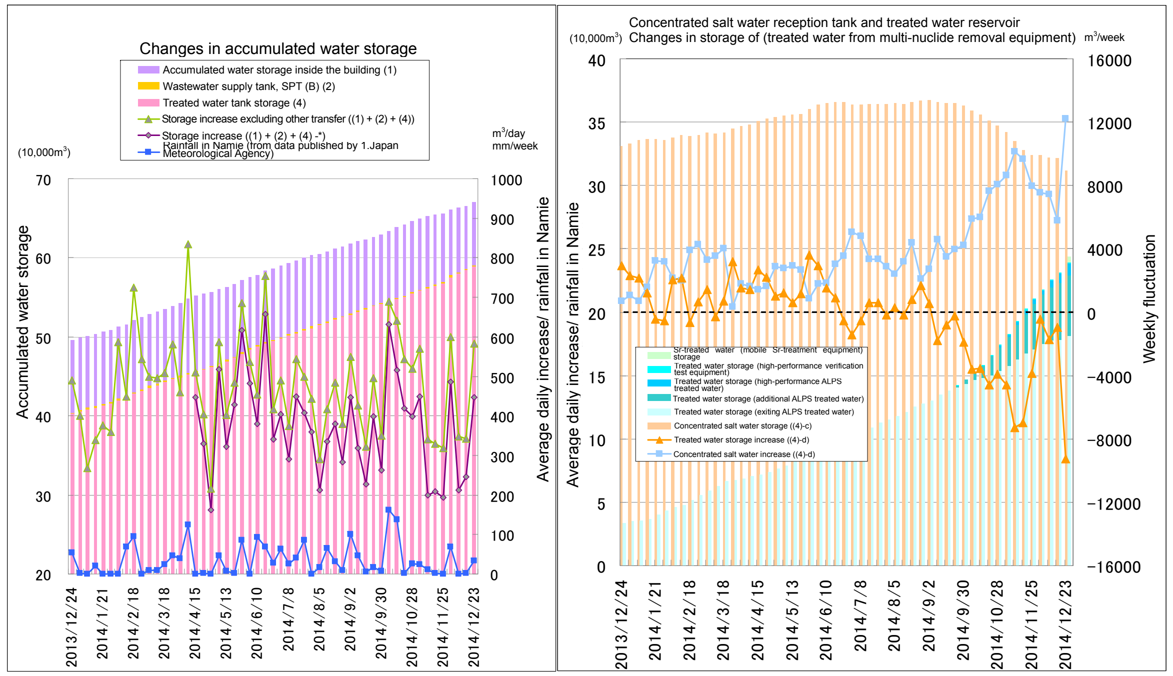


Figure 4: Status of accumulated water storage

Measures in Tank Areas

- Rainwater under the temporary release standard having accumulated inside the fences in the contaminated water tank area, was sprinkled on site after removing radioactive materials using rainwater-treatment equipment since May 21 (as of December 22, a total of 13,500 m³). On December 5, treatment of rainwater stored in underground reservoir No.7 was completed.

Removal of contaminated water from seawater-pipe trenches

- Filling and closure of the Unit 2 seawater-pipe trench commenced on November 25, and on December 18 filling of the tunnel sections was completed. Water was pumped up from the Vertical Shafts on December 24, and the filling status of the tunnel sections is currently being confirmed. Preparations for filling of the Vertical Shafts will proceed based on these results.
- At the Unit 3 seawater-pipe trench Vertical Shaft D, drilling of holes for frozen and temperature-measurement pipes was completed (December 5). Pumping tests were performed on December 15, and it was estimated that the trench

is connected to the Turbine Building. Decisions will be made on how to proceed based on the results of the pumping tests.

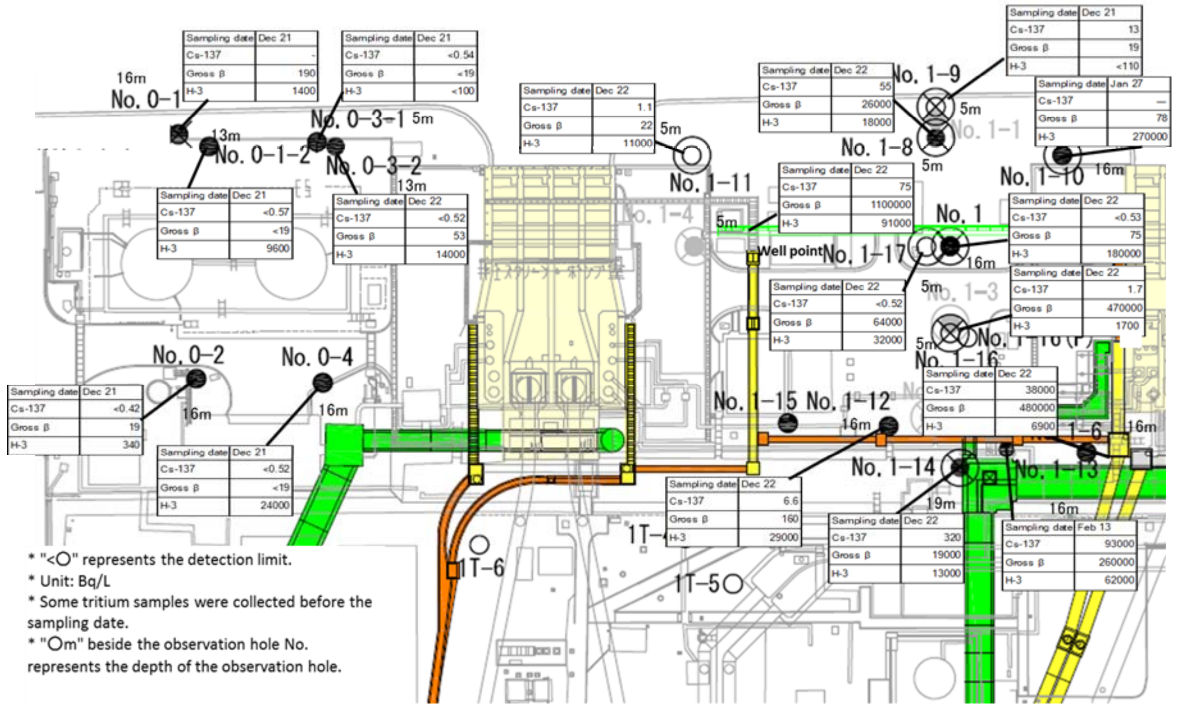
- The site conditions of the Unit 4 seawater-pipe trench will be confirmed.

3. Plan to reduce radiation dose and mitigate contamination

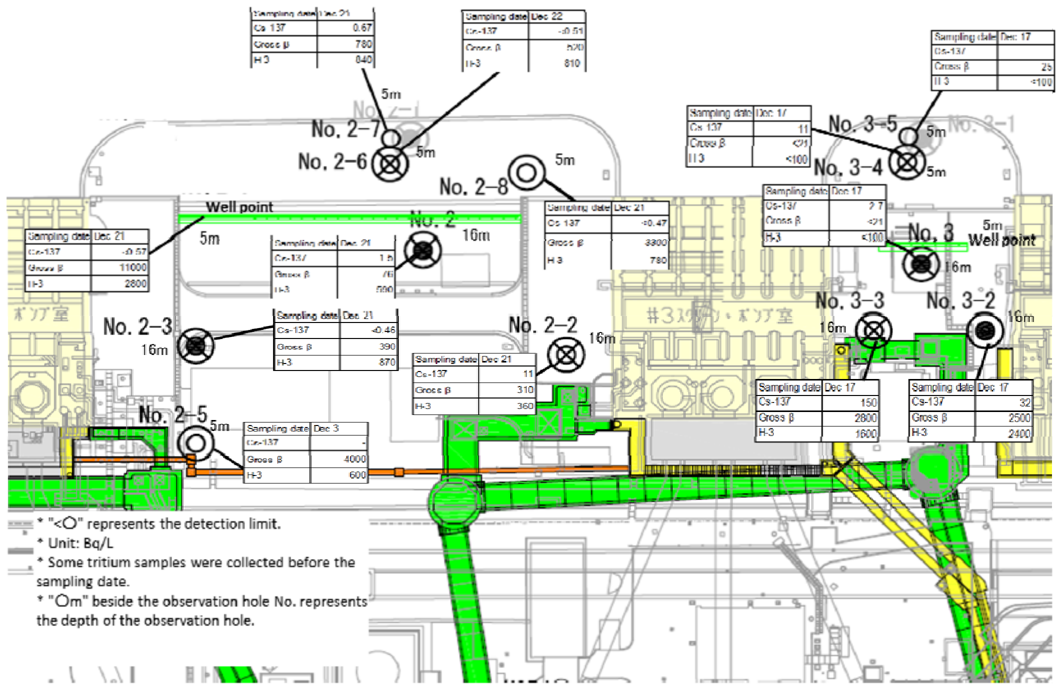
Effective dose-reduction at site boundaries and purification of the port water to mitigate the impact of radiation on the external environment

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

- Regarding the radioactive materials in groundwater near the bank on the north side of the Unit 1 intake, the density of tritium has been increasing at groundwater Observation Holes Nos. 0-1-2 and 0-4 since July, currently standing at around 9,000 and 23,000 Bq/L, respectively in these locations. Pumping of 1 m^3/day of water from Observation Hole No. 0-3-2 continues.
- Regarding the groundwater near the bank between the Unit 1 and 2 intakes, the density of gross β radioactive materials at groundwater Observation Hole Nos. 1 to 6 increased to 7.8 million Bq/L in October, but is currently standing at around 500,000 Bq/L. Though the density of tritium at groundwater Observation Hole Nos. 1 to 8 had become around 10,000 Bq/L, it fluctuated greatly after June, and is currently around 20,000 Bq/L.
  Though the density of tritium at groundwater Observation Hole No. 1-17, which had been around 10,000 Bq/L, increased to 160,000 Bq/L since October, it is currently standing at around 40,000 Bq/L. The density of gross β, which has been increasing since March, reached 1.2 million Bq/L by October and is currently standing at around 60,000 Bq/L. Water pumping from the well point (10 m^3/day) and the pumping well No. 1-16 (P) (1m^3/day) installed near the Observation Hole No. 1-16 continues.
- Regarding the radioactive materials in groundwater near the bank between the Unit 2 and 3 intakes, the densities of tritium and gross β radioactive materials are high on the north (Unit 2) side up to November. These densities have been decreasing since November, currently standing at around 3,000 and 20,000 Bq/L for tritium and gross β radioactive materials respectively. To increase the height of the ground improvement area with mortar, the volume of water pumped from the well point increased to 50 m^3/day (from October 31).
- Regarding the radioactive materials in groundwater near the bank between the Unit 3 and 4 intakes, a low density was maintained at all Observation Holes as up to November.
- Regarding the radioactive materials in seawater outside the sea-side impermeable walls inside the open channels of Units 1-4, a low density equivalent to that at the point to the north of the east breakwater was maintained as up to November.
- The density of radioactive materials in seawater within the port has been slowly declining as up to November.
- The radioactive material density in seawater at and outside the port entrance has remained within the same range previously recorded.
- Construction to cover the seabed soil within the port is underway to prevent contamination spreading due to stirred-up seabed soil (scheduled for completion at the end of FY2014). Modifications to the slurry plant were implemented at the time of the covering work in Area (2). Test construction was carried out from November 17, and since confirmation of the workability and the covering material quality were completed, construction resumed from December 14 (see Figure 8). As of December 23, 33% of the construction had been completed. The seabed of the intake open channels had been covered by FY2012.



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



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

Figure 5: Groundwater density on the Turbine Building east side

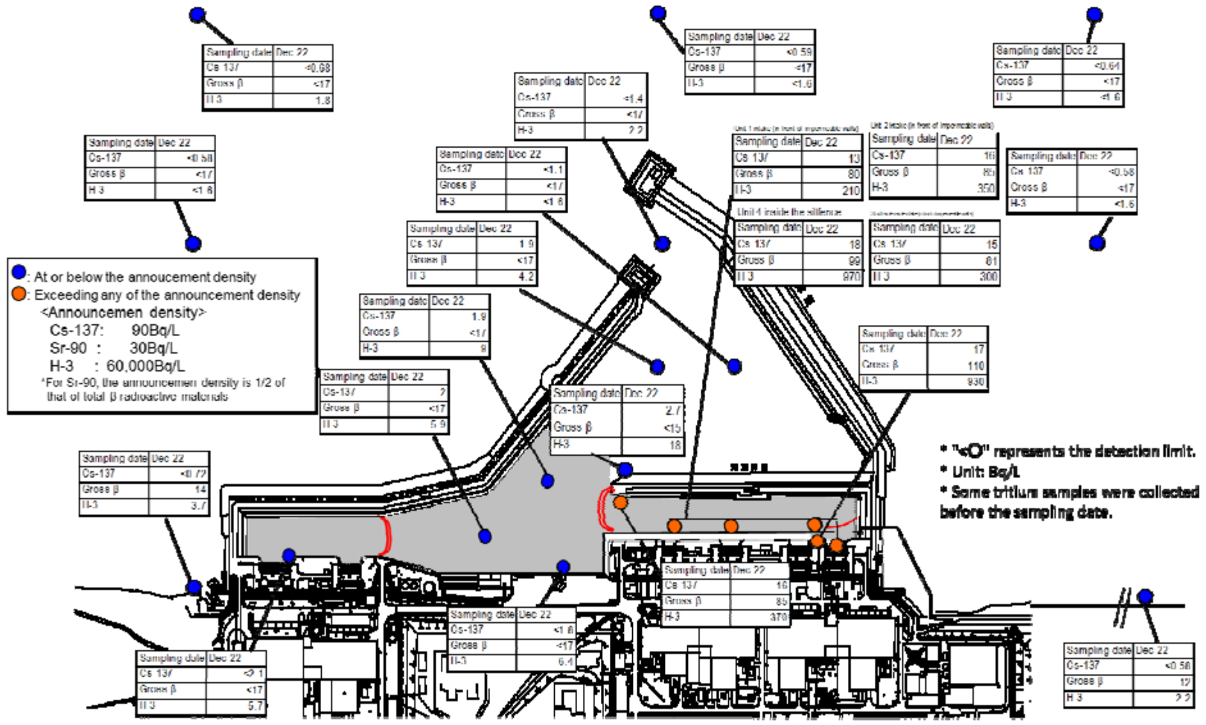


Figure 6: Seawater density around the port

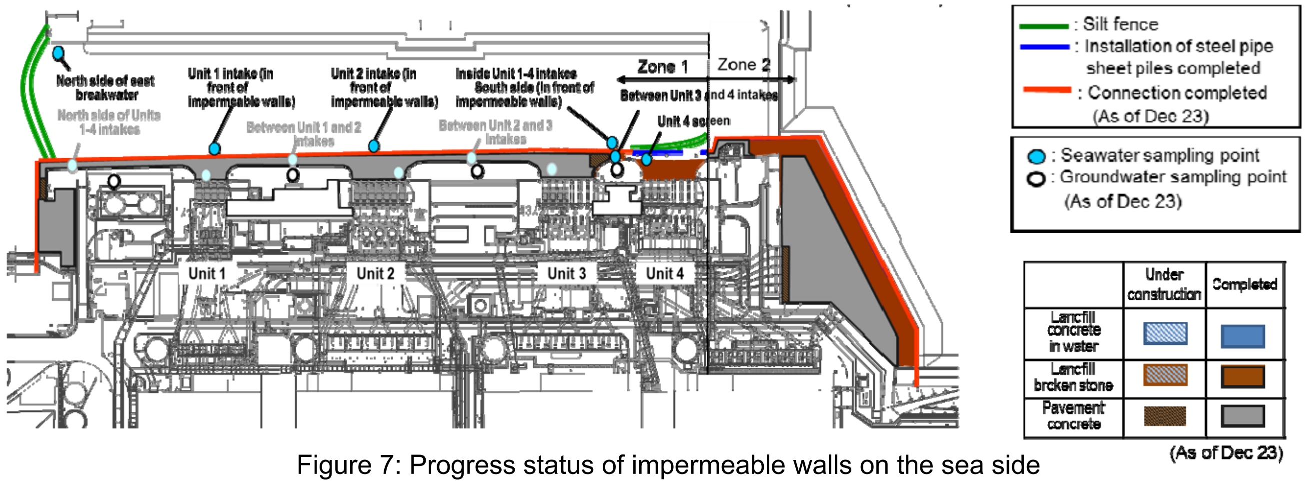


Figure 7: Progress status of impermeable walls on the sea side

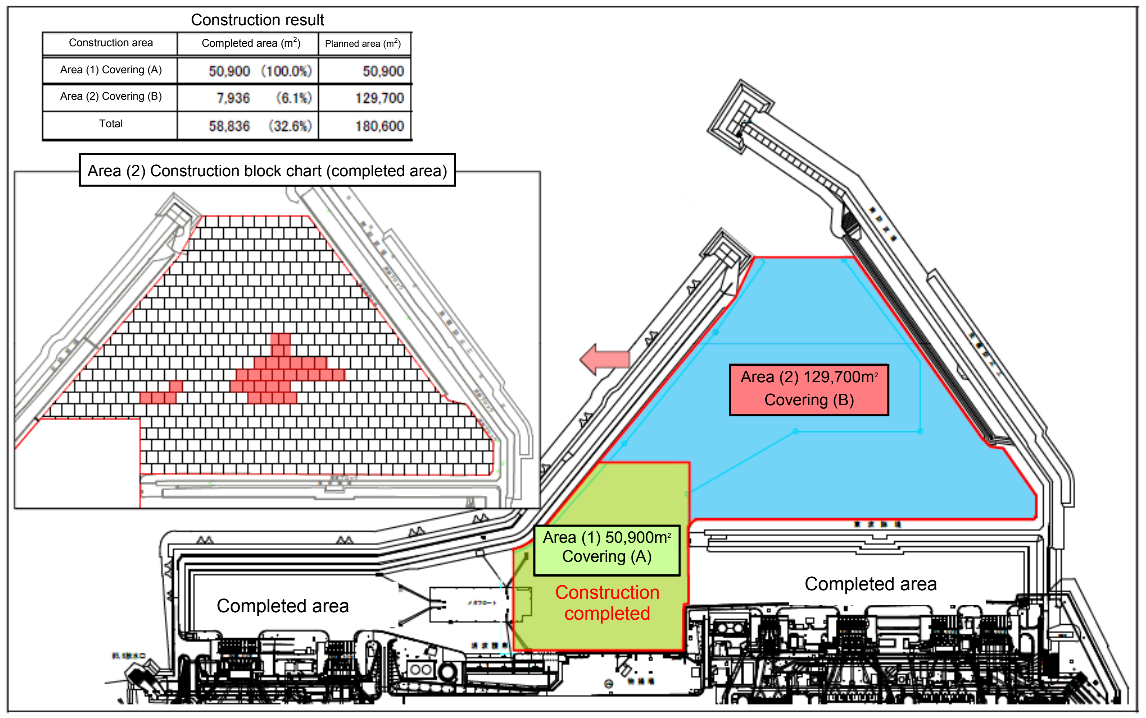


Figure 8: Progress status of the seabed soil covering within the port

4. Plan to remove fuel from the spent fuel pools

Work to help remove spent fuel from the pool is progressing steadily 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. On December 22, the transfer of 1,331 spent fuel assemblies in the pool, as well as 202 non-irradiated fuel assemblies, was completed (2 of the non-irradiated fuel assemblies were removed in advance in July 2012 for fuel checks). This marks the completion of fuel removal from the Unit 4 Reactor Building.
- To evaluate long-term soundness of fuel assemblies removed from the spent fuel pool, a visual inspection on fuel assemblies transferred from the Unit 4 spent fuel pool to the common pool was conducted (November 18-25). The results of the inspection were that no major damage to or distortion of fuel assemblies, abnormal increases in oxide film thicknesses, or notable corrosion on the inner surfaces of lock nuts were detected.
- In order to confirm the post-transportation status of 2 leaked fuel assemblies that were transported from the Unit 4 spent fuel pool to the common pool, visual inspections using underwater cameras and examinations of leaked fuel rods using fiberscopes were conducted (December 17, 18). The results of these examinations are currently being summarized.

➢ Main work to help remove spent fuel at Unit 3

- During rubble removal inside the spent fuel pool, the console and the overhanging pedestal of a fuel-handling machine, which were scheduled for removal, fell (August 29) and the work was therefore suspended. However, on December 17 the rubble removal work resumed and the removal of the console and overhanging pedestal were completed (December 19).

➢ Main work to help remove spent fuel at Unit 1

- Spraying of anti-scattering agents on the top floor of the Reactor Building and investigations into the status of rubble and concentration of dust were conducted, and the roof panels of the Reactor Building cover that had been removed were put back on December 4. At that time, projecting members were also mounted to the removed roof panels and part of a hole used for spraying of anti-scattering agents that had been expanded was covered from the exterior.
- After removing the two roof panels, the trends of the dust conditions were monitored with regard to the density of radioactive materials in the air, and the results confirmed that due to the effects of the wind, there were no elevations in the concentration of dust.
- In the rubble investigation, confirmation in greater detail was achieved than it could be achieved with balloon investigations and other types of investigations performed in the past. Since it was possible to confirm the status of the rubble to be removed in advance at the upper part of the Reactor Building, the plans for rubble removal will be reviewed. On the underside of the collapsed roof, no conditions such as fallen fuel-handling machines or steel frame materials protruding from the water surface that would cause damage to the spent fuel pool or to the fuel assemblies inside the pool were detected. Further investigations will be conducted after the roof cover has been dismantled.

Covering status of expanded hole in roof panel of building cover | Existing steel frame at upper part of Reactor Building | Underside of collapsed roof

Figure 9: Upper part of Unit 1 Reactor Building – Covering status of hole in roof panel and status of rubble investigations

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)

- Development of technology for detection of fuel debris inside the reactor
  - In order to gain an understanding of the positions and amounts of fuel debris, which is required for investigations into fuel debris removal methods, it is planned to carry out position measurement of the debris via imaging technology that uses muons (a type of elementary particle), which are derived from cosmic radiation. Measurement using muon radiography at Unit 1 is scheduled to commence from around early February.

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

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

- Management status of rubble and trimmed trees
  - As of the end of November, the total storage volume of concrete and metal rubble was approx. 131,900 m^3 (+8,600 m^3 compared to at the end of October, area-occupation rate: 74%). The total storage volume of trimmed trees was approx. 79,700 m^3 (+100 m^3 compared to at the end of October, area-occupation rate: 58%). The increase in rubble was mainly attributable to construction to install tanks and impermeable walls with frozen soil. The increase in trimmed trees was mainly attributable to construction to install tanks.
- Management status of secondary waste from water treatment
  - As of December 23, 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 removal equipment was 1,433 (area-occupation rate: 43%).
  - Operation of storage for cesium absorption vessels (3rd storage) which store HICs generated from the multi-nuclide removal equipment will commence on December 9, within the scope of approved use (768 assemblies).

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 total of people registered for at least one day per month to work on site during the past quarter from August to October was approx. 13,700 (TEPCO and partner company workers), which exceeded the monthly average number of actual workers (approx. 10,700). 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 January (approx. 6,810 per day: TEPCO and partner company workers)* would be secured at present. The average numbers of workers per day for each month of the last fiscal year (actual values) were maintained with approx. 3,000 to 6,600 per month since the last fiscal year (See Figure 10).

* Some works for which contract procedures have yet to be completed are excluded from the January estimate.

  - The number of workers is increasing, both from within and outside Fukushima prefecture. However, as the growth rate of workers from outside exceeds that of those from within the prefecture, the local employment ratio (TEPCO and partner company workers) as of November was approx. 45%.

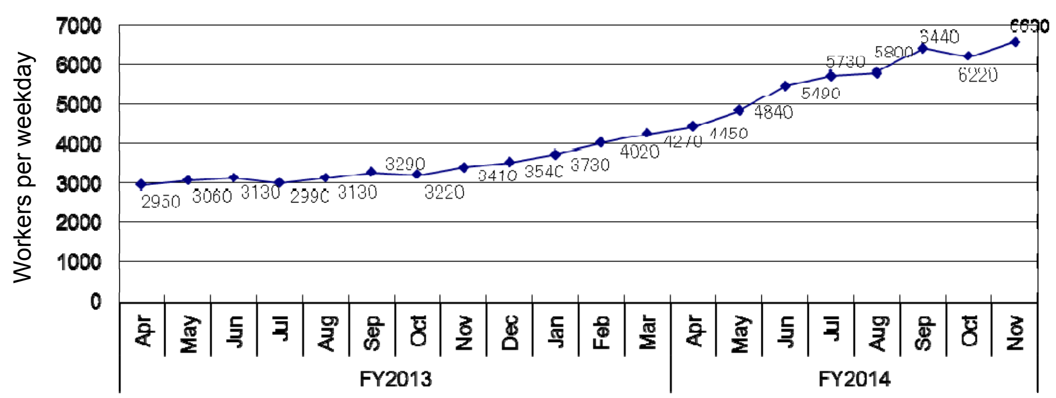


Figure 10: Changes in the average number of workers per weekday for each month since FY2013 (actual values)

- The average exposure dose of workers remained at approx. 1mSv/month in both FY2013 and FY2014. (Reference: annual average exposure dose 20mSv/year≒1.7mSv/month)
- For most workers, the exposure dose is sufficiently within the limit and at a level which allows them to continue engaging in radiation work.

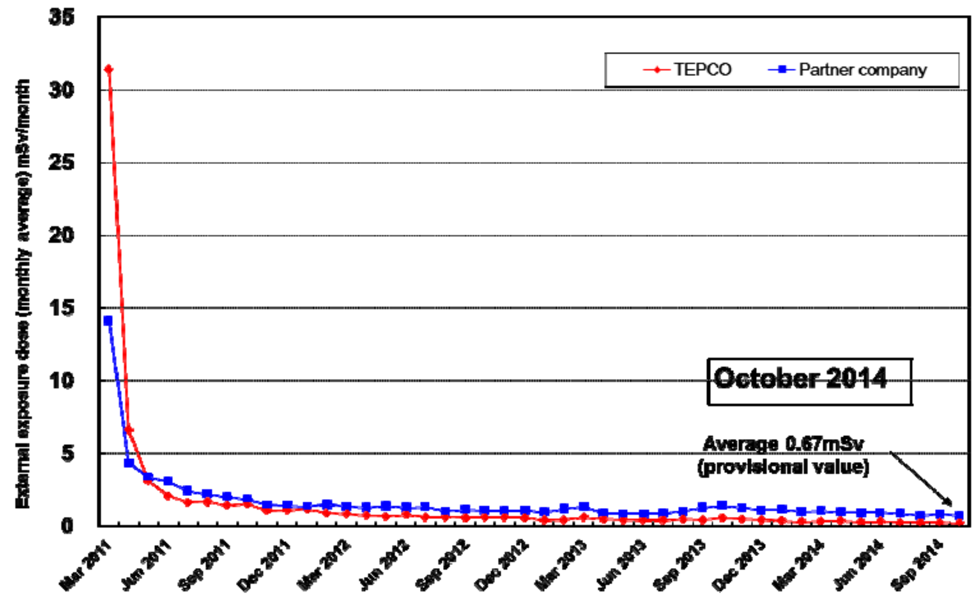


Figure 11: Changes in monthly individual worker exposure dose
(monthly average exposure dose since March 2011)

- Preventing infection and expansion of influenza and norovirus
  - Since October, measures for influenza and norovirus have been implemented. As part of these efforts, free influenza vaccination (subsidized by TEPCO) is being provided at the new Administration Office Building in the Fukushima Daiichi Nuclear Power Station (from October 29 to December 5) and medical clinics around the site (from November 4 to January 30, 2015) for workers of partner companies. As of December 19, a total of 7,893 workers had been vaccinated. In addition, a comprehensive range of other measures is also being implemented, including daily actions to prevent infection and expansion (measuring body temperature, health check and monitoring infection status) and response after detecting possible infection (control of swift entry/exit and mandatory wearing of masks in working spaces).
- Status of influenza and norovirus cases
  - From the 47th week of 2014 (November 10, 2014 to November 17, 2014) to the 51st week of 2014 (December 15, 2014 to December 21, 2014), there were 108 cases of influenza infection and 1 case of norovirus infection. The totals for the same period of the previous season were 1 case of influenza infection and 11 cases of norovirus infection. The totals for the entire previous season (December 2013 to May 2014) were 254 cases of influenza infection and 35 cases of norovirus infection.
- Status of implementation of work safety measures at Fukushima Daiichi NPS
  - Up until November of this fiscal year, 40 people were victims of work-related incidents (excluding heat exhaustion). Although various measures, such as the implementation of "Individual Hazard Prediction (*Kiken Yochi*, or '*KY*')" have been established in the past to stop workers to take action without checking surroundings, subsequent accidents have continued to occur. Furthermore, serious accidents such as electric shocks have also occurred.
  - It is currently recognized that issues which should be the responsibility of ordering parties, such as maintaining work sites in safe conditions, should also be addressed by TEPCO. While receiving advice from external consultants, Safety Management Guidance Meetings led by contractors together with the TEPCO Fukushima Daiichi NPS Superintendent are being held, with the goal of eliminating any further work-related incidents from this point on.

8. Others

- Leakage of water treated by multi-nuclide removal equipment
  - On December 17, while sending water that had undergone treatment by multi-nuclide removal equipment (ALPS) to a tank, a valve connected to piping that was still under construction was opened due to an error regarding the system configuration, causing leakage from that piping (approx. $6m^3$) to occur. Recovery of the leaked water and soil from the areas surrounding the leak were carried out, and there was no outflow to the ocean.
  - Misidentified piping lines on the construction drawings had been left uncorrected, leading to the preparation of an incorrect procedure document. Since the causes of this incident consisted of failure to notice the errors in the procedure document and failure to confirm the actual line configuration, from here on whenever newly-installed valves are to be operated, the actual line configuration will be confirmed prior to their operation.

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

"The highest value" →"the latest value (sampled during December 15-22)"; unit (Bq/L); ND represents a value below the detection limit

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

Cesium-134 : 3.3 (2013/10/17) →ND(1.2) Below 1/2
Cesium-137 : 9.0 (2013/10/17) → 1.9 Below 1/4
Gross β : **74** (2013/ 8/19) → ND(17) Below 1/4
Tritium : 67 (2013/ 8/19) → 4.2 Below 1/10

Cesium-134 : 4.4 (2013/12/24) →ND(1.5) Below 1/2
Cesium-137 : 10 (2013/12/24) → 1.9 Below 1/6
Gross β : **60** (2013/ 7/ 4) → ND(17) Below 1/3
Tritium : 59 (2013/ 8/19) → 9.0 Below 1/6

Cesium-134 : 5.0 (2013/12/2) → ND(1.5) Below 1/3
Cesium-137 : 8.4 (2013/12/2) → 2.0 Below 1/4
Gross β : **69** (2013/8/19) → ND(17) Below 1/4
Tritium : 52 (2013/8/19) → 5.9 Below 1/8

Cesium-134 : 2.8 (2013/12/2) → ND(2.8)
Cesium-137 : 5.8 (2013/12/2) → ND(2.1) Below 1/2
Gross β : **46** (2013/8/19) → ND(17) Below 1/2
Tritium : 24 (2013/8/19) → 5.7 Below 1/4

Cesium-134 : ND(1.4)
Cesium-137 : 2.7
Gross β : ND(15)
Tritium : 18
(Sampled in Dec. 22)

Cesium-134 : 3.3 (2013/12/24) →ND(1.1) Below 1/3
Cesium-137 : 7.3 (2013/10/11) → ND(1.4) Below 1/5
Gross β : **69** (2013/ 8/19) → ND(17) Below 1/4
Tritium : 68 (2013/ 8/19) → 2.2 Below 1/30

Cesium-134 : 3.5 (2013/10/17) →ND(1.0) Below 1/3
Cesium-137 : 7.8 (2013/10/17) →ND(1.1) Below 1/7
Gross β : **79** (2013/ 8/19) →ND(17) Below 1/4
Tritium : 60 (2013/ 8/19) →ND(1.6) Below 1/30

Cesium-134 : 32 (2013/10/11) → 3.9 Below 1/8
Cesium-137 : 73 (2013/10/11) → **16** Below 1/4
Gross β : 320 (2013/ 8/12) → **85** Below 1/3
Tritium : 510 (2013/ 9/ 2) → 370 Below 8/10

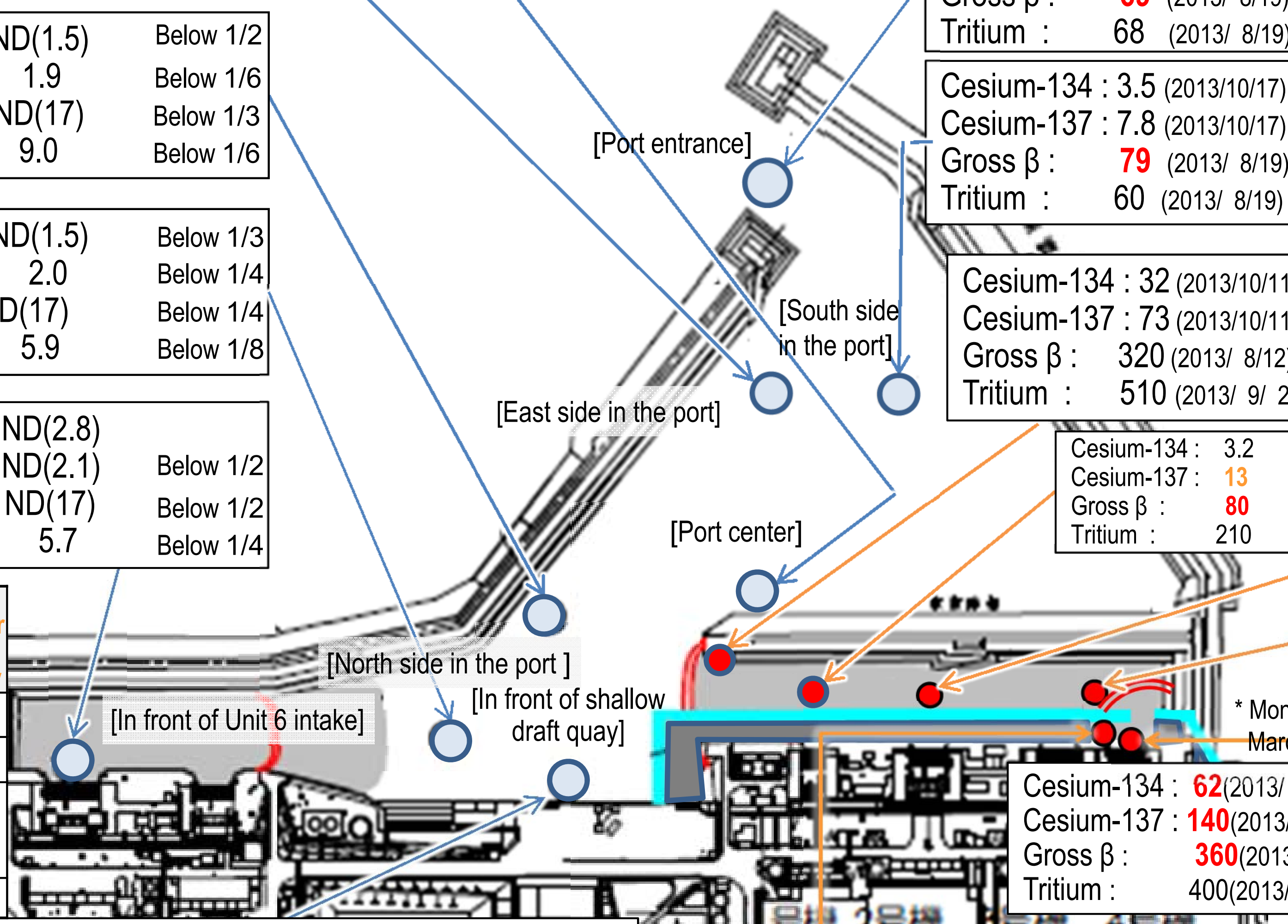
Cesium-134 : 3.2
Cesium-137 : **13**
Gross β : **80**
Tritium : 210 *

Cesium-134 : 4.8
Cesium-137 : **16**
Gross β : **85**
Tritium : 350 *

Cesium-134 : 2.6
Cesium-137 : **15**
Gross β : **81**
Tritium : 300 *

* Monitoring commenced in or after March 2014

Cesium-134 : **62**(2013/ 9/16) → 5.5 Below 1/10
Cesium-137 : **140**(2013/ 9/16) → **18** Below 1/7
Gross β : **360**(2013/ 8/12) → **99** Below 1/3
Tritium : 400(2013/ 8/12) → 970



	Legal discharge limit	WHO Guidelines for Drinking Water Quality
Cesium134	60	10
Cesium137	90	10
Strontium-90 (strongly correlate with Gross β)	30	10
Tritium	60,000	10,000

Cesium-134 : 5.3 (2013/8/ 5) → ND(1.6) Below 1/3
Cesium-137 : 8.6 (2013/8/ 5) → ND(1.8) Below 1/4
Gross β : **40** (2013/7/ 3) → ND(17) Below 1/2
Tritium : 340 (2013/6/26) → 6.4 Below 1/50

Cesium-134 : **28**(2013/ 9/16) → 5.5 Below 1/5
Cesium-137 : **53**(2013/12/16) → **17** Below 1/3
Gross β : **390**(2013/ 8/12) → **110** Below 1/3
Tritium : 650(2013/ 8/12) → 930

Summary of TEPCO data as of December 24

Note: The gross β measurement values include natural potassium 40 (approx. 12 Bq/L).

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 December 15-22)

	Legal discharge limit	WHO Guidelines for Drinking Water Quality
Cesium134	60	10
Cesium137	90	10
Strontium-90 (strongly correlate with Gross β)	30	10
Tritium	60,000	10,000

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

[Northeast side of port entrance(offshore 1km)]

Cesium-134 : ND (2013) →ND(0.67)
Cesium-137 : ND (2013) →ND(0.68)
Gross β : ND (2013) →ND(17)
Tritium : ND (2013) → 1.8

[East side of port entrance (offshore 1km)]

Cesium-134 : ND (2013) →ND(0.50)
Cesium-137 : 1.6 (2013/10/18) →ND(0.59) Below 1/2
Gross β : ND (2013) →ND(17)
Tritium : 6.4 (2013/10/18) →ND(1.6) Below 1/5

[Southeast side of port entrance(offshore 1km)]

Cesium-134 : ND (2013) →ND(0.80)
Cesium-137 : ND (2013) →ND(0.64)
Gross β : ND (2013) →ND(17)
Tritium : ND (2013) →ND(1.6)

[North side of north breakwater(offshore 0.5km)]

Cesium-134 : ND (2013) →ND(0.66)
Cesium-137 : ND (2013) →ND(0.58)
Gross β : ND (2013) →ND(17)
Tritium : 4.7 (2013/8/18) →ND(1.6) Below 1/2

[Port entrance]

Cesium-134 : 3.3 (2013/12/24) → ND(1.1) Below 1/3
Cesium-137 : 7.3 (2013/10/11) → ND(1.4) Below 1/5
Gross β : 69 (2013/ 8/19) → ND(17) Below 1/4
Tritium : 68 (2013/ 8/19) → 2.2 Below 1/30

[South side of south breakwater(offshore 0.5km)]

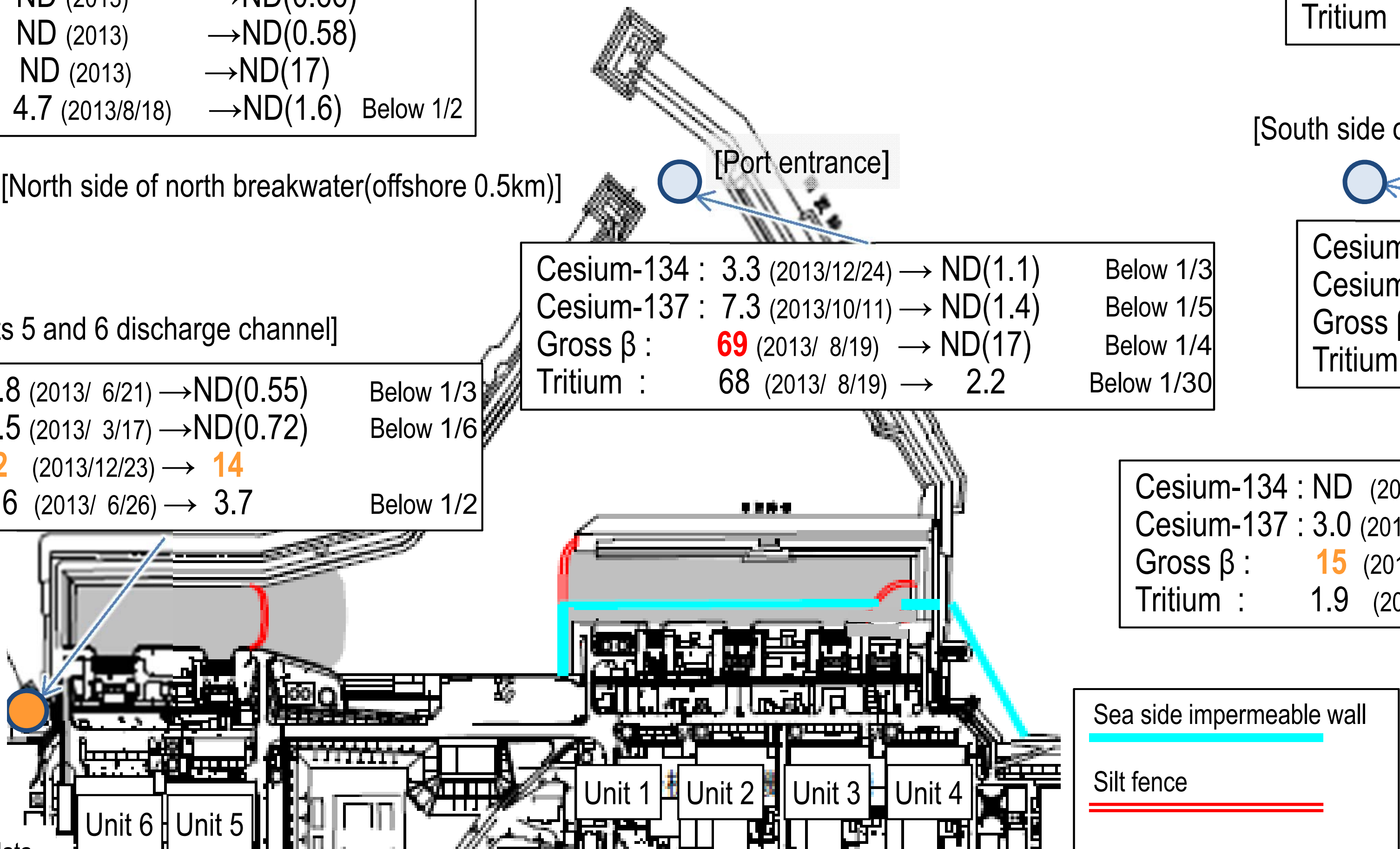
Cesium-134 : ND (2013) →ND(0.51)
Cesium-137 : ND (2013) →ND(0.58)
Gross β : ND (2013) →ND(17)
Tritium : ND (2013) →ND(1.6)

[North side of Units 5 and 6 discharge channel]

Cesium-134 : 1.8 (2013/ 6/21) →ND(0.55) Below 1/3
Cesium-137 : 4.5 (2013/ 3/17) →ND(0.72) Below 1/6
Gross β : 12 (2013/12/23) → 14
Tritium : 8.6 (2013/ 6/26) → 3.7 Below 1/2

[Around south discharge channel]

Cesium-134 : ND (2013) → ND(0.58)
Cesium-137 : 3.0 (2013/ 7/15) → ND(0.58) Below 1/5
Gross β : 15 (2013/12/23) → 12
Tritium : 1.9 (2013/11/25) → 2.2



Note: The gross β measurement values include natural potassium 40 (approx. 12 Bq/L).

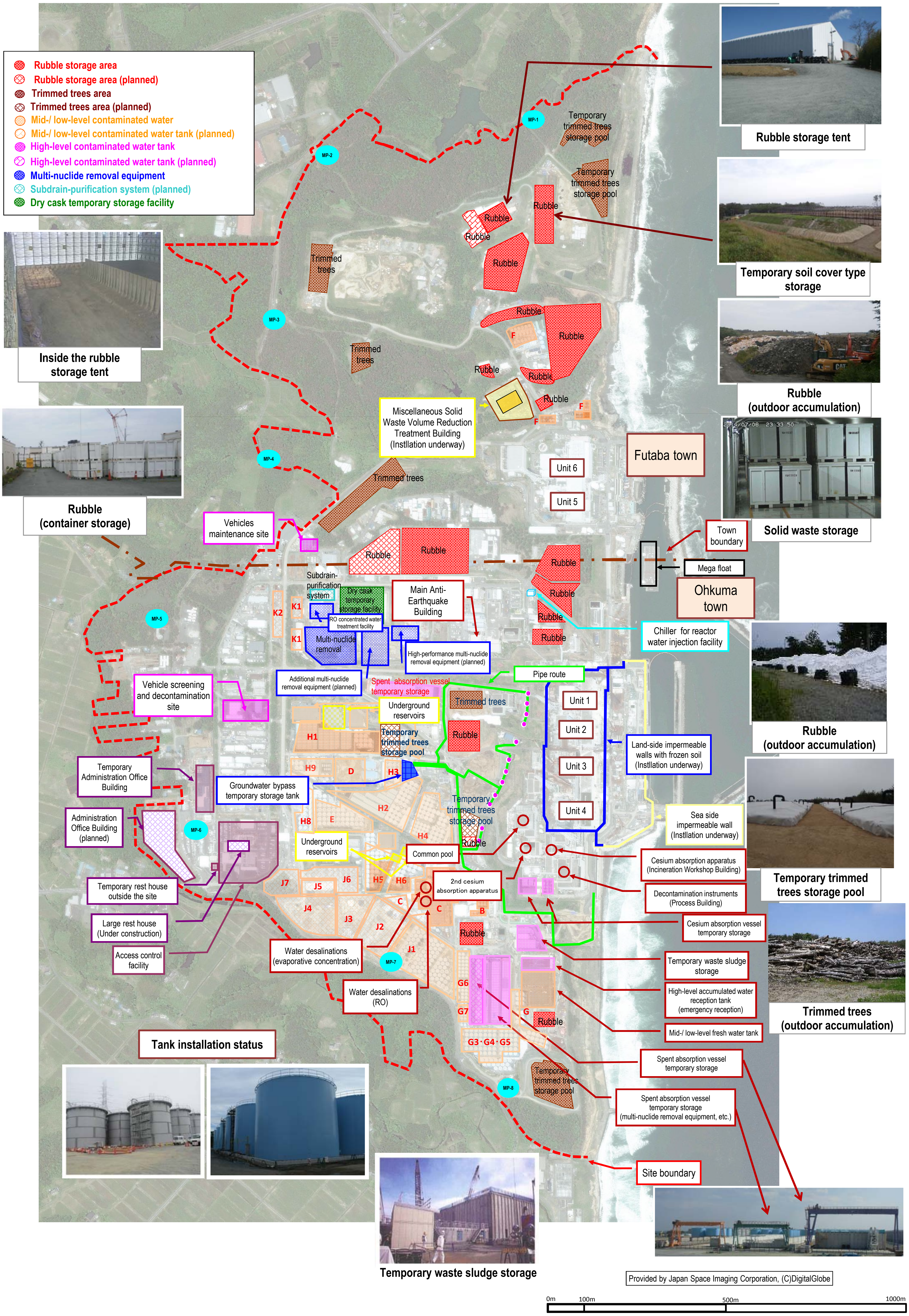
Summary of TEPCO data as of December 24

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

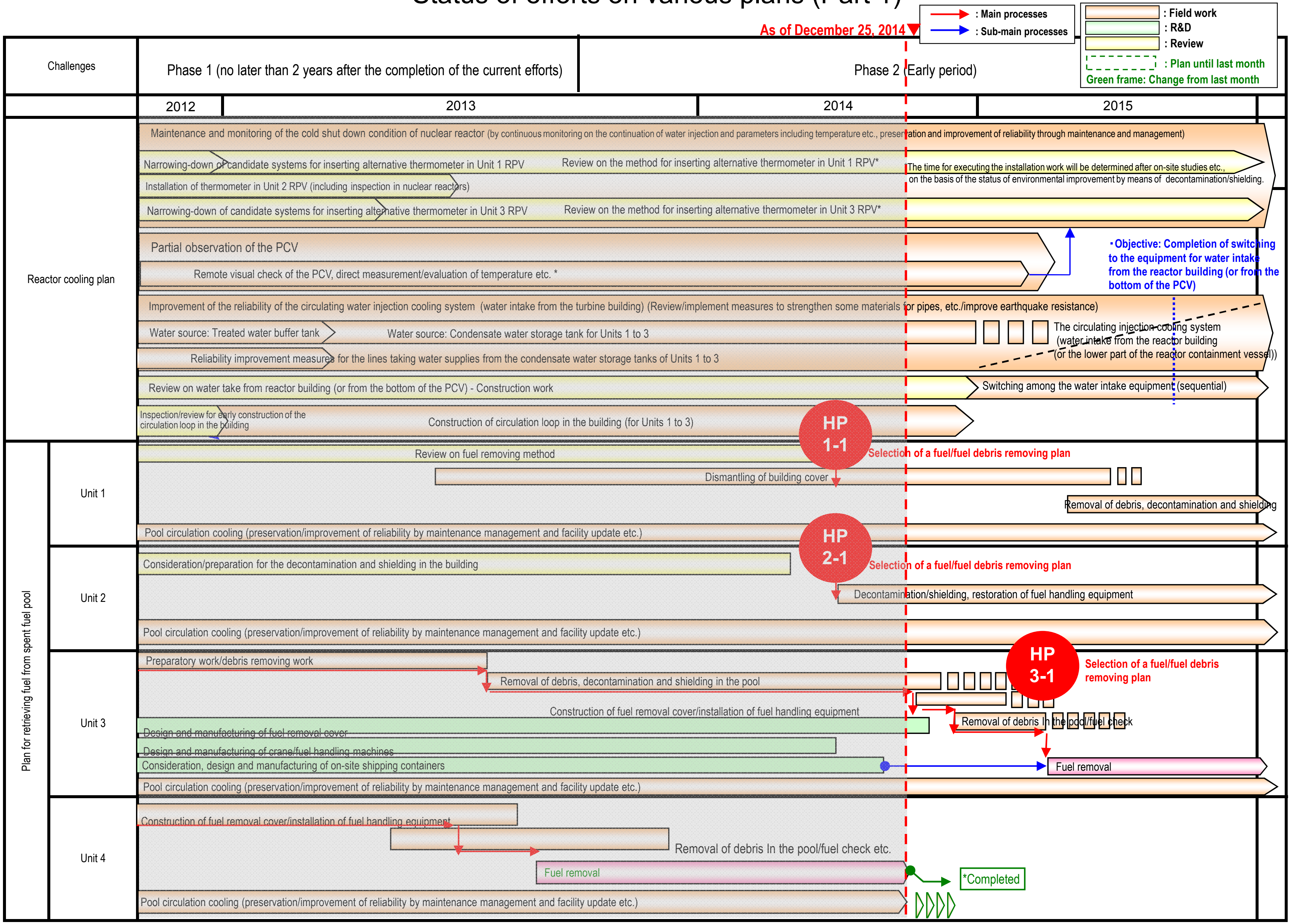
December 25, 2014

TEPCO Fukushima Daiichi Nuclear Power Station Site Layout



Status of efforts on various plans (Part 1)

Attachment 3



Status of efforts on various plans (Part 2)

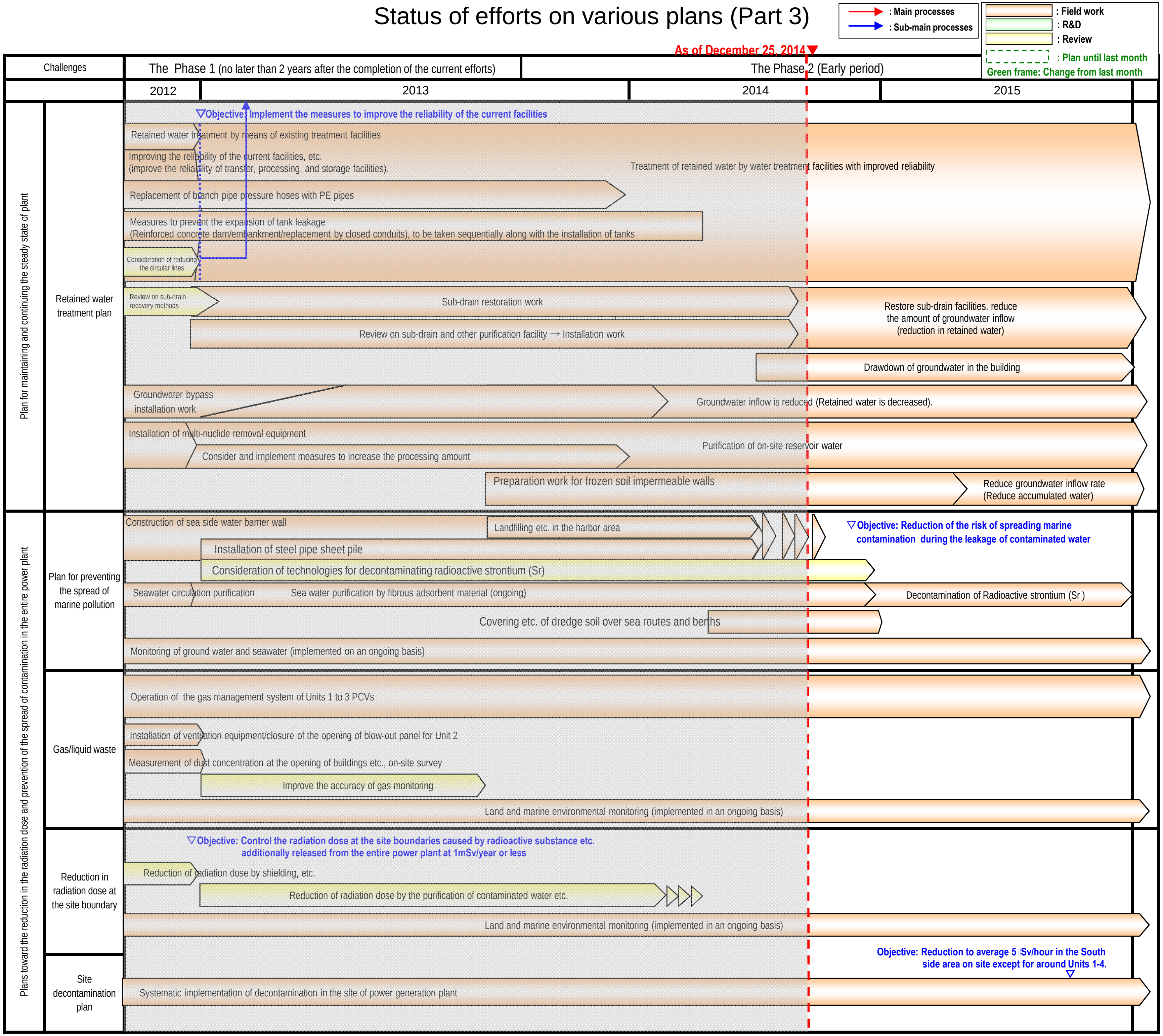
: Main processes
: Sub-main processes

: Field work
: R&D
: Review
: Plan until last month
Green frame: Change from last month

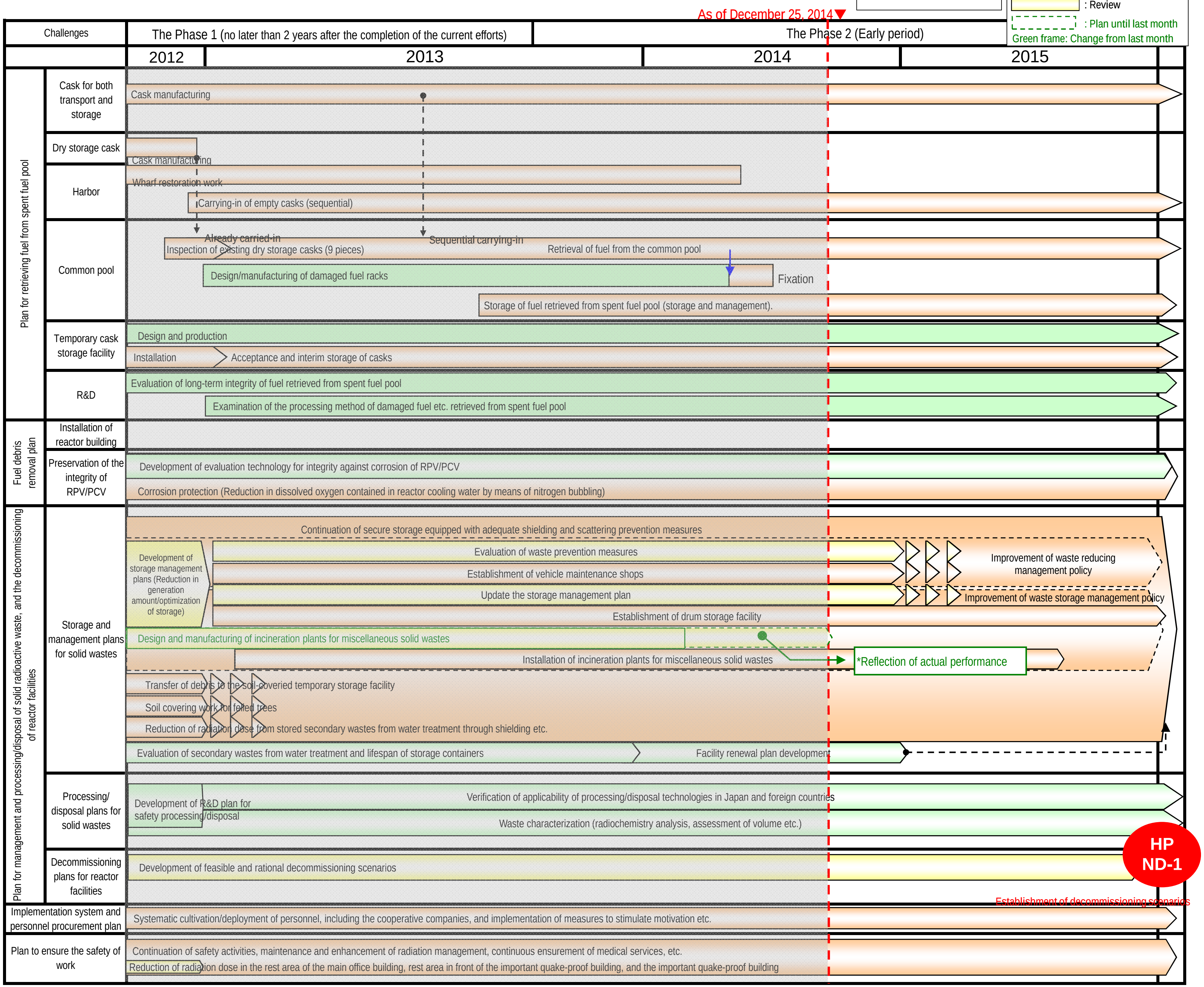
As of December 25, 2014

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
	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☆
		☆: Including on-site demonstration
		[Unit 2] Inspection of the basement of the nuclear reactor building, Inspection of leaking locations☆
	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)



Status of efforts on various plans (Part 4)



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 involved commencing 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.

On November 5, 2014, within a year since the fuel removal commenced, the transfer of 1,331 spent fuel assemblies in the pool to the common pool was completed.

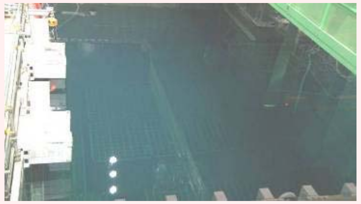
The transfer of the remaining non-irradiated fuel assemblies to the Unit 6 SFP was completed on December 22, 2014.

(2 of the non-irradiated fuel assemblies were removed in advance in July 2012 for fuel checks)

This marks the completion of fuel removal from the Unit 4 Reactor Building.

Based on this experience, fuel assemblies will be removed from the Unit 1-3 pools.

Fuel removal status



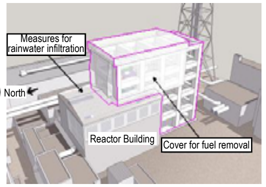
Conditions in the Unit 4 SFP

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

Steps toward fuel removal

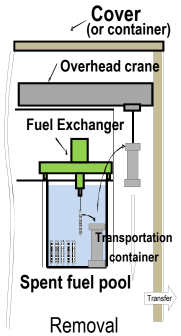
Removal of rubble from the roof of the Reactor Building

Completed in Dec. 2012



Installation of cover for fuel removal

From Apr. 2012, completed in Nov. 2013

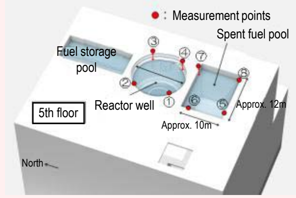


Removal

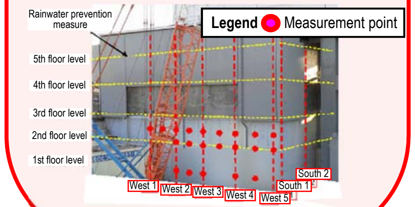
Commenced in Nov. 2013

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)

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

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) are underway (from October 15, 2013). Removal of large rubble from the SFP is also underway (from December 17, 2013).

Before removal of the large rubble

After removal of the large rubble

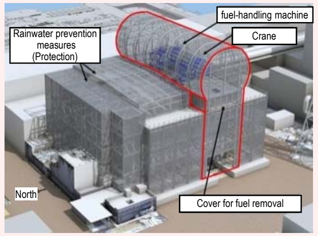


Image of the cover for fuel removal

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. Two roof panels of the Unit 1 Reactor Building (R/B) were removed to facilitate investigation of the rubble status on the R/B top floor.

No scattering of dust or conditions that would cause immediate damage to the fuel assemblies in the SFP were detected.

- Regarding Unit 2, to prevent risks of reworking due to change in the fuel debris removal plan, the plan continues to be examined within a scope not affecting the scheduled commencement of removal.

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.

(1) Spraying anti-scattering agents

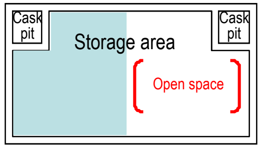
(2) Removing dust and dirt by suctioning devices

(3) Preventing dust from being stirred up via a windbreak sheet

(4) Enhancing the dust-monitoring system by installing additional monitors

Measures to reduce release

Common pool

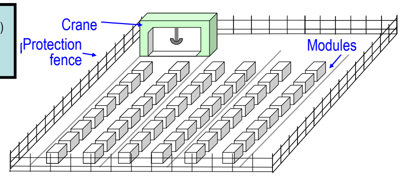


An open space will be maintained in the common pool (Transfer to the temporary dry cask storage facility)

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 (*2) 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, 2013); 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 the core internals are inspected.

(*2) Cask: Transportation container for samples and equipment, including radioactive materials.

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

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

3D laser scan inside the Unit 1 R/B underground floor

The upper part of the underground floor (torus room) of Unit 1 R/B was investigated with a laser scan using a remote-controlled robot, and collected its 3D data.

The 3D data, which allows examination based on actual measurements, can be used to examine more detailed accessibility and allocation of equipment.

Combining it with the 3D data on the R/B 1st floor allows obstacles on both 1st and underground floors to be checked simultaneously. This allows efficient examination of positions to install repair equipment for PCVs and vacuum break lines.

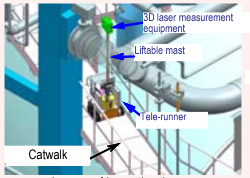


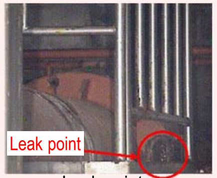
Image of investigation

External appearance of remote-controlled robot

Image of 3D data

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

Investigation in the leak point detected in the upper part of Unit 1 S/C from May 27 from one expansion joint cover among the lines installed there. As no leakage was identified from other parts, specific methods will be examined to halt the flow of water and repair the PCV.



Leak point

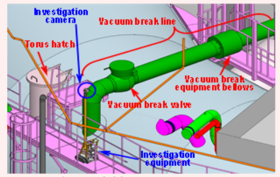
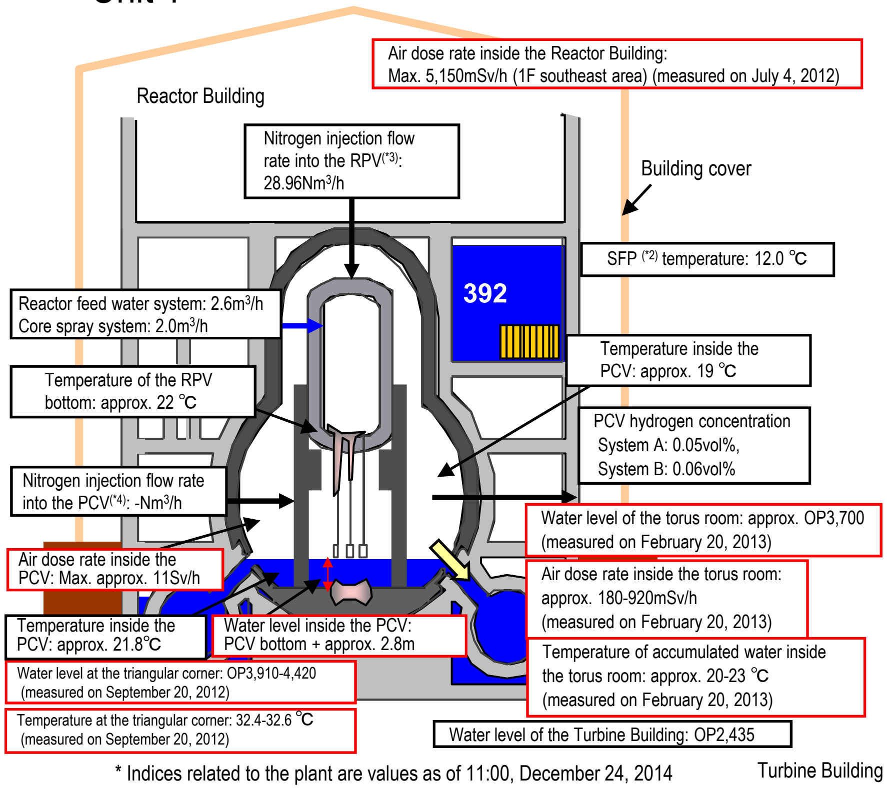


Image of the S/C upper part investigation

Unit 1



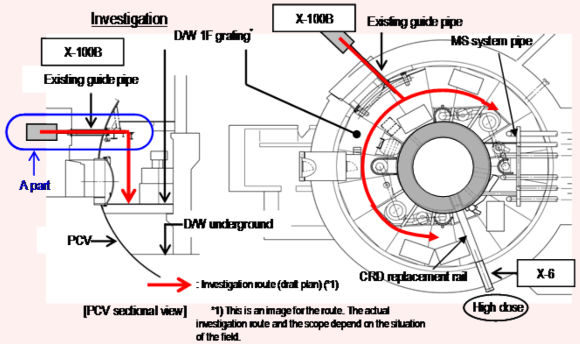
* Indices related to the plant are values as of 11:00, December 24, 2014

Status of equipment development toward investigating inside the PCV

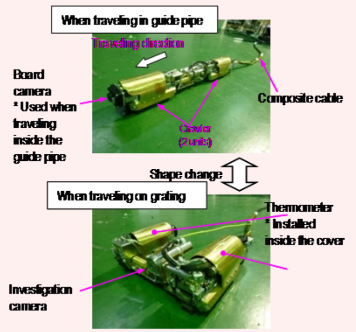
Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigation inside the PCV is scheduled.

[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.



Investigative 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

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

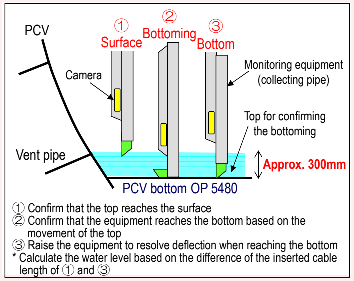
Installation of an RPV thermometer and permanent PCV supervisory instrumentation

(1) Replacement of the RPV thermometer

- As the thermometer installed at the Unit 2 RPV bottom after the earthquake had broken, it was excluded from the monitoring thermometers (February 19).
- On April 17, removal of the broken thermometer failed and was suspended. It was confirmed with full-scale piping that it is possible for wire guides to be drawn out if rust-stripping chemicals that do not generate hydrogen are used. The removal will be impermanent in around January 2015.

(2) Reinstallation of the PCV thermometer and water-level gauge

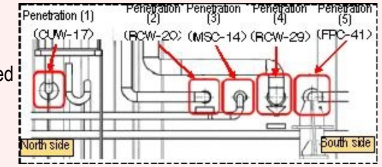
- Some of the permanent supervisory instrumentation for PCV could not be installed in the planned locations due to interference with existing grating (August 13, 2013).
- The instrumentation was removed on May 27, 2014 and new instruments were reinstalled on June 5 and 6. The trend of added instrumentation will be monitored for approx. one month to evaluate its validity.
- The measurement during the installation confirmed that the water level inside the PCV was approx. 300mm from the bottom.



Method to measure water levels when re-installing monitoring instrumentation for Unit 2 PCV

Investigative results on torus room walls

- The torus room walls were investigated (on the north side of the east-side walls) using equipment specially developed for that purpose (a swimming robot and a floor traveling robot).
- At the east-side wall pipe penetrations (five points), "the status" and "existence of flow" were checked.
- A demonstration using the above two types of underwater wall investigative equipment showed how the equipment could check the status of penetration.
- Regarding Penetrations 1 - 5, the results of checking the sprayed tracer (*5) by camera showed no flow around the penetrations. (investigation by the swimming robot)
- Regarding Penetration 3, a sonar check showed no flow around the penetrations. (investigation by the floor traveling robot)



Penetrations investigated

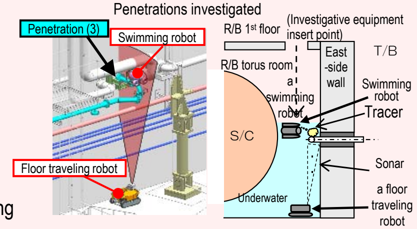
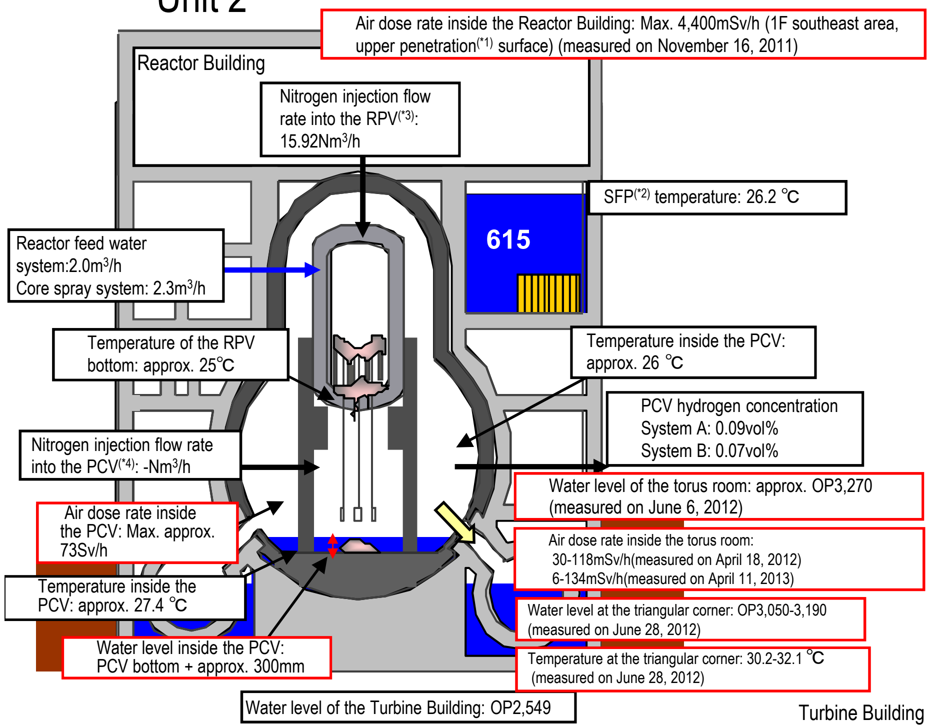


Image of the torus room east-side cross-sectional investigation

Unit 2



* Indices related to plant are values as of 11:00, December 24, 2014

Status of equipment development toward investigating inside the PCV

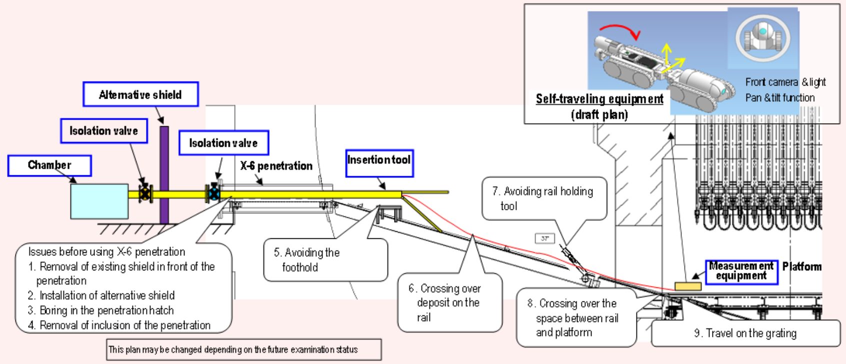
Prior to removing fuel debris, to check the conditions inside the Primary Containment Vessel (PCV), including the location of the fuel debris, investigations inside the PCV are scheduled.

[Investigative outline]

- Inserting the equipment from Unit 2 X-6 penetration(*1) and accessing inside 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.



Investigative issues 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) Tracer: Material used to trace the fluid flow. Clay particles

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

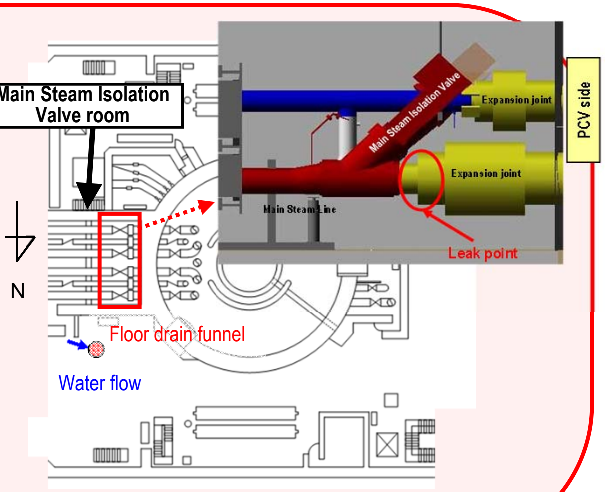
Immediate target	Identify the plant status and commence R&D and decontamination toward fuel debris removal

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

On January 18, a flow of water 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

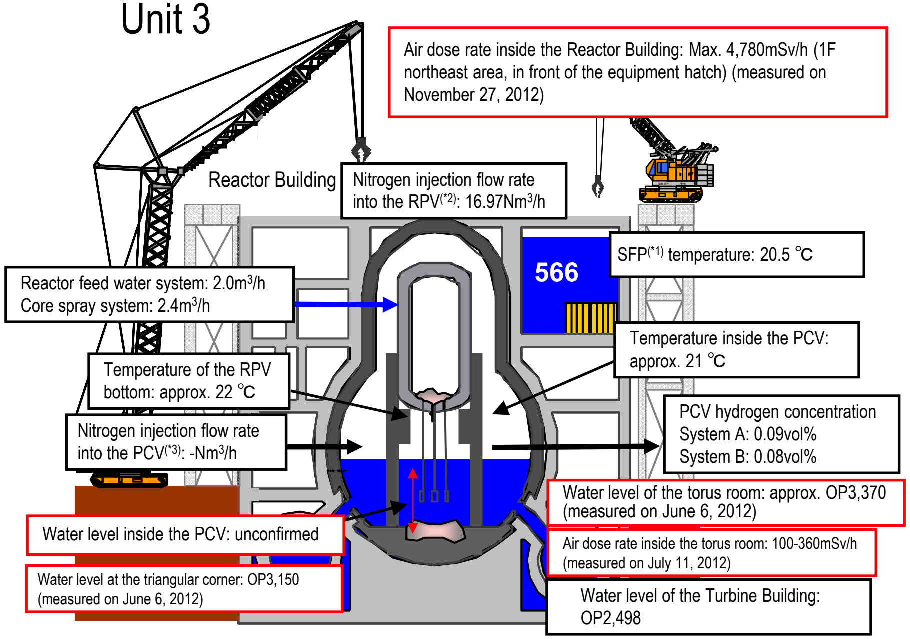
* Main Steam Isolation Valve: A valve to shut off the steam generated from the Reactor in an emergency

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

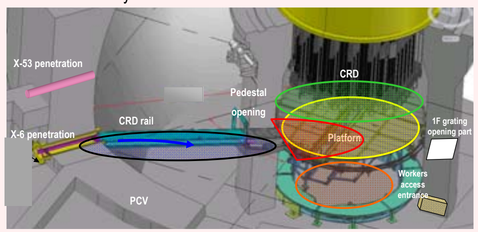


* Indices related to plant are values as of 11:00, December 24, 2014

Status of equipment development toward investigating 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. As the water level inside the PCV is high and the penetration scheduled for use in Units 1 and 2 may be under the water, another method needs to be examined.

[Steps for investigation and equipment development]
(1) Investigation from X-53 penetration
-From October 22-24, the status of X-53 penetration, which may be under the water and which is scheduled for use to investigate the inside of the PCV, was investigated using remote-controlled ultrasonic test equipment. Results showed that the penetration is not under the water.
-An investigation of the inside of the PCV is scheduled for around the 1st half of FY2015. Given the high radioactivity around X-53 penetration, the introduction of remote-controlled equipment will be examined based on the decontamination status and shielding.
(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)

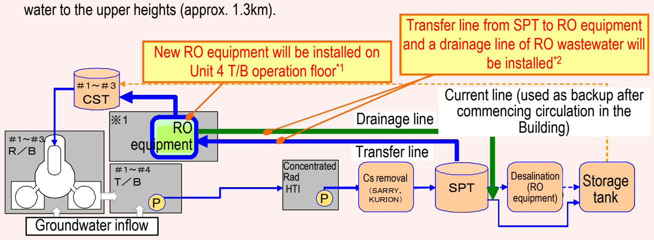
Progress toward decommissioning: Work related to circulation cooling and accumulated water treatment line

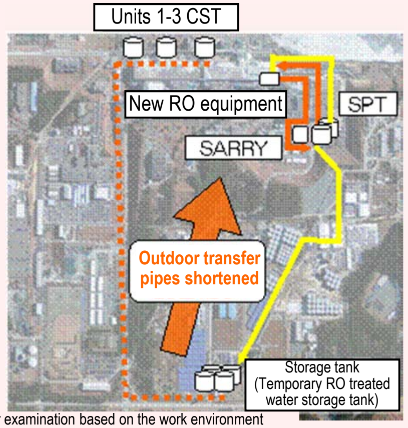
Immediate target	Stably continue reactor cooling and accumulated water treatment, and improve reliability

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 first half of FY2015, 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 based on the work environment

*2 A detailed line configuration will be determined after further examination

Typhoon measures improved for Tank Area

-Enhanced rainwater measures were implemented, including increasing the height of fences to increase the capacity to receive rainwater and installing rain gutters and fence cover to prevent rainwater inflow. Though a total of 300mm of rainfall was recorded by typhoon Nos. 18 and 19, no outflow of contaminated rainwater from inside the fences was detected.


Before installing the fence cover

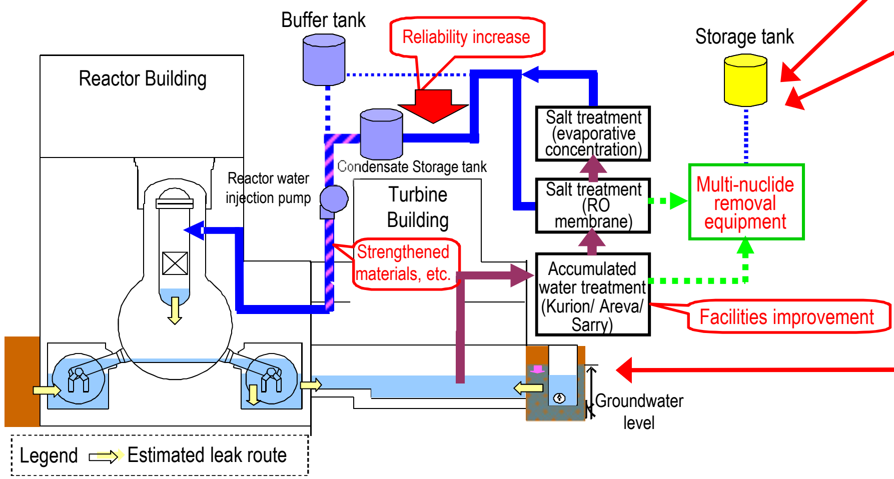

After installing the fence cover

Risk reduction of contaminated water stored in tanks

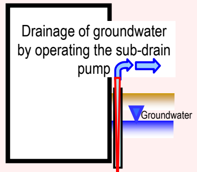
In addition to multi-nuclide removal equipment (ALPS), the installation of multiple purification systems to remove strontium is also proceeding.

The contaminated water in the initial group of tanks was treated using mobile strontium-removal equipment that circulates contaminated water in tanks and removes strontium from it.

The cesium absorption apparatus (KURION) and secondary cesium absorption apparatus (SARRY), which remove cesium from contaminated water transferred from buildings, were modified to commence their operation with the added operation of the removal of strontium from the end of December.

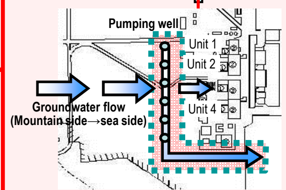


Preventing groundwater from flowing into the Reactor Buildings



Aiming to reduce the level of groundwater by pumping subdrain water, tests were conducted to verify the stable operation of water treatment facilities, including subdrain. The results showed that through purification by the system, the density of radioactive materials declined to below the operational target and no other γ nuclides were detected.

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.

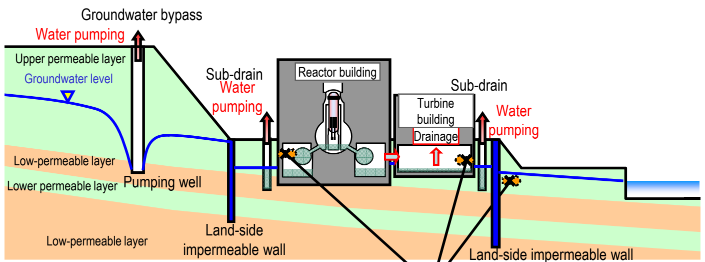
The pumped up groundwater is temporarily stored in tanks and released after TEPCO and a third-party organization have confirmed that its quality meets operational targets.

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

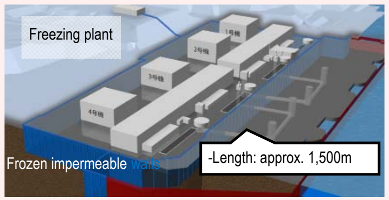
At the observation holes installed at a height equivalent to the buildings, the trend showing a decline in groundwater levels is checked.

The analytical results on groundwater inflow into the buildings based on existing data showed a declining trend.

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



Preventing water from accessing contamination source



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

Targeting efforts to commence freezing at the end of this fiscal year, drilling holes to install frozen pipes commenced from June 2.

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.

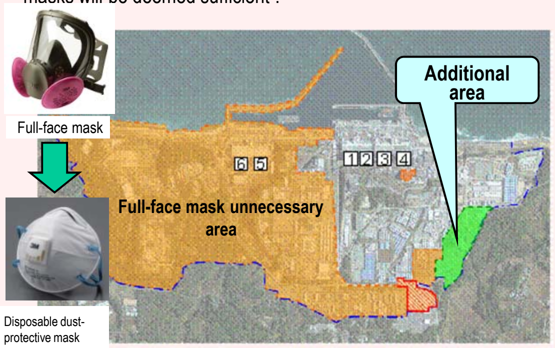
Progress toward decommissioning: Work to improve the environment within the site

Immediate targets	- 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

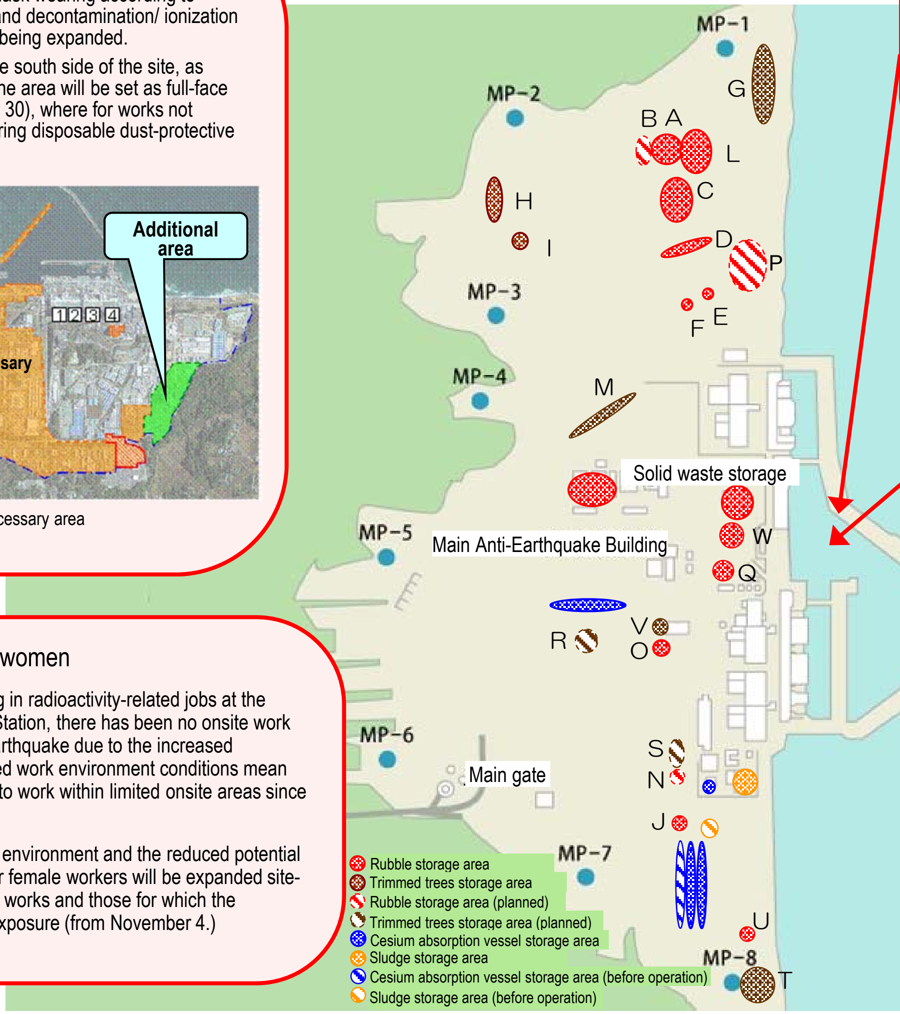
Expansion of full-face mask unnecessary area

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 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



Expansion of work areas for women

Regarding female workers engaging in radioactivity-related jobs at the Fukushima Daiichi Nuclear Power Station, there has been no onsite work area since the East Japan Great Earthquake due to the increased radioactivity rate. However, improved work environment conditions mean female workers have been allowed to work within limited onsite areas since June 2012.

Based on the improved onsite work environment and the reduced potential for internal exposure, work areas for female workers will be expanded site-wide, excluding specified high-dose works and those for which the radiation dose exceeds 4mSv per exposure (from November 4.)

Installation of impermeable walls on the sea side

To prevent contamination expansion into the sea where contaminated water had leaked into groundwater, impermeable walls are being installed.

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, 2014)
(3) Eliminate contamination sources
-Removing contaminated water in branch trenches and closing them (completed on September 19, 2013)
-Removal of contaminated water in the seawater pipe trench
Unit 2: November 25, 2014 to December 18, 2014 - filling of tunnel sections with cement-based materials.
Unit 3: Drilling of holes to install frozen/ temperature-measurement pipes is completed.