Outline of Decommissioning and Contaminated Water Management

April 30, 2020
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment

Main decommissioning work and steps

Fuel removal from the spent fuel pool was completed in December 2014 at Unit 4 and started from April 15, 2019 at Unit 3. Dust density in the surrounding environment is being monitored and work is being implemented with safety first. Work continues sequentially toward the start of fuel removal from Units 1 and 2 and debris (Note 1) retrieval from Units 1-3.

Fuel Removal from SFP

Units 1 & 2: Rubble removal & dose reduction → Installing fuel removal machine
Unit 3: Fuel removal
Unit 4: Storage and handling

Units 1-6	Completion of fuel removal	Within 2031
Unit 1	Start of fuel removal	FY2027 - FY2028
Unit 2	Start of fuel removal	FY2024 - FY2026
Unit 3	Completion of fuel removal	Within FY2020
Unit 4	Completion of fuel removal	2014

Fuel Debris Retrieval

Unit 1-3 / Unit 2: Ascertaining the status inside the PCV/ examining the fuel debris retrieval method, etc. (Note 2) → Fuel debris retrieval → Storage and handling

First unit	Start of fuel debris retrieval
Unit 2	Within 2021

Dismantling Facilities

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

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

Fuel removal from the spent fuel pool

Fuel removal from the spent fuel pool started from April 15, 2019 at Unit 3. With the aim of completing fuel removal by the end of FY2020, rubble and fuel are being removed.

Fuel removal (April 15, 2019)

Removed fuel (assemblies)
119/566
(As of April 30, 2020)

Contaminated water management proceeds with the following three efforts:

(1) Efforts to promote contaminated water management based on the three basic policies

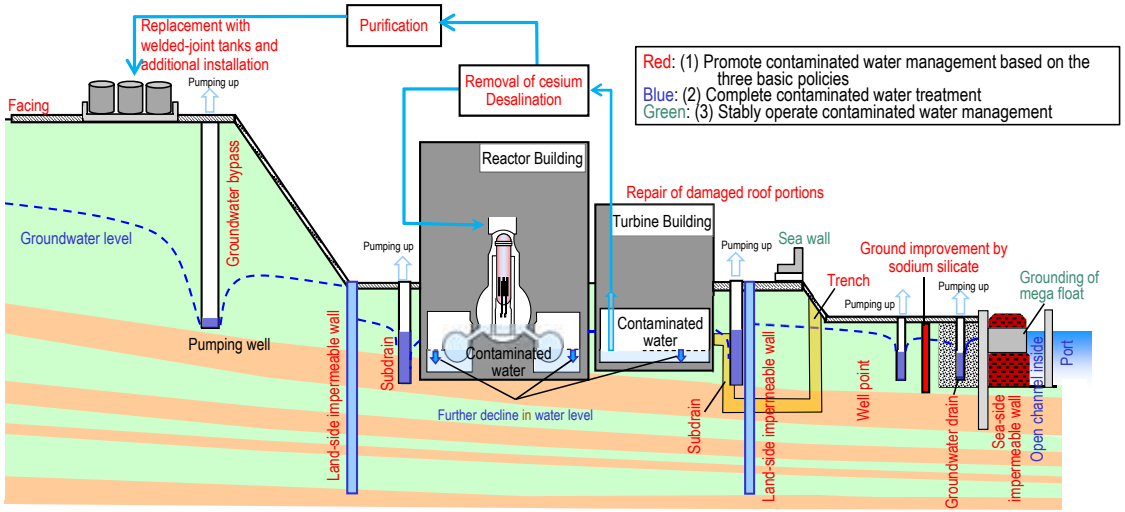
[Three basic policies]
1. "Remove" the source of water contamination
2. "Redirect" fresh water from contaminated areas
3. "Retain" contaminated water from leakage

(2) Efforts to complete contaminated water treatment

4. Treatment of contaminated water in buildings
5. Measures to remove α–nuclide and reduce the density in contaminated water
6. Measures to alleviate the radiation dose of Zeolite sandbags in the Process Main Building and High-Temperature Incinerator Building and examine safe management methods

(3) Efforts to stably operate contaminated water management

7. Planning and implementing necessary measures to prepare for large-scale disasters such as tsunami and heavy rain
8. Periodically inspecting and updating facilities to maintain the effect of contaminated water management going forward
9. Examining additional measures as required, with efforts to gradually expand the scale of fuel debris retrieval in mind



(1) Efforts to promote contaminated water management based on the three basic policies

- Strontium-treated water from other equipment is being re-treated in the multi-nuclide removal equipment (ALPS) and stored in welded-joint tanks.
- Multi-layered contaminated water management measures, including land-side impermeable walls and subdrains, have stabilized the groundwater at a low level. The increased contaminated water generated during rainfall is being suppressed by repairing damaged portions of building roofs, facing onsite, etc. Through these measures, the generation of contaminated water was reduced from approx. 540 m^3/day (in May FY2014) to approx. 170 m^3/day (in FY2018).
- Measures continue to further suppress the generation of contaminated water to approx. 150 m^3/day within FY2020 and 100 m^3/day or less within 2025.

(2) Efforts to complete contaminated water treatment

- Contaminated water levels in buildings declined as planned and connected parts between Units 1 and 2 and Units 3 and 4 were separated respectively. For α-nuclide detected as water levels progressively declined, characteristics are being determined and treatment methods are examined.
- Treatment of contaminated water in buildings will be completed within 2020, excluding Unit 1-3 Reactor Buildings, Process Main Building and High Temperature Incinerator Building. For Reactor Buildings, the amount of contaminated water will be halved during the period FY2022 - 2024 from the levels at the end of 2020.
- For Zeolite sandbags on the basement floors of the Process Main Building and High Temperature Incinerator Building, measures to reduce the radiation dose are being examined with stabilization in mind.

(3) Efforts to stably operate contaminated water management

- To prepare for tsunamis, measures including closing openings of buildings, installing sea walls and transferring and grounding the mega float are being implemented. For heavy rain, sandbags are being installed to suppress direct inflow into buildings while enhancing drainage channels and implementing other measures as planned.

Progress Status and Future Challenges of the Mid-and-Long-Term Roadmap toward Decommissioning of TEPCO Holdings Fukushima Daiichi Nuclear Power Station (Outline)

Progress status

◆ The temperatures of the Reactor Pressure Vessel (RPV) and Primary Containment Vessel (PCV) of Units 1-3 have been maintained within the range of approx. 15-25°C*1 over the past month. There was no significant change in the density of radioactive materials newly released from Reactor Buildings into the air*2. It was concluded that the comprehensive cold shutdown condition had been maintained.

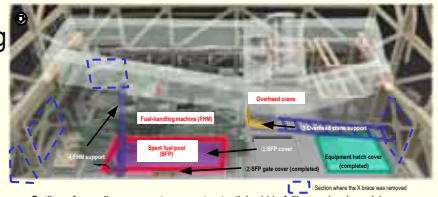
* 1 The values varied somewhat, depending on the unit and location of the thermometer.

* 2 In March 2020, the radiation exposure dose due to the release of radioactive materials from the Unit 1-4 Reactor Buildings was evaluated at less than 0.00014 mSv/year at the site boundary. The annual radiation dose from natural radiation is approx. 2.1 mSv/year (average in Japan).

Toward installation of the Unit 1 SFP cover

As part of work to remove the falling roof on the south side of the Reactor Building operating floor, a cover will be installed over the SFP to prevent rubble falling on the pool and reduce risks. Before the actual installation, a mockup test of the work was conducted to confirm that there was no problem with the insertion of the rolled SFP cover bag and its extension. At present, the final check for the work, including training, is underway.

After the check, the bag will be inserted on the SFP from the east side of the Reactor Building from around mid-June 2020. The bag will then be expanded by air, air mortar injected in the bag and the cover installation completed by around late June.



<Outline of overall measures to prevent potential rubble falling and reduce risks>

<Insertion-expansion of the cover bag>

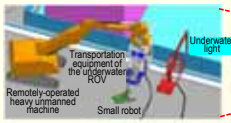
<Injection of air mortar and completion of installation>

Investigation inside the Unit 2 SFP in mid-June

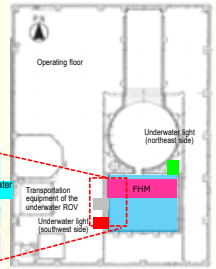
Before fuel removal from the SFP, a remote-controlled investigation inside the SPF using an underwater ROV with a camera will be conducted to check the fuel top and any potential obstacles.

At present, preparation is underway, including carrying in equipment. Following mockup training at the Fukushima Robot Test Field in mid-May, the investigation will be conducted in mid-June.


<Underwater ROV>



<Image of equipment installation on the SFP southwest side>

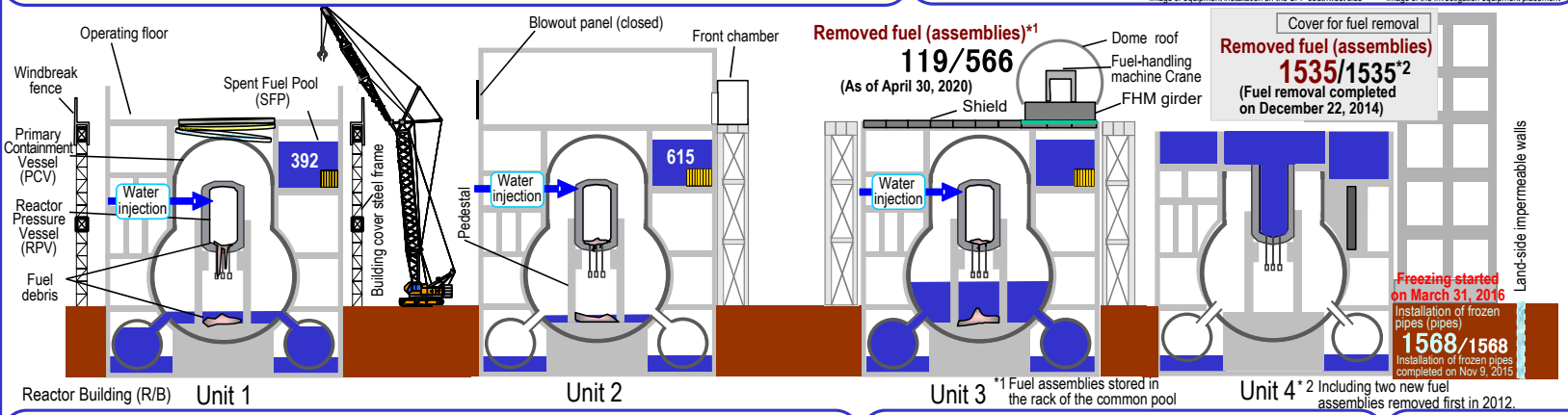


<Image of the investigation equipment placement>

Inspection including operation check for the Unit 3 FHM

From March 30, the fuel-handling machine (FHM) is being inspected during the legal inspection of cranes. In FY2020, in addition to the inspection items of FY2019, a series of operation checks assuming fuel removal are being conducted.

With safer and earlier removal in mind, rubble was removed in advance. To prepare for continuous fuel removal, additional training for added workers will be provided after the inspection and fuel removal will be resumed from late May if possible.



*1 Fuel assemblies stored in the rack of the common pool

*2 Including two new fuel assemblies removed first in 2012.

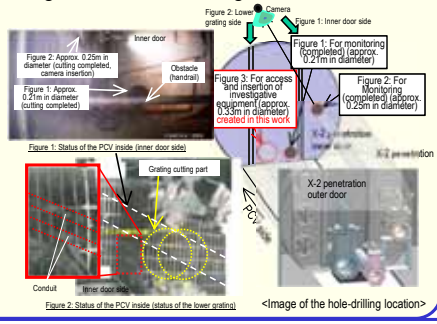
"Sessions for hearing opinions"

Based on the report from the "Subcommittee on Handling of the ALPS Treated Water" published on February 10, 2020, the government held a meeting as an opportunity to receive opinions from a wide variety of concerned parties, including representatives of local municipalities and associations in the fields of agriculture, forestry and fisheries, on April 6 and 13 and is opening a call for public comments in written documents during the period April 6 – May 15.

Completion of the PCV inner door holes created to construct the Unit 1 access route

Toward investigating the inside of the Unit 1 Primary Containment Vessel (PCV), an access route is being constructed. As pre-investigation before cutting obstacles inside the PCV, a camera was inserted from the completed hole to check the inside and confirm that no fallen objects which may affect future cutting work were present.

After the pre-investigation, work to create the third hole (approx. 0.33 m in diameter: Figure 3) in the inner door started and was completed on April 22. As the following access route construction work, cutting of obstacles will start from around mid-May if possible.



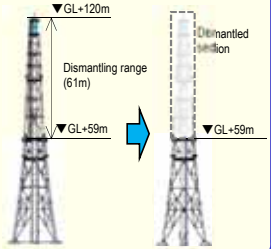
<Image of the hole-drilling location>

Dismantling to the scheduled 23rd block of the Unit 1/2 exhaust stack

For the Unit 1/2 exhaust stack, dismantling to the scheduled 23rd block had been completed by April 29.

As a measure to prevent rainwater infiltration from the top, a lid will be installed on the top.

Work continues with safety first, toward completing dismantling by early May.



<Before dismantling>

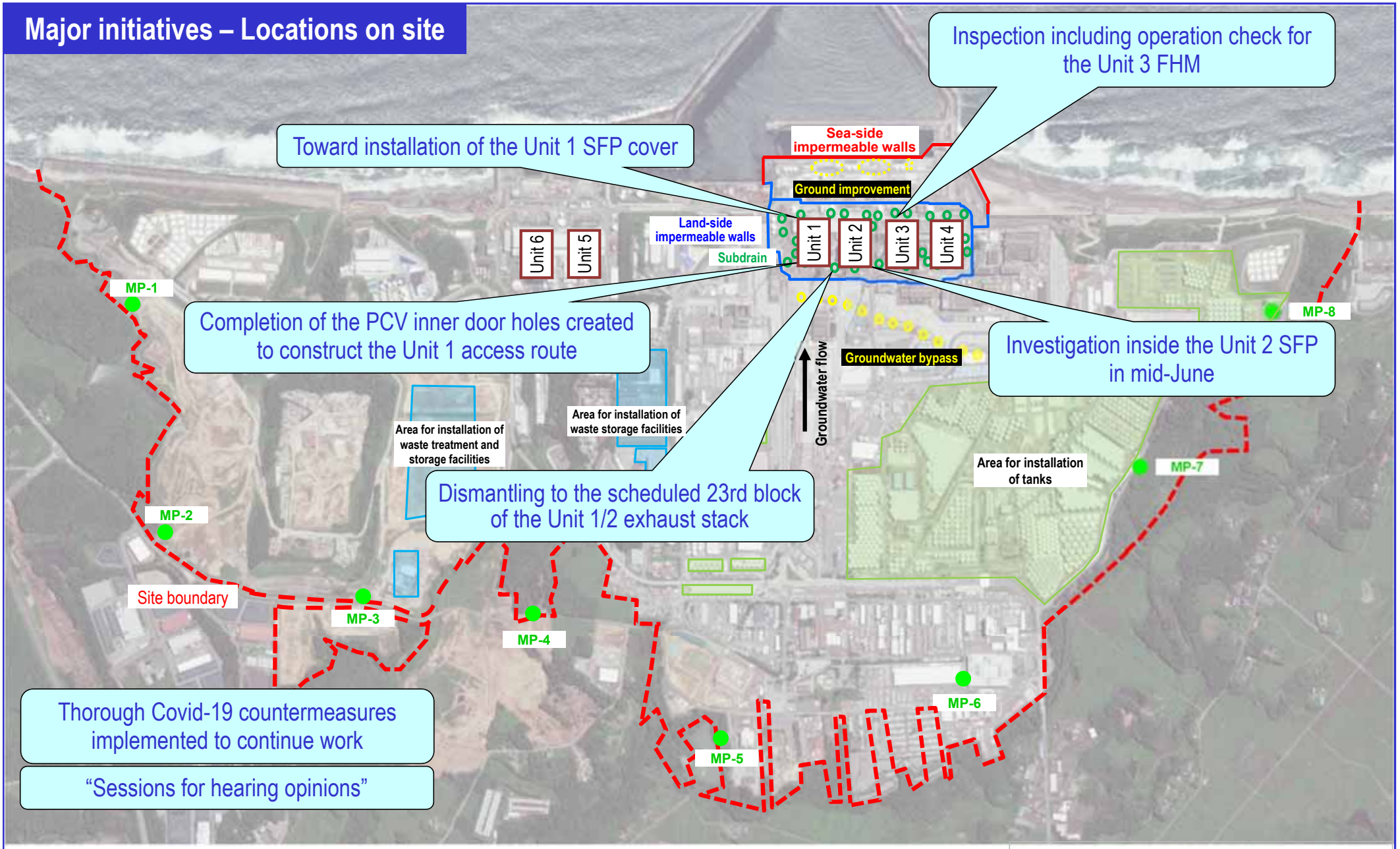
<Present>

Thorough Covid-19 countermeasures implemented to continue work

At the Fukushima Daiichi Nuclear Power Station, countermeasures have been implemented to prevent the infection spread of Covid-19, such as requiring employees to take their temperature prior to coming to the office and to wear masks at all times, etc. In light of the fact that no TEPCO HD employees or cooperative firm laborers at the Fukushima Daiichi NPS have contracted Covid-19 (as of April 27), at current time fieldwork will continue as usual.

In order to prevent the infection spread of Covid-19, efforts shall further be enhanced to avoid the "Three Cs" (Closed spaces, Crowded places, Close-contact settings). Moreover, the following additional countermeasures are implemented from April 29 through May 10, which has been deemed an "enhanced countermeasures period," in order to reduce the risk of infection: all personnel have been requested to avoid leaving their homes for unnecessary reasons, including travel outside of Fukushima Prefecture, during this period. Efforts will continue to prevent occurrence and increase of infection cases.

Major initiatives – Locations on site



* Data of Monitoring Posts (MP1-MP8.)

Data (10-minute values) of Monitoring Posts (MPs) measuring the airborne radiation rate around site boundaries showed 0.347 – 1.266 μSv/h (March 26 – April 26, 2020).

We improved the measurement conditions of monitoring posts 2 to 8 to measure the air-dose rate precisely. Construction work, such as tree-clearing, surface soil removal and shield wall setting, were implemented from February 10 to April 18, 2012.

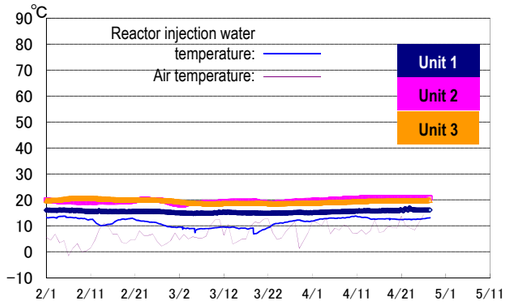
Therefore, monitoring results at these points are lower than elsewhere in the power plant site.

The radiation shielding panels around monitoring post No. 6, which is one of the instruments used to measure the radiation dose at the power station site boundary, were taken off from July 10-11, 2013, since further deforestation, etc. had caused the surrounding radiation dose to decline significantly.

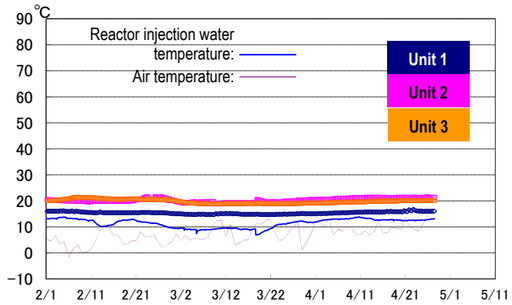
I. Confirmation of the reactor conditions

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 were maintained within the range of approx. 15 to 25°C for the past month, though they varied depending on the unit and location of the thermometer.



RPV bottom temperatures (recent quarter)



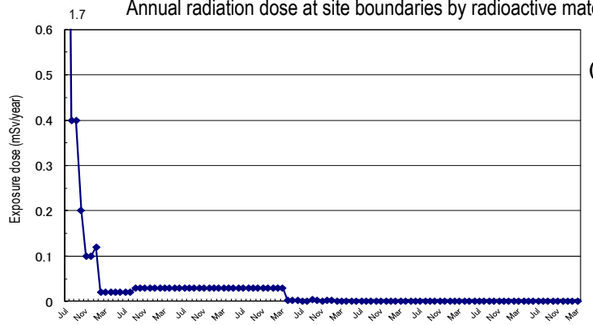
PCV gas phase temperatures (recent quarter)

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

2. Release of radioactive materials from the Reactor Buildings

As of March 2020, the density of the radioactive materials newly released from Reactor Building Units 1-4 into the air and measured at the site boundary was evaluated at approx. 3.4×10^{-12} Bq/cm³ and 1.4×10^{-11} Bq/cm³ for Cs-134 and Cs-137 respectively, while the radiation exposure dose due to the release of radioactive materials there was less than 0.00014 mSv/year.

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/cm³
[Cs-137]: 3 x 10^{-5} Bq/cm³

* Data of Monitoring Posts (MP1-MP8).
Data of Monitoring Posts (MPs) measuring the air dose rate around the site boundary showed 0.347 – 1.266 μSv/h (March 26 – April 26, 2020).
To measure the variation in the air dose rate of MP2-MP8 more accurately, environmental improvement (tree trimming, removal of surface soil and shielding around the MPs) was completed.

Note 1: 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. The evaluation has been changed to a method considering the values of continuous dust monitors since FY2015, with data to be evaluated monthly and announced the following month.

Note 2: Radiation dose was calculated using the evaluation values of release amount from Units 1-4 and Units 5 and 6. The radiation dose of Unit 5 and 6 was evaluated based on expected release amount during operation until September 2019 but the evaluation method was reviewed and changed to calculate based on the actual measurement results of Units 5 and 6 from October.

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 anomaly in the cold shutdown condition or criticality sign 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.

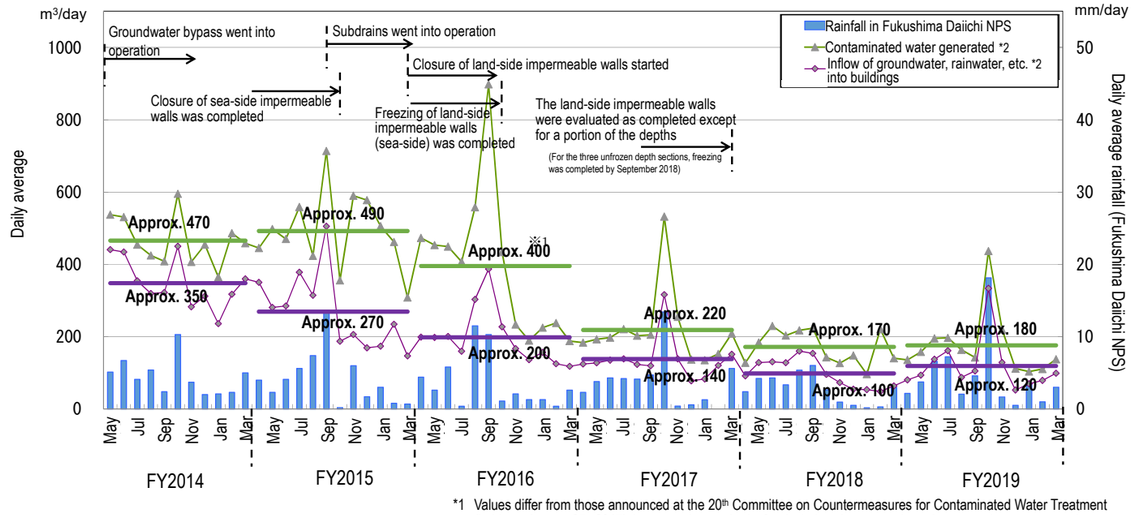
II. Progress status by each plan

1. Contaminated water management

Based on the three basic policies: "remove" the source of water contamination, "redirect" fresh water from contaminated areas and "retain" contaminated water from leakage, multi-layered contaminated water management measures have been implemented to stably control groundwater

➢ Status of contaminated water generated

- Multi-layered measures, including pumping up by subdrains and land-side impermeable walls, which were implemented to control the continued generation of contaminated water, suppressed the groundwater inflow into buildings.
- After "redirecting" measures (groundwater bypass, subdrains, land-side impermeable walls and others) were steadily implemented, the generation amount reduced from approx. 470 m³/day (the FY2014 average) when the measures were first launched to approx. 180 m³/day (the FY2019 average).
- Measures will continue to further reduce the volume of contaminated water generated.



*1 Values differ from those announced at the 20th Committee on Countermeasures for Contaminated Water Treatment (held on August 25, 2017) because the method of calculating the contaminated water volume generated was reviewed on March 1, 2018. Details of the review are described in the materials for the 50th and 51st meetings of the Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment.

*2: The monthly daily average is derived from the daily average from the previous Thursday to the last Wednesday, which is calculated based on the data measured at 7:00 on every Thursday.

Figure 1: Changes in contaminated water generated and inflow of groundwater, rainwater, into buildings

➢ Operation of the groundwater bypass

- From April 9, 2014, the operation of 12 groundwater bypass pumping wells commenced sequentially to pump up groundwater. The release then started from May 21, 2014, in the presence of officials from the Intergovernmental Liaison Office for the Decommissioning and Contaminated Water Issue of the Cabinet Office. Up until April 26, 2020, 548,651 m³ of groundwater had been released. The pumped-up groundwater was temporarily stored in tanks and released after TEPCO and a third-party organization had confirmed that its quality met operational targets.
- Pumps are inspected and cleaned as required based on their operational status.

➢ Operation of the Water Treatment Facility special for Subdrain & Groundwater drains

- To reduce the level of groundwater flowing into the buildings, work began to pump up groundwater from wells (subdrains) around the buildings on September 3, 2015. The pumped-up groundwater was then purified at dedicated facilities and released from September 14, 2015, in the presence of officials from the Intergovernmental Liaison Office for the Decommissioning and Contaminated Water Issue of the Cabinet Office. Up until April 26, 2020, a total of 885,806 m³ had been drained after TEPCO and a third-party organization had confirmed that its quality met operational targets.
- Due to the rising level of the groundwater drain pond after the sea-side impermeable walls had been closed, pumping started on November 5, 2015. Up until April 27, 2020, a total of approx. 234,523 m³ had been pumped up and a volume of under 10 m³/day is being transferred from the groundwater drain to the Turbine Buildings (average for the period March 19 - April 22, 2020).
- As one of the multi-layered contaminated-water management measures, in addition to waterproof pavement (facing that aims to improve the work environment and prevent rainwater infiltration: as of the end of March 2020, approx.

94% of the planned area (1,450,000 m² onsite) had been completed) to suppress rainwater infiltrating the ground, facilities to enhance the subdrain treatment system were installed and went into operation from April 2018, increasing the treatment capacity from 900 to 1,500 m³/day and improving reliability. Operational efficiency was also improved to treat up to 2,000 m³/day for almost one week during the peak period.

- To maintain the level of groundwater , work to install additional subdrain pits and to recover existing ones is underway. The additional pits are scheduled to start operation sequentially, from a pit which work is completed (12 of 14 new subdrain pits went into operation). For recovering the existing pits, work for all three pits scheduled was completed. All of them went into operation from December 26, 2018. Work to recover another pit started from November 2019 (No. 49 pit).
- To eliminate the need to suspend water pumping while cleaning the subdrain transfer pipe, the pipe will be duplicated. Installation of the pipe and ancillary facilities was completed.
- Since the subdrains went into operation, the inflow to buildings tended to decline to under 150 m³/day when the subdrain water level declined below T.P. 3.0 m but increased during rainfall.

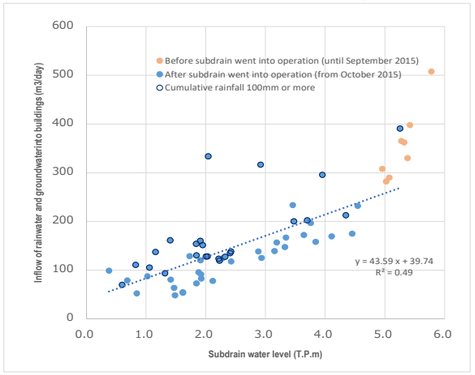


Figure 2: Correlation between inflow such as groundwater and rainwater into buildings and the water level of Units 1-4 subdrains

➢ Construction status of the land-side impermeable walls and status of groundwater levels around the buildings

- An operation to maintain the land-side impermeable walls and prevent the frozen soil from thickening further continued from May 2017 on the north and south sides and started from November 2017 on the east side, where sufficiently thick frozen soil was identified. The scope of the maintenance operation was expanded in March 2018.
- In March 2018, construction of the land-side impermeable walls was completed, except for a portion of the depth, based on a monitoring result showing that the underground temperature had declined below 0°C in almost all areas, while on the mountain side, the difference in internal and external water levels increased to approx. 4-5 m. The 21st Committee on Countermeasures for Contaminated-Water Treatment, held on March 7, 2018, evaluated that alongside the function of subdrains and other measures, a water-level management system to stably control groundwater and redirect groundwater from the buildings had been established and allowed the amount of contaminated water generated to be reduced significantly.
- A supplementary method was implemented for the unfrozen depth and it was confirmed that the temperature of this portion had declined below 0°C by September 2018. From February 2019, a maintenance operation started throughout all sections.
- The groundwater level in the area inside the land-side impermeable walls has been declining every year. On the mountain side, the difference between the inside and outside increased to approx. 5-6 m. The water level in the bank area has remained low (T.P. 1.6-1.7 m) compared to the ground surface (T.P. 2.5 m).

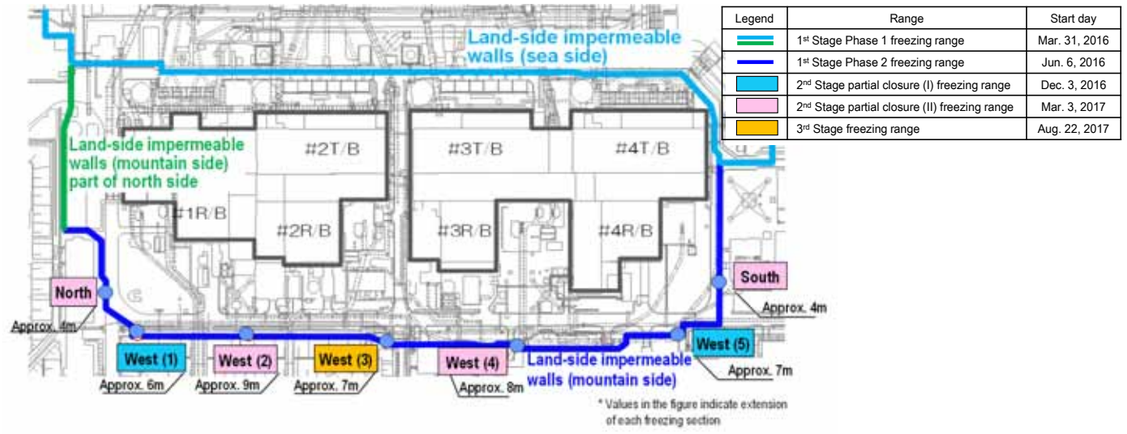


Figure 3: Closure parts of the land-side impermeable walls (on the mountain side)

➢ Operation of multi-nuclide removal equipment

- Regarding the multi-nuclide removal equipment (existing 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; and for high-performance equipment, from October 18, 2014). The additional multi-nuclide removal equipment went into full-scale operation from October 16, 2017.
- As of April 23, 2020, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 433,000, 642,000 and 103,000 m³, respectively (including approx. 9,500 m³ stored in the J1(D) tank, which contained water with highly concentrated radioactive materials at the System B outlet of the existing multi-nuclide removal equipment).
- To reduce the risks of strontium-treated water, treatment using existing, additional and high-performance multi-nuclide removal equipment has been underway (existing: from December 4, 2015; additional: from May 27, 2015; high-performance: from April 15, 2015). Up until April 23, 2020, approx. 701,000 m³ had been treated.

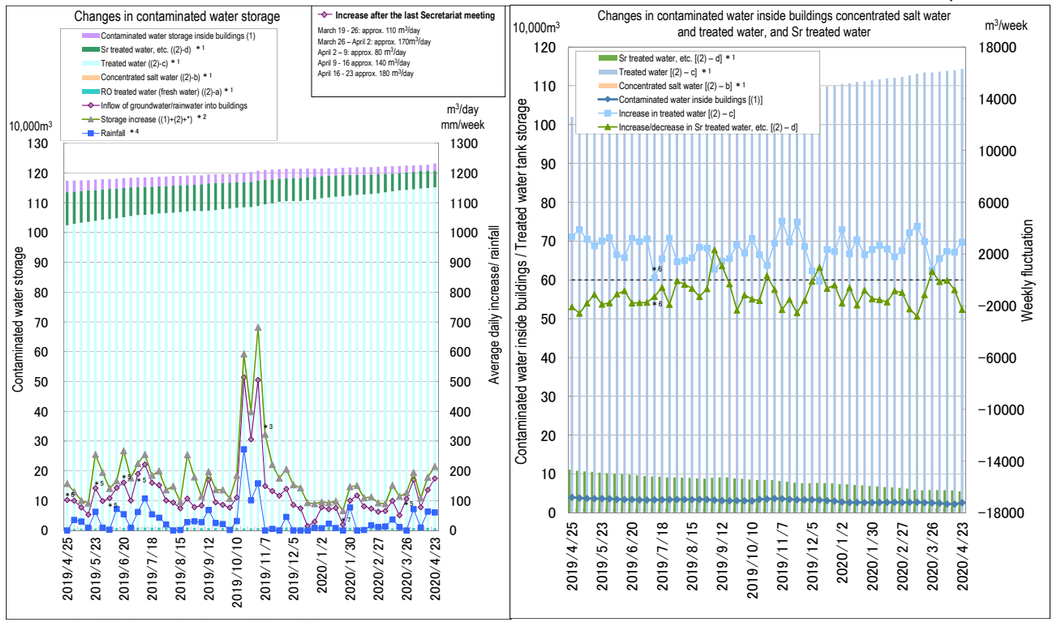
➢ Toward reducing the risk of contaminated water stored in tanks

- Treatment measures comprising the removal of strontium by cesium-absorption apparatus (KURION) (from January 6, 2015), the secondary cesium-absorption apparatus (SARRY) (from December 26, 2014) and the third cesium-absorption apparatus (SARRY II) (from July 12, 2019) are underway. Up until April 23, 2020, approx. 581,000 m³ had been treated.

➢ Measures in the Tank Area

- Rainwater accumulates and is collected inside the area of contaminated water tanks. After removing radionuclides, the rainwater is sprinkled on the ground of the site, if the radioactivity level does not meet the standard for discharging into the environment since May 21, 2014 (as of April 27, 2020, a total of 152,350 m³).

As of April 23, 2020



*1: Water amount for which the water-level gauge indicates 0% or more

*2: To detect storage increases more accurately, the calculation method was reviewed as follows from February 9, 2017: (The revised method was applied from March 1, 2018)
[(Inflow of groundwater/rainwater into buildings) + (other transfer) + (chemical injection into ALPS)]

*3: The storage amount increased due to transfer to buildings in association with the decommissioning work.
(The transferred amount comprised (① Transfer of RO concentrated water from groundwater drains to Turbine Building: approx. 80 m³/day, ② Transfer from wells and groundwater drains: approx.50 m³/day, ③ Transfer from Unit 5//6 SPT to Process Main Building: approx. 20 m³/day, others)

*4: Changed from December 13, 2018 from rainfall in Namie to that within the site.

*5: Considered attributable to the increased inflow of groundwater, rainwater and others to buildings due to the decline in the level of contaminated water in buildings. (April 22, May 16 and 30, June 13 and 27, 2019, March 18, 2020)

*6: Methods of calculating the water volume and the capacity of tanks, which had varied in each tank area, were unified, which led to changes in the calculated increase in treated water and variation in Sr-treated water and others. However, the actual treated volumes were approx. 2,200 m³/week for treated water and approx. 1,100 m³/week for Sr-treated water and others (July 11, 2019).

*7: From the period January 16-23, 2019, amid a decline in the water level in Unit 4 R/B, system water in S/C flowing into R/B contaminated water is reflected in the inflow of groundwater and rainwater in addition to the transferred amount generated in decommissioning work.

Figure 4: Status of contaminated water storage

➢ Onsite investigation toward removing the Unit 1/2 SGTS pipes

- Removal of pipes for the Unit 1/2 standby gas treatment system (SGTS) is being examined because the high density is possibly attributable to the radioactivity density in water from the Unit 1/2 exhaust stack drain sump pit and to prevent interference with work of the rainwater prevention measures for the Unit 1/2 Radioactive Waste Treatment Building and reduce the onsite dose.
- Toward removing the Unit 1/2 SGTS pipes, an onsite investigation will be conducted. As an investigation inside the exhaust stack, inside images are being taken and the inside dose measured from April 2020 and a wipe sampling of the inner surface will be conducted.
- Based on the investigative results, examination will proceed to complete the pipe removal within the 1st half of FY2021.

2. Fuel removal 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 was completed by December 22, 2014

➢ Main work to help spent fuel removal at Unit 1

- From March 18, 2019, the removal of small rubble in the east-side area around the spent fuel pool (SFP) started using pliers and suction equipment, while from July 9, small rubble removal on the south side of the SFP started.
- The well plug, which was considered misaligned from its normal position due to the influence of the hydrogen explosion at the time of the accident, was investigated for the period July 17 – August 26, 2019, by taking photos with a camera, measuring the air dose rate and collecting 3D images.
- A prior investigation on September 27, 2019 confirmed the lack of any obstacle which may affect the plan to install the cover over the SFP, the absence of any heavy object such as a concrete block, as detected in Unit 3 and the fact that panel- and bar-shaped rubble pieces were scattered on the rack.
- After examining two methods: (i) installing a cover after rubble removal and (ii) initially installing a large cover over the Reactor Building and then removing rubble inside the cover, method (ii) was selected to ensure safer and more secure removal.
- As part of work to remove the falling roof on the south side of the Reactor Building operating floor, a cover will be installed over the SFP to prevent rubble falling on the pool and reduce risks. Before the actual installation, a mockup test of the work was conducted to confirm that there was no problem with the insertion of the rolled SFP cover bag and its extension. At present, the final check for the work, including training, is underway. After the check, the bag will be inserted on the SFP from the east side of the Reactor Building from around mid-June 2020. The bag will then be expanded by air, air mortar injected in the bag and the cover installation completed by around late June.

➢ Main work to help spent fuel removal at Unit 2

- On November 6, 2018, before investigating with a work plan to dismantle the Reactor Building rooftop and other tasks in mind, work to move and contain the remaining objects on the operating floor (1st round) was completed.
- On February 1, 2019, an investigation to measure the radiation dose on the floor, walls and ceiling inside the operating floor and confirm the contamination status was completed. After analyzing the investigative results, the “contamination density distribution” throughout the entire operating floor was obtained, based on which the air dose rate inside the operating floor could be evaluated. A shielding design and measures to prevent radioactive material scattering will be examined.
- From April 8, 2019, work to move and contain the remaining objects on the operating floor (second round) started, such as materials and equipment which may hinder installation of the fuel-handling facility and other work. The second round mainly included moving the remaining small objects and placing them in the container. It also included cleaning the floor to suppress dust scattering and was completed on August 21.
- From September 10, 2019, work to move and contain the remaining objects on the operating floor (third round) started, such as materials and equipment which may hinder the installation of the fuel-handling facility and other work. The third round mainly included moving the remaining large objects and placing them in the container.
- Training to practice work skills started from March 2020 and containers housing the remaining objects during the previous work will be transported to the solid waste storage facility from May.
- For fuel removal methods, based on the investigative results inside the operating floor from November 2018 to February 2019, a method to access from a small opening installed on the south side of the building was selected with aspects such as dust management and lower work exposure in mind (the method previously examined had involved fully dismantling the upper part of the building).
- Before fuel removal from the SFP, a remote-controlled investigation inside the SFP using an underwater ROV with a camera will be conducted to check the fuel top and any potential obstacles. At present, preparation is underway, including carrying-in of equipment. Following mockup training at the Fukushima Robot Test Field in mid-May 2020, the investigation will be conducted in mid-June.

➢ Main process to help fuel removal at Unit 3

- From April 15, 2019, work to remove 514 spent fuel assemblies and 52 non-irradiated fuel assemblies (566 assemblies in total) stored in the spent fuel pool started. Seven non-irradiated fuel assemblies were then loaded into the transportation cask and transported to the common pool on April 23. The first fuel removal was completed on April 25.
- From July 4, 2019, fuel removal was resumed and up until July 21, 28 of all 566 fuel assemblies had been removed.
- The periodical inspection of the fuel-handling facility, which started on July 24, 2019, was completed on September 2, 2019. Some defective rotations of the tensile truss and mast were detected during the following adjustment work toward resumption of the fuel removal. In response, parts were replaced and the operation checked to confirm no problem.
- During an operation check using simulant fuel, however, interference of cans inside the transportation cask and

simulant fuel was identified on December 14, 2019. Though the following investigation confirmed slight leaning of the FHM mast, countermeasures, including a review of the procedures, were implemented.

- Fuel removal work was resumed from December 23, 2019 and has proceeded as planned.
- By February 14, 2020, a visual check of all fuel handles was completed. On March 25, a check of fuel soundness by a tool detected deformation of another fuel handle and a fuel rack hanging piece. There was no damage affecting the external environment (deformed handles were identified in a total of 15 fuel assemblies).
- From March 30, 2020, the fuel-handling machine is being inspected during the legal inspection of cranes. This fiscal year, in addition to the inspection items of the previous fiscal year, a series of operation checks assuming fuel removal are being conducted. With safer and earlier removal in mind, rubble was removed before the work. To prepare for continuous fuel removal, additional training for added workers will be provided after the inspection and fuel removal will be resumed from late May if possible.

➢ Progress status of dismantling work for the Unit 1/2 exhaust stack

- For the Unit 1/2 exhaust stack, dismantling to the scheduled 23rd block had been completed by April 29, 2020. As a measure to prevent rainwater infiltration from the top, a lid will be installed on the top.
- Work continues with safety first toward completing dismantling by early May 2020.

3. Retrieval of fuel debris

➢ Construction of an access route toward investigating the inside of the Unit 1 PCV

- Toward investigating the inside of the Unit 1 Primary Containment Vessel (PCV), an access route is being constructed. As pre-investigation before cutting obstacles inside the PCV, a camera was inserted from the completed hole to check the inside and confirm that no fallen objects which may affect future cutting work were present.
- After the pre-investigation, work to create the third hole (approx. 0.33 m in diameter) in the inner door started and was completed on April 22, 2020. As the following access route construction work, cutting of obstacles will start from around mid-May if possible.

4. Plans to store, process and dispose of solid waste and decommission of 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 the rubble and trimmed trees

- As of the end of March 2020, the total storage volume of the concrete and metal rubble was approx. 292,000 m³ (+2,200 m³ compared to at the end of February with an area-occupation rate of 72%). The total storage volume of trimmed trees was approx. 134,300 m³ (+100 m³, with an area-occupation rate of 77%). The total storage volume of used protective clothing was approx. 46,400 m³ (-1,800 m³, with an area-occupation rate of 68%). The increase in rubble was mainly attributable to work related to rubble removal around the Unit 1-4 buildings, while the decrease in used protective clothing was attributable to the operation of the incinerator.

➢ Management status of secondary waste from water treatment

- As of April 2, 2020, the total storage volume of waste sludge was 597 m³ (area-occupation rate: 85%), while that of concentrated waste fluid was 9,356 m³ (area-occupation rate: 91%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment and other vessels, was 4,718 (area-occupation rate: 74%).

5. Reactor cooling

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

➢ Deviation from the limiting condition for operation at the nitrogen injection facility and determination of recovery

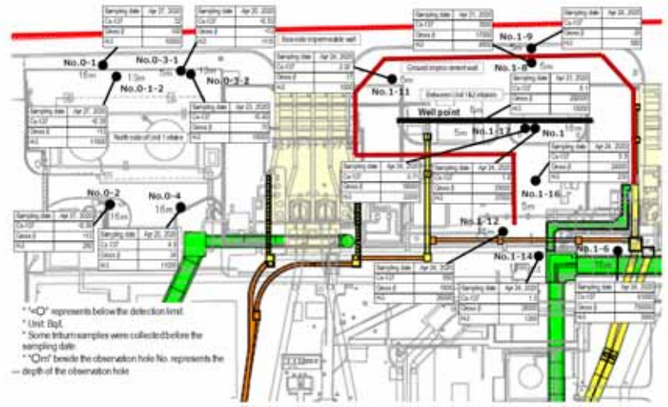
- On April 24, 2020, for the nitrogen injection facility into the reactor, the nitrogen flow rate did not decline when the nitrogen gas separator (B) was suspended for the regular separator switching operation. An investigation into the past operation confirmed that the power supply to the nitrogen density meter of the separator (B) was lost from April 21. This was regarded as deviation from the limiting condition for operation (LCO) because the requirement to “check the nitrogen density daily” as specified in the Implementation Plan Part 1 Article 25 (Function to maintain inert atmosphere inside the PCV) had not been satisfied.
- On the same day, the facility was re-switched. After confirming that the injected nitrogen density was 99% or more, it was determined the same day that the deviation from the LOC had been recovered.
- At present, the detailed cause of this event is being investigated and measures examined.

6. Reduction in radiation dose and mitigation of contamination

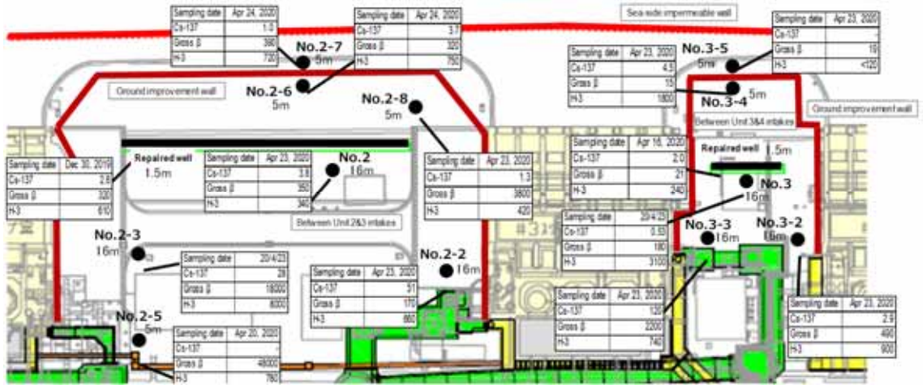
Effective dose-reduction at site boundaries and purification of port water to mitigate the impact of radiation on the external environment

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

- At No. 1-6, the concentration of gross β radioactive materials has been increasing from around 160,000 Bq/L since March 2020 and currently stands at around 750,000 Bq/L.
- At No. 1-9, the concentration of gross β radioactive materials has been repeatedly increasing and declining from around 20 Bq/L since April 2019 and currently stands at around 40 Bq/L.
- At No. 1-12, the concentration of gross β radioactive materials has been increasing from around 500 Bq/L since December 2019 and currently stands at around 1,800 Bq/L. Since August 15, 2013, pumping of groundwater continued (at the well point between the Unit 1 and 2 intakes: August 15, 2013 – October 13, 2015 and from October 24; at the repaired well: October 14-23, 2015).
- At No. 2-3, the H-3 concentration had been declining from around 6,000 Bq/L since August 2019, then increasing and currently stands at around 8,000 Bq/L. The concentration of gross β radioactive materials at the same point had been declining from around 14,000 Bq/L to around 5,000 Bq/L since August 2019, then increasing and currently stands at around 18,000 Bq/L.
- At No. 2-5, the H-3 concentration had been declining from around 2,300 Bq/L to less than 120 Bq/L since June 2019, then repeatedly increasing and declining and currently stands at around 800 Bq/L. The concentration of gross β radioactive materials at the same point had been declining from around 65,000 Bq/L to around 500 Bq/L since September 2019, then increasing and currently stands at around 48,000 Bq/L.
- At No. 2-6, the concentration of gross β radioactive materials had been increasing from around 100 Bq/L since May 2019 and currently stands at around 300 Bq/L. Since December 18, 2013, pumping of groundwater continued (at the well point between the Unit 2 and 3 intakes: December 18, 2013 - October 13, 2015; at the repaired well: from October 14, 2015).
- The densities of radioactive materials in drainage channels have remained constant, despite increasing during rainfall.
- In the open channel area of seawater intake for the units 1 to 4, concentration of radionuclides in seawater have remained below the legal discharge limit, even while observing small increases in Cs-137 and Sr-90 during rainfall. They have also been declining following the completed installation and the connection of steel pipe sheet piles for the sea-side impermeable walls. The concentration of Cs-137 has remained slightly higher in front of the south side impermeable walls and slightly lower on the north side of the east breakwater since March 20, 2019, when the silt fence was transferred to the center of the open channel due to mega float-related construction.
- In the area of the port, concentration of radionuclides in seawater have remained below the legal discharge limit, even while observing small increases in Cs-137 and Sr-90 during rainfall. They have remained below the level of those in the Units 1-4 intake open channel area and been declining following the completed installation and connection of steel pipe sheet piles for the sea-side impermeable walls.
- In the area outside the port, regarding the densities of radioactive materials in seawater, those of Cs-137 and Sr-90 declined and remained low after steel pipe sheet piles for the sea-side impermeable walls were installed and connected.



<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 concentration on the Turbine Building east side

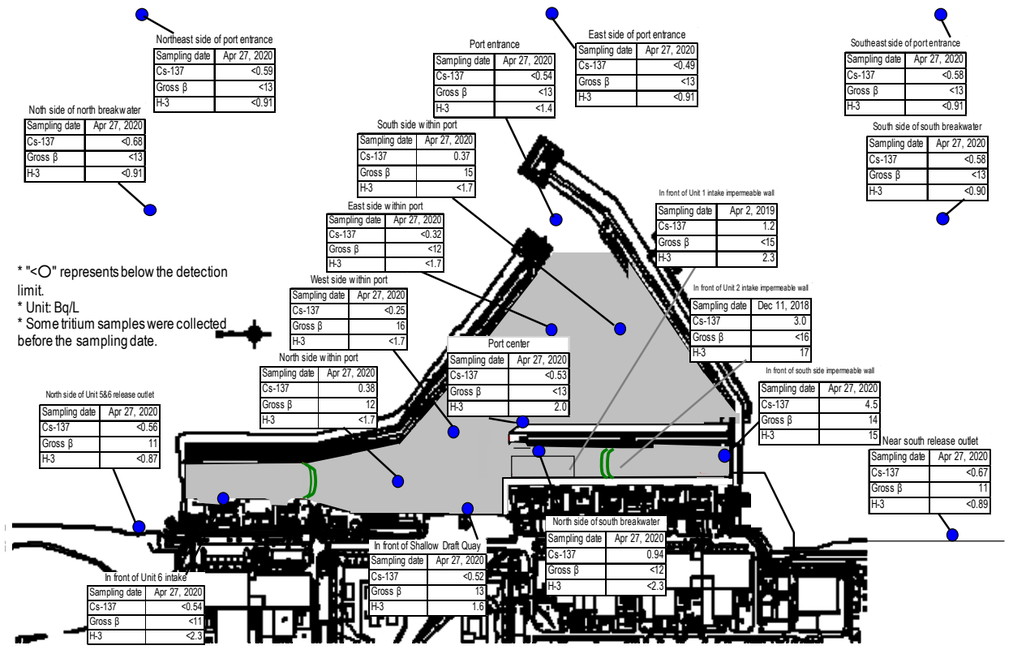


Figure 6: Seawater concentration around the port

7. Outlook of the number of staff required and efforts to improve the labor environment and conditions

Adequate number of staff will be secured in the long-term, while firmly implementing radiation control of workers. The work environment and labor conditions will be continuously improved by responding to the needs on the site.

➢ Staff management

- The monthly average total of personnel registered for at least one day per month to work on site during the past quarter from December 2019 to February 2020 was approx. 9,200 (TEPCO and partner company workers), which exceeded the monthly average number of actual workers (approx. 6,900). Accordingly, sufficient personnel are registered to work on site.
- It was confirmed with the prime contractors that the estimated manpower necessary for the work in May 2020 (approx. 3,900 per day: TEPCO and partner company workers) would be secured at present. The average numbers of workers per day per month (actual values) were maintained, with approx. 3,400 to 5,600 since FY2017 (see Figure 7).
- The number of workers from within Fukushima Prefecture increased slightly while those from outside decreased slightly. The local employment ratio (TEPCO and partner company workers) as of March 2020 also remained constant at around 60%.
- The monthly average exposure dose of workers remained at approx. 0.22, 0.22, 0.24 and 0.21 mSv/month during FY2016, FY2017, FY2018 and FY2019, respectively. (Reference: Annual average exposure dose 20 mSv/year ≒ 1.7 mSv/month)
- For most workers, the exposure dose was sufficiently within the limit and allowed them to continue engaging in radiation work.

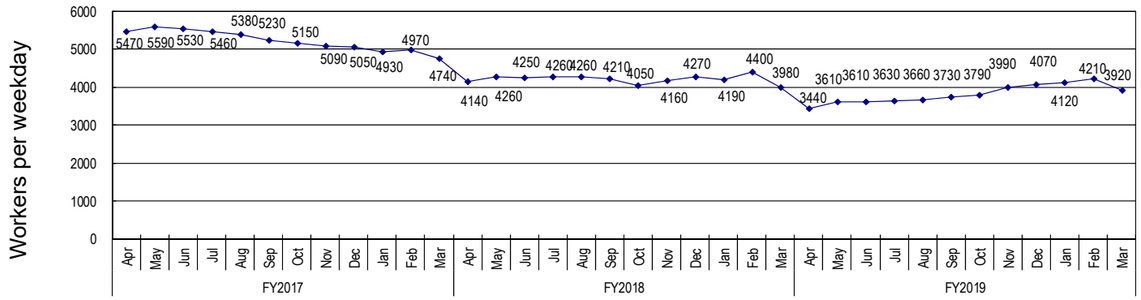


Figure 7: Changes in the average number of workers per weekday for each month since FY2017 (actual values)

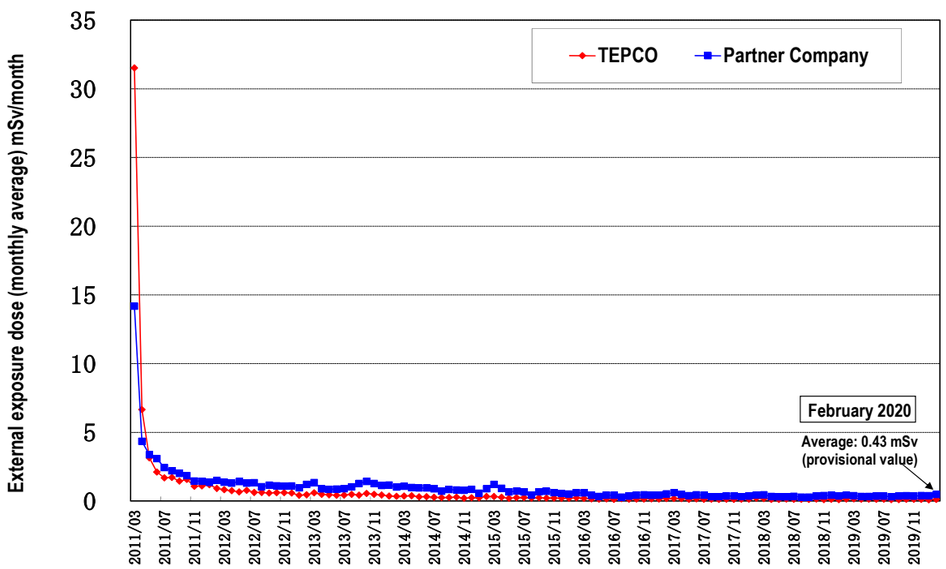


Figure 8: Changes in monthly individual worker exposure dose
(monthly average exposure dose since March 2011)

➢ Measures to prevent infection and expansion of influenza and norovirus

- Since November, measures for influenza and norovirus have been implemented, including free influenza vaccinations (subsidized by TEPCO HD) for partner company workers in the Fukushima Daiichi Nuclear Power Station (from November 13 to December 13, 2019) and at medical clinics around the site (from December 2, 2019 to January 30, 2020). As of January 30, 2020, a total of 6,107 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 checks and monitoring infection status) and response after detecting possible infections (swift exit of possible patients and control of entry, mandatory wearing of masks in working spaces, etc.).

➢ Status of influenza and norovirus cases

- Until the 17th week of 2020 (April 20-26, 2020), 170 influenza infections and ten norovirus infections were recorded. The totals for the same period for the previous season showed 311 cases of influenza and 15 norovirus infections.

➢ FY2019 accident occurrence status and FY2020 safety activity plan

- The number of work accidents in FY2019 increased to 32 from 22 in the previous fiscal year. Issues such as an increased number of accidents and two involving serious injuries (incapacitating the persons concerned from work for 14 days or more) need to be analyzed and ongoing accident prevention measures must be reviewed and improved.
- The number of heat stroke cases in FY2019 increased to 14 from eight in the previous fiscal year. FY2019 had a hot summer as in the previous year, with cases involving insufficient heat adaptation (caused by soaring temperatures after the end of the rainy season and significant temperature differences from the previous day). Furthermore, as characteristics in FY2019, many cases involved workers in their 40s and 50s, wearing full-face masks and working for more than 90 minutes. This fiscal year, safety will be managed based on these characteristics.
- In FY2020, safety activities will be implemented focused on “raising and infiltrating safety awareness,” “improving safety management skills” and “improving management such as activation of TBM-KY.” In addition, measures to prevent heat stroke cases during work with full-face masks after the end of rainy season will also be enhanced to eliminate accidents causing injury or death.

➢ Covid-19 countermeasures at the Fukushima Daiichi Nuclear Power Station

- At the Fukushima Daiichi Nuclear Power Station, countermeasures have been implemented to prevent the infection spread of Covid-19, such as requiring employees to take their temperature prior to coming to the office and to wear masks at all times, etc. In light of the fact that no TEPCO HD employees or cooperative firm laborers at the Fukushima Daiichi NPS have contracted Covid-19 (as of April 27), at current time fieldwork will continue as usual.
- In order to prevent the infection spread of Covid-19, efforts shall further be enhanced to avoid the “Three Cs” (Closed spaces, Crowded places, Close-contact settings). Moreover, the following additional countermeasures are implemented from April 29 through May 10, which has been deemed an “enhanced countermeasures period,” in order to reduce the risk of infection: all personnel have been requested to avoid leaving their homes for unnecessary reasons, including travel outside of Fukushima Prefecture, during the enhanced countermeasures period. Efforts will continue to prevent occurrence and increase of infection cases.

➢ Health management of workers in the Fukushima Daiichi NPS

- As health management measures in line with the guidelines of the Ministry of Health, Labour and Welfare (issued in August 2015), a scheme was established and operated, whereby prime contractors confirmed reexamination at medical institutions and the subsequent status of workers who were diagnosed as requiring “detailed examination and treatment” in the health checkup, with TEPCO confirming the operation status by the prime contractors.
- The recent report on the management status of the health checkup during the third quarter (October – December) in FY2019 confirmed that the prime contractors had provided appropriate guidance and managed operation properly under the scheme. The report on the follow-up status during the second quarter in FY2019 and before confirmed that responses to workers, which had not been completed by the time of the previous report, were being provided on an ongoing basis and checking of operations will continue.

8. Others

➢ Formulation of the long-term maintenance and management plan for facilities within the Fukushima Daiichi NPS

- For facilities being used in the countermeasures for decommissioning and contaminated-water management and those having been installed before the earthquake but not used, risks which should be particularly focused on for decommissioning were determined in view of the post-earthquake environmental change. For the facilities (equipment) concerned, a long-term maintenance and management plan will be formulated according to its aging mode and measures implemented based on the same.
- All facilities and equipment (approx. 340,000 items) and buildings and structures (approx. 580 items) within the site were listed and rated according to their respective priority. Emergency measures for those rated as Priority 1 were completed in March 2020. After examining the measures and implementation schedule taking the degradation status of each piece of equipment into account, the long-term maintenance and management plan will be formulated by the first quarter of FY2020.
- The progress status of the long-term maintenance and management plan and the validation of the rating will be checked appropriately and measures reviewed, as necessary.

➢ Future plan of the self-driving EV bus

- To further improve the transportation efficiency and convenience on site, a self-driving EV bus “ARMA” was in practical operation for two years from April 2018 with future unmanned driving in mind and to contribute to public transportation service in the Hamadori area.
- Having achieved the milestone of driving with an operator, the operation of “ARMA” was terminated at the end of March 2020. Based on the issues identified and knowledge gained during this operation, unmanned operation will be tested in the next step. To further develop the self-driving technology, a new partner is being selected.

➢ “Sessions for hearing opinions” held concerning handling ALPS-treated water

- Based on the report from the “Subcommittee on Handling of the ALPS-Treated Water” published on February 10, 2020, the government held a meeting as an opportunity to receive opinions from a wide variety of concerned parties, including representatives of local municipalities and associations in the fields of agriculture, forestry and fisheries, on April 6 and 13 and is opening a call for public comments in written documents during the period April 6 – May 15.

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 April 22-27)"; 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

Sea side impermeable wall
Silt fence
Silt fence for construction

Cesium-134:	3.3	(2013/10/17) →	ND(0.26)	Below 1/10
Cesium-137:	9.0	(2013/10/17) →	ND(0.32)	Below 1/20
Gross β:	74	(2013/ 8/19) →	ND(12)	Below 1/6
Tritium:	67	(2013/ 8/19) →	ND(1.7)	Below 1/30

Cesium-134:	4.4	(2013/12/24) →	ND(0.30)	Below 1/10
Cesium-137:	10	(2013/12/24) →	ND(0.25)	Below 1/40
Gross β:	60	(2013/ 7/ 4) →	16	Below 1/3
Tritium:	59	(2013/ 8/19) →	ND(1.7)	Below 1/30

Cesium-134:	5.0	(2013/12/2) →	ND(0.27)	Below 1/10
Cesium-137:	8.4	(2013/12/2) →	0.38	Below 1/20
Gross β:	69	(2013/8/19) →	12	Below 1/5
Tritium:	52	(2013/8/19) →	ND(1.7)	Below 1/30

Cesium-134:	2.8	(2013/12/2) →	ND(0.39)	Below 1/7
Cesium-137:	5.8	(2013/12/2) →	ND(0.54)	Below 1/10
Gross β:	46	(2013/8/19) →	ND(11)	Below 1/4
Tritium:	24	(2013/8/19) →	ND(2.3)	Below 1/10

	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

Cesium-134:	ND(0.40)			
Cesium-137:	ND(0.53)			
Gross β:	ND(13)			
Tritium:	2.0	*1		

Cesium-134:	3.3	(2013/12/24) →	ND(0.41)	Below 1/8
Cesium-137:	7.3	(2013/10/11) →	ND(0.54)	Below 1/10
Gross β:	69	(2013/ 8/19) →	ND(13)	Below 1/5
Tritium:	68	(2013/ 8/19) →	ND(1.4)	Below 1/40

Cesium-134:	3.5	(2013/10/17) →	ND(0.30)	Below 1/10
Cesium-137:	7.8	(2013/10/17) →	0.37	Below 1/20
Gross β:	79	(2013/ 8/19) →	15	Below 1/5
Tritium:	60	(2013/ 8/19) →	ND(1.7)	Below 1/30

Cesium-134:	32	(2013/10/11) →	ND(0.47)	Below 1/60
Cesium-137:	73	(2013/10/11) →	0.94	Below 1/70
Gross β:	320	(2013/ 8/12) →	ND(12)	Below 1/20
Tritium:	510	(2013/ 9/ 2) →	ND(2.3)	Below 1/200

From February 11, 2017, the location of the sampling point was shifted approx. 50 m south of the previous point due to the location shift of the silt fence.

Cesium-134:	ND(0.41)	
Cesium-137:	4.5	
Gross β:	14	
Tritium:	15	*1

Cesium-134:	5.3	(2013/8/ 5) →	ND(0.34)	Below 1/10
Cesium-137:	8.6	(2013/8/ 5) →	ND(0.52)	Below 1/10
Gross β:	40	(2013/7/ 3) →	13	Below 1/3
Tritium:	340	(2013/6/26) →	1.6	Below 1/200

【Port entrance】
【South side in the port】
【East side in the port】
【Port center】
【West side in the port】
【North side in the port】
【In front of shallow draft quay】
【In front of Unit 6 intake】
*4
*2
*3
Unit 1
Unit 2
Unit 3
Unit 4

*1: Monitoring commenced in or after March 2014. Monitoring inside the sea-side impermeable walls was finished because of the landfill.
*2: For the point, monitoring was finished from December 12, 2018 due to preparatory work for transfer of mega float.
*3: For the point, monitoring point was moved from February 6, 2019 due to preparatory work for transfer of mega float.
*4: For the point, monitoring was finished from April 3, 2019 due to preparatory work for transfer of mega float.

Note: The gross β measurement values include natural potassium 40 (approx. 12 Bq/L). They also include the contribution of yttrium 90, which radioactively balance strontium 90.

Summary of TEPCO data as of April 28, 2020

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 April 22-27)

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 (0.57)
Cesium-137: ND (2013) → ND (0.59)
Gross β: ND (2013) → ND (13)
Tritium: ND (2013) → ND (0.91)

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

Cesium-134: ND (2013) → ND (0.73)
Cesium-137: 1.6 (2013/10/18) → ND (0.49) Below 1/3
Gross β: ND (2013) → ND (13)
Tritium: 6.4 (2013/10/18) → ND (0.91) Below 1/7

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

Cesium-134: ND (2013) → ND (0.70)
Cesium-137: ND (2013) → ND (0.64)
Gross β: ND (2013) → ND (13)
Tritium: ND (2013) → ND (0.86)

Cesium-134: ND (2013) → ND (0.77)
Cesium-137: ND (2013) → ND (0.68)
Gross β: ND (2013) → ND (13)
Tritium: 4.7 (2013/ 8/18) → ND (0.91) Below 1/5

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

【Port entrance】

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

Cesium-134: ND (2013) → ND (0.64)
Cesium-137: ND (2013) → ND (0.58)
Gross β: ND (2013) → ND (13)
Tritium: ND (2013) → ND (0.90)

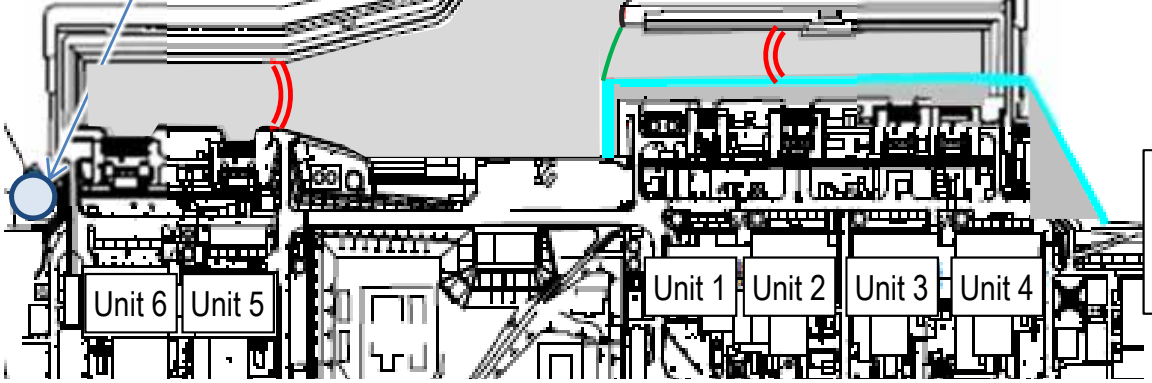
【North side of Unit 5 and 6 release outlet】

Cesium-134: 1.8 (2013/ 6/21) → ND (0.46) Below 1/3
Cesium-137: 4.5 (2013/ 3/17) → ND (0.56) Below 1/8
Gross β: 12 (2013/12/23) → 11
Tritium: 8.6 (2013/ 6/26) → ND (0.87) Below 1/9

Cesium-134: 3.3 (2013/12/24) → ND (0.41) Below 1/8
Cesium-137: 7.3 (2013/10/11) → ND (0.54) Below 1/10
Gross β: 69 (2013/ 8/19) → ND (13) Below 1/5
Tritium: 68 (2013/ 8/19) → ND (1.4) Below 1/40

Cesium-134: ND (2013) → ND (0.41)
Cesium-137: 3.0 (2013/ 7/15) → ND (0.67) Below 1/4
Gross β: 15 (2013/12/23) → 11
Tritium: 1.9 (2013/11/25) → ND (0.87) Below 1/2

【Near south release outlet】



Note: The gross β measurement values include natural potassium 40 (approx. 12 Bq/L). They also include the contribution of yttrium 90, which radioactively balance strontium 90.

Note: Because safety of the sampling points was unassured due to the influence of Typhoon No. 10 in 2016, samples were taken from approx. 330 m south of the Unit 1-4 release outlet. Samples were also taken from a point approx. 280m south from the same release outlet from January 27, 2017 and approx. 320m from March 23, 2018

Summary of TEPCO data as of April 28, 2020

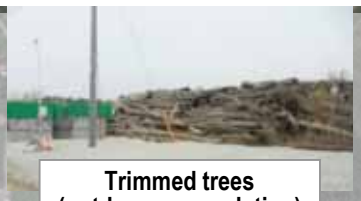
Source: TEPCO website, Analysis results on nuclides of radioactive materials around Fukushima Daiichi Nuclear Power Station, http://www.tepco.co.jp/nu/fukushima-np/f1/smp/index-j.html

Appendix 2

April 30, 2020

TEPCO Holdings Fukushima Daiichi Nuclear Power Station Site Layout

- Rubble storage area
- Rubble storage area (planned)
- Used protective clothing
- Trimmed trees area
- Mid-/ low-level contaminated water tank (existing)
- Mid-/ low-level contaminated water tank (planned)
- Secondary waste from water treatment (existing)
- Secondary waste from water treatment (planned)
- Waste treatment facility
- Non-controlled facility
- Analysis and research facility



Trimmed trees (outdoor accumulation)

Temporary trimmed trees storage pool

Temporary soil-covered type storage facility

Rubble storage tent

Rubble (outdoor accumulation)

Inside the rubble storage tent

Rubble (covered by sheet)

Solid waste storage facility

Rubble (container storage)

Futaba town

Okuma town

Radioactive Waste Incinerator

Used protective clothing

Trimmed trees

Unit 6

Unit 5

Periodical inspection material storage (cut of flange tank)

Vehicles maintenance site

Rubble

Mega float

Town boundary

Chiller for reactor water injection facility

JAEA Site Management Building

Vehicle screening and decontamination site

Water treatment facility for Subdrain and others

Temporary Cask Cleaning Area

Main Anti-Earthquake Building

Large equipment decontamination facility

Pipe route

Multi-nuclide removal equipment

Additional multi-nuclide removal equipment

High-performance multi-nuclide removal equipment

Spent absorption vessel temporary storage

Underground reservoirs

Land-side impermeable walls freezing plant

Land-side impermeable walls with frozen soil

Unit 1

Unit 2

Unit 3

Unit 4

Sea side impermeable wall

Water desalinations (RO)

Common pool

Cesium absorption apparatus (Incineration Workshop Building)

Decontamination instruments (Process Building)

3rd cesium adsorption apparatus (Onsite Bunker Building)

2nd cesium adsorption apparatus (HTI Building)

Cesium absorption vessel temporary storage

Partner Companies' Building

Groundwater bypass temporary storage tank

Temporary rest house outside the site

New Administration Office Building

Large rest house

Access control facility

Water desalinations (evaporative concentration)

Water desalinations (RO)

K1 K2 K3 K4

H1 H2 H3 H4 H5 H6 H8 H9

J1 J2 J3 J4 J5 J6 J7 J8 J9

B C D E F G1 G6 G7 G1 South G3・G4・G5

MP-1 MP-2 MP-3 MP-4 MP-5 MP-6 MP-7 MP-

Tank installation status

Temporary waste sludge storage

Spent adsorption vessel temporary storage facility

Provided by Japan Space Imaging, photo taken on June 14, 2018
Product(C) [2018] DigitalGlobe, Inc.

0m 100m 500m 1000m

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

April 30, 2020
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment

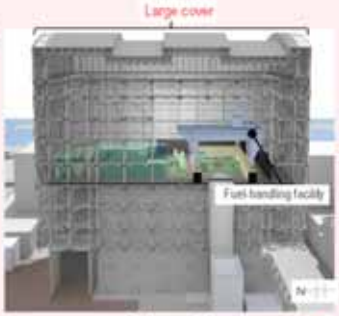
Immediate target Commence fuel removal from the Unit 1-3 Spent Fuel Pools

Unit 1

Toward fuel removal from the Unit 1 spent fuel pool, investigations have been implemented to ascertain the conditions of the fallen roof on the south side and the contamination of the well plug. Based on the results of these investigations, "the method to initially install a large cover over the Reactor Building and then remove rubble inside the cover" was selected to ensure a safer and more secure removal. Details of the selected method will be designed and the process of fuel removal will be refined.

<Reference> Progress to date
Rubble removal on the north side of the operating floor started from January 2018 and has been implemented sequentially. In July and August 2019, the well plug, which was misaligned from its normal position, was investigated and in August and September, the conditions of the overhead crane were checked. Based on the results of these investigations, as the removal requires more careful work taking dust scattering into consideration, two methods were examined: installing a cover after rubble removal and initially installing a large cover over the Reactor Building and then removing rubble inside the cover.

Rubble removal (image)

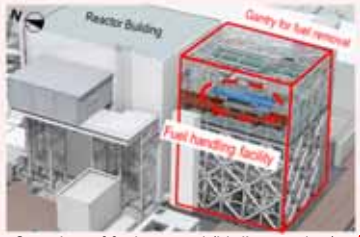


Fuel removal (image)

Unit 2

Toward fuel removal from the Unit 2 spent fuel pool, based on findings from internal operating floor investigations from November 2018 to February 2019, instead of fully dismantling the upper part of the building, the decision was made to install a small opening on the south side and use a boom crane. The changed method will be established and the fuel removal process refined.

<Reference> Progress to date
Previously, potential to recover the existing overhead crane and the fuel handling machine was examined. However, the high radiation dose inside the operating floor meant the decision was taken to dismantle the upper part of the building in November 2015. Findings from internal investigations of the operating floor from November 2018 to February 2019 underlined the potential to conduct limited work there and the means of accessing from the south side had been examined.

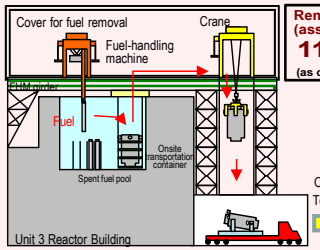


Overview of fuel removal (bird's-eye view)

Unit 3

Prior to the installation of a cover for fuel removal, removal of large rubble from the spent fuel pool was completed in November 2015. To ensure safe and steady fuel removal, training of remote control was conducted at the factory using the actual fuel-handling machine which will be installed on site (February – December 2015). Measures to reduce dose on the Reactor Building top floor (decontamination, shields) were completed in December 2016. Installation of a cover for fuel removal and a fuel-handling machine is underway from January 2017. Installation of the fuel removal cover was completed on February 23, 2018.
Toward fuel removal, the rubble retrieval training inside the pool, which was scheduled in conjunction with fuel removal training, started from March 15, 2019, and started fuel removal from April 15, 2019.

Installation of dome roof (February 21, 2019)



Overview of the fuel-handling facility inside the cover

Removed fuel (assemblies)
119/566
(as of April 30, 2020)


Fuel removal status (April 15, 2019)

Unit 4

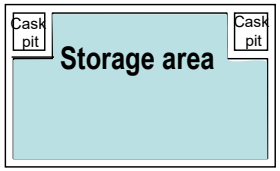
In the Mid- and Long-Term Roadmap, the target of Phase 1 involved commencing fuel removal from inside the spent fuel pool (SFP) of the 1st Unit within two years of completion of Step 2 (by December 2013). On November 18, 2013, fuel removal from Unit 4, or the 1st Unit, commenced and Phase 2 of the roadmap started.

On November 5, 2014, within a year of commencing work to fuel removal, all 1,331 spent fuel assemblies in the pool had been transferred. 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 Unit 1-3 pools.


Fuel removal status

* A part of the photo is corrected because it includes sensitive information related to physical protection.

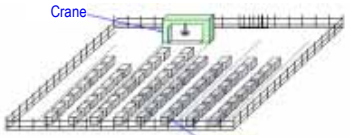
Common pool



An open space will be maintained in the common pool (Transfer to the temporary cask custody area)

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 removal from the Unit 4 spent fuel pool began to be received (November 2013 - November 2014)
- Fuel removal from the Unit 3 spent fuel pool began to be received (from April 2019)

Temporary cask (*2) custody area



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 retrieval

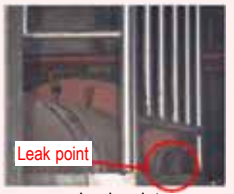
Immediate target	Identify the plant status and commence R&D and decontamination toward fuel debris retrieval

Investigation into TIP Room of the Unit 1 Reactor Building

- To improve the environment for future investigations inside the PCV, etc., an investigation was conducted from September 24 to October 2, 2015 at the TIP Room(*1). (Due to high dose around the entrance in to the TIP Room, the investigation of dose rate and contamination distribution was conducted through a hole drilled from the walkway of the Turbine Building, where the dose was low)
- The investigative results identified high dose at X-31 to 33 penetrations(*2) (instrumentation penetration) and low dose at other parts.
- As it was confirmed that work inside the TIP room would be available, the next step will include identification of obstacles which will interfere the work inside the TIP Room and formulation of a plan for dose reduction.

Investigation in the leak point detected in the upper part of the Unit 1 Suppression Chamber (S/C(*3))

Investigation in the leak point detected in the upper part of Unit 1 S/C from May 27, 2014 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

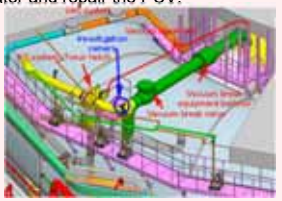
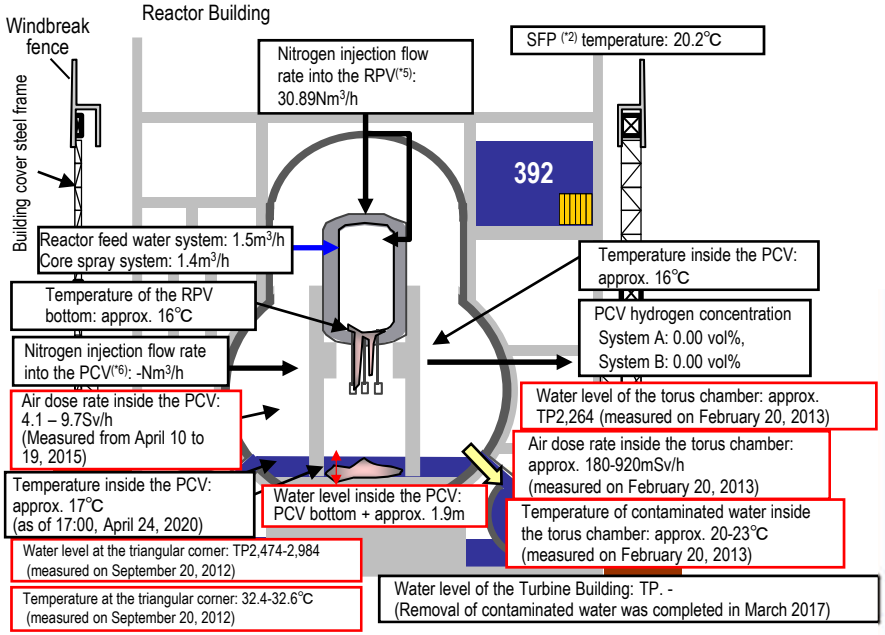


Image of the S/C upper part investigation

Unit 1

Air dose rate inside the Reactor Building:
Max. 5,150mSv/h (1F southeast area) (measured on July 4, 2012)



* Indices related to the plant are values as of 11:00, April 27, 2020

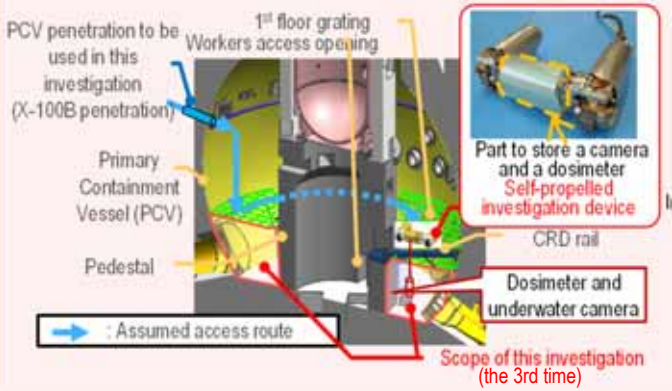
Investigations inside PCV	1st (Oct 2012)	- Acquiring images - Measuring air temperature and dose rate - Measuring water level and temperature - Sampling contaminated water - Installing permanent monitoring instrumentation
	2nd (Apr 2015)	Confirming the status of PCV 1st floor - Acquiring images - Measuring air temperature and dose rate - Replacing permanent monitoring instrumentation
	3rd (Mar 2017)	Confirming the status of PCV 1st basement floor - Acquiring images - Measuring and dose rate - Sampling deposit - Replacing permanent monitoring instrumentation
Leakage points from PCV		- PCV vent pipe vacuum break line bellows (identified in May 2014) - Sand cushion drain line (identified in November 2013)

Status of investigation inside the PCV

Prior to fuel debris retrieval, an investigation inside the PCV will be conducted to inspect the status there including the location of fuel debris.

[Investigative outline]

- In April 2015, a device, which entered the inside of the PCV through a narrow access opening (bore: ϕ 100 mm), collected information such as images and airborne dose inside the PCV 1st floor.
- In March 2017, the investigation using a self-propelled investigation device, conducted to inspect the spreading of debris to the basement floor outside the pedestal, took images of the PCV bottom status for the first time. The status inside the PCV will continue to be examined based on the collected image and dose data.



<Image of investigation inside the PCV>

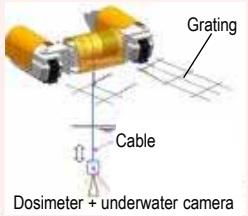


Image of hanging of dosimeter and camera

Image near the bottom

Capturing the location of fuel debris inside the reactor by measurement using muons

Period	Evaluation results
Feb - May 2015	Confirmed that there was no large fuel in the reactor core.

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

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

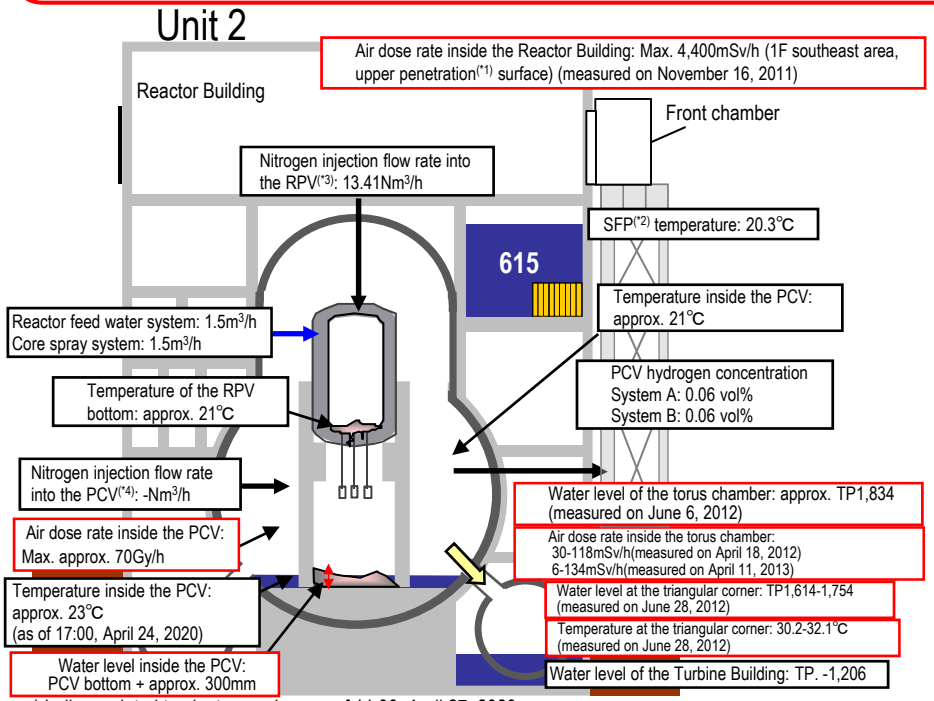
April 30, 2020
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
3/6

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

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 in February 2014, it was excluded from the monitoring thermometers.
- In April 2014, removal of the broken thermometer failed and was suspended. Rust-stripping chemicals were injected and the broken thermometer was removed in January 2015. A new thermometer was reinstalled in March. The thermometer has been used as a part of permanent supervisory instrumentation since April.

(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 2013). The instrumentation was removed in May 2014 and new instruments were reinstalled in June 2014. 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.

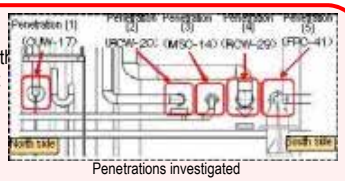


* Indices related to plant are values as of 11:00, April 27, 2020

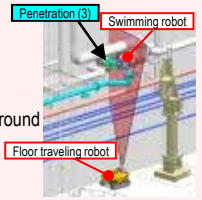
Investigations inside PCV	1st (Jan 2012)	- Acquiring images - Measuring air temperature
	2nd (Mar 2012)	- Confirming water surface - Measuring water temperature - Measuring dose rate
	3rd (Feb 2013 – Jun 2014)	- Acquiring images - Sampling contaminated water - Measuring water level - Installing permanent monitoring instrumentation
	4th (Jan – Feb 2017)	- Acquiring images - Measuring dose rate - Measuring air temperature
	5th (Jan 2018)	- Acquiring images - Measuring dose rate - Measuring air temperature
	6th (Feb 2019)	- Acquiring images - Measuring dose rate - Measuring air temperature - Grasping characteristics of a portion of deposit
Leakage points from PCV	- No leakage from torus chamber rooftop - No leakage from all inside/outside surfaces of S/C	

Investigative results on torus chamber walls

- July 2014, the torus chamber walls were investigated (on the north and 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



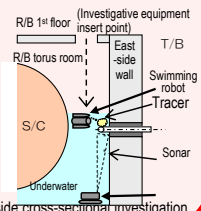


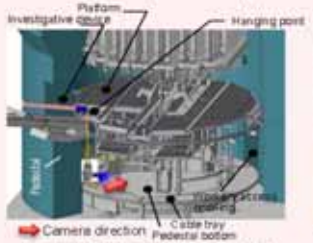
Image of the torus chamber east-side cross-sectional investigation

Status of investigation inside the PCV

Prior to fuel debris retrieval, an investigation inside the PCV will be conducted to inspect the status there including the location of fuel debris.

[Investigative outline]
- Investigative devices such as a robot will be injected from Unit 2 X-6 penetration(*1) and access the inside of the pedestal using the CRD rail.

[Progress status]
- On January 26 and 30, 2017, a camera was inserted from the PCV penetration to inspect the status of the CRD replacement rail on which the robot will travel. On February 9, deposit on the access route of the self-propelled investigative device was removed and on February 16, the inside of the PCV was investigated using the device.
- The results of this series of investigations confirmed fallen and deformed gratings and a quantity of deposit inside the pedestal.
- On January 19, 2018, the status below the platform inside the pedestal was investigated using an investigative device with a hanging mechanism. From the analytical results of images obtained in the investigation, deposits probably including fuel debris were found at the bottom of the pedestal. In addition, multiple parts higher than the surrounding deposits were also detected. We presumed that there were multiple routes of fuel debris falling. Obtained data were processed in panoramic image visualization to acquire clearer images.
- On February 13, 2019, an investigation touching the deposits at the bottom of the pedestal and on the platform was conducted and confirmed that the pebble-shaped deposits, etc. could be moved and that hard rock-like deposits that could not be gripped may exist.
- In addition, images, etc. would help determine the contour and size of the deposits could be collected by moving the investigative unit closer to the deposits than the previous investigation.



Investigative status (image)

Bottom of the pedestal (after being processed in panoramic image visualization)

Capturing the location of fuel debris inside the reactor by measurement using muons

Period	Evaluation results
Mar – Jul 2016	Confirmed the existence of high-density materials, which was considered as fuel debris, at the bottom of RPV, and in the lower part and the outer periphery of the reactor core. It was assumed that a large part of fuel debris existed at the bottom of RPV.

<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 retrieval

April 30, 2020
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 retrieval

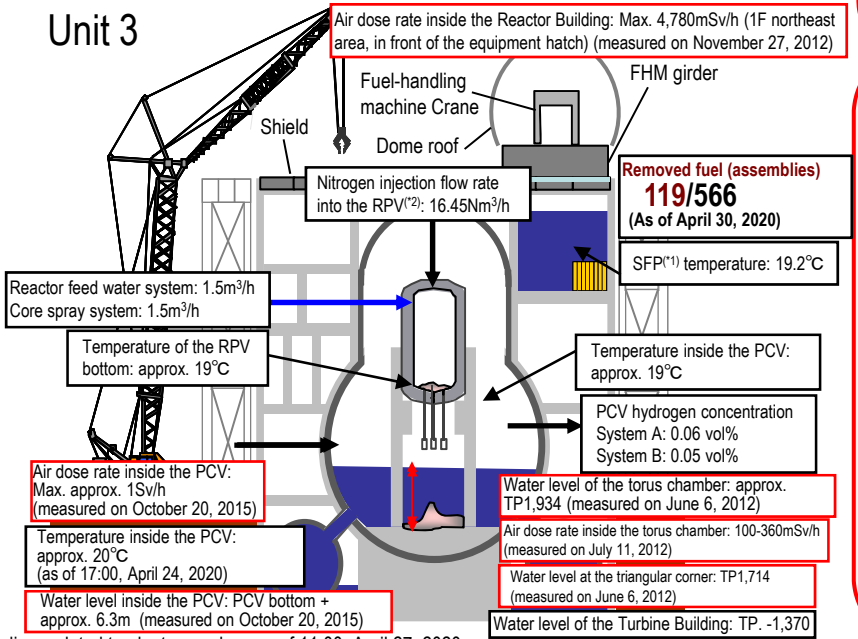
Water flow was detected from the Main Steam Isolation Valve* room

On January 18, 2014, 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, 2014, 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, 2014, water flow from the expansion joint of one Main Steam Line was detected.

This is the first leak from PCV detected in the 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.

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

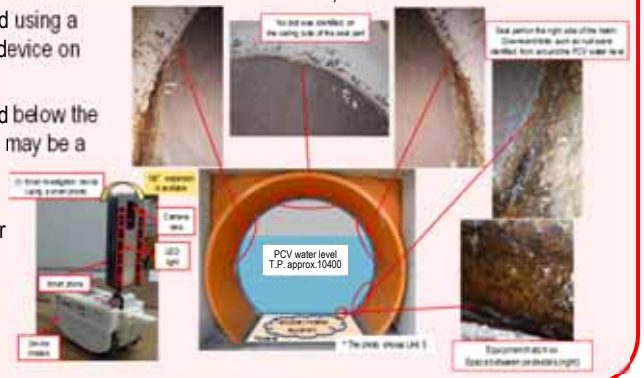


* Indices related to plant are values as of 11:00, April 27, 2020

Investigations inside PCV	1st (Oct – Dec 2015)	- Acquiring images - Measuring air temperature and dose rate - Measuring water level and temperature - Sampling contaminated water - Installing permanent monitoring instrumentation (December 2015)
	2nd (Jul 2017)	- Acquiring images - Installing permanent monitoring instrumentation (August 2017)
Leakage points from PCV	- Main steam pipe bellows (identified in May 2014)	

Investigative results into the Unit 3 PCV equipment hatch using a small investigation device

- As part of the investigation into the PCV to facilitate fuel debris retrieval, the status around the Unit 3 PCV equipment hatch was investigated using a small self-traveling investigation device on November 26, 2015.
- Given blots such as rust identified below the water level inside the PCV, there may be a leakage from the seal to the extent of bleeding.
  Methods to investigate and repair the parts, including other PCV penetrations with a similar structure, will be considered.

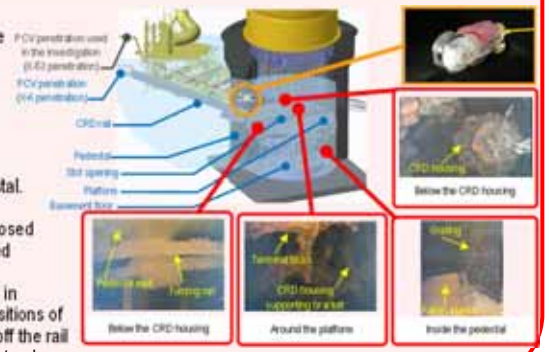


Investigation inside the PCV

Prior to fuel debris retrieval, the inside of the Primary Containment Vessel (PCV) was investigated to identify the status there including the location of the fuel debris.

[Investigative outline]

- The status of X-53 penetration(*4), 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. The results showed that the penetration was not under the water (October 22-24, 2014).
- For the purpose of confirming the status inside the PCV, an investigation device was inserted into the PCV from X-53 penetration on October 20 and 22, 2015 to obtain images, data of dose and temperature and sample contaminated water. No damage was identified on the structure and walls inside the PCV and the water level was almost identical with the estimated value. In addition, the dose inside the PCV was confirmed to be lower than in other Units.
- In July 2017, the inside of the PCV was investigated using the underwater ROV (remotely operated underwater vehicle) to inspect the inside of the pedestal.
- Analysis of image data obtained in the investigation identified damage to multiple structures and the supposed core internals. Consideration about fuel removal based on the obtained information will continue.
- Videos obtained in the investigation were reproduced in 3D. Based on the reproduced images, the relative positions of the structures, such as the rotating platform slipping off the rail with a portion buried in deposits, were visually understood.



Status inside the pedestal

Capturing the location of fuel debris inside the reactor by measurement using muons

Period	Evaluation results
May – Sep 2017	The evaluation confirmed that no large lump existed in the core area where fuel had been placed and that part of the fuel debris potentially existed at the bottom of the RPV.

<Glossary>
(*1) SFP (Spent Fuel Pool) (*2) RPV (Reactor Pressure Vessel) (*3) PCV (Primary Containment Vessel) (*4) Penetration: Through-hole of the PCV

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

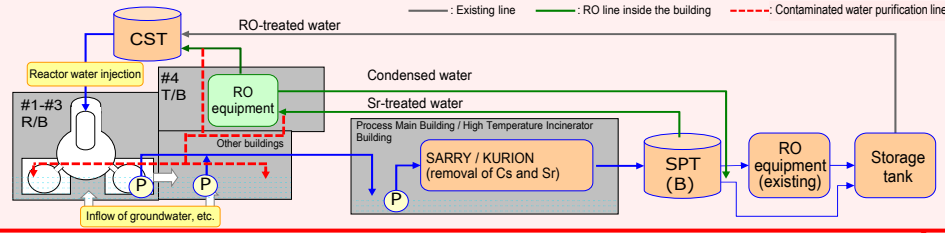
April 30, 2020
Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment
5/6

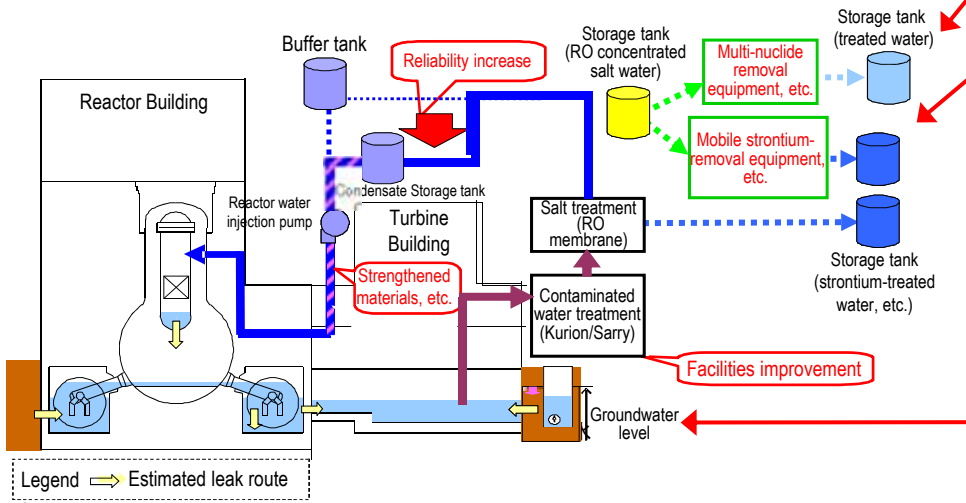
Immediate target | Stably continue reactor cooling and contaminated water treatment, and improve reliability

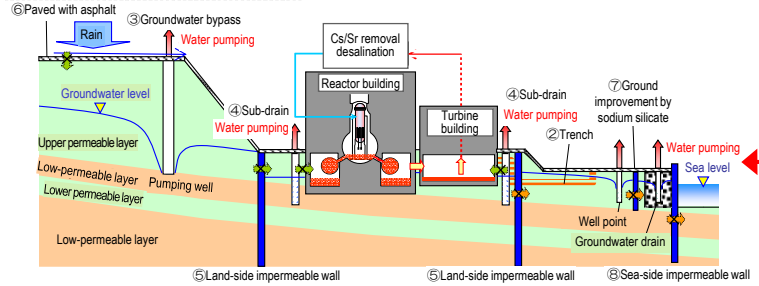
Work to improve the reliability of the circulation water injection cooling system and pipes to transfer contaminated water.

- Operation of the reactor water injection system using Unit 3 Condensate Storage Tank (CST) as a water source commenced (from July 5, 2013). Compared to the previous systems, the reliability of the reactor water injection system was enhanced, e.g. by increasing the amount of water-source storage and enhancing durability.
- To reduce the risk of contaminated-water leakage, the circulation loop was shortened by installing a reverse osmosis (RO) device in the Unit 4 Turbine Building within the circulation loop, comprising the transfer of contaminated water, water treatment and injection into the reactors. Operation of the installed RO device started from October 7 and 24-hour operation started from October 20. Installation of the new RO device inside the building shortened the circulation loop from approx. 3 to 0.8 km.
- To accelerate efforts to reduce the radiation density in contaminated water inside the buildings, circulating purification of contaminated water inside the buildings stared on the Unit 3 and 4 side on February 22 and on the Unit 1 and 2 side on April 11.
- For circulating purification, a new pipe (contaminated water purification line) divided from the water treatment equipment outlet line was installed to transfer water purified at the water treatment equipment to the Unit 1 Reactor Building and the Unit 2-4 Turbine Buildings.
- The risks of contaminated water inside the buildings will continue to be reduced in addition to reduction of its storage.

* 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).







Progress status of dismantling of flange tanks

- To facilitate replacement of flanged tanks, dismantling of flanged tanks started in H1 east/H2 areas in May 2015. Dismantling of all flanged tanks was completed in H1 east area (12 tanks) in October 2015, in H2 area (28 tanks) in March 2016, in H4 area (56 tanks) in May 2017, in H3 B area (31 tanks) in September 2017, in H5 and H5 north areas (31 tanks) in June 2018, in G6 area (38 tanks) in July 2018, H6 and H6 north areas (24 tanks) in September 2018 and G4 south area (17 tanks) in March 2019.


Start of dismantling in H1 east area

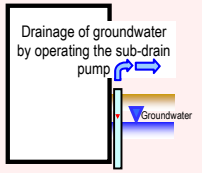

After dismantling in H1 east area

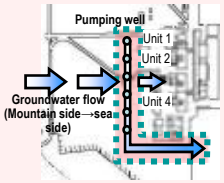
Completion of purification of contaminated water (RO concentrated salt water)

Contaminated water (RO concentrated salt water) is being treated using seven types of equipment including the multi-nuclide removal equipment (ALPS). Treatment of the RO concentrated salt water was completed on May 27, 2015, with the exception of the remaining water at the tank bottom. The remaining water will be treated sequentially toward dismantling the tanks.

The strontium-treated water from other facilities than the multi-nuclide removal equipment will be re-purified in the multi-nuclide removal equipment to further reduce risks.

Preventing groundwater from flowing into the Reactor Buildings





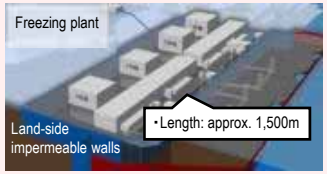
Reducing groundwater inflow by pumping sub-drain water

To reduce groundwater flowing into the buildings, pumping-up of groundwater from wells (subdrains) around the buildings started on September 3, 2015. Pumped-up groundwater was purified at dedicated facilities and released after TEPCO and a third-party organization confirmed that its quality met operational targets.

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

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.

Installing land-side impermeable walls with frozen soil around Units 1-4 to prevent the inflow of groundwater into the building



To prevent the inflow of groundwater into the buildings, installation of impermeable walls on the land side is planned. Freezing started on the sea side and at a part of the mountain side from March 2016 and at 95% of the mountain side from June 2016. Freezing of the remaining unfrozen sections advanced with a phased approach and freezing of all sections started in August 2017.

In March 2018, construction of the land-side impermeable walls was completed, except for a portion of the depth, based on a monitoring result showing that the underground temperature had declined below 0℃ in almost all areas, while on the mountain side, the difference between the inside and outside increased to approx. 4-5 m. The 21st Committee on Countermeasures for Contaminated Water Treatment, held on March 7, 2018, evaluated that together with the function of sub-drains, etc., a water-level management system to stably control groundwater and isolate the buildings from it had been established and had allowed a significant reduction in the amount of contaminated water generated.

For the unfrozen depth, a supplementary method was implemented and it was confirmed that temperature of the part declined below 0℃ by September 2018. From February 2019, maintenance operation started at all sections.

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

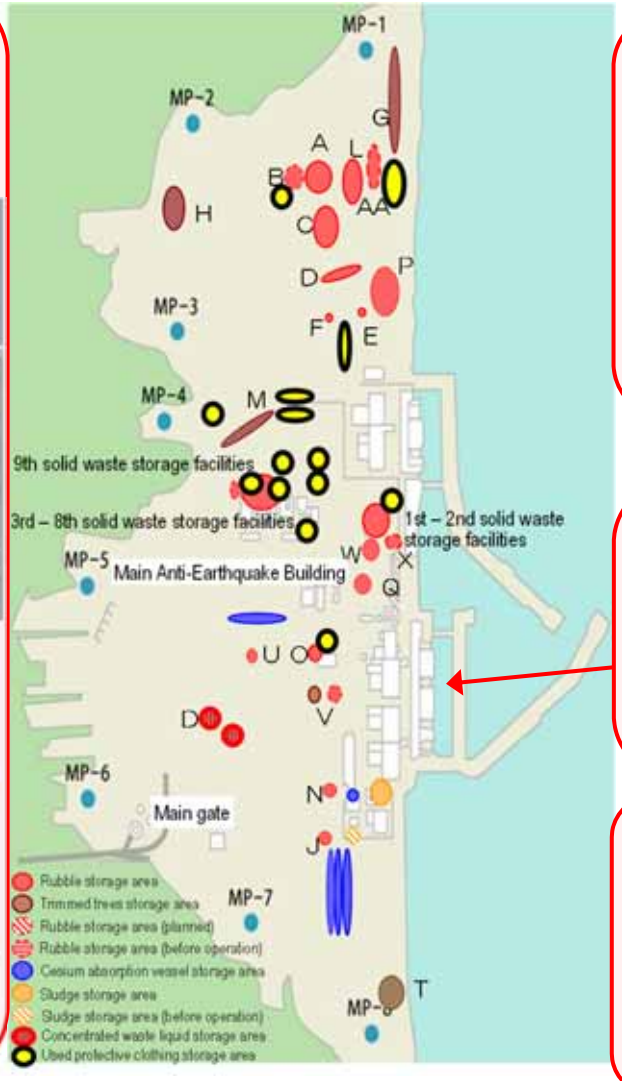
Optimization of radioactive protective equipment

Based on the progress of measures to reduce environmental dosage on site, the site is categorized into two zones: highly contaminated area around Unit 1-4 buildings, etc. and other areas to optimize protective equipment according to each category aiming at improving safety and productivity by reducing load during work.

From March 2016, limited operation started. From March and September 2017, the G Zone was expanded.

R zone (Anorak area)	Y zone (Coverall area)	G zone (General wear)
Full-face mask	Full-face or half-face masks *1, *2	Disposable disposable mask
Anorak on coverall Or double coveralls	Coverall	General*3 / Dedicated on-site wear

*1 For works in buildings including water-treatment facilities (multi-nuclide removal equipment, etc.) (excluding site visits), wear a full-face mask.
*2 For works in tank areas containing concentrated salt water or Sr-treated water (excluding works not handling concentrated salt water, etc., patrol, on-site investigation for work planning, and site visits) and work related to tank transfer lines, wear a full-face mask.
*3 Specified light works (patrol, monitoring, delivery of goods brought from outside, etc.)



Installation of dose-rate monitors

To help workers in the Fukushima Daiichi Nuclear Power Station precisely understand the conditions of their workplaces, a total of 86 dose-rate monitors were installed by January 4, 2016.

These monitors allow workers to confirm real time on-site dose rates at their workplaces.

Workers are also able to check concentrated data through large-scale displays installed in the Main Anti-Earthquake Building and the access control facility.

Installation of Dose-rate monitor

Installation of sea-side impermeable walls

To prevent the outflow of contaminated water into the sea, sea-side impermeable walls have been installed.

Following the completed installation of steel pipe sheet piles on September 22, 2015, connection of these piles was conducted and connection of sea-side impermeable walls was completed on October 26, 2015. Through these works, closure of sea-side impermeable walls was finished and the contaminated water countermeasures have been greatly advanced.

Installation of steel pipe sheet piles for sea-side impermeable wall

Status of the large rest house

A large rest house for workers was established and its operation commenced on May 31, 2015.

Spaces in the large rest house are also installed for office work and collective worker safety checks as well as taking rest.

On March 1, 2016 a convenience store opened in the large rest house. On April 11, operation of the shower room started. Efforts will continue to improve convenience of workers.