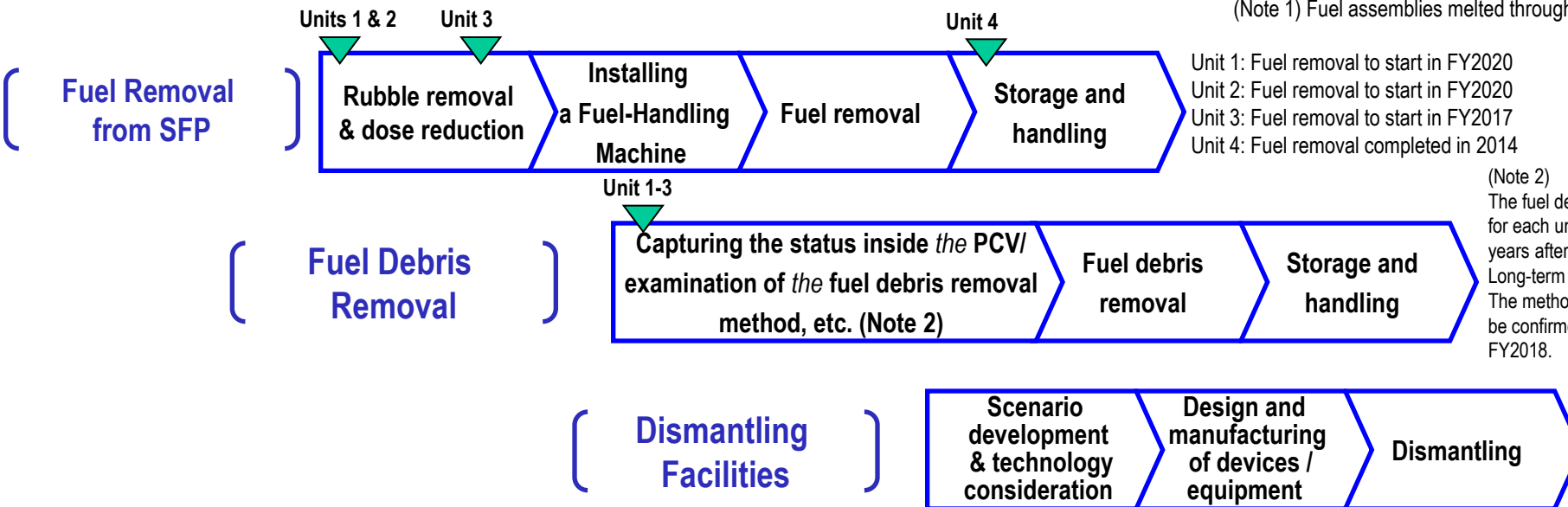


## Main decommissioning works and steps

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

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



### Toward fuel removal from pool

Toward fuel removal from Unit 1 SFP, works to dismantle the building cover are underway.

Dismantling of the building cover started in July 2015 and dismantling of wall panel was completed in November 2016. The work is being conducted steadily, with anti-scattering measures fully implemented and the density of radioactive materials monitored.



(Dismantling of Unit 1 building cover wall panels)

## Three principles behind contaminated water countermeasures

Countermeasures for contaminated water are implemented in accordance with the following three principles:

### 1. Eliminate contamination sources

- ① Multi-nuclide removal equipment, etc.
  - ② Remove contaminated water in the trench (Note 3)
- (Note 3) Underground tunnel containing pipes.

### 2. Isolate water from contamination

- ③ Pump up groundwater for bypassing
- ④ Pump up groundwater near buildings
- ⑤ Land-side impermeable walls
- ⑥ Waterproof pavement

### 3. Prevent leakage of contaminated water

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



### Multi-nuclide removal equipment (ALPS), etc.

- This equipment removes radionuclides from the contaminated water in tanks and reduces risks.
- Treatment of contaminated water (RO concentrated salt water) was completed in May 2015 via multi-nuclide removal equipment, additional multi-nuclide removal equipment installed by TEPCO (operation commenced in September 2014) and a subsidy project of the Japanese Government (operation commenced in October 2014).
- Strontium-treated water from equipment other than ALPS is being re-treated in ALPS.



(High-performance multi-nuclide removal equipment)

### Land-side impermeable walls

- Land-side impermeable walls surround the buildings and reduce groundwater inflow into the same.
- Freezing started on the sea side and part of the mountain side from March 2016 and on 95% of the mountain side from June 2016.
- On the sea side, the underground temperature declined below 0°C throughout the scope requiring freezing except for the unfrozen parts under the seawater pipe trenches and the areas above groundwater level in October 2016.



(Opening/closure of frozen pipes)

### Sea-side impermeable walls

- Impermeable walls are being installed on the sea side of Units 1-4, to prevent the contaminated groundwater from flowing into the sea.
- The installation of steel pipe sheet piles was completed in September 2015 and they were connected in October 2015. These works completed the closure of the sea-side impermeable walls.



(Sea-side impermeable wall)



# Progress Status and Future Challenges of the Mid- and Long-Term Roadmap toward Decommissioning of TEPCO Holdings' Fukushima Daiichi Nuclear Power Station Units 1-4 (Outline)

## Progress status

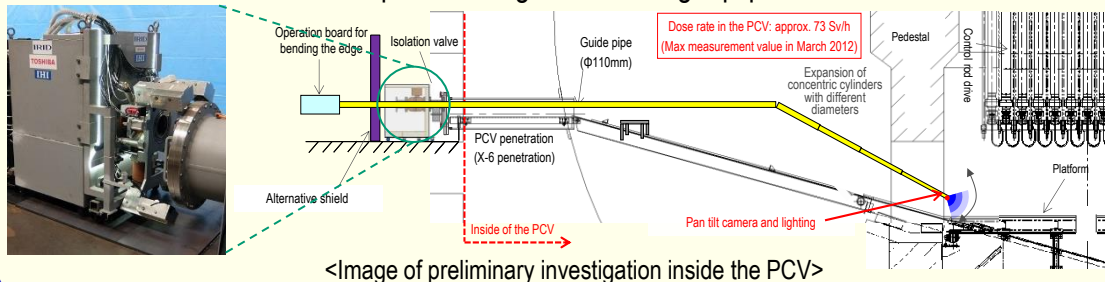
◆ The temperatures of the Reactor Pressure Vessel (RPV) and the Primary Containment Vessel (PCV) of Units 1-3 were maintained within the range of approx. 15-30°C<sup>\*1</sup> for the past month. There was no significant change in the density of radioactive materials newly released from Reactor Buildings in the air<sup>\*2</sup>. It was evaluated 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 November 2016, the radiation exposure dose due to the release of radioactive materials from the Unit 1-4 Reactor Buildings was evaluated as less than 0.00069 mSv/year at the site boundary. The annual radiation dose by natural radiation is approx. 2.1 mSv/year (average in Japan).

## Efforts toward an investigation inside the Unit 2 PCV

Toward an investigation inside the Unit 2 Primary Containment Vessel (PCV), after making a hole at the pipe penetration from which a robot will be inserted, a prior investigation will be conducted using a camera mounted on the edge of an expansible pipe in January 2017 to check for deposits which may impact on the operation of the self-traveling equipment and the damage status of the platform inside the pedestal. Following the preliminary investigation, the status inside the PCV will be inspected using self-travelling equipment.

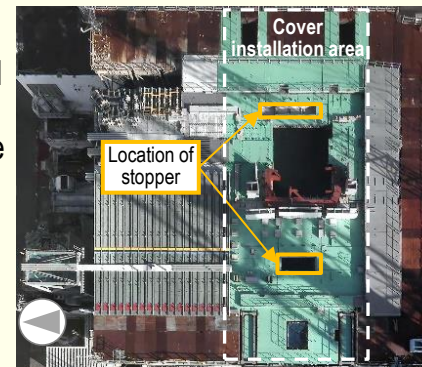


## Completion of Shield Installation on the Unit 3 R/B top floor

Toward fuel removal from Unit 3, the installation of shields was completed on December 2 as a measure to reduce the dose on the Reactor Building (R/B) top floor. Based on the dose gaging results after the installation of shields, measures will be implemented to reduce exposure and ensure safety while the cover for fuel removal will be installed.

Stoppers\* will be installed as part of the cover from January 2017.

\* Projections to horizontally support the fuel removal cover to the reactor building.



<Status of the R/B top floor (operation floor)>

## Reduction of water injection volume to the reactor

The water injection volume to the Unit 1 reactor was reduced from 4.5 to 4.0 m<sup>3</sup>/h from December 14. The temperature of the Reactor Pressure Vessel bottom remains within the anticipated range. The volume will be further reduced up to 3.0m<sup>3</sup>/h.

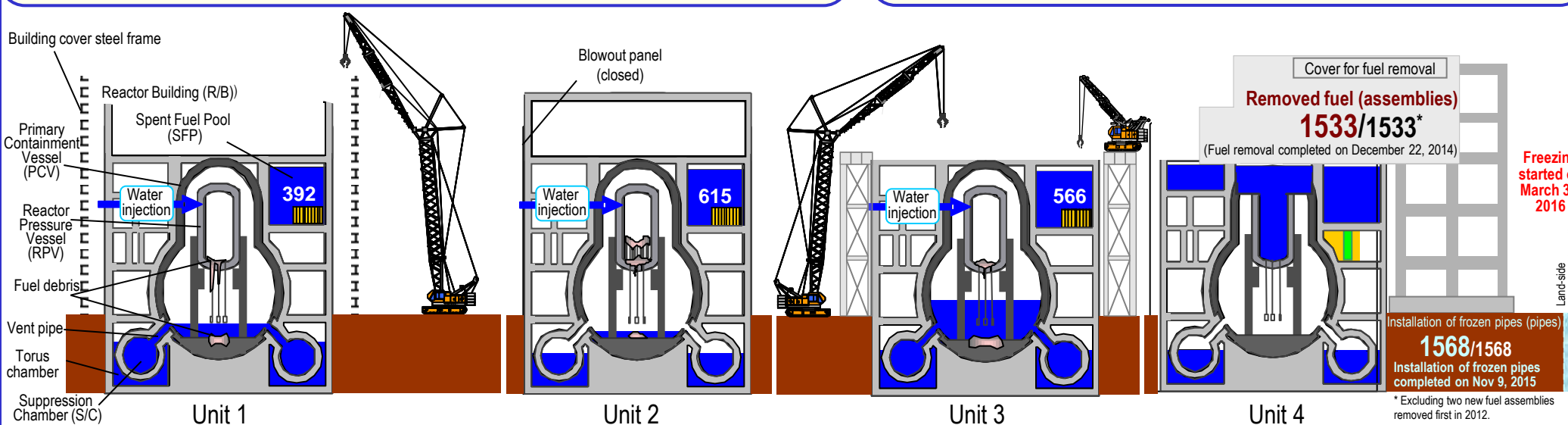
After the water injection reduction, the frequency of disclosing plant parameters, has been increased to twice daily.

## Status of the land-side impermeable walls

As for the land-side impermeable walls (on the mountain side), closure of two of seven unfrozen sections started on December 3 and the temperature is decreasing gradually.

As for the land-side impermeable walls (on the sea side), groundwater levels and its volumes pumped at the area 4 m above sea level have been monitored to evaluate the effect of the closure.

The water level declined to that before heavy rainfall in August and September. Effects of the land-side impermeable walls and other measures have been identified such as a record-low groundwater volume pumped at the area 4 m above sea level and lower increase after rainfall.



## Results of the questionnaire survey for workers to improve the work environment

With the aim of improving the work environment for workers at the power station, the 7<sup>th</sup> questionnaire survey was conducted, to which approx. 89% (6,182) of workers responded. The evaluation results on the work environment showed further improvement compared to those of the previous survey.

For potentially inappropriate working situations (such as cases labor conditions were not explained to the workers) were identified in the questionnaire answers, a follow-up investigation was conducted into the items for which the prime contractors and employer companies identified.

The investigative results confirmed that the working situations were appropriate. Efforts to improve the work environment will continue, based on opinions and requests received from workers.

## Suspension of safety equipment attributable to human errors

Equipment for safety failed: on December 4, cooling of the Unit 2 and 3 spent fuel pools was suspended; and on December 5, water injection to the Unit 3 reactor was suspended. As both were attributable to human errors, we must reaffirm that even a single error may lead to suspension of important functions. Based on this awareness, rigorous recurrence prevention measures will be implemented.

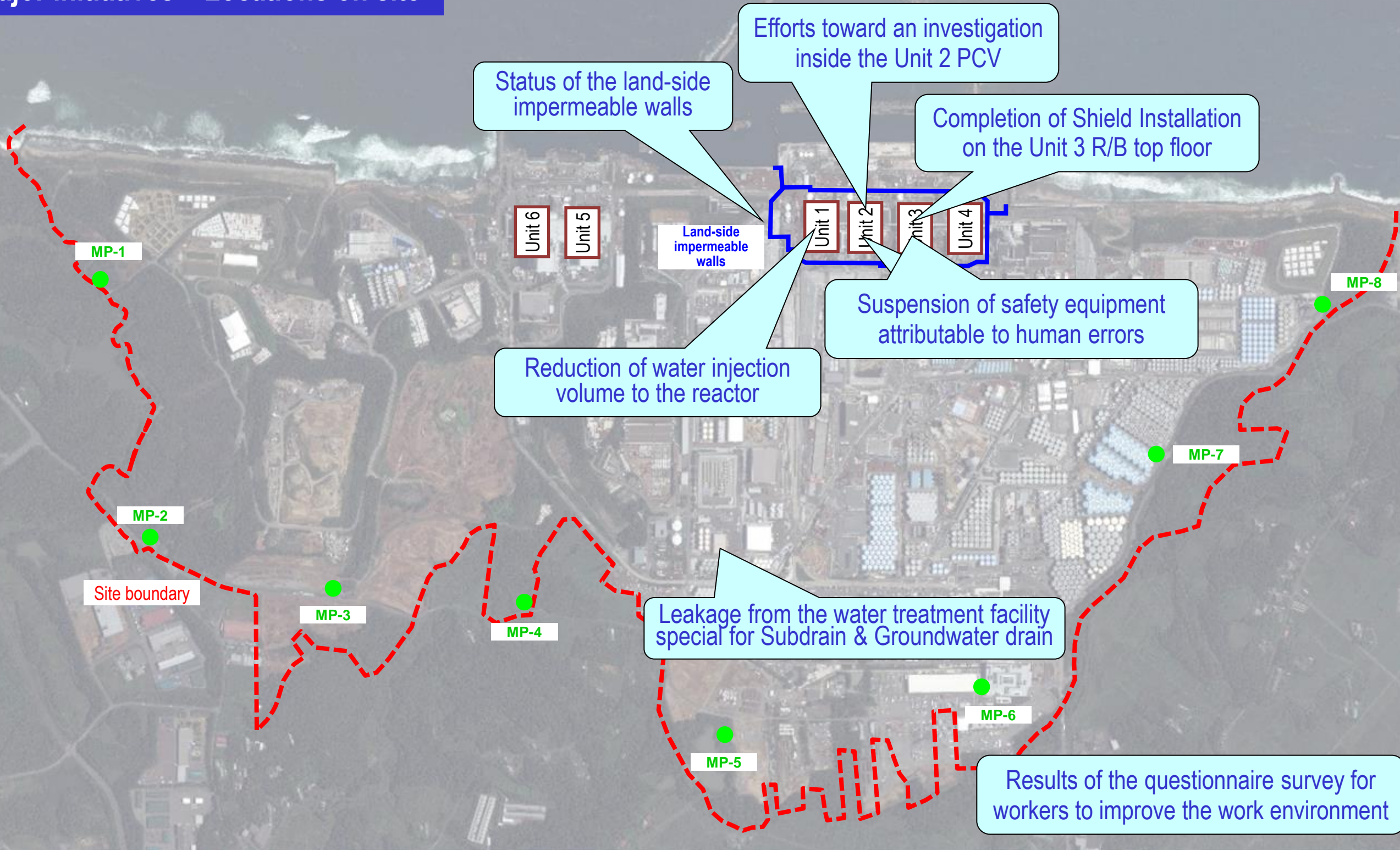
In addition to thorough measures such as physical protection to prevent suspension of important functions in the event of a human error, notifications and announcements will be made without delay for keeping people from worrying.

## Leakage from the water treatment facility for Subdrains

For leakage from flexible hoses connecting to the absorption vessel inlet and outlet of the facility detected on November 15 and December 6, flexible hoses of equivalent specification were replaced with new hoses by December 8. Materials of flexible hoses will be changed to corrosion-resistant synthetic rubber to prevent recurrence.



# Major initiatives – Locations on site



Provided by Japan Space Imaging, (C) DigitalGlobe

\* Data of Monitoring Posts (MP1-MP8.)  
 Data (10-minute value) of Monitoring Posts (MPs) measuring airborne radiation rate around site boundaries show 0.554 – 2.125  $\mu\text{Sv/h}$  (November 22 – December 20, 2016).  
 We improved the measurement conditions of monitoring posts 2 to 8 for precise measurement of **the** air dose rate. Construction works 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 panel around monitoring post No. 6, which is one of the instruments used to measure the radiation dose of the power station site boundary, were taken off from July 10-11, 2013, since the surrounding radiation dose has largely **declined** due to further **deforestation**, etc.