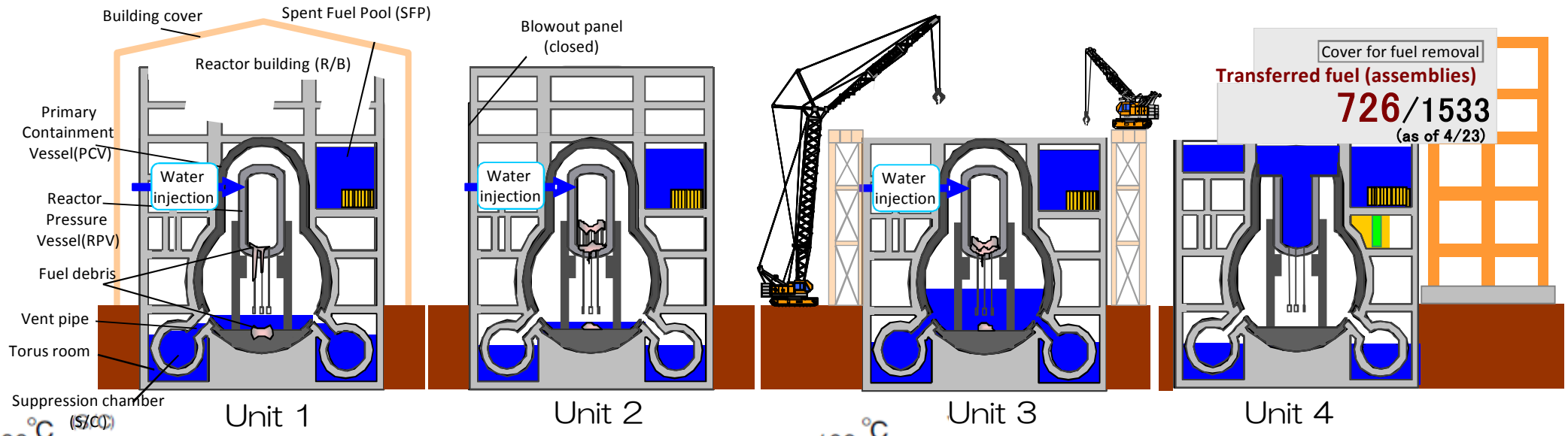
Status of Fukushima Daiichi Nuclear Power Station

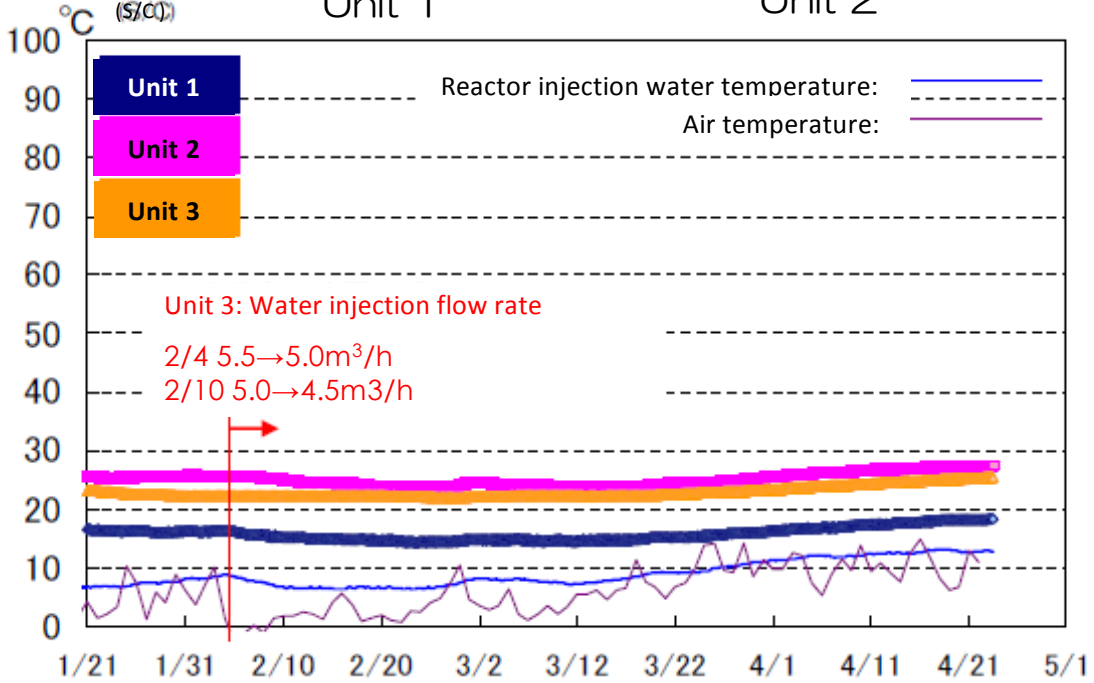
Apr. 25, 2014

Tokyo Electric Power Co., Inc.

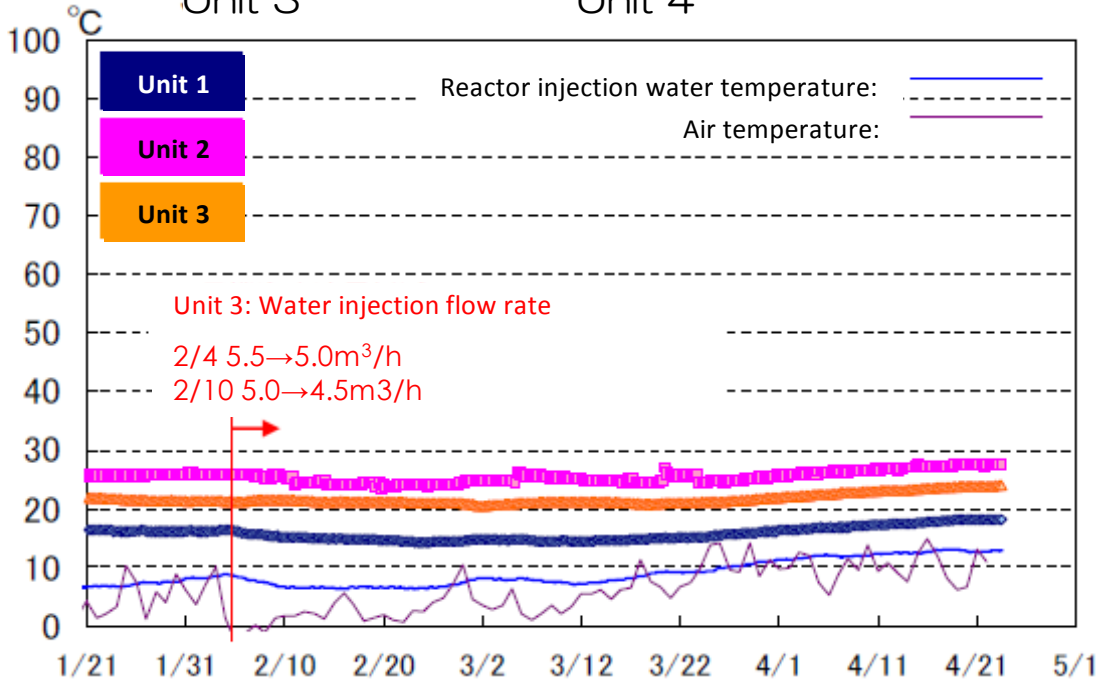
Confirmation of cold shutdown condition

➢All units remain in cold shutdown condition.



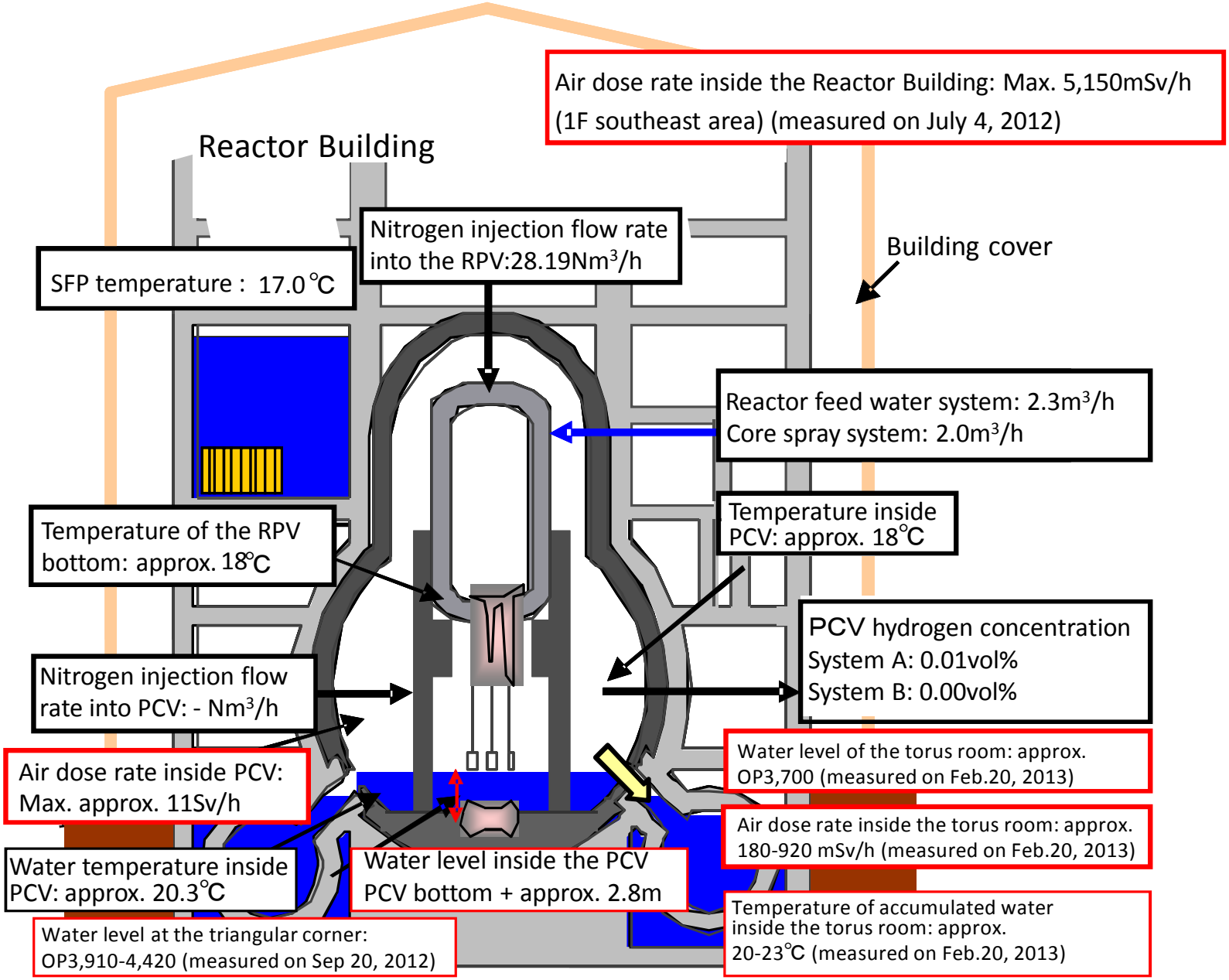


RPV bottom temperatures



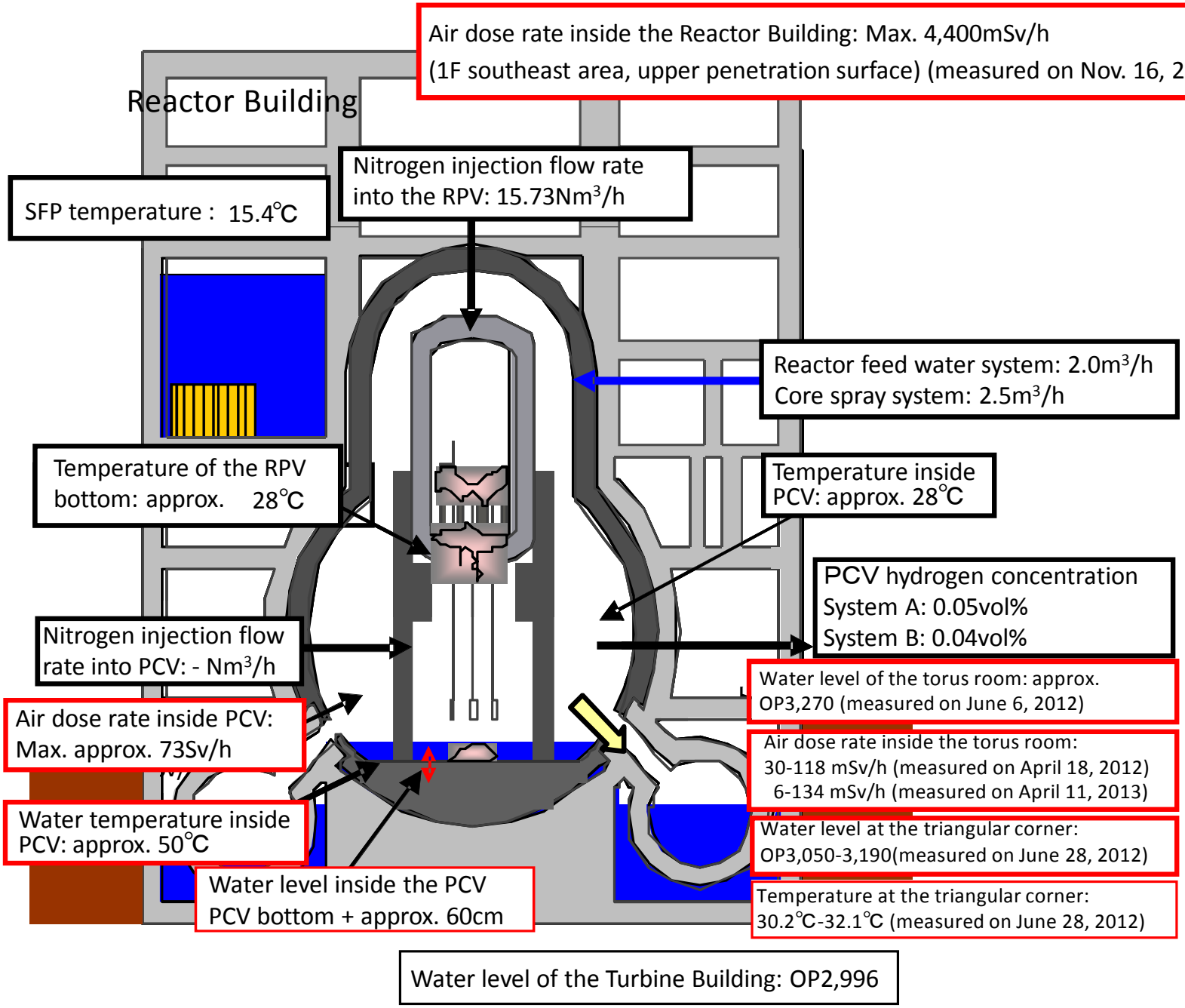
PCV gas phase temperatures

Situation of Unit 1



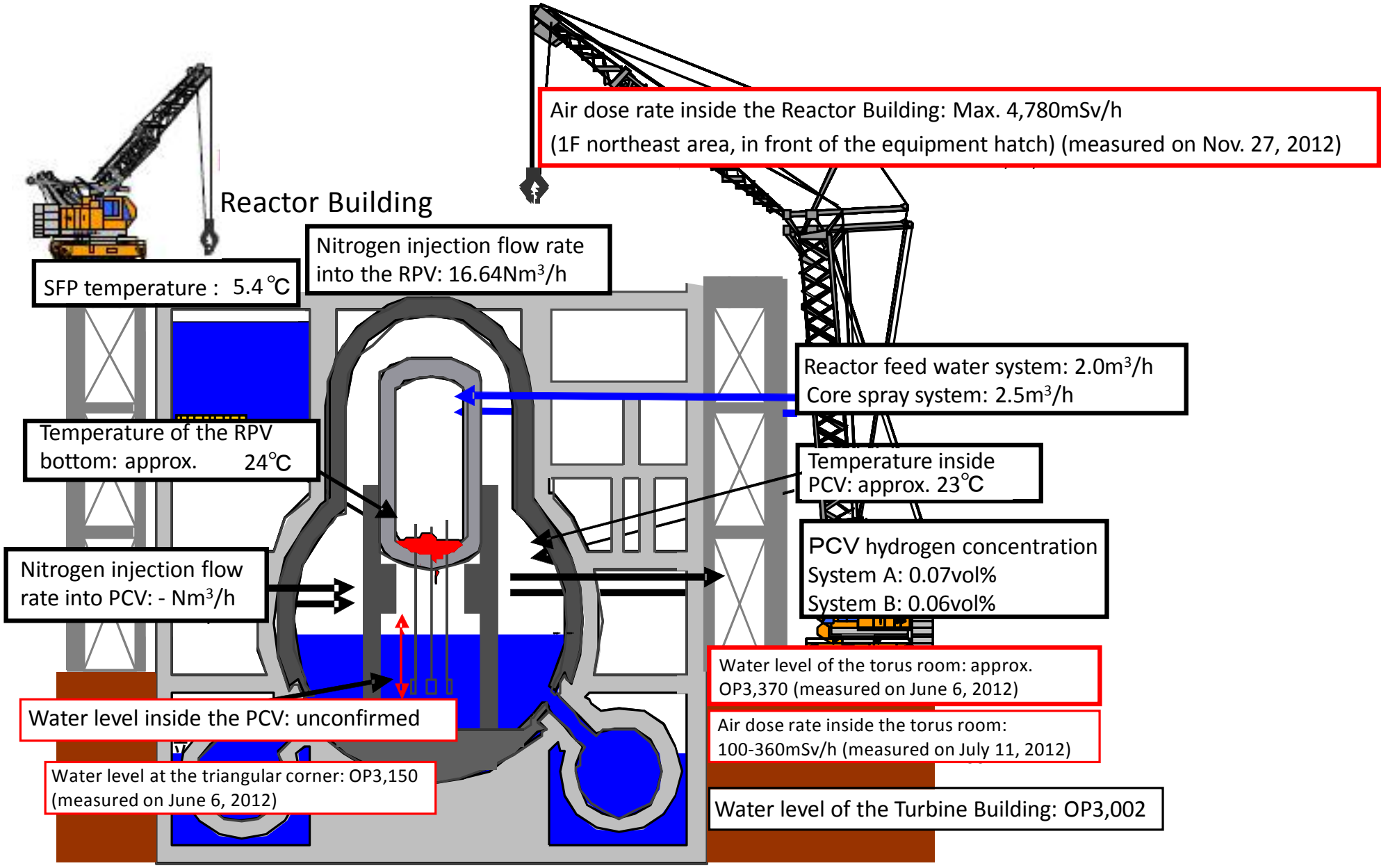
* Indices related to plant are values as of 11:00, April 23, 2014

Situation of Unit 2



* Indices related to plant are values as of 11:00, April 23, 2014

Situation of Unit 3



* Indices related to plant are values as of 11:00, April 23, 2014

Outline of Countermeasures for Decommissioning and Contaminated Water Treatment

Preparation for fuel removal and fuel debris retrieval from Units 1-3 is promoted as well as promotion of fuel removal from spent fuel at Unit 4 are carried out.

Major work items and operation step of "Decommissioning"

Units 1 and 2 / Unit 3 / Unit 4

Fuel removal from spent fuel pool

- Removal of rubble, decontamination (Units 1 and 2)
- Install fuel removal facility (Unit 3)
- Fuel removal (Unit 4)
- Storage/Transfer

1- Unit 3

Fuel debris (molten fuel)retrieval

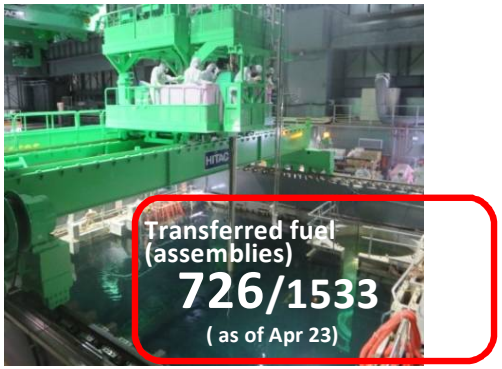
- Decontamination, leakage point investigation
- Water stoppage
- Fuel debris retrieval
- Storage and Transfer

Dismantling of nuclear facility etc.

- Verification of scenario /technology
- Facility design
- Dismantling etc.

Fuel removal from spent fuel pool

- Started fuel removal from Unit 4 Spent fuel pool from Nov. 18, 2013.
- Working on the preparation work aiming at the completion of fuel retrieval from Unit 4 by the end of 2014.



(Fuel removal)

Outline of Countermeasures for Decommissioning and Contaminated Water Treatment

Three principles and major tasks of "Countermeasures on Contaminated water issues"

- Underground water flowing into the water cooled down the fuel melted in the accident. Approx. 400 tons/day of contaminated water is generated, and stored in the tanks within the site.

Policy 1. **Eliminating** the source of the contamination

(1) Purification of contaminated water by multi-nuclide removal equipment.

(2) Removing contaminated water in the trench.

Policy 2. **Keeping water away** from the contamination

(3) Pumping ground water through a groundwater bypass

(4) Pumping ground water from the well near the building.

(5) Installation of land impermeable barrier by the frozen soil method.

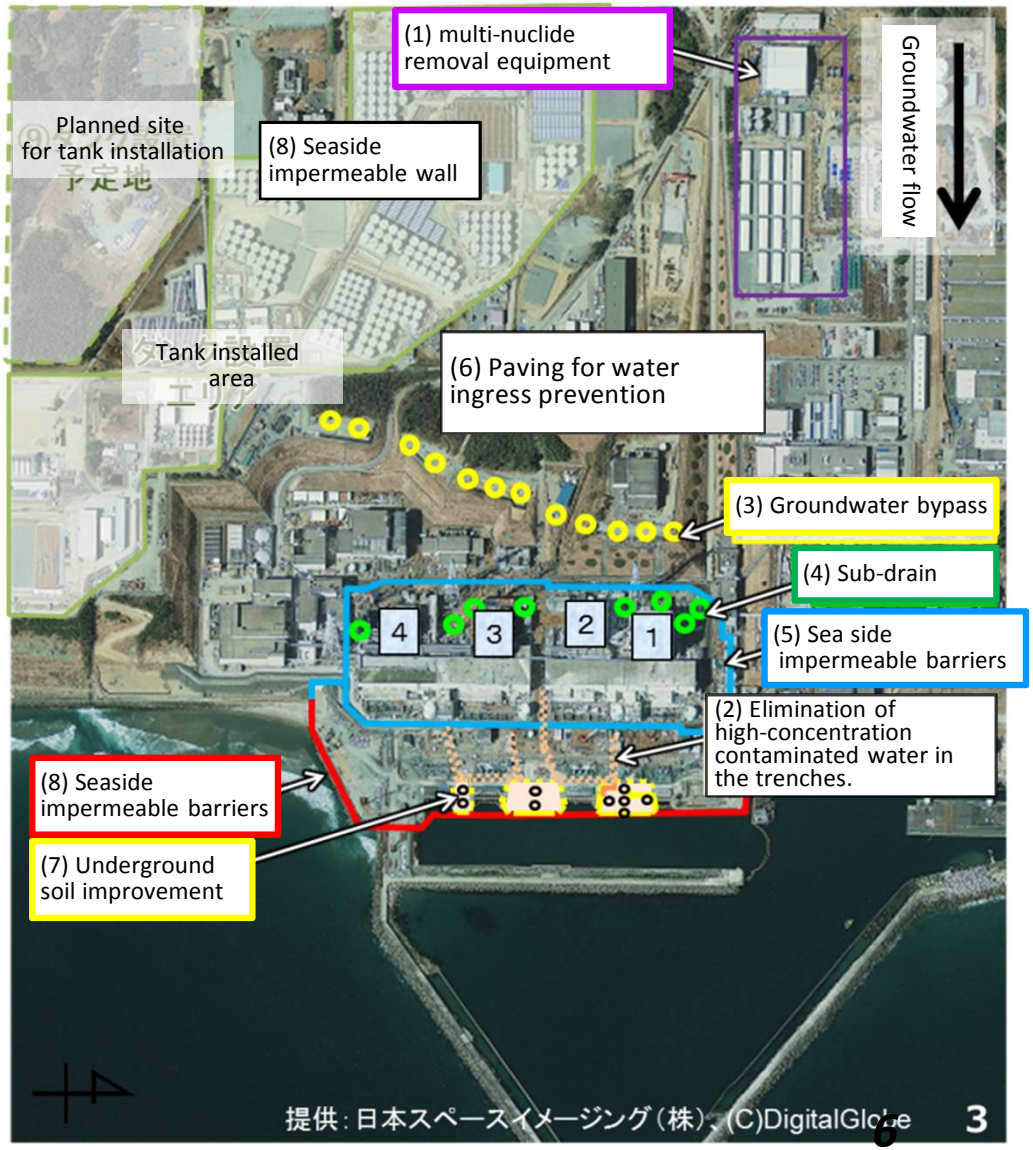
(6) Pave the ground surface to prevent the ingress of rainwater.

Policy 3. **Avoiding leakage** of the contaminated water

(7) Underground soil improvement by liquid glass

(8) Installation of impermeable barriers in the sea

(9) Installation of additional tanks
(e.g. Replace with welded joint tanks.)



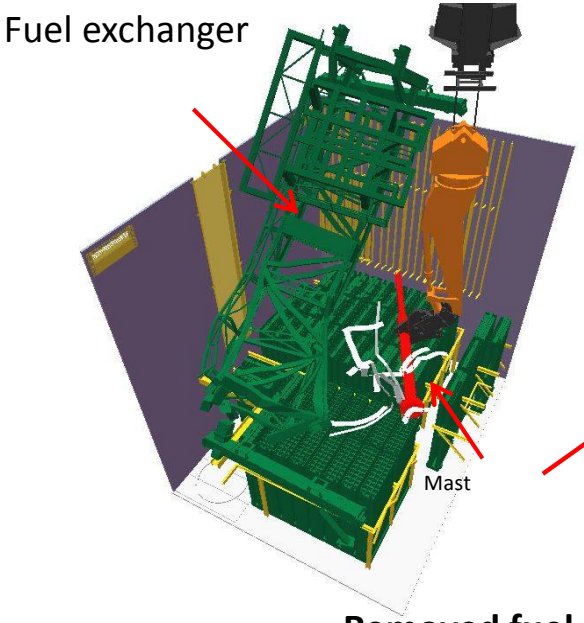
Status of Countermeasures for Decommissioning and Contaminated Water Treatment in the past one month

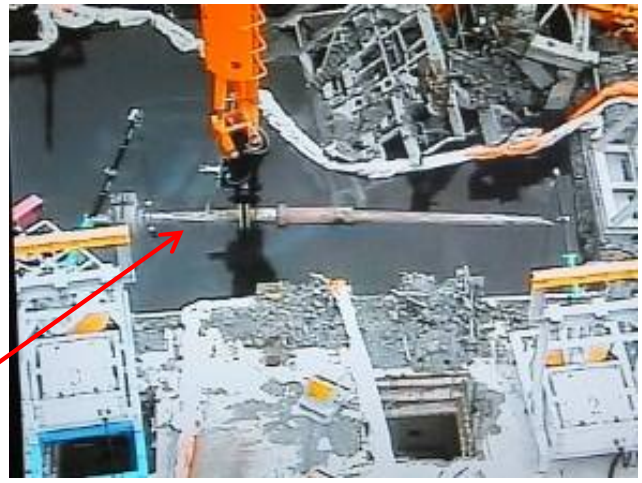
(1) Started operation of pumping through a groundwater bypass

- Activated each pump of 12 groundwater bypass pumping wells sequentially from Apr. 9, and started pumping up the groundwater.
- Groundwater which was pumped up is stored in the tank and water quality test by the third party is ongoing.

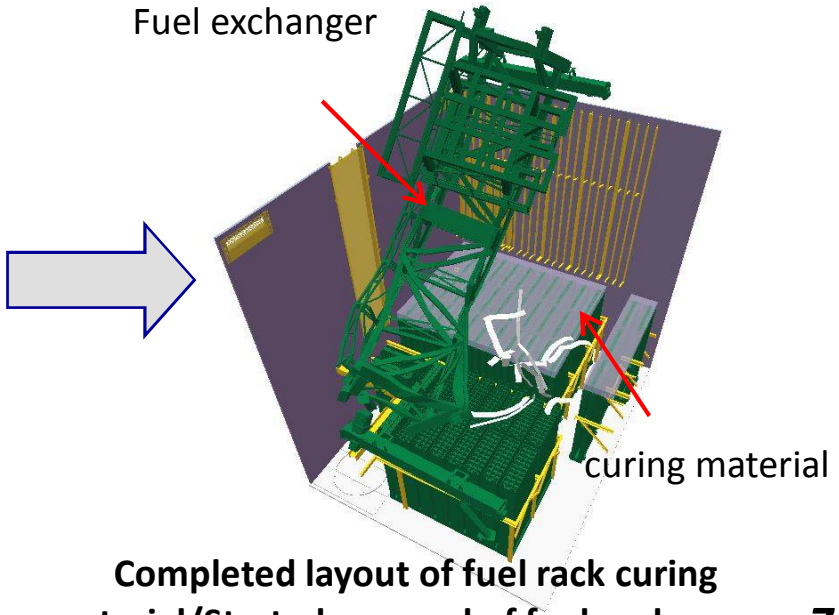
(2) Started removal of fuel exchanger at Unit 3 fuel exchangers

- Started removal of rubble in Spent fuel pool from last Dec.
- Removal of fuel exchangers was started on Apr. 19 earlier than expected due to the acceleration of removal of rebar, roof material, and concrete piece.





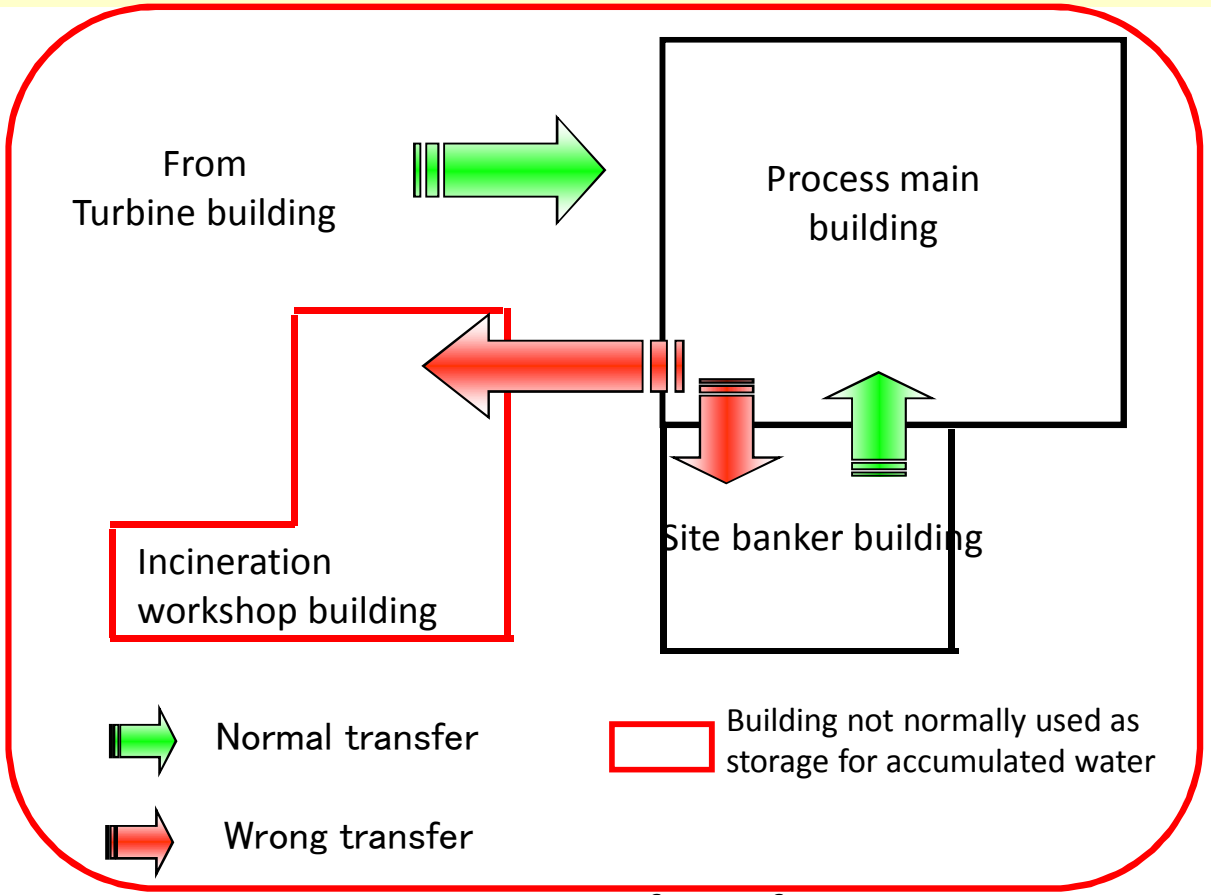
Removed fuel exchangers mast (3.27.2014)



Completed layout of fuel rack curing material/Started removal of fuel exchangers

(3) Wrong transfer of accumulated water to incineration workshop building

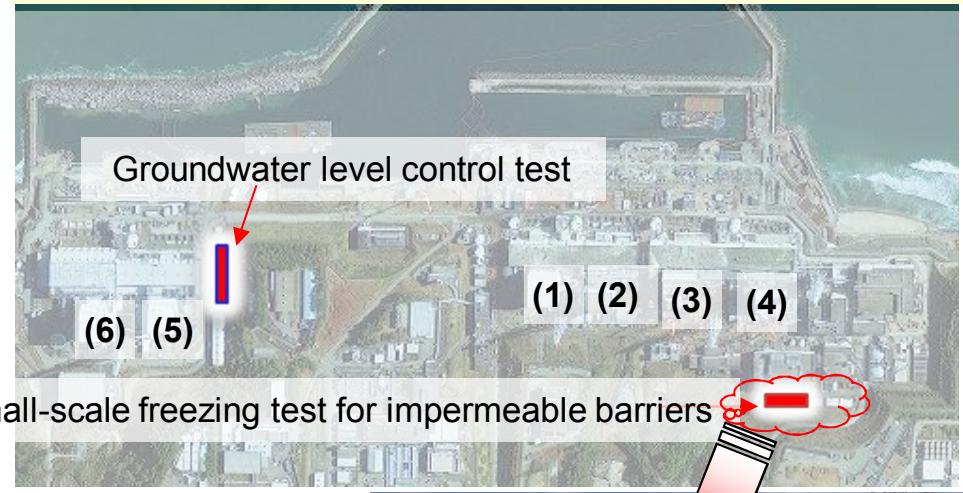
- Since Four temporary pumps, which is normally not used (Process main building →Site banker building : One unit, process main building →Incineration workshop building: One unit, Incineration workshop building→Process main building : Two units) was operated, accumulated water was transferred from process main building to the incineration workshop building, which is supposed not to store it.
- Now accumulated water in the incineration workshop building is being transferred to the process main building (Apr. 14-). As countermeasures for management, security of power panel, control of valve, and locking of building/door are enhanced.

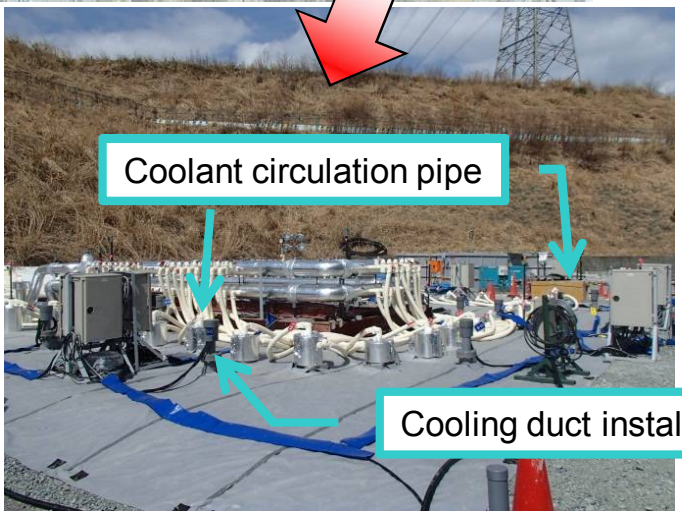


Layout of transfer route

(4) Validation of freezing of small-scale impermeable barriers

- A feasibility study has been conducted toward the installation of frozen impermeable barriers surrounding Units 1 to 4.
- Freezing test for small-scale impermeable barriers, about 10m x 10m on the west side of the common pool began on Mar. 14.
- Small-scale impermeable barriers were confirmed to be developed by the temperature / groundwater level check, and confirmation by turning over the soil .





(5) Design plan for additional storage tank of accumulated water

- Accelerated to execute the plan from 2015 to 2014, to increase the number of tanks up to about 800000 m^3 by transferring tank manufactured in the factory by the ship, in addition to the tank to be constructed on site.

Tank transported by the ship

Unloading tank

(6) Fukushima Advisory Board for the countermeasures for Decommissioning and Contaminated Water Treatment

- Second meeting was held on Apr. 14 (Iwaki-city) . Based on the opinions from last time(Feb. 17), information on the current project was shared. We received suggestions from the attendees for further improvement for timely information sharing .

(7) Established Fukushima Daiichi Decommissioning Promotion Company

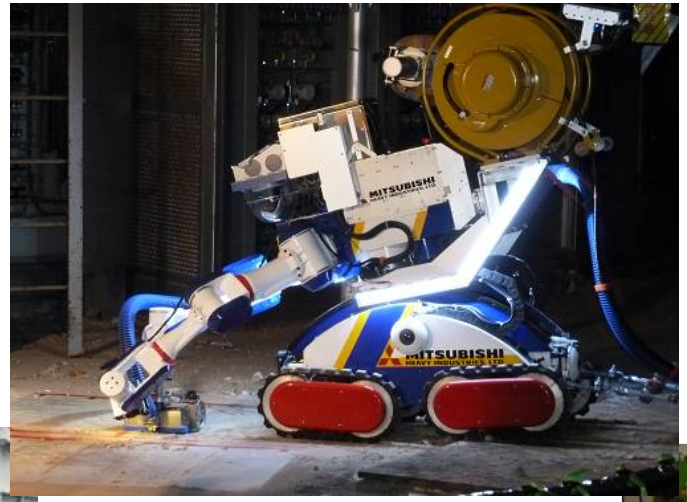
- Launched “Fukushima Daiichi Decommissioning Promotion Company” on Apr. 1 for the purpose of the clarification of responsibility structure of countermeasures for Decommissioning and Contaminated Water Treatment for Fukushima Daiichi Nuclear Power Station and focusing on the project .

Progress of Fuel Debris Retrieval in the past one month

(1) Demonstration of decontamination equipment in the building

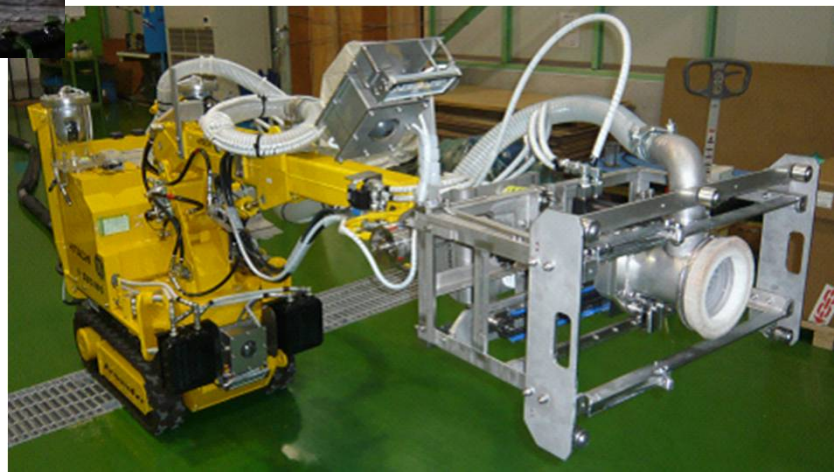
➢ To establish decontamination plan for reactor building in preparation of future debris retrieval , conducted demonstration of decontamination equipment, and developed for the subsidized project by METI.

- Suction/blast decontamination equipment : 1/30-2/4 First floor at Unit 1 Reactor building
- Dry ice blast decontamination equipment : 4/15- 21 First floor at Unit 2 Reactor building
- High-pressure water decontamination equipment : 4/23- 29 First floor at Unit 1 Reactor building



Suction/blast decontamination equipment

Decontamination equipment for dry ice blast



Decontamination equipment for high-pressure water

Progress of Fuel Debris Retrieval in the past one month

(2) Boring on the floor in preparation of investigation for outer bottom section of Suppression chamber of Unit 2

- In order to confirm the applicability of investigation equipment for outer bottom section, which is developed in subsidized project by METI, actual device verification for Unit 2 was planned during the month of July-Aug. Boring process will be conducted in advance to prevent interference with other work. (4/17-26)

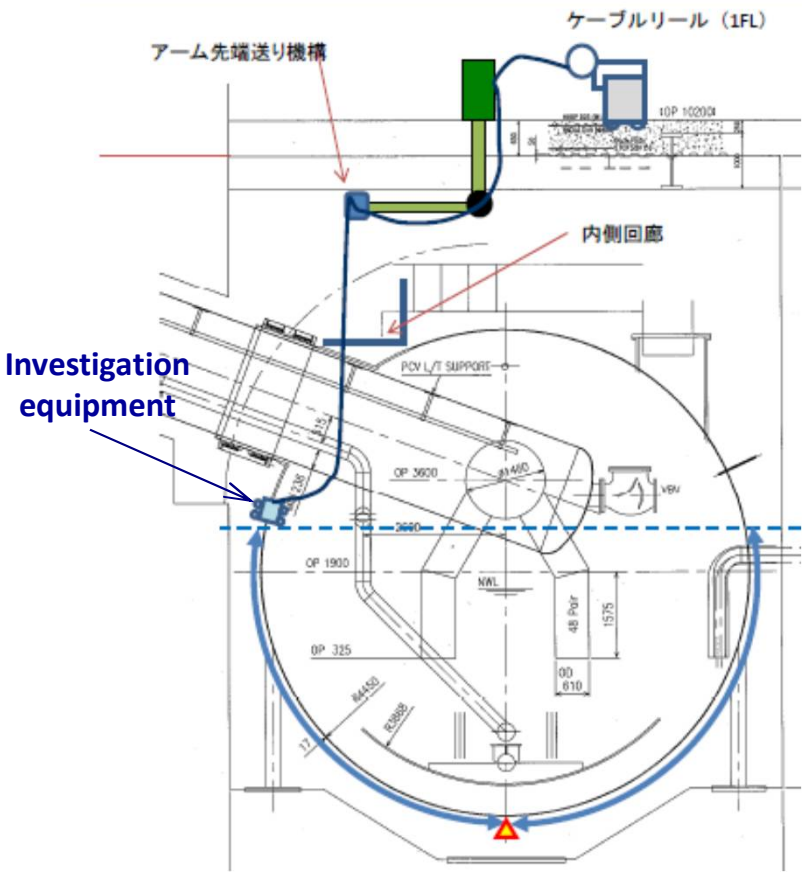
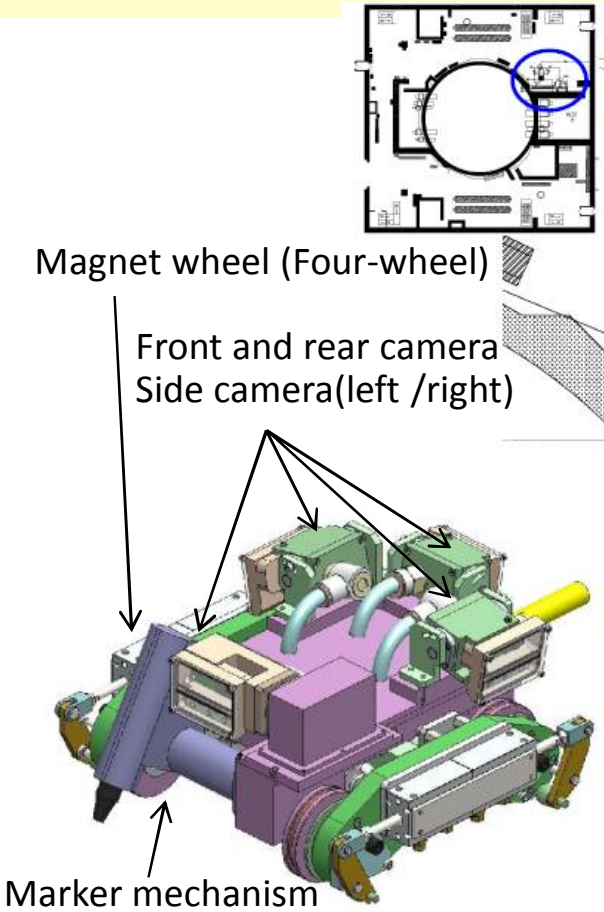
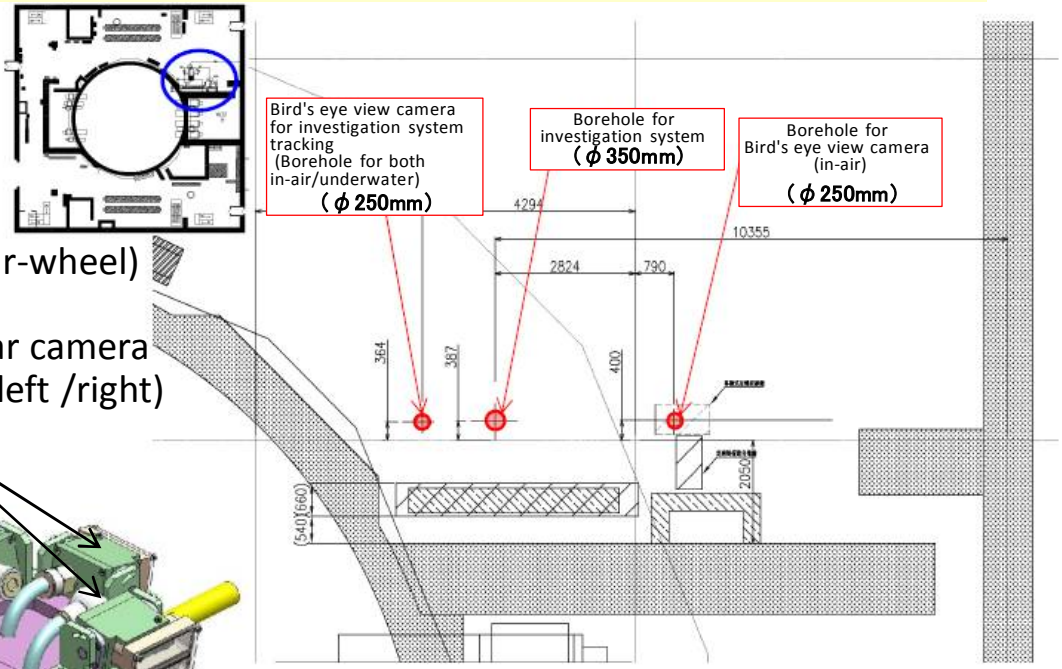


Image of actual device verification



Investigation equipment for S/C outer bottom section

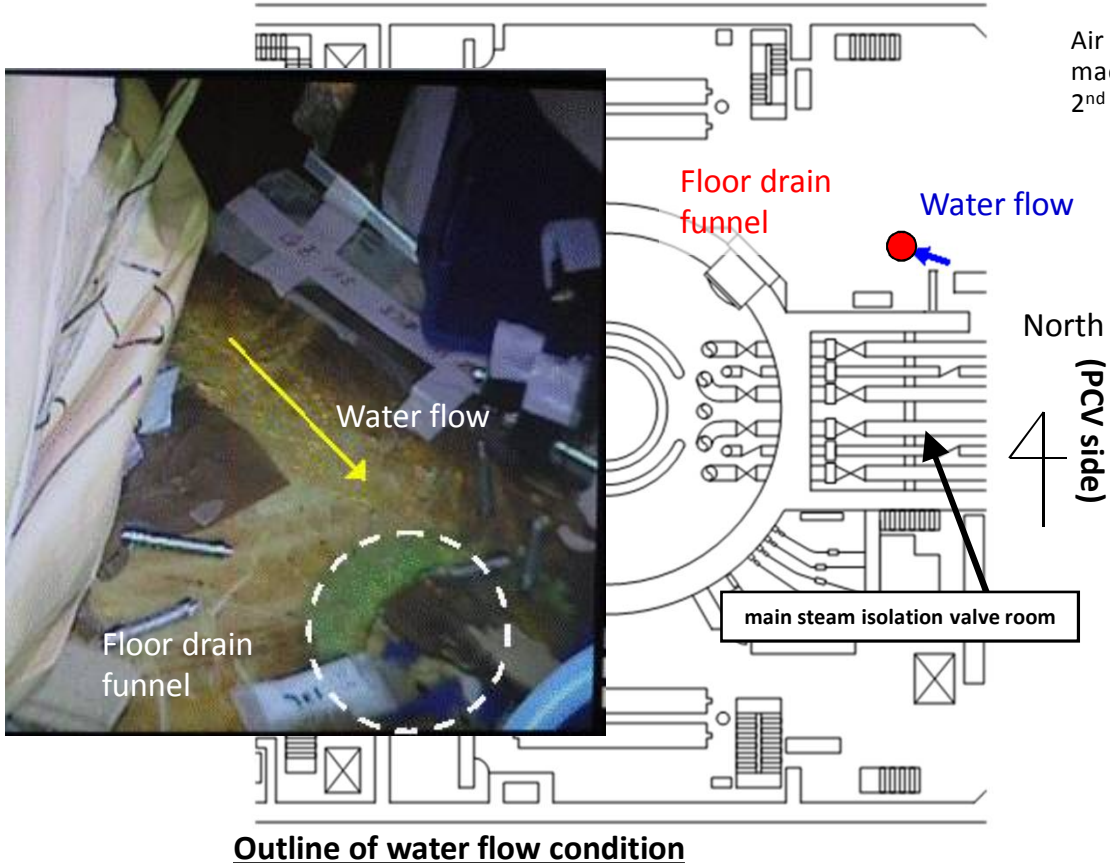


Borehole location on the 1st floor of reactor building at Unit 2

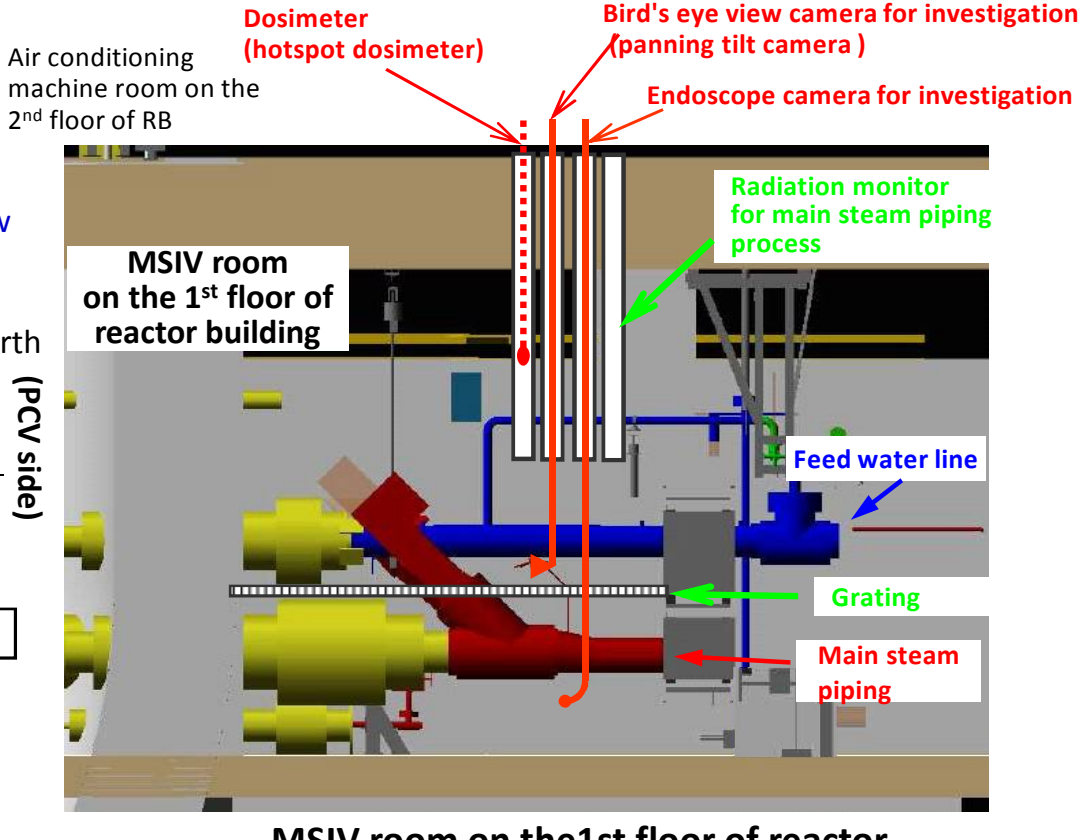
Status of Fuel Debris Retrieval in the past one month

(3) First floor of reactor building for Unit 3
Investigation of water flow from main steam isolation valve room

- Water flow was confirmed to be flown from around the door of the main steam isolation valve room located in the northeast area of 1st floor of reactor building into adjacent floor drain funnel (outlet) on Jan. 18. The outlet is connected to the basement stairs of reactor building, and it will not be leaked outside the building.
- Based on the results of temperature of water flow and radioactive material , drawings etc., accumulated water is expected to exist in the PCV.
- From Apr. 23, started to conduct image acquisition by the camera and dose measurement for the piping for instrument that connected air conditioning machine room on the 2nd floor of reactor building and main steam isolation valve room of 1st floor.



Outline of water flow condition

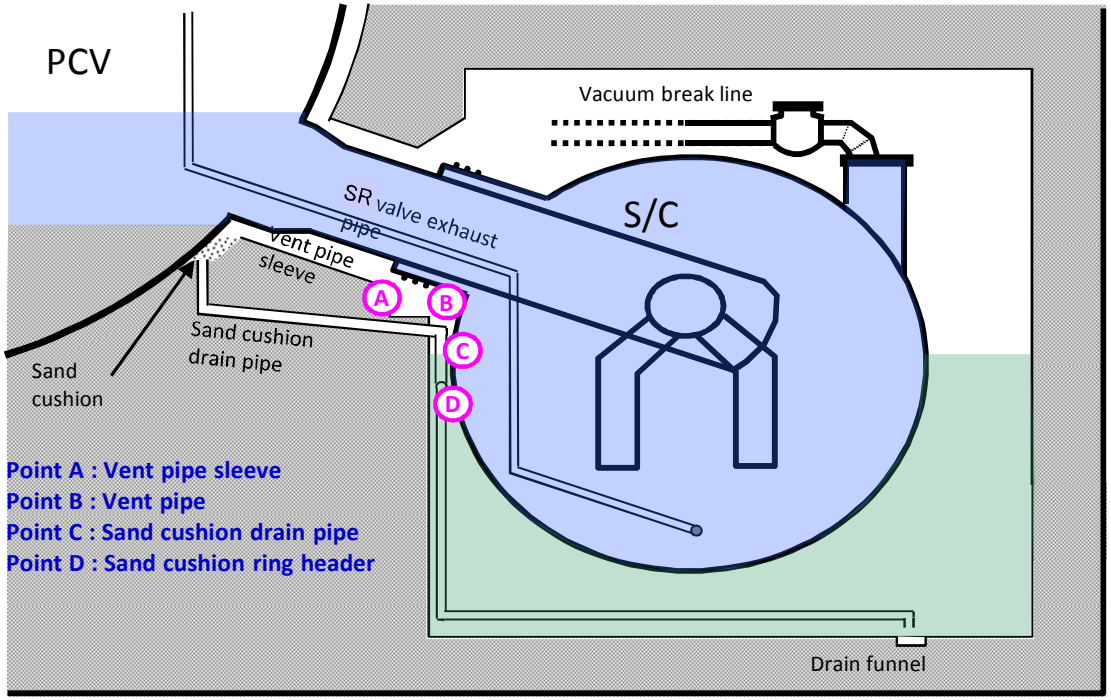


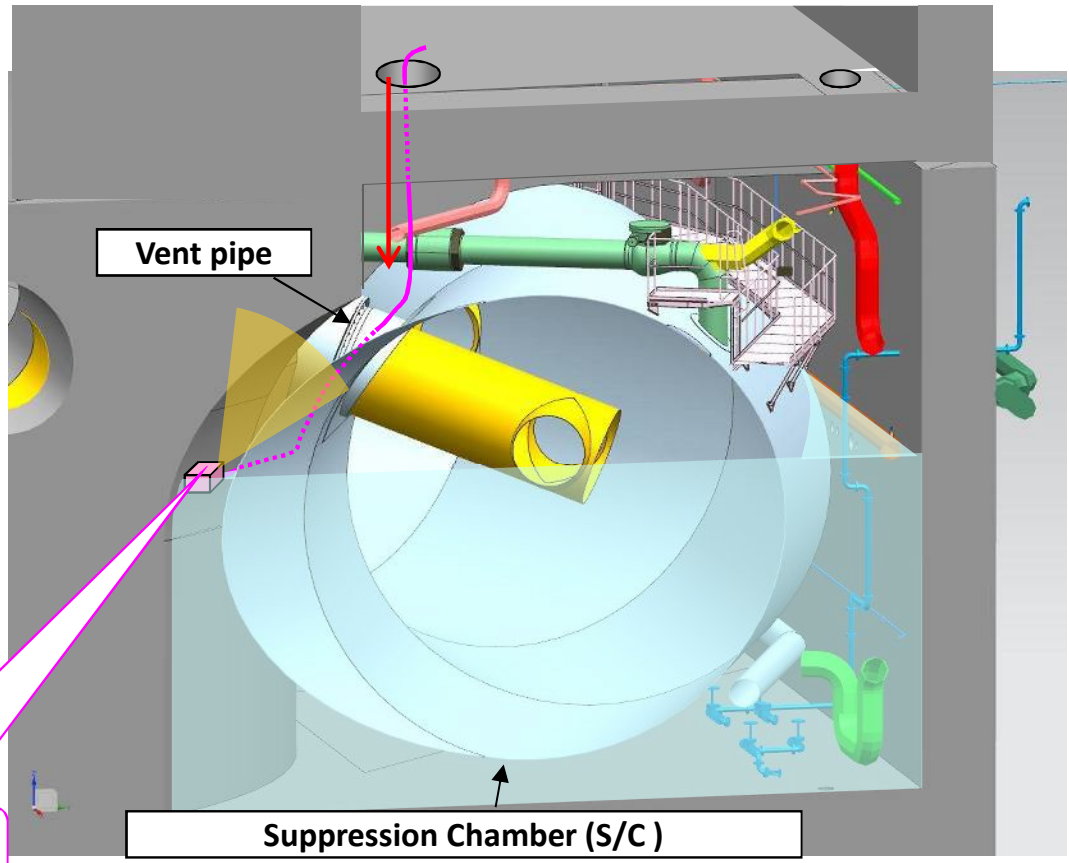
MSIV room on the1st floor of reactor building (cross section)

(Reference) Status of Fuel debris retrieval

(1) Investigation around lower part of vent pipe at Unit 1(Outline)

- In preparation of PCV repair (water stoppage) required for fuel debris retrieval, conducted investigation around the lower part of vent pipe to estimate point of leakage from PCV.
- Leakage from the vent pipes and the sand cushion drain pipes, and the external conditions of these pipes were checked using images captured by cameras mounted on a surface boat.






Surface boat: Travel test at factory

Surface boat

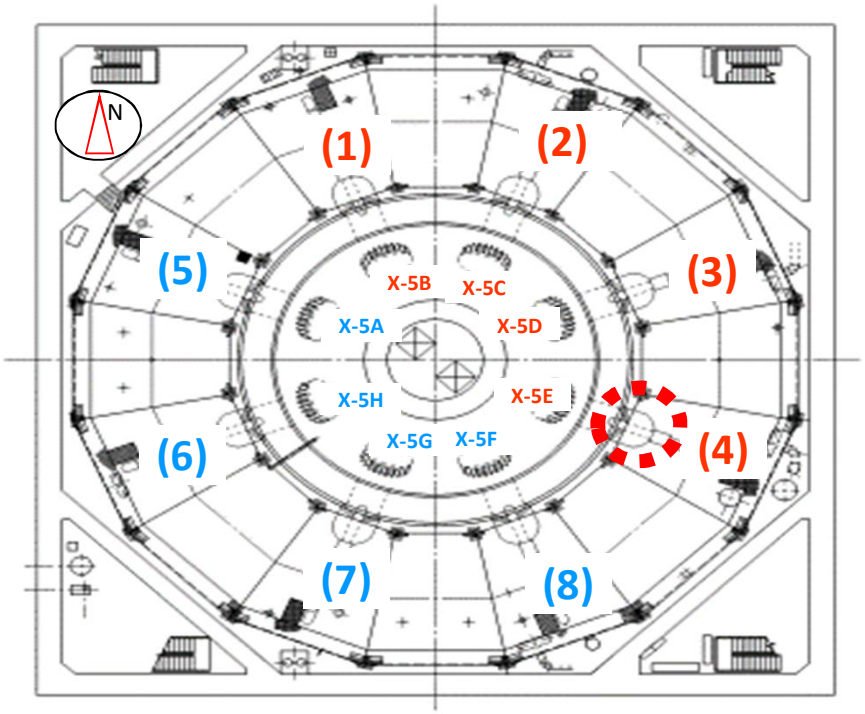
(Reference) Status of Fuel debris retrieval

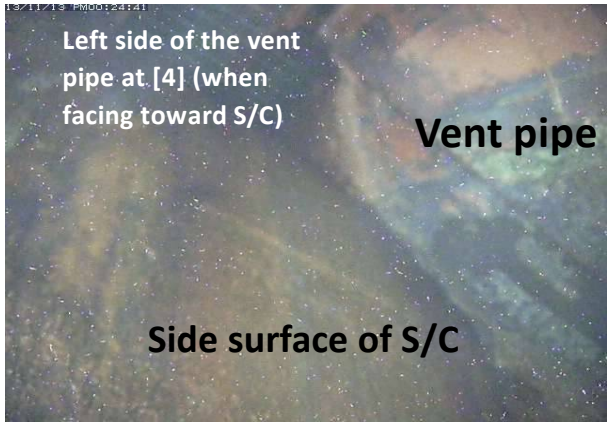
(1) Investigation around lower part of vent pipe at Unit 1 (investigation results)

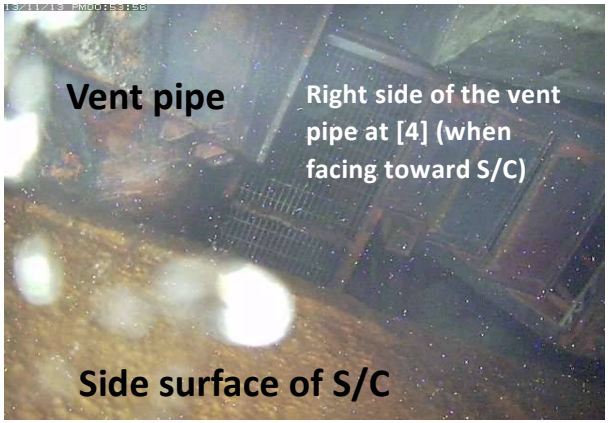
➢Investigation results of suction drain pipe

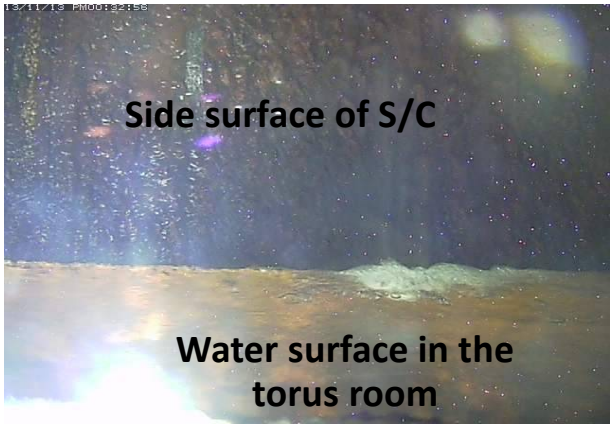
Water was confirmed to be flown downward on the surface of S/C from the direction of upper part of the S/C of vent pipe [4].

No leakage was found between [1]- [3] and [5]- [8].







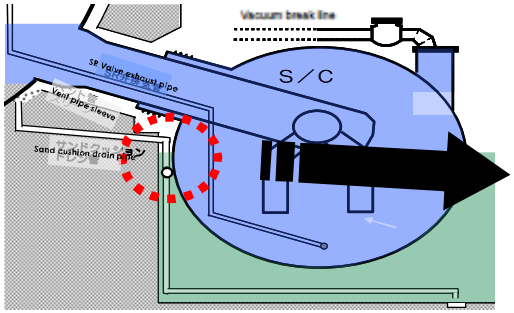


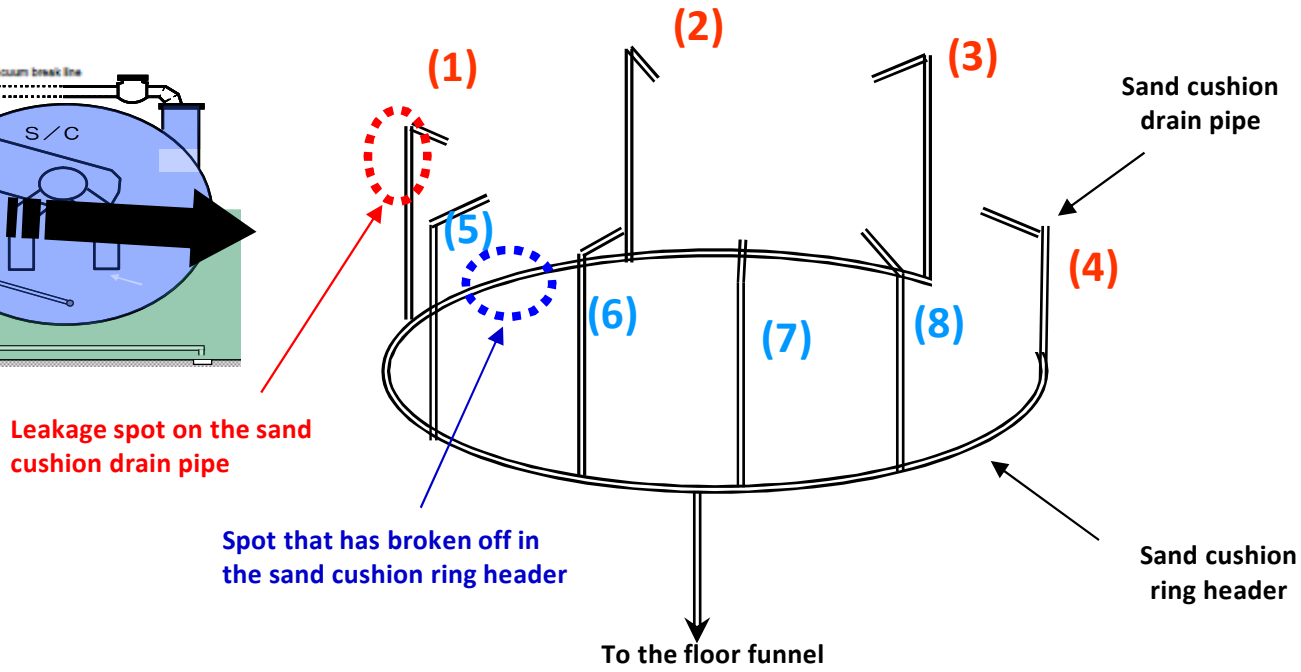
(Reference) Status of Fuel debris retrieval

(1) Investigation around lower part of vent pipe at Unit 1 (investigation results)

➢Investigation results on the sand cushion drain pipes

- Damage and leakage were found on the sand cushion drain pipe at [1].
- Drain pipe was not damaged and there was no water flow between [2] and [8].
- The sand cushion ring header was found to have been damaged between [1] and [2].





(Reference) Status of Fuel debris retrieval

(2)Measuring inside the S/C at the Units 2(Outline)

- Conducted measurement for water level inside the S/C (Suppression chamber) for the purpose of estimating opening status of point leaking from PCV in preparation of PCV repair (water stoppage) required for fuel debris retrieval. (Estimating aperture area at leakage point by the difference of water level inside and outside the S/C (Torus room), and verifying possibility of releasing of water stopping material that fills the S/C from inside the S/C etc.)
- Demonstration of technology to measure water level inside the S/C of reactor building at Unit 2 by ultrasonic wave from outer surface of S/C on Sep. 2013 by using remote control developed for Agency for Natural Resources and Energy FY2012 Structural improvement project for technology related to the measurement on the power reactor accident. (development of base technology for remote control for water level measurement inside the cylindrical container). Since S/C surface condition was worse than expected, water level could not be detected instead of confirming the water phase. Based on the experience and the result of mock-up test at plant and Unit 4, water level measurement was confirmed to be capable of being conducted, and resumed demonstration at Unit 2.

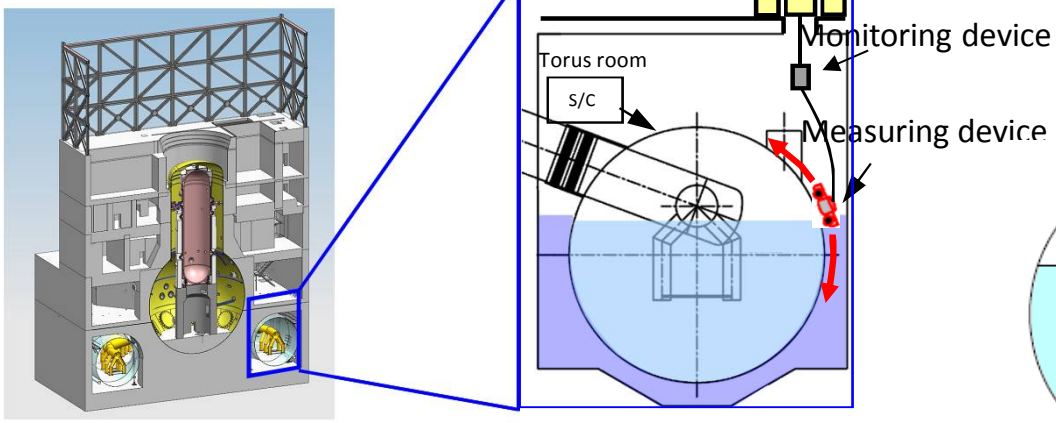
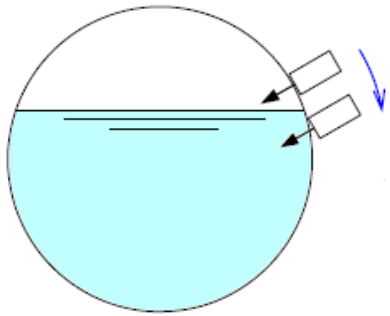


Image of Measurement inside the S/C at the Units 2



Measurement

(Reference) Status of Fuel debris retrieval

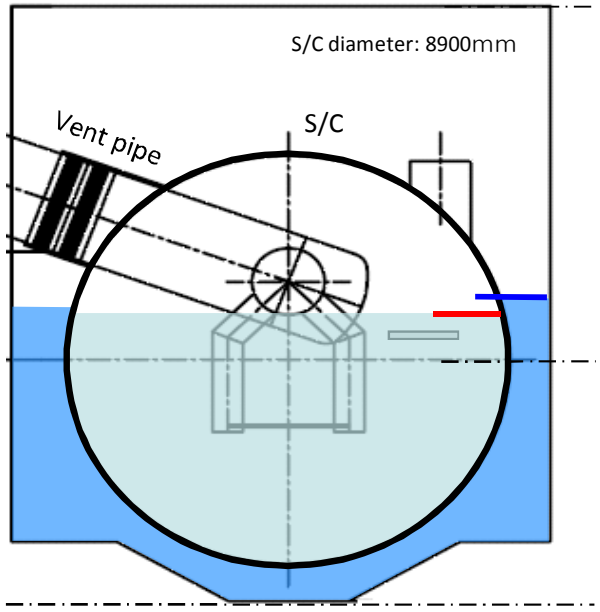
(2) Measuring inside the S/C at the Units 2(Measurement results)

➢ The measuring was conducted from January 14 to 16 at multiple lines (multiple longitudes) in order to enhance the reliability of specifying the exact water level. The numerical values of January 14 and 15 in the following chart were obtained in the middle of the series of the data collecting work.

Measurement date	January 14	January 15	January 16
Water level in S/C	about OP3,210	about OP3,160	about OP3,150
Water level of accumulating water inside Torus Room (Reference)	about OP3,230	about OP3,190	about OP3,160
Water level difference	about 20mm	about 30mm	about 10mm
Measuring method	Direct distance measuring for structures the in the water		

[Note] It is estimated that the water level inside the S/C is influenced by the change of the water level of accumulating water inside the torus room.

During of the water level measuring



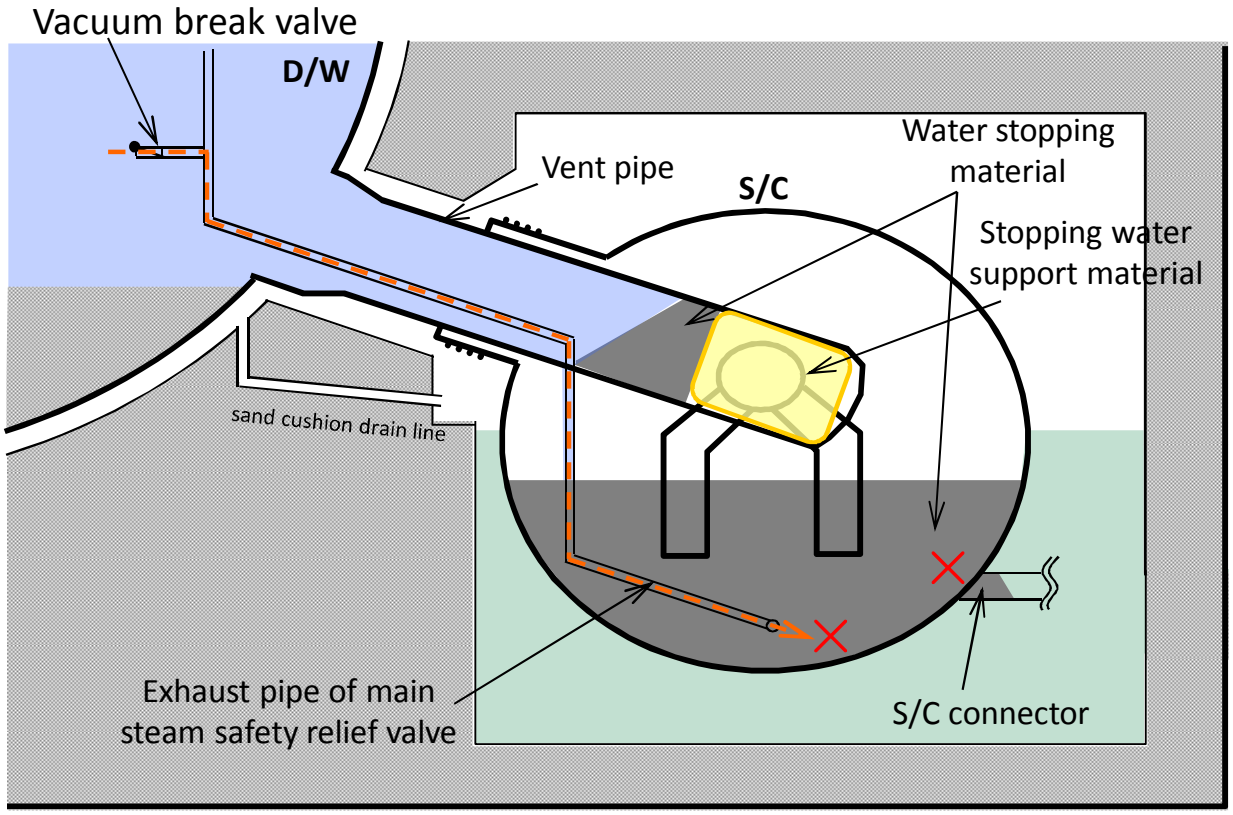
First floor level of the Unit 2 Reactor Building: OP 10,200 mm

S/C equator : OP 1,900 mm

First basement floor of the Unit 2 Reactor Building (Lowest level): OP-3 3,360 mm

(Reference) Status of Fuel debris retrieval

(2)Measuring inside the S/C at the Units 2 (Future effort)



Water stoppage method

- Element test of water stoppage method for vent pipe as a national project is on-going.
- Since cooling water in the D/W will be flowing into S/C via piping inside the vent pipe when increasing water level inside the D/W, verification on the filling inside the S/C with water stopping material will be conducted (also isolate S/C connector).

Investigate on lower surface of S/C to check possibility of releasing of water stopping material that fills the S/C Torus room.