Physics of Reactors Topical Meeting 2014 - PHYSOR2014

Current Status on Fukushima Daiichi NPS

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Today's topics

1. Earthquake/tsunami and emergency response immediately after the accident
2. Measures against contaminated water
3. Steps for decommissioning
    - 3-1. Current status of Unit 1
    - 3-2. Current status of Unit 2
    - 3-3. Current status of Unit 3
    - 3-4. Current status of Unit 4
4. Work environment etc.

1.Earthquake/tsunami and emergency response immediately after the accident

Earthquake and tsunami

Time/date of earthquake: Friday, March 11, 2011 at 14:46pm

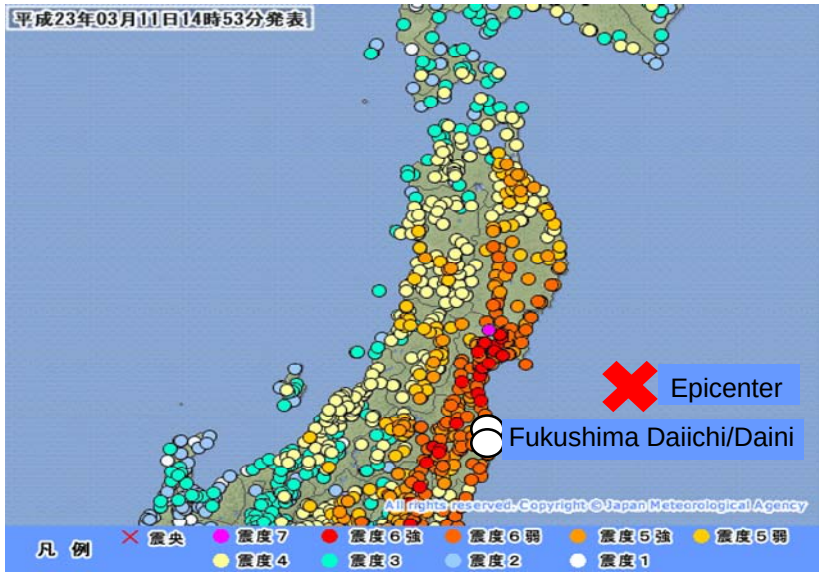
Epicenter: Off the Sanriku coast（38° N, 142.9° E) Focal Depth of 24km Magnitude 9.0

The Japan Meteorological Agency Seismic Intensity Scale: (Range: 0-7, 10 grades with 5-U/L, 6-U/L)

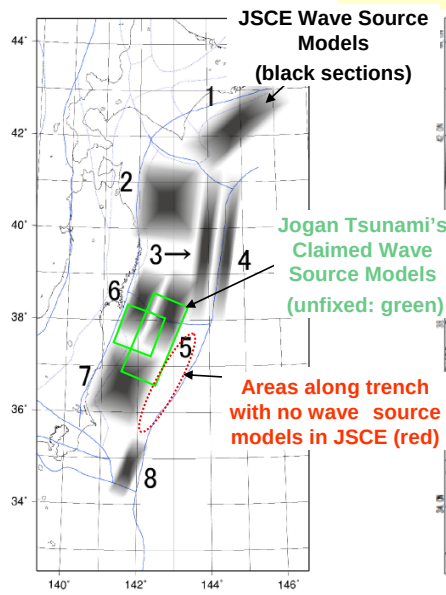
7 : Kurihara City, Miyagi Prefecture

6-Upper: Naraha, Tomioka, Okuma, and Futaba Towns in Fukushima Prefecture

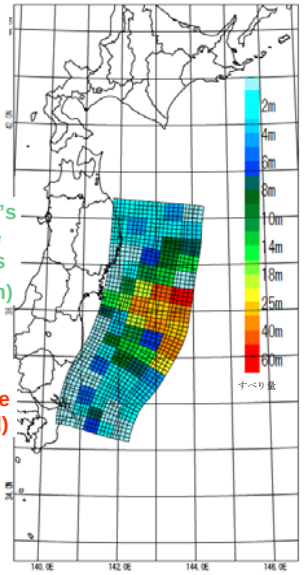
6-Lower: Ishinomaki City & Onagawa Town, Miyagi Prefecture; Tokai Village, Ibaraki Prefecture



Distribution of Seismic Intensity on 3-11



JSCE Method and Jogan Tsunami Claimed Sources
(Jogan source is based on Satake et.al 2008)



Tsunami Wave Source on 3-11
(Evaluated by TEPCO)

- Massive earthquake (magnitude 9.0 and the fourth largest ever recorded worldwide)
- Caused by simultaneous move of several regions: Area of 500 km x 200 km slipped off the coast along the trench
- Even though the Head of Earthquake Research Promotion evaluated earthquake and tsunami for individual area with historical records, simultaneous movements was not considered.

Damages by tsunami

Unit5 Sea water pump area

Unit1 PCV cooling sea water pump

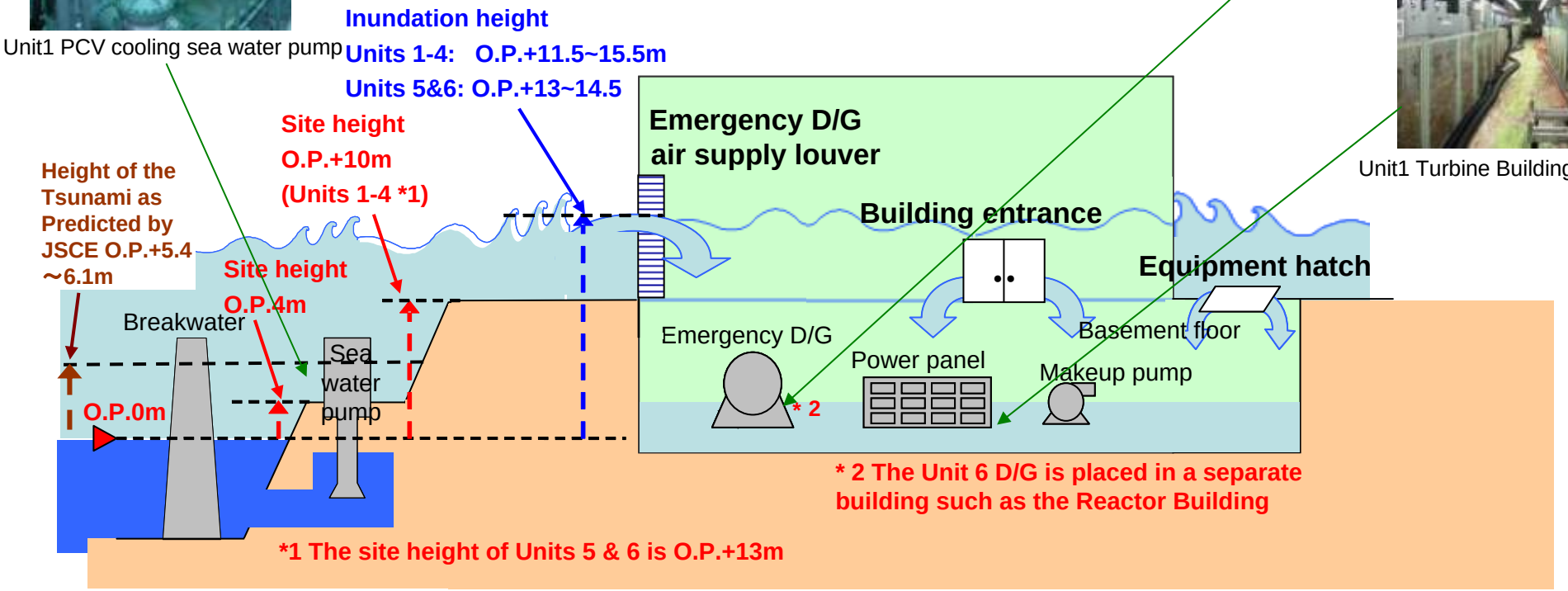
The main inundation routes are:

1) Building entrance
2) Equipment hatches
3) Emergency D/G air in-take louvers
4) Trenches, ducts (cable penetrations, etc.) etc.

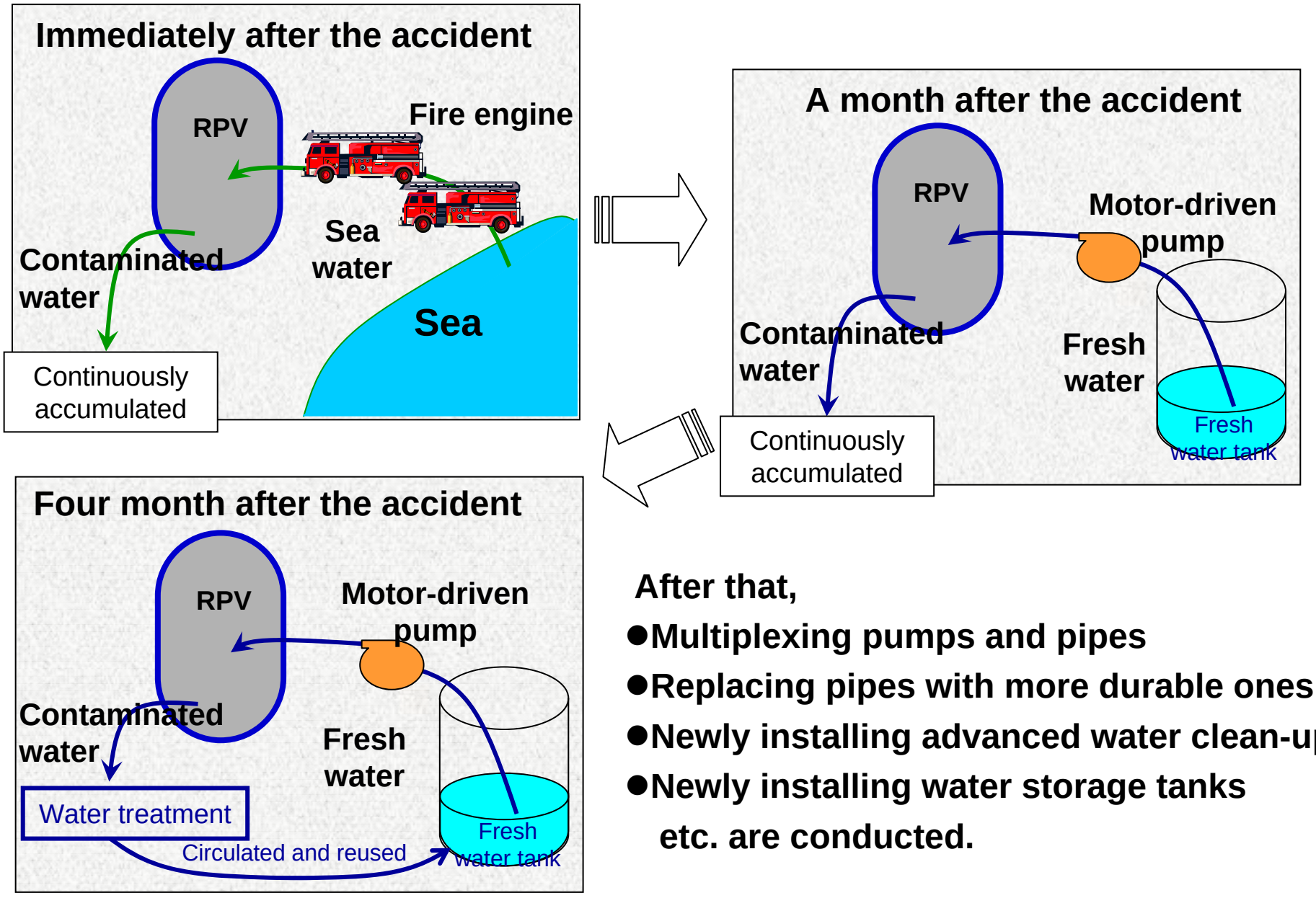
➡ The D/G and electric panel room etc. were flooded.

Unit1 D/G（1B）

Unit1 Turbine Building Power panel



Core cooling after the accident



After that,

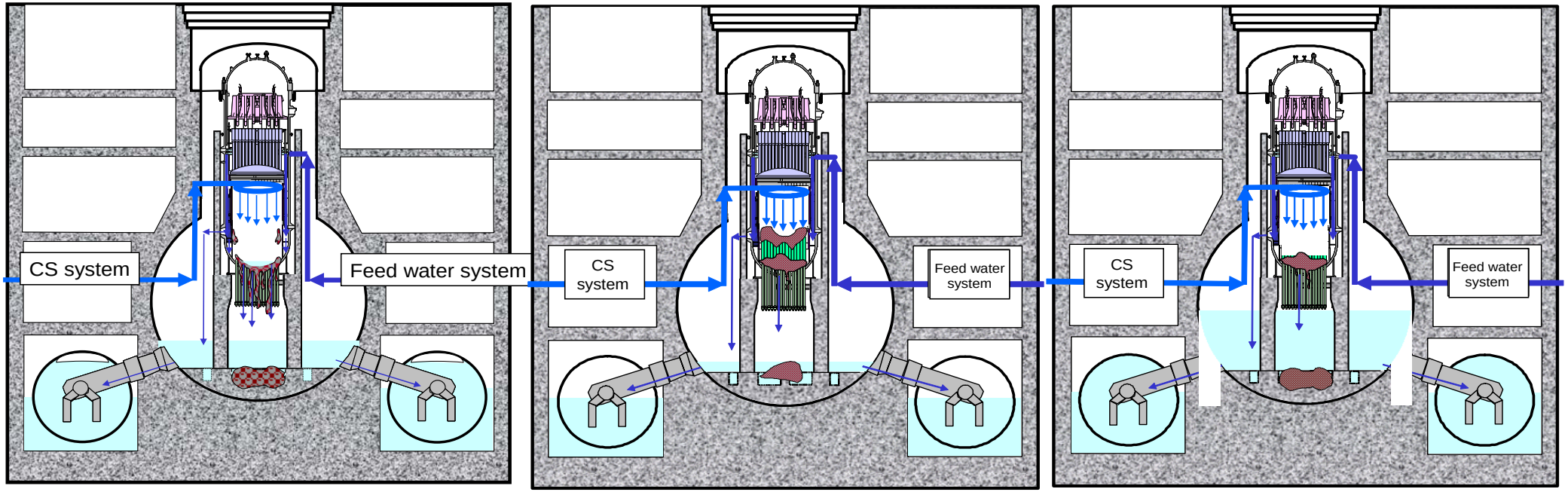
- **Multiplexing pumps and pipes**
- **Replacing pipes with more durable ones**
- **Newly installing advanced water clean-up facilities**
- **Newly installing water storage tanks**

etc. are conducted.

Assumption of current situation

Current assumption of reactor condition (Water level and position of fuel debris)

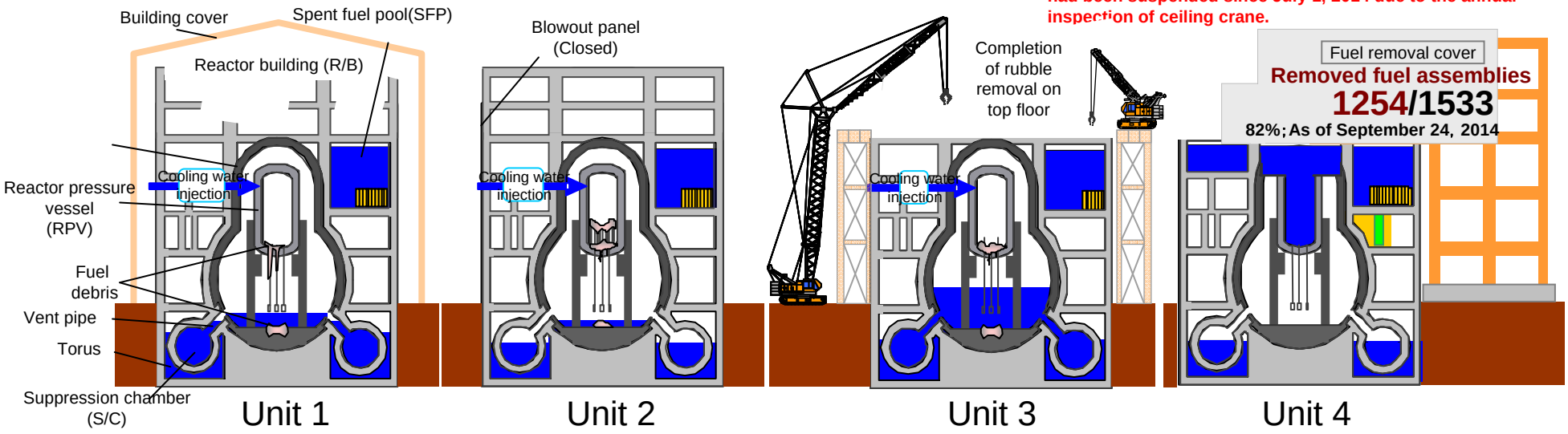
- Unit 1 – Almost all amount of debris is at the bottom of PCV
- Units 2 & 3 – A certain amount of debris remains RPV, and the other amount is at the bottom of PCV.
- Fuel debris is cooled by water of CS system and feed water system.



Current status

- All plants maintain cold shutdown state.

* The fuel removal work was resumed on September 4, 2014, which had been suspended since July 1, 2014 due to the annual inspection of ceiling crane.



RPV bottom temp.	
Unit 1	Approx. 29℃
Unit 2	Approx. 36℃
Unit 3	Approx. 34℃
Unit 4	—

PCV internal temp.	
Unit 1	Approx. 29℃
Unit 2	Approx. 37℃
Unit 3	Approx. 34℃
Unit 4	—

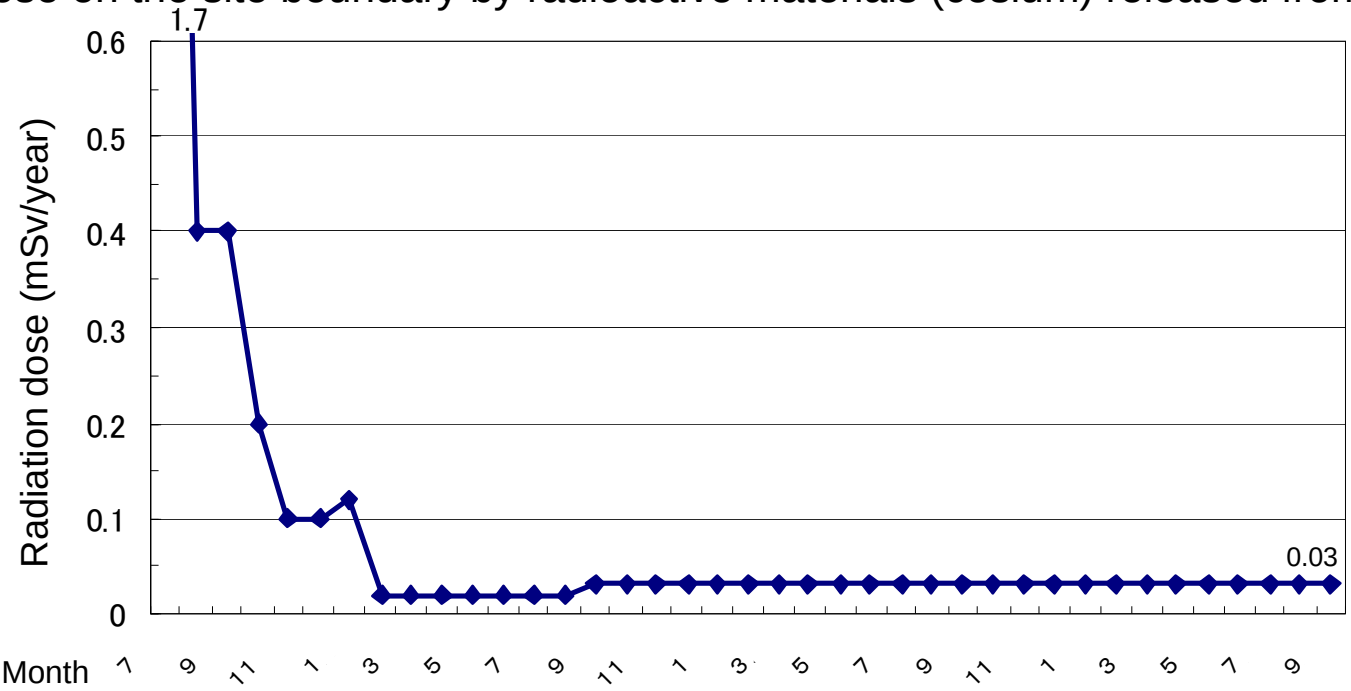
Fuel pool temp.	
Unit 1	Approx. 26℃
Unit 2	Approx. 22℃
Unit 3	Approx. 21℃
Unit 4	Approx. 22℃

Reactor cooling water injection volume	
Unit 1	Feed water system: 2.6㎥/h Core spray system: 2.0㎥/h
Unit 2	Feed water system: 2.0㎥/h Core spray system: 2.5㎥/h
Unit 3	Feed water system: 1.9㎥/h Core spray system: 2.4㎥/h
Unit 4	—

Status of airborne radioactive materials

- Concentration of radioactive materials in the air on the site boundary additionally released from R/B in Units 1 to 4 is 1.4×10^{-9} Bq/cm^3 both for Cs-134 and for Cs-137.
- Radiation dose from released radioactive materials is 0.03 mSv/year on the site boundary which is equivalent to one-seventieth of annual dose from background radiation (2.1mSv/year, mean value in Japan).

Annual dose on the site boundary by radioactive materials (cesium) released from R/B in Units 1 to 4



(Reference)

* Concentration limit in the air of environment surveillance area :
[Cs-134] : 2×10^{-5}Bq/cm^3, [Cs-137] : 3×10^{-5}Bq/cm^3

* Dust concentration in the area surrounding 1F site boundary :
[Cs-134] : ND (Detection limit: approx. 1×10^{-7}Bq/cm^3) ,
[Cs-137] : ND (Detection limit: approx. 2×10^{-7}Bq/cm^3)

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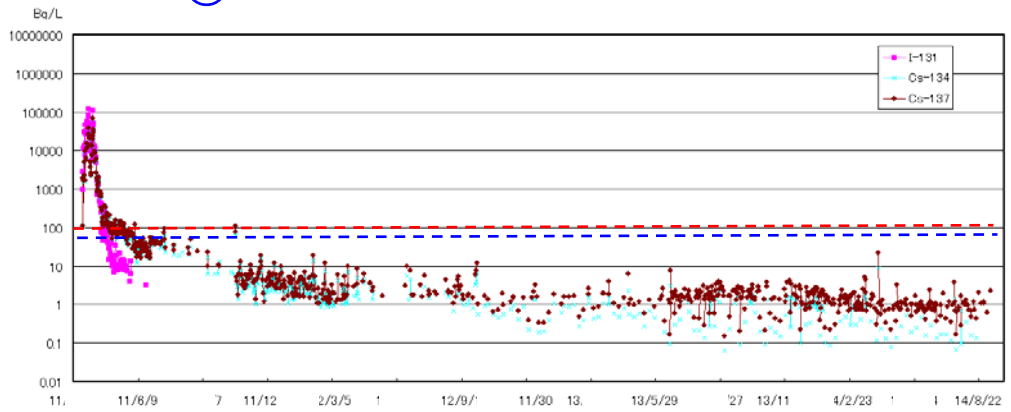
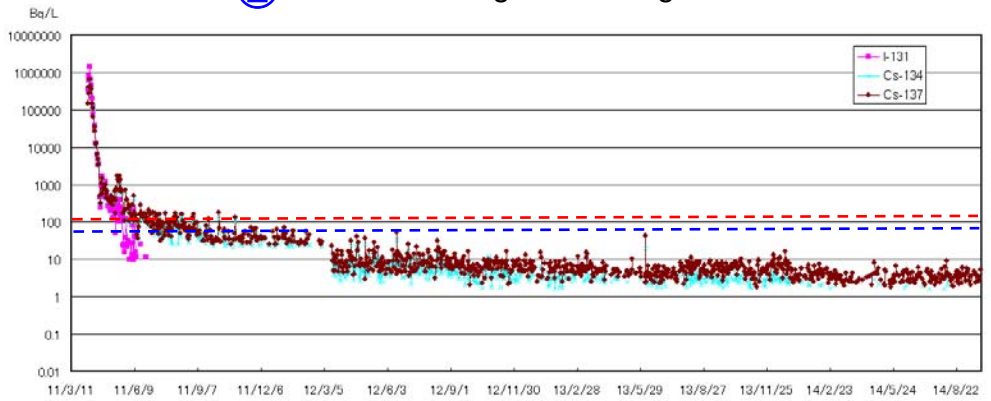
Concentration of radioactive materials in seawater

Concentration of radioactive materials has been reduced up to one-100,000th to one-1,000,000th as compared to the time right after the accident.

① North side of water outlets at Units 5 and 6

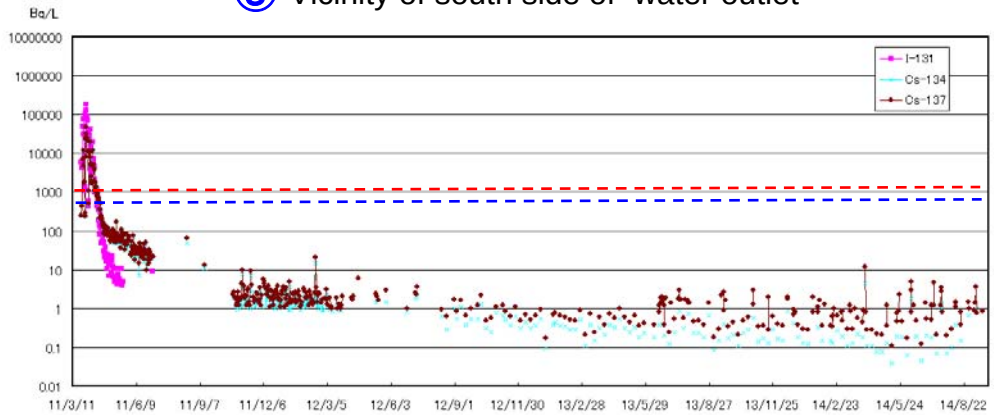


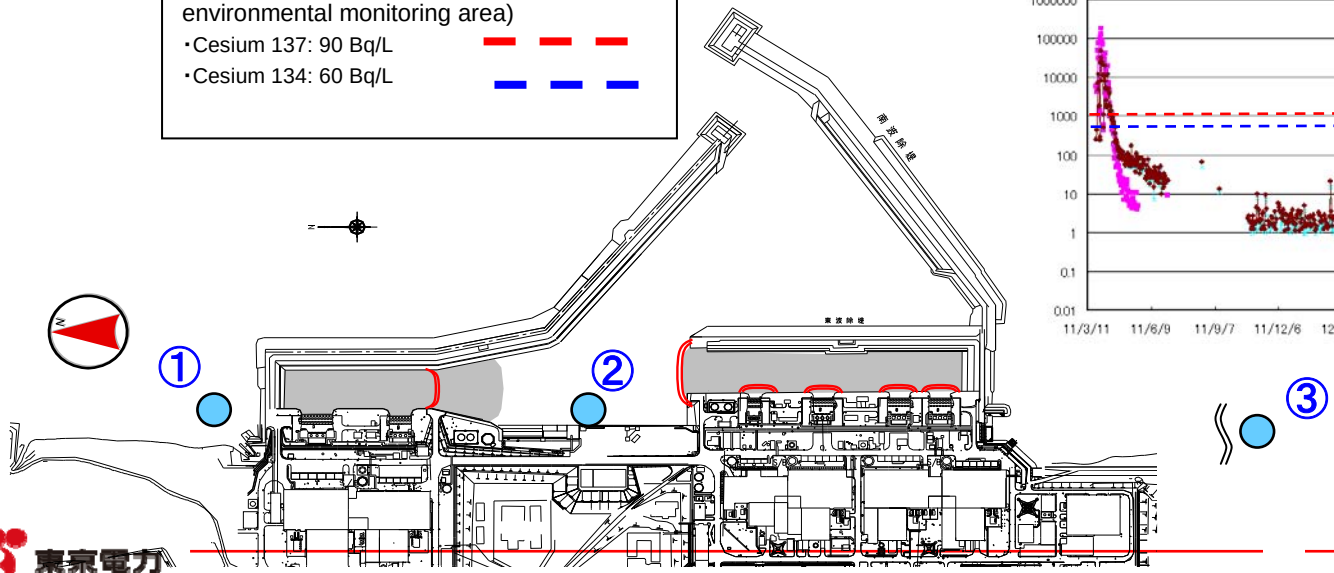
② Front of cargo unloading wharf



<Reference> Notified concentrations
(Concentration limits for water outside environmental monitoring area)
・Cesium 137: 90 Bq/L
・Cesium 134: 60 Bq/L

③ Vicinity of south side of water outlet

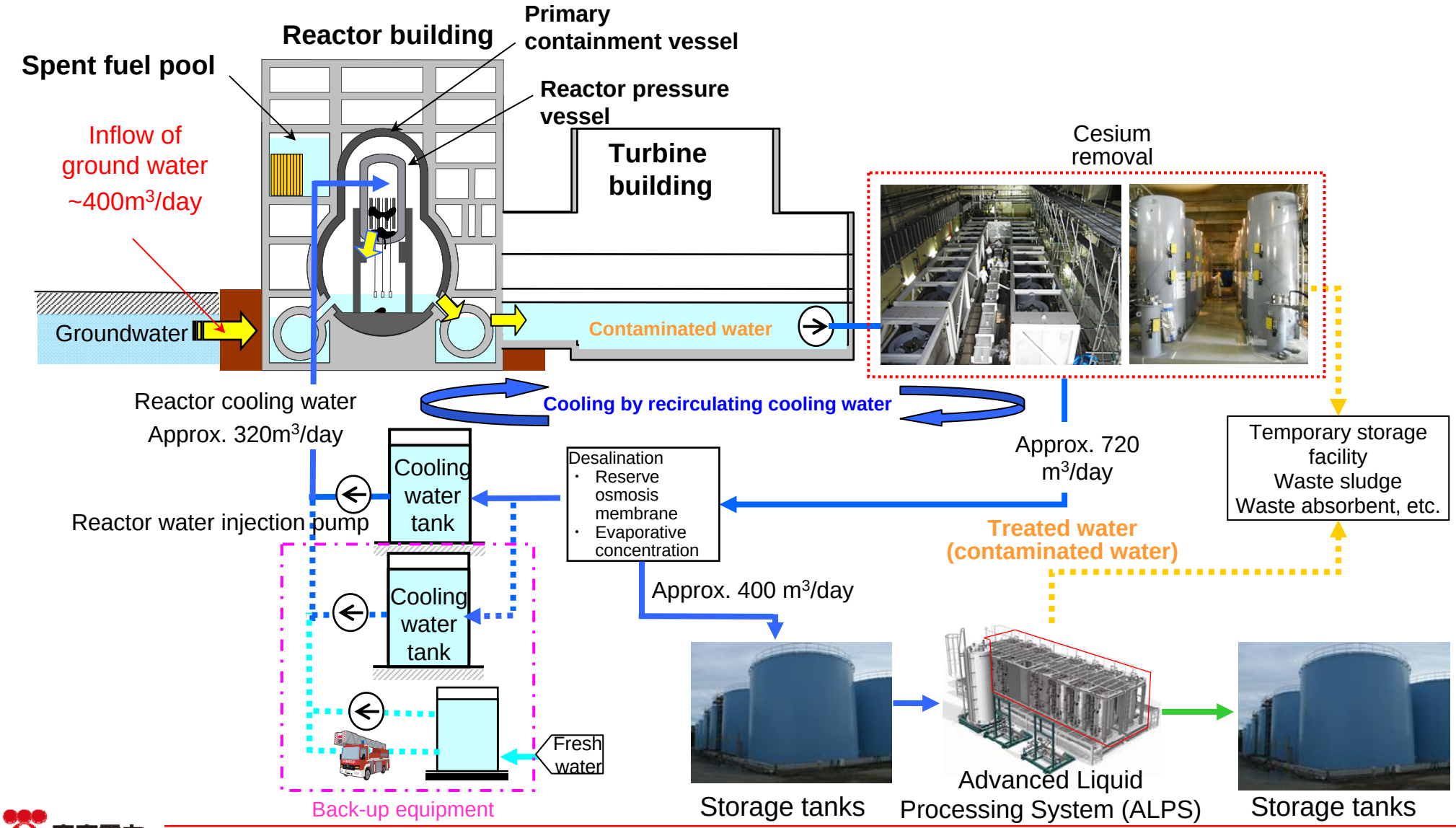




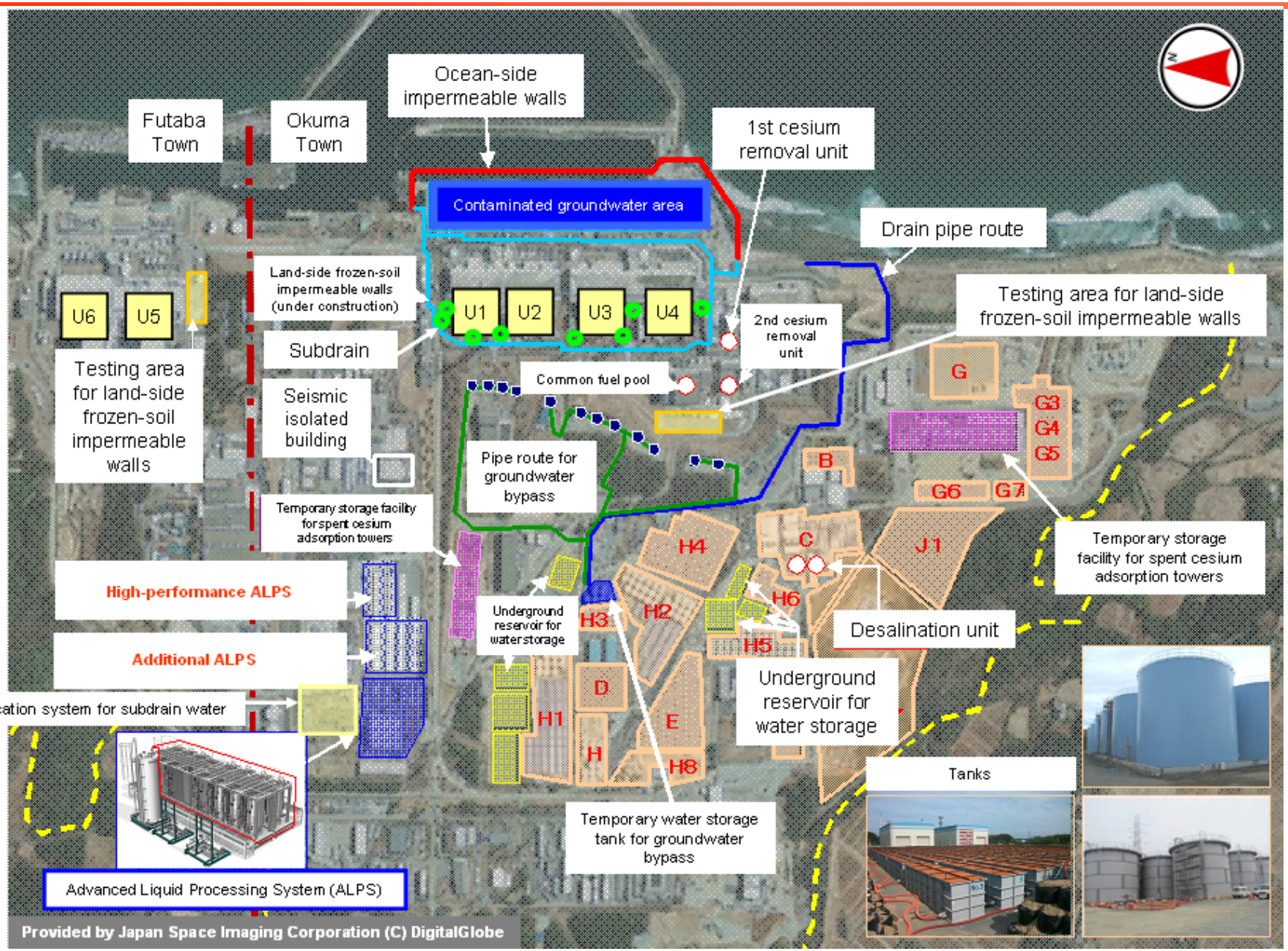
2. Measures against contaminated water

Reactor cooling and contaminated water treatment

- Plants have been stabilized with sufficiently low temperature by continuous circulation water cooling.
- Plant conditions have been monitored at seismic isolated building on a 24-hour basis.



Current site layout



Contaminated water storage tanks

- Current available storage capacity is approx. 580,000m^3 . Total amount of approx. 540,000m^3 is stored in tanks.
- Available storage capacity will increase up to 800,000m^3. (Under consideration on further increase in capacity)

Tank type		Numbers (Units 1 to 4)
Cylindrical tank	Flange type (Bolted)	332
	Welded type	232
Square type tank	Welded type	78
Horizontal tank	Welded type	262

(Note) Including a filtrate tank and tanks whose operation has not started.

Contaminated water storage in Units 1 to 4

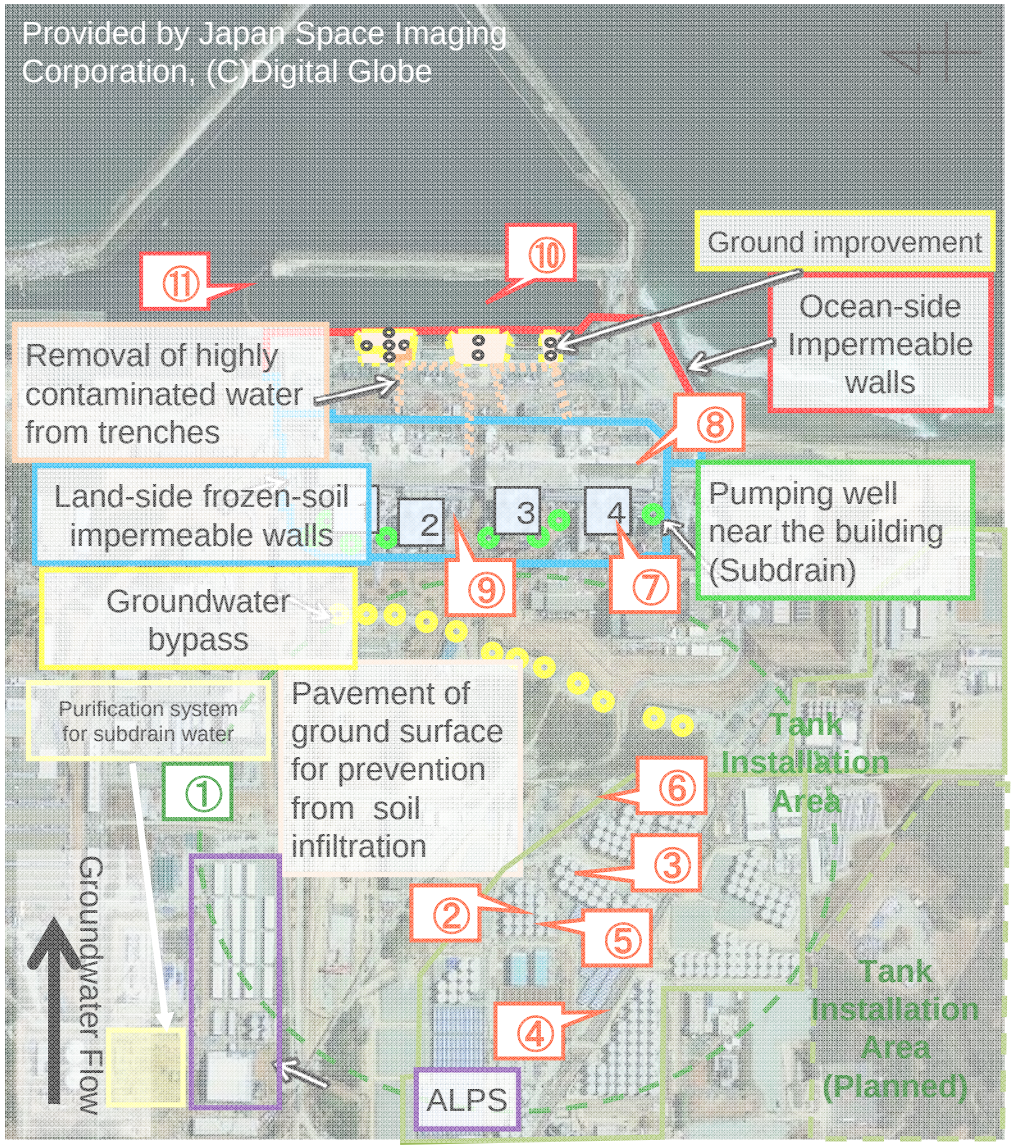
[Unit: 10^4 m^3]

Tanks	Stored amount	Capacity
Receiving tank of concentrated salt water at RO device	36.5	39.5
Receiving tank of fresh water	2.2	2.8
Storage tank of waste water generated by evaporative concentration	0.9	1.0
Storage tank of water treated by ALPS	14.2	15.2

(Note) Including a filtrate tank and excluding tanks whose operation has not started.

*As of September 23, 2014

Measures against contaminated water (1/5)



Three basic principles

1. **Removal** of contamination source ●
2. **Isolation** of water from contamination source ○
3. **Leakage prevention** of contaminated water ◆

Emergency measures

1. Removal of highly contaminated water from trenches ●
2. Ground improvement at contaminated area with water glass, pavement of ground surface with asphalt, etc. and pumping up groundwater ○◆
3. Groundwater bypass ○

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Fundamental measures

4. Sub-drain ○
5. Ocean-side impermeable walls ◆
6. Land-side frozen-soil impermeable walls ○
7. Contaminated water processing facilities with higher performance ●

etc.

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Main preventive measures and measures in depth

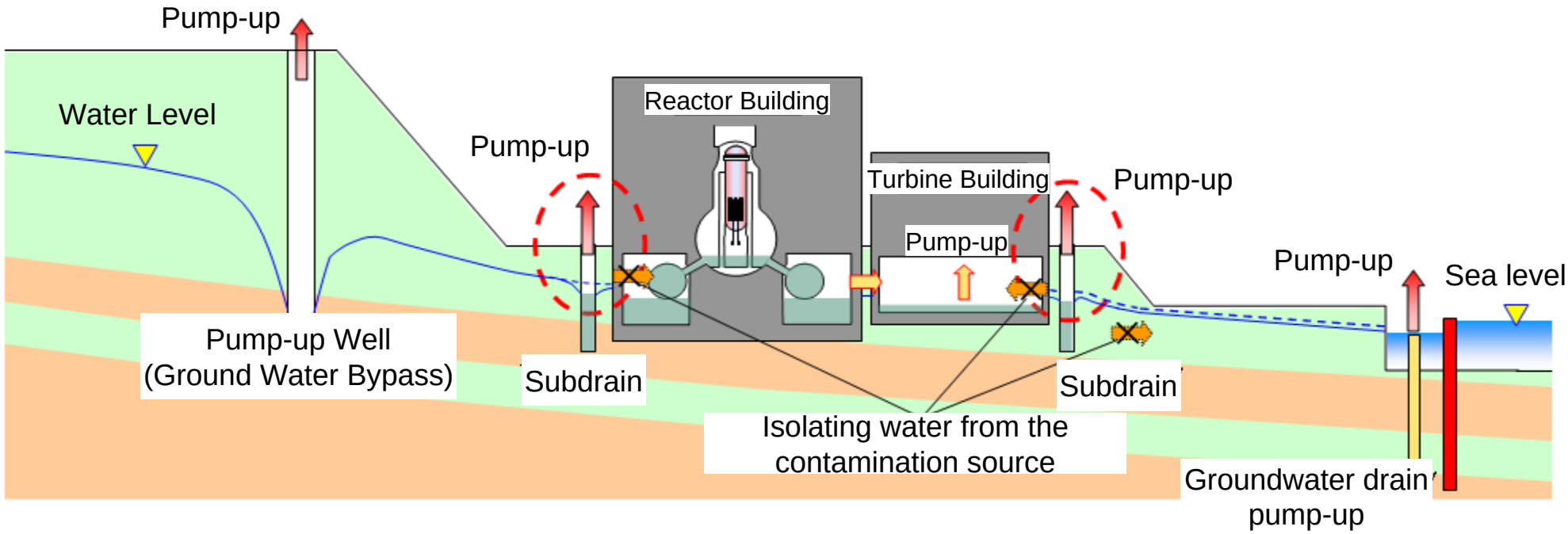
① Additional measures for mitigating inflow of groundwater (Facing) ○
② Elevating dikes surrounding tanks and making dikes redundant◆
③ Acceleration and reliability improvement of installation of welded type tank◆
④ Covering drainage, and change on route of drainage channel into port area◆
⑤ Detection of microleakage from tank◆
⑥ Capture of strontium in the soil●
⑦ Shortening transferring route of contaminated water◆
⑧ Sealing buildings (penetration and gap between the buildings, perimeter of the building)◆
⑨ Countermeasure against large-scale tsunami (improvement on water-proof performance, consideration on countermeasures such as seawall)◆
⑩ Cleaning up the seawater within the port area, covering soil at the bottom of the sea in the port area●
⑪ Using contamination preventing filter which can remove radioactive materials● etc.

Measures against contaminated water (2/5)

Emergency Groundwater bypass [Isolation]

Fundamental Pump up groundwater by subdrains [Isolation]

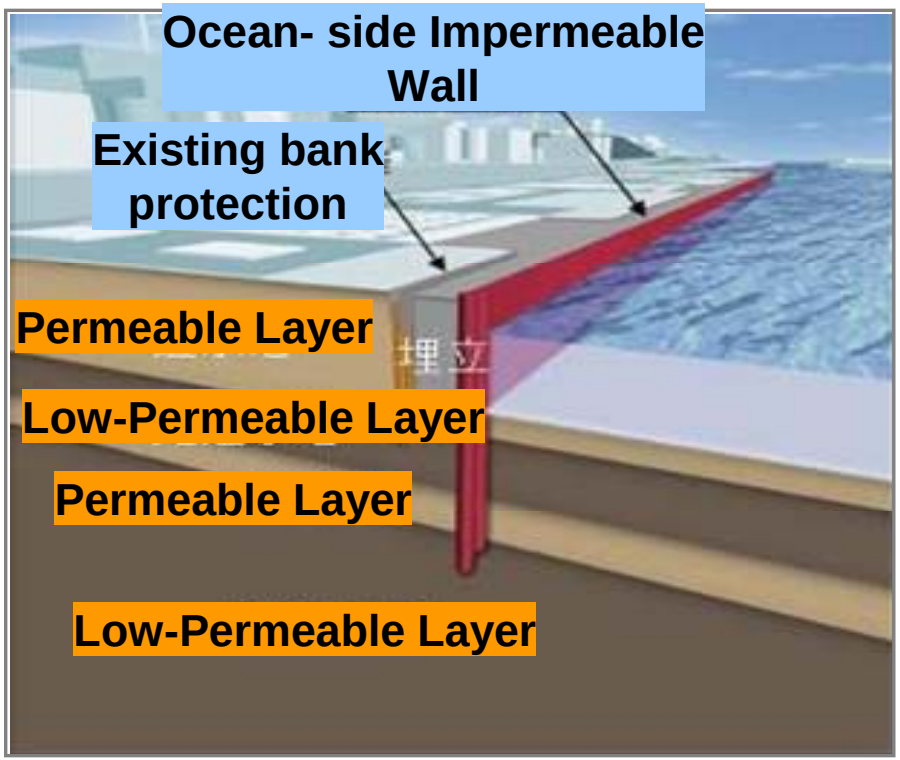
- Groundwater bypass – Pump up groundwater flowing from the mountain side upstream of the building to reduce groundwater inflow.
- Subdrains – Restoring subdrains and pump up groundwater around the buildings with the subdrains to reduce groundwater inflow.



Measures against contaminated water (3/5)

Fundamental **Ocean-side impermeable walls [Prevent leakage]**

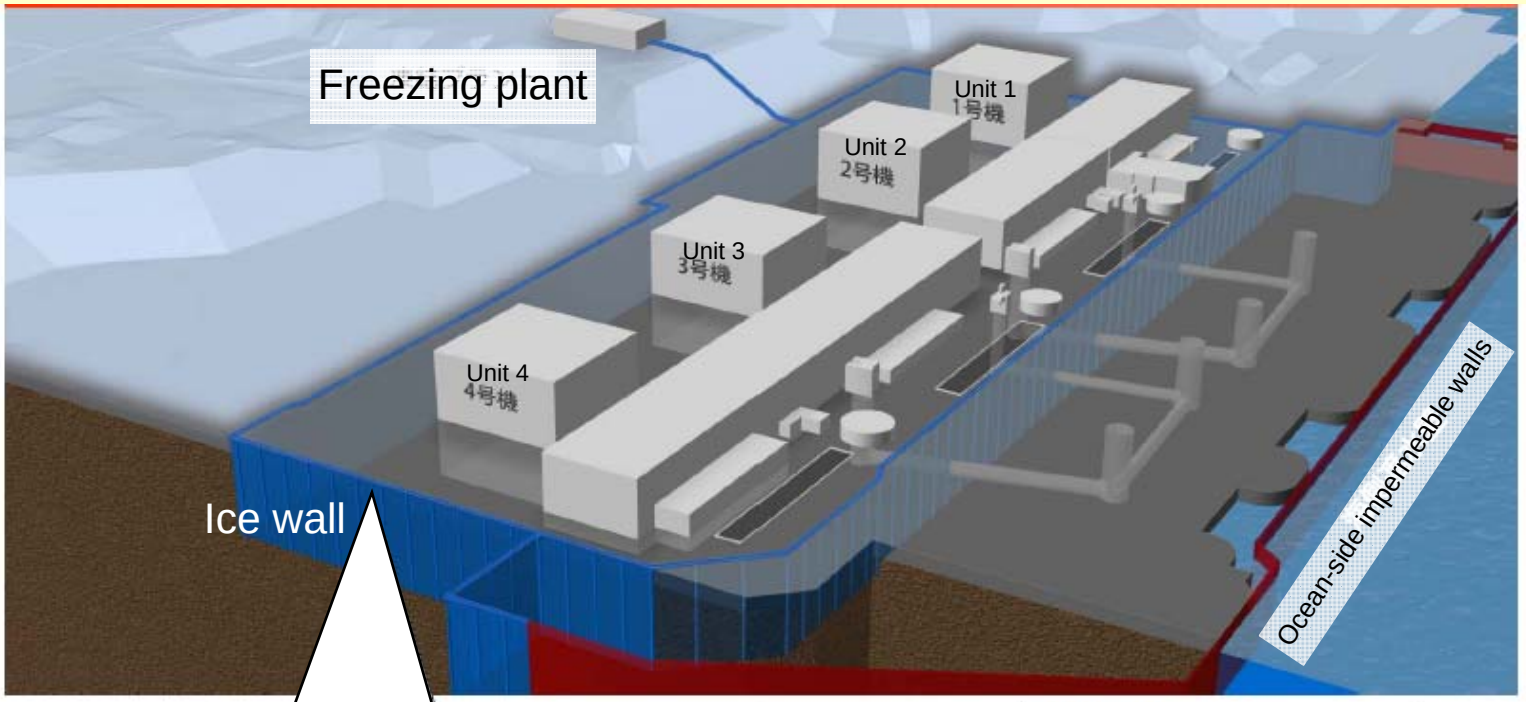
- Impermeable walls are installed on the ocean side to suppress the outflow of groundwater to the sea. It is scheduled to complete in September 2014.



Measures against contaminated water (4/5)

Land-side frozen-soil impermeable walls by Government support [Isolation]

- Installation of underground ice walls in the mountain side area near the buildings mitigates groundwater inflow into the buildings.
- Operation is scheduled to start in March, 2015.
- Construction has started since June 2, 2014.



-Total length; 1,500m
-Amount of soil to be froze; 70,000m^3
(In case Units 1 to 4 is surrounded by ice wall)

Freezing plant
(Minus 30-40℃ coolant (brine) production facility)
- Cooling tower: 30 units
- Brine tank
- Brine pump

Layout (Planned)*

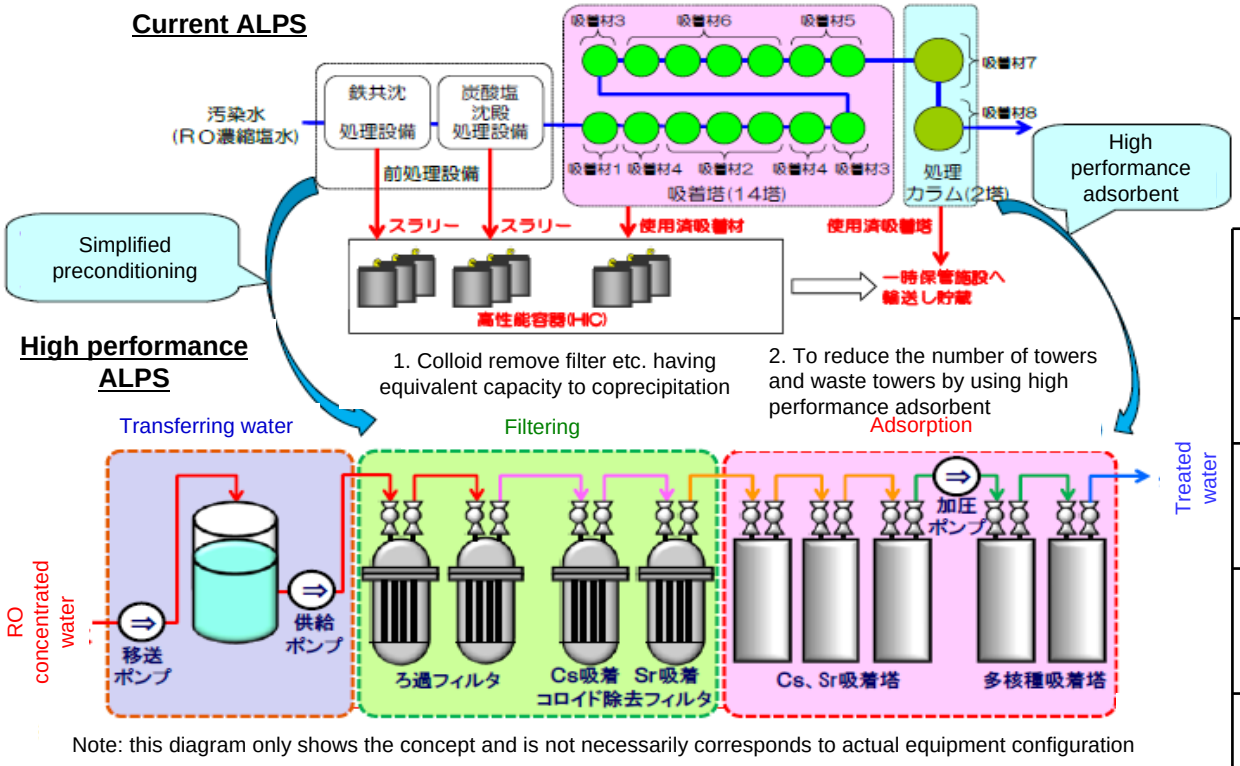
* Installation range is subject to change depending on the future consideration.

Measures against contaminated water (5/5)

Fundamental

For more efficient contaminated water processing (ALPS with high-performance by Government support)

- Current ALPS has three trains. It has started processing contaminated water since March, 2013.
- Additional ALPS will also have three trains. In the middle of September, 2014, 1 train out of 3 trains started processing contaminated water.
- High-performance ALPS will have one train. In the middle of October, 2014, it will start processing contaminated water.



Note: this diagram only shows the concept and is not necessarily corresponds to actual equipment configuration

Concept of high-performance ALPS

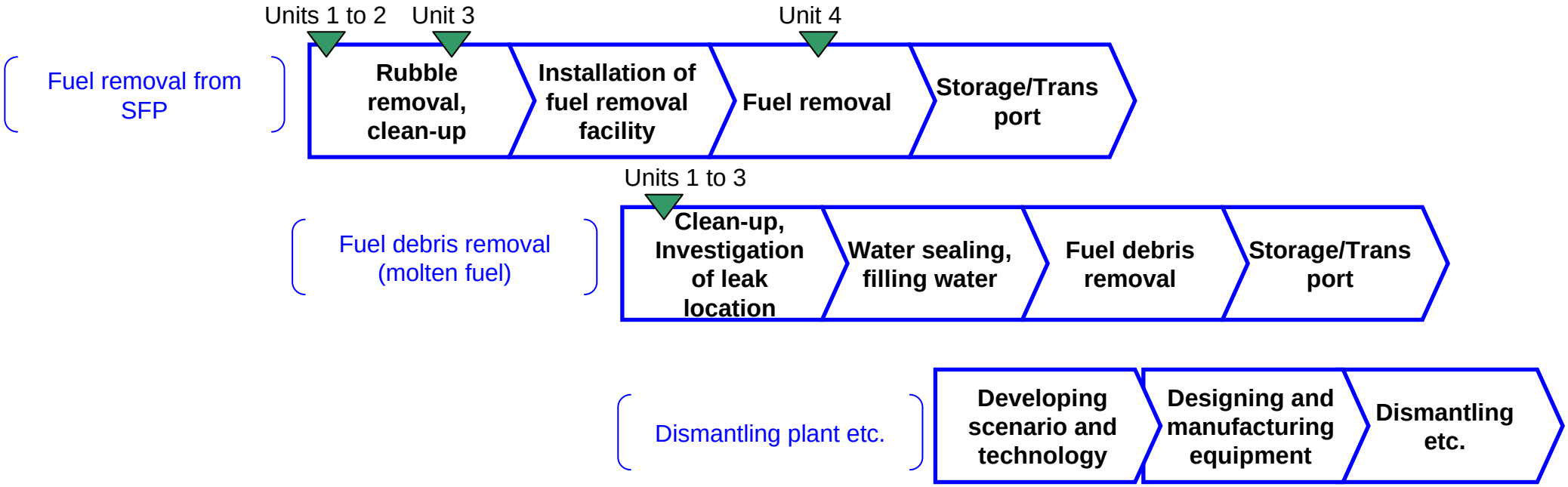
Outline of each system

	Current ALPS	Additional ALPS	High-performance ALPS
Capacity	750 m³/day	750 m³/day	Over 500 m³/day
Number of trains	3 (250 m³ each)	3 (250 m³ each)	1
Performance target	Concentration of 62 nuclides in all of 63 nuclides should be under regulatory limit (excluding tritium)		
Waste to be generated	–	–	One-twentieth of current ALPS
Starting date	March 2013	Middle of Sept., 2014	Middle of Oct., 2014

3. Steps for decommissioning

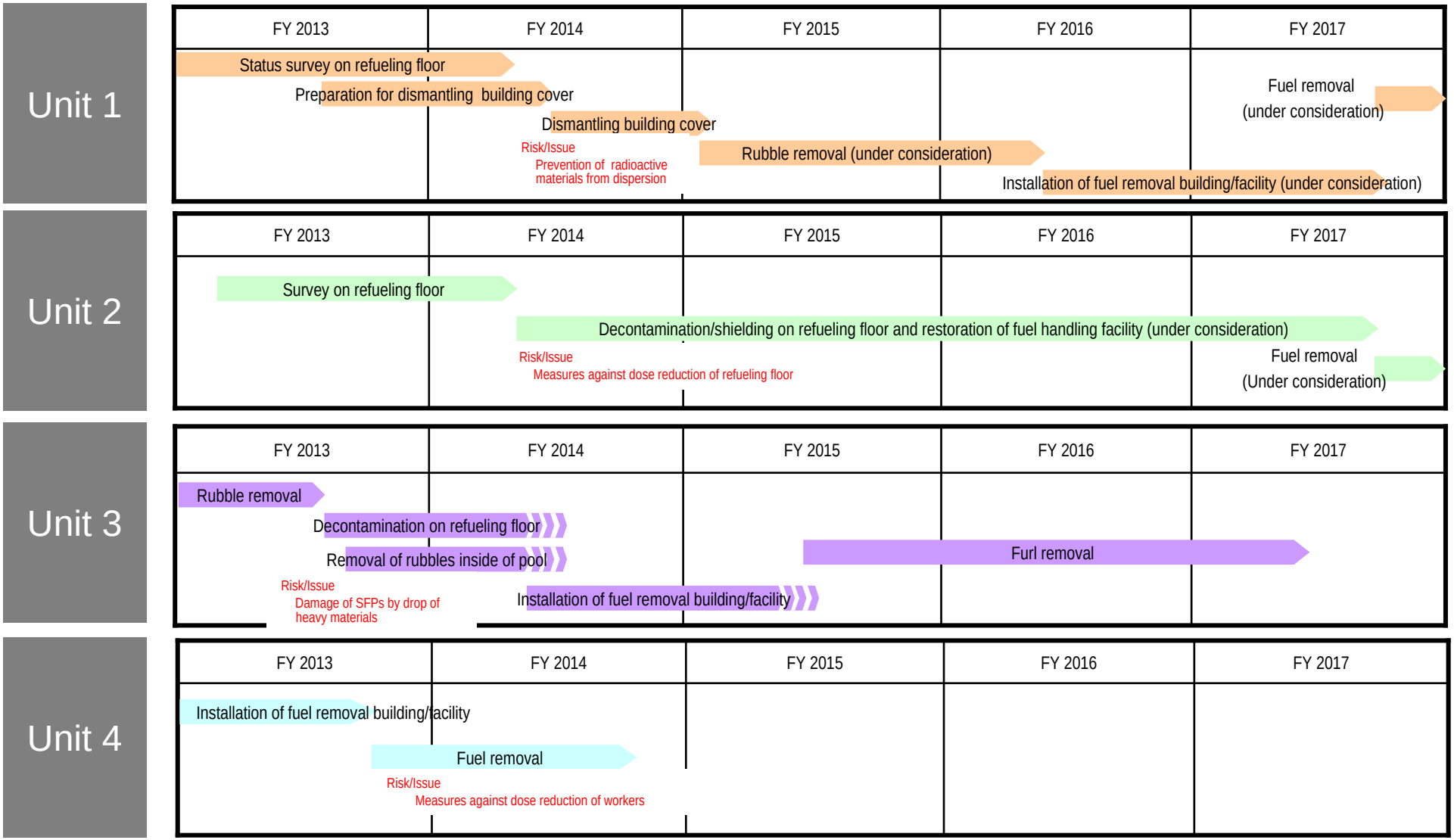
Major work for decommissioning

- The major work for decommissioning includes fuel removal from SFP, fuel debris removal (molten fuel), dismantling plant etc.
- Currently removing fuels from Unit 4 SFP and simultaneously preparing for starting fuel debris removal in Units 1 to 3.



Toward removal of spent fuels and fuel debris

- Based on constraints of construction of seismic safety/covers etc., plan and commencing time is set for each task.



3. Steps for decommissioning

3-1. Current status of Unit 1

Current Status of Unit 1

Current Status

- Building cover installed (November, 2011)
- Sustained stable reactor cooling, which has reduced the generated amount of radioactive materials

Tasks

- Removal of the building cover
- Identification of the status of debris on the refueling floor and inside the pools
- Countermeasures for the dispersion of radioactive materials during the removal of the building cover

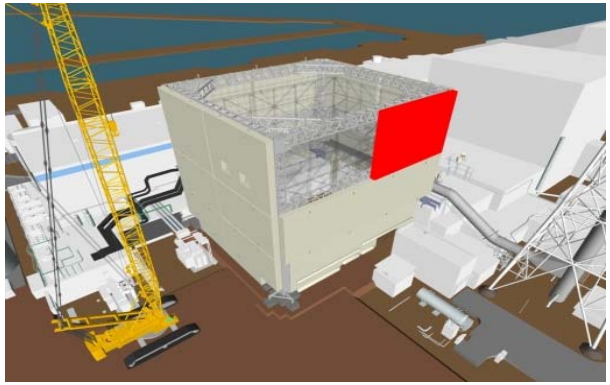
As of Mar. 12, 2011

Completion of building cover structure
Present

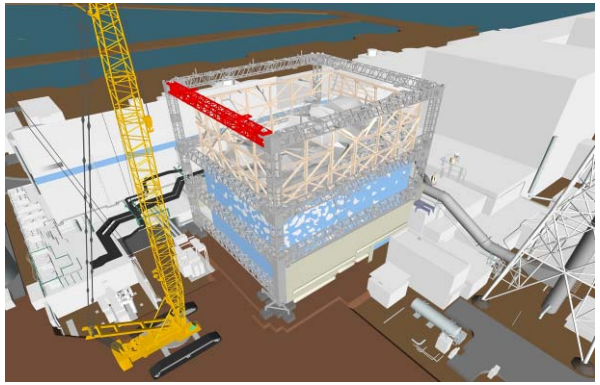
Building cover removal process (1/2)

- Ceiling panels ⇒ Wall panels ⇒ Columns and beams are to be dismantled

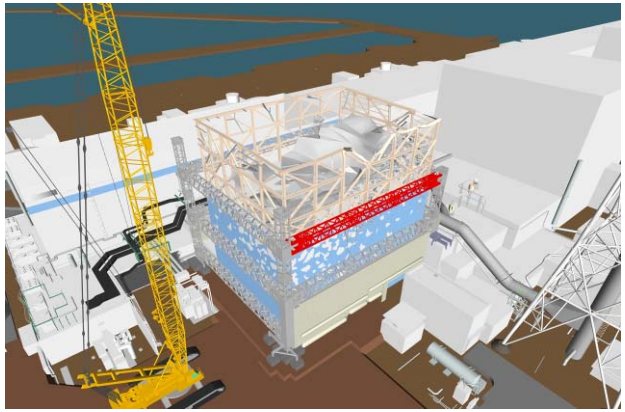
①Ceiling panel



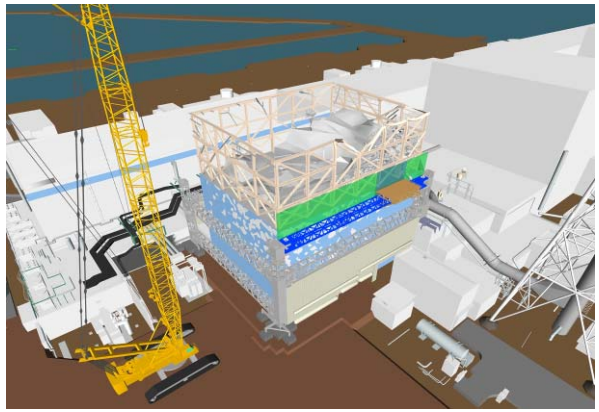
② Wall panel



③ Frame dismantle



④De-installation of beam*



⑤Re-installation of beam *

⑥ Complete

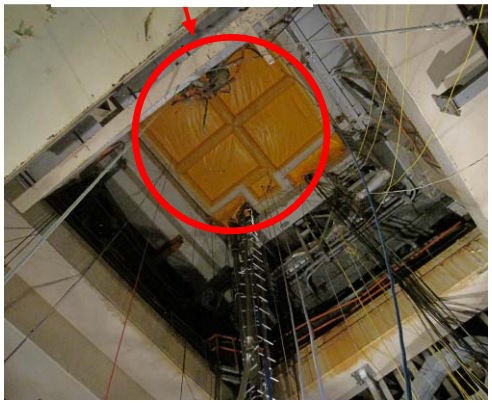
- After dismantlement of the second ceiling panel, monitoring and trending will be performed to ensure everything is fine then proceed to next panel.

* Windbreak sheet will be attached to removed beam and returned to the structure.

Building cover removal process (2/2)

1. Spraying anti-scattering agent
2. Reduction of air volume into the refueling floor: By installing balloons to decrease area of openings in the reactor building (equipment hatch, air-lock and emergency doors), air volume flow into the refueling floor is reduced. (Installation completed on June 4, 2014)
3. Vacuuming up roof blocks, sand and dust scattered on the fallen roof before cover removal.
4. Installation of water spray equipment

1. Spraying anti-scattering agent



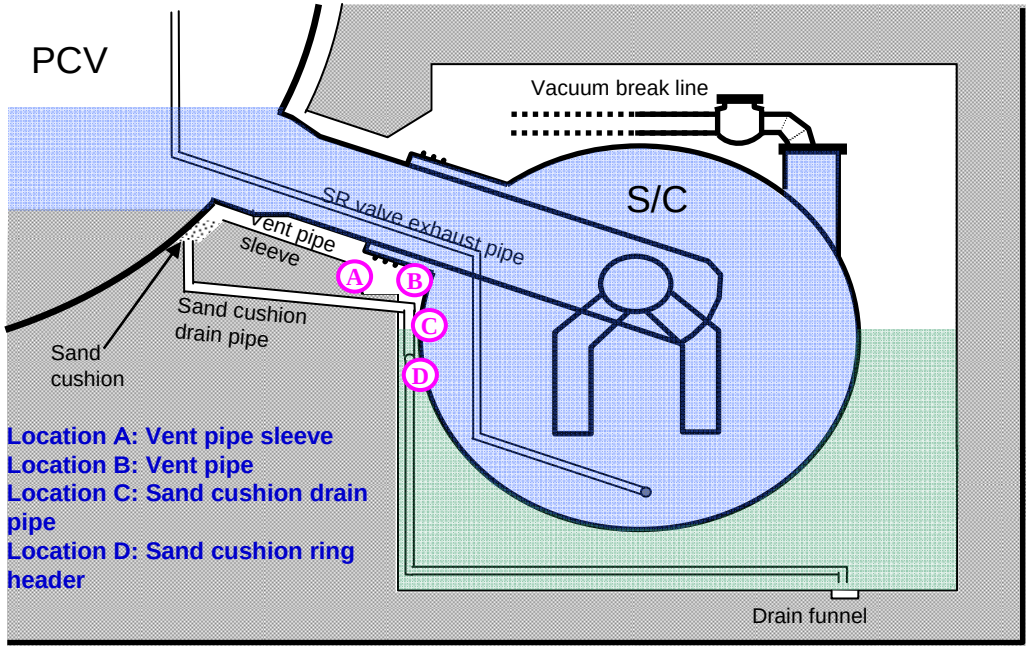
2. Installation of balloon

3. Debris, dust vacuum machine

4. Water spray (image)

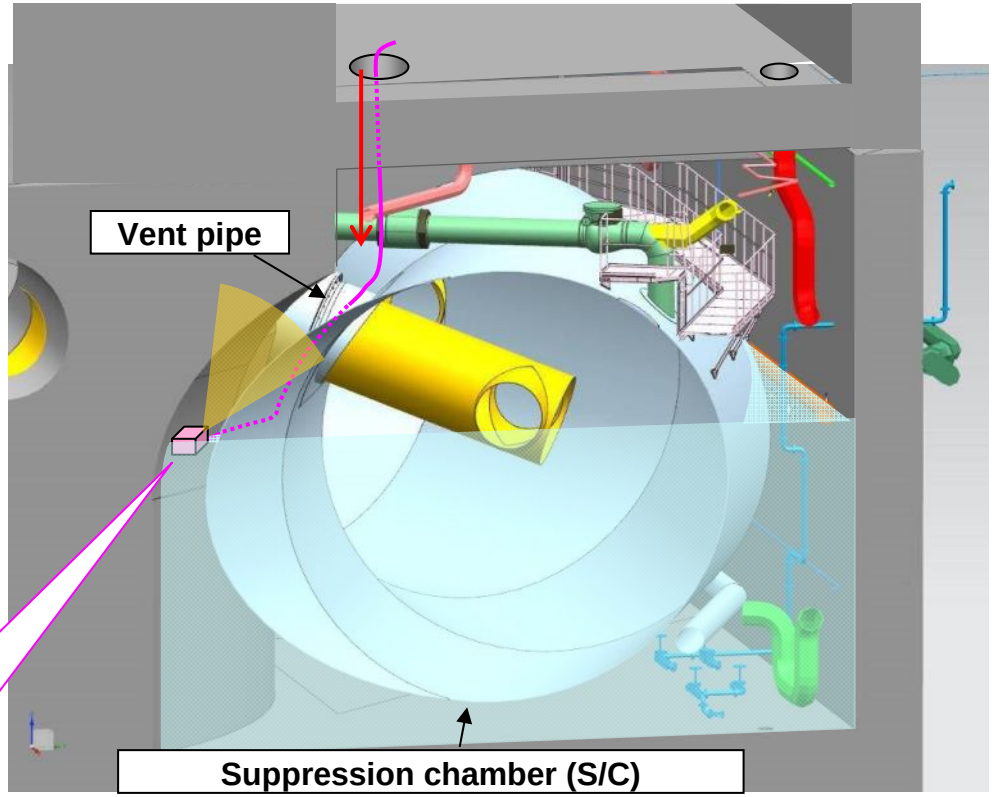
Investigation inside of torus room in Unit 1 (1/2)

- To repair (seal the water leak locations of) the PCV in preparation for the fuel debris removal, investigation under vent pipes was conducted to identify the leak locations in the PCV.
- With the images taken by the camera equipped with the water boat, it was checked whether there is any water flow from the sleeve ends of vent pipes or not, and the status of the sand cushion drain pipes was also checked (by viewing appearance).



Water boat: trial operation at the plant

Water boat



Investigation inside of torus room in Unit 1 (2/2)

- By deploying a remote controlled robot on the cat walks in the torus room in the unit 1 from May 27, a leak from the cover of a expansion joint on vacuum break line was identified.
- The investigation results will be reflected into the planning for further investigation and sealing the PCV for filling the PCV with water in the future.

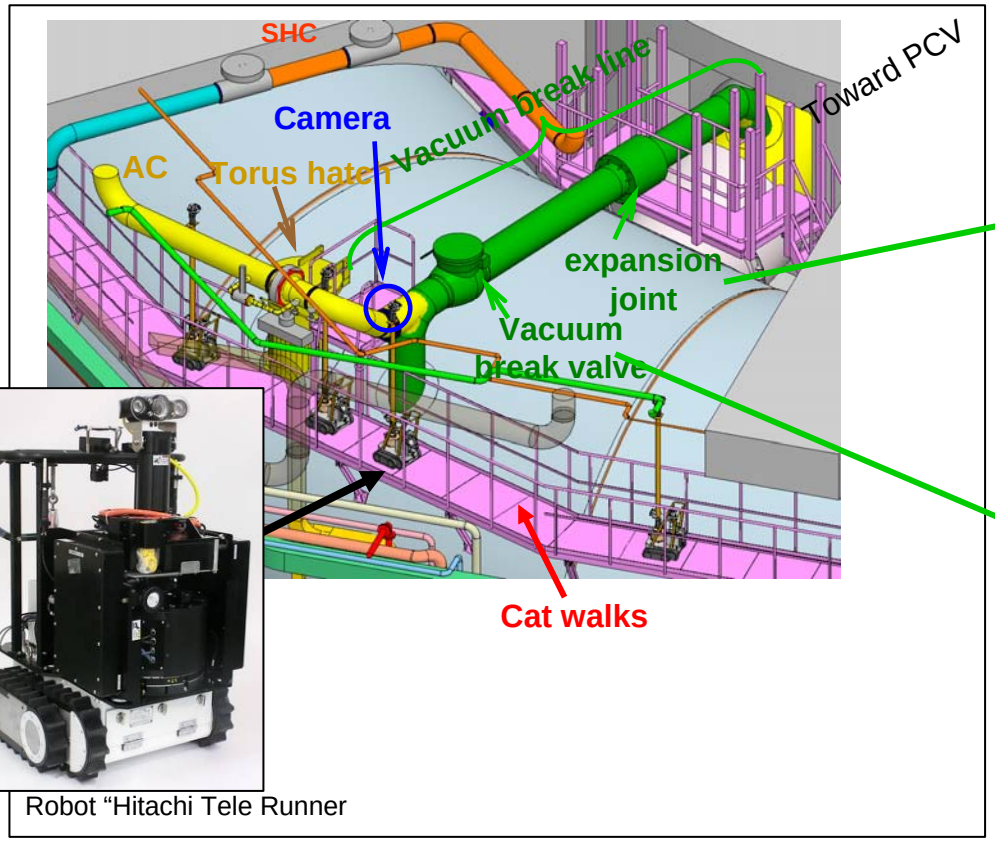
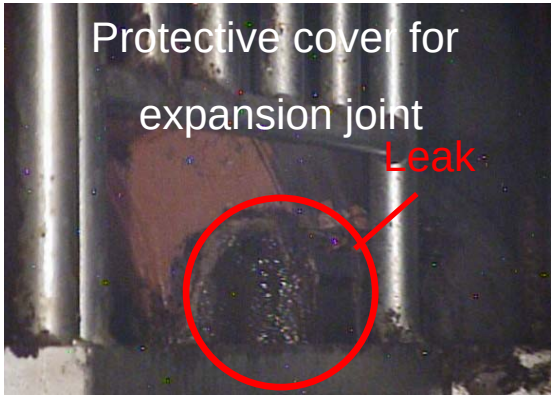
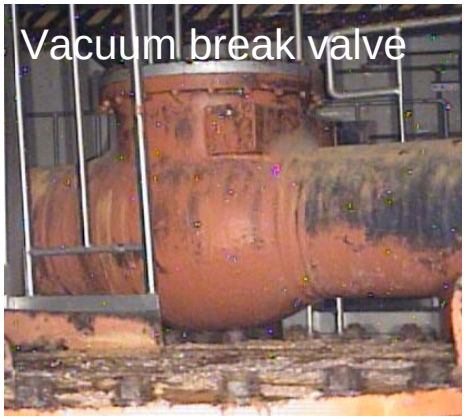


Image of investigation on upper part of suppression chamber





3. Steps for decommissioning

3-2. Current status of Unit 2

Current Status of Unit 2

Current Status

•Very high radiation level in the building

Inspection of contamination status on the refueling floor will be conducted in the future.

Tasks

•Radiation dose reduction measures

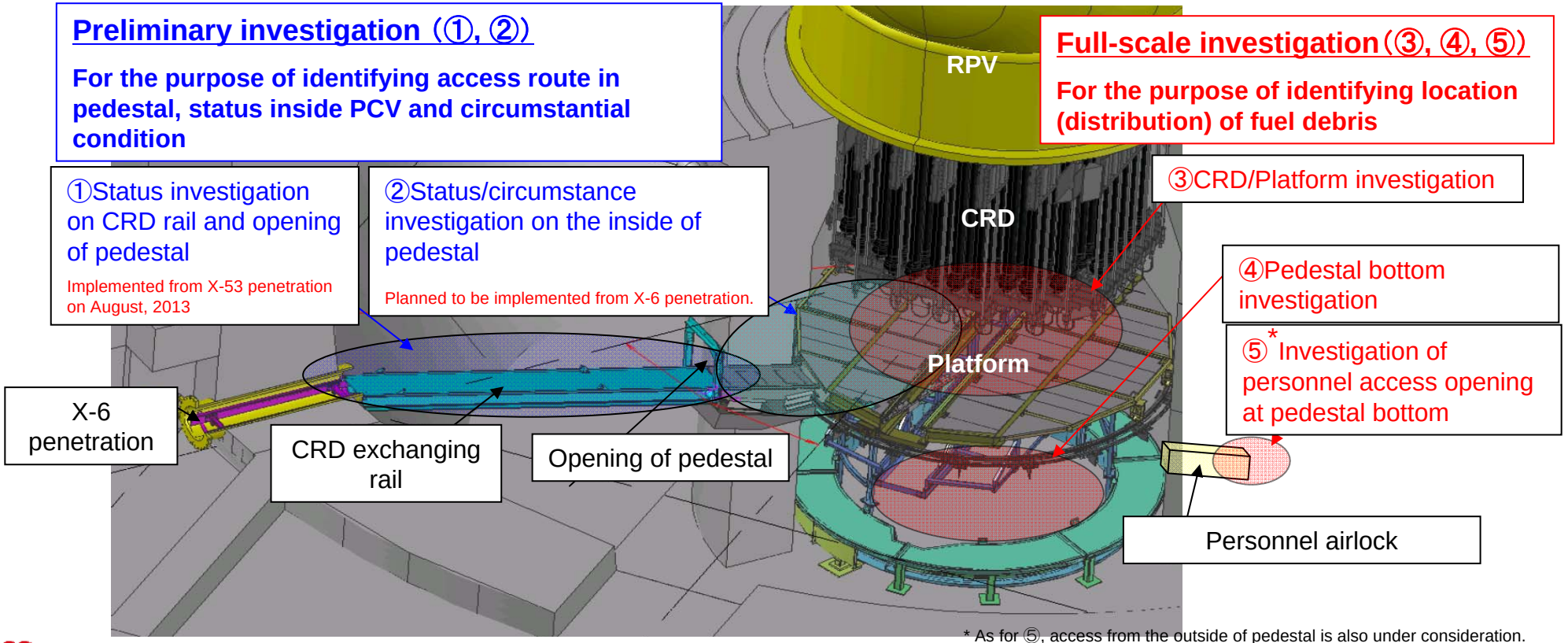
•Countermeasures for the dispersion of radioactive materials during engineering work

Opened blowout panel

As of Apr. 10, 2011 **Present**

Preparation for fuel debris removal in Unit 2 (1/2)

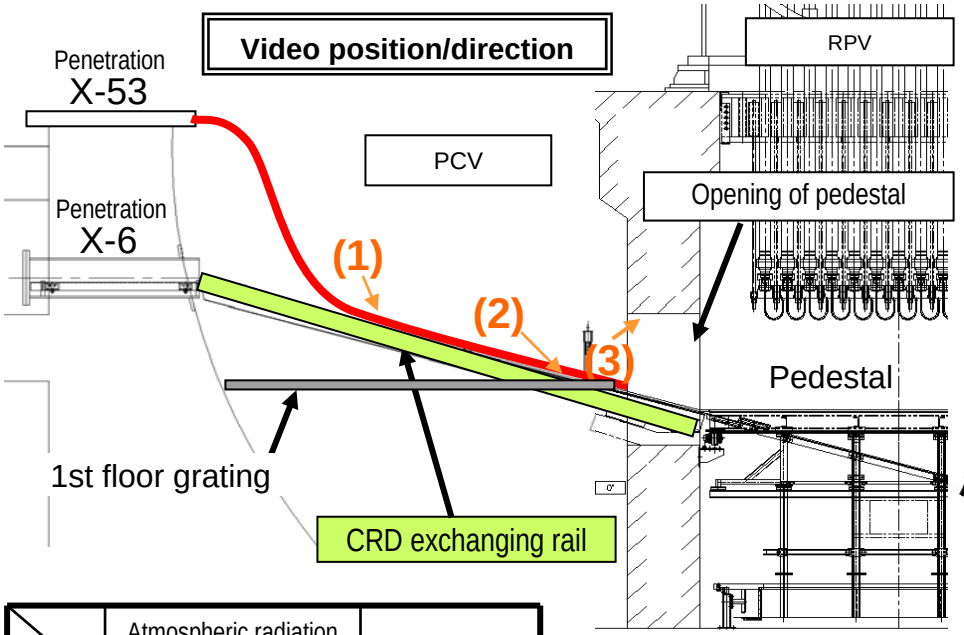
- A water level gauge was introduced into PCV, and water level was confirmed (bottom + approx. 60cm) in Unit 2.
- Investigation for identifying leakage: Since the water level inside S/C seems to be relatively low, remote-operated device investigated the inside of S/C with ultrasonic wave. As a result, it was confirmed that water level inside S/C is almost the same as that outside S/C (Groundwater level in R/B).
- Fuel debris status investigation: A investigation device will be inserted into PCV so that location of fuel debris at the bottom of PCV can be identified (the following ①-⑤). As a preliminary investigation, a camera was inserted into the vicinity of the bottom of RPV (Opening of pedestal)(①, ②). Status of interference objects will be confirmed, and the result will be reflected on the actual investigation plan.



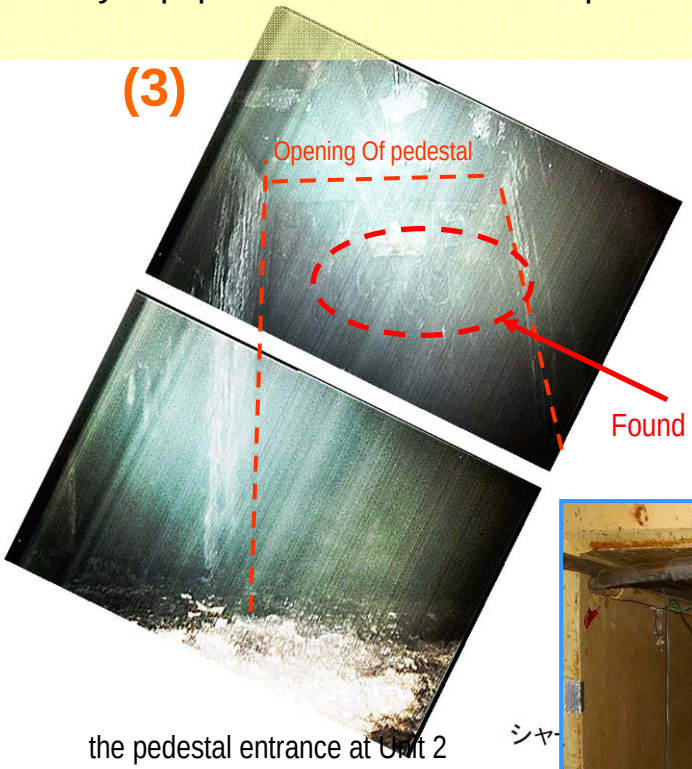
* As for ⑤, access from the outside of pedestal is also under consideration.

Preparation for fuel debris removal in Unit 2 (2/2)

- A survey will be conducted on the pedestal's internal side in order to check the condition inside the PCV (fuel debris position, etc.).
- In preparation for the survey, equipment was introduced from the penetration (cameras, dosimeters and thermometers) to investigate the status of the CRD exchanging rail, etc. (August 12, 2013)
- The survey was conducted up to the vicinity of the opening of pedestal. However, the interior could not be checked due to interference by deposits, etc.
- Based on the issues identified by the preliminary survey, survey equipment has been developed and will be tested in the field in the second half of FY 2014.



	Atmospheric radiation levels	Temperature
(1)	About 24 Sv/h	About 41 ℃
(2)	About 30 Sv/h	About 45 ℃
(3)	About 36 Sv/h	About 45 ℃



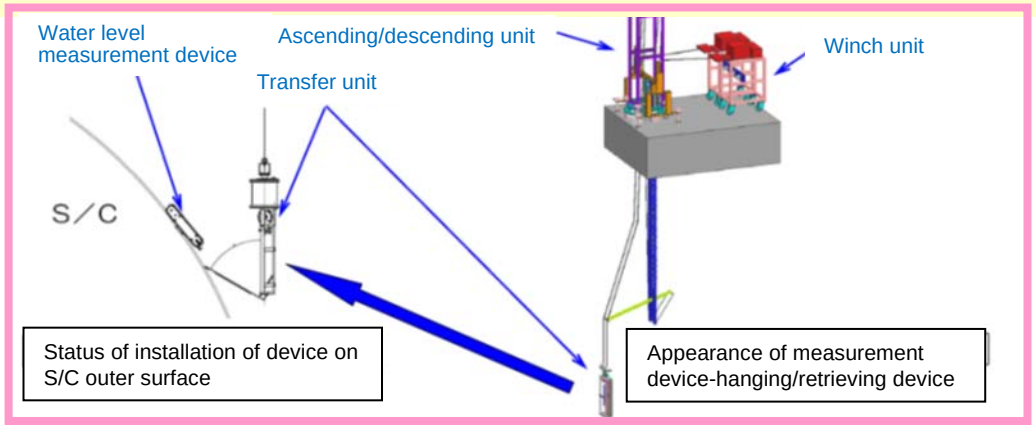
the pedestal entrance at Unit 2

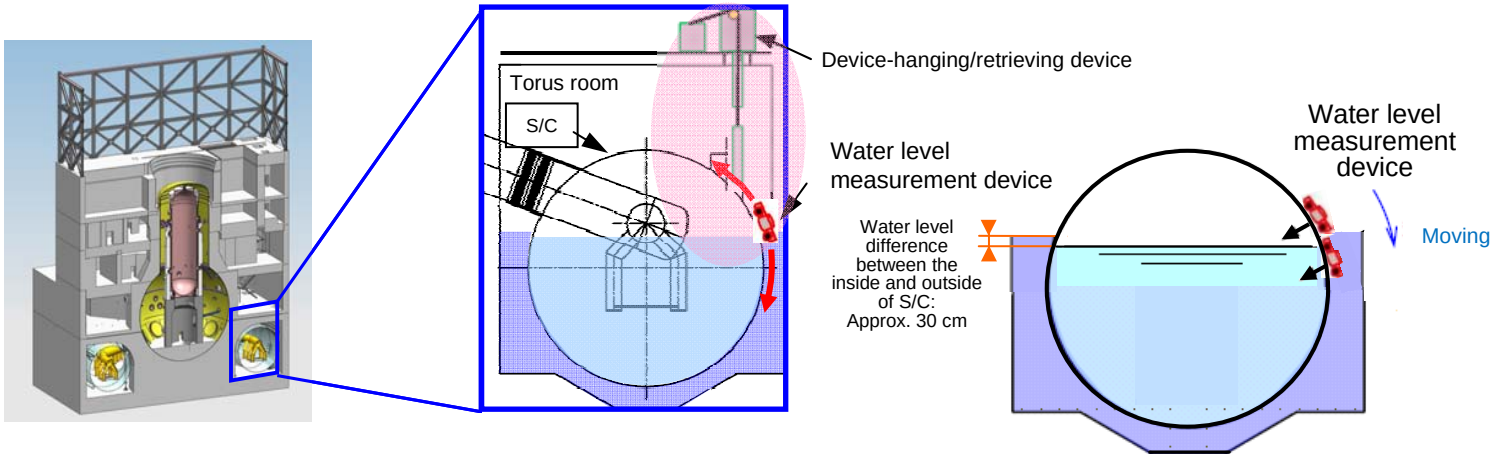
Pedestal: foundation of the bottom of RPV

Reference: opening of pedestal at Unit 5

Measurement of water level inside of torus room in Unit 2 (1/2)

- To repair (seal the water leak locations of) the PCV in preparation for the fuel debris removal, the water level in S/C was measured to assume the state of the opening area at leak locations in the PCV.
  (By checking the water level difference between the inside and outside of the S/C, the opening area was assumed, and it will be considered that it is possible whether the water sealing material might flow out of the S/C or not.)





Overview on water level measurement in S/C at Unit 2

Measurement by device

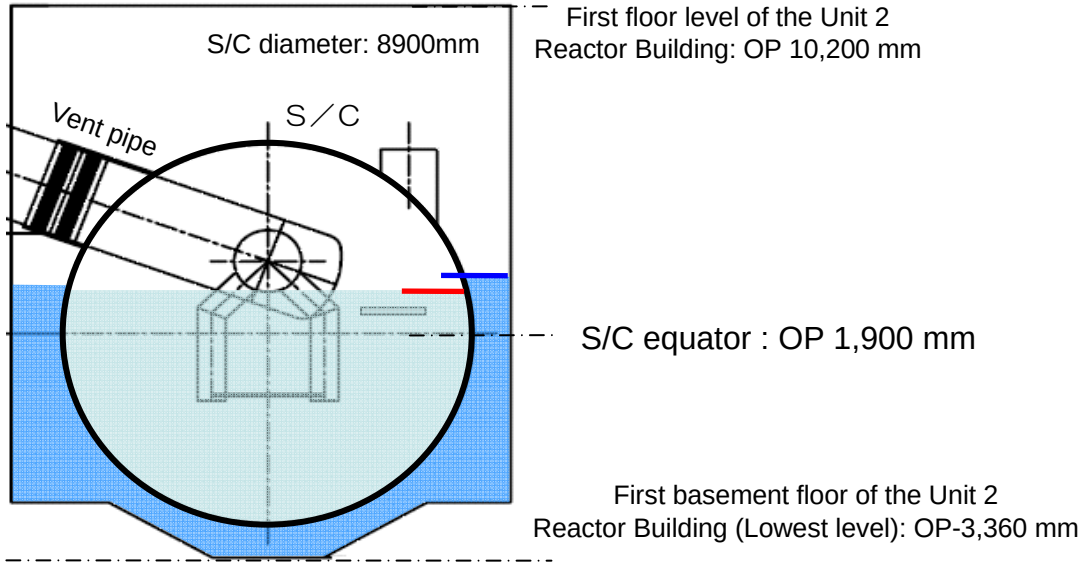
Measurement of water level inside of torus room in Unit 2 (2/2)

- 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.

Measuring date	January 14	January 15	January 16
Water level inside S/C	Approx. OP. 3,210 mm	Approx. OP. 3,160 mm	Approx. OP. 3,150 mm
Water level inside Torus Room (Reference)	Approx. OP. 3,230 mm	Approx. OP. 3,190 mm	Approx. OP. 3,160 mm
Water level difference	Approx. 20 mm	Approx. 30 mm	Approx. 10 mm
Measuring method	Direct distance measuring for structures the in the water		

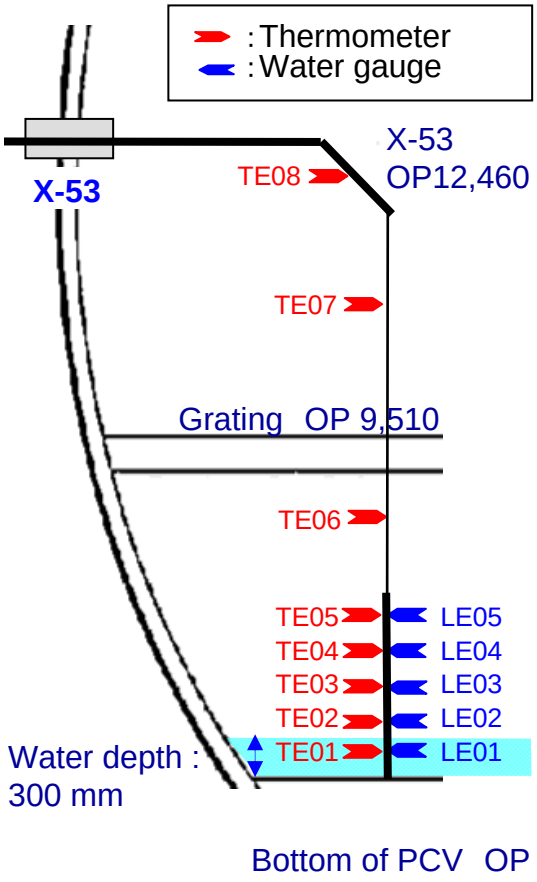
[Note] It is estimated that the water level inside the S/C is influenced by the change of the water level of accumulating water inside the torus room.

During the water level measuring

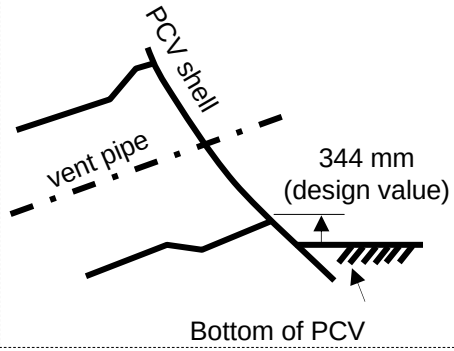


Measurement of water levels inside of PCV in Unit 2

- After failing to insert a measurement instrument in March 2012, re-inserting of an instrument was successful in early June 2014.
- Water levels and temperatures inside PCV have since been monitored.



The water level seems to be around over flow height into the vent pipe



Ref: around a vent pipe

［As of 8:00, June 11, 2014］

Monitoring results				Height
Temp.[℃]		Water level		
TE08	33.7	–	–	OP.11,920
TE07	33.7	–	–	OP.10,690
TE06	33.5	–	–	OP.8,100
TE05	33.5	LE05	OFF	OP.6,430
TE04	33.5	LE04	OFF	OP.6,230
TE03	33.6	LE03	OFF	OP.6,030
TE02	35.0	LE02	OFF	OP.5,830 *350 mm from the bottom of PCV
TE01	**35.8**	LE01	**ON**	OP.5,630 * 350 mm from the bottom of PCV

3. Steps for decommissioning

3-3. Current status of Unit 3

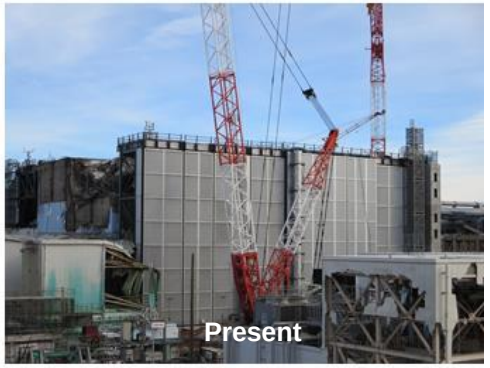
Current Status of Unit 3

Current Status

- Debris removal from the top of the reactor building completed (October 11, 2013)
- Installation of fuel removal cover and fuel handling facility planned
- Steel frame debris dropped into SFP (September, 2012)
- Beginning target of fuel removal activities rescheduled from the perspective of getting safety most prioritized (Changed from the end of December, 2014 to the end of September, 2015)

Tasks

- Due to high radiation levels, radiation dose reduction measures must be conducted safely and steadily with remote-controlled heavy machinery.



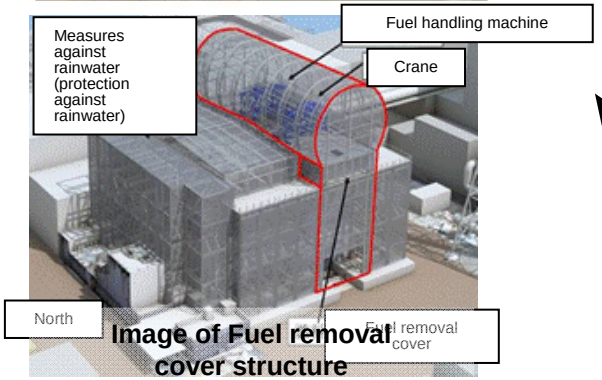
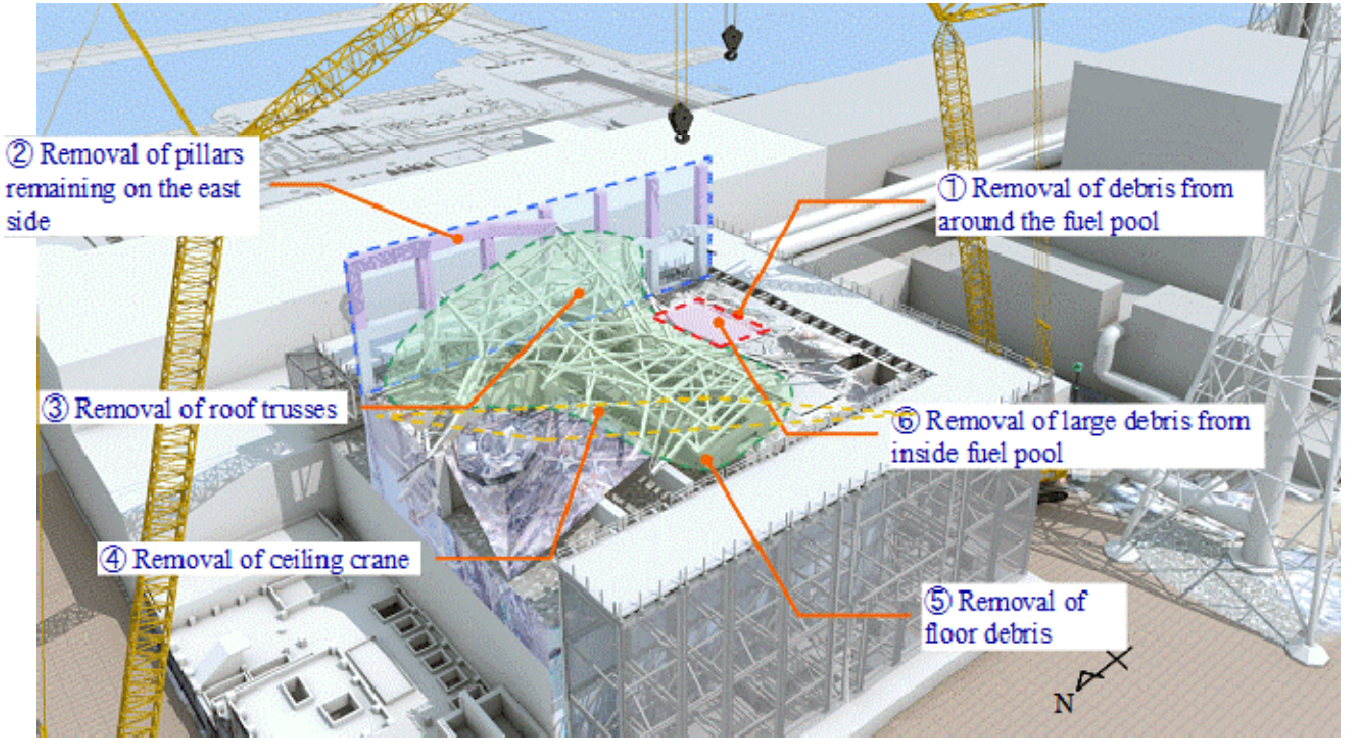


Image of Fuel removal cover structure

Spent fuel removal

- With remotely operated heavy machinery, the removing activity of debris from the top floor completed (October 11, 2013)
- Fuel removal from spent fuel pool continuously conducted
- Currently developing/implementing the plan for decontamination and shielding against radiation



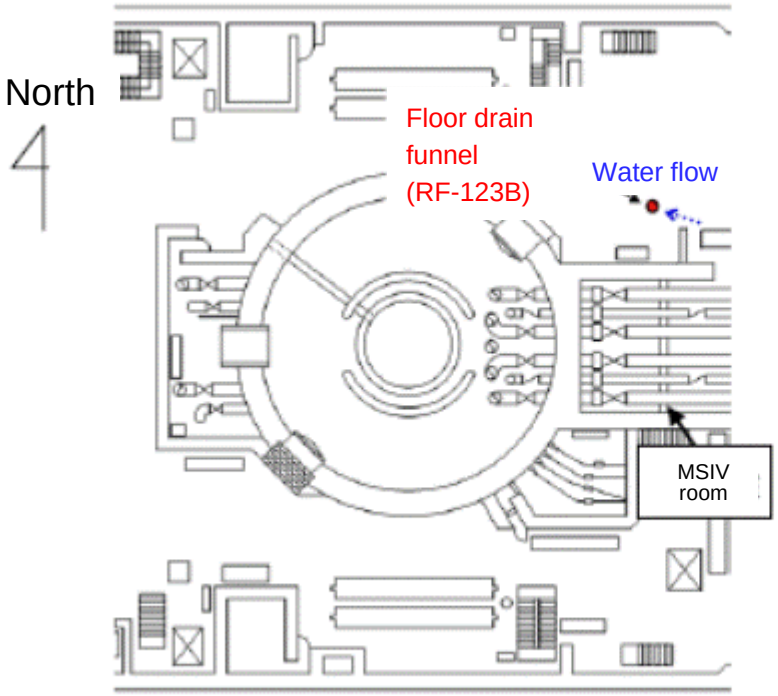
Before large debris removal

After removal of large debris

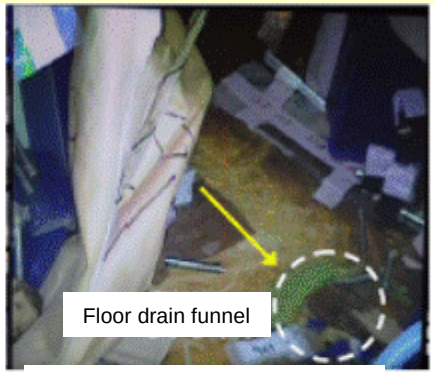
Water flow from area near MSIV room (1/2)

Water flow from area near MSIV room to floor drain funnel on 1st floor in R/B at Unit 3

- On January 18, 2014, checking the camera images from the debris removal robot (ASTACO-SoRa) in unit 3, our personnel found that water flowing from the area near the door of the main steam isolation valve (MSIV) room toward the floor drain funnel in the vicinity in the north-eastern area on the 1st floor at Unit 3 R/B.
- On January 21, 2014, it was identified that water injection amount was greatly reduced while the robot was operated for debris removal work.
- No change on plant parameter, etc has been found.



Floor map of 1st floor in R/B at Unit 3



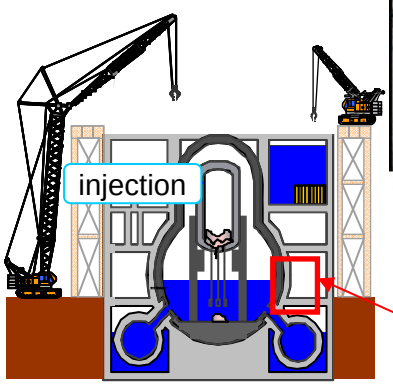
Water flow confirmed (on Jan. 18)

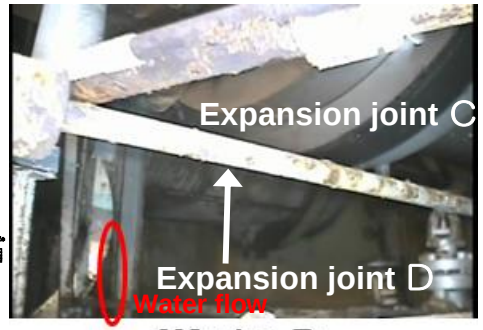
Water flow reduction confirmed (on Jan. 21)

Remote-controlled heavy machinery (ASTACO-SoRa)

Identification of water leakage in Unit 3

- On May 15, by inserting a camera into the Main Steam Isolation Valve (MSIV) room, a leak from around a Main Steam (MS) line was identified. It was the first confirmation of a leak from the Unit 3 PCV.

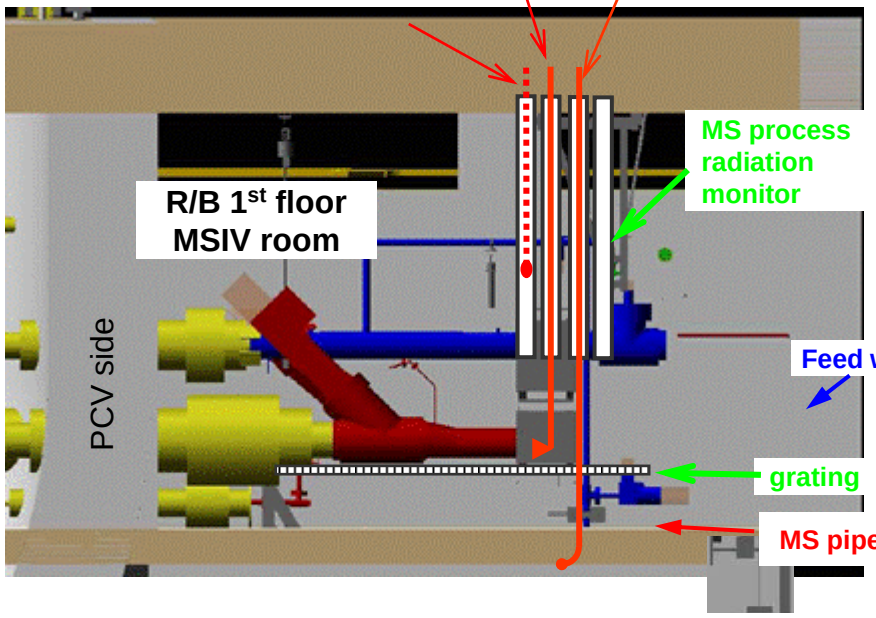


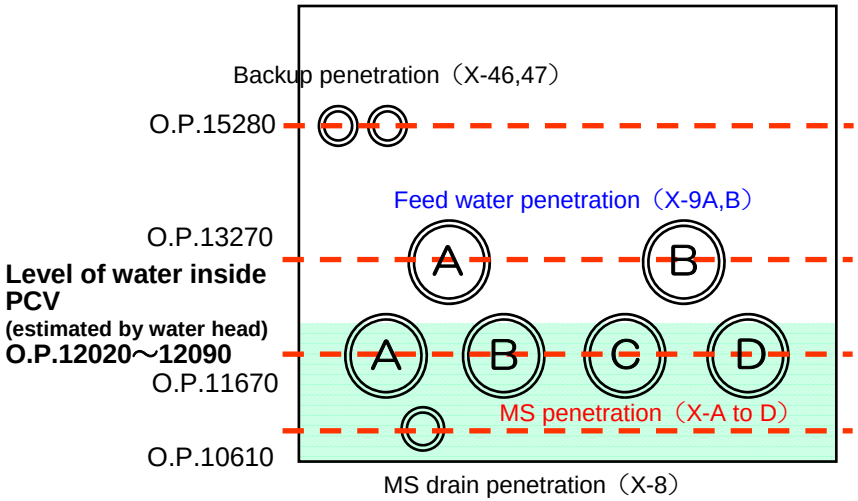


Penetration on PCV by MS pipes

Pan-tilt camera

Endoscope camera





Penetration on PCV in MSIV room

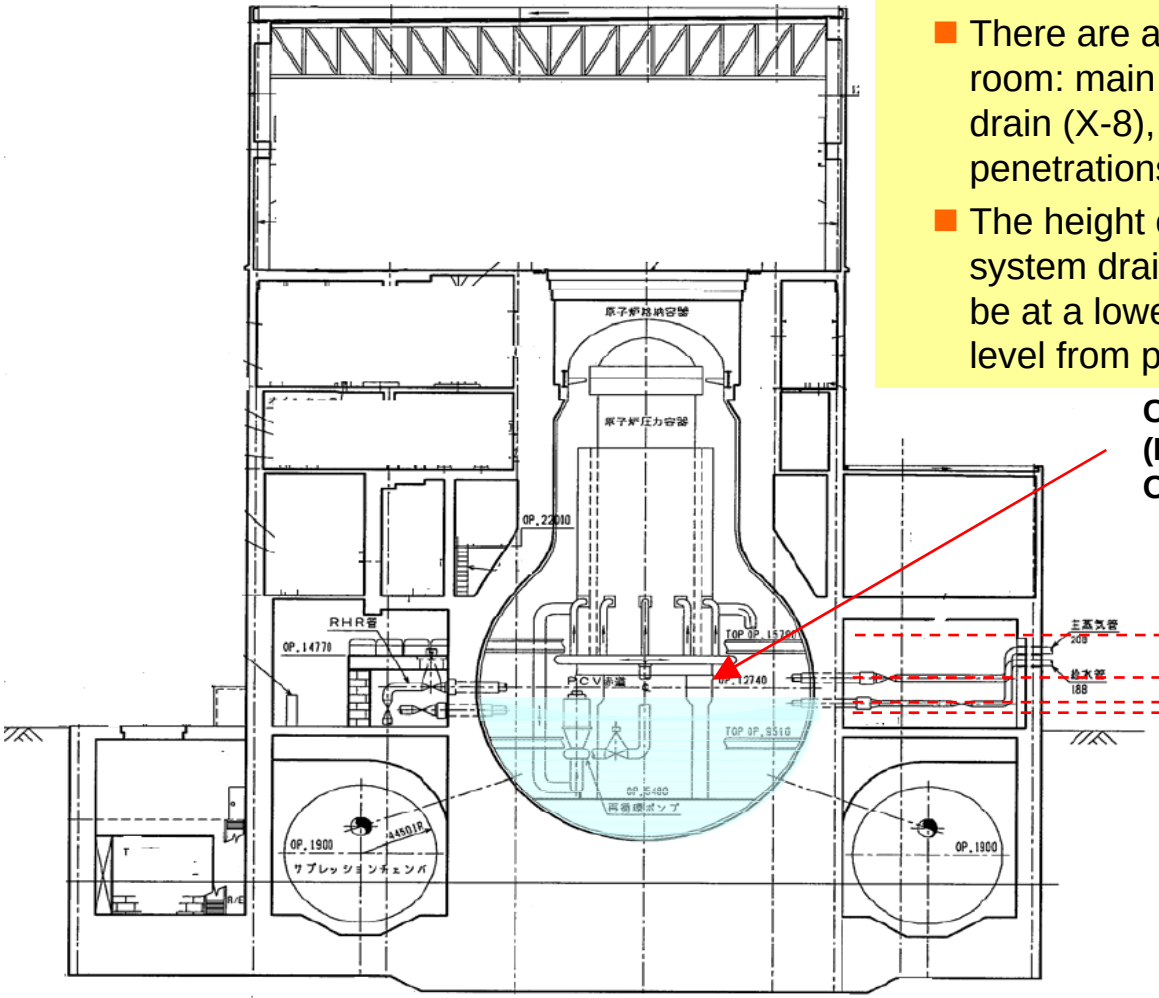
Cross section of MSIV room

Water flow from area near MSIV room (2/2)

Water flow from area near MSIV room to floor drain funnel on 1st floor in R/B at Unit 3 (Estimation of the flow pathway)

Containment vessel pipe penetration seal

- There are a total of 9 pipe penetration seals in the MSIV room: main steam system (X-7A~D), main steam system drain (X-8), feed water system (X-9A,B), and the backup penetrations (X-46,47)
- The height of the main steam system and the main steam system drain penetrations (total of 5 places) are estimated to be at a lower level than PCV water level (estimated water level from pressure conversion)



Containment vessel water level
(Estimated water level from pressure conversion)
O.P.12020~12090

Backup(X-46,47)
Height: O.P. approx. 14800~15300

Feed water system pipe penetration seal (X-9A,B)
Height: O.P. approx. 12800~13700

Main steam system pipe penetration seal (X-7A~D)
Height: O.P. approx. 11100~12200

Main steam system drain pipe penetration seal (X-8)
Height: O.P. approx. 10400~10800

Unit 3 Reactor Building cross-section

3. Steps for decommissioning

3-4. Current status of Unit 4

Current Status of Unit 4

Current Status

•Fuel removal from SFP commenced (November 18, 2013, target by the end of year 2014)

Tasks

•Continuing work while ensuring safety

•Exploring the methodology for the removal of the fuels with their leaks confirmed

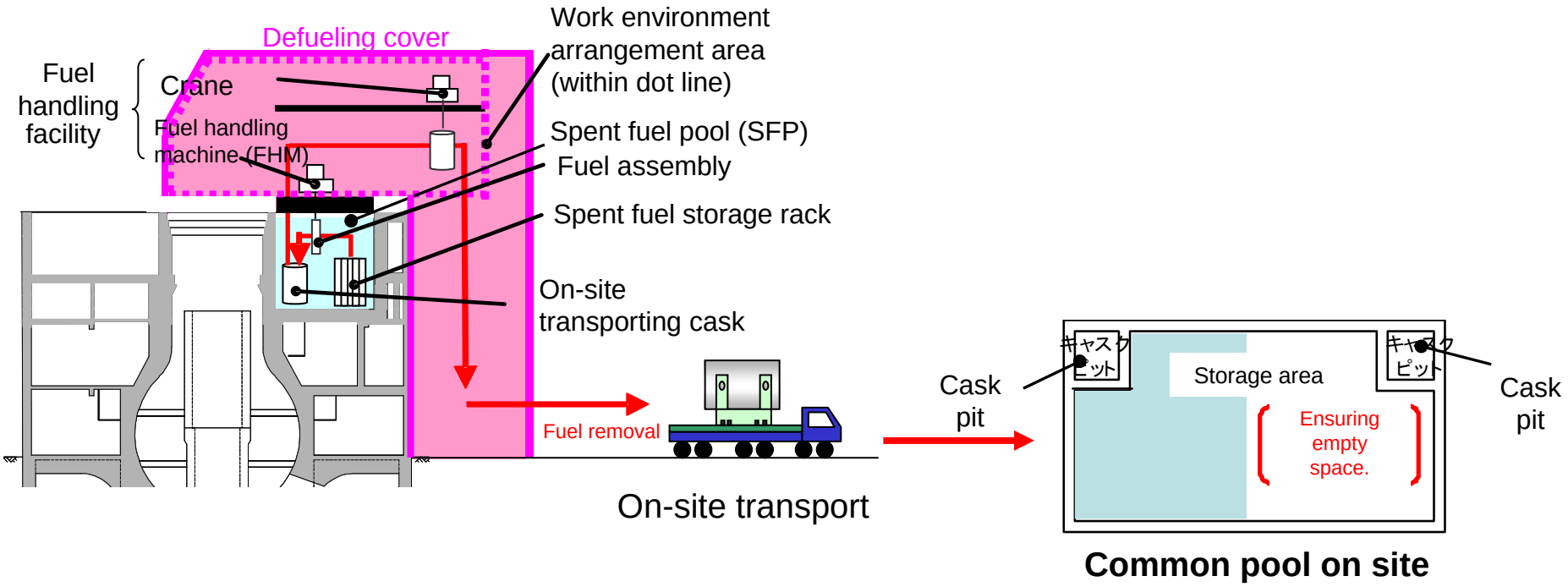
As of Sep. 22, 2011

Fuel Removal Cover Structure Present

Spent fuel removal (1/2)

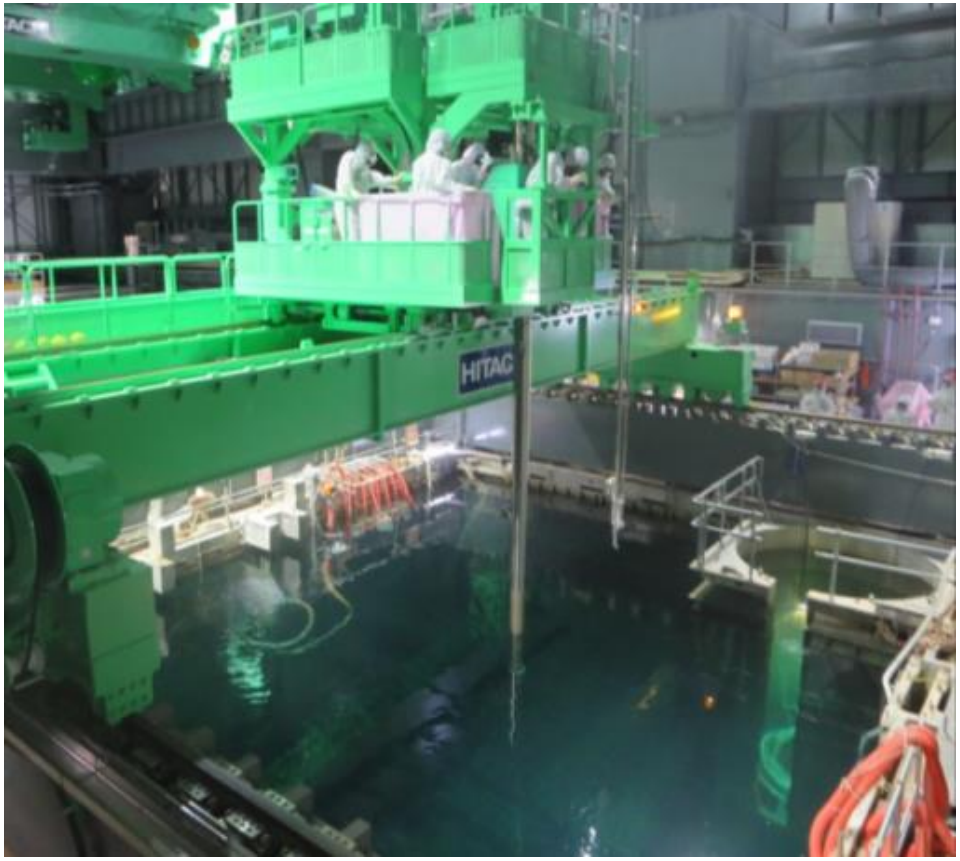
■ 1254/1533 fuels have been already removed and transported to common fuel pool on site as of September 24, 2014.

- Fuels have been removed from Spent Fuel Pool (SFP) in Unit 4 since November 18, 2013.
- 1533 fuels was stored inside SFP at the time of starting fuel removal.
  They are scheduled to be completely removed by the end of year 2014.



Spent fuel removal (2/2)

Fuel removal activity



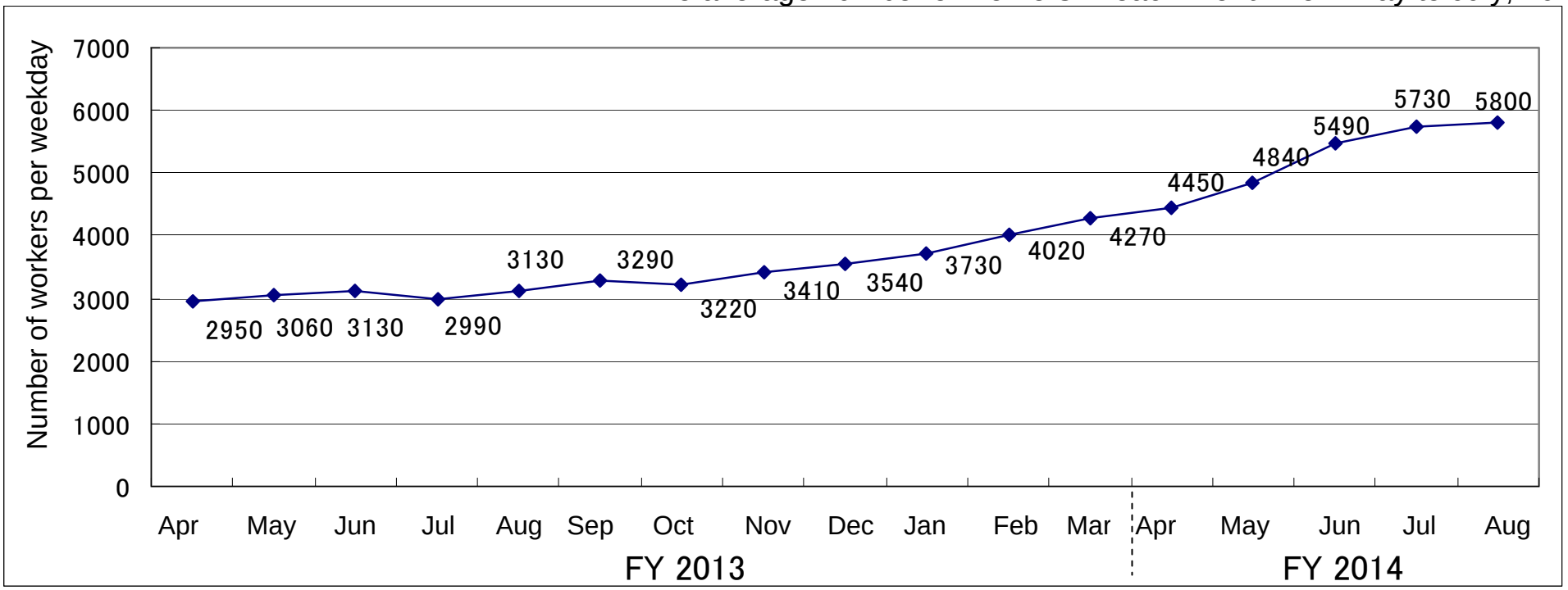
Loading the cask on transporting vehicle

4. Work environment etc.

Number of workers

- Since registered workers are approx. 12,500* and workers who actually conducted the activities in the field are approx. 9,600*, registered workers are ensured with a certain margin.
- The average number of workers per weekday in each month of FY 2014 was approximately between 3,000 and 5,800.
- Employment rate of contractors and TEPCO personnel who had lived near the plant siting area is approximately 45% as of August, 2014.

* The average number of workers in each month from May to July, 2014



Trend in the average number of workers per weekday in each month of FY 2013 and 2014

Radiation exposure of workers

■For most workers, the exposure dose is sufficiently within the limit and at a level which allows them to continue engaging in radiation work.

- Cumulative radiation exposure in FY 2012 was 20 mSv/year or less for approx. 95% of the total.
- Cumulative radiation exposure in FY 2013 was 20 mSv/year or less for approx. 96% of the total.

Cumulative radiation exposure in FY 2012

Category (mSv)	TEPCO employees	Contractors	Total
Over 250	0	0	0
Over 200 and no more than 250	0	0	0
Over 150 and no more than 200	0	0	0
Over 100 and no more than 150	0	0	0
Over 50 and no more than 100	1	0	1
Over 20 and no more than 50	62	567	629
Over 10 and no more than 20	129	1778	1907
Over 5 and no more than 10	261	1837	2098
5 or less	1159	7427	8586
Total	1612	11609	13221
Maximum	53.97	41.45	53.97
Average	4.46	5.44	6.32

The radiation exposure of 95% workers are 20 mSv or less in FY 2012

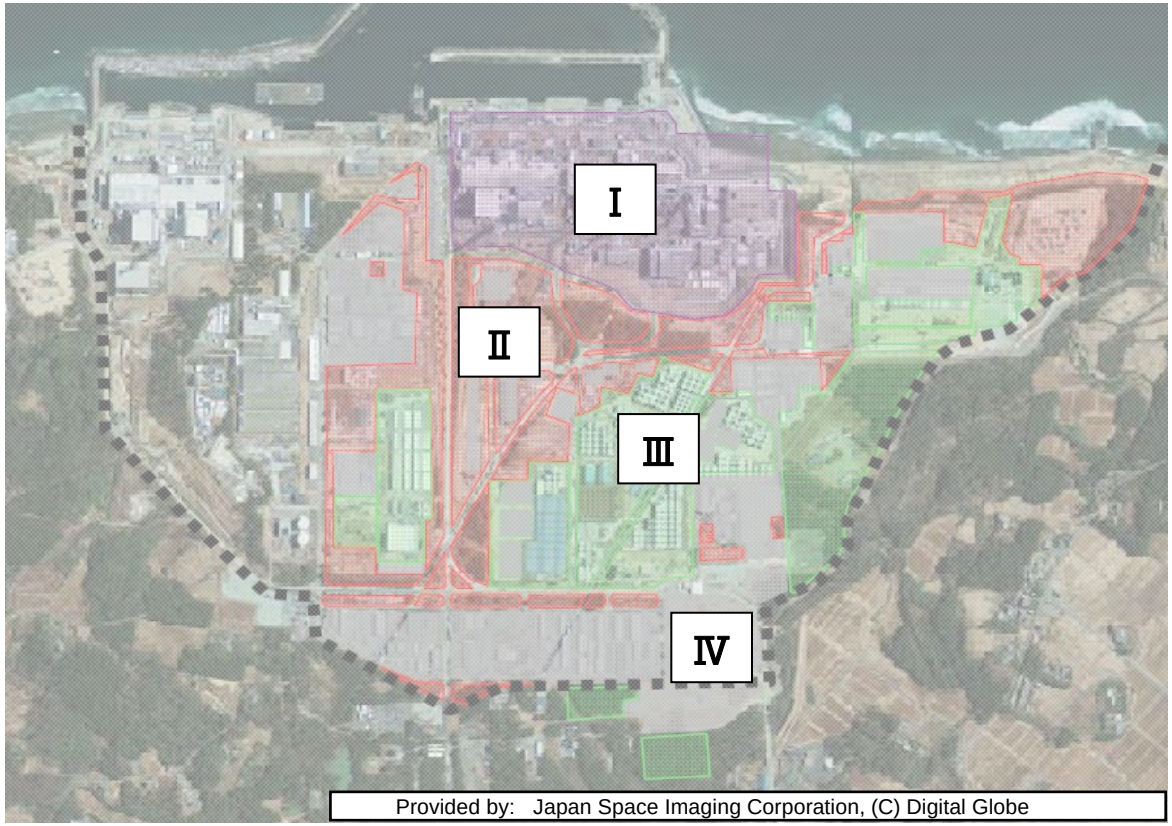
Cumulative radiation exposure in FY 2013

Category (mSv)	TEPCO employees	Contractors	Total
Over 250	0	0	0
Over 200 and no more than 250	0	0	0
Over 150 and no more than 200	0	0	0
Over 100 and no more than 150	0	0	0
Over 50 and no more than 100	0	0	0
Over 20 and no more than 50	30	625	655
Over 10 and no more than 20	93	2049	2142
Over 5 and no more than 10	195	1882	2077
5 or less	1375	8492	9867
Total	1693	13048	14741
Maximum	41.59	41.36	41.59
Average	3.18	5.46	5.20

The radiation exposure of 96% workers are 20 mSv or less in FY 2013

Improvement on work environment - Dose reduction (1/2)

To reduce dose of site workers, dose reduction is proceeded through **deforestation, top soil removal, soil flipping and shielding**, etc, considering characteristics of fall-out contamination and radiation source per area (direct rays, leakage points of contaminated water etc.) on the Fukushima Daiichi Nuclear Power Station's entire site.
Target radiation dose rates will be gradually marked down, ultimately coming close to pre-accident levels.



Provided by: Japan Space Imaging Corporation, (C) Digital Globe

- Area Ⅰ Areas in the vicinity of Units 1-4 where radiation dose rates are particularly high
- Area Ⅱ Planting areas and areas with remaining woods
- Area Ⅲ Areas where facilities are installed or are to be installed in the future
- Area Ⅳ Already paved areas, such as streets and parking lots
- Scope of the mid- and long-term implementation policy for reducing on-site dose

Area	Current dose [μSv/h] *1	Target dose [μSv/h] *2	Measures against dose reduction
Ⅰ	＞100 +radiation	Investigating detailed situation of radiation source and setting target of dose rate	- Removing rubble impeding works - Shielding main road, pipe with high dose etc. - Considering direct ray from building and facility etc. based on decommissioning process
Ⅱ			- Deforestation, top soil removal, soil flipping and shielding etc.
Ⅲ	10-100	＜5	- Deforestation, top soil removal, soil flipping and shielding etc. at the time of installation - Implementing them in order from the area contaminated by the leakage of contaminated water - Treating water with high contamination level
Ⅳ			-Cleaning road surface, replacement of pavement, shielding etc. - Implementing them in order from the area where many workers exist, work interference is small
Other Area	5-50	—	- Conducting clean-up based on site utilization plan - The area surrounding Units 5 and 6 has low dose level, and there is no site utilization plan in the north of solid waste storage area.

*1 Survey results with on-site vehicles (Nov. 21, 2013)

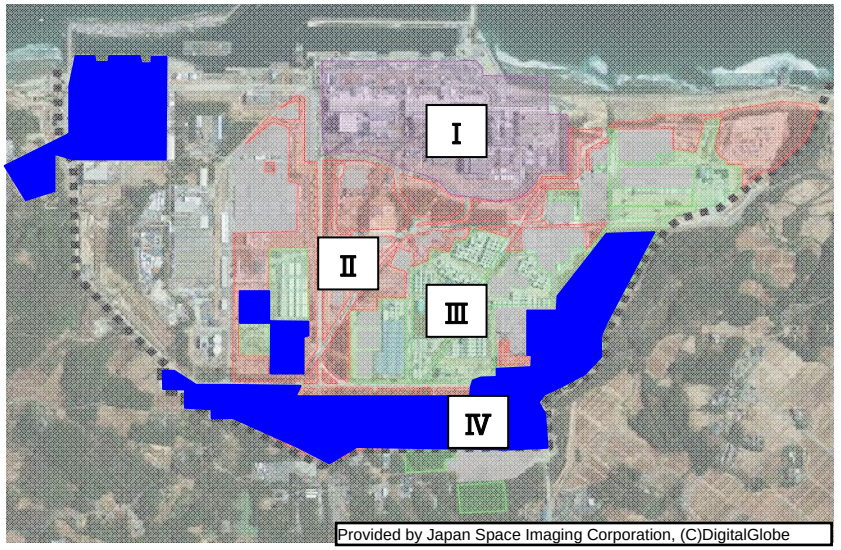
*2 Mean value without impact form direct rays per block where clean-up was conducted

Improvement on work environment - Dose reduction (2/2)

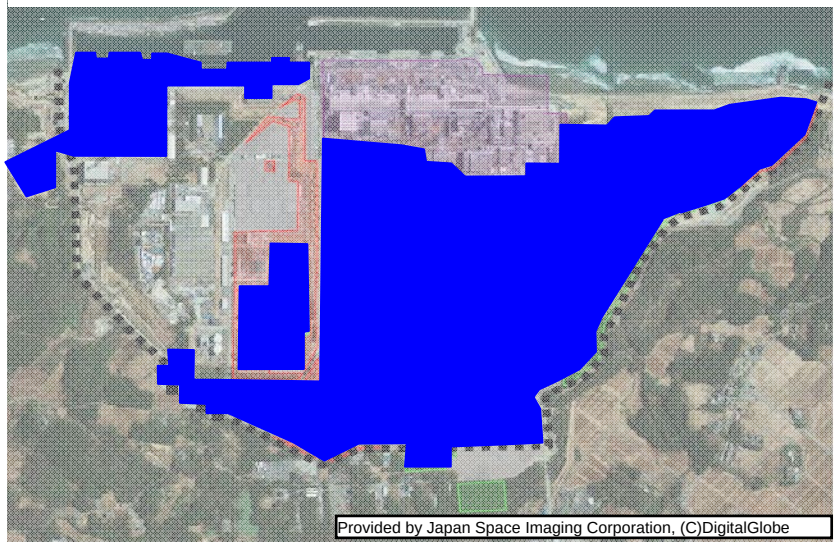
◇ Efforts to expand the low radiation dose area to reduce radiation dose for site workers

Measures for dose reduction (e.g. removal and area shielding etc. of rubbles disturbing decommissioning work) are being conducted.
Since the area surrounding Units 1 to 4 (Area Ⅰ) is high-radiation area where plants and facilities exists, dose reduction will be conducted according to the schedule regarding dismantlement of high-radiation facilities and rubble removal of R/B.

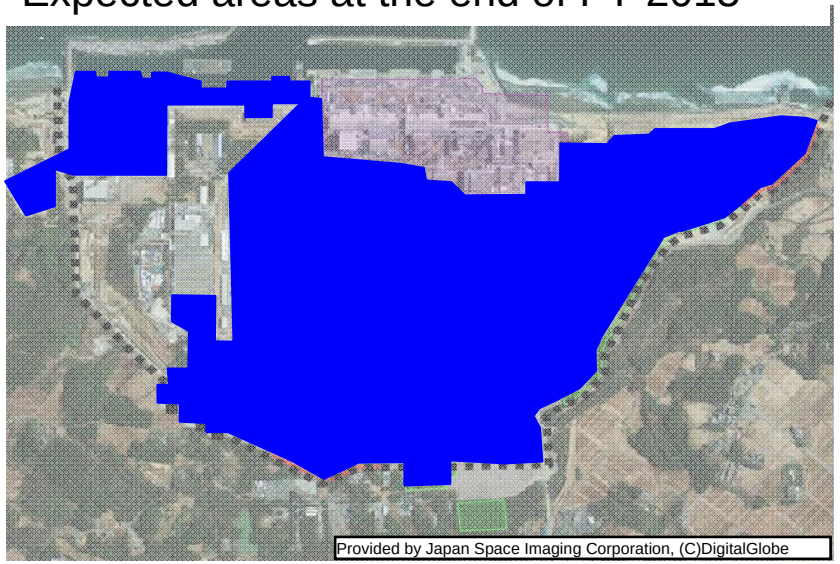
Expected areas at the end of FY 2013



Expected areas at the end of FY 2014



Expected areas at the end of FY 2015



* Areas with approx. 5 μSv/h are marked with .

Improvement on work environment - Temporary office administrative building 50

Illustration of building exterior

Administrative room inside the building

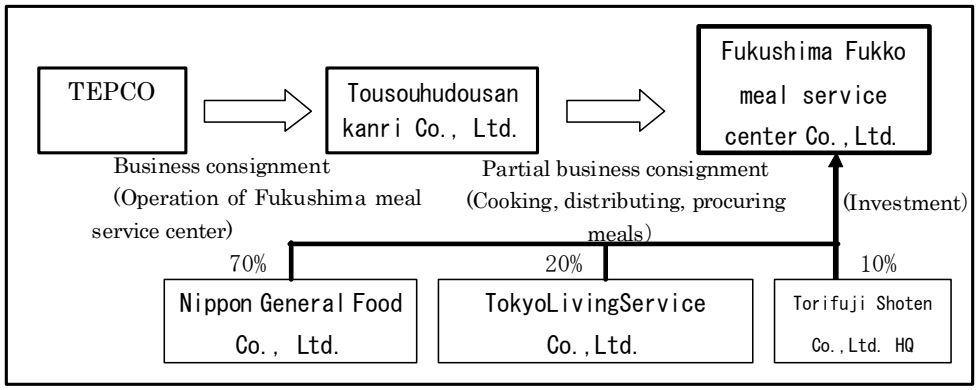
Progress outline

Building name	2013	2014		2015
	second half	first half	second half	
Temporary office administrative building	1st phase of construction		2nd phase of construction	
Main office administrative building				

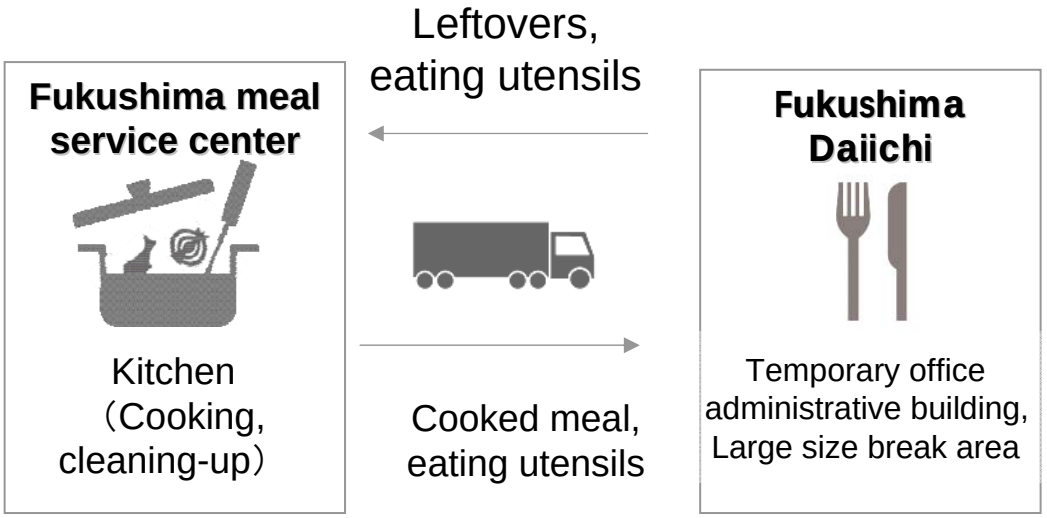
* As for temporary office administrative building, 1st phase of construction was completed. (June 30, 2014) The operation partly started. (July 22, 2014) The vicinity of access control building is considered as a candidate site for construction of main office administrative building.

Improvement on work environment - Fukushima meal service center

Conceptual drawing on completion of construction



Operation scheme



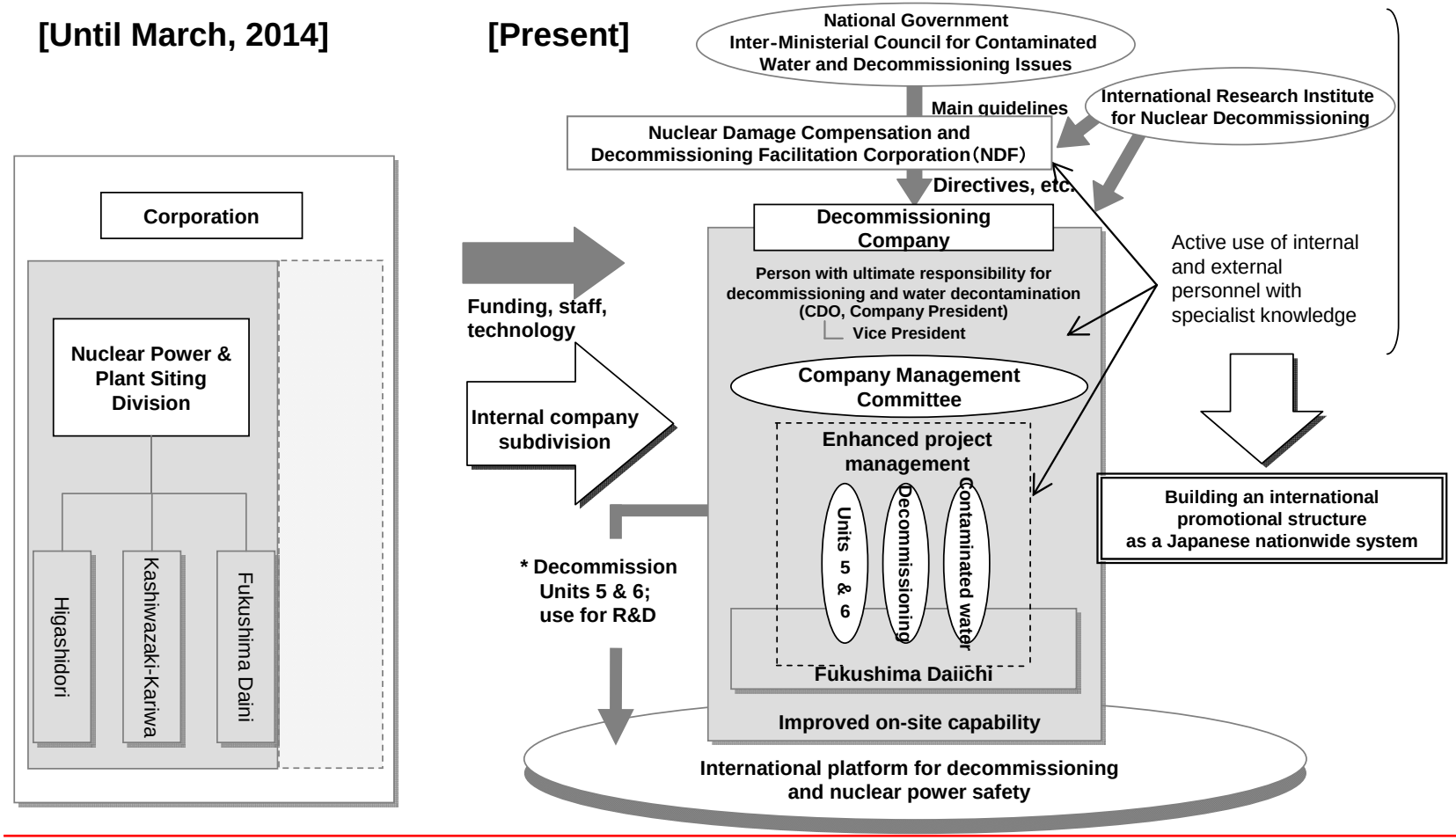
The way to provide on Fukushima meal service center

Progress outline

Item	2013	2014	
	second half	first half	second half
Planning	Selection of premise and development of basic plan		
Design and construction		Design and construction	

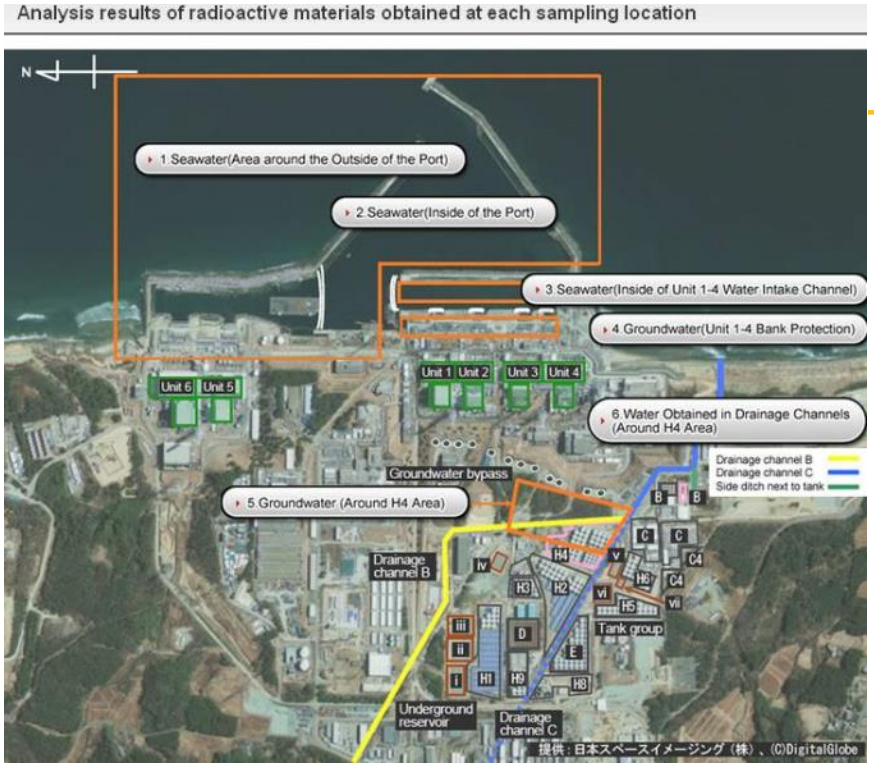
Promotion of decommissioning work

- Fukushima Daiichi Decontamination and Decommissioning Engineering Company (FDEC) was established to control the entire decommissioning-related divisions. Decommissioning and measures against contaminated water issue will be expedited as a Japanese government project by collecting the wisdom from experts inside and outside of Japan.

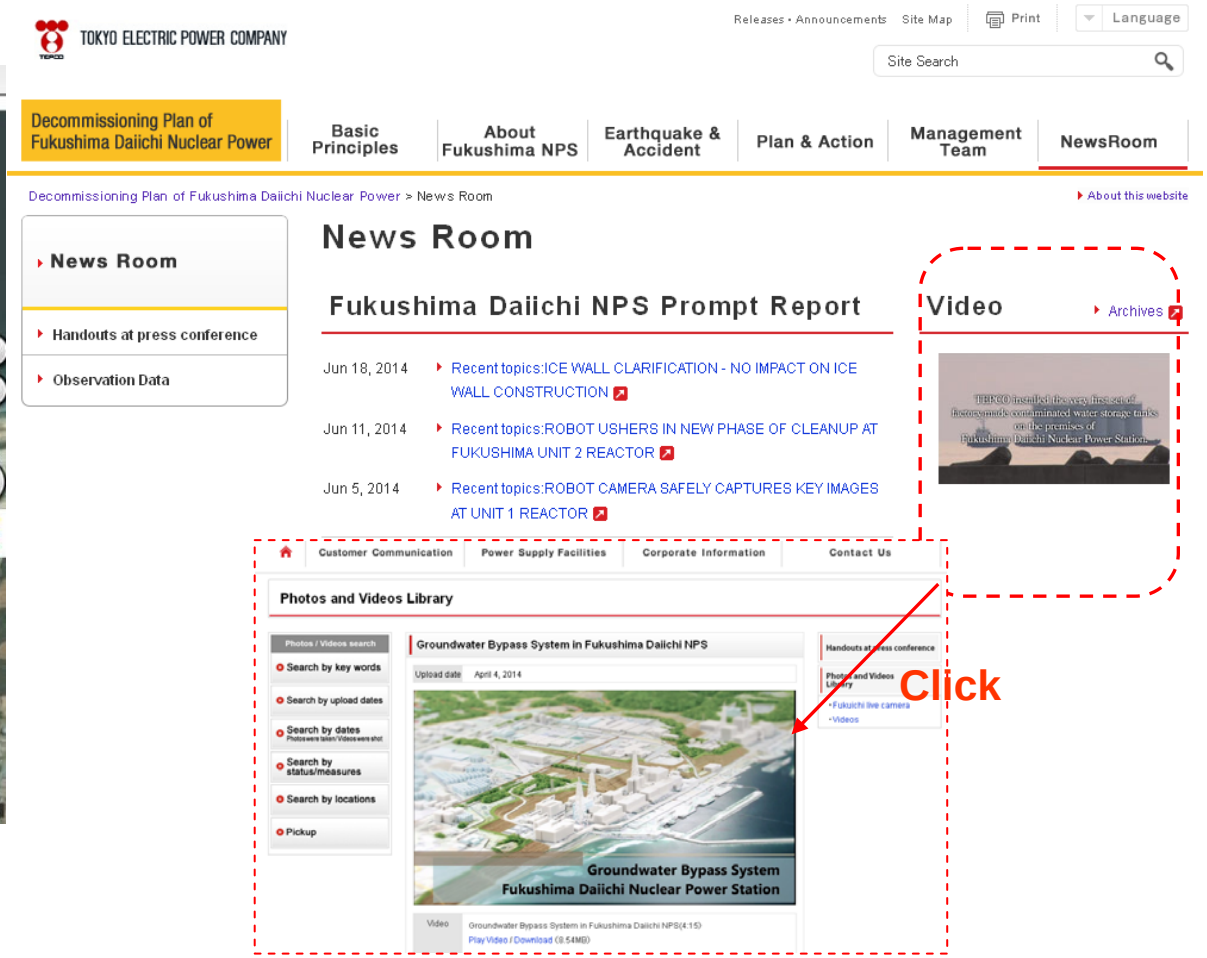


For more information

- Updated information regarding decommissioning is shared on TEPCO website.
  http://www.tepco.co.jp/en/decommision/index-e.html



<Result of radioactive analysis around Fukushima Daiichi NPS map imaging>



<Photo and video library>










We will push forward with our reforms in earnest.

TEPCO