

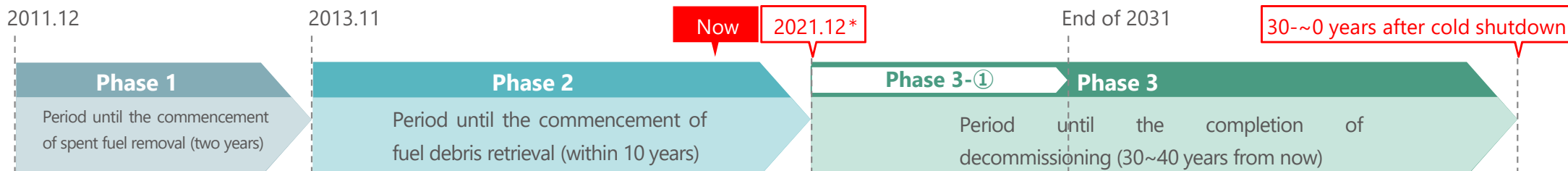
March 8, 2022 19th Nuclear Reform Monitoring Committee Meeting

Status of Initiatives at Fukushima Daiichi



Fukushima Daiichi Decontamination &
Decommissioning Engineering Company

Mid/Long-Term Roadmap



Phase 3-① is the period until the end of 2031, and is defined as the “period during which we will move forward in a planned manner with various work schedules in order to steadily forward with full-scale decommissioning efforts.”

<Main schedule targets>

Field	Details		Period
Contaminated water countermeasures	Amount of contaminated water generated	Reduce to approximately 150m ³ /day	During 2020 Achieved
		Reduce to under 100m ³ /day	During 2025
	Accumulated water treatment	Complete the treatment of accumulated water in building *	During 2020 Achieved
		Reduce the amount of accumulated water in the reactor buildings by half by the end of 2020	FY2022~FY2024
Fuel removal from the spent fuel pools	Complete fuel removal from Units 1~6		During 2031
	Complete Unit 1 large cover installation		Around FY2023
	Commence fuel removal from Unit 1		FY2027~FY2028
	Commence fuel removal from Unit 2		FY2024~FY2026
Fuel debris retrieval	Commence fuel debris retrieval from the first unit (fuel debris retrieval will start at Unit 2 and the scale gradually enlarged)		During 2021
Waste countermeasures	Technical forecast for treatment/disposal measures and the safety of such measures		Around FY2021
	Eliminate the temporary outdoor storage of rubble		During FY2028

*:Excluding the Units 1~3 reactor buildings, process main building, and high temperature incinerator building

Current conditions at Units 1~4

Unit 1



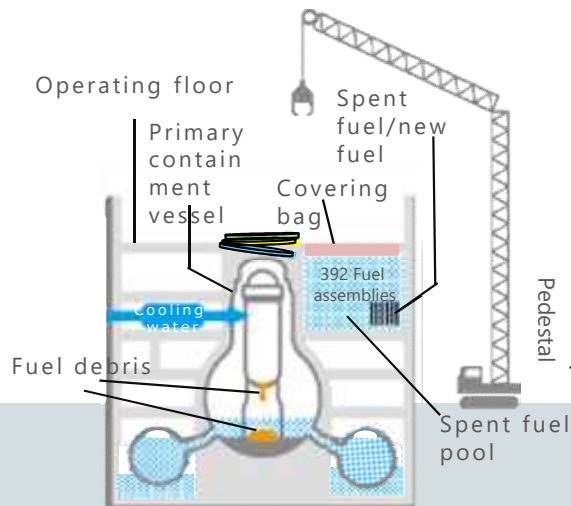
Unit 2



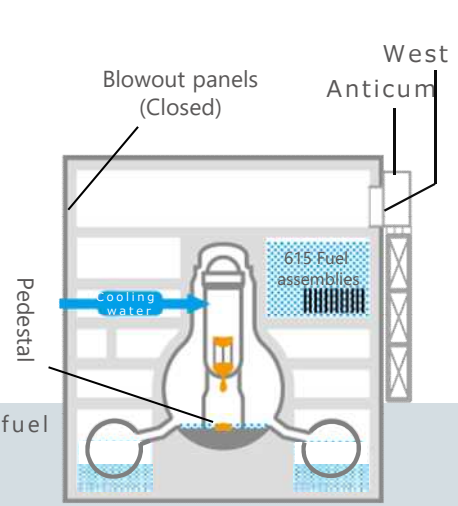
Unit 3



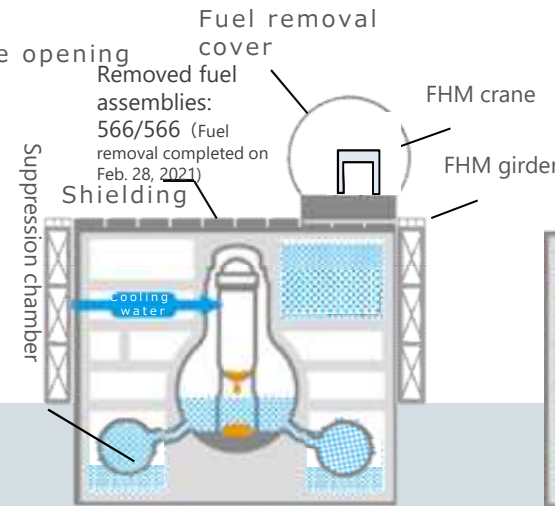
Unit 4



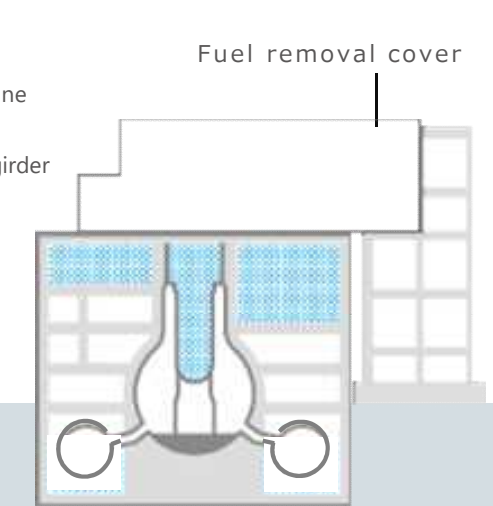
In August we began installation of the large cover as part of work to assemble a temporary work platform, which has been underway since April 2021, in preparation for removing the fuel from the spent fuel pools. Internal investigations of the primary containment vessel using a submersible ROV began on February 8, 2022 in preparation for fuel debris retrieval.



In preparation for the removal of fuel from the spent fuel pool, we completed decontamination of the operating floor of the reactor building in December 2021, which was implemented to prevent dust dispersion. Performance tests of equipment that will be used for the trial retrieval of fuel debris were completed in January 2022.



Removal of the fuel from the spent fuel pool (566 assemblies) was completed on February 28, 2021.



Removal of the fuel from the spent fuel pool (1535 assemblies) was completed on December 22, 2014 thereby eliminating risks associated with fuel.

Fuel pool removal: Conditions at Units 1~4

Work schedule

Rubble removal, etc.

Fuel removal
equipment
installation

Fuel
removal

Relocation of fuel
to storage

Unit 1



Status of large cover installation

We aim to commence fuel removal during FY2027~2028. We are currently inspecting the condition of the outer walls of the reactor building in preparation for the installation of the large cover.



Units 1 reactor building site

Unit 2



Operating floor decontamination and the fuel removal work platform construction plan

In preparation for the commencement of fuel removal during FY2024~2026, we have completed decontamination of the operating floor in December 2020 in order to prevent the dispersion of dust. We also began installing shielding above the reactor well in February 2022. And, ground improvements have been underway since October 2021 in order to construct a work platform.



Unit 2 reactor building south side yard

Unit 3



Visual inspection of the common pool for removed new fuel

Fuel removal was completed on February 28, 2021. In order to deliberate the dry storage and transport of this fuel in the future, two new fuel assemblies were hoisted out of the common pool into the open air to perform a visual inspection. Some rubble could be seen dispersed amongst the fuel, but no damage/deformation could be seen to fuel rods or other components.



Rubble removed from the fuel assembly

Unit 4



Cleaning Unit 4 new fuel being stored at Unit 6

Fuel removal was completed on December 22, 2014. Flowing water will be used to clean the new fuel from Unit 4 that is being stored in the Unit 6 spent fuel pool.



Rubble removal device
guide

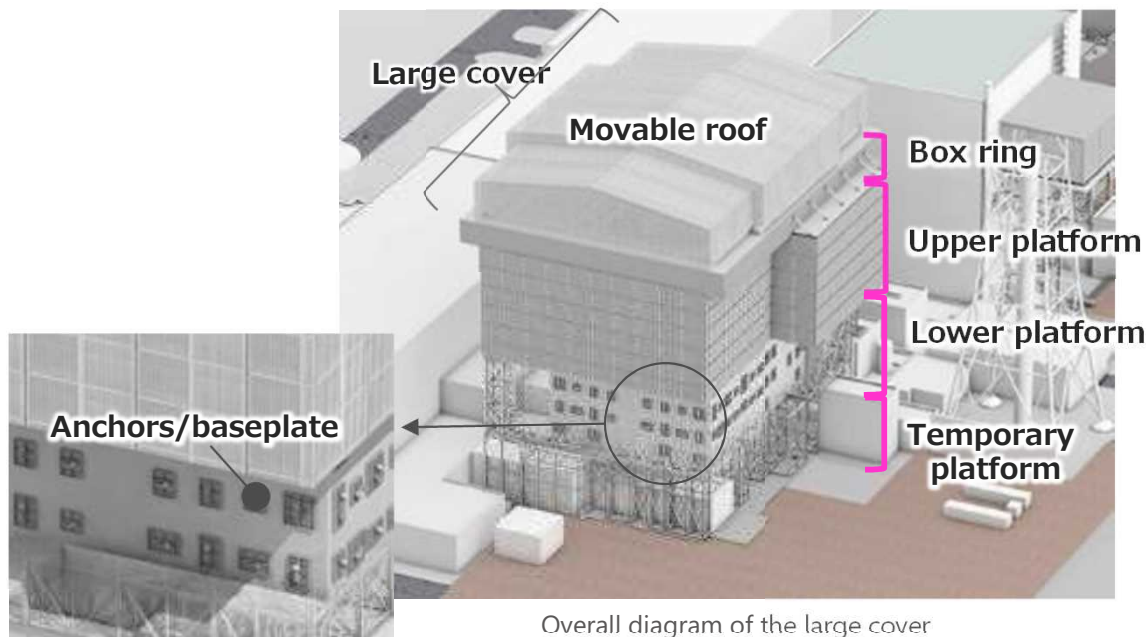
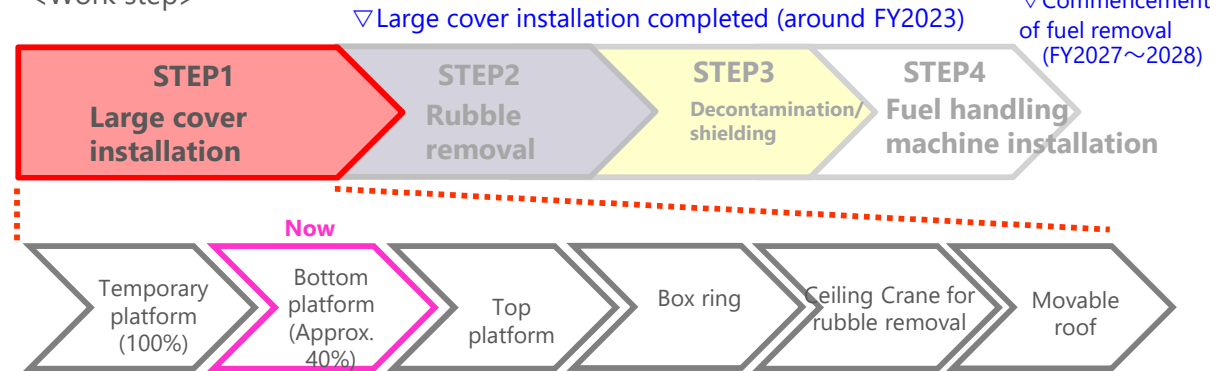
Pool fuel removal: Unit 1

Large cover installation



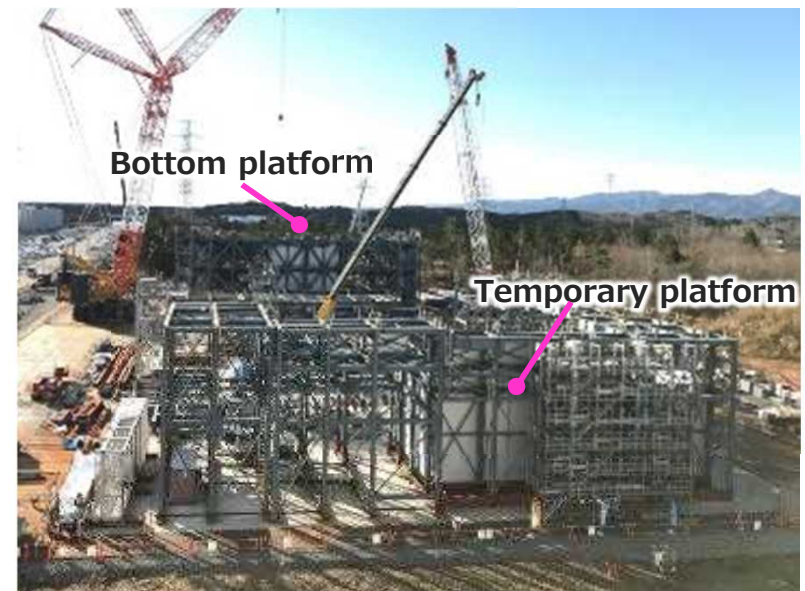
- We are in the process of installing a large cover to encompass the reactor building in preparation for the commencement of fuel removal in FY2027~2028.
- The large cover is a steel structure comprised of a bottom platform, a top platform, a box ring, and a movable roof, with the bottom platform secured to the reactor building using anchors and base plates.
- Basic assembly of the steel frame is taking place off-site, and basic assembly of the temporary platform has been completed. Basic assembly of the bottom platform is approximately 40% complete (as of December 2021)
- We have inspected the outer walls of the reactor building (October-December 2, 2021) and have confirmed that cracks and concrete integrity are within design limits, and that it will be possible to secure the large cover using anchors as planned.

<Work step>



Overall diagram of the large cover

* This is merely a Concept diagram, so it may differ from the actual structure

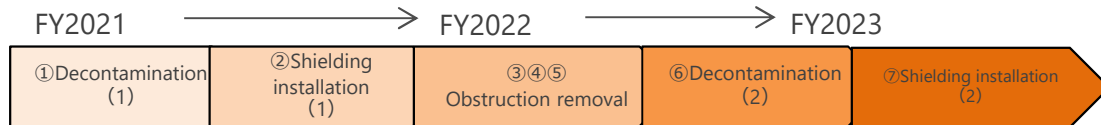


Offsite yard (December 13, 2021)

Pool fuel removal: Unit 2 Work platform construction preparation

Operating floor dose level reductions

- Decontamination (1) to reduce dose levels on the operating floor began in August 2021 and concluded in December. Shielding installation (1) will begin in February 2022
 - Shielding will be installed above the reactor well where dose levels are the highest
 - After the shielding is installed we shall check the effect that it has on reducing dose levels, and if the measured dose levels are higher than the dose reduction measure plan targets, we will deliberate additional decontamination/shielding measures.



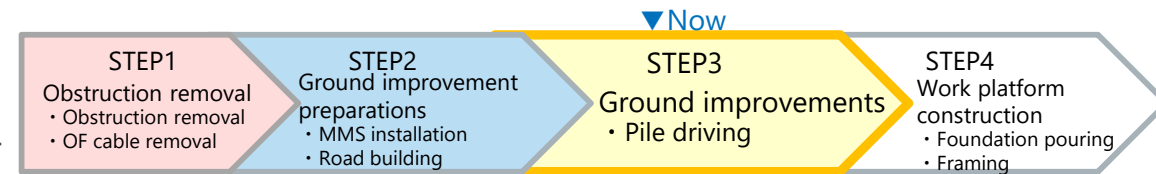
Prior to floor decontamination



After floor decontamination

Fuel removal platform construction plan

- STEP 3 ground improvements are underway in preparation for construction of the fuel removal platform
 - In off-site yard is being prepared for basic assembly of the frame structure in preparation for frame structure construction of STEP 4

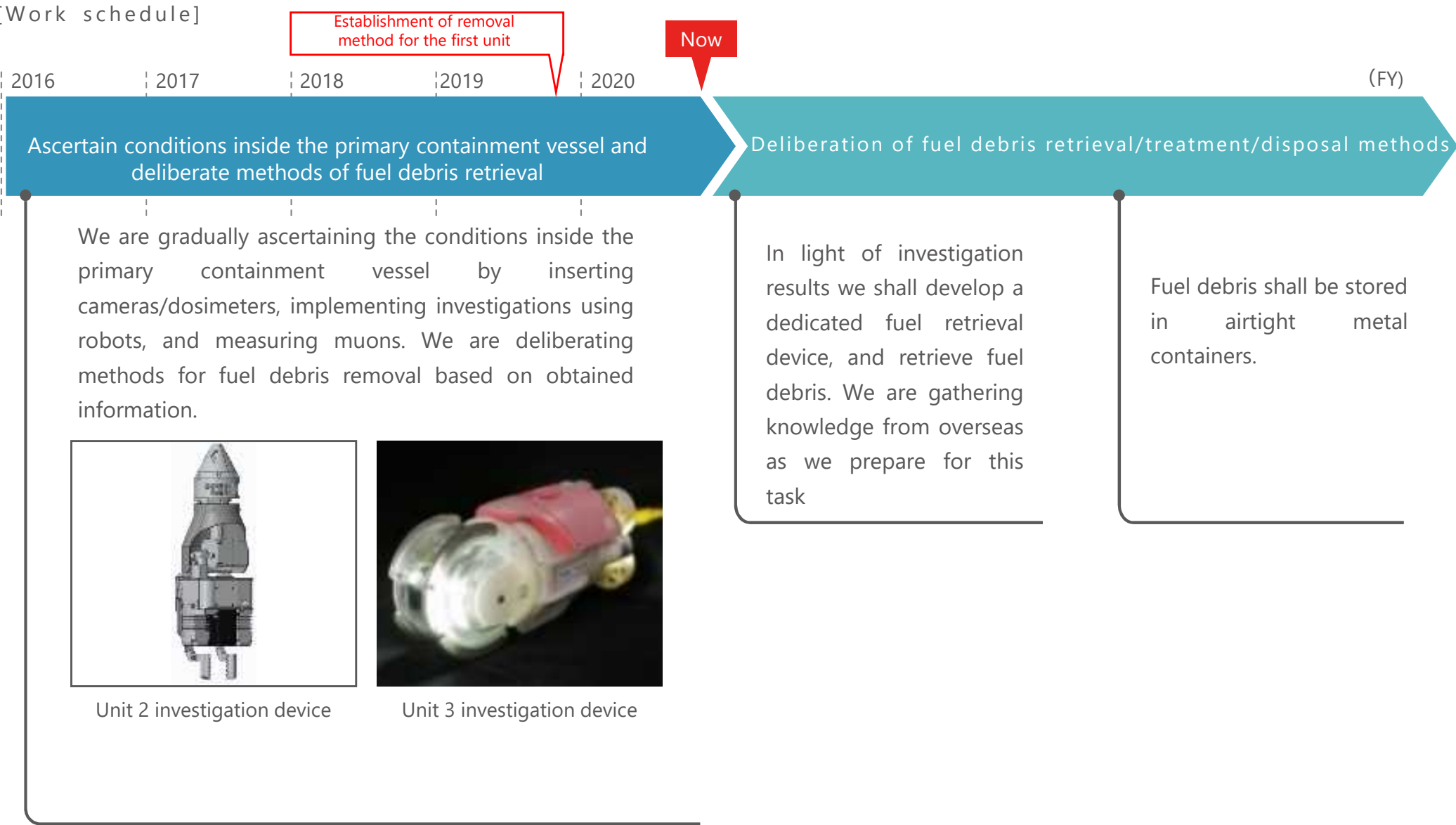


- Progress status of ground improvements
 - Pile driving began in October 2021 and as of January 26, 2022, 25 out of 74 piles have been driven into the ground (progress rate: approximately 34%)
 - All piles should be in place by April 2022



Assembly yard on the south side of the Unit 2 reactor building (January 8, 2022)

Fuel debris removal: Work schedule



Fuel debris removal: Unit 1

Primary containment vessel internal investigations

Commencement of investigations using a submersible remotely operated vehicle (ROV)

- Investigations include detailed visual investigations of the inside and outside of the pedestal, measuring deposit thickness, detecting deposit debris, sampling deposits, and of the 3-D mapping of deposits.
 - From February 8, 2022, we have been installing rings (guide rings) to prevent the cable to the submersible ROP from becoming entangled.
 - Conditions to the east-northeast of the PCV (215°) and the area around the pedestal opening were investigated in order to obtain information for future investigations, and deposits found.

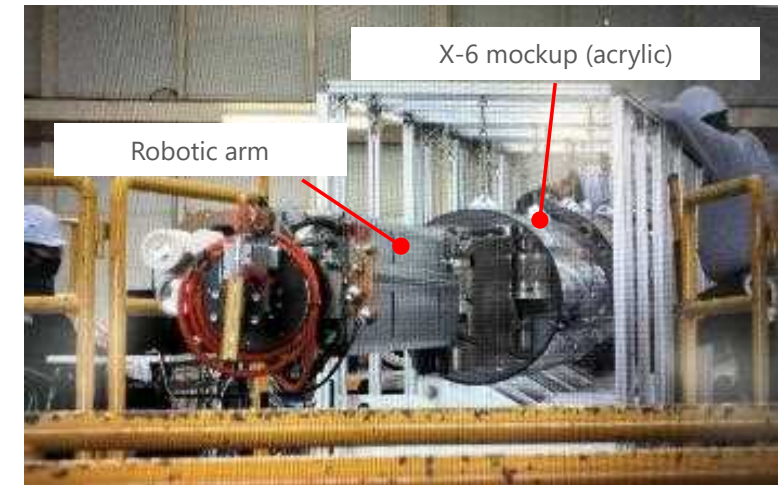


Fuel debris removal: Unit 2

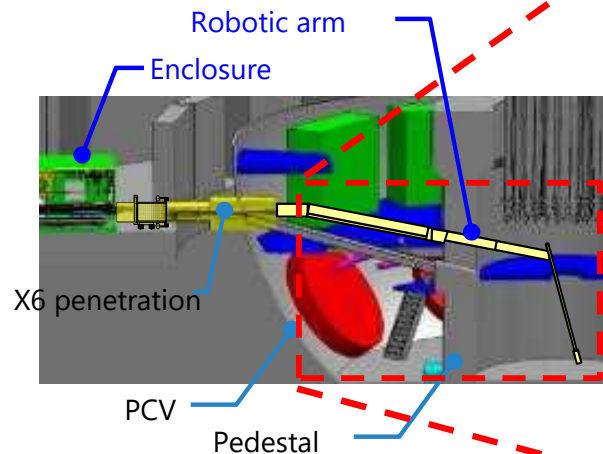
Trial retrieval device preparations

The trial removal device that was being developed in the UK has arrived in Japan

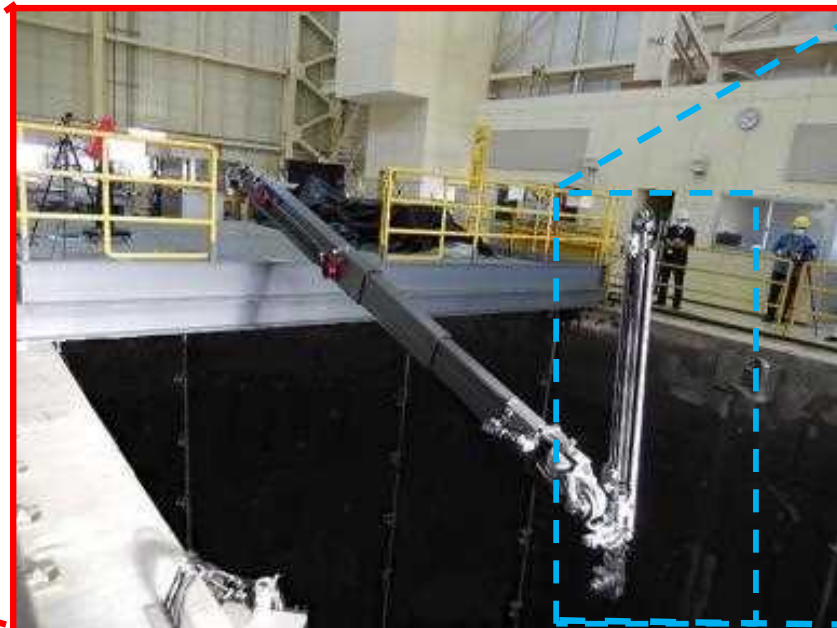
- The trial removal device (robotic arm) arrived in Japan on July 10, 2021
- Performance tests commenced at a factory in Kobe, Japan in August 2021 and concluded on January 21, 2022
 - Tests of passing the robotic arm through a mockup of the X-6 penetration were conducted and there were no problems
 - The robotic arm was extended to full-length to check operability and acquire data on sagging
- The device arrived at the Naraha mockup facility on January 31, 2022



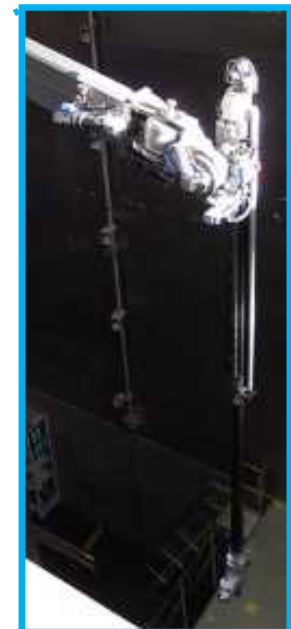
Tests to pass the robotic arm through the X-6 penetration



Arm during maximum extension



When tip of arm is extended

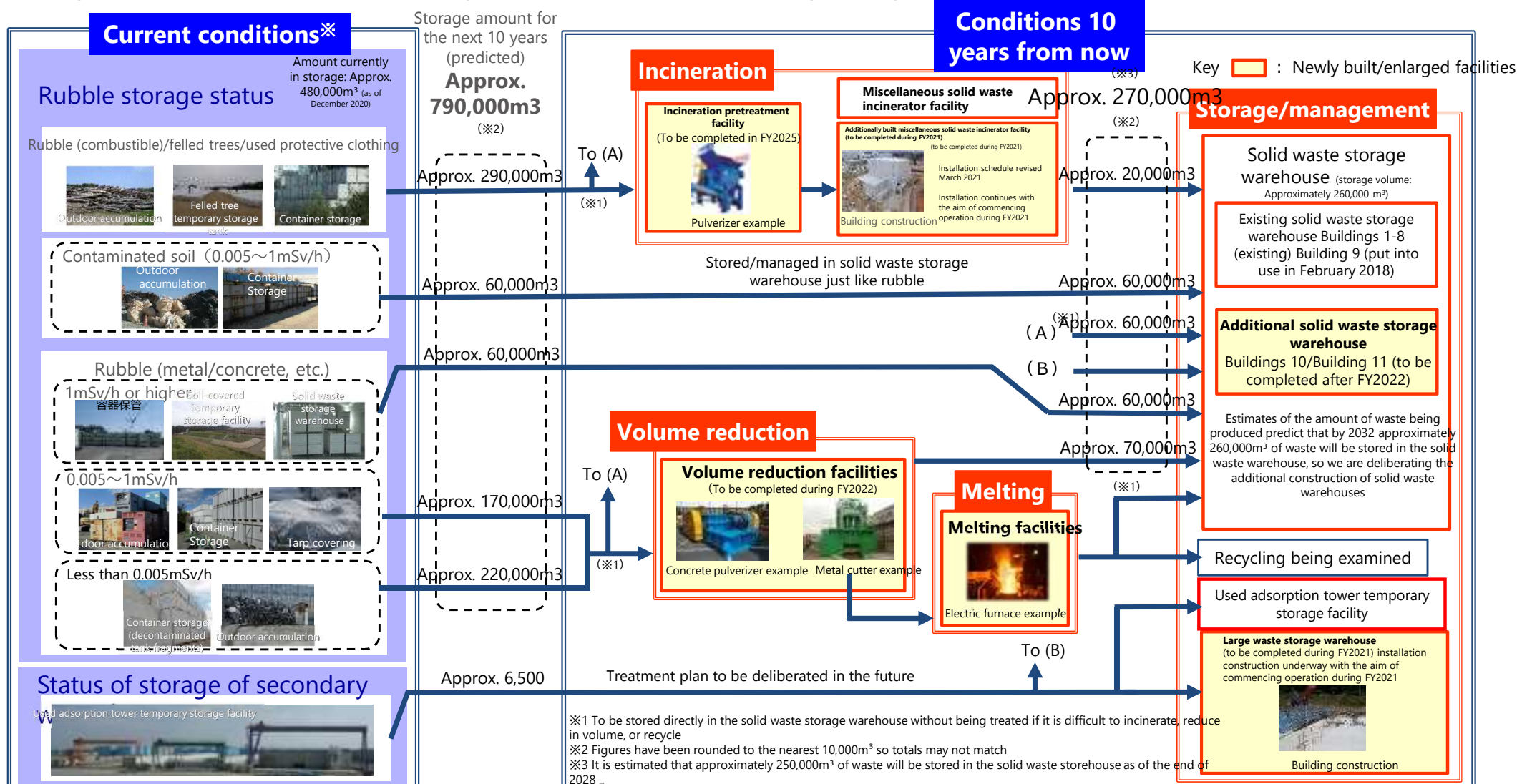


Robotic arm performance checks (operability checks)

※ A video produced by the International Research Institute for Nuclear Decommissioning (IRID) on the development of technology for performing detailed investigations of the inside of the primary containment vessel (voluntary project) (field demonstration of detailed internal investigation technology and the X-6 penetration) can be found on YouTube at the following link
<https://youtu.be/m01kXs5YOac>

Solid waste storage and management plan

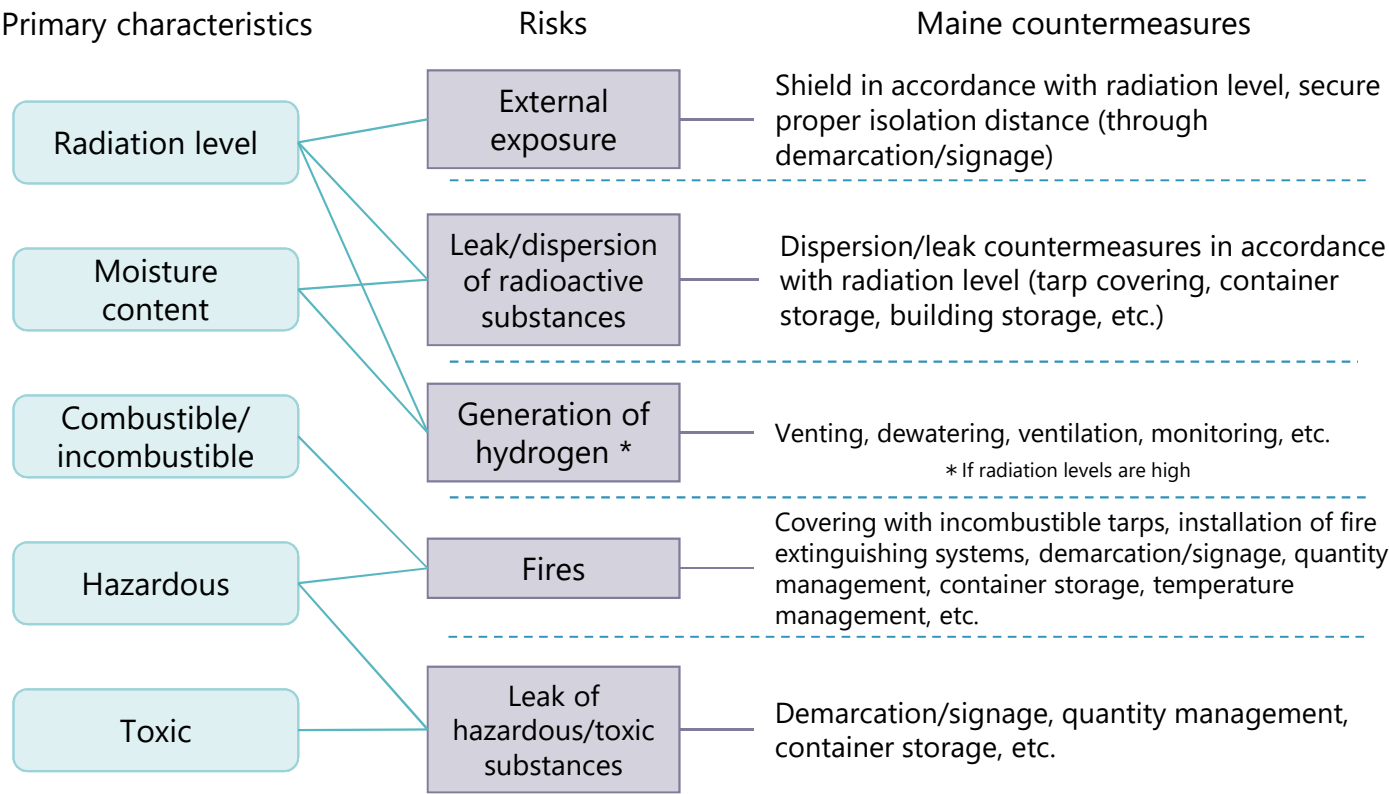
- In light of the actual amount of waste generated, such as rubble, etc., as of the end of March 2021, and the most up-to-date construction plans, we have forecasted the amount of waste that will be generated over the next approximate 10 years, and are checking the impact that this will have on facility construction.
- We predict that we will be able to achieve our Mid/Long-Term Roadmap target (during FY2028) for the elimination of the temporary storage of rubble, etc. (excluding reuse and repurpose Inc.), and are moving forward with plans towards achieving that target.



※ At current time this does not include used protective clothing that has not been incinerated and will be treated/reused, or concrete rubble with radiation levels the same as background levels.

Waste countermeasures: Material management corrections

- Materials on-site shall be stored suitably regardless of their "positioning" as construction materials, temporarily accumulated items, or rubble, etc.
- The nature of the materials on-site shall be focused on and if any safety measures are found to be insufficient, priorities shall be set and corrections will be made.



Demarcation/signage for temporary accumulation locations



Temporary tarp covering of notch tanks

Treated water countermeasures:

Overview of ocean discharge facilities

Secondary treatment facilities (newly installed reverse osmosis membrane device)

For the secondary treatment of water being treated for which the sum of legally required concentrations of nuclides, except for tritium, is between 1~10.

Secondary treatment facilities (ALPS)

For the secondary treatment of water being treated for which the sum of legally required concentrations of nuclides equals or exceeds 1.

ALPS treated water, etc. tanks

Measurement/inspection facilities (K4 tank group)

Consists of three sets of tanks for receiving, measurement/inspection, and discharge. During the measurement/inspection process, water is sampled after homogenization by mixing/agitation, and analyzed. (Approx. 10,000m³ x 3 groups)

Used in rotation

ALPS treated water transfer pump

Seawall

Erected mainly around emergency shut-off valves and transfer pipes

Flow meter/Flow regulation valve/emergency shut-off valve (Tsunami countermeasures)

Seawater pipe header

(Diameter: Approx. 2m x Length: Approx. 7m)

Seawater flow meter

Emergency shut-off valve

Seawater pipe

Discharge shaft (downstream water tank)

Road

Discharge shaft (upstream water tank)

Unit 5 intake channel

Seawater transfer pipe

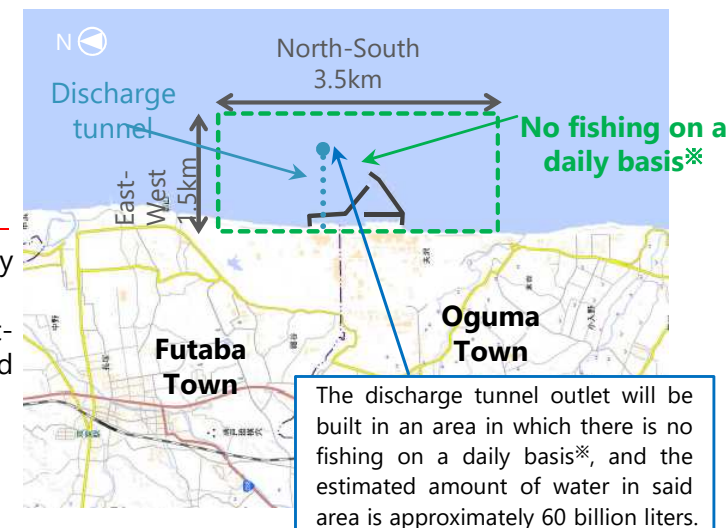
(3)

Seawater for dilution (taken from outside the port)

Discharge tunnel (Approx. 1km)

To ocean

Source: Created by Tokyo Electric Power Company Holdings, Inc. based on maps from the Geographical Survey Institute (Digital GSI Maps)
<https://maps.gsi.go.jp/#13/37.422730/141.044970/&base=std&ls=std&disp=1&vs=c1j0h0k0l0u0t0z0r0s0m0f1>



※ : Area for which there are no joint fishing rights established

For the time being a vertical shaft will be used to directly confirm that seawater has mixed with ALPS treated water and been diluted, after which it will be discharged.

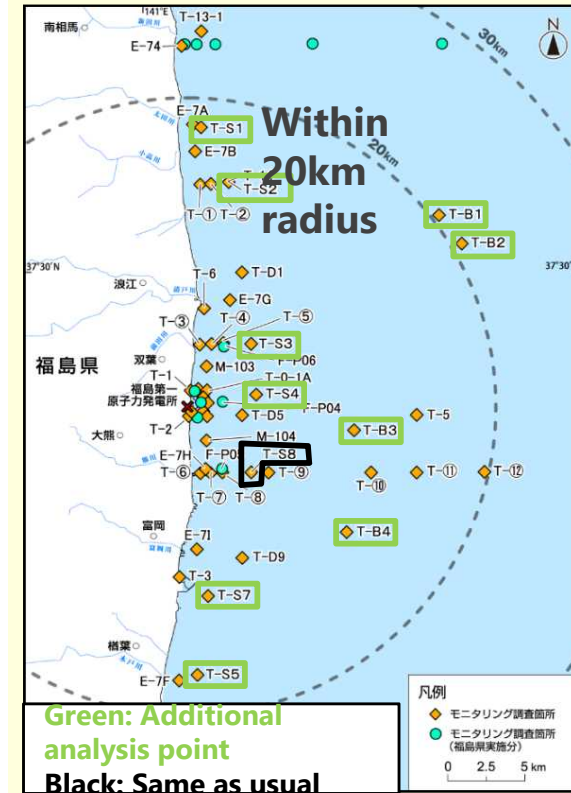
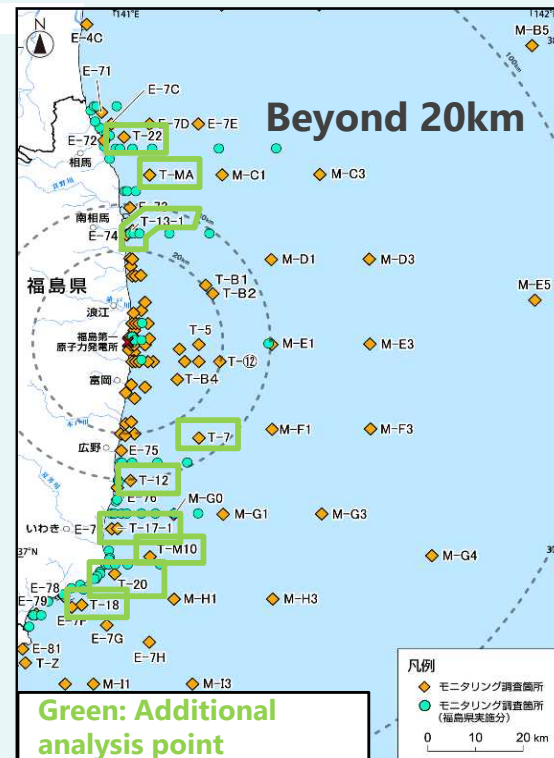
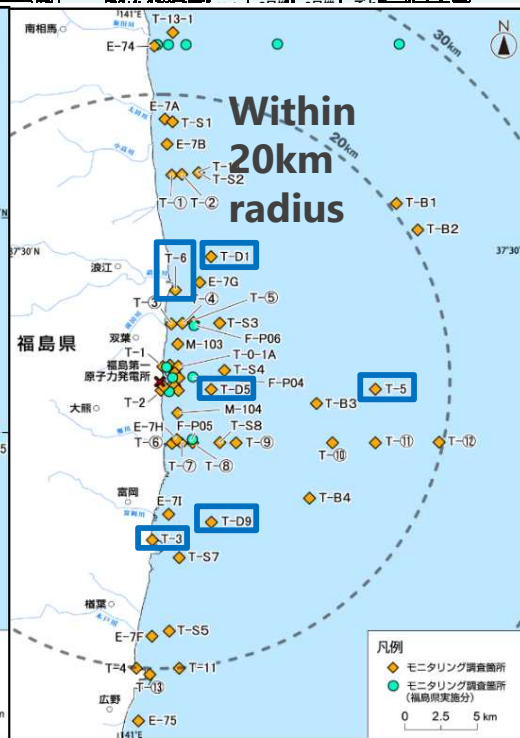
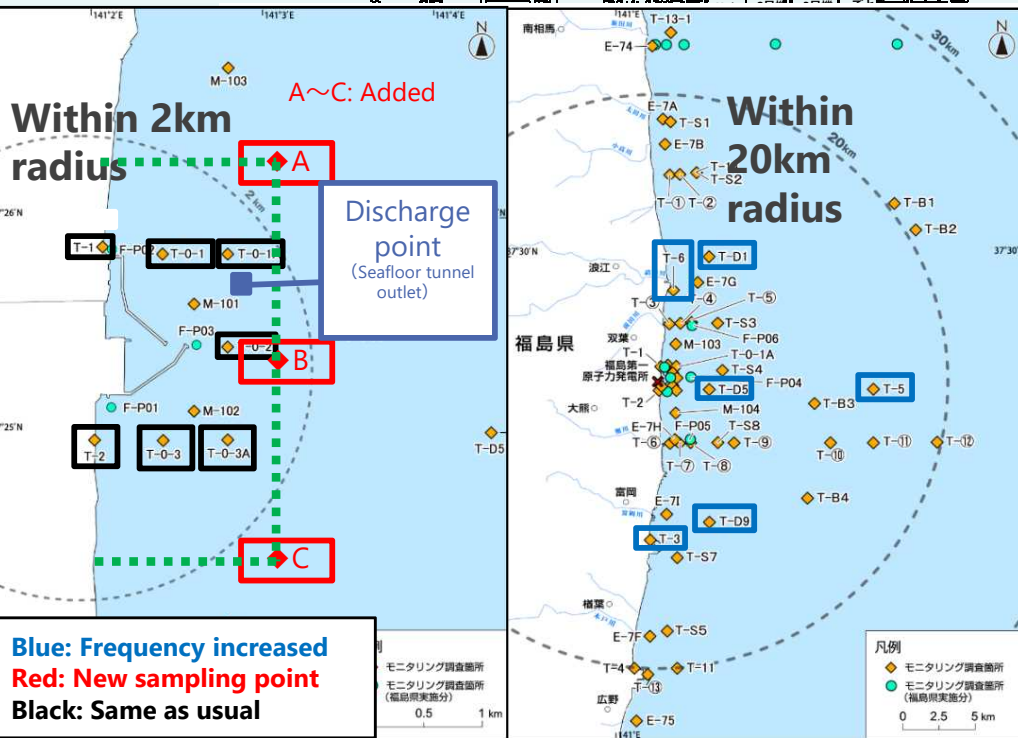
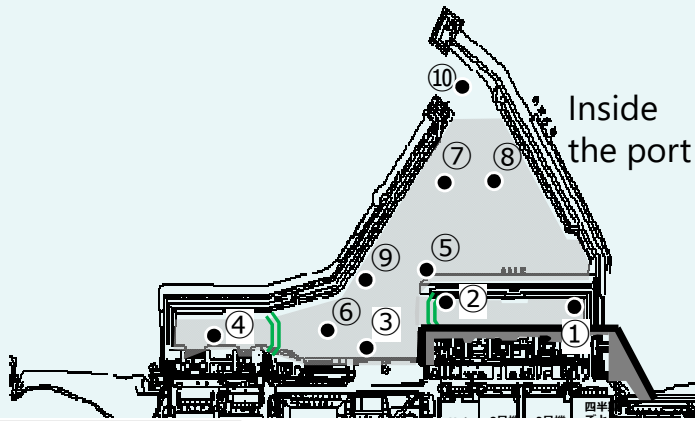
Treated water countermeasures: Ocean monitoring plan **TEPCO**

Seawater

Monitoring targets:
cesium/tritium

Fish

Monitoring targets:
cesium/tritium



Area in which there is no fishing on a daily basis※
SW1.5km NS3.5km
※ : Area for which there are no joint fishing rights established

Tritium analysis point (tritium analyses will be conducted at all points within the port)