

Status of E Area D1/D2 Tank (Flange Type) Disassembly

Confirmed alpha nuclide (total alpha) from residual D1 tank water (RO concentrated brine, etc.)

<Reference document>

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Fukushima Daiichi Decontamination &
Decommissioning Engineering Company

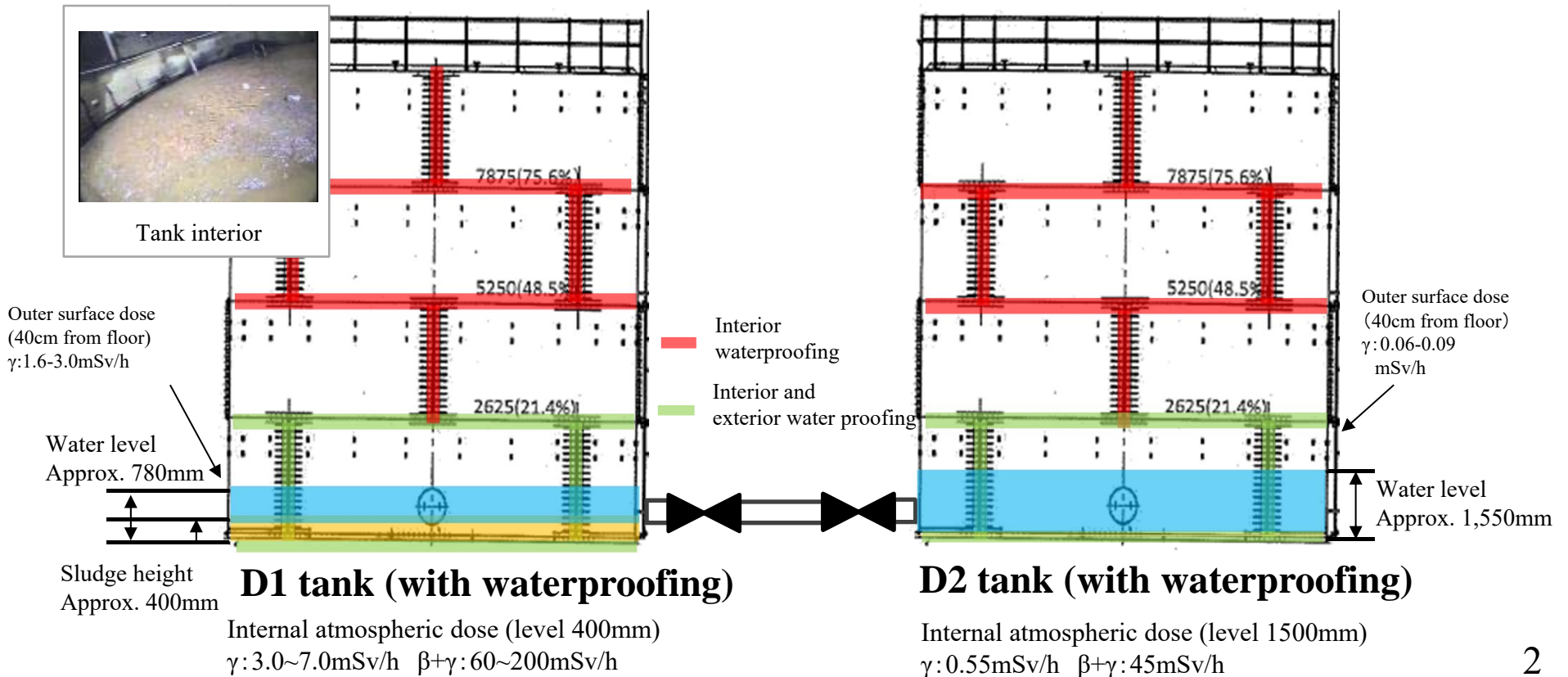
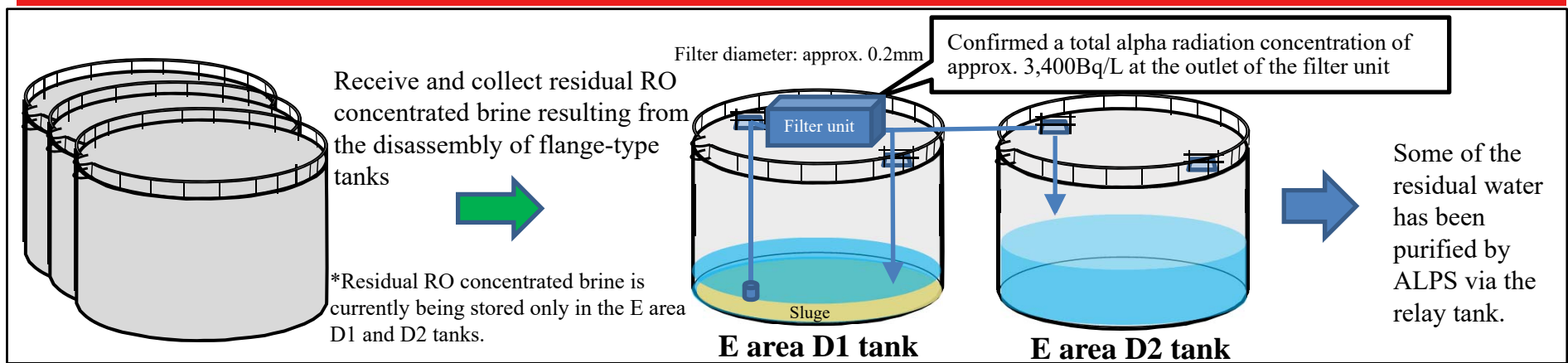
<Overview>

- The disassembly of flange type (assembled) tanks is underway in the E area (42 out of 49 units disassembled as of July), and residual water in tanks D1 and D2 (water and sludge) is currently being treated. This water (total of approx. 300m³ as of July) is a collection of residual water (RO concentrated brine*, etc.) left at the base of tanks during its disassembly in the tank area. Due to the high concentration of radioactive material (strontium 90), future works to treat residual water and the disassembly of tanks will be performed carefully while prioritizing safety.

*Contaminated water from the initial post-accident period that has been treated to remove cesium 134 and 137 using cesium absorption facility, and further treated and concentrated using the reverse osmosis (RO) unit. The cesium facility unit used at the time did not remove strontium 90 which was a beta emitting isotope; therefore, the total beta radiation concentration is high. Treatment for RO concentrated brine has been completed in May 2015.

- The radioactive concentration of residual water (collected on January 28th) inside the D1 tank was measured from the perspective of performing disassembly safely, and it was confirmed that the concentration of alpha emitting isotopes (total alpha radiation) was at the same level as water remaining in the reactor building.
 - Concentration of total alpha radiation (including sludge) in residual water (from the filter unit outlet): approx. 3,400 Bq/L (measured on June 23)
<Reference> Concentration of total alpha radiation after purification of residual water (from the filter unit outlet): approx. 47Bq/L (measured on June 23)
Concentration of total alpha radiation in the water retained in the reactor building: approx. $1 \times 10^1 - 1 \times 10^5$ Bq/L
- Alpha emitting isotopes primarily exist in the form of particulates. In disassembling the tanks storing the RO concentrated brine, residual water at the bottom of the tanks were collected in tanks D1 and D2 (with water proofing). This caused a sludge to settle which is assumed to have increased the concentration of total alpha radiation in the residual water at the bottom of the subject tank.
- Water in the D1 and D2 tanks was transferred to the relay tank after being partially filtered (approx. 270m³) from October to November 2020, and was purified and treated with the waste being generated on a daily basis (Sr removed water) using the Multi-nuclide removal equipment (ALPS). There was a trend of the total alpha radiation concentration being relatively high (approx. 10Bq/L) at the inlet of the ALPS (existing/additionally installed) after initiating purification of the subject relay tank water, and the total alpha radiation concentration at the ALPS outlet was not detected after initiating purification, confirming that alpha emitting isotopes were being removed to not detective limit by ALPS.
- Work in the subject area is being performed using appropriate protective equipment, and no body contamination and internal exposure has been confirmed. Also, there is no significant fluctuation in the dust monitors around the D1 and D2 tanks, and there is no impact to the peripheral environment.
- Due to residual water in the D1 tank being confirmed to have equivalent levels of total alpha radiation concentration to the water remaining in the reactor building, risk reduction measures shall be implemented to prevent the leak of residual water and scattering of dust. Future treatment of residual water and disassembly of tanks shall be conducted carefully while thoroughly implementing necessary measures against alpha emitting isotopes (such as isolation).

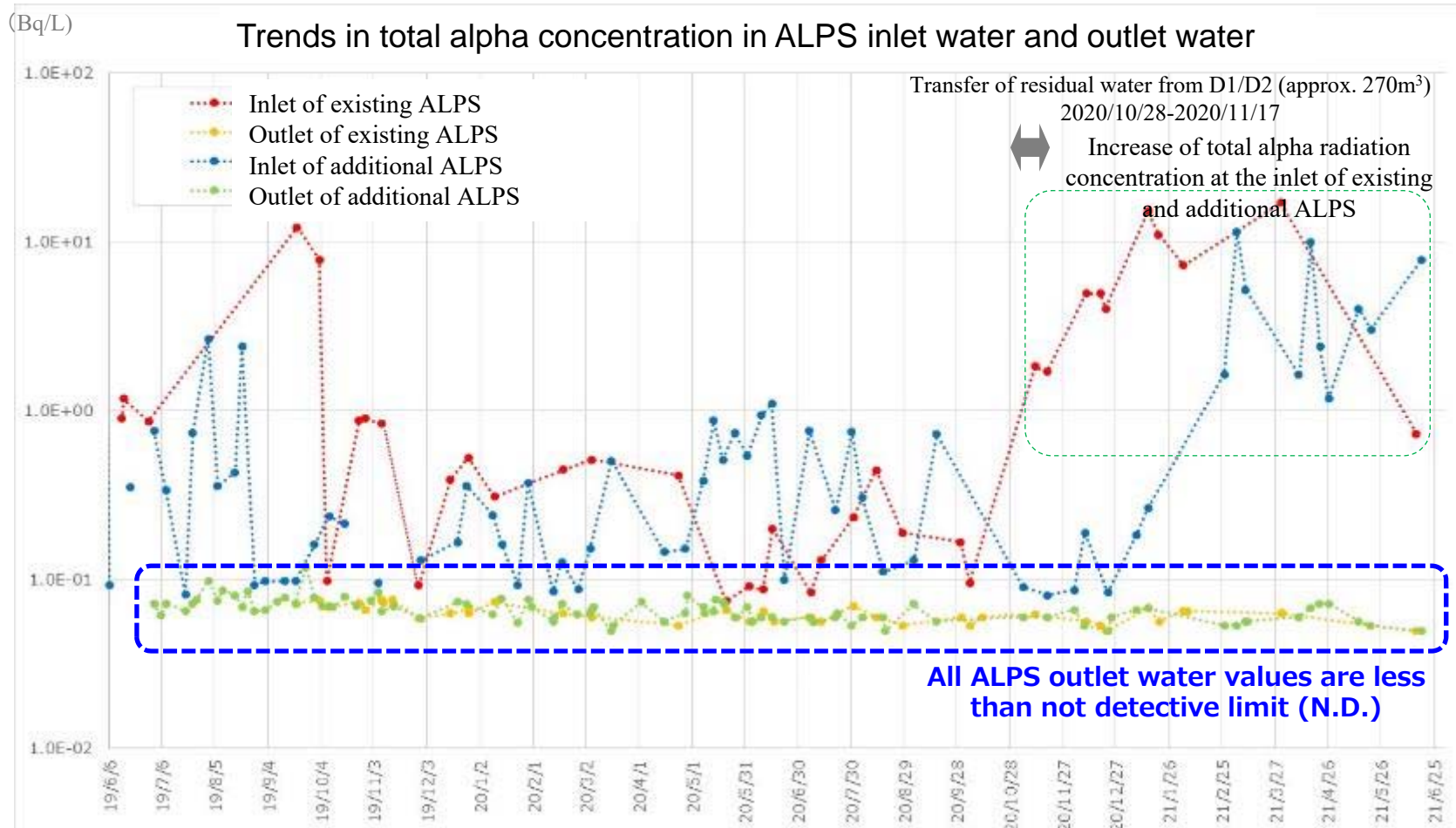
Status of the E area, D1 and D2 Tanks



Trends in total alpha concentration in ALPS inlet water and outlet water

Some of the residual water was transferred to the pre-ALPS treatment relay tank prior to ALPS treatment (Sr removed water storage tank) from October to November 2020, and was purified using ALPS with waste being generated on a daily basis (Sr removed water).

There was a trend of the total alpha radiation concentration being relatively high (approx. 10Bq/L) at the inlet of the ALPS (existing/additional) and the total alpha radiation concentration at the ALPS outlet was not detected after initiating purification.



Status of Radiological Management for Workers

Residual water in the D1 and D2 tanks have a high beta dose due to the high concentration of the beta emitting isotope, strontium 90. Exposure control equivalent to those applied when designating “areas with alpha emitting isotopes” are implemented appropriately for the work of transferring residual water. It has been confirmed that worker exposure has not been affected.

① External exposure management

- Wear protective suits and gloves offering protection from beta rays to reduce exposed dose.
- Wear ring badges and vision badges in consideration for the risk of focused beta ray exposure of crystalline lens and skin.

② Internal exposure management

- Prevent ingestion of radioactive material through the use of a full-face mask
- Wear an anorak over coveralls to prevent the spread of contamination during work.
- Confirm the absence of body contamination and ingestion through post-work contamination screening.

Protective equipment and dosimeter used when transferring residual water in the D1 and D2 tanks

[Protective equipment]

Full-face mask, coveralls, anorak, protective suit, beta ray protection gloves, cotton gloves, rubber gloves (double layer), socks (double layer), special work shoes (boots), special helmet

[Dosimeter]

Fluoro-glass dosimeter, electronic dosimeter, ring badge, lens badge

*Underlined equipment are protective equipment required when setting “areas with alpha emitting isotopes”

Impacts on the surrounding environment

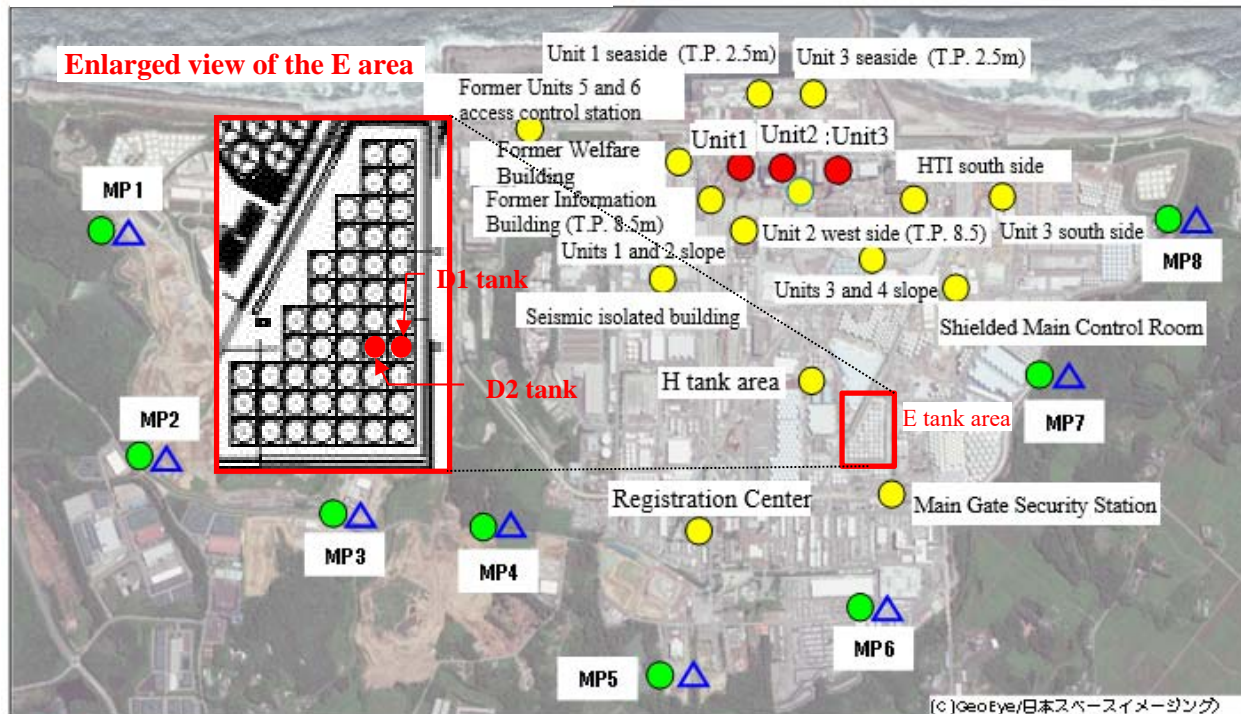
The items below were confirmed, and no impact on the surrounding environment has been observed

✓Interior of the ventilation tubes on top of the D1 and D2 tanks were inspected for surface contamination, and alpha radiation was at not-detected levels.

(sample taken June 30th, 2021)

✓No significant fluctuations in the beta rays were observed in the dust monitors installed at the site boundary and in the periphery of the D1 and D2 tanks.

Layout of dust monitors



D1 tank ventilation tube



Future Course of Action

■ Assumed risks

- Water leak from tanks containing alpha emitting isotopes
- Dust containing alpha emitting isotopes being generated by the dry tank interior.
- Internal exposure caused by ingestion of alpha and beta emitting isotopes when performing work, and excessive external exposure caused by beta emitting isotopes (to skin and crystalline lens of eye)

■ Response to risks

① Reduction of leak risk and reduction of dust scattering risk

- ✓ Transfer of residual water (top layer) in the D1 and D2 tanks to the building*

*Not treated using ALPS, transferred to the upper side of the contaminated water treatment facility (planned to be transferred to the main processing building)

- ✓ Installation of high-performance air filter to the ventilation tube above the D1 and D2 tanks, monitor dust near the ventilation tube.

② Safety measures for tank disassembly

- ✓ Carefully conduct the removal of sludge containing alpha emitting isotopes and the disassembly of the flange tank while thoroughly taking necessary measures against alpha emitting isotopes (isolation, etc.).

③ Work management

- ✓ Spread of contamination and ingestion shall be prevented when performing work in the D1 and D2 tank interior and when handling water and sludge in the tank through the monitoring of the work area, the appropriate use of protective equipment, and the thorough conduct of body survey for workers.
- ✓ Reduce external exposure to beta emitting isotopes by performing work remotely.