The future of ALPS treatment

（Secondary treatment of treated water to be re-purified and full-scale treatment of concentrated waste liquid (supernatant liquid))

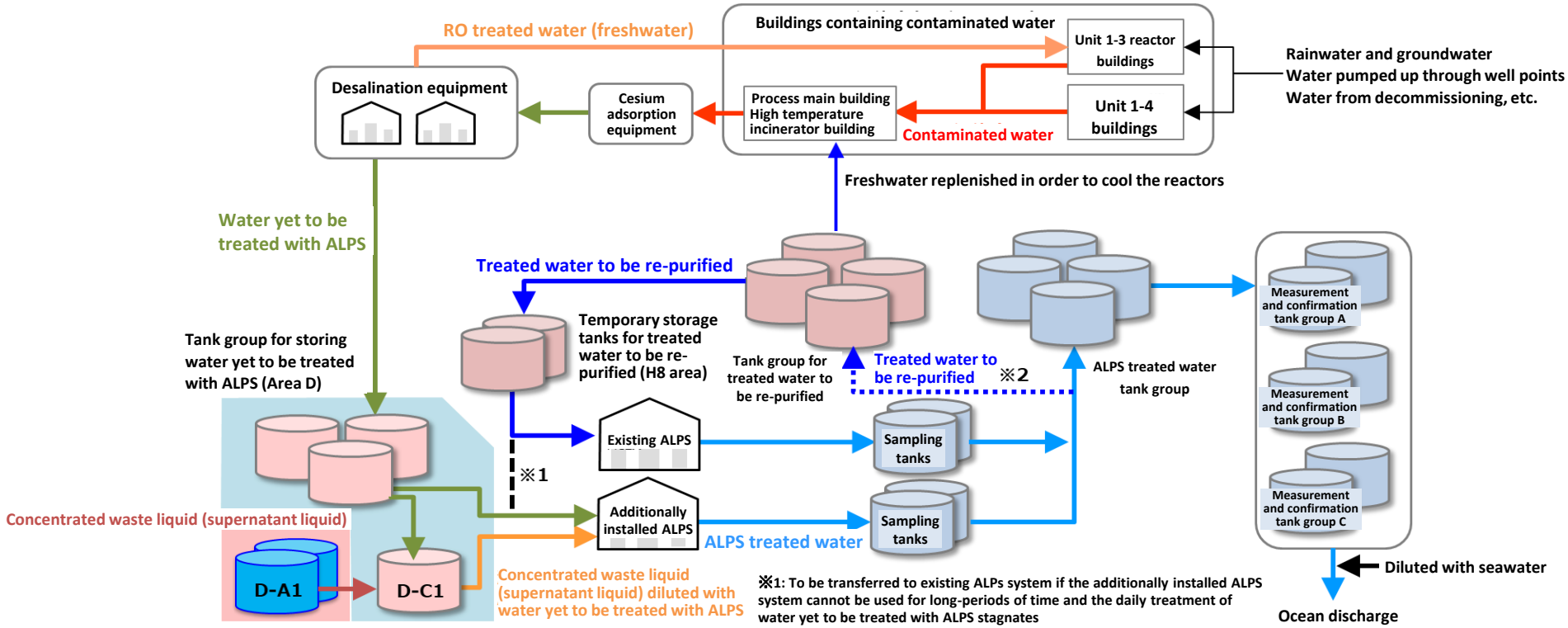
November 26, 2026

TEPCO

Tokyo Electric Power Company Holdings, Inc.

1. Overview of ALPS treatment and future ALPS treatment

- "Contaminated water", which is generated daily when groundwater and rainwater flowing into the buildings of Units 1-4 come into contact with radioactive materials inside the buildings, is first purified using cesium adsorption equipment and then separated into freshwater and the remaining water (water yet to be treated with ALPS) by a desalination system. The freshwater is reused to cool the reactors, and the water yet to be treated with ALPS is further purified using the ALPS system.
- Going forward, "treated water to be re-purified" stored at the Fukushima Daiichi Nuclear Power Station that does not fulfill the criteria for discharge into the environment will be subjected to re-purification (secondary treatment) and we will begin the full-scale treatment of concentrated waste liquid (supernatant liquid) that was generated during the initial response to the accident by first mixing it with water that has yet to be purified with ALPS thereby reducing risks associated with a leak and enabling us to proceed safely and steadily with decommissioning. We are currently making preparations, such as the installation of pipes required for existing ALPS and additionally installed ALPS systems, to treat this water.



※1: To be transferred to existing ALPs system if the additionally installed ALPS system cannot be used for long-periods of time and the daily treatment of water yet to be treated with ALPS stagnates
※2: Making the reduction of radiation levels within the power station a top priority, we transferred it during periods when ALPS was in operation, etc.

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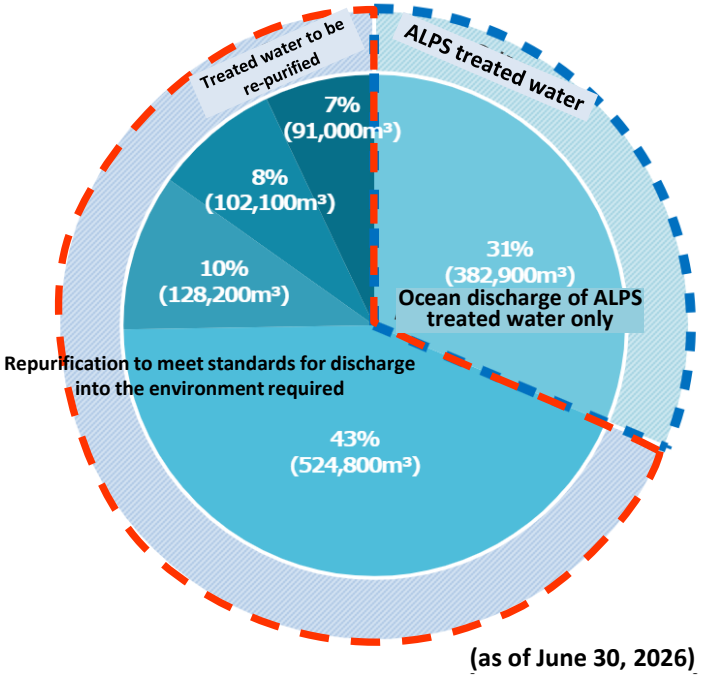
2-1. Information on the secondary treatment of treated water to be re-purified

- At the Fukushima Daiichi Nuclear Power Station, both ALPS treated water that meets the standards for discharge into the environment* with respect to radionuclides other than tritium, and treated water to be repurified that does not yet meet these standards, are being stored.
- Treated water to be re-purified will be subjected to re-purification with ALPS (secondary treatment) until it meets the criteria for “ALPS treated water” and the systematic implementation of the secondary treatment of treated water to be re-purified is needed to proceed safely and steadily forward with decommissioning.
- Some of the treated water to be re-purified contains relatively low tritium concentrations, so by subjecting this water to secondary treatment, it will be possible to discharge it as ALPS treated water with relatively low tritium concentrations.



Amount of water in storage broken down by the sum of the ratios of regulatory concentration limits (estimated)

- ～1X
- 1X～5X
- 5X～10X
- 10X～100X
- 100X～

※The sum may be less than 100 because numbers have been rounded down

※ **STANDARDS FOR DISCHARGE INTO THE ENVIRONMENT**

Regulatory standards for radioactive substances discharged into the environment are based on the recommendations from the International Commission on Radiological Protection (ICRP), with the basic objective of limiting the annual radiation exposure to the public resulting from such discharges to less than 1mSv. These standards are referred to as the “regulatory concentration limits” for each radioactive substance.
When discharged water contains multiple radioactive substances, the concentration of each radioactive substance is divided by the regulatory concentration limit for each substance and that total (sum of the ratios of regulatory concentration limits)is used to determine if discharge standards have been met. If this total is less than 1, the water meets the standards for discharge into the environment.

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2-1. Approach to the order of tanks to be subjected to secondary treatment

【Water to be subjected to secondary treatment】

- According to the ALPS treated water discharge plan, storage tanks for which measurement and confirmation facility analysis results estimate that the sum of the ratios of regulatory required concentration limits is less than 0.9 are subject to discharge, while **tanks with estimated sum of the ratios of concentrations to the regulatory concentration limits of 0.9 or higher are subject to secondary treatment** to absolutely ensure that the sum of the ratios of regulatory required concentration limits does not exceed 1.

【Secondary treatment plan formulation method】

- When treated water is subject to secondary treatment (treated water to be re-purified for which the sum of the ratios of regulatory required concentration limits is 0.9 or higher) **the basic principle is to start treatment with water that has low concentrations of tritium, however the secondary treatment plan that determines the order of the tanks to be treated will be formulated based on comprehensive assessment of the following:**

The secondary treatment plan will be revised every year and disclosed to the public.

○ Preventing radionuclide detachment

- Within the ALPS system, when water with low regulatory required concentration limit ratio sums is treated after water with high regulatory required concentration limit ratio sums, there is a chance that the radionuclides will detach※ from the adsorbent material.

  ※ Phenomenon by where materials once held by the adsorbent materials is released

- The order of the tanks to be treated may be switched around in order to decrease the yearly amount of tritium discharged the following fiscal year in consideration of preventing radionuclide detachment.

○ Reducing risks associated with long-term storage

- In order to reduce equipment risks associated with long-term storage in tanks, treated water to be re-purified that has high regulatory required concentration limit ratio sums will be subject to systematic secondary treatment, however the order of the tanks to be treated will be determined in consideration of preventing radionuclide detachment.

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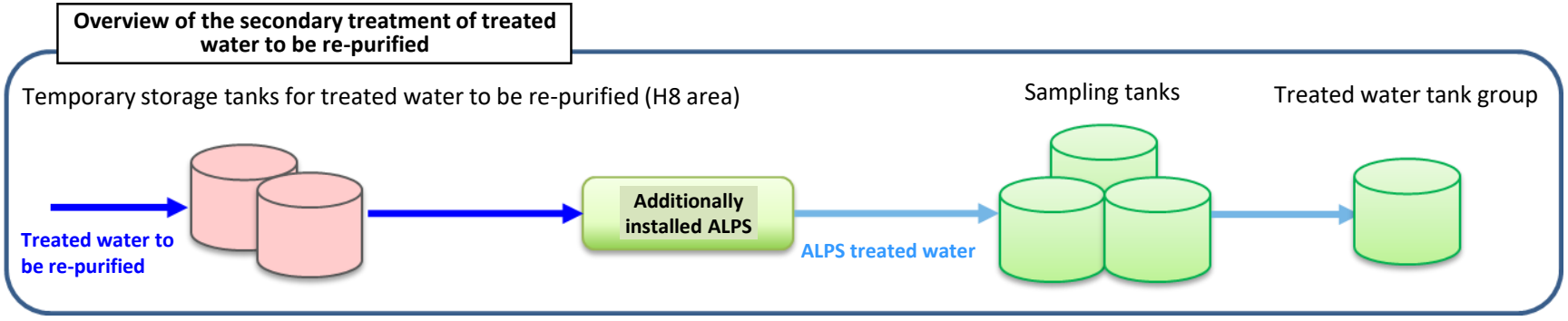
2-1. Using ALPS for secondary treatment (system configuration)

- The following preparations shall be made for the secondary treatment of treated water to be re-purified:
  - The H8 tank, which is being used for the temporary storage of water that has yet to be purified with ALPS, will be partially cleaned and used for the temporary storage of treated water to be re-purified as it awaits secondary treatment.
  - Transfer pipes will be connected from the tank being used to store treated water to be re-purified to the H8 tank.
- The plan calls for the use of existing ALPS system for secondary treatment. The inside of the existing ALPS system will be cleaned and adsorbent materials replaced so that water left inside the system that has yet to be purified does not impact secondary treatment.
- The water that has been subjected to secondary treatment will be sampled and analyzed after it has been transferred to the treated water tank group, where it will be verified that the sum of the ratios of regulatory required concentration limits, with the exception of tritium, falls below 0.9 thereby fulfilling the criteria for ALPS treated water.



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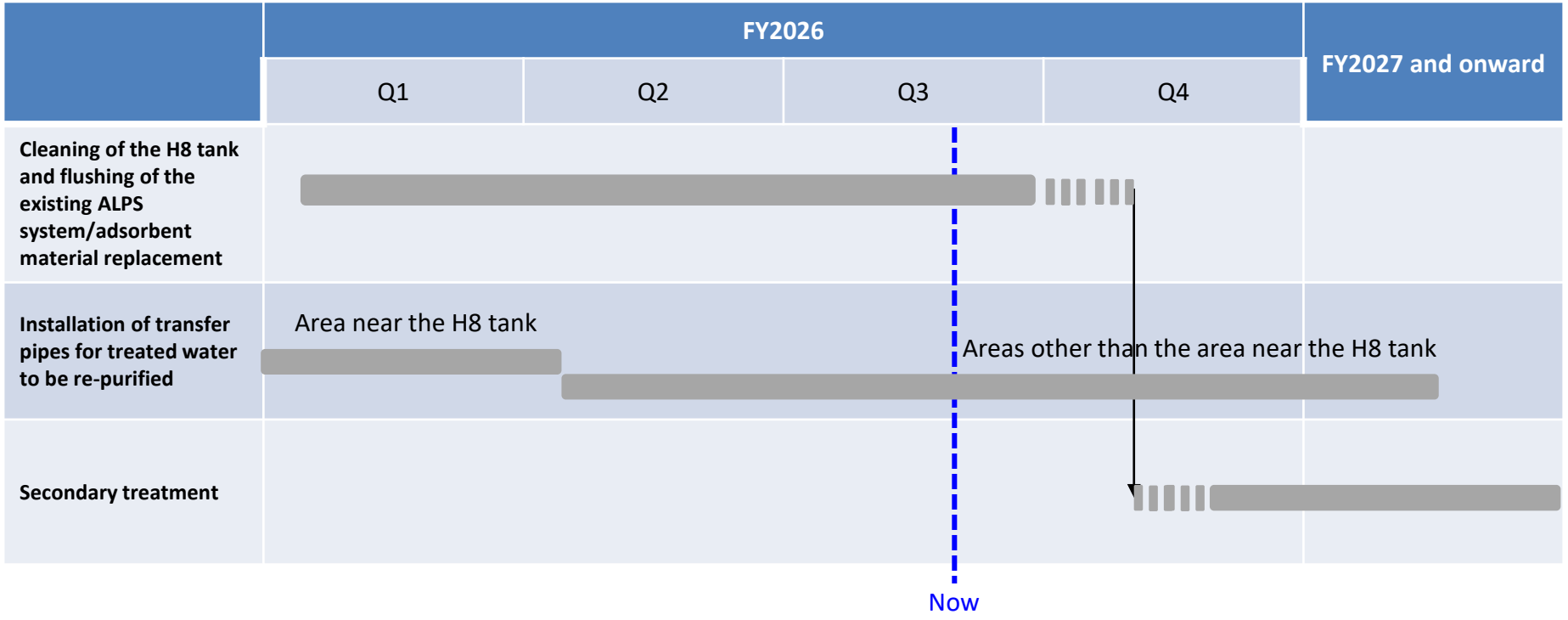
2-1. Secondary treatment schedule

- For the transfer piping from the storage tanks containing treated water to be re-purified to the H8 tanks, a section of the piping (in the area near the H8 tanks) passed pre-use inspection in July 2026. Installation of the transfer piping in the remaining areas is currently underway, and pre-use inspections are scheduled to be conducted once preparations are complete.
- Secondary treatment is scheduled to commence in the fourth quarter of FY2026 once preparations, such as the cleaning of the H8 tank and flushing of the existing ALPS system, have been completed.
- For the time being, ALPS treated water produced through secondary treatment will not be included in the discharge plan for the fiscal year in which the secondary treatment is carried out. Instead, it will be stored, and batches for which verification of the analytical results has been completed will be incorporated into the discharge plans for FY2027 and subsequent fiscal years.



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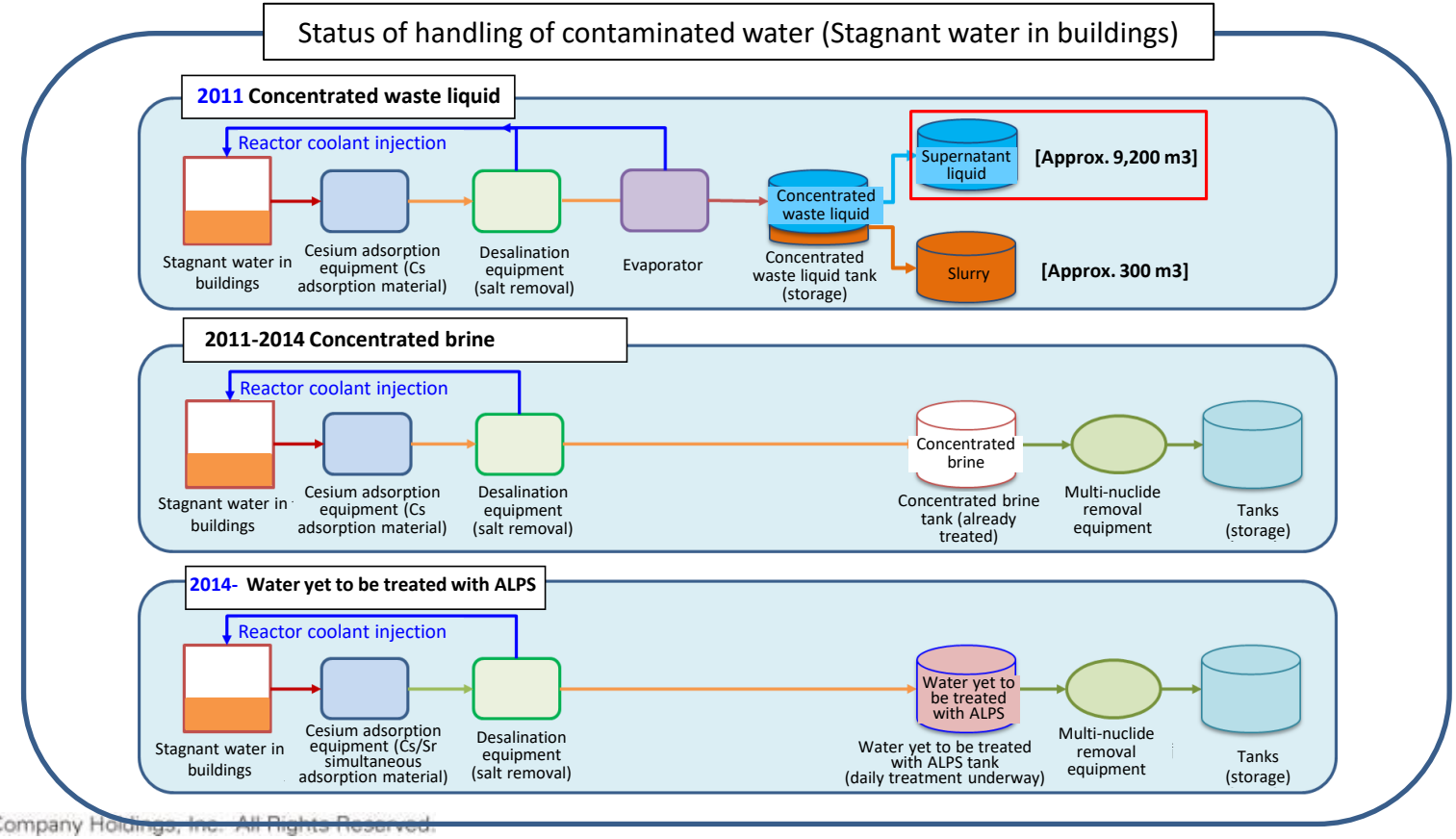
2-2. Concentrated waste liquid

- Immediately following the disaster, in order to secure freshwater for reactor cooling, stagnant water inside the reactor buildings was treated using cesium adsorption equipment, and freshwater was produced using desalination and evaporators. The concentrated waste liquid generated by the evaporators during this process is currently being stored in tanks as secondary waste from water treatment.
- Currently, the concentrated water produced by the desalination equipment (water yet to be treated with ALPS) is being treated with ALPS, and no additional concentrated waste liquid is being generated.

(**Concentrated waste liquid (supernatant liquid) [Approx. 9,200 m³]** and slurry ※ [Approx. 300 m³])

※： A separate treatment method for slurry is being deliberated



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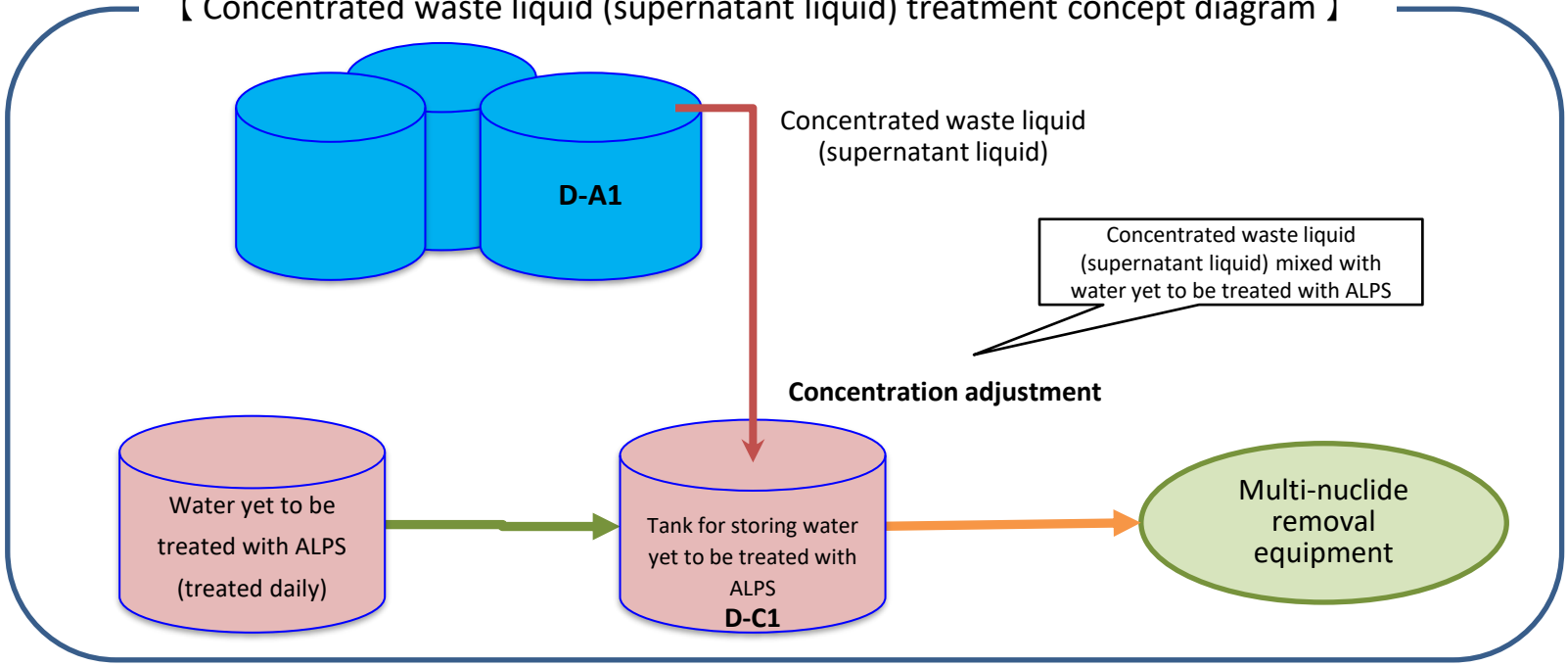
2-2. Concentrated waste liquid (supernatant liquid) treatment

- The concentrated waste liquid (supernatant water) was generated when treating stagnant water inside the reactor buildings. After treatment with cesium adsorption equipment, the water was concentrated using desalination equipment and then further concentrated through evaporation. The concentrations of radioactive substances, etc. in this liquid are higher than those of the water to be treated with ALPS, which undergoes ALPS treatment daily.

- Therefore, in order to quickly reduce the risks associated with leaks, the plan is to use water that has yet to be purified with ALPS **to adjust the concentrations of the concentrated waste liquid to within a range for which there is a proven track record of successful ALPS treatment to achieve a total concentration ratio that is less than 1, and then treat it using ALPS.**

【 Concentrated waste liquid (supernatant liquid) treatment concept diagram 】



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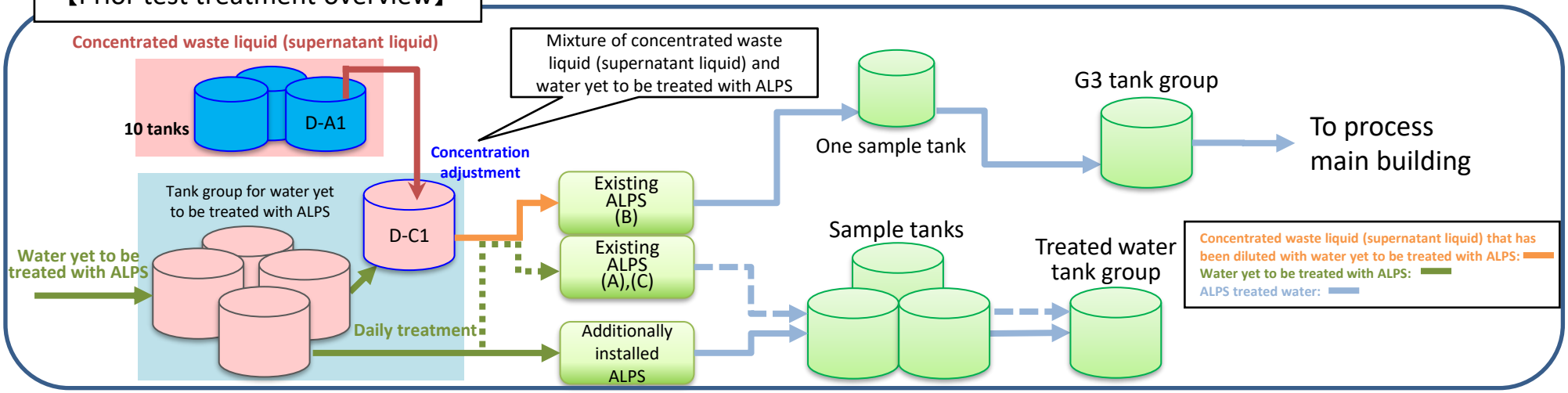
2-2. Overview of prior test treatment

- During test treatment, the concentrated waste liquid was diluted in advance by a factor of 1/200 to 1/20* using water yet to be treated with ALPS, and **the concentration was adjusted to a range for which there was a proven track record of successful ALPS treatment to achieve a regulatory required concentration limit ratio sum of less than 1, thereby ensuring that requirements can be met with ALPS treatment.**
- Test treatment was carried out using the existing ALPS (B) exclusively after isolating it from the system used for the daily treatment of water yet to be purified with ALPS.
- As this was a test, the treated water was analyzed and then transferred to the Process Main Building, where it was reused as freshwater for reactor coolant injection.

※ : Diluting to a factor of 1/200 means that for every 1,000m^3 water yet to be purified with ALPS, there is 5m^3 of concentrated waste liquid (supernatant liquid)

【Prior test treatment overview】



	FY2024	FY2025			
		Q1	Q2	Q3	Q4
Existing ALPS (B)	1/200 dilution (Completed)	1/100 dilution (Completed)		1/50 dilution (Completed)	1/20 dilution (Completed)
Existing ALPS (A)(C)	Daily treatment				
Additionally installed ALPS	Daily treatment				

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2-2. Prior test treatment analysis results (summary)

- Results from the test treatment confirmed that the **sum of the ratios of regulatory required concentration limits was less than 1** for all dilution ratios (1/200, 1/100, 1/50 and 1/20).
- It was also confirmed that the results for the sum of the ratios of regulatory required concentration limits showed **no significant difference** when compared to the analyses of pre-discharge ALPS treated water that had not been mixed with concentrated waste liquid (supernatant water) to date 【0.076～0.61】

Item \ Target		Primary nuclides							Nuclides targeted for measurement and assessment
		Cs-134 [Bq/L]	Cs-137 [Bq/L]	Co-60 [Bq/L]	Ru-106 [Bq/L]	Sb-125 [Bq/L]	I-129 [Bq/L]	Sr-90 [Bq/L]	Sum of the ratios of regulatory required concentration limits
Regulatory required concentration limits		60	90	200	100	800	9	30	—
(Reference) concentrated waste liquid		ND（1,340）	14,500	800	ND（11,000）	7,100	601	30,800,000	（1,000,000 or more※）
1/200 dilution	Prior to treatment	38	2,100	14	ND（170）	1,100	27	200,000	（6,600 or more※）
	After treatment	**ND（0.028）**	**0.14**	**0.32**	**ND（0.23）**	**0.15**	**0.05**	**0.21**	**Less than 0.059**
1/100 dilution	Prior to treatment	ND（40）	3,300	27	ND（220）	1,700	34	390,000	（13,000 or more※）
	After treatment	**0.03**	**0.042**	**0.22**	**ND（0.24）**	**0.16**	**0.14**	**0.30**	**Less than 0.095**
1/50 dilution	Prior to treatment	ND（44）	3,000	21	ND（300）	1,600	110	760,000	（25,000 or more※）
	After treatment	**ND（0.035）**	**ND（0.036）**	**0.87**	**ND（0.26）**	**0.16**	**0.14**	**0.51**	**Less than 0.14**
1/20 dilution	Prior to treatment	ND（41）	2,300	ND（19）	ND（360）	1,700	140	1,600,000	（52,000 or more※）
	After treatment	**ND（0.036）**	**0.053**	**2.2**	**ND（0.29）**	**0.15**	**0.31**	**0.18**	**Less than 0.16**

※ : Indicates the sum of the ratios of regulatory required concentration limits for primary nuclides

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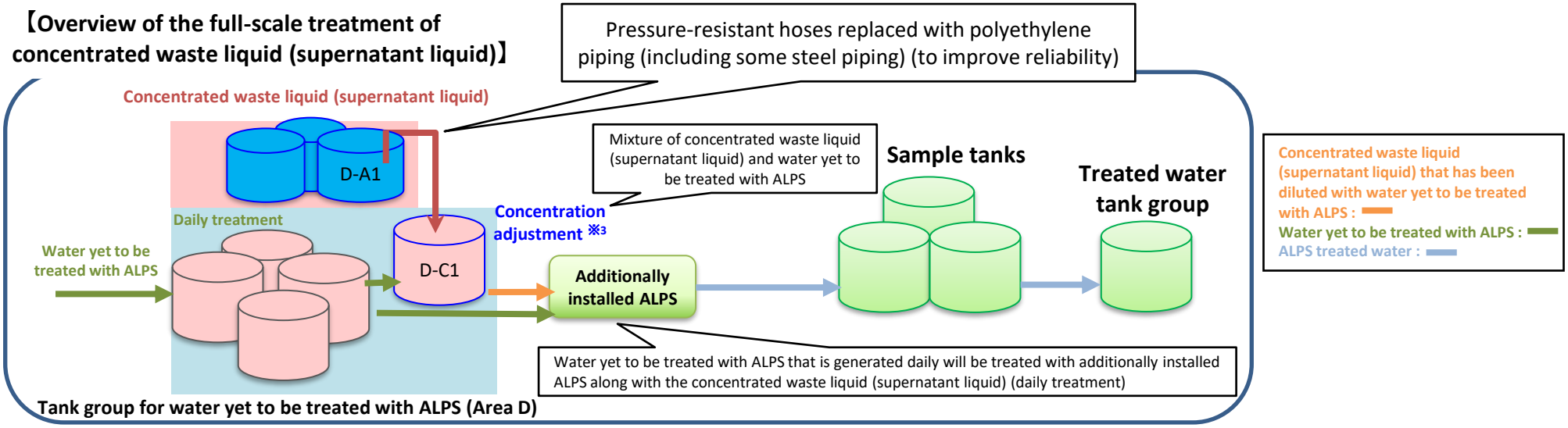
2-2. Overview of the full-scale treatment of concentrated waste liquid (supernatant liquid)

- Based on the results of the test treatment※1, full-scale treatment will **generally be carried out using a dilution ratio of 1/20** in order to quickly reduce risks associated with the leak of concentrated waste liquid (supernatant liquid). However, considering the tritium concentration in the water yet to be treated with ALPS, the dilution ratio will be adjusted within the range used during the test treatment.
- The concentrated waste liquid (supernatant liquid) will be **treated using the additional installed ALPS facility**. Once the treated water has been transferred to, and stored in, the receiving water tanks for treated water, samples will be collected and analyzed to confirm that the sum of the ratios of regulatory required concentration limits for radionuclides other than tritium for the resulting ALPS treated water is less than 0.9. The timing of discharge will then be appropriately determined, taking into account the tritium concentration.
- Furthermore, in regards to the transfer line from the concentrated waste liquid (supernatant liquid) to the tank (D-C1) used to store water yet to be treated with ALPS, the existing **pressure-resistant hoses will be replaced with polyethylene piping (including some steel piping)** to improve reliability in consideration of long-term use in preparation for full-scale treatment※2.

【Overview of the full-scale treatment of concentrated waste liquid (supernatant liquid)】



*1: During test treatment, the treated water was analyzed in the sample tank, and it was confirmed that the sum of the ratios of regulatory required concentration limits was below 1.
*2: The transfer lines for water yet to be treated with ALPS and ALPS treated water have already been installed using polyethylene piping (including steel piping in some areas).
*3: During full-scale treatment, the concentration will be adjusted based on the results of the test treatment. Therefore, no analysis will be conducted of the D-C1 tank after concentration adjustment. In addition, as with water yet to be treated with ALPS, analyses will be conducted at the ALPS inlet and outlet to assess the water before and after treatment.

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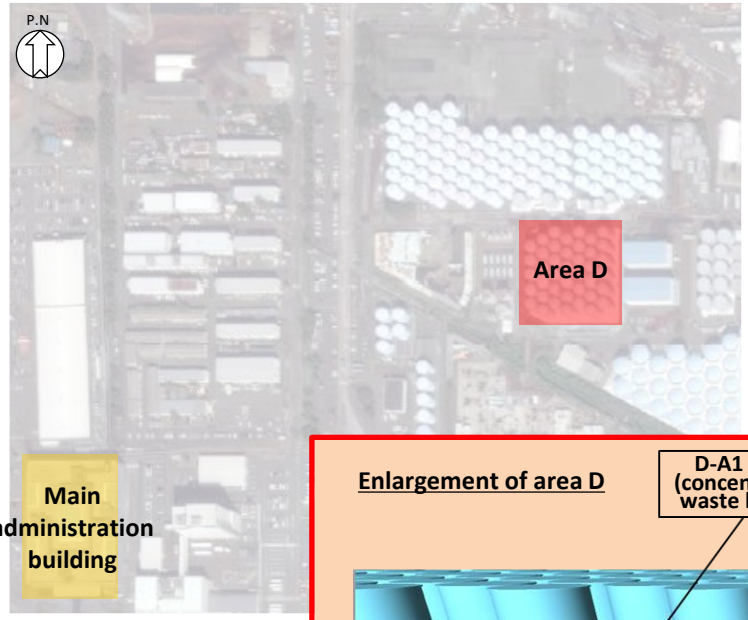
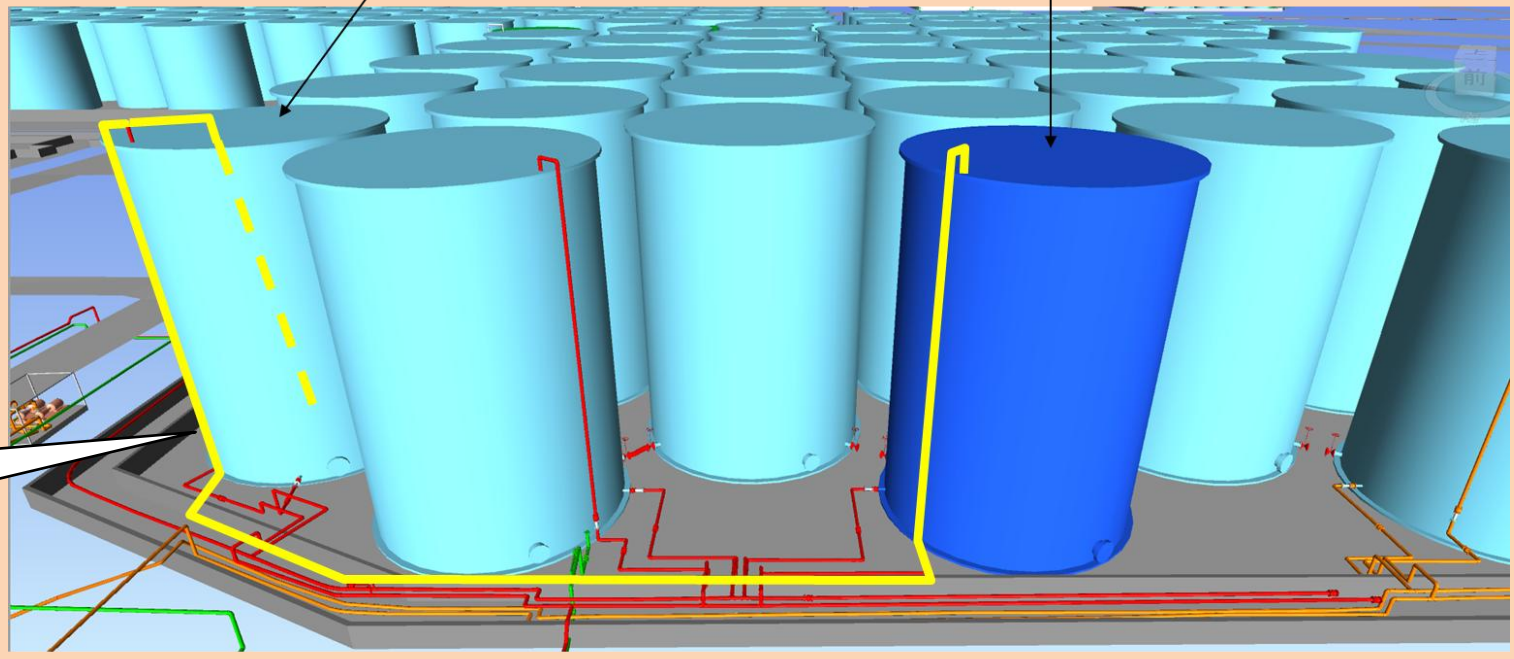
【Reference】 Area D and a summary of the concentrated waste liquid transfer line configuration



Enlargement of area D



Pressure-resistant hoses replaced with polyethylene piping (including some steel piping) (to improve reliability)

: Concentrated waste liquid transfer line

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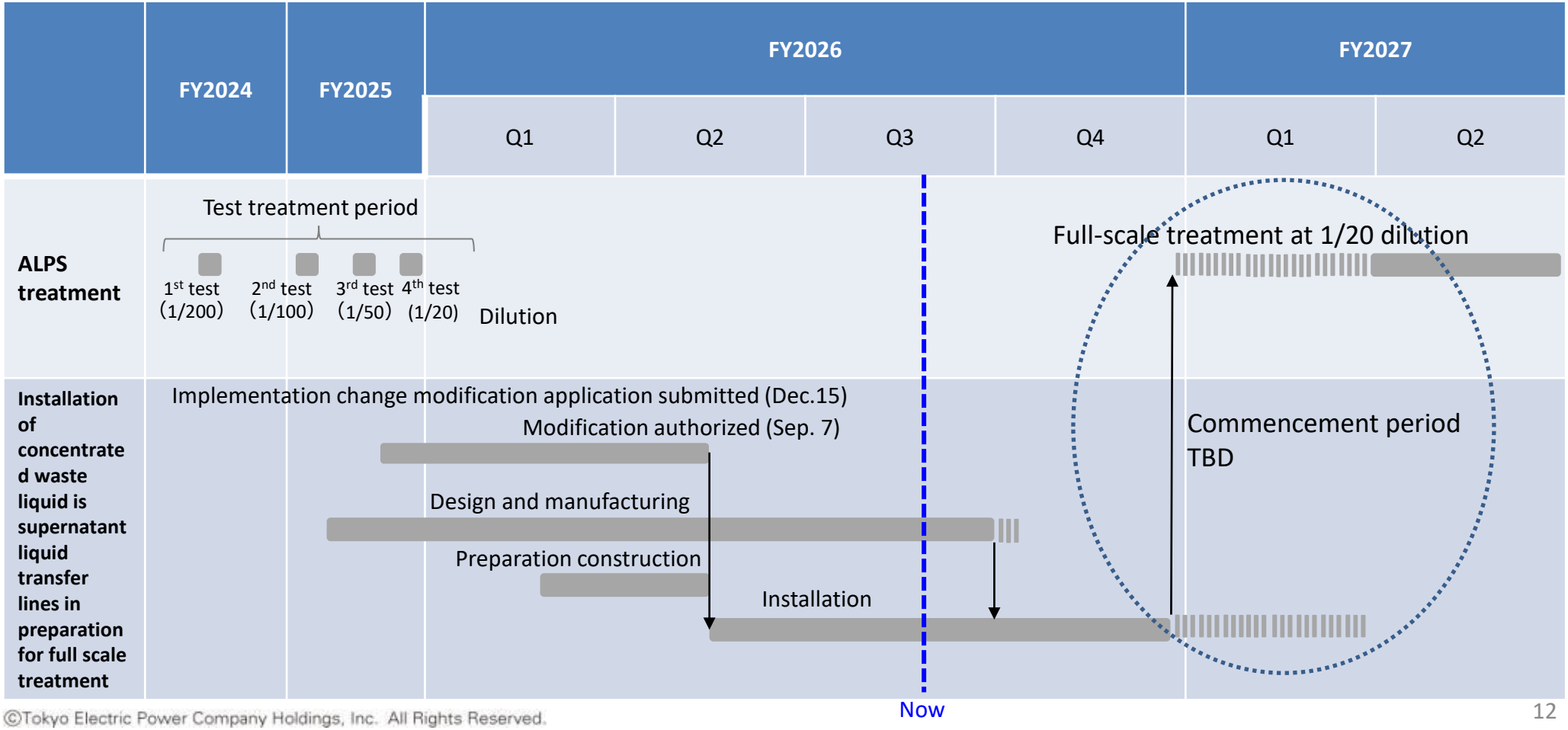
2-2. Concentrated waste liquid (supernatant liquid) full-scale treatment schedule

- Transfer lines for concentrated waste liquid (supernatant liquid) began in FY2026 in preparation for the commencement of full-scale treatment. The treatment plan will be formulated based on the results of the test treatment and the overall ALPS treatment plan. Full-scale treatment is scheduled to commence around the first half of FY2027.
- Once the treated water has been fully stored in the receiving tanks for treated water, samples will be collected and analyzed to confirm that the sum of the ratios of regulatory required concentration limits for radionuclides other than tritium for the resulting ALPS treated water is less than 0.9. The timing of discharge will then be appropriately determined in consideration of the tritium concentration.



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