

# **Situation of Storage and Treatment of Accumulated Water including Highly Concentrated Radioactive Materials at Fukushima Daiichi Nuclear Power Station (94<sup>th</sup> Release)**

April 10, 2013

Tokyo Electric Power Company

## **1. Introduction**

This document is to report the following matters in accordance with the instruction of “Installment of treatment facility and storing facility of water including highly concentrated radioactive materials at Fukushima Daiichi Nuclear Power Station of the Tokyo Electric Power Company (Instruction) “(NISA No. 6, June 8, 2011), dated on June 9, 2011.

<Instruction>

TEPCO should report to NISA the situation of storing and treatment of the contaminated water in the Power Station and future forecast based upon the current situation have to be reported to NISA as soon as the treatment facility starts its operation. Also, subsequently, continued report has to be submitted to NISA once a week until the treatment of the accumulated water in the Central Radioactive Waste Treatment Facility is completed.

## **2. Situation of storing and treatment of accumulated water in the building (actual record)**

Stored amounts in each unit building (Units 1 to 4 (including condensers and trenches)), and stored and treated amount in the Accumulated Water Storing Facility (including underpass area close to the High Temperature Incinerator Building), and other related data, as of April 9, are shown in the Attachment -1.

## **3. Forecast of storing and treatment**

### **(1) Short term forecast**

Water transfer is planned so that the levels of the accumulated water in Units 1&2 and Units 3&4 building will be maintained around at the level of OP. 3,000, based on the stored amount in the Accumulated Water Storing Facilities and the operating situation of the radioactive material treatment equipment. Water is transferred to the Process Main Building and/or High Temperature Incinerator Building as Accumulated Water Storing Facilities.

Treatment is implemented considering the situation of storage and transfer of Accumulated Water Storing Facilities.

We assume stored amounts in each unit building (Units 1 to 4 (including condenser and trench)),

and stored and treated amount in the Accumulated Water Storing Facilities (including underpass area close to the High Temperature Incinerator Building), and other related data as of April 16, as shown in Attachment -2.

## **(2) Middle term forecast**

Regarding accumulated water in Unit 1&2 building and Unit 3&4 building, from the viewpoint of reducing the risks of discharging to the ocean and leaking into the groundwater, it is necessary to keep enough capacity for the accumulated water in the building until its level reaches OP. 4,000 and to keep the accumulated water level lower than the groundwater level. On the other hand, based on the view of limiting inflow of underwater to buildings and reducing the amount of emerged accumulated water, we are planning to transfer accumulated water keeping its level in the building around OP. 3,000 considering water tank capacity.

As for accumulated water of the Process Main Building and the High Temperature Incinerator Building, we are planning to treat the accumulated water considering the situation of construction of middle and low level waste water tanks, the operation factor of the radioactive material treatment instruments and duration for maintenance.

We forecast stored amounts in each unit building (Unit 1 to 4 (including condensers and trenches)), and storing and treatment situations in the Accumulated Water Storing Facilities (including underpass areas close to the High Temperature Incinerator Building) for 3 months, as shown in Attachment -3.

Stored amounts in each building and the water storage equipment are forecasted to be unchanged in case transfer and treatment were implemented as scheduled without rain. However, it would be subject to change depending on the operation factor of the radioactive material treatment instruments and so on.

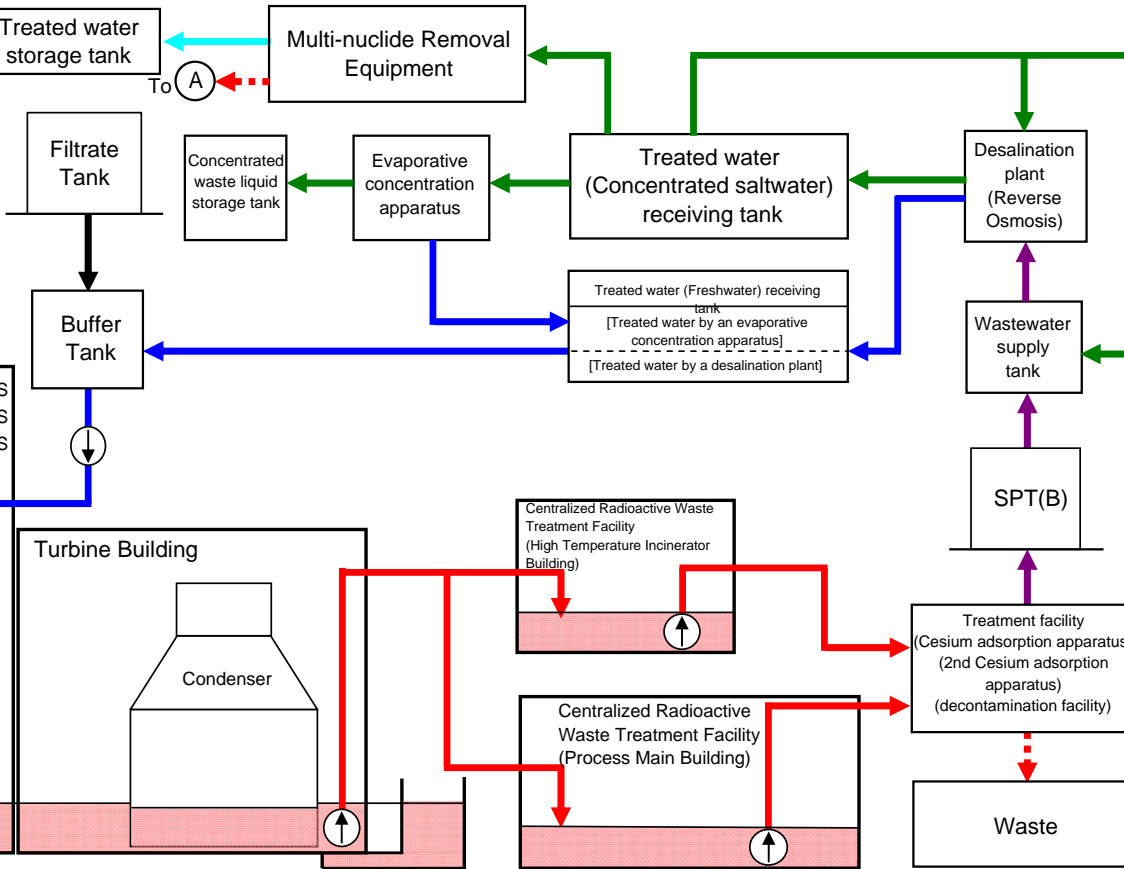
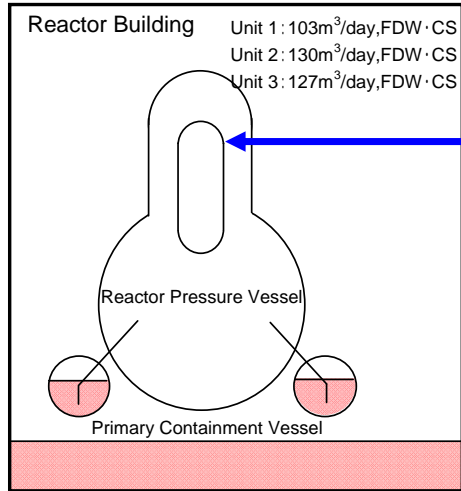
Also, the water treated at the radioactive material treatment equipment (fresh water and condensed salt water) can be stored in the middle and low level waste water tanks.

END

# Storage and treatment of high level radioactive accumulated water (as of April 9, 2013)

Classification	
	High level radioactive water/Waste
	Treated water (saltwater)
	Treated water (concentrated saltwater)
	Treated water (freshwater)
	Treated water from Multi-nuclide Removal Equipment
	Freshwater

Volume of water to be injected to Reactor (4/3 - 4/9)	Change from last report
Filtrate water	-
Treated water (freshwater)	2,542m <sup>3</sup> -43m <sup>3</sup>
Cumulative treated water	313,110m <sup>3</sup>



	Storage volume <sup>*1</sup>	Change from last report	Storage capacity <sup>*2,3</sup>
Concentrated saltwater receiving tank	249,688m <sup>3</sup>	+ 2,407m <sup>3</sup>	268,800m <sup>3</sup>
Freshwater receiving tank	23,489m <sup>3</sup>	+ 375m <sup>3</sup>	31,400m <sup>3</sup>
Concentrated waste liquid storage tank	5,524m <sup>3</sup>	+ 11m <sup>3</sup>	9,500m <sup>3</sup>
Treated water storage tank <sup>4</sup>	571m <sup>3</sup>	+ 503m <sup>3</sup>	4,400m <sup>3</sup>

	Storage volume	Change from last report	Storage volume <sup>*2</sup>
Waste liquid supply tank	495m <sup>3</sup>	-268m <sup>3</sup>	1,200m <sup>3</sup>
SPT(B)	1,052m <sup>3</sup>	+ 135m <sup>3</sup>	3,100m <sup>3</sup>

	Chloride concentration
Before/After Desalination	400ppm / <1ppm (Sampled on Mar. 19)
Before/After Evaporative Concentration	6,900ppm / 2ppm (Sampled on Dec. 20, 2011)

Place of Sampling	Radioactivity density <sup>*5</sup>
Process Main Building	6.4E+04 Bq/cm <sup>3</sup> (Sampled on Mar. 19)
Exit of cesium adsorption apparatus	6.9E+00 Bq/cm <sup>3</sup> (Sampled on Mar. 19)
Exit of decontamination facility	-
High Temperature Incinerator Building	3.5E+04 Bq/cm <sup>3</sup> (Sampled on Mar. 14)
Exit of second cesium adsorption apparatus	6.9E-01 Bq/cm <sup>3</sup> (Sampled on Mar. 14)

Facility	Storage volume	Change from last report	Water level in T/B
Unit 1	Approx. 14,300m <sup>3</sup>	+ 400m <sup>3</sup>	OP.2,774
Unit 2	Approx. 23,100m <sup>3</sup>	+ 300m <sup>3</sup>	OP.3,198
Unit 3	Approx. 21,100m <sup>3</sup>	+ 200m <sup>3</sup>	OP.2,703
Unit 4	Approx. 15,800m <sup>3</sup>	-100m <sup>3</sup>	OP.2,683
<b>Total</b>	<b>Approx. 74,300m<sup>3</sup></b>		

Storage Facility	Storage volume	Change from last report	Water level	Treated volume (4/3 - 4/9)	Cumulative treated volume	Waste produced	Change from last report	Storage capacity
Process Main Building	Approx. 15,100m <sup>3</sup>	+ 110m <sup>3</sup>	OP.4,265	Approx. 5,700m <sup>3</sup> *6	Approx. 612,990m <sup>3</sup> *6	Sludge	597m <sup>3</sup>	No change
High Temperature Incinerator Building	Approx. 3,880m <sup>3</sup>	-30m <sup>3</sup>	OP.2,634			Used vessels	502 <sup>*7</sup>	No change
<b>Total</b>	<b>Approx. 18,980m<sup>3</sup></b>							

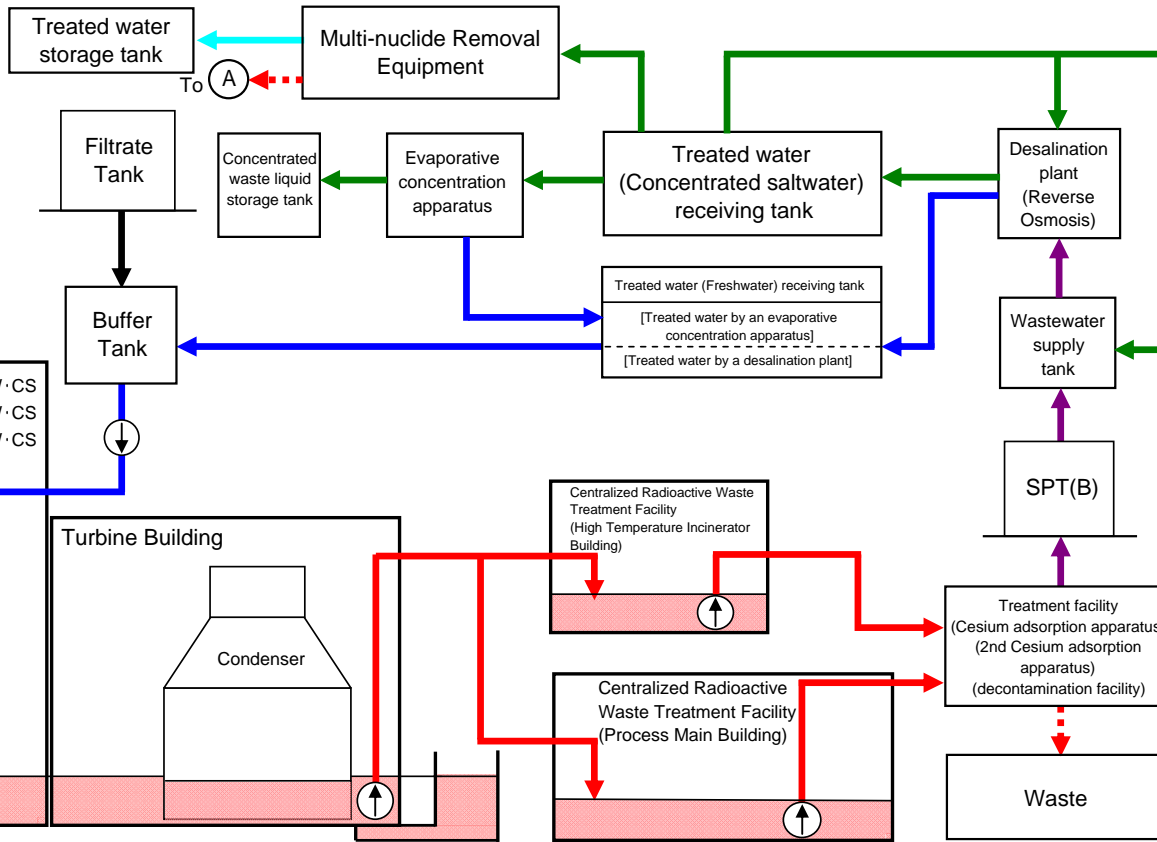
[Highlights from the previous update (April 2, 2013) to the present status]  
 - On April 5, water transfer from Unit 2 to Unit 3 Turbine Building was restarted. On April 6, water transfer from Unit 2 to the High Temperature Incinerator Building was stopped. On April 6, water transfer from Unit 2 to Unit 3 Turbine Building was restarted, and water transfer is in progress.  
 - Water transfer from Unit 3 to the High Temperature Incinerator Building is in progress.  
 - Since November 29, water transfer from Unit 4 has been under suspension.  
 - 2nd Cesium Adsorption Apparatus is under operation (Availability factor 67.9% (Projected: 65%)).  
 - Since March 21, Cesium Adsorption Apparatus has been stopped.  
 - The usage of the Underground Reservoir i and vi were changed from the "treated water storage tank" to the "concentrated saltwater receiving tank."  
 - On April 5, water transfer to the other tanks was being conducted since the leakage was found at the Underground Reservoir ii (from April 6 to April 9, water transfer to the Underground Reservoir i and vi is in progress).  
 - On April 7, storage capacity of the concentrated saltwater receiving tank was changed in order to limit the maximum water level of the Underground Reservoir iii to 80% since there was a possibility of the leakage at upper part of the Underground Reservoir iii.  
 - Storage capacity of the concentrated saltwater receiving tank was changed in order to limit the maximum water level of the Underground Reservoir i, ii and vi to 80% in response to the leakage at the Underground Reservoir iii.  
 - Underground Reservoir v and vii were excluded from the calculation of storage capacity of the "treated storage tank."

\*1 The figures are just for reference when the water level of Desalination System and Evaporative concentration apparatus are not stable.  
 \*2 Shows the operational limit.  
 \*3 The figure is subtracted approx. 3,400m<sup>3</sup> since the accumulated water of Unit 5-6 has been stored in the water storage tank in basement already.  
 \*4 The treated water from the Multi-nuclide Removal Equipment (under hot test) is stored. Freshwater and concentrated saltwater will be stored depending on the operation status.  
 \*5 Data of Cs-137 are described above.  
 \*6 Total treated amount of Cesium adsorption apparatus and 2nd Cesium adsorption apparatus  
 Breakdown of the treated amount: Cesium adsorption apparatus (0m<sup>3</sup>)  
 2nd Cesium adsorption apparatus (5,700m<sup>3</sup>)  
 Breakdown of the cumulative treated amount: Cesium adsorption apparatus (179,610m<sup>3</sup>)  
 2nd Cesium adsorption apparatus (433,380m<sup>3</sup>)  
 Cesium adsorption apparatus (424)  
 2nd cesium Cesium adsorption apparatus (78)  
 Storage container of the Multi-nuclide Removal Equipment (0) and treated column (0)  
 \*7 Breakdown of the used vessels:

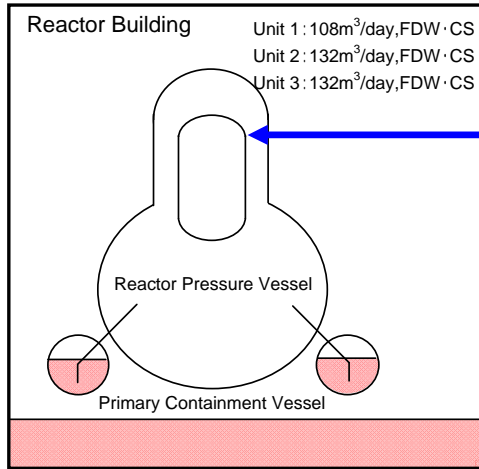
# Storage and treatment of high level radioactive accumulated water (April 16, 2013)

Classification	
	High level radioactive water/Waste
	Treated water (saltwater)
	Treated water (concentrated saltwater)
	Treated water (freshwater)
	Treated water from Multi-nuclide Removal Equipment
	Freshwater

Volume of water to be injected to Reactor (4/10 - 4/16)	Change from last report
Filtrate water	-
Treated water (freshwater)	2,604m <sup>3</sup> + 62m <sup>3</sup>
Cumulative treated water	315,714m <sup>3</sup>



Storage volume	Change from last report	Storage capacity <sup>1,2</sup>
Concentrated saltwater receiving tank	250,465m <sup>3</sup> + 777m <sup>3</sup>	268,800m <sup>3</sup>
Freshwater receiving tank	24,413m <sup>3</sup> + 924m <sup>3</sup>	31,400m <sup>3</sup>
Concentrated waste liquid storage tank	5,724m <sup>3</sup> + 200m <sup>3</sup>	9,500m <sup>3</sup>
Treated water storage tank <sup>3</sup>	1,621m <sup>3</sup> + 1,050m <sup>3</sup>	10,700m <sup>3</sup>



Facility	Storage volume	Change from last report	Water level in T/B
Unit 1	Approx. 14,300m <sup>3</sup>	No Change	OP.3,228 (Unit 2 T/B)
Unit 2	Approx. 23,300m <sup>3</sup>	+ 200m <sup>3</sup>	
Unit 3	Approx. 20,500m <sup>3</sup>	-600m <sup>3</sup>	OP.2,634 (Unit 3 T/B)
Unit 4	Approx. 15,400m <sup>3</sup>	-400m <sup>3</sup>	
Total	Approx. 73,500m <sup>3</sup>		

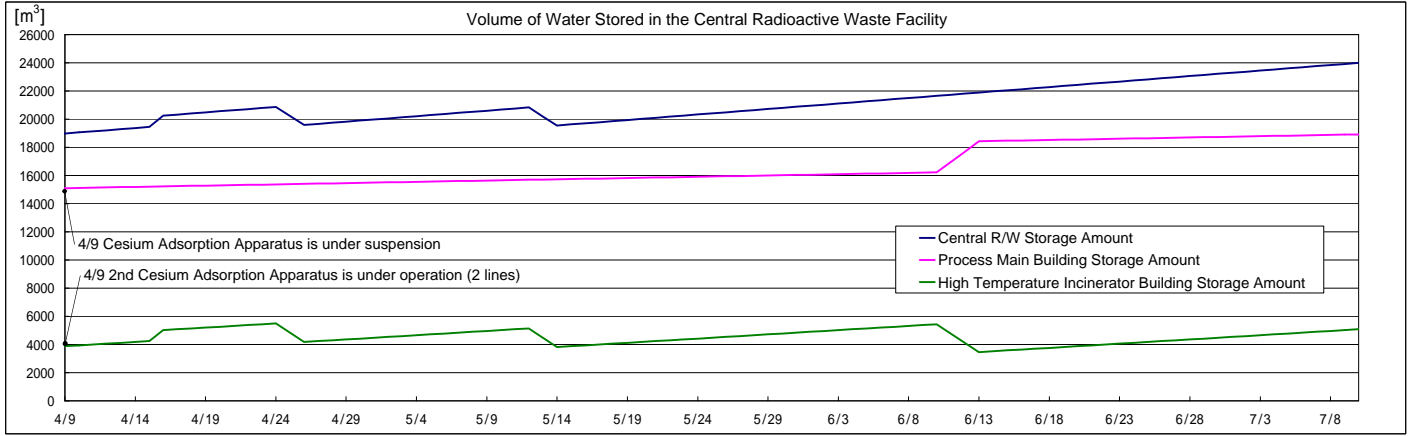
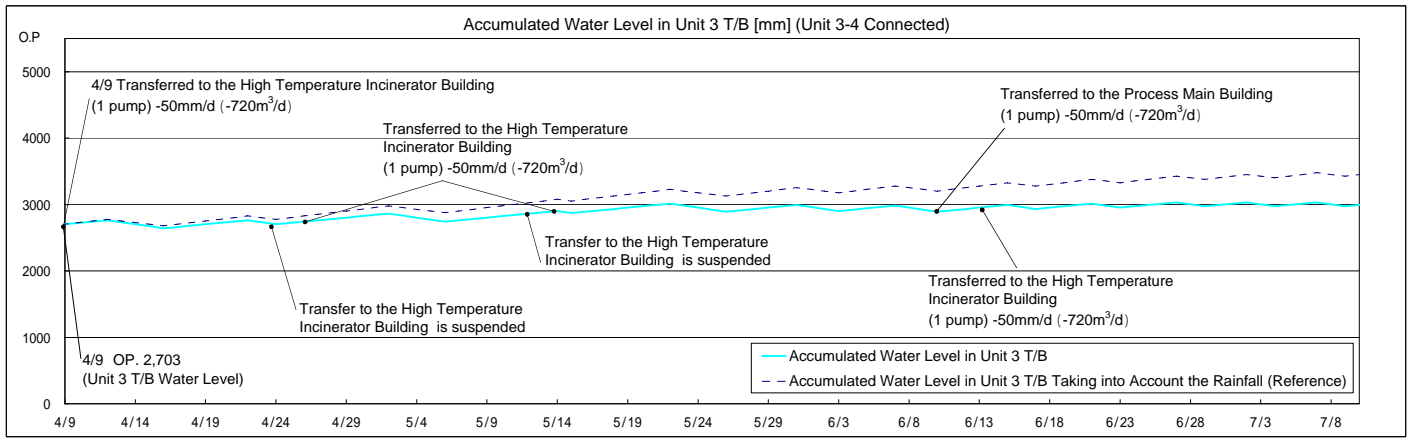
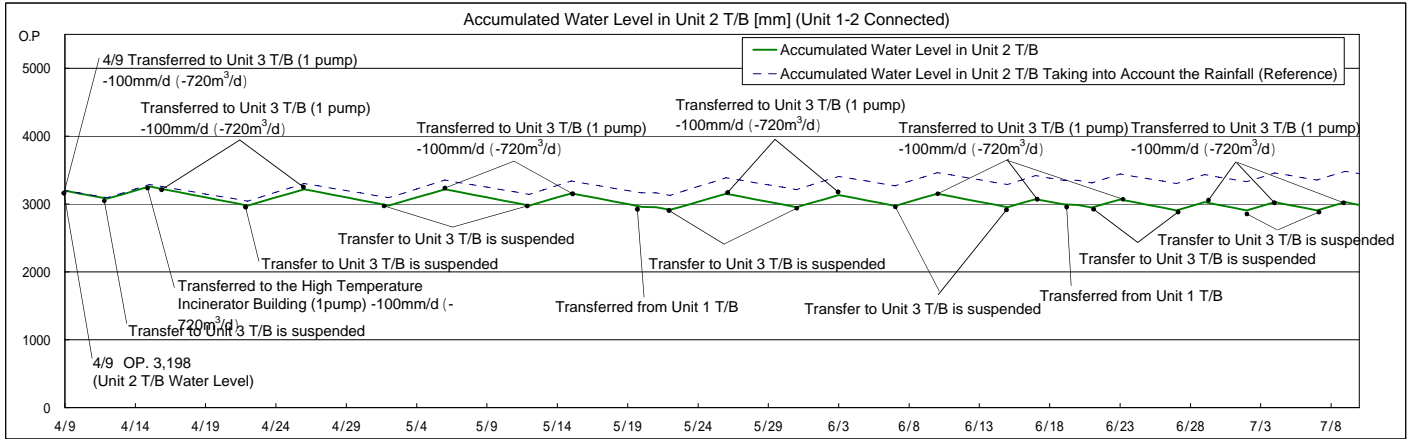
Storage Facility	Storage volume	Change from last report	Water level	Treated volume (4/10 - 4/16)	Cumulative treated volume	Waste produced	Change from last report	Storage capacity
Process Main Building	Approx. 15,220m <sup>3</sup>	+ 120m <sup>3</sup>	OP.4,300	Approx. 5,460m <sup>3</sup> *4	Approx. 618,450m <sup>3</sup> *4	Sludge	597m <sup>3</sup>	700m <sup>3</sup> *11
High Temperature Incinerator Building	Approx. 4,570m <sup>3</sup>	+ 690m <sup>3</sup>	OP.3,197			Used vessels	506*5	
Total	Approx. 19,790m <sup>3</sup>							

[Highlights from the present status (April 9, 2013) to the supposition status]

- Water transfer from Unit 2 to Unit 3 Turbin Building will be suspended. Water transfer from Unit 2 to the High Temperature Incinerator Building will be restarted.
- Water transfer from Unit 3 to the High Temperature Incinerator Building will be conducted.
- Water transfer from Unit 4 will be stopped continuously.
- Operation of 2nd Cesium Adsorption Apparatus is scheduled: Availability Factor 65% (Projected)
- Cesium Adsorption Apparatus will be stopped continuously.
- On April 9, water transfer from the Underground Reservoir ii to the Underground Reservoir i was suspended (actual performance).
- Water transfer from the Underground Reservoir ii to the "concentrated waste liquid storage tank" will be conducted (storage amount of the "concentrated seawater receiving tank" will be decreased and the "concentrated waste liquid storage tank" will be increased).
- Storage capacity of the "treated water storage tank" will be increased by adding tanks.

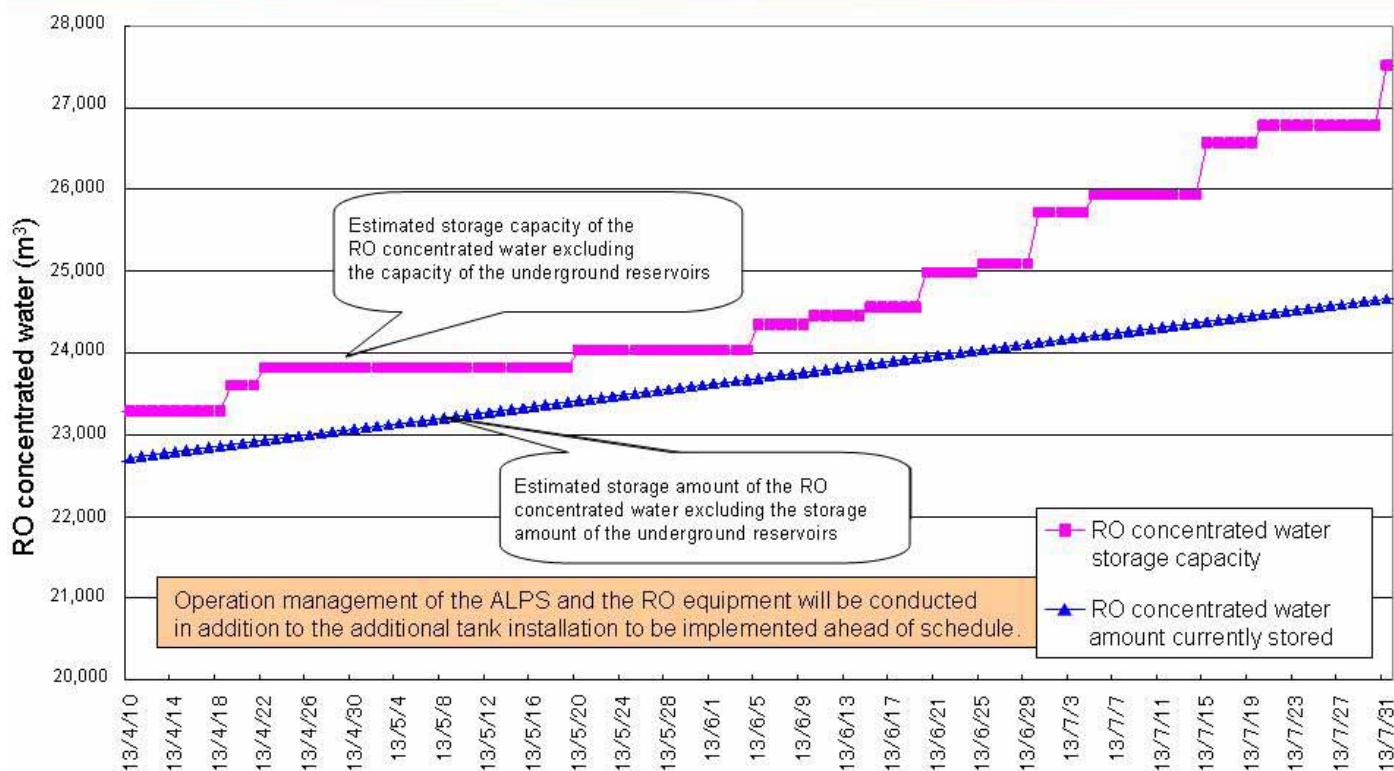
\*1 Shows the operational limit.  
 \*2 The figure is subtracted approx. 3,400m<sup>3</sup> since the accumulated water of Unit 5-6 has been stored in the water storage tank in basement already.  
 \*3 The treated water from the Multi-nuclide Removal Equipment (under hot test) is stored. Freshwater and concentrated saltwater will be stored depending on the operation status.  
 \*4 Total treated amount of Cesium adsorption apparatus and 2nd Cesium adsorption apparatus  
 Breakdown of the treated amount: Cesium adsorption apparatus (0m<sup>3</sup>)  
 2nd Cesium adsorption apparatus (5,460m<sup>3</sup>)  
 Breakdown of the cumulative treated amount: Cesium adsorption apparatus (179,610m<sup>3</sup>)  
 2nd Cesium adsorption apparatus (438,840m<sup>3</sup>)  
 \*5 Breakdown of the used vessels: Cesium adsorption apparatus (424)  
 2nd cesium Cesium adsorption apparatus (78)  
 Storage container of the Multi-nuclide Removal Equipment (4) and treated column (0)

# Simulation Results of Accumulated Water Treatment in Unit 1-4 T/B



- Note
- The treated water volume is assumed to be 780m<sup>3</sup>/d (Subject to change depending on the level of water accumulated in T/B).
  - The accumulated water level in T/B is a simulation result in consideration of fluctuation of water level such as recent rainfall, inflow of groundwater, and etc.
  - The accumulated water level in T/B is assumed to increase by 5mm daily, taking into consideration the average rain fall in the surrounding area of Fukushima Daiichi Nuclear Power Station (August-October in the past 3 years).

### Water Balance Simulation (RO Concentrated Water)



### Water Balance Simulation (Underground Reservoir)

