Situation of Storage and Treatment of Accumulated Water including Highly Concentrated Radioactive Materials at Fukushima Daiichi Nuclear Power Station (233rd Release)

December 25, 2015
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 the future forecast based upon the current situation has 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 amounts, and other related data in the Accumulated Water Storing Facility as of December 24 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 state 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 amounts, and other related data in the Accumulated Water Storing

Facilities as of December 31, 2015 and January 7, 2016, 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.

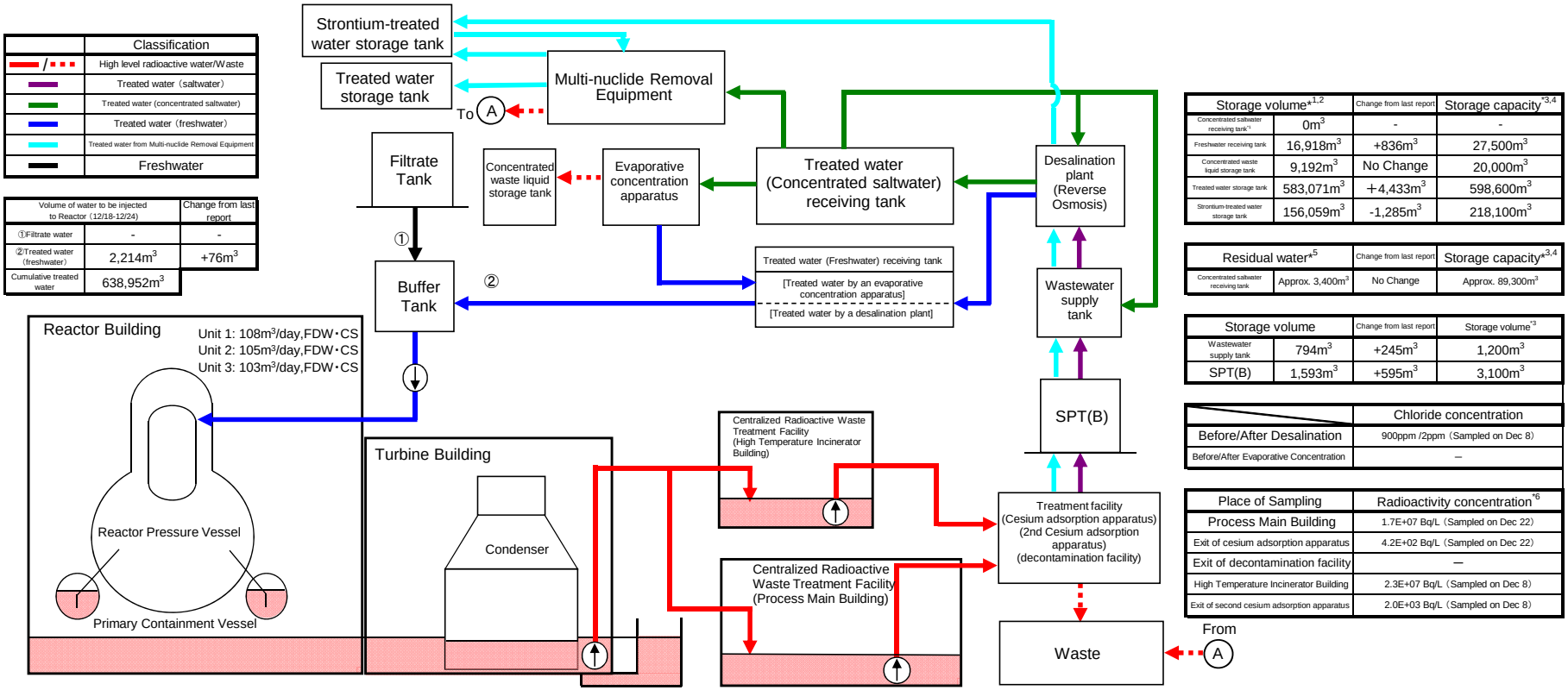
We forecast stored amounts in each unit building (Unit 1 to 4 (including condensers and trenches)), and storing and treatment situations in the Accumulated Water Storing Facilities for the next 3 months, as shown in Attachment -3.

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 December 24, 2015)



Volume of water to be injected to Reactor（12/18-12/24）		Change from last report
①Filtrate water	-	-
②Treated water (freshwater)	2,214m³	+76m³
Cumulative treated water	638,952m³	

Storage volume*1,2		Change from last report	Storage capacity*3,4
Concentrated saltwater receiving tank*1	0m³	-	-
Freshwater receiving tank	16,918m³	+836m³	27,500m³
Concentrated waste liquid storage tank	9,192m³	No Change	20,000m³
Treated water storage tank	583,071m³	+4,433m³	598,600m³
Strontium-treated water storage tank	156,059m³	-1,285m³	218,100m³

Residual water*5		Change from last report	Storage capacity*3,4
Concentrated saltwater receiving tank	Approx. 3,400m³	No Change	Approx. 89,300m³

Storage volume		Change from last report	Storage volume*3
Wastewater supply tank	794m³	+245m³	1,200m³
SPT(B)	1,593m³	+595m³	3,100m³

	Chloride concentration
Before/After Desalination	900ppm /2ppm（Sampled on Dec 8）
Before/After Evaporative Concentration	–

Place of Sampling	Radioactivity concentration*6
Process Main Building	1.7E+07 Bq/L（Sampled on Dec 22）
Exit of cesium adsorption apparatus	4.2E+02 Bq/L（Sampled on Dec 22）
Exit of decontamination facility	—
High Temperature Incinerator Building	2.3E+07 Bq/L（Sampled on Dec 8）
Exit of second cesium adsorption apparatus	2.0E+03 Bq/L（Sampled on Dec 8）

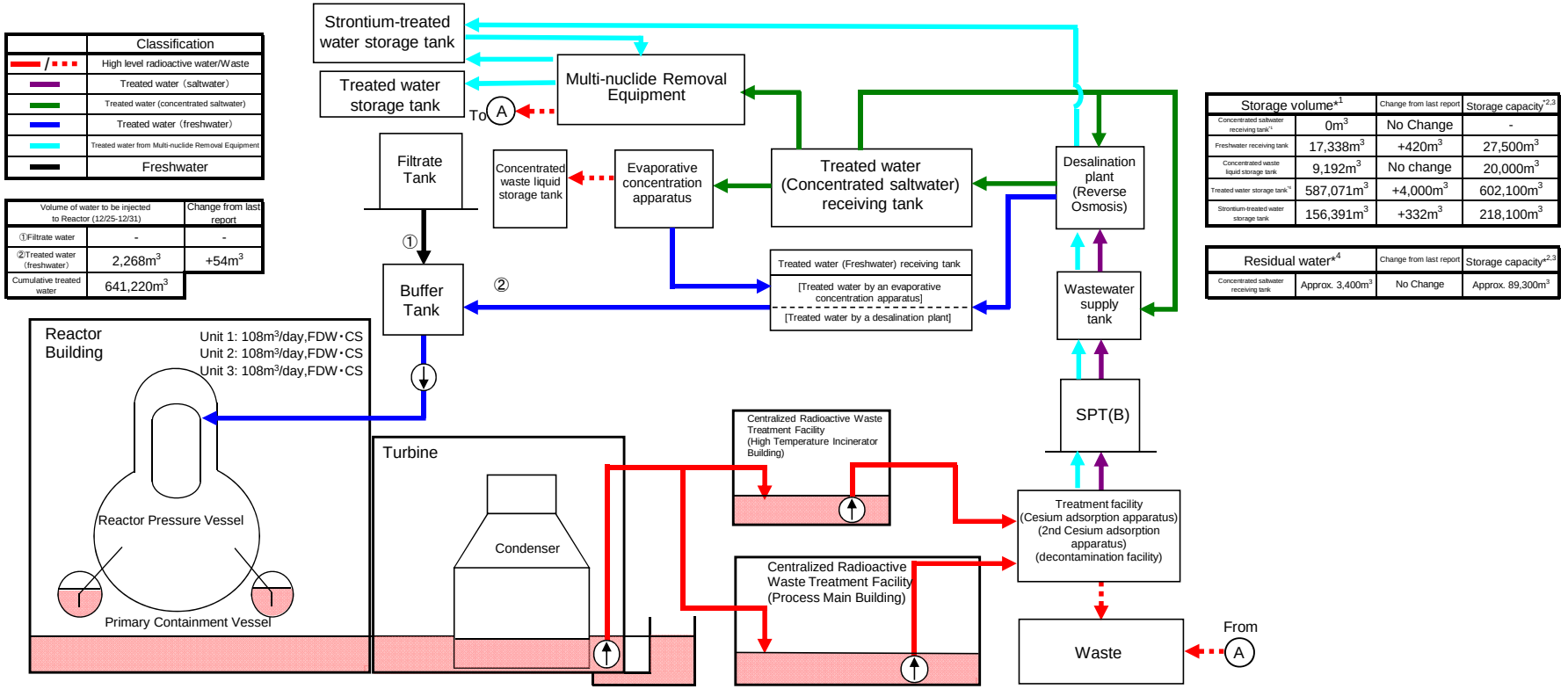
Facility	Storage volume	Change from last	Water level in T/B *8
Unit 1	Approx. 12,500m³	-100m³	T.P.1,155 (O.P.2,612)
Unit 2	Approx. 17,800m³	+200m³	T.P.1,705 (O.P.3,157)
Unit 3	Approx. 18,600m³	-200m³	T.P.1,687 (O.P.3,124)
Unit 4	Approx. 18,600m³	No Change	T.P.1,770 (O.P.3,209)
Total	Approx. 67,500m³		

Storage Facility	Storage volume	Change from last report	Water level *8	Treated volume (12/18-12/24)	Cumulative treated volume	Waste produced		Change from last report	Storage capacity
Process Main Building	Approx. 16,830m³	-1,650m³	T.P.3,395 (O.P. 4,757)	Approx. 7270m³ *7	Approx. 1,400,230m³ *7	Sludge	597m³	No Change	700m³ *3
High Temperature Incinerator Building	Approx. 4,410m³	+10m³	T.P.1,399 (O.P. 2,845)			Used vessels	2,912*9	+12	6,055
Total	Approx. 21,240m³								

[Main operations that have been conducted during the period from December 17, 2015 (the previous announcement data) to December 24, 2015]
- Water transfer from the Unit 1 Reactor Building to the High Temperature Incinerator Building was conducted whenever necessary.
- Water transfer from the Unit 2 T/B to the High Temperature Incinerator Building was conducted whenever necessary.
- Water transfer from the Unit 3 T/B to the High Temperature Incinerator Building was conducted whenever necessary.
- The operation of the Cesium Adsorption Apparatus has been conducted; the availability factor has been 19% (previously assumed: 15%)
- The operation of the 2nd Cesium Adsorption Apparatus has been conducted; the availability factor has been 68% (previously assumed: 70%)
- On Dec. 21, the operation of the Cesium Adsorption Apparatus was restarted.
- On Dec. 17 and 18, water transfer from the Unit 3 Underground Storage Facility for Radioactive Waste to the Unit 3 Radioactive Waste Treatment Facility was conducted.
- On Dec. 17 and 21, water transfer from the Unit 1 House Boiler Room to the Unit 1 T/B was conducted.
- On Dec. 20, water transfer from the Unit 1 T/B and Unit 1 Radioactive Waste Treatment Facility was conducted.
- Storage capacity of treated water was increased by starting the operations of new storage tanks.

*1 The figures of the data are treated as a reference, because water levels during water transfer are not stable.
*2 The figures of the storage volume do not include those of the following volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%:
Freshwater receiving tank (approx. 1,000m³), Concentrated waste liquid storage tank (approx.100m³),
Treated water storage tank (approx. 1,000m³), Strontium-treated water storage tank (approx. 3,000m³).
*3 The figures of the data show the operational limits.
*4 The figures of "Storage capacity" do not include those of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%. However, each tank has the capacity that accomodates more than the storage volume that accumulates up to the height of "DS."
*5 The figure of "Residual water" includes the one of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%. The amount of the residual water of concentrated saltwater is calculated based on that of the water treated through the ALPS and other facilities.
*6 The data shown here are those of Cs-137.
*7 Total treated amount of Cesium adsorption apparatus and 2nd Cesium adsorption apparatus
Breakdown of the treated amount: Cesium adsorption apparatus (1,600m³)
2nd Cesium adsorption apparatus (5,670m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (314,450m³)
2nd Cesium adsorption apparatus (1,085,780m³)
*8 The data of the water levels in the Reactor Buildings are the data as of 7 a.m., December 24.
*9 Breakdown of the used vessels: Cesium adsorption apparatus (682)
2nd Cesium adsorption apparatus (152) Others: Storage container (1,832),
Treated column (7) ,Used vessel (174), Filiters and so forth (65)

Storage and treatment of high level radioactive accumulated water (as of December 31, 2015)



Volume of water to be injected to Reactor (12/25-12/31)		Change from last report
①Filtrate water	-	-
②Treated water (freshwater)	2,268m³	+54m³
Cumulative treated water	641,220m³	

Storage volume*1		Change from last report	Storage capacity*2,3
Concentrated saltwater receiving tank*1	0m³	No Change	-
Freshwater receiving tank	17,338m³	+420m³	27,500m³
Concentrated waste liquid storage tank	9,192m³	No change	20,000m³
Treated water storage tank*3	587,071m³	+4,000m³	602,100m³
Strontium-treated water storage tank	156,391m³	+332m³	218,100m³

Residual water*4		Change from last report	Storage capacity*2,3
Concentrated saltwater receiving tank	Approx. 3,400m³	No Change	Approx. 89,300m³

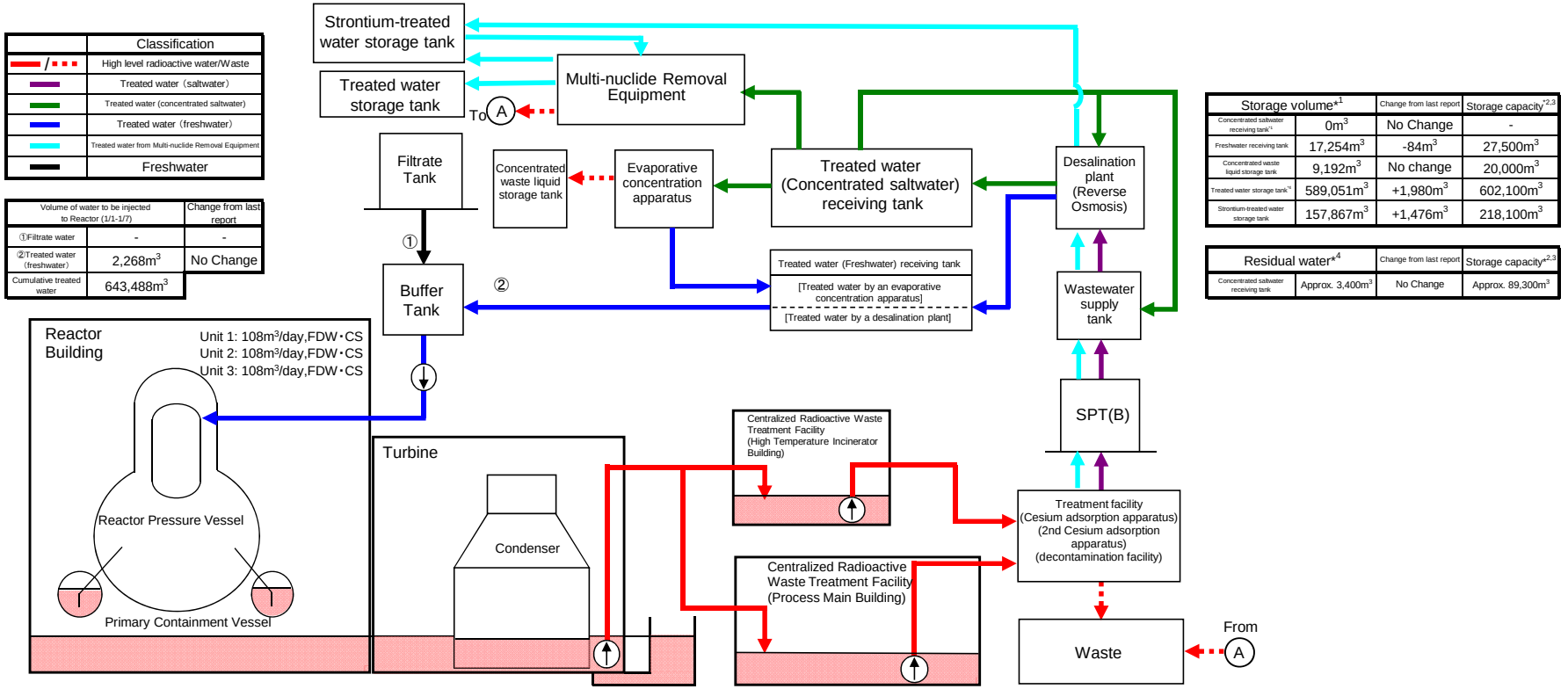
Facility	Storage volume	Change from last	Water level in T/B
Unit 1	Approx. 12,600m³	+100m³	T.P. 1,686 (O.P. 3,138) (Unit 2 T/B)
Unit 2	Approx. 17,700m³	-100m³	
Unit 3	Approx. 18,800m³	+200m³	T.P. 1,712 (O.P. 3,149) (Unit 3 T/B)
Unit 4	Approx. 18,200m³	-400m³	
Total	Approx. 67,300m³		

Storage Facility	Storage volume	Change from last report	Water level	Treated volume (12/25-12/31)	Cumulative treated volume	Waste produced		Change from last report	Storage capacity
Process Main Building	Approx. 17,990m³	+1,160m³	T.P. 3,725 (O.P. 5,087)	Approx. 6,720m³ *5	Approx. 1,406,950m³ *5	Sludge	597m³	No Change	700m³ *2
High Temperature Incinerator Building	Approx. 3,580m³	-830m³	T.P. 714 (O.P. 2,160)			Used vessels	2,926*6	+14	6,055
Total	Approx. 21,570m³								

[Main operations that are planned to be conducted during the period from December 24, 2015 to December 31, 2015.]
- Water transfer from the Unit 1 Reactor Building to the High Temperature Incinerator Building and the Process Main Building will be conducted whenever necessary.
- Water transfer from the Unit 2 T/B to the High Temperature Incinerator Building and the Process Main Building will be conducted whenever necessary.
- Water transfer from the Unit 3 T/B to the High Temperature Incinerator Building and the Process Main Building will be conducted whenever necessary.
- The operation of the Cesium Adsorption Apparatus is scheduled to resume (assumed Availability Factor 15%). The operation of the Cesium Adsorption Apparatus will be suspended.
- The operation of the 2nd Cesium Adsorption Apparatus is scheduled to resume (assumed Availability Factor 65%).
- Water transfer from the Unit 1 T/B to the Unit 1 Radioactive Waste Treatment Facility will be conducted.
- Storage capacity of treated water was increased by starting the operations of new storage tanks.

*1 The figures of "Storage volume" do not include those of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%.
*2 The figures of the data show the operational limits.
*3 The figures of "Storage capacity" do not include those of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%. However, each tank has the capacity that accomodates more than the storage volume that accumulates up to the height of "DS."
*4 The figure of "Residual water" includes the one of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%. The amount of the residual water of concentrated saltwater is calculated based on that of the water treated through the ALPS and other facilities.
*5 Total treated amount of Cesium adsorption apparatus and 2nd Cesium adsorption apparatus
Breakdown of the treated amount: Cesium adsorption apparatus (1,260m³)
2nd Cesium adsorption apparatus (5,460m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (315,710m³)
2nd Cesium adsorption apparatus (1,091,240m³)
*6 Breakdown of the used vessels: Cesium adsorption apparatus (682)
2nd Cesium adsorption apparatus (152),
Others: Storage container (1,846),
Treated column (7)
Used vessels (174) , Filters and so forth (65)

Storage and treatment of high level radioactive accumulated water (as of January 7, 2016)



	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 (1/1-1/7)		Change from last report
①Filtrate water	-	-
②Treated water（freshwater）	2,268m³	No Change
Cumulative treated water	643,488m³	

Storage volume*1		Change from last report	Storage capacity*2,3
Concentrated saltwater receiving tank*1	0m³	No Change	-
Freshwater receiving tank	17,254m³	-84m³	27,500m³
Concentrated waste liquid storage tank	9,192m³	No change	20,000m³
Treated water storage tank*5	589,051m³	+1,980m³	602,100m³
Strontium-treated water storage tank	157,867m³	+1,476m³	218,100m³

Residual water*4		Change from last report	Storage capacity*2,3
Concentrated saltwater receiving tank	Approx. 3,400m³	No Change	Approx. 89,300m³

Facility	Storage volume	Change from last	Water level in T/B
Unit 1	Approx. 12,600m³	No Change	T.P. 1,761 (O.P. 3,213) (Unit 2 T/B)
Unit 2	Approx. 18,200m³	+500m³	
Unit 3	Approx. 19,200m³	+400m³	T.P. 1,768 (O.P. 3,205) (Unit 3 T/B)
Unit 4	Approx. 18,600m³	+400m³	
Total	Approx. 68,600m³		

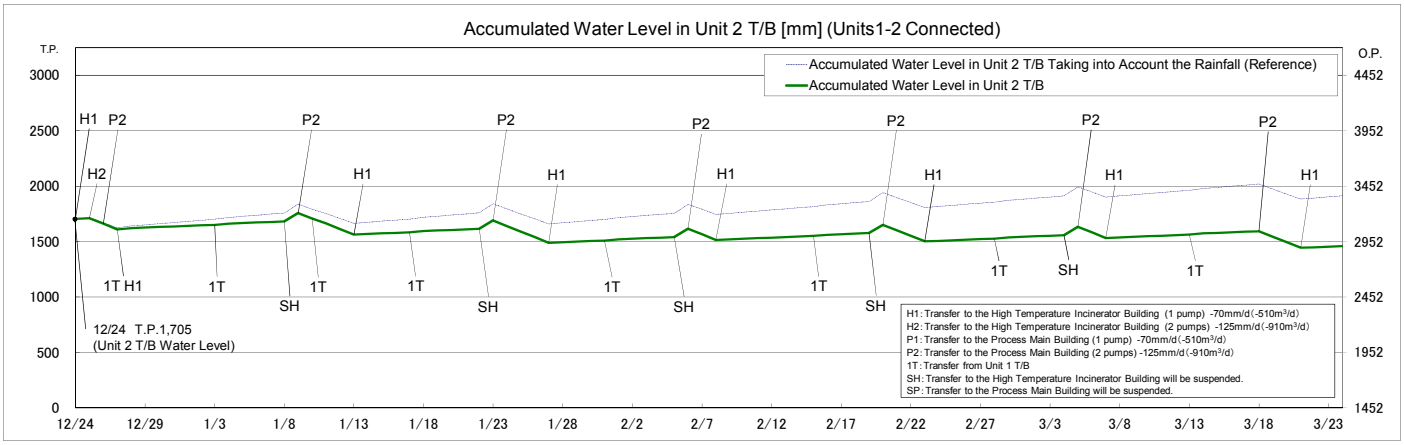
Storage Facility	Storage volume	Change from last report	Water level	Treated volume (1/1-1/7)	Cumulative treated volume	Waste produced		Change from last report	Storage capacity
Process Main Building	Approx. 18,110m³	+120m³	T.P. 3,760 (O.P. 5,122)	Approx. 5,460m³ *5	Approx. 1,412,410m³ *5	Sludge	597m³	No Change	700m³ *2
High Temperature Incinerator Building	Approx. 3,900m³	+320m³	T.P. 980 (O.P. 2,426)			Used vessels	2,934*6	+8	6,055
Total	Approx. 22,010m³								

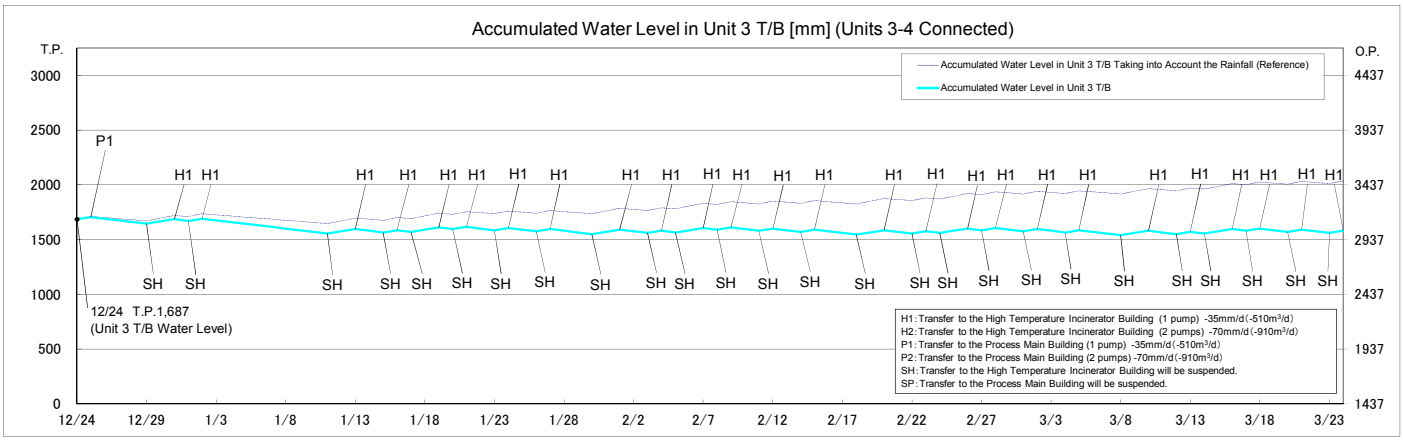
[Main operations that are planned to be conducted during the period from December 31, 2015 to January 7, 2016.]
- Water transfer from the Unit 1 Reactor Building to the High Temperature Incinerator Building will be conducted whenever necessary.
- Water transfer from the Unit 2 T/B to the High Temperature Incinerator Building will be conducted whenever necessary.
- Water transfer from the Unit 3 T/B to the High Temperature Incinerator Building will be conducted whenever necessary.
- The operation of the Cesium Adsorption Apparatus is scheduled to keep suspending.
- The operation of the 2nd Cesium Adsorption Apparatus is scheduled to resume (assumed Availability Factor 65%).
- Water transfer from the Unit 1 T/B to the Unit 1 Radioactive Waste Treatment Facility will be conducted.

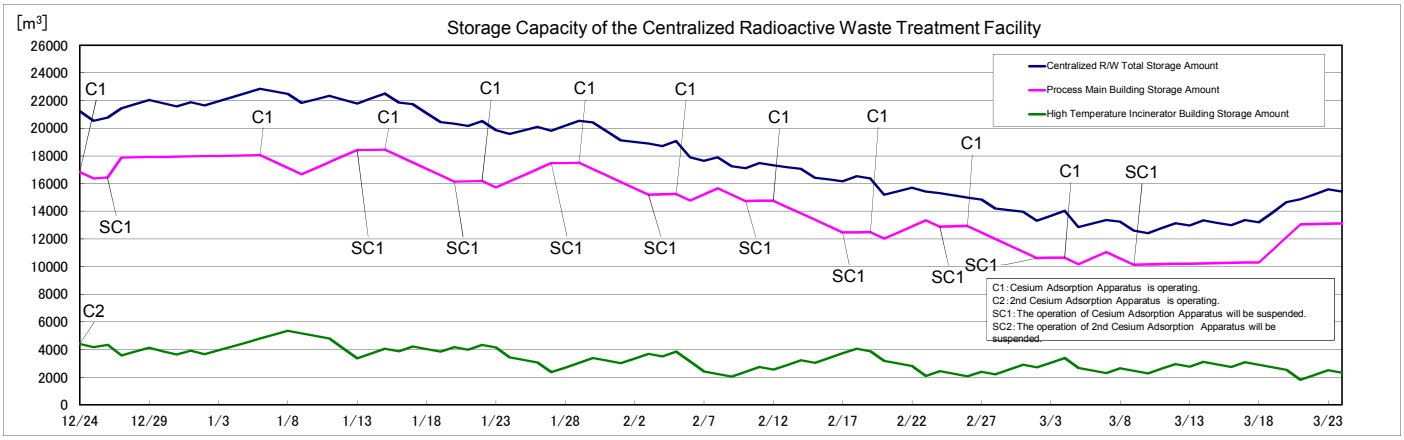
*1 The figures of "Storage volume" do not include those of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%.
*2 The figures of the data show the operational limits.
*3 The figures of "Storage capacity" do not include those of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%. However, each tank has the capacity that accomodates more than the storage volume that accumulates up to the height of "DS."
*4 The figure of "Residual water" includes the one of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%. The amount of the residual water of concentrated saltwater is calculated based on that of the water treated through the ALPS and other facilities.
*5 Total treated amount of Cesium adsorption apparatus and 2nd Cesium adsorption apparatus
Breakdown of the treated amount: Cesium adsorption apparatus (0m³)
2nd Cesium adsorption apparatus (5,460m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (315,710m³)
2nd Cesium adsorption apparatus (1,096,700m³)
*6 Breakdown of the used vessels: Cesium adsorption apparatus (682)
2nd Cesium adsorption apparatus (152),
Others: Storage container (1,854),
Treated column (7)
Used vessels (174) , Filters and so forth (65)

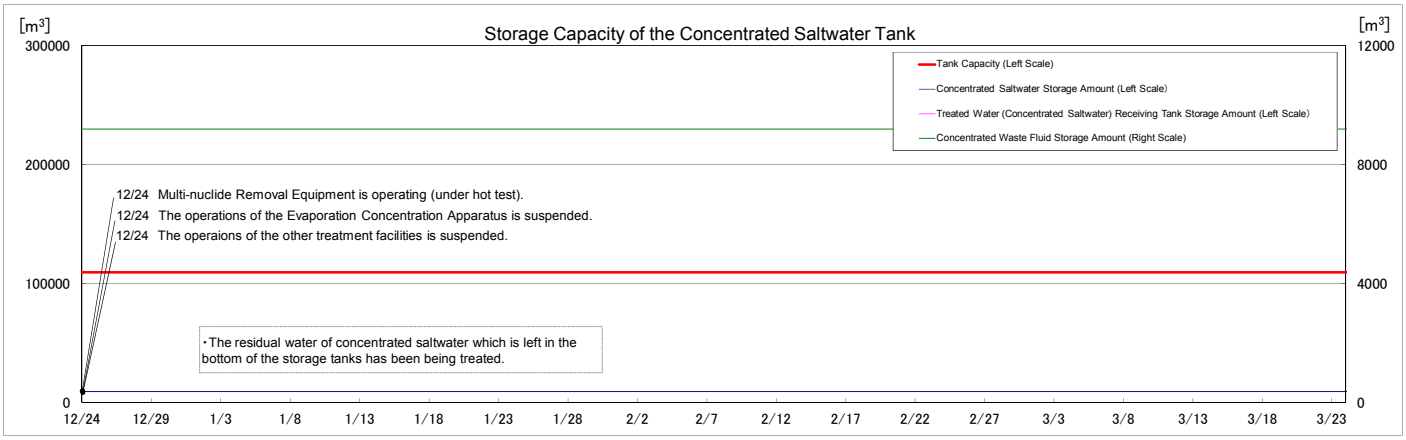
Simulation Results of Accumulated Water Treatment in Units 1-4 T/B

Attachment-3









Note
- The amount of water treated with the 2nd Cesium Adsorption Apparatus is estimated to be 780m³/d (Subject to change depending on the factors such as the levels of water accumulated in T/Bs.)
- "Accumulated Water Levels in Unit 2 and 3 T/Bs" are simulated water levels in consideration of the change of the water levels caused by recent rainfall, inflow of groundwater, etc. in the surrounding areas of the Fukushima Daiichi Nuclear Power Station.
- "Accumulated Water Levels in Unit 2 and 3 T/Bs Taking into Account the Rainfall" are simulated water levels which are calculated by adding to the accumulated water water amounts which are assumed to increase at the rate of 5mm a day when the surrounding areas of the Fukushima Daiichi Nuclear Power Station have the rainfall equal to the average amount of rain which fell for three months from August to October in 2008 to 2010.