Situation of Storage and Treatment of Accumulated Water including Highly Concentrated Radioactive Materials at Fukushima Daiichi Nuclear Power Station (285th Release)

January 6, 2016

Tokyo Electric Power Company Holdings, Inc.

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 29, 2016 and January 5, 2017 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 and 2 and Units 3 and 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 January 12, 2017, as shown in Attachment -2.

(2) Middle term forecast

Regarding accumulated water in Units 1 and 2 buildings and Units 3 and 4 buildings, 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 TP. 2,564 (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 TP. 1,564 (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 (Units 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.

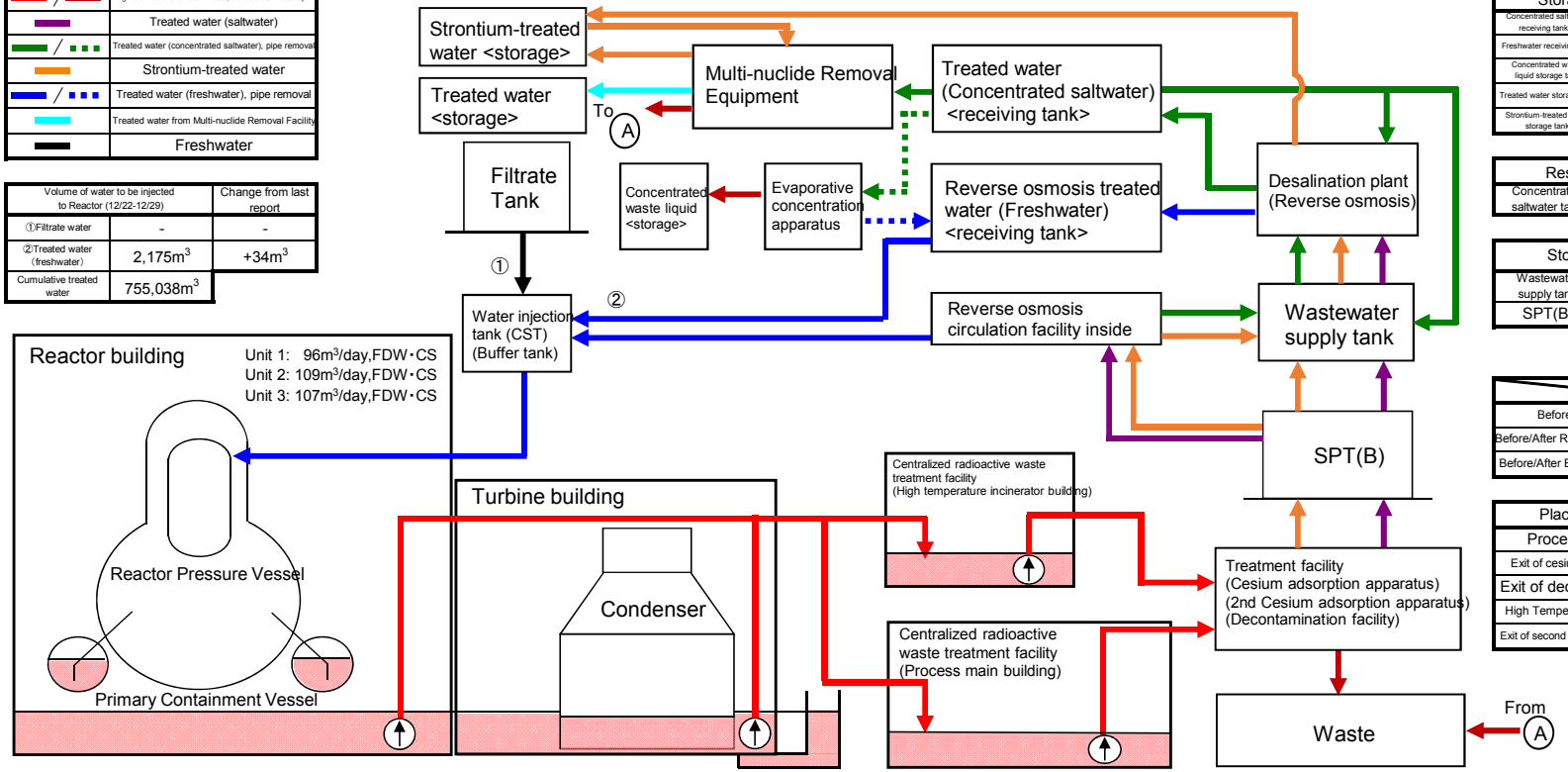
END

Attachment-1

Storage and treatment of high level radioactive accumulated water (as of December 29, 2016)

Classification
High level radioactive water/ Waste, Concentrated waste liquid
Treated water (saltwater)
Treated water (concentrated saltwater), pipe removal
Strontium-treated water
Treated water (freshwater), pipe removal
Treated water from Multi-nuclide Removal Facility
Freshwater

Volume of water to be injected to Reactor (12/22-12/29)		Change from last report
①Filtrate water	-	-
②Treated water (freshwater)	2,175m^3	+34m^3
Cumulative treated water	755,038m^3	



Storage volume *1,2		Change from last report	Storage capacity *3,4
Concentrated saltwater receiving tank*1	0m^3	-	-
Freshwater receiving tank	15,837m^3	+500m^3	18,900m^3
Concentrated waste liquid storage tank	9,144m^3	-12m^3	10,700m^3
Treated water storage tank	709,037m^3	+2,065m^3	736,100m^3
Strontium-treated water storage tank	213,906m^3	+683m^3	239,100m^3

Residual water *5		Change from last report	Storage capacity *3
Concentrated saltwater tank	Approx. 2,700m^3	No Change	Approx. 22,100m^3

Storage volume		Change from last report	Storage volume*3
Wastewater supply tank	752m^3	+45m^3	1,200m^3
SPT(B)	689m^3	-665m^3	3,100m^3

	Chloride concentration
Before/After Desalination	210ppm/<1ppm (Sampled on October 18)
Before/After Reverse Osmosis Circulation	210ppm/<1ppm (Sampled on December 8)
Before/After Evaporative Concentration	–

Place of Sampling	Radioactivity concentration *6
Process Main Building	3.3E+07 Bq/L (Sampled on October 18)
Exit of cesium adsorption apparatus	5.1E+02 Bq/L (Sampled on October 13)
Exit of decontamination facility	–
High Temperature Incinerator Building	2.0E+07 Bq/L (Sampled on December 6)
Exit of second cesium adsorption apparatus	2.3E+02 Bq/L (Sampled on December 6)

Facility	Storage volume	Change from last report	Water level in T/B *8
Unit 1	Approx. 11,800m^3	+100m^3	T.P. 1,371 (O.P. 2,828)
Unit 2	Approx. 16,500m^3	+600m^3	T.P. 1,520 (O.P. 2,972)
Unit 3	Approx. 16,500m^3	+300m^3	T.P. 1,420 (O.P. 2,857)
Unit 4	Approx. 16,100m^3	+200m^3	T.P. 1,422 (O.P. 2,861)
Total	Approx. 60,900m^3		

Storage facility	Storage volume	Change from last report	Water level *8	Treated volume (12/22-12/29)	Cumulative treated volume
Process Main Building	Approx. 10,680m^3	-2,850m^3	T.P. 1,236 (O.P. 2,598)	Approx. 4,780m^3 *7	Approx. 1,696,850m^3 *7
High Temperature Incinerator Building	Approx. 3,090m^3	+120m^3	T.P. 304 (O.P. 1,750)		
Total	Approx. 13,770m^3				

Waste produced		Change from last report	Storage capacity
Sludge	597m^3	No Change	700m^3 *3
Used vessels	3,453 *9	+15m^3	6,239

[Main operations that have been conducted during the period from December 22, 2016 (the previous announcement data) to December 29, 2016]
- Water transfer from the Unit 1 Reactor Building to the Process Main Building was conducted whenever necessary.
- Water transfer from the Unit 2 Reactor Building to the Process Main Building was conducted whenever necessary.
- Water transfer from the Unit 2 Turbine Building to the Process Main Building was conducted whenever necessary.
- Water transfer from the Unit 2 Radioactive Waste Treatment Facility to the Process Main Building was conducted whenever necessary.
- Water transfer from the Unit 3 Turbine Building to the Process Main Building was conducted whenever necessary.
- On December 25, water transfer from the Unit 1 Turbine Building to the Unit 1 Radioactive Waste Treatment Facility was conducted.
- From November 1, operations of the Cesium Adsorption Apparatus has been suspended.
- Operations of the 2nd Cesium Adsorption Apparatus have been conducted; the availability factor is 57% (previously simulated: 60%).
- Due to other work, water transfer to the buildings (Units 1-4, the Process Main Building, the High Temperature Incinerator Building) was conducted whenever necessary.

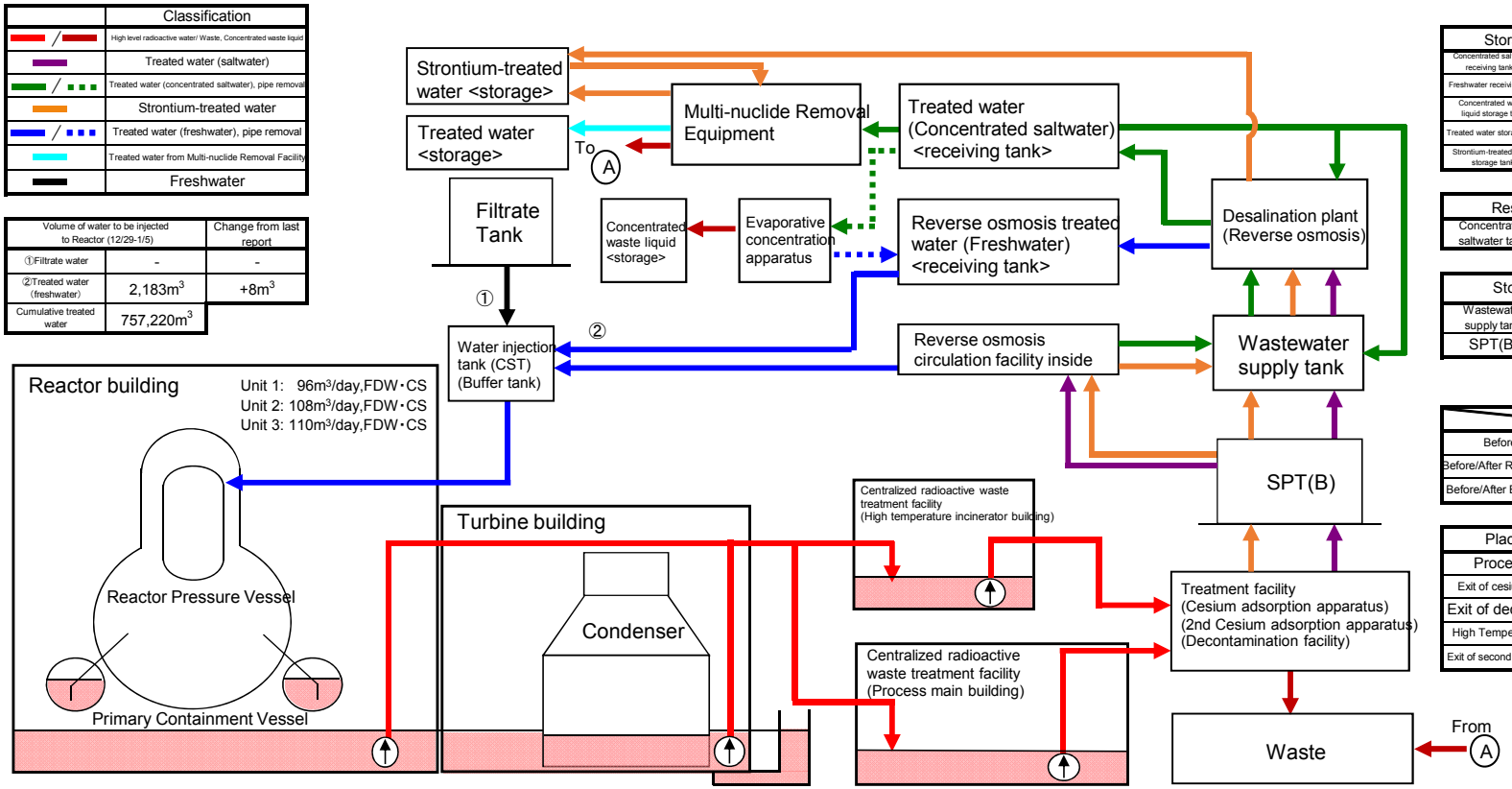
*1 The figures of the data are treated as a reference, because water levels during water transfer are not stable.
*2 The figures of the storage volume do not include those of the following volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%:
Freshwater receiving tank (approx. 1,000m^3), Concentrated waste liquid storage tank (approx.100m^3),
Treated water storage tank (approx. 1,000m^3), Strontium-treated water storage tank (approx. 5,000m^3).
*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 (0m^3)
2nd Cesium adsorption apparatus (4,780m^3)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (370,290m^3)
2nd Cesium adsorption apparatus (1,326,560m^3)
*8 The data of the water levels in the Reactor Buildings are the data as of 7 a.m., December 29.
*9 Breakdown of the used vessels: Cesium adsorption apparatus (758)
2nd Cesium adsorption apparatus (180)
Others: Storage container (2,244), Treated column (9), Used vessel (197), Filiters and so forth (65)

Attachment-1

Storage and treatment of high level radioactive accumulated water (as of January 5, 2017)

Classification
High level radioactive water/ Waste, Concentrated waste liquid
Treated water (saltwater)
Treated water (concentrated saltwater), pipe removal
Strontium-treated water
Treated water (freshwater), pipe removal
Treated water from Multi-nuclide Removal Facility
Freshwater

Volume of water to be injected to Reactor (12/29-1/5)		Change from last report
①Filtrate water	-	-
②Treated water (freshwater)	2,183m^3	+8m^3
Cumulative treated water	757,220m^3	



Storage volume *1,2		Change from last report	Storage capacity *3,4
Concentrated saltwater receiving tank*1	0m^3	-	-
Freshwater receiving tank	15,787m^3	-50m^3	18,900m^3
Concentrated waste liquid storage tank	9,133m^3	-11m^3	10,700m^3
Treated water storage tank	711,052m^3	+2,015m^3	736,100m^3
Strontium-treated water storage tank	213,740m^3	-166m^3	239,100m^3

Residual water *5		Change from last report	Storage capacity *3
Concentrated saltwater tank	Approx. 2,700m^3	No Change	Approx. 22,100m^3

Storage volume		Change from last report	Storage volume*3
Wastewater supply tank	770m^3	+18m^3	1,200m^3
SPT(B)	759m^3	+70m^3	3,100m^3

	Chloride concentration
Before/After Desalination	210ppm/<1ppm (Sampled on October 18)
Before/After Reverse Osmosis Circulation	210ppm/<1ppm (Sampled on December 8)
Before/After Evaporative Concentration	–

Place of Sampling	Radioactivity concentration *6
Process Main Building	3.3E+07 Bq/L (Sampled on October 18)
Exit of cesium adsorption apparatus	5.1E+02 Bq/L (Sampled on October 13)
Exit of decontamination facility	–
High Temperature Incinerator Building	2.0E+07 Bq/L (Sampled on December 6)
Exit of second cesium adsorption apparatus	2.3E+02 Bq/L (Sampled on December 6)

Facility	Storage volume	Change from last report	Water level in T/B *8
Unit 1	Approx. 11,700m^3	-100m^3	T.P. 1,215 (O.P. 2,672)
Unit 2	Approx. 16,500m^3	No Change	T.P. 1,519 (O.P. 2,971)
Unit 3	Approx. 14,500m^3	-2,000m^3	T.P. 1,159 (O.P. 2,596)
Unit 4	Approx. 15,400m^3	-700m^3	T.P. 1,322 (O.P. 2,761)
Total	Approx. 58,100m^3		

Storage facility	Storage volume	Change from last report	Water level *8	Treated volume (12/29-1/5)	Cumulative treated volume
Process Main Building	Approx. 12,670m^3	+1,990m^3	T.P. 1,886 (O.P. 3,248)	Approx. 4,550m^3 *7	Approx. 1,701,400m^3 *7
High Temperature Incinerator Building	Approx. 3,140m^3	+50m^3	T.P. 352 (O.P. 1,798)		
Total	Approx. 15,810m^3				

Waste produced		Change from last report	Storage capacity
Sludge	597m^3	No Change	700m^3 *3
Used vessels	3,461 *9	+8m^3	6,239

[Main operations that have been conducted during the period from December 29, 2016 (the previous announcement data) to January 5, 2017.
- Water transfer from the Unit 1 Reactor Building to the Process Main Building was conducted whenever necessary.
- Water transfer from the Unit 2 Reactor Building to the Process Main Building was conducted whenever necessary.
- Water transfer from the Unit 2 Radioactive Waste Treatment Facility to the Process Main Building was conducted whenever necessary.
- Water transfer from the Unit 3 Turbine Building to the Process Main Building was conducted whenever necessary.
- Water transfer from the Unit 3 Radioactive Waste Treatment Facility to the Process Main Building was conducted whenever necessary.
- On January 1, water transfer from the Unit 1 Turbine Building to the Unit 1 Radioactive Waste Treatment Facility was conducted.
- From November 1, operations of the Cesium Adsorption Apparatus has been suspended.
- Operations of the 2nd Cesium Adsorption Apparatus have been conducted; the availability factor is 54% (previously simulated: 60%).
- Due to other work, water transfer to the buildings (Units 1-4, the Process Main Building, the High Temperature Incinerator Building) was conducted whenever necessary.

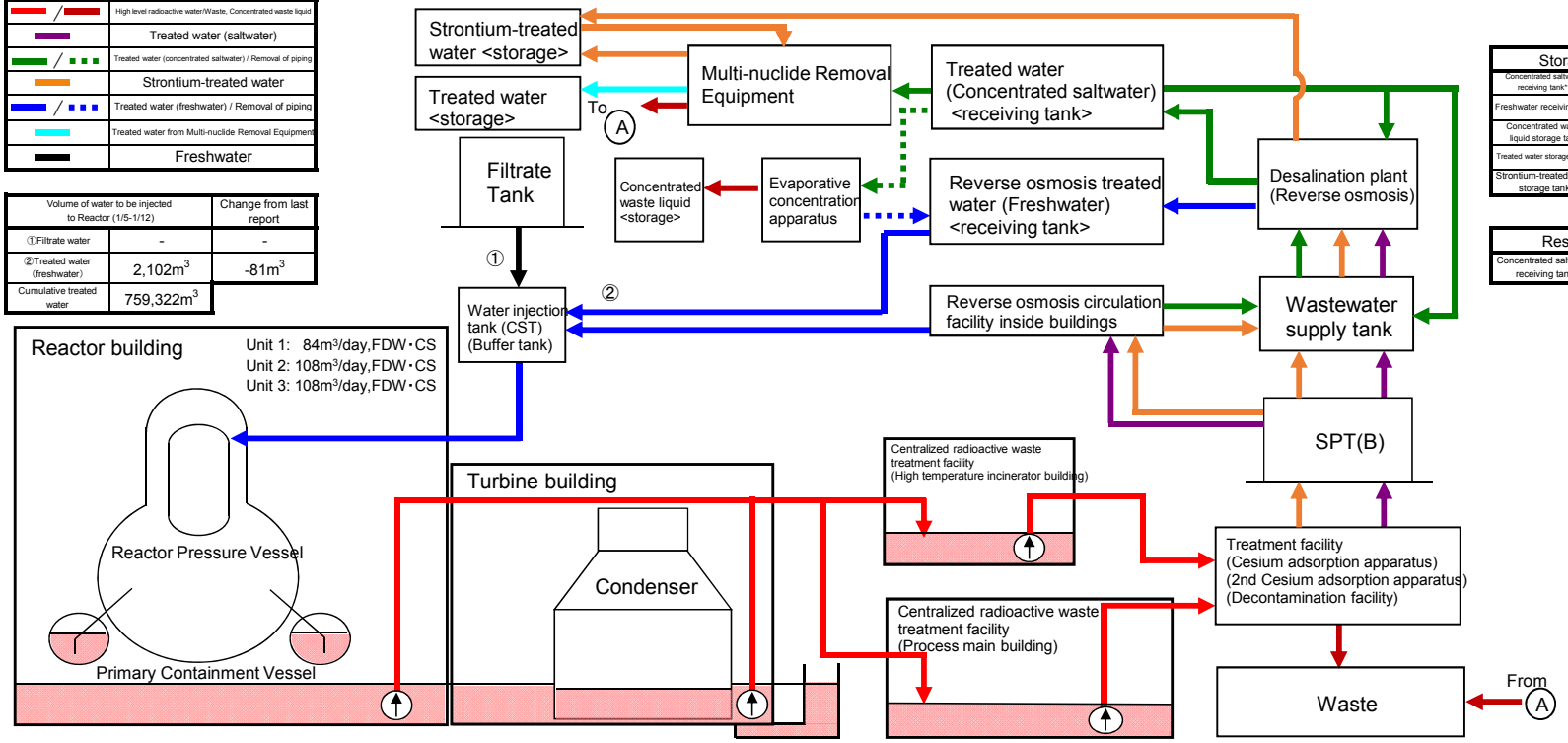
*1 The figures of the data are treated as a reference, because water levels during water transfer are not stable.
*2 The figures of the storage volume do not include those of the following volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water 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. 5,000m³).
*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 (0m³)
2nd Cesium adsorption apparatus (4,550m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (370,290m³)
2nd Cesium adsorption apparatus (1,331,110m³)
*8 The data of the water levels in the Reactor Buildings are the data as of 7 a.m., December 29.
*9 Breakdown of the used vessels: Cesium adsorption apparatus (758)
2nd Cesium adsorption apparatus (180)
Others: Storage container (2,252), Treated column (9), Used vessel (197), Filiters and so forth (65)

Attachment-2

Storage and treatment of high level radioactive accumulated water (as of January 12, 2017)

Classification
High level radioactive water/Waste, Concentrated waste liquid
Treated water (saltwater)
Treated water (concentrated saltwater) / Removal of piping
Strontium-treated water
Treated water (freshwater) / Removal of piping
Treated water from Multi-nuclide Removal Equipment
Freshwater

Volume of water to be injected to Reactor (1/5-1/12)		Change from last report
①Filtrate water	-	-
②Treated water (freshwater)	2,102m³	-81m³
Cumulative treated water	759,322m³	



Storage volume*1		Change from last report	Storage capacity*2,3
Concentrated saltwater receiving tank*1	0m³	-	-
Freshwater receiving tank	15,868m³	+81m³	18,900m³
Concentrated waste liquid storage tank	9,133m³	No Change	10,700m³
Treated water storage tank*4	716,141m³	+5,089m³	736,100m³
Strontium-treated water storage tank	211,731m³	+2,009m³	239,100m³

Residual water*4		Change from last report	Storage capacity*2,3
Concentrated saltwater receiving tank	Approx. 2,100m³	-600m³	Approx. 22,100m³

Facility	Storage volume	Change from last report	Water level in T/B
Unit 1	Approx. 11,700m³	No Change	T.P. 1,420 (O.P. 2,872) (Unit 2 T/B)
Unit 2	Approx. 15,600m³	-900m³	
Unit 3	Approx. 15,100m³	+600m³	T.P. 1,240 (O.P. 2,677) (Unit 3 T/B)
Unit 4	Approx. 16,000m³	+600m³	
Total	Approx. 58,400m³		

Storage Facility	Storage volume	Change from last report	Water level	Treated volume (1/5-1/12)	Cumulative treated volume
Process Main Building	Approx. 13,080m³	+410m³	T.P. 2,066 (O.P. 3,428)	Approx. 4,200m³ *5	Approx. 1,705,600m³ *5
High Temperature Incinerator Building	Approx. 3,190m³	+50m³	T.P. 387 (O.P. 1,833)		
Total	Approx. 16,270m³				

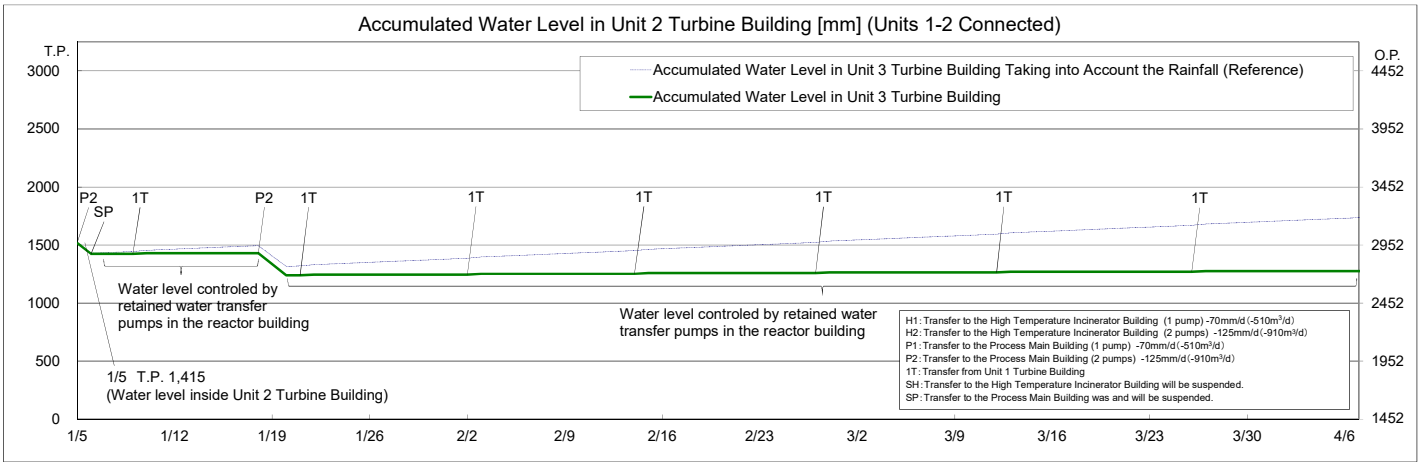
Waste produced		Change from last report	Storage capacity
Sludge	597m³	No Change	700m³ *2
Used vessels	3,471*6	+10m³	6,239

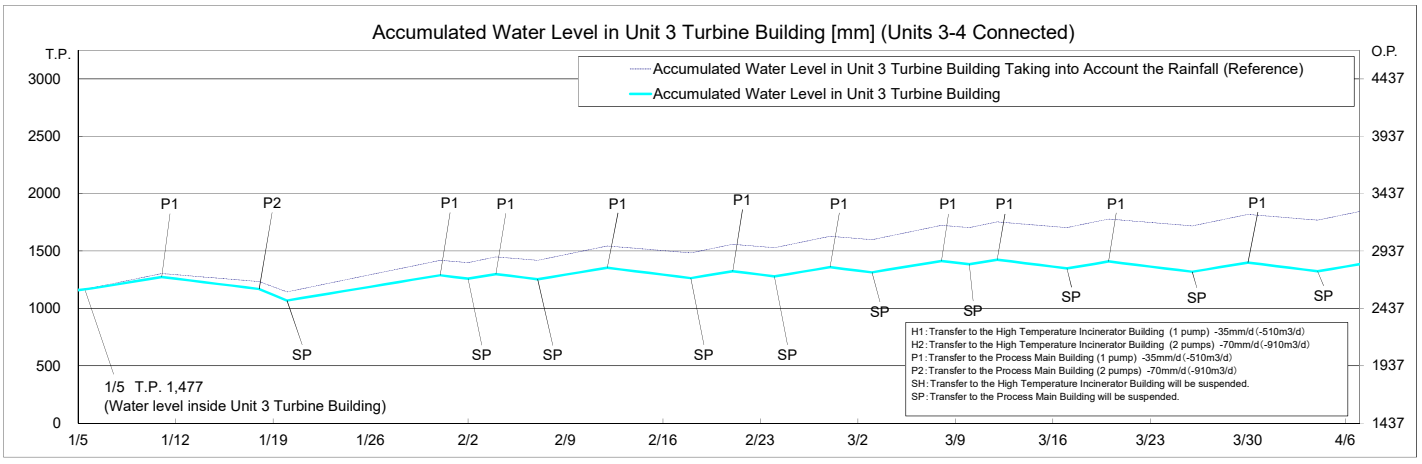
[Main operations that are planned to be conducted during the period from January 5, 2017 to January 12, 2017.]
- Water transfer from the Unit 1 Reactor Building to the Process Main Building will be conducted whenever necessary.
- Water transfer from the Unit 2 Reactor Building to the Process Main Building will be conducted whenever necessary.
- Water transfer from the Unit 2 Turbine Building to the Process Main Building will be conducted whenever necessary.
- Water transfer from the Unit 2 Radioactive Waste Treatment Facility to the Process Main Building will be conducted whenever necessary.
- Water transfer from the Unit 3 Turbine Building to the Process Main Building will be conducted whenever necessary.
- Water transfer from the Unit 1 Turbine Building to the Unit 1 Radioactive Waste Treatment Facility will be conducted.
- Operations of the Cesium Adsorption Apparatus will continue to be suspended.
- Operations of the 2nd Cesium Adsorption Apparatus will be conducted (assumed availability factor: 50%).

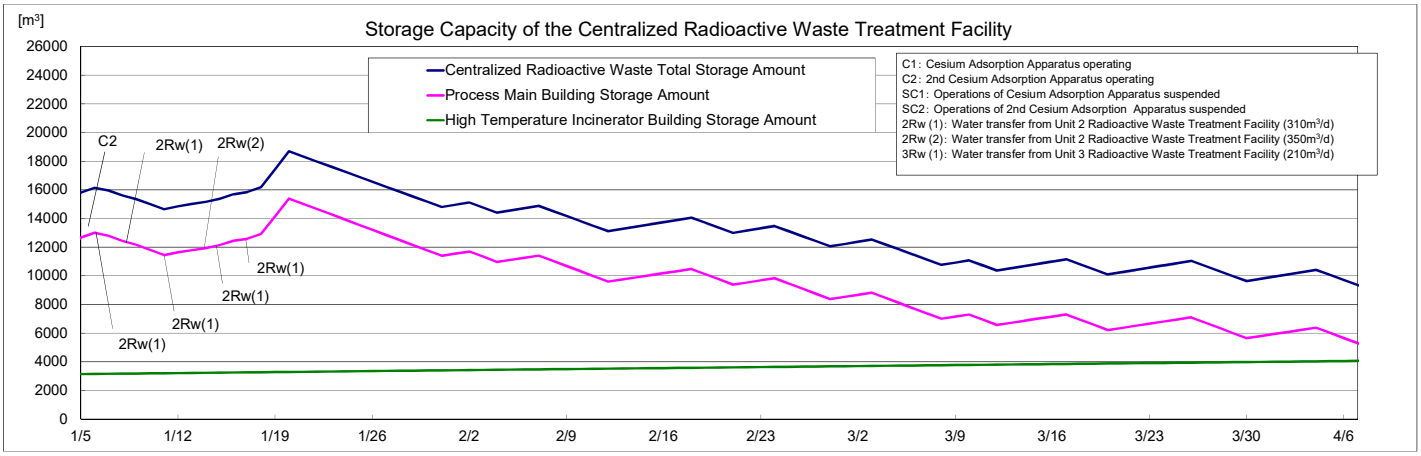
*1 The figures of "Storage volume" do not include those of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%.
*2 The figures of the data show the operational limits.
*3 The figures of "Storage capacity" do not include 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 (4,200m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (370,290m³)
2nd Cesium adsorption apparatus (1,335,310m³)
*6 Breakdown of the used vessels: Cesium adsorption apparatus (758)
2nd Cesium adsorption apparatus (180)
Others: Storage container (2,262), Treated column (9), Used vessels (197), Filters and so forth (65)

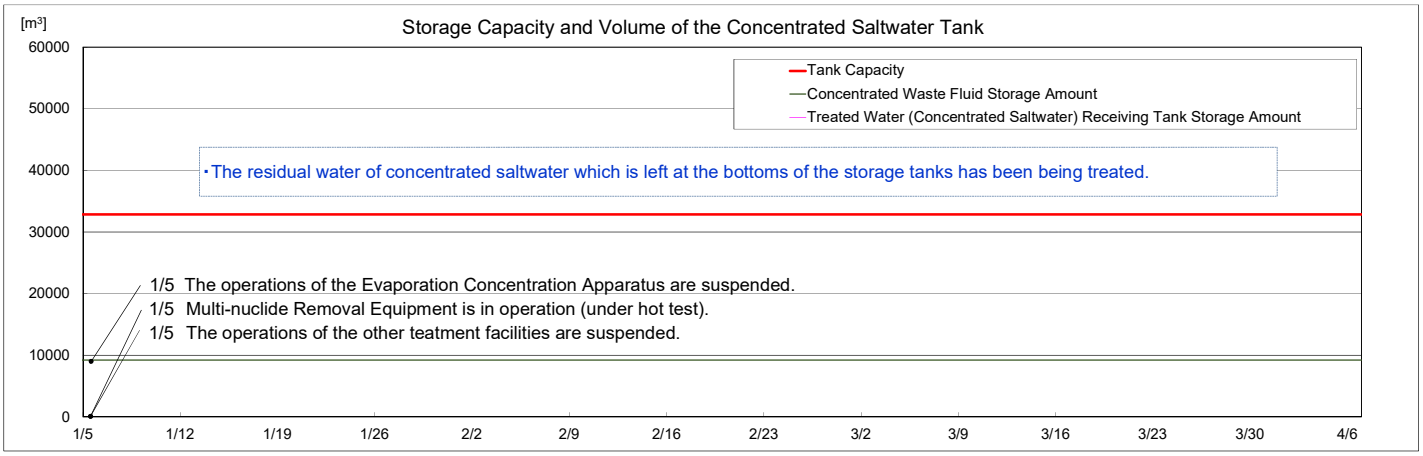
Simulation Results of Accumulated Water Treatment in Units 1-4 Turbine Buildings

Attachment-3









Note
- The amount of water treated through 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 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.