

Situation of Storage and Treatment of Accumulated Water including Highly Concentrated Radioactive Materials at Fukushima Daiichi Nuclear Power Station (432nd Release)

December 23, 2019

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 19, 2019 are shown in the Attachment -1.

3. Forecast of storing and treatment

(1) Short term forecast

Water transfer in Units 1 and 2 and Units 3 and 4 is planned based on the stored amount in the Accumulated Water Storing Facilities and the operating situation of the radioactive material treatment equipment and the subdrain catchment facility. 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 26, 2019 and January 2, 2020 are 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 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 specific water-level difference between accumulated water in the building around and subdrain water and making the lowest floor surface of buildings other than Units 1 to 3 reactor buildings where circulating water is injected into exposed by 2020.

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.

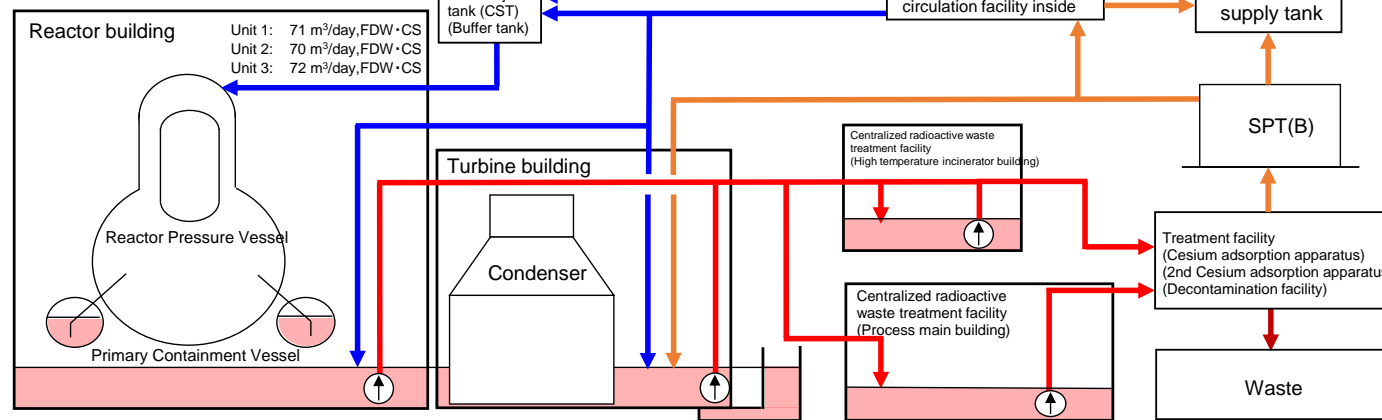
Also, the water treated at the radioactive material treatment equipment (fresh water and condensed salt water) can be stored in the middle and low level waste water tanks.

END

Storage and treatment of high level radioactive accumulated water (as of December 19, 2019)

Classification	
	High level radioactive water/ Waste, Concentrated waste liquid
	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 [m ³] (12/12-12/19)	Change from last report [m ³]
① Filtrate water	—
② Treated water (freshwater)	1,485 +37
Cumulative treated water	987,851



Storage volume [m ³] ^{*1,2}	Change from last report [m ³]	Storage capacity [m ³] ^{*3,4}
Concentrated saltwater receiving tank	0	—
Freshwater receiving tank	10,265 +658	24,600
Concentrated waste liquid storage tank	9,245	No Change
Strontium-treated water storage tank ^{*10}	1,091,429 +923	1,122,300
Sample water storage tank ^{*14}	6,933 +1,425	11,600
Treated water storage tank (Reuse) ^{*15}	0	No Change
Strontium-treated water storage tank ^{*10}	76,406 -669	114,400

Residual water [m ³] ^{*5}	Change from last report [m ³]	Storage capacity [m ³] ^{*3,4}
Concentrated saltwater tank	Approx.500	No Change
Treated water tank ^{*13}	Approx.100	No Change
Strontium-treated water tank ^{*11}	0	No Change

Storage volume [m ³]	Change from last report [m ³]	Storage volume [m ³]
Wastewater supply tank	695 +51	1,200
SPT(B)	1,556 +215	3,100

Chloride concentration	
Before/After Desalination	380ppm/<1ppm (Sampled on Nov 12, 2019)
Before/After Reverse Osmosis Circulation	280ppm/4ppm (Sampled on Oct 10, 2019)
Before/After Evaporative Concentration	—

Place of Sampling	Radioactivity concentration ^{*6}
Process Main Building	2.7E+07 Bq/L (Sampled on Nov 12, 2019)
Exit of cesium adsorption apparatus	3.8E+03 Bq/L (Sampled on Mar 22, 2019)
Exit of decontamination facility	—
High Temperature Incinerator Building	3.9E+07 Bq/L (Sampled on Jul 2, 2019)
Exit of second cesium adsorption apparatus	1.5E+02 Bq/L (Sampled on Nov 12, 2019)
Exit of third cesium adsorption apparatus	3.5E+02 Bq/L (Sampled on Aug 6, 2019)

Facility	Storage volume [m ³]	Change from last report	Water level in T/B ^{*8}
Unit 1	Approx.1,580	-80	—
Unit 2	Approx.4,070	-40	T.P.-1,266
Unit 3	Approx.4,050	-300	T.P.-1,220
Unit 4	Approx.3,560	-200 ^{*16}	T.P.-1,314
Total	Approx.13,260		

Storage facility	Storage volume [m ³]	Change from last report [m ³]	Water level ^{*8}	Treated volume (12/12-12/19)	Cumulative treated volume [m ³]	Waste produced	Change from last report	Storage capacity
Process Main Building	Approx.12,850	-1,250	T.P.2,163	Approx. 3,940 ^{*7}	Approx. 2,199,460 ^{*7}	Sludge [m ³]	No Change	700 ^{*3}
High Temperature Incinerator Building	Approx.3,220	+70	T.P.418			Used vessels	+10	6,372
Total	Approx.16,070					4,587 ^{*9}		

[Main operations that have been conducted during the period from December 12, 2019 to December 19, 2019]

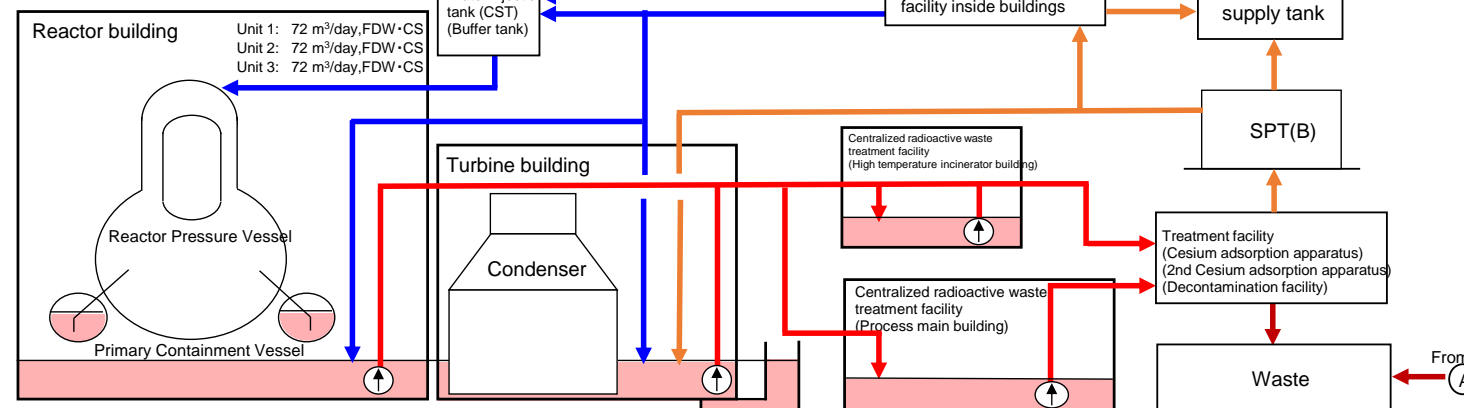
- Water transfer from the Units 1-4 to the buildings (Units 1-4, Centralized radioactive waste treatment facilities) and to the treatment facilities was conducted whenever necessary.
- Due to other works, water transfer to the buildings (Units 1-4, Centralized radioactive waste treatment facilities) was conducted whenever necessary.
- Operations of the Cesium Adsorption Apparatus have been suspended.
- Operations of the 2nd Cesium Adsorption Apparatus have continued to be conducted; the availability factor is 47% (previous simulated : 35%).
- Operations of the 3rd Cesium Adsorption Apparatus have been suspended.

*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. 1,100m³), Concentrated waste liquid storage tank (approx.100m³), Treated water storage tank (approx. 2,000m³), Strontium-treated water storage tank (approx. 400m³).
 *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 accommodates 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 and 3rd Cesium adsorption apparatus.
 Breakdown of the treated amount: Cesium adsorption apparatus (0m³)
 2nd Cesium adsorption apparatus (3,940m³)
 3rd Cesium adsorption apparatus (0m³)
 Breakdown of the cumulative treated amount: Cesium adsorption apparatus (394,720m³)
 2nd Cesium adsorption apparatus (1,788,760m³)
 3rd Cesium adsorption apparatus (15,980 m³)
 *8 The data of the water levels in the Reactor Buildings are the data as of 5 a.m., December 19.
 *9 Breakdown of the used vessels: Cesium adsorption apparatus (779), 2nd Cesium adsorption apparatus (222), 3rd Cesium adsorption apparatus (0)
 Others: Storage container (3,290), Treated column (11), Used vessel (218), Filters and so forth (65)
 *10 Volume of the Strontium-treated water stored in the welded-type tanks
 *11 Volume of the Strontium-treated water remaining in the frange-type tanks
 *12 Volume of the treated water stored in the welded-type tanks
 *13 Volume of the treated water remaining in the frange-type tanks
 *14 Volume of the treated water stored in the ALPS sample tanks (frange-type), the additional ALPS temporary storage tanks (welded-type) and the high performance ALPS temporary storage tanks (welded-type)
 *15 Volume of the treated water stored in the reuse welded-type tanks which stored strontium-treated water before.
 (These welded-type tanks have been reused from 2019).
 *16 Decrease of the Unit 4 seawater piping trench: Approx. 30m³

Storage and treatment of high level radioactive accumulated water (as of December 26, 2019)

Classification	
	High level radioactive water/ Waste, Concentrated waste liquid
	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 [m ³] (12/19-12/26)	Change from last report [m ³]
① Filtrate water	-
② Treated water (freshwater)	+27
Cumulative treated water	989,363



Storage volume [m ³] ^{*1}	Change from last report [m ³]	Storage capacity [m ³] ^{*2,3}
Concentrated saltwater receiving tank	0	-
Freshwater receiving tank	10,238	-27
Concentrated waste liquid storage tank	9,245	No Change
Treated water storage tank ^{*9}	1,093,046	+1,617
Sample water storage tank ^{*11}	9,166	+2,233
Treated water storage tank (Reuse) ^{*12}	0	No Change
Strontium-treated water storage tank ^{*7}	75,874	-532

Residual water [m ³] ^{*4}	Change from last report [m ³]	Storage capacity ^{*2,3}
Concentrated saltwater receiving tank	Approx. 500	No Change
Treated water tank ^{*10}	Approx. 100	No Change
Strontium-treated water tank ^{*8}	0	No Change

Facility	Storage volume [m ³]	Change from last report	Water level in T/B
Unit 1	Approx. 1,600	+20	T.P. -1,266 (Unit 2 T/B)
Unit 2	Approx. 4,070	No Change	
Unit 3	Approx. 4,050	No Change	T.P. -1,220 (Unit 3 T/B)
Unit 4	Approx. 2,250	-1,310	
Total	Approx. 11,970		

Storage Facility	Storage volume [m ³]	Change from last report [m ³]	Water level	Treated volume (12/19-12/26)	Cumulative treated volume [m ³]	Waste produced	Change from last report	Storage capacity
Process Main Building	Approx. 12,700	-150	T.P. 2,098	Approx. 4,620	Approx. 2,204,080	Sludge [m ³]	597	No Change
High Temperature Incinerator Building	Approx. 3,280	+60	T.P. 463	^{*7}	^{*7}	Used vessels	4,595 ^{*6}	+8
Total	Approx. 15,980							700 ^{*2}
								6,372

[Main operations that are planned to be conducted during the period from December 19, 2019 to December 26, 2019]

- Water transfer from the Units 1-4 to the buildings (Units 1-4, Centralized radioactive waste treatment facilities) and to the treatment facilities will be conducted whenever necessary.
- Due to other works, water transfer to the buildings (Units 1-4, Centralized radioactive waste treatment facilities) will be conducted whenever necessary.
- Operations of the Cesium Adsorption Apparatus will continue to be suspended.
- Operations of the 2nd Cesium Adsorption Apparatus will continue to be conducted (assumed availability factor : 55%).
- Operations of the 3rd Cesium Adsorption Apparatus will continue to be suspended.
- Storage capacity of treated water will be changed as operations of new tanks started.

^{*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 accommodates 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 salt water 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 and 3rd Cesium adsorption apparatus
 Breakdown of the treated amount: Cesium adsorption apparatus (0m³)
 2nd Cesium adsorption apparatus (4,620m³)
 3rd Cesium adsorption apparatus (0m³)
 Breakdown of the cumulative treated amount: Cesium adsorption apparatus (394,720m³)
 2nd Cesium adsorption apparatus (1,793,380m³)
 3rd Cesium adsorption apparatus (15,980m³)

^{*6} Breakdown of the used vessels: Cesium adsorption apparatus (779)
 2nd Cesium adsorption apparatus (224)
 3rd Cesium adsorption apparatus (0)
 Others: Storage container (3,298), Treated column (11), Used vessels (218), Filters and so forth (65)

^{*7} Volume of the Strontium-treated water stored in the welded-type tanks

^{*8} Volume of the Strontium-treated water remaining in the frange-type tanks

^{*9} Volume of the treated water stored in the welded-type tanks

^{*10} Volume of the treated water remaining in the frange-type tanks

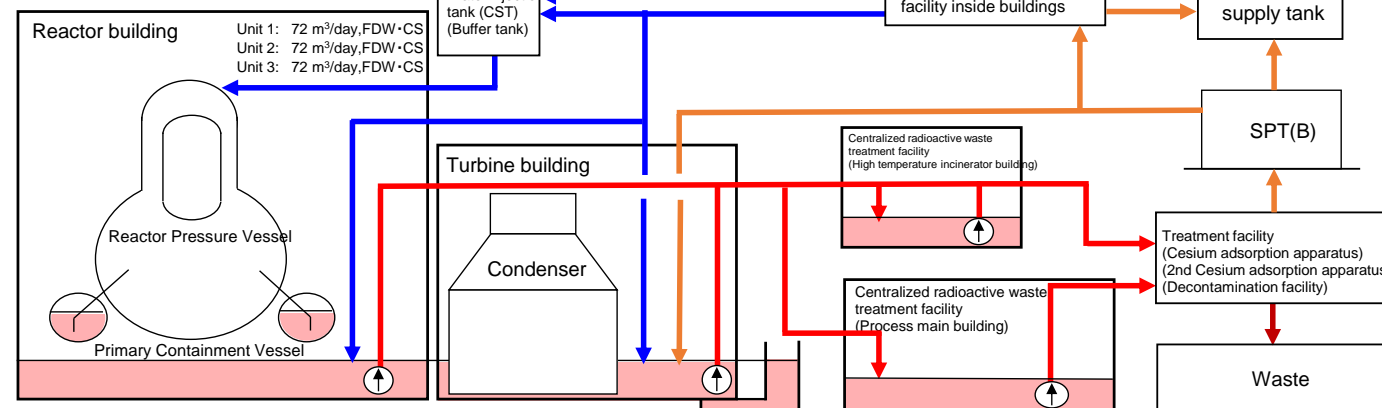
^{*11} Volume of the treated water stored in the ALPS sample tanks (frange-type), the additional ALPS temporary storage tanks (welded-type) and the high performance ALPS temporary storage tanks (welded-type)

^{*12} Volume of the treated water stored in the reuse welded-type tanks which stored strontium-treated water before. (These welded-type tanks have been reused from 2019.)

Storage and treatment of high level radioactive accumulated water (as of January 2, 2020)

Classification	
	High level radioactive water/ Waste, Concentrated waste liquid
	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 (m ³) (12/26-1/2)	Change from last report (m ³)
① Filtrate water	—
② Treated water (freshwater)	1,512 No Change
Cumulative treated water	990,875



Storage volume [m ³] ^{*1}	Change from last report [m ³]	Storage capacity [m ³] ^{*2,3}
Concentrated saltwater receiving tank	0	-
Freshwater receiving tank	10,238 No Change	24,600
Concentrated waste liquid storage tank	9,245 No Change	10,300
Treated water storage tank *9	1,099,620 +6,574	1,126,200
Sample water storage tank *11	8,215 -951	11,600
Treated water storage tank (Reuse) *12	0 No Change	5,900
Strontium-treated water storage tank *7	73,207 -2,667	114,400

Residual water [m ³] ^{*4}	Change from last report [m ³]	Storage capacity ^{*2,3}
Concentrated saltwater receiving tank	Approx. 500 No Change	Approx. 2,100
Treated water tank *10	Approx. 100 No Change	Approx. 1,100
Strontium-treated water tank *8	0 No Change	0

Facility	Storage volume [m ³]	Change from last report	Water level in T/B
Unit 1	Approx. 1,600	No Change	T.P. -1,266 (Unit 2 T/B)
Unit 2	Approx. 4,070	No Change	
Unit 3	Approx. 4,060	+ 10	T.P. -1,220 (Unit 3 T/B)
Unit 4	Approx. 2,250	No Change	
Total	Approx. 11,980		

Storage Facility	Storage volume [m ³]	Change from last report [m ³]	Water level	Treated volume (12/26-1/2)	Cumulative treated volume [m ³]	Waste produced		Change from last report	Storage capacity
						Sludge [m ³]	Used vessels		
Process Main Building	Approx. 11,390	-1,310	T.P. 1,538	Approx. 4,200	Approx. 2,208,280	597	6,372	No Change	700 *2
High Temperature Incinerator Building	Approx. 3,290	+ 10	T.P. 474	*7	*7	4,607 *6	6,372	+ 12	6,372
Total	Approx. 14,680								

*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 accommodates 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 salt water 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 and 3rd Cesium adsorption apparatus
 Breakdown of the treated amount: Cesium adsorption apparatus (0m³)
 2nd Cesium adsorption apparatus (4,200m³)
 3rd Cesium adsorption apparatus (0m³)
 Breakdown of the cumulative treated amount: Cesium adsorption apparatus (394,720m³)
 2nd Cesium adsorption apparatus (1,797,580m³)
 3rd Cesium adsorption apparatus (15,980m³)

*6 Breakdown of the used vessels: Cesium adsorption apparatus (779)
 2nd Cesium adsorption apparatus (224)
 3rd Cesium adsorption apparatus (0)
 Others: Storage container (3,310), Treated column (11), Used vessels (218), Filters and so forth (65)

*7 Volume of the Strontium-treated water stored in the welded-type tanks

*8 Volume of the Strontium-treated water remaining in the frange-type tanks

*9 Volume of the treated water stored in the welded-type tanks

*10 Volume of the treated water remaining in the frange-type tanks

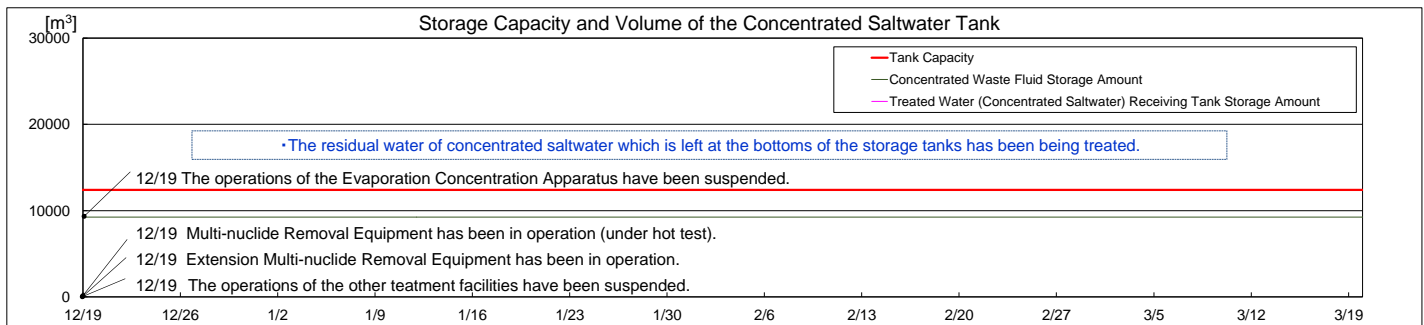
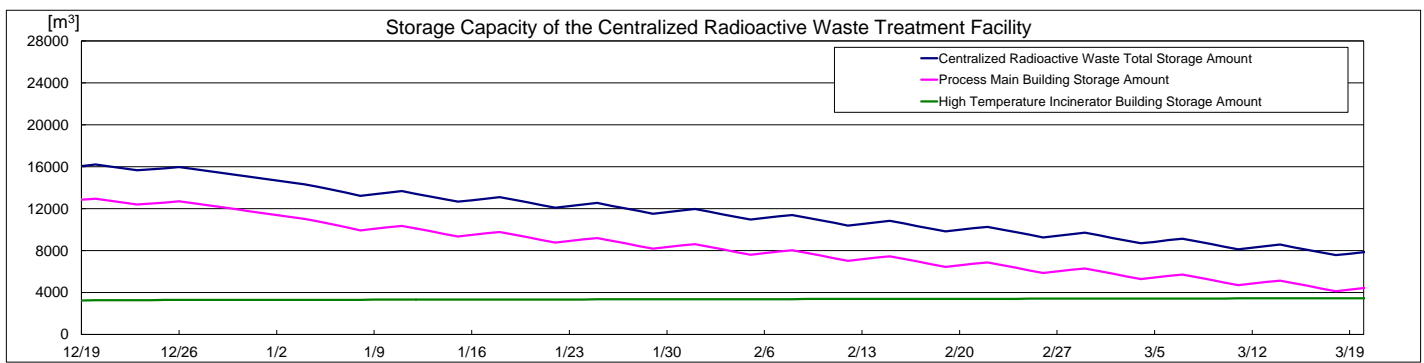
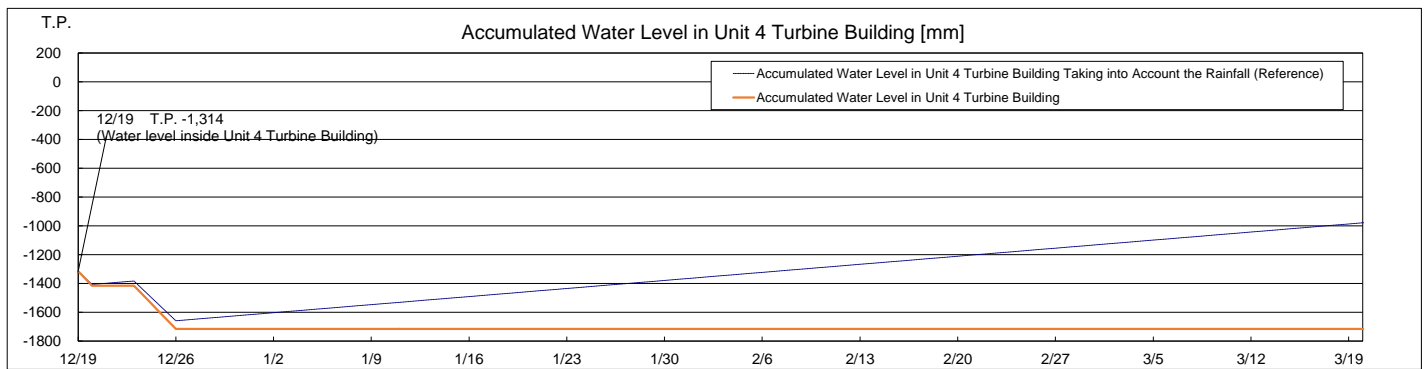
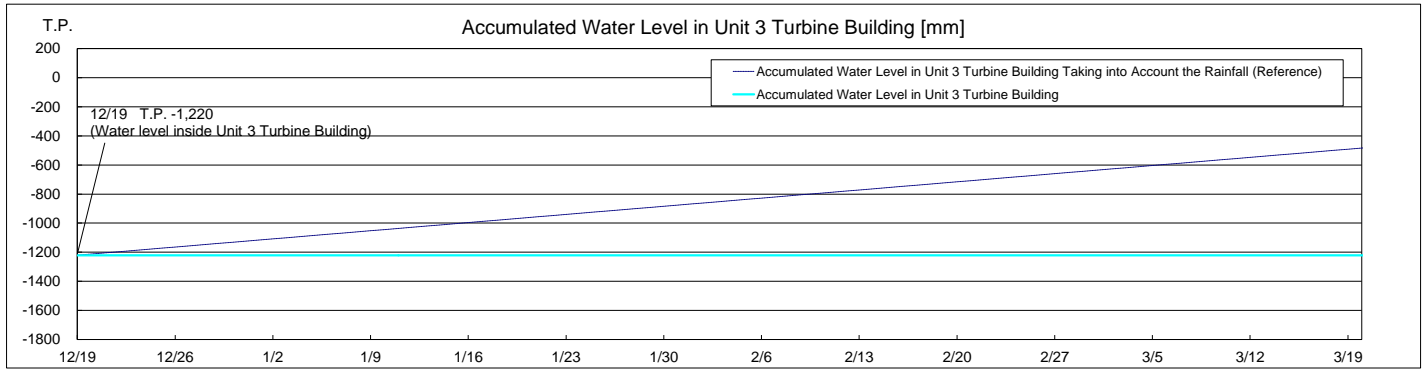
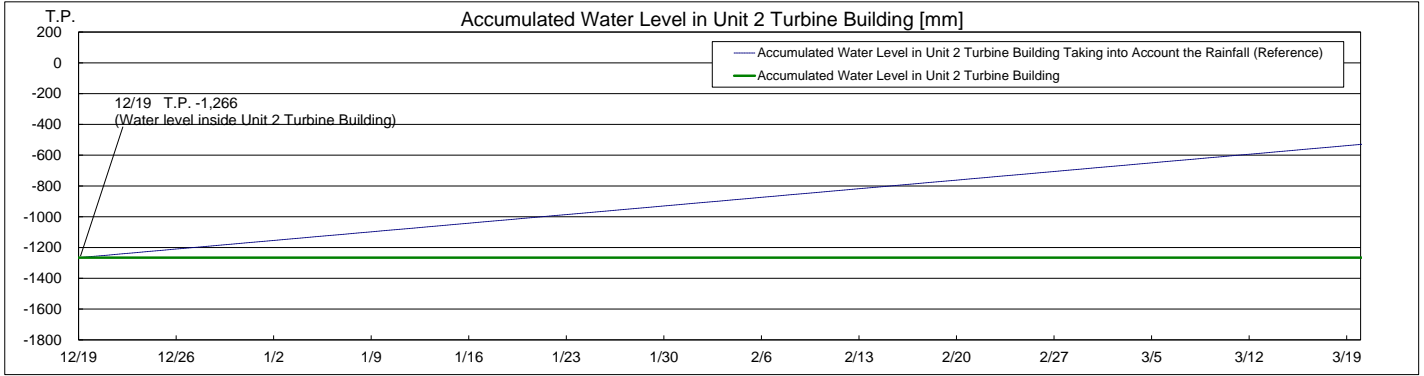
*11 Volume of the treated water stored in the ALPS sample tanks (frange-type), the additional ALPS temporary storage tanks (welded-type) and the high performance ALPS temporary storage tanks (welded-type)

*12 Volume of the treated water stored in the reuse welded-type tanks which stored strontium-treated water before. (These welded-type tanks have been reused from 2019.)

[Main operations that are planned to be conducted during the period from December 26, 2019 to January 2, 2020]

- Water transfer from the Units 1-4 to the buildings (Units 1-4, Centralized radioactive waste treatment facilities) and to the treatment facilities will be conducted whenever necessary.
- Due to other works, water transfer to the buildings (Units 1-4, Centralized radioactive waste treatment facilities) will be conducted whenever necessary.
- Operations of the Cesium Adsorption Apparatus will continue to be suspended.
- Operations of the 2nd Cesium Adsorption Apparatus will continue to be conducted (assumed availability factor : 50%).
- Operations of the 3rd Cesium Adsorption Apparatus will continue to be suspended.

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



- 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, 3 and 4 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, 3 and 4 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 8mm 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 2015 to 2017.
 - Unit 2 Turbine Building water level is controlled by retained water transfer pumps in the Unit 2 reactor building.
 - Unit 3 Turbine Building water level is controlled by retained water transfer pumps in the Unit 3 turbine building.
 - Unit 4 Turbine Building water level is controlled by retained water transfer pumps in the Unit 4 turbine building.