Situation of Storage and Treatment of Accumulated Water containing Highly Concentrated Radioactive Materials at Fukushima Daiichi Nuclear Power Station (450th Release)

May 13, 2020

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 containing 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 April 30, 2020 and May 7, 2020 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 May 14, 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.

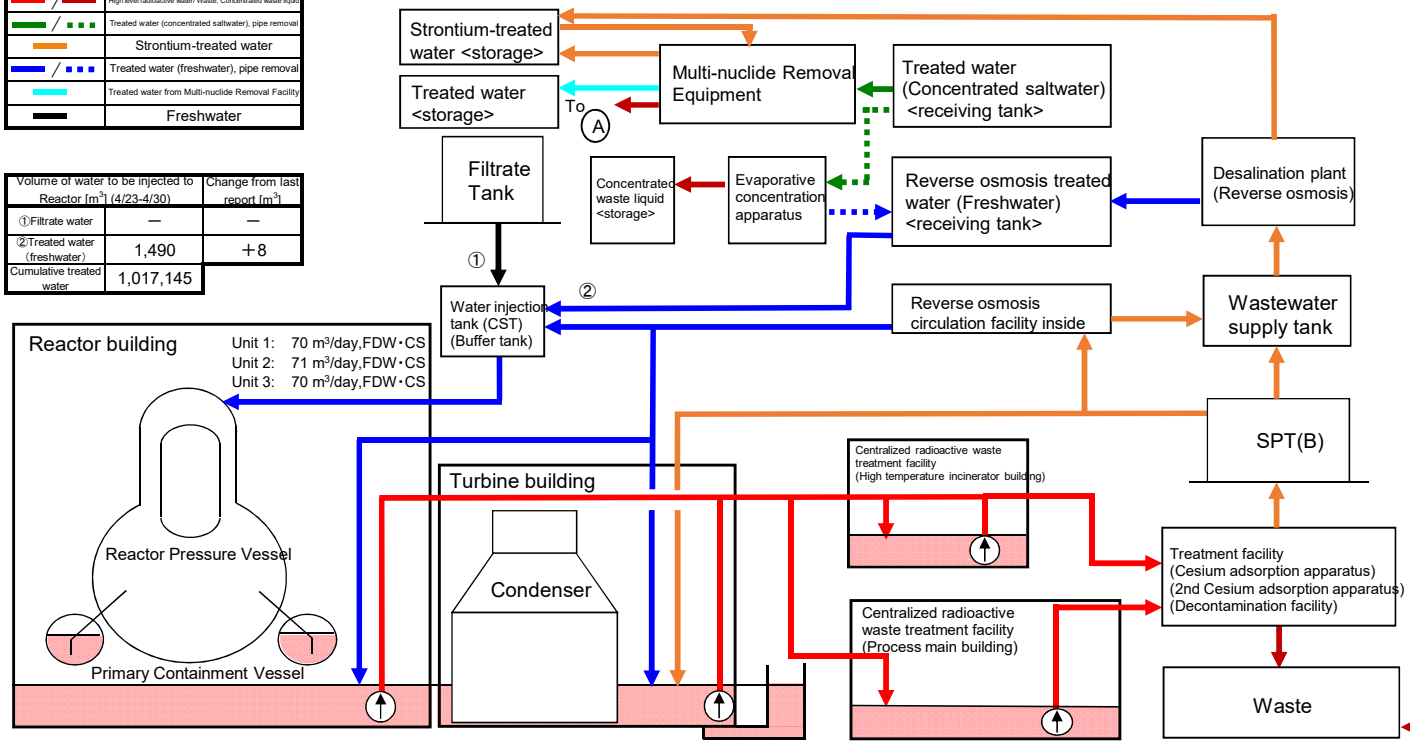
Stored amounts in each building and the water storage equipment are forecasted to be unchanged in case transfer and treatment were implemented as scheduled without rain. However, it would be subject to change depending on the operation factor of the radioactive material treatment instruments and so on.

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 April 30, 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 [m³] (4/23-4/30)		Change from last report [m³]
①Filtrate water	—	—
②Treated water (freshwater)	1,490	+8
Cumulative treated water	1,017,145	

Storage volume [m³] *1,2		Change from last report [m³]	Storage capacity [m³] *3,4
Concentrated saltwater receiving tank	0	—	—
Freshwater receiving tank	8,011	+167	24,600
Concentrated waste liquid storage tank	9,257	+12	10,300
Treated water storage tank *12	1,137,125	+3,778	1,163,300
Sample water storage tank *14	7,162	+762	11,600
Treated water storage tank (Reuse) *15	3,643	No Change	12,600
Strontium-treated water storage tank *10	52,668	−2,876	109,000

Residual water [m³] *5		Change from last report [m³]	Storage capacity [m³] *3,4
Concentrated saltwater tank	Approx.500	No Change	2100
Treated water tank *13	Approx.100	No Change	1100
Strontium-treated water tank *11	0	No Change	0

Storage volume [m³]		Change from last report [m³]	orage volume [m³]
Wastewater supply tank	790	+135	1,200
SPT(B)	1,277	+306	3,100

	Chloride concentration
Before/After Desalination	380ppm/<1ppm (Sampled on Nov 12, 2019)
Before/After Reverse Osmosis Circulation	480ppm/3ppm (Sampled on Feb 6, 2020)
Before/After Evaporative Concentration	–

Place of Sampling	Radioactivity concentration *6
Process Main Building	2.3E+07 Bq/L (Sampled on Mar 3, 2020)
Exit of cesium adsorption apparatus	3.8E+03 Bq/L (Sampled on Mar 22, 2019)
Exit of decontamination facility	—
High Temperature Incinerator Building	3.4E+07 Bq/L (Sampled on Feb 4, 2020)
Exit of second cesium adsorption apparatus	1.7E+02 Bq/L (Sampled on Mar 3, 2020)
Exit of third cesium adsorption apparatus	4.0E+02 Bq/L (Sampled on Mar 3, 2020)

Facility	Storage volume [m³]	Change from last report	Water level in T/B *8
Unit 1	Approx.1,290	No Change	—
Unit 2	Approx.3,260	−30	T.P.−1,288
Unit 3	Approx.2,940	−480	T.P.−1,465
Unit 4	Approx.1,660	−80	Under T.P.−1,479
Total	Approx.9,150		

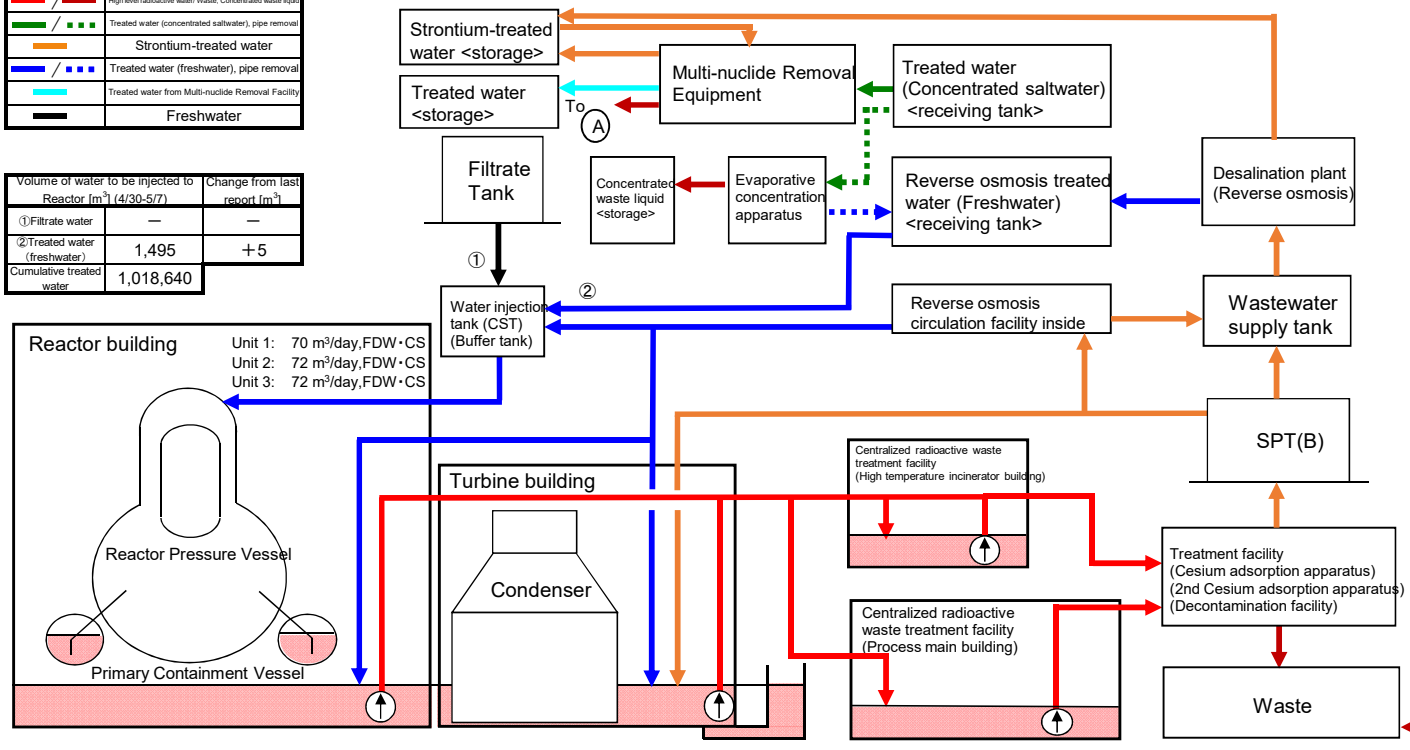
Storage facility	Storage volume [m³]	Change from last report [m³]	Water level *8	Treated volume (4/23-4/30)	Cumulative treated volume [m³]	Waste produced		Change from last report	Storage capacity
Process Main Building	Approx.9,000	−900	T.P.804	Approx. 3,540 *7	Approx. 2,265,510 *7	Sludge [m³]	417 *16	No Change	700 *3
High Temperature Incinerator Building	Approx.3,190	+40	T.P.390			Used vessels	4,750 *9	+10	6,372
Total	Approx.12,190								

[Main operations that have been conducted during the period from April 23, 2020 to April 30, 2020]
- Water transfer from the Units 1-4 to the buildings (Units 1-4, Centrailzed 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, Centrailzed radioactive waste rteatment facilities) was conducted whenever necessary.
- Operations of the Cesium Adsorption Apparatus have been suspended.
- From April 23, operations of the 2nd Cesium Adsorption Apparatus have been resumed; the availability factor is 42% (previous simulated : 40%).
- Operations of the 3rd Cesium Adsorption Apparatus have been suspended.
- Storage capacity of treated water was changed as operations of new tanks started.

*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. 2,100m³)
Treated water storage tank (reuse) (approx. 0m³), 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 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 and 3rd Cesium adsorption apparatus.
Breakdown of the treated amount: Cesium adsorption apparatus (0m³)
2nd Cesium adsorption apparatus (3,540m³)
3rd Cesium adsorption apparatus (0m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (394,720m³)
2nd Cesium adsorption apparatus (1,830,640m³)
3rd Cesium adsorption apparatus (40,150 m³)
*8 The data of the water levels in the Reactor Buildings are the data as of 5 a.m., April 30.
*9 Breakdown of the used vessels: Cesium adsorption apparatus (779), 2nd Cesium adsorption apparatus (230), 3rd Cesium adsorption apparatus (2)
Others: Storage container (3,436), Treated column (17), Used vessel (221), Filiters 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 resued from 2019.)
*16 Sum of sludge and supernatant water (as of 10 a.m., April 30)

Storage and treatment of high level radioactive accumulated water (as of May 7, 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 [m³] (4/30-5/7)		Change from last report [m³]
①Filtrate water	—	—
②Treated water (freshwater)	1,495	+5
Cumulative treated water	1,018,640	

Storage volume [m³] *1,2		Change from last report [m³]	Storage capacity [m³] *3,4
Concentrated saltwater receiving tank	0	—	—
Freshwater receiving tank	8,345	+334	24,600
Concentrated waste liquid storage tank	9,257	No Change	10,300
Treated water storage tank *12	1,142,121	+4,996	1,163,300
Sample water storage tank *14	6,433	−729	11,600
Treated water storage tank (Reuse) *15	4,089	+446	12,600
Strontium-treated water storage tank *10	49,752	−2,916	109,000

Residual water [m³] *5		Change from last report [m³]	Storage capacity [m³] *3,4
Concentrated saltwater tank	Approx.500	No Change	2100
Treated water tank *13	Approx.100	No Change	1100
Strontium-treated water tank *11	0	No Change	0

Storage volume [m³]		Change from last report [m³]	orage volume [m³]
Wastewater supply tank	933	+143	1,200
SPT(B)	1,542	+265	3,100

	Chloride concentration
Before/After Desalination	380ppm/<1ppm (Sampled on Nov 12, 2019)
Before/After Reverse Osmosis Circulation	480ppm/3ppm (Sampled on Feb 6, 2020)
Before/After Evaporative Concentration	–

Place of Sampling	Radioactivity concentration *6
Process Main Building	2.3E+07 Bq/L (Sampled on Mar 3, 2020)
Exit of cesium adsorption apparatus	3.8E+03 Bq/L (Sampled on Mar 22, 2019)
Exit of decontamination facility	–
High Temperature Incinerator Building	3.4E+07 Bq/L (Sampled on Feb 4, 2020)
Exit of second cesium adsorption apparatus	1.7E+02 Bq/L (Sampled on Mar 3, 2020)
Exit of third cesium adsorption apparatus	4.0E+02 Bq/L (Sampled on Mar 3, 2020)

Facility	Storage volume [m³]	Change from last report	Water level in T/B *8
Unit 1	Approx.1,300	+10	—
Unit 2	Approx.3,380	+120	T.P.−1,236
Unit 3	Approx.3,310	+370	T.P.−1,328
Unit 4	Approx.1,680	+20	Under T.P.−1,479
Total	Approx.9,670		

Storage facility	Storage volume [m³]	Change from last report [m³]	Water level *8	Treated volume (4/30-5/7)	Cumulative treated volume [m³]
Process Main Building	Approx.7,120	−1,880	T.P.262	Approx. 3,700 *7	Approx. 2,269,210 *7
High Temperature Incinerator Building	Approx.3,210	+20	T.P.406		
Total	Approx.10,330				

Waste produced		Change from last report	Storage capacity
Sludge [m³]	417 *16	No Change	700 *3
Used vessels	4,759 *9	+9	6,372

[Main operations that have been conducted during the period from April 30, 2020 to May 7, 2020]
- Water transfer from the Units 1-4 to the buildings (Units 1-4, Centrailzed 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, Centrailzed radioactive waste rteatment 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 44% (previous simulated : 45%).
- Operations of the 3rd Cesium Adsorption Apparatus have been suspended.

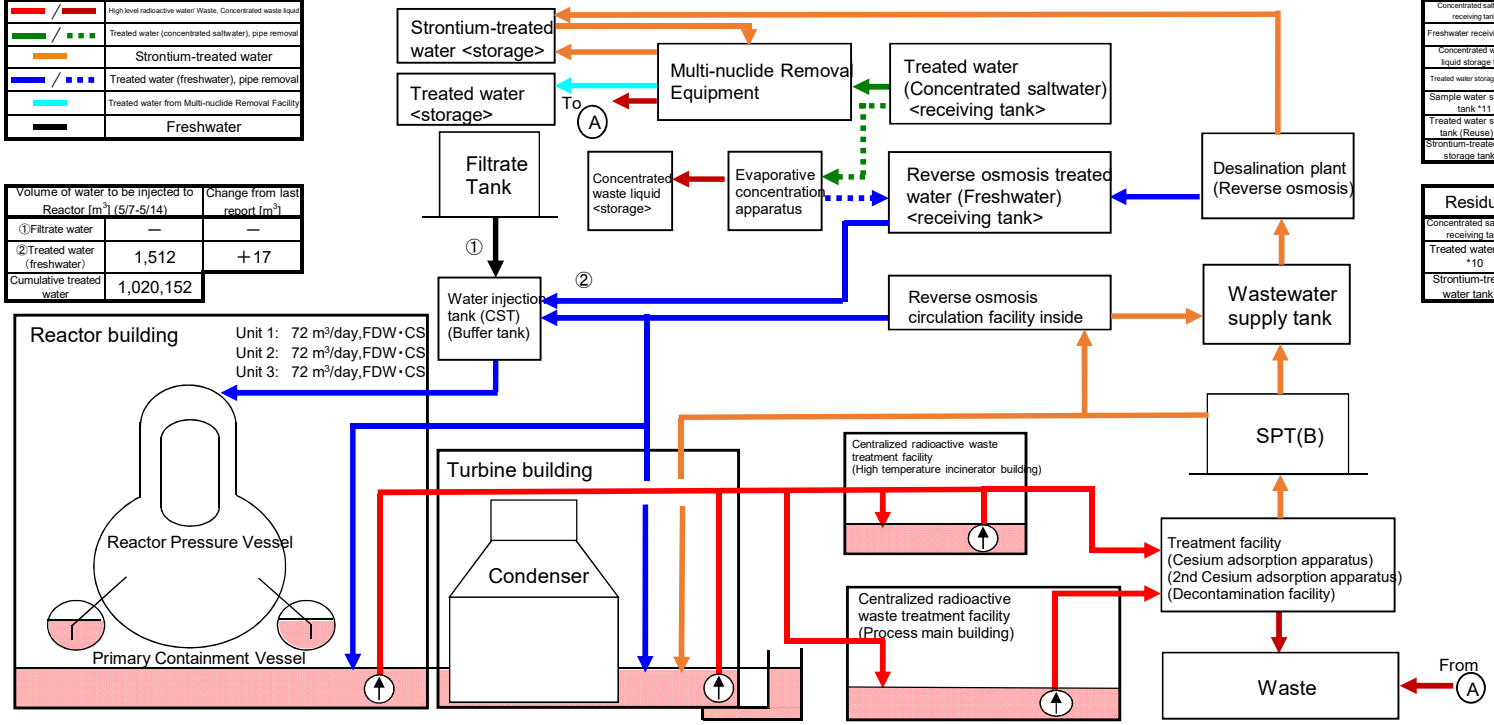
*1 The figures of the data are treated as a reference, because water levels during water transfer are not stable.
*2 The figures of the storage volume do not include those of the following volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%:
Freshwater receiving tank (approx. 1,100m³), Concentrated waste liquid storage tank (approx.100m³), Treated water storage tank (approx. 2,100m³)
Treated water storage tank (reuse) (approx. 0m³), 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 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 and 3rd Cesium adsorption apparatus.
Breakdown of the treated amount: Cesium adsorption apparatus (0m³)
2nd Cesium adsorption apparatus (3,700m³)
3rd Cesium adsorption apparatus (0m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (394,720m³)
2nd Cesium adsorption apparatus (1,834,340m³)
3rd Cesium adsorption apparatus (40,150 m³)
*8 The data of the water levels in the Reactor Buildings are the data as of 5 a.m., May 7.
*9 Breakdown of the used vessels: Cesium adsorption apparatus (779), 2nd Cesium adsorption apparatus (230), 3rd Cesium adsorption apparatus (2)
Others: Storage container (3,445), Treated column (17), Used vessel (221), Filiters 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 resued from 2019.)
*16 Sum of sludge and supernatant water (as of 10 a.m., May 7)

Attachment-2

Storage and treatment of high level radioactive accumulated water (as of May 14, 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 [m³] (5/7-5/14)		Change from last report [m³]
①Filtrate water	—	—
②Treated water (freshwater)	1,512	+17
Cumulative treated water	1,020,152	



Storage volume [m³] *1		Change from last report [m³]	Storage capacity [m³] *2,3
Concentrated saltwater receiving tank	0	-	-
Freshwater receiving tank	8,328	−17	24,600
Concentrated waste liquid storage tank	9,257	No Change	10,300
Treated water storage tank *9	1,144,354	+2,233	1,163,300
Sample water storage tank *11	9,516	+3,083	11,600
Treated water storage tank (Reuse) *12	4,089	No Change	12,600
Strontium-treated water storage tank *7	44,875	−4,877	109,000

Residual water [m³] *4		Change from last report [m³]	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 [m³]	Change from last report	Water level in T/B
Unit 1	Approx.1,310	+10	-
Unit 2	Approx.3,340	−40	T.P.−1,236
Unit 3	Approx.2,800	−510	T.P.−1,573
Unit 4	Approx.1,580	−100	Under T.P.−1,479
Total	Approx.9,030		

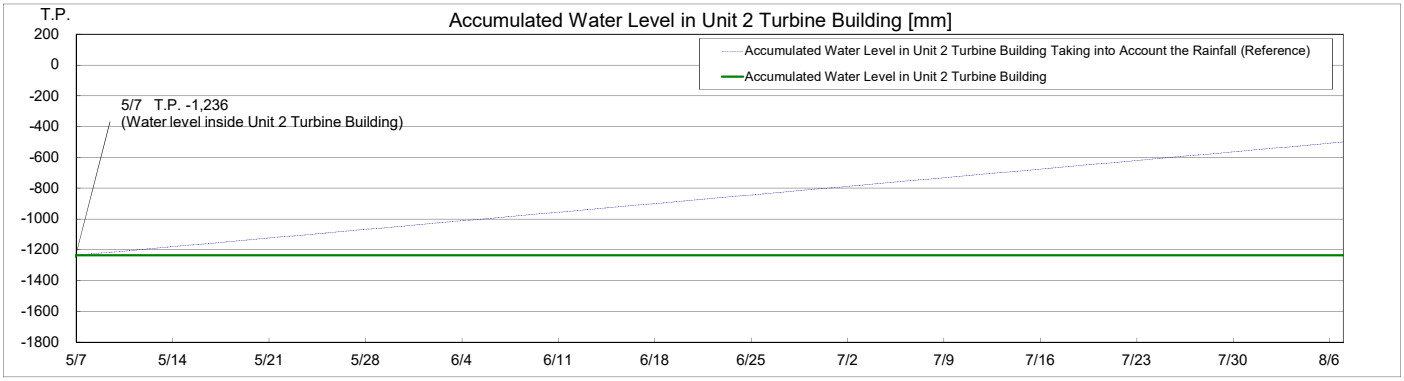
Storage Facility	Storage volume [m³]	Change from last report [m³]	Water level	Treated volume (5/7-5/14)	Cumulative treated volume [m³]
Process Main Building	Approx.8,220	+1,100	T.P.590	Approx. 1,680 *5	Approx. 2,270,890 *5
High Temperature Incinerator Building	Approx.3,130	−80	T.P.343		
Total	Approx.11,350				

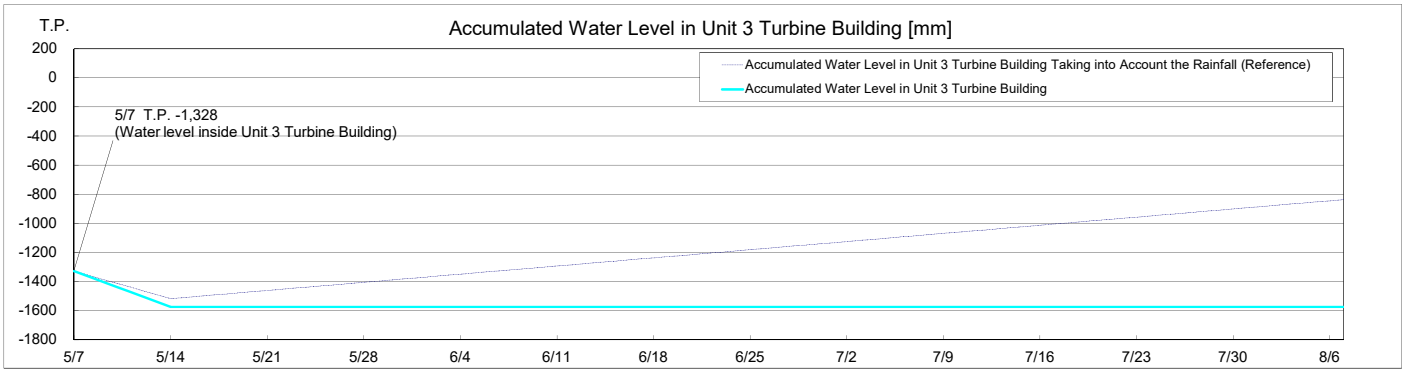
Waste produced		Change from last report	Storage capacity
Sludge [m³]	417	No Change	700 *2
Used vessels	4,770 *6	+11	6,372

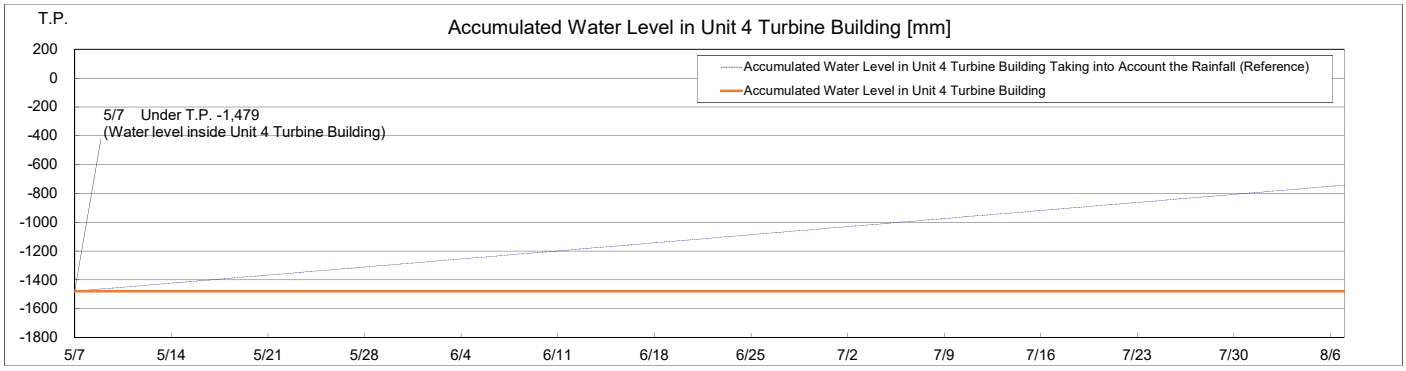
[Main operations that are planned to be conducted during the period from May 7, 2020 to May 14, 2020]
- Water transfer from the Units 1-4 to the buildings (Units 1-4, Centrailzed radioactive waste treatment facilities) and to the treatment facilities will be conducted whenever necessary.
- Due to other works, water transfer to the buildings (Units 1-4, Centrailzed radioactive waste rteatment 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 be conducted (assumed availability factor : 20%).
- Operations of the 3rd Cesium Adsorption Apparatus will continue to be suspended.

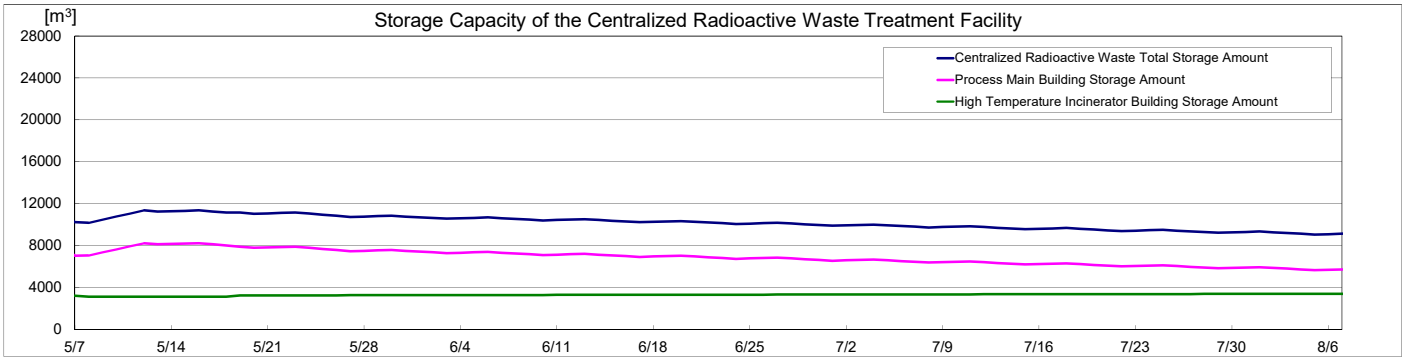
*1 The figures of "Storage volume" do not include those of the volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%.
*2 The figures of the data show the operational limits.
*3 The figures of "Storage capacity" do not include 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 and 3rd Cesium adsorprion apparatus
Breakdown of the treated amount: Cesium adsorption apparatus (0m³)
2nd Cesium adsorption apparatus (1,680m³)
3rd Cesium adsorption apparatus (0m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (394,720m³)
2nd Cesium adsorption apparatus (1,836,020m³)
3rd Cesium adsorption apparatus (40,150m³)
*6 Breakdown of the used vessels: Cesium adsorption apparatus (779)
2nd Cesium adsorption apparatus (230)
3rd Cesium adsorption apparatus (2)
Others: Storage container (3,456), Treated column (17), Used vessels (221), 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.)

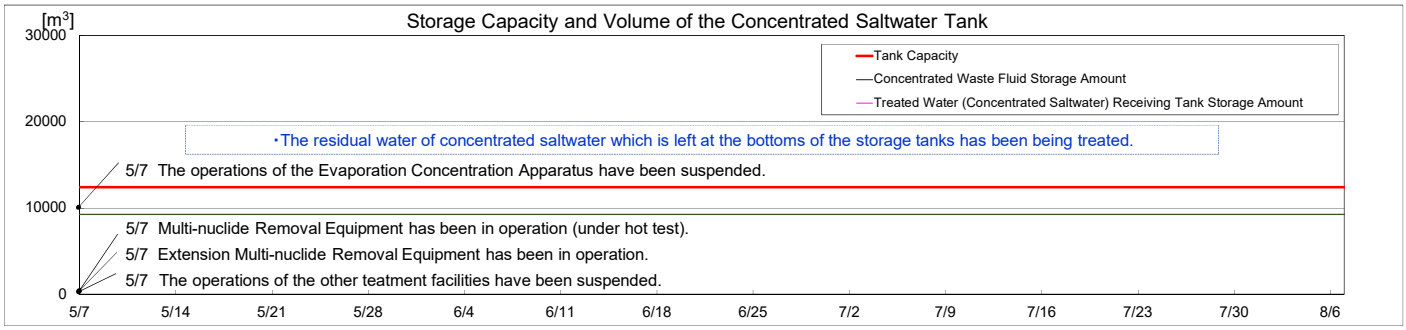
Simulation Results of Accumulated Water Treatment in Units 1-4 Turbine Buildings











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 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 controled by retained water transfer pumps in the Unit 2 reactor building.
- Unit 3 Turbine Building water level is controled by retained water transfer pumps in the Unit 3 turbine building.
- Unit 4 Turbine Building water level is controled by retained water transfer pumps in the Unit 4 turbine building.