Situation of Storage and Treatment of Accumulated Water containing Highly Concentrated Radioactive Materials at Fukushima Daiichi Nuclear Power Station (599th Release)

May 11, 2023

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 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 (Unit 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 27, 2023 and May 4, 2023 are shown in the Attachment -1.

3. Forecast of storing and treatment

(1) Short term forecast

Water transfer in Unit 1 and 2 and Unit 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 (Unit 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 11, 2023 are shown in Attachment -2.

(2) Middle term forecast

Regarding accumulated water in Unit 1 and 2 buildings and Unit 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.

At the same time, in order to suppress the flow of groundwater into buildings and reduce the amount of accumulated water being generated, we are planning to transfer accumulated water from the Unit 1 to 3 reactor buildings, where injected cooling water is being circulated, in accordance with the status of the treatment of accumulated water containing highly concentrated radioactive materials and the amount of water being stored in accumulated water storage facilities, while ensuring a specific difference between the levels of accumulated water in buildings and the water levels of subdrains in the vicinity. At other buildings where the lowermost floors have been exposed, we are planning to transfer accumulated water to keep these floor surfaces exposed.

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 storing and treatment situations in the Accumulated Water Storing Facilities for the next 3 months, as shown in Attachment -3.

Stored amounts in 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.

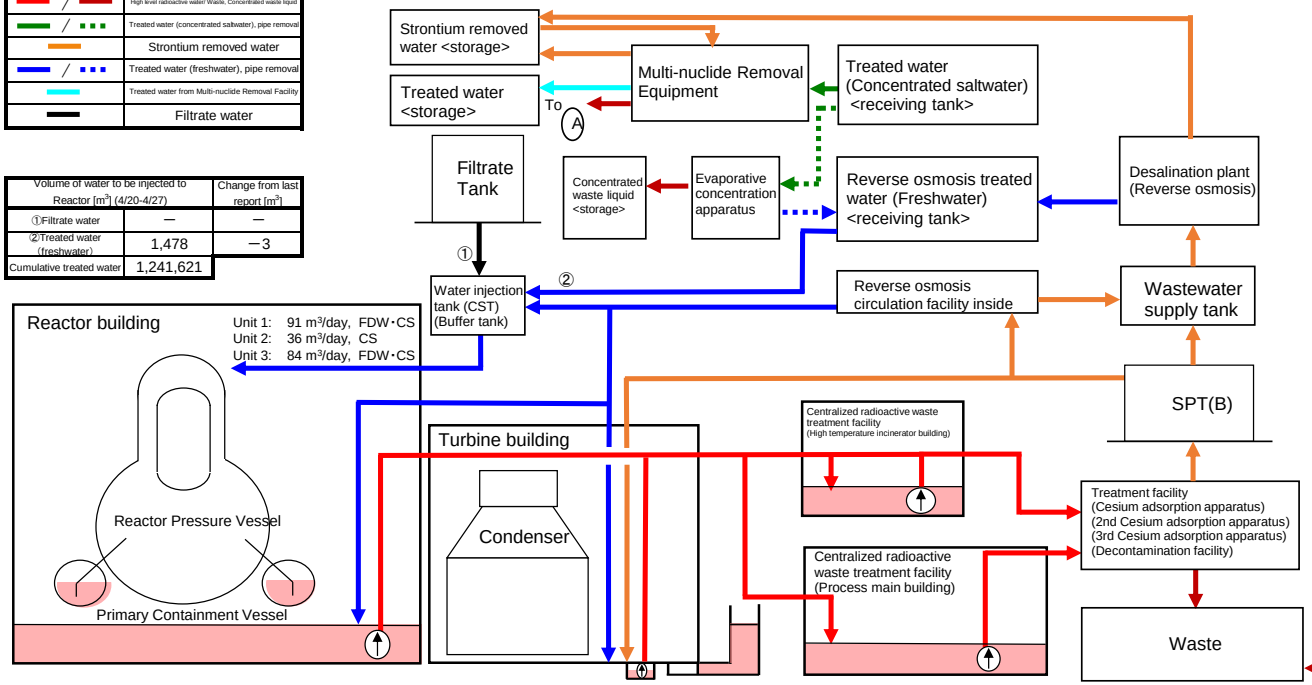
Also, the water treated at the radioactive material treatment equipment can be stored in the middle and low level waste water tanks.

END

Storage and treatment of high level radioactive accumulated water (as of April 27, 2023)

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

Volume of water to be injected to Reactor [m³] (4/20-4/27)		Change from last report [m³]
①Filtrate water	—	—
②Treated water (freshwater)	1,478	−3
Cumulative treated water	1,241,621	



Storage volume [m³] *1,2		Change from last report [m³]	Storage capacity [m³] *3,4
Concentrated saltwater receiving tank	0	—	—
Freshwater receiving tank	4,014	+562	12,000
Concentrated waste liquid storage tank	9,341 *18	+10	10,300
Treated water storage tank *12,16	1,224,355	+436	1,249,200
Sample water storage tank *14,16	2,544	−61	11,600
Treated water storage tank (Reuse) *15,16	92,866	No Change	94,000
Strontium removed water storage tank *10	9,088	+134	27,600

Residual water [m³] *5		Change from last report [m³]	Storage capacity [m³] *3,4
Concentrated saltwater tank	Approx.100	No Change	Approx.1,000
Treated water tank *13,16	0	No Change	0
Strontium removed water tank *11	0	No Change	0

Storage volume [m³]		Change from last report [m³]	Storage volume [m³] *3
Wastewater supply tank	662 *20	+87	1,200
SPT(A)	423 *19	−43	3,100
SPT(B)	1,200	−362	3,100
Unit 1 CST	709	−5	1,600
Unit 2 CST	1,599	−49	2,200
Unit 3 CST	1,937	No Change	2,200
Buffer Tank	635	No Change	700

	Chloride concentration
Before/After Desalination	280ppm/10ppm (Sampled on Apr. 4, 2023)
Before/After Reverse Osmosis Circulation	60ppm/<1ppm (Sampled on Nov. 8, 2022)
Before/After Evaporative Concentration	—

Place of Sampling	Radioactivity concentration *6
Process Main Building	1.2E+07 Bq/L (Sampled on Oct. 4, 2022)
Exit of cesium adsorption apparatus	3.8E+03 Bq/L (Sampled on Mar. 22, 2019)
Exit of decontamination facility	—
High Temperature Incinerator Building	7.3E+06 Bq/L (Sampled on Apr. 11, 2023)
Exit of second cesium adsorption apparatus	1.8E+02 Bq/L (Sampled on Apr. 11, 2023)
Exit of third cesium adsorption apparatus	3.0E+03 Bq/L (Sampled on Nov. 1, 2022)

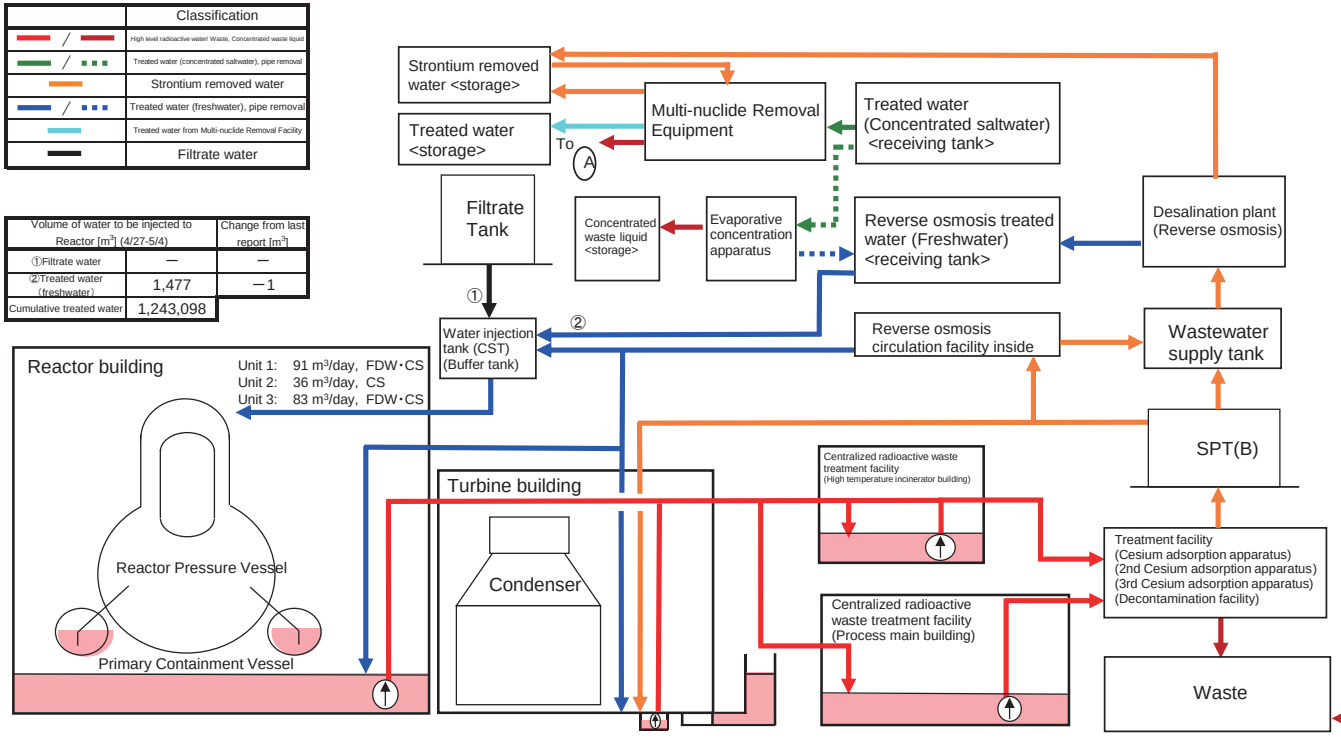
Facility	Storage volume [m³]	Change from last report [m³]	Water level in T/B *8
Unit 1	Approx.880	−10	—
Unit 2	Approx.1,140	−10	—
Unit 3	Approx.1,250	+20	—
Unit 4	Approx.10	No Change	—
Total	Approx.3,280		

Storage facility	Storage volume [m³]	Change from last report [m³]	Water level *8	Treated volume (4/20-4/27)	Cumulative treated volume [m³]	Waste produced		Change from last report	Storage capacity
Process Main Building	Approx.5,790	−90	T.P.−203	Approx. 2,310 *7	Approx. 2,625,810 *7	Sludge [m³]	493 *17	No Change	700 *3
High Temperature Incinerator Building	Approx.2,420	−130	T.P.−245			Used vessels	5,559 *9	+5	6,500
Total	Approx.8,210								

[Main operations that have been conducted during the period from April 20, 2023 to April 27, 2023]
- 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.
- From April 21, operations of the 2nd Cesium Adsorption Apparatus have been resumed; the availability factor is 24% (previous simulated: 30%).
- From April 21, operations of the 3rd Cesium Adsorption Apparatus have been resumed; the availability factor is 8% (previous simulated: 15%).
- 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. 100m³), Concentrated waste liquid storage tank (approx.100m³), Treated water storage tank (approx. 2,200m³)
Treated water storage tank (reuse) (approx. 200m³), Strontium removed water storage tank (approx. 200m³).
*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 (0 m³)
2nd Cesium adsorption apparatus (1,990 m³)
3rd Cesium adsorption apparatus (320 m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (394,720 m³)
2nd Cesium adsorption apparatus (2,042,030 m³)
3rd Cesium adsorption apparatus (189,060 m³)
*8 The data of the water levels are as of 5 a.m., April 27
*9 Breakdown of the used vessels: Cesium adsorption apparatus (779), 2nd Cesium adsorption apparatus (259), 3rd Cesium adsorption apparatus (17)
Others: Storage container (4,168), Treated column (17), Used vessel (254), Filters and so forth (65)
*10 Volume of the Strontium removed water (before ALPS treatment) stored in the welded-type tanks
*11 Volume of the Strontium removed water (before ALPS treatment) remaining in the flange-type tanks
*12 Volume of the "ALPS treated water" and "treated water to be re-purified" stored in the welded-type tanks
*13 Volume of the "treated water to be re-purified" remaining in the flange-type tanks
*14 Volume of the "treated water to be re-purified" stored in the ALPS sample tanks (flange -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 to be re-purified" stored in the reuse welded-type tanks which stored Strontium removed water (before ALPS treatment) before. (These welded-type tanks have been reused from 2019)
*16 The volume of the "ALPS treated water, etc." is the sum of the storage volume in each column of treated water, sample water, treated water (reuse) and treated water (residual).
*17 Sum of sludge and supernatant water (as of 11 a.m., April 27)
*18 Part of concenrated waste liquid is stored in the Strontium removed water storage tanks temporarily.
*19 Water transfer from SPT(A) to PMB/HTI was conducted whenever necessary.
*20 Water transfer from treated water storage tanks to wastewater supply tanks was conducted whenever necessary.

Storage and treatment of high level radioactive accumulated water (as of May 4, 2023)



Volume of water to be injected to Reactor [m³] (4/27-5/4)		Change from last report [m³]
①Filtrate water	—	—
②Treated water (freshwater)	1,477	−1
Cumulative treated water	1,243,098	

Storage volume [m³] *1,2		Change from last report [m³]	Storage capacity [m³] *3,4
Concentrated saltwater receiving tank	0	—	—
Freshwater receiving tank	3,893	−121	12,000
Concentrated waste liquid storage tank	9,347 *18	+6	10,300
Treated water storage tank *12,16	1,225,393	+1,038	1,249,200
Sample water storage tank *14,16	3,035	+491	11,600
Treated water storage tank (Reuse) *15,16	92,866	No Change	94,000
Strontium removed water storage tank *10	8,281	−807	27,600

Residual water [m³] *5		Change from last report [m³]	Storage capacity [m³] *3,4
Concentrated saltwater tank	Approx.100	No Change	Approx.1,000
Treated water tank *13,16	0	No Change	0
Strontium removed water tank *11	0	No Change	0

Storage volume [m³]		Change from last report [m³]	Storage volume [m³] *3
Wastewater supply tank	522 *20	−140	1,200
SPT(A)	423 *19	No Change	3,100
SPT(B)	793	−407	3,100
Unit 1 CST	714	+5	1,600
Unit 2 CST	1,533	−66	2,200
Unit 3 CST	1,937	No Change	2,200
Buffer Tank	634	−1	700

	Chloride concentration
Before/After Desalination	280ppm/10ppm (Sampled on Apr. 4, 2023)
Before/After Reverse Osmosis Circulation	60ppm/<1ppm (Sampled on Nov. 8, 2022)
Before/After Evaporative Concentration	–

Place of Sampling	Radioactivity concentration *6
Process Main Building	1.2E+07 Bq/L (Sampled on Oct. 4, 2022)
Exit of cesium adsorption apparatus	3.8E+03 Bq/L (Sampled on Mar. 22, 2019)
Exit of decontamination facility	—
High Temperature Incinerator Building	7.3E+06 Bq/L (Sampled on Apr. 11, 2023)
Exit of second cesium adsorption apparatus	1.8E+02 Bq/L (Sampled on Apr. 11, 2023)
Exit of third cesium adsorption apparatus	3.0E+03 Bq/L (Sampled on Nov. 1, 2022)

Facility	Storage volume [m³]	Change from last report [m³]	Water level in T/B *8
Unit 1	Approx.890	+10	—
Unit 2	Approx.1,120	−20	—
Unit 3	Approx.1,240	−10	—
Unit 4	Approx.10	No Change	—
Total	Approx.3,260		

Storage facility	Storage volume [m³]	Change from last report [m³]	Water level *8	Treated volume (4/27-5/4)	Cumulative treated volume [m³]	Waste produced		Change from last report	Storage capacity
Process Main Building	Approx.5,770	−20	T.P.−212	Approx. 1,180 *7	Approx. 2,626,990 *7	Sludge [m³]	493 *17	No Change	700 *3
High Temperature Incinerator Building	Approx.2,970	+550	T.P.206			Used vessels	5,562 *9	+3	6,500
Total	Approx.8,740								

[Main operations that have been conducted during the period from April 27, 2023 to May 4, 2023]
- 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.
- From April 27, operations of the 2nd Cesium Adsorption Apparatus have been suspended; the availability factor is 2% (previous simulated: 5%).
- Operations of the 3rd Cesium Adsorption Apparatus have been conducted; the availability factor is 25% (previous simulated: 25%).

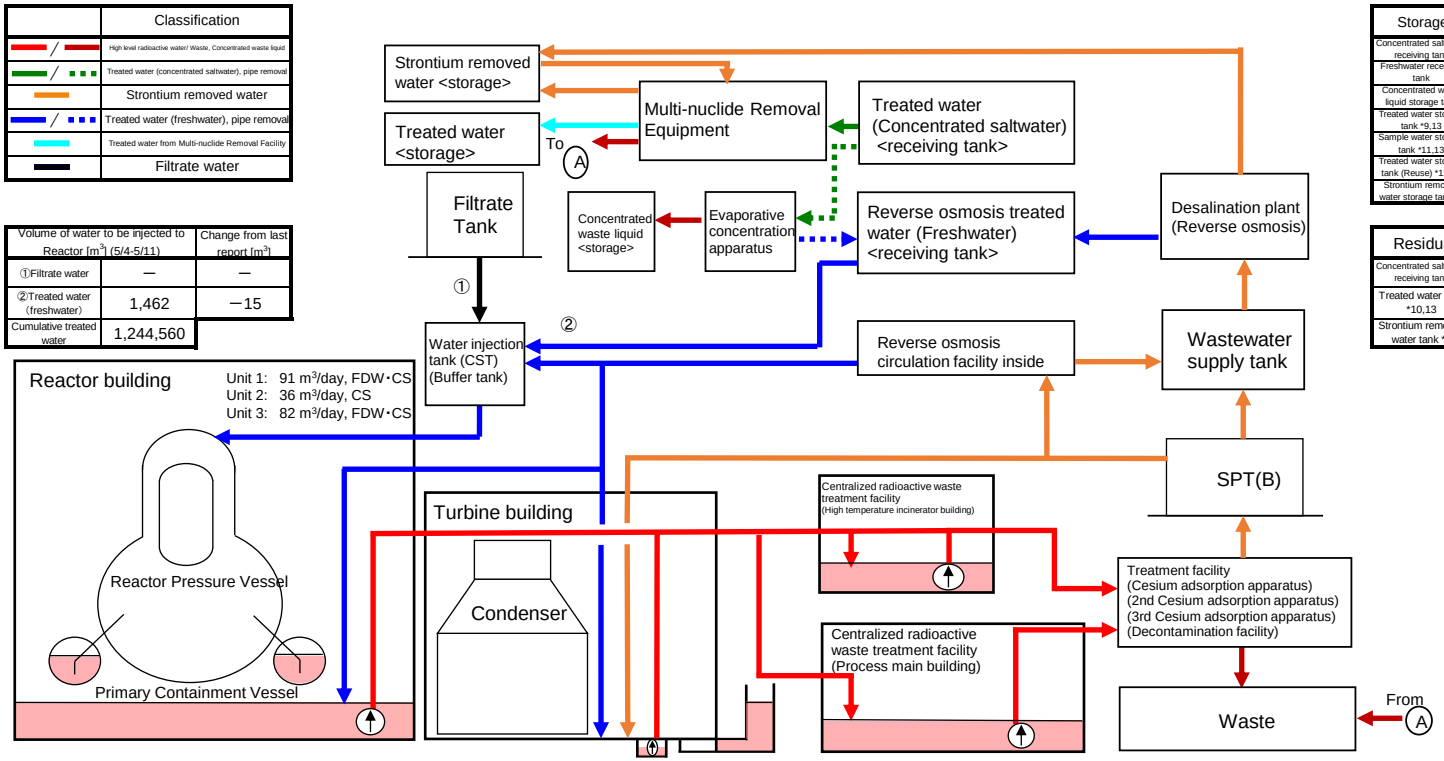
*1 The figures of the data are treated as a reference, because water levels during water transfer are not stable.
*2 The figures of the storage volume do not include those of the following volumes that have accumulated from the bottom of the tanks to the height of so-called "down scale (DS)," where water gauges show 0%:
Freshwater receiving tank (approx. 100m³), Concentrated waste liquid storage tank (approx.100m³), Treated water storage tank (approx. 2,200m³)
Treated water storage tank (reuse) (approx. 200m³), Strontium removed water storage tank (approx. 200m³).
*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 accommodate s 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 (0 m³)
2nd Cesium adsorption apparatus (140 m³)
3rd Cesium adsorption apparatus (1,040 m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (394,720 m³)
2nd Cesium adsorption apparatus (2,042,170 m³)
3rd Cesium adsorption apparatus (190,100 m³)
*8 The data of the water levels are as of 5 a.m., May 4
*9 Breakdown of the used vessels: Cesium adsorption apparatus (779), 2nd Cesium adsorption apparatus (259), 3rd Cesium adsorption apparatus (17)
Others: Storage container (4,171), Treated column (17), Used vessel (254), Filters and so forth (65)
*10 Volume of the Strontium removed water (before ALPS treatment) stored in the welded-type tanks
*11 Volume of the Strontium removed water (before ALPS treatment) remaining in the flange-type tanks
*12 Volume of the "ALPS treated water" and "treated water to be re-purified" stored in the welded-type tanks
*13 Volume of the "treated water to be re-purified" remaining in the flange-type tanks
*14 Volume of the "treated water to be re-purified" stored in the ALPS sample tanks (flange-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 to be re-purified" stored in the reuse welded-type tanks which stored Strontium removed water (before ALPS treatment) before. (These welded-type tanks have been reused from 2019)
*16 The volume of the "ALPS treated water, etc." is the sum of the storage volume in each column of treated water, sample water, treated water (reuse) and treated water (residual).
*17 Sum of sludge and supernatant water (as of 1 p.m., May 4)
*18 Part of concenrated waste liquid is stored in the Strontium removed water storage tanks temporarily.
*19 Water transfer from SPT(A) to PMB/HTI was conducted whenever necessary.
*20 Water transfer from treated water storage tanks to wastewater supply tanks was conducted whenever necessary.

Attachment-2

Storage and treatment of high level radioactive accumulated water (as of May 11, 2023)

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

Volume of water to be injected to Reactor [m³] (5/4-5/11)		Change from last report [m³]
①Filtrate water	—	—
②Treated water (freshwater)	1,462	−15
Cumulative treated water	1,244,560	



Storage volume [m³] *1		Change from last report [m³]	Storage capacity [m³] *2,3
Concentrated saltwater receiving tank	0	-	-
Freshwater receiving tank	3,909	+16	12,000
Concentrated waste liquid storage tank	9,347 *14	No Change	10,300
Treated water storage tank *9,13	1,225,432	+39	1,249,200
Sample water storage tank *11,13	3,823	+788	11,600
Treated water storage tank (Reuse) *12,13	92,866	No Change	94,000
Strontium removed water storage tank *7	8,326	+45	27,600

Residual water [m³] *4		Change from last report [m³]	Storage capacity [m³] *2,3
Concentrated saltwater receiving tank	Approx.100	No Change	Approx.1,000
Treated water tank *10,13	0	No Change	0
Strontium removed water tank *8	0	No Change	0

Facility	Storage volume [m³]	Change from last report [m³]	Water level in T/B
Unit 1	Approx.890	No Change	—
Unit 2	Approx.1,120	No Change	—
Unit 3	Approx.1,240	No Change	—
Unit 4	Approx.10	No Change	—
Total	Approx.3,260		

Storage Facility	Storage volume [m³]	Change from last report [m³]	Water level	Treated volume (5/4-5/11)	Cumulative treated volume [m³]
Process Main Building	Approx.5,620	−150	T.P.−273	Approx. 2,310 *5	Approx. 2,629,300 *5
High Temperature Incinerator Building	Approx.3,180	+210	T.P.382		
Total	Approx.8,800				

Waste produced		Change from last report	Storage capacity
Sludge [m³]	493	No Change	700 *2
Used vessels	5,564 *6	+2	6,500

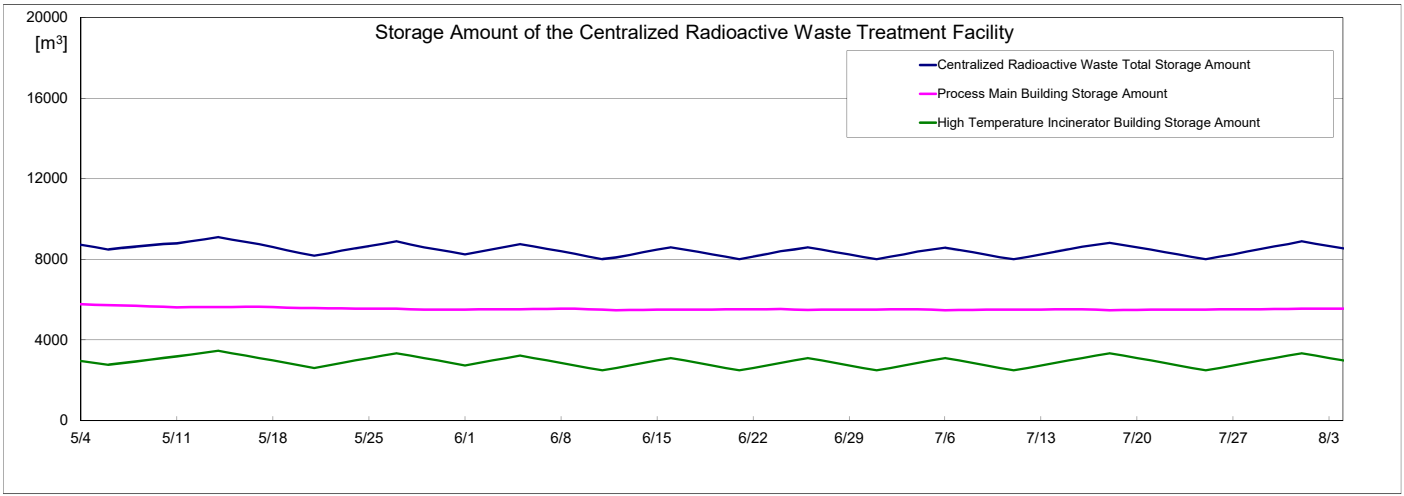
[Main operations that are planned to be conducted during the period from May 4, 2023 to May 11, 2023]

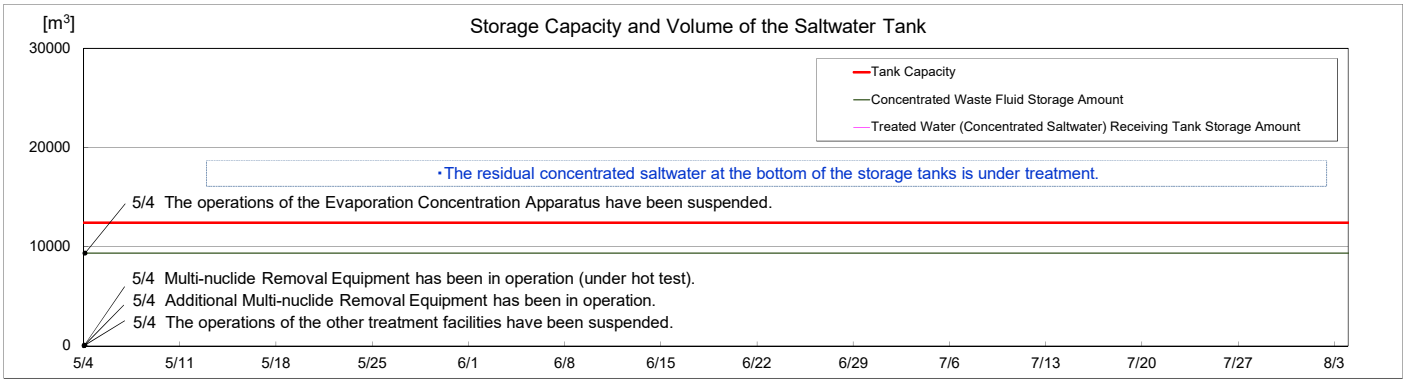
- Water transfer from the Units 1-4 to the buildings (Units 1-4, Centralized radioactive waste treatment facilities) and to the treatment facilities will be conducted whenever necessary.
- Due to other works, water transfer to the buildings (Units 1-4, Centralized radioactive waste treatment facilities) will be conducted whenever necessary.
- Operations of the Cesium Adsorption Apparatus will continue to be suspended.
- Operations of the 2nd Cesium Adsorption Apparatus will be resumed (assumed availability factor: 5%).
- Operations of the 3rd Cesium Adsorption Apparatus will be conducted (assumed availability factor: 45%).

*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 accommodate s 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 sal twater 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 (420m³)
3rd Cesium adsorption apparatus (1,890m³)
Breakdown of the cumulative treated amount: Cesium adsorption apparatus (394,720m³)
2nd Cesium adsorption apparatus (2,042,590m³)
3rd Cesium adsorption apparatus (191,990m³)
*6 Breakdown of the used vessels: Cesium adsorption apparatus (779)
2nd Cesium adsorption apparatus (259)
3rd Cesium adsorption apparatus (17)
Others: Storage container (4,173), Treated column (17), Used vessels (254), Filters and so forth (65)
*7 Volume of the Strontium removed water (before ALPS treatment) stored in the welded-type tanks
*8 Volume of the Strontium removed water (before ALPS treatment) remaining in the flange-type tanks
*9 Volume of the "ALPS treated water" and "treated water to be re-purified" stored in the welded-type tanks
*10 Volume of the "treated water to be re-purified" remaining in the flange-type tanks
*11 Volume of the "treated water to be re-purified" stored in the ALPS sample tanks (flange-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 to be re-purified" stored in the reuse welded-type tanks which stored Strontium removed water (before ALPS treatment) before. (These welded-type tanks have been reused from 2019.)
*13 The volume of the "ALPS treated water, etc." is the sum of the storage volume of each column of treated water, sample water, treated water (reuse) and treated water (residual).
*14 Part of concentrated waste liquid is stored in the Strontium removed water storage tanks temporarily.

Attachment-3

Simulation Results of Storing and Treatment in the Accumulated Water Storing Facilities





Note
- The amount of water treated through the treatment facilities is changed depending on the factors such as stored amount in the accumulated water storing facilities.