

Pre-discharge Analysis Results of ALPS Treated Water in the Measurement/Confirmation Tanks (1/4)

Sample Name	ALPS Treated Water in the Measurement/Confirmation Tanks		Group B
Date and Time of Sampling	March 27, 2023	10:57	
Storage Volume (m ³)	8919		

Summary	Nuclides to be measured and assessed (29 nuclides) : The sum of the ratios of the concentration of each radionuclide to the regulatory concentration	0.28 (Confirmed to be less than 1)
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Radioactivity Analysis: Nuclides to be measured and assessed (29 nuclides)

No.	Nuclides	Analysis Results						Ratios to Regulatory Concentration Limit				Regulatory Concentration Limits *2 (Bq/L)	Analysis Methods *4
		TEPCO			KAKEN Co.,Ltd.			TEPCO		KAKEN Co.,Ltd.			
		Analysis Values (Bq/L)	Uncertainties *1 (Bq/L)	Detection Limits (Bq/L)	Analysis Values (Bq/L)	Uncertainties *1 (Bq/L)	Detection Limits (Bq/L)						
1	C-14	1.4E+01	± 2.7E+00	2.6E+00	1.4E+01	± 9.3E-01	8.7E-01	7.1E-03	7.1E-03	2000	Measurement		
2	Mn-54	ND	-	2.6E-02	ND	-	2.8E-02	less than 2.6E-05	less than 2.8E-05	1000	Measurement		
3	Fe-55	ND	-	1.5E+01	ND	-	1.1E+01	less than 7.4E-03	less than 5.4E-03	2000	Measurement		
4	Co-60	3.5E-01	± 6.4E-02	2.4E-02	3.2E-01	± 3.8E-02	2.7E-02	1.7E-03	1.6E-03	200	Measurement		
5	Ni-63	ND	-	8.8E+00	ND	-	4.9E+00	less than 1.5E-03	less than 8.2E-04	6000	Measurement		
6	Se-79	ND	-	9.3E-01	ND	-	1.8E+00	less than 4.7E-03	less than 9.2E-03	200	Measurement		
7	Sr-90	4.1E-01	± 2.7E-02	3.6E-02	3.7E-01	± 6.2E-02	7.8E-02	1.4E-02	1.2E-02	30	Measurement		
8	Y-90	4.1E-01	-	3.6E-02	3.7E-01	-	7.8E-02	1.4E-03	1.2E-03	300	Sr-90/Y-90 Radioactive Equilibrium Assessment		
9	Tc-99	6.8E-01	± 4.5E-01	2.0E-01	6.1E-01	± 1.2E-01	6.4E-02	6.8E-04	6.1E-04	1000	Measurement		
10	Ru-106	ND	-	2.5E-01	ND	-	2.5E-01	less than 2.5E-03	less than 2.5E-03	100	Measurement		
11	Sb-125	1.8E-01	± 6.5E-02	8.6E-02	7.9E-02	± 5.2E-02	7.7E-02	2.3E-04	9.8E-05	800	Measurement		
12	Te-125m	6.4E-02	-	3.0E-02	2.8E-02	-	2.7E-02	7.1E-05	3.1E-05	900	Sb-125/Te-125m Radioactive Equilibrium Assessment		
13	I-129	2.0E+00	± 1.5E-01	2.3E-02	2.0E+00	± 3.0E-01	1.3E-01	2.2E-01	2.2E-01	9	Measurement		
14	Cs-134	ND	-	3.3E-02	ND	-	4.7E-02	less than 5.4E-04	less than 7.9E-04	60	Measurement		
15	Cs-137	4.7E-01	± 8.1E-02	2.8E-02	4.8E-01	± 5.2E-02	3.9E-02	5.2E-03	5.3E-03	90	Measurement		
16	Ce-144	ND	-	3.6E-01	ND	-	2.6E-01	less than 1.8E-03	less than 1.3E-03	200	Measurement		
17	Pm-147	ND	-	3.1E-01	ND	-	3.3E-01	less than 1.0E-04	less than 1.1E-04	3000	Eu-154 Relative Ratio Assessment		
18	Sm-151	ND	-	1.2E-02	ND	-	1.2E-02	less than 1.5E-06	less than 1.6E-06	8000	Eu-154 Relative Ratio Assessment		
19	Eu-154	ND	-	7.0E-02	ND	-	7.3E-02	less than 1.8E-04	less than 1.8E-04	400	Measurement		
20	Eu-155	ND	-	1.9E-01	ND	-	1.4E-01	less than 6.3E-05	less than 4.8E-05	3000	Measurement		
21	U-234									20	Gross Alpha		
22	U-238									20	Gross Alpha		
23	Np-237									9	Gross Alpha		
24	Pu-238	ND	-	2.1E-02	ND	-	2.6E-02	less than 5.3E-03	less than 6.6E-03	*3	*3	4	Gross Alpha
25	Pu-239											4	Gross Alpha
26	Pu-240											4	Gross Alpha
27	Am-241											5	Gross Alpha
28	Cm-244											7	Gross Alpha
29	Pu-241											200	Pu-238 Relative Ratio Assessment
The sum of the ratios of the concentration of each radionuclide to the regulatory concentration (sum of the ratios to regulatory concentration limit)								less than 2.8E-01	less than 2.8E-01				

• ND indicates that analysis result is less than the detection limit.

• Values are expressed in exponential notation.

For example, "3.1E+01" means "3.1×10¹" and equals 31. Similarly, "3.1E+00" means "3.1×10⁰" and equals 3.1, and "3.1E-01" means "3.1×10⁻¹" and equals 0.31.

*1 "Uncertainty" refers to the accuracy of analysis data.

"Uncertainty" is calculated using "Expanded Uncertainty: Coverage Factor k=2".

*2 Regulatory concentration limits stipulated in the Regulations of the Safety and Physical Protection of Specific Nuclear Fuel Material at Fukushima Daiichi Nuclear Power Station of the Tokyo Electric Power Company, Incorporated.

(Attached Chart 1, Row 6: Concentration limits in the water outside of the environmental monitoring area [in this chart Bq/cm³ has been converted into Bq/L])

*3 The ratio to regulatory concentration limit for alpha-radionuclides has been assessed using the lowest regulatory concentration limit for all the target nuclides.

*4 Analysis methods are as follows:

Measurement - The concentrations of each radionuclide have been calculated by directly measuring/analyzing radioactivity intensity and the quantity of the element.

Gross Alpha - The total amount of alpha-radionuclides in the specimen are calculated by directly measuring alpha rays.

Radioactive Equilibrium Assessment - Calculated using a physical phenomenon in which the amount of radioactivity of one radionuclide and another radionuclide produced by the decay of that radionuclide exist in a certain ratio.

Relative Ratio Assessment - Calculated based on the assessment values of radionuclides that existed inside the reactor while considering radionuclide decay and migration into ALPS treated water.

Pre-discharge Analysis Results of ALPS Treated Water in the Measurement/Confirmation Tanks (2/4)

Summary	14 (x10 ⁴ Bq/L)	(confirmed to be less than 1 million Bq/L)
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Radioactivity Analysis: Tritium

No.	Nuclides	Analysis Results						Analysis Objective	Analysis Method *3
		TEPCO			KAKEN Co.,Ltd.				
		Analysis Value (Bq/L)	Uncertainty *1 (Bq/L)	Detection Limit (Bq/L)	Analysis Value (Bq/L)	Uncertainty *1 (Bq/L)	Detection Limit (Bq/L)		
1	H-3	1.4E+05	± 9.5E+03	1.9E+01	1.4E+05	± 7.8E+03	1.4E+02	*2	Measurement

· Values are expressed in exponential notation.

For example, "3.1E+01" means "3.1×10¹" and equals 31. Similarly, "3.1E+00" means "3.1x10⁰" and equals 3.1, and "3.1E-01" means "3.1x10⁻¹" and equals 0.31.

*1 "Uncertainty" refers to the accuracy of analysis data.

"Uncertainty" is calculated using "Expanded Uncertainty: Coverage Factor k=2".

*2 To confirm that tritium concentration is less than 1E+06Bq/L (Less than 1 million Bq/L).

*3 Analysis method is as follows:

Measurement - The concentration of radionuclide has been calculated by directly measuring/analyzing radioactivity intensity and the quantity of the element.

Pre-discharge Analysis Results of ALPS Treated Water in the Measurement/Confirmation Tanks (3/4)

Summary	No significant concentrations found of any of the nuclides
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Radioactivity Analysis: Nuclides voluntarily checked to ensure that they are not significantly present (39 nuclides)

No.	Nuclides	TEPCO		KAKEN Co.,Ltd.		Confirmation Methods *2
		Assessments *1	Detection Limits (Bq/L)	Assessments *1	Detection Limits (Bq/L)	
1	Fe-59	○	5.5E-02	○	6.7E-02	Measurement
2	Co-58	○	2.5E-02	○	3.5E-02	
3	Zn-65	○	5.8E-02	○	9.7E-02	
4	Rb-86	○	4.1E-01	○	1.0E+00	
5	Sr-89	○	6.8E-02	○	2.5E-01	
6	Y-91	○	2.1E+00	○	1.2E+01	
7	Nb-95	○	3.2E-02	○	2.8E-02	
8	Ru-103	○	3.6E-02	○	8.5E-02	
9	Ag-110m	○	2.6E-02	○	3.8E-02	
10	Cd-113m	○	8.4E-02	○	5.1E-02	
11	Cd-115m	○	1.6E+00	○	2.0E+00	
12	Sn-123	○	7.4E-01	○	5.1E+00	
13	Sn-126	○	1.7E-01	○	1.2E-01	
14	Sb-124	○	6.3E-02	○	7.6E-02	
15	Te-123m	○	5.7E-02	○	3.3E-02	
16	Te-127	○	2.9E+00	○	2.8E+00	
17	Te-129m	○	9.3E-01	○	1.8E+00	
18	Te-129	○	4.3E-01	○	1.1E+00	
19	Cs-136	○	3.8E-02	○	1.5E-01	
20	Ba-140	○	1.7E-01	○	6.2E-01	
21	Ce-141	○	1.2E-01	○	1.6E-01	
22	Pm-146	○	4.0E-02	○	3.5E-02	
23	Pm-148m	○	2.9E-02	○	4.4E-02	
24	Pm-148	○	3.7E-01	○	1.9E+01	
25	Eu-152	○	1.2E-01	○	1.3E-01	
26	Gd-153	○	1.6E-01	○	1.3E-01	
27	Tb-160	○	7.8E-02	○	1.1E-01	
28	Am-243	○	2.1E-02	○	2.6E-02	
29	Cm-242	○	2.1E-02	○	2.6E-02	
30	Cm-243	○	2.1E-02	○	2.6E-02	
31	Rh-103m	○	3.6E-02	○	8.5E-02	Ru-103/Rh-103m Radioactive Equilibrium Assessment
32	Rh-106	○	2.5E-01	○	2.5E-01	Ru-106/Rh-106 Radioactive Equilibrium Assessment
33	Sn-119m	○	6.4E-03	○	4.5E-03	Sn-126 Relative Ratio Assessment
34	Te-127m	○	2.9E+00	○	2.9E+00	Te-127 Relative Ratio Assessment
35	Cs-135	○	1.9E-07	○	2.6E-07	Cs-137 Relative Ratio Assessment
36	Ba-137m	○	2.7E-02	○	3.7E-02	Cs-137/Ba-137m Radioactive Equilibrium Assessment
37	Pr-144m	○	5.5E-03	○	3.9E-03	Ce-144/Pr-144m Radioactive Equilibrium Assessment
38	Pr-144	○	3.6E-01	○	2.6E-01	Ce-144/Pr-144 Radioactive Equilibrium Assessment
39	Am-242m	○	1.4E-04	○	1.8E-04	Am-241 Relative Ratio Assessment

*1 "○" indicates that the absence of significant concentrations was confirmed by the following, and "x" indicates that significant concentrations of nuclide was confirmed.

- Concentration of nuclide measured was below detection limit

- For nuclide that has been assessed using radioactive equilibrium, etc., if its target nuclide is detected and the assessment value of the target nuclide is extremely small compared to the regulatory concentration limit, or in other words, if it is less than 1/100 of the regulatory concentration limit which is the value set as the detection limit, then it shall be deemed to be below the detection limit.

Nuclides	Assessment Values (Bq/L)		Regulatory Concentration Limits *3
	TEPCO	KAKEN Co.,Ltd.	
Rh-103m	-	-	2.0E+05
Rh-106	-	-	3.0E+05
Sn-119m	-	-	2.0E+03
Te-127m	-	-	3.0E+02
Cs-135	3.1E-06	3.1E-06	6.0E+02
Ba-137m	4.4E-01	4.5E-01	8.0E+05
Pr-144m	-	-	4.0E+04
Pr-144	-	-	2.0E+04
Am-242m	-	-	5.0E+00

- "-" indicates that the concentration of the target nuclide was below the detection limit.

- Values are expressed in exponential notation.

For example, "3.1E+01" means "3.1×10¹" and equals 31. Similarly, "3.1E+00" means "3.1×10⁰" and equals 3.1, and "3.1E-01" means "3.1×10⁻¹" and equals 0.31.

*2 Analysis Methods are as follows:

Measurement - The concentrations of each radionuclide have been calculated by directly measuring/analyzing radioactivity intensity and the quantity of the element.

Measurement (substituted with gross alpha) - The total amount of alpha-radionuclides in the specimen are calculated by directly measuring alpha rays.

Radioactive Equilibrium Assessment - Calculated using a physical phenomenon in which the amount of radioactivity of one radionuclide and another radionuclide produced by the decay of that radionuclide exist in a certain ratio.

Relative Ratio Assessment - Calculated based on the assessment values of radionuclides that existed inside the reactor while considering radionuclide decay and migration into ALPS treated water.

*3 Regulatory concentration limits stipulated in the Regulations of the Safety and Physical Protection of Specific Nuclear Fuel Material

at Fukushima Daiichi Nuclear Power Station of the Tokyo Electric Power Company, Incorporated.

(Attached Chart 1, Row 6: Concentration limits in the water outside of the environmental monitoring area [in this chart Bq/cm³ has been converted into Bq/L])

Pre-discharge Analysis Results of ALPS Treated Water in the Measurement/Confirmation Tanks (4/4)

Summary	Criteria satisfied
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General Water Quality Analysis: Voluntary check to confirm that there are no unusual water quality (44 criteria)

No.	Measurement Items	Units	Analysis Results	Criteria *1
1	Hydrogen Ions (pH)	–	8.7	Sea Area 5.0~9.0
2	Suspended Solids (SS)	mg/L	<1	Maximum: 70 or less Average: 50 or less
3	Chemical Oxygen Demand (COD)	mg/L	1.1	Maximum: 40 or less Average: 30 or less
4	Boron	mg/L	0.5	Sea Area 230 or less
5	Soluble Iron	mg/L	<0.1	10 or less
6	Copper	mg/L	<0.1	2 or less
7	Nickel	mg/L	<0.1	2 or less
8	Chrome	mg/L	<0.1	2 or less
9	Zinc	mg/L	0.1	2 or less
10	Biochemical Oxygen Demand (BOD)	mg/L	1	Maximum: 40 or less Average: 30 or less
11	Coliform Count	pcs/cm ³	0	3000 or less
12	Cadmium	mg/L	<0.01	0.03 or less
13	Cyanide	mg/L	<0.05	0.5 or less
14	Organic Phosphorus	mg/L	<0.1	1 or less
15	Lead	mg/L	<0.01	0.1 or less
16	Hexavalent Chromium	mg/L	<0.05	0.2 or less
17	Arsenic	mg/L	<0.01	0.1 or less
18	Mercury	mg/L	<0.0005	0.005 or less
19	Alkyl Mercury	mg/L	<0.0005	Not Detected
20	Polychlorinated Biphenyl	mg/L	<0.0005	0.003 or less
21	Trichlorethylene	mg/L	<0.03	0.1 or less
22	Tetrachloroethylene	mg/L	<0.01	0.1 or less
23	Dichloromethane	mg/L	<0.02	0.2 or less
24	Carbon Tetrachloride	mg/L	<0.002	0.02 or less
25	1,2-Dichloroethane	mg/L	<0.004	0.04 or less
26	1,1-Dichloroethylene	mg/L	<0.1	1 or less
27	Cis-1,2-Dichloroethylene	mg/L	<0.04	0.4 or less
28	1,1,1-Trichloroethane	mg/L	<0.3	3 or less
29	1,1,2-Trichloroethane	mg/L	<0.006	0.06 or less
30	1,3-Dichloropropene	mg/L	<0.002	0.02 or less
31	Thiuram	mg/L	<0.006	0.06 or less
32	Simazine	mg/L	<0.003	0.03 or less
33	Thiobencarb	mg/L	<0.02	0.2 or less
34	Benzene	mg/L	<0.01	0.1 or less
35	Selenium	mg/L	<0.01	0.1 or less
36	Fenitrothion	mg/L	<0.003	0.03 or less
37	Phenols	mg/L	<0.1	1 or less
38	Fluorine	mg/L	<0.5	Sea Area 10 or less
39	Soluble Manganese	mg/L	<1	10 or less
40	Ammonia, Ammonium Compounds	mg/L	<1	100 or less
41	Nitrite Compounds and Nitrate Compounds	mg/L	<1	
42	1,4-Dioxane	mg/L	<0.05	0.5 or less
43	n-Hexane Extractables (Mineral Oils)	mg/L	<0.5	1 or less
44	n-Hexane Extractables (Animal and Vegetable Oils and Fats)	mg/L	<1	10 or less

• “less than” symbol (<) indicates that the quantity is below quantitation limit.

*1 In accordance with Fukushima Prefecture’s “Ordinance on Discharge Standards Based on the Air Pollution Control Act and Wastewater Standard based on the Water Pollution Prevention Act (attached Chart 2)”, and “the Ordinance Enforcement Regulations Pertaining to the Preservation of the Living Environment in Fukushima (attached Chart 5)”.