Inspection on the Radioactive Accumulated Water Found in the Trenches in Fukushima Daiichi Nuclear Power Station (FY 2012)

< Reference >
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[Background]

- On December 18, 2011, radioactive accumulated water was found in the common pool connecting duct. In response to the incident, we received a directive document “Measures to be taken against the radioactive accumulated water found in the trenches of Fukushima Daiichi Nuclear Power Station” from the Nuclear Industrial and Safety Agency (NISA) of the Ministry of Economy, Trade and Industry on December 19, 2011.
- The inspection results of FY 2012 are reported.

[Countermeasures (Reported on March 30, 2012)]

- On March 30, 2012, we reported to NISA on the accumulated water transfer from the common pool connecting duct, implementation of measures to stop water inflow, cause investigation of the radioactive materials included in the water and recurrence prevention measures. From October 2012, the water stop work has been ongoing.
- The results of inspecting the accumulated water in other trenches, etc. were reported to NISA on March 30, 2012.

[Measures to be implemented according to the radioactivity density (Cs) of accumulated water (Reported on March 30, 2012)]

- Due to the Tsunami water and rainwater, etc. which are assumed to have flowed in from the openings and accumulated, it is possible that accumulated water is found in multiple trenches, etc.
- The radioactivity density (Cs) of the accumulated water is assumed to be less than 10^2Bq/cm^3, which is the highest density detected in the sub-drains installed around Units 1-4 buildings.
- If the radioactivity density exceeds this level, the inflow of highly radioactive contaminated water to trenches, etc. must be suspected.
- The measures to be implemented according to the radioactivity density (Cs) of accumulated water in the buildings taking into considerations the impact on the accumulated water treatment/storage as well as radiation exposure, etc. are provided in Table-1 on the following page.

Based on the above, the inspection of the trenches other than the common pool connecting duct for FY 2012 has been performed.

Table-1 Measures to be Implemented against Accumulated Water

Radioactivity density of accumulated water (Cs)	Measures	Classification
10^3Bq/cm^3 or higher	Investigate the possibility of accumulated water outflow to the sea, inflow routes and accumulated water transfer while considering countermeasures including water stop work, etc. Promptly report the results and implement measures. For example, the following items are to be investigated. - Feasibility of using existing accumulated water transfer routes, necessity of newly establishing transfer routes, pump installation locations - Confirmation of the drawings (connecting pipes, building connection elevation, etc.), feasibility of investing the inside of trenches, etc. - Water stop material injection into inflow locations, consideration of measures such as closing up trenches, etc.	A
10^2Bq/cm^3 level	- Measure the accumulated water level and radioactivity density on a regular basis while paying attention to radiation exposure. Monitor status and implement measures such as water removal in the future. - If there is a possibility of highly radioactive contaminated water inflow as a result of status monitoring, investigate its outflow to the sea and inflow routes while considering measures such as accumulated water transfer and water stop work. Implement necessary measures.	B
10^1Bq/cm^3 or lower	- To be safe, monitor the status of trenches connected to buildings where highly radioactive contaminated water is accumulated while paying attention to radiation exposure. Consider measures for other trenches as well and implement measures such as water removal in the future.	C

[Trench inspection results obtained this time]

- There were 16 trenches where accumulated water was found and the radioactivity density (Cs) was less than 10^{1}Bq/cm^{3} (Classification C) at all locations (Refer to the attachment).
- As a result of inspection, no significant abnormality was found and the condition of the accumulated water found in trenches was confirmed to fall into Classification C. We will continue performing the inspection.

< Reference: Reasons for fluctuations of approximate accumulated water amount >

- The amount of accumulated water in the transformer cable duct for starting up Unit 3 was increased since the water stop work at the connection with Unit 3 Control Building was completed on December 5, 2012.
- The amount of accumulated water in the Central Environment Facility Waste System common duct and the Waste Treatment Building connecting duct was increased due to the gradual inflow of groundwater in the surrounding area into the ducts.
- The amount of accumulated water in Unit 1 seawater pipe trench was reduced since the accumulated water was used for pipe flushing.
- Measurement errors found are considered to be caused by inconsistent measurement locations and measurement accuracy due to obstacles such as debris, etc. in the measurement locations, measurements performed in the dark narrow area inside the trench, restricted measurement method under high radiation dose and change in the conditions of measurement locations according to the progress of restoration work.

< Results of Accumulated Water Inspection>

No.	Location	Inspection performed this time (December 2012)								Previous inspection (January 2012)								Fluctuation	
		Accumulated water found	Surface dose rate (μSv/h)	Nuclide analysis results (Bq/cm^3)				Classification of accumulated water*5	Approx. amount of accumulated water (m^3)	Accumulated water found	Surface dose rate (μSv/h)	Nuclide analysis results (Bq/cm^3)				Classification of accumulated water*5	Approx. amount of accumulated water (m^3)	Approx. amount of accumulated water (m^3)	Reasons
				I-131	Cs-134	Cs-137	Cs total					I-131	Cs-134	Cs-137	Cs合計				
1- 1	Connecting Duct between the Water Treatment Building and Unit 1 T/B	Yes	0.6	ND	4.0×10^{-1}	7.8×10^{-1}	1.2×10^{0}	C	100	Yes	1.5	ND	8.8×10^{-1}	1.3×10^{0}	2.2×10^{0}	C	150	▲ 50	Measurement errors, etc.
1- 2	Unit 1 Chemical Tank Connecting Duct	Yes	1	ND	6.9×10^{-1}	1.2×10^{0}	1.9×10^{0}	C	6	Yes	1.2	ND	2.4×10^{0}	3.5×10^{0}	5.9×10^{0}	C	3	3	Measurement errors, etc.
1- 3	Unit 1 Radioactive Fluid Piping Duct	Yes	0.7	ND	5.7×10^{-1}	9.5×10^{-1}	1.5×10^{0}	C	30	Yes	9.0	ND	1.4×10^{0}	1.9×10^{0}	3.3×10^{0}	C	30	0	
1- 4	Unit 1 Power Source Cable Trench	Yes	1.1	ND	4.4×10^{-1}	7.6×10^{-1}	1.2×10^{0}	C	20	Yes	5.5	ND	2.3×10^{0}	3.2×10^{0}	5.5×10^{0}	C	50	▲ 30	Measurement errors, etc.
1- 5	Unit 1 Reserve Power Cable Duct	Yes	0.4	ND	4.0×10^{-1}	7.7×10^{-1}	1.2×10^{0}	C	280	Yes	10.0	ND	5.4×10^{-1}	8.0×10^{-1}	1.3×10^{0}	C	300	▲ 20	Measurement errors, etc.
1- 6	Unit 1 Seawater Piping Trench	Yes	1.0	ND	4.7×10^{-2}	8.9×10^{-2}	1.4×10^{-1}	C	2,500	Yes	1.3	ND	2.9×10^{-1}	4.4×10^{-1}	7.3×10^{-1}	C	2,700	▲ 200	Accumulated water used for pipe flushing
1- 7	Unit 1 Common Piping Duct (North Side)	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 8	Unit 1 Common Piping Duct (East Side)	Yes	1.0	ND	1.9×10^{0}	3.6×10^{0}	5.5×10^{1}	C	80	Yes	1.0	ND	1.0×10^{1}	1.5×10^{1}	2.5×10^{1}	C	90	▲ 10	Measurement errors, etc.
1- 9	Unit 1 Control Cable Duct	Yes	0.6	ND	1.4×10^{-1}	2.5×10^{-1}	3.9×10^{-1}	C	300	Yes	4.5	ND	4.8×10^{-1}	7.1×10^{-1}	1.2×10^{0}	C	300	0	
1- 10	Unit 1 Hot Shower Drain Tank Connecting Duct	-*1	—	–	–	–	–	–	—	-*1	–	–	–	–	–	–	–	–	
1- 11	Unit 1 Pump Room Circulating Water Pump Discharge Valve Pit	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 12	Units 2-4 DG Connecting Duct	Yes	0.6	ND	1.5×10^{0}	2.5×10^{0}	4.0×10^{0}	C	2,000	Yes	9.0	ND	1.9×10^{0}	2.6×10^{0}	4.5×10^{0}	C	2,050	▲ 50	Measurement errors, etc.
1- 13	Unit 2 Radioactive Fluid Piping Duct	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 14	Unit 2 Common Piping Duct	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 15	Unit 2 Pump Room Circulating Water Pump Discharge Valve Pit	Countermeasure implementation completed in April 2012								Yes	45.0	ND	7.1×10^{3}	9.1×10^{3}	1.6×10^{4}	A	500	—	
1- 16	Units 2-3 Emergency Power Cable Connecting Duct	-*2	—	–	–	–	–	–	—	-*2	–	–	–	–	–	–	–	–	
1- 17	Unit 2 Power Cable Trench	-*2	—	–	–	–	–	–	—	-*2	–	–	–	–	–	–	–	–	
1- 18	Unit 2 Seawater Piping (SW) Trench	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 19	No. 2 Light Oil Piping Trench	-*2	—	–	–	–	–	–	—	-*2	–	–	–	–	–	–	–	–	
1- 20	Unit 2 Chemical Tank Connecting Duct	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 21	Transformer Cable Duct for Starting up Unit 3	Yes	2	ND	2.0×10^{-1}	3.5×10^{-1}	5.5×10^{-1}	C	520	Yes	1.6	ND	4.9×10^{1}	6.9×10^{1}	1.2×10^{2}	B	300	220	Increase due to water stop work done at the inflow location
1- 22	Unit 3 Radioactive Fluid Piping Duct	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 23	Unit 3 Chemical Tank Connecting Duct	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 24	Unit 3 Pump Room Circulating Water Pump Discharge Valve Pit	Countermeasure implementation completed in May 2012								Yes	21.0	ND	3.8×10^{2}	4.8×10^{2}	8.6×10^{2}	B	600	—	
1- 25	Unit 3 Off-Gas Piping Duct (North Side)	-*1 *2	—	–	–	–	–	–	—	-*1 *2	–	–	–	–	–	–	–	–	
1- 26	Unit 3 Off-Gas Piping Duct (South Side)	Yes	1.0	ND	8.0×10^{0}	1.4×10^{1}	2.2×10^{1}	C	30	Yes	4.0	ND	3.1×10^{1}	4.1×10^{1}	7.2×10^{1}	C	20	10	Measurement errors, etc.
1- 27	Heavy Oil Piping Trench (East side of Units 3-4)	-*1	—	–	–	–	–	–	—	-*1	–	–	–	–	–	–	–	–	
1- 28	Unit 3 Power Cable Trench	-*1	—	–	–	–	–	–	—	-*1	–	–	–	–	–	–	–	–	
1- 29	Unit 4 Radioactive Fluid Piping Duct	Yes	2	ND	2.7×10^{0}	4.7×10^{0}	7.4×10^{0}	C	5	Yes	2.5	ND	2.2×10^{1}	2.8×10^{1}	5.0×10^{1}	C	5	0	
1- 30	Unit 4 Chemical Tank Connecting Duct	Yes	3.0	ND	1.4×10^{0}	2.5×10^{0}	3.9×10^{0}	C	1	Yes	3.0	ND	1.3×10^{0}	1.7×10^{0}	3.0×10^{0}	C	1	0	
1- 31	Unit 4 Seawater Piping Trench	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 32	Unit 4 Pump Room Circulating Water Pump Discharge Valve Pit	Yes	2.0	ND	4.8×10^{0}	8.2×10^{0}	1.3×10^{1}	C	410	Yes	1.3	ND	4.5×10^{0}	6.3×10^{0}	1.1×10^{1}	C	400	10	Measurement errors, etc.
1- 33	Common Piping Duct of the Central Environment Facility Waste System	Yes	0.6	ND	9.9×10^{-2}	1.1×10^{-1}	2.1×10^{-1}	C	730	Yes	5.0	ND	7.3×10^{-1}	9.4×10^{-1}	1.7×10^{0}	C	450	280	Increase due to gradual inflow of groundwater
1- 34	Common Pool Connecting Duct	Countermeasure implementation planned to be completed in February 2013								No	–	–	–	–	–	–	–	–	
1- 35	Unit 4 Off-Gas Piping Duct	-*1	—	–	–	–	–	–	—	-*1	–	–	–	–	–	–	–	–	
1- 36	Unit 4 Common Piping Duct	No	—	–	–	–	–	–	—	No	–	–	–	–	–	–	–	–	
1- 37	Connecting Duct between Waste Treatment Buildings	Yes	0.4	ND	9.9×10^{-2}	2.0×10^{-1}	3.0×10^{-1}	C	400	Yes	–	ND	1.5×10^{-1}	1.7×10^{-1}	3.2×10^{-1}	C	142	258	Increase due to gradual inflow of groundwater
1- 38	Unit 4 Power Cable Trench	–	–	–	–	–	–	–	–	No	–	–	–	–	–	–	–	–	
								Total	7,412							Total	8,091		

*1 Locations unable to access due to high radiation dose

*2 The condition inside cannot be inspected due to obstacles.

*5 Classification of accumulated water

A: 1.0×10^{3}Bq/cm^3 and higher

B: 1.0×10^{2}Bq/cm^3 and higher

C: 1.0×10^{1}Bq/cm^3 and lower