

Progress Status of Countermeasures

Legend	 : Implemented	 : Under construction	 : Filed work started, but construction not started	 : Field work not started yet
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Areas	Issues	Target	Countermeasures	Unit 1	Unit 2	Unit 3	Unit 4	
I. Cooling	(1) Reactors	Target [1] Stable cooling	Countermeasures started by April 17	Countermeasure [1]: Injecting fresh water into the RPV by pumps	-In progress (from March 25)	-In progress (from March 26)	-In progress (from March 25)	
				Countermeasure [2]: Injecting nitrogen gas into the PCV (start from Unit1)	-In progress (from April 6)	-Injection line is under preparation (from April 16)	-Injection line is under preparation (from April 16)	
				Countermeasure [3]: Consideration of flooding the PCV up to the top of active fuel	-Under consideration (from April 13)	-Under consideration (from April 13)	-Under consideration (from April 13)	
				Countermeasure [4]: Lower the amount of steam generated by sufficiently cooling the reactor (to be achieved by countermeasures in Step1 and Step2)	-Various countermeasures have been taken	-Various countermeasures have been taken	-Various countermeasures have been taken	
				Countermeasure [5]: Consideration of shielding the leakage by covering the reactor building	-Consideration is completed		-Designing is in progress (continue to Step 2)	-Designing is in progress (continue to Step 2)
				Countermeasure [7]: Cooling at minimum water injection rate (control the leakage of contaminated water)	-In progress	-In progress	-In progress	
				Countermeasure [8]: Install interconnecting lines of offsite power soon	-Installation completed			
				Countermeasures in Step 1	Countermeasure [6]: Consideration of sealing the leakage location in the PCV		-Under consideration (various tests of grout materials are in progress)	
			Countermeasure [9]: Flood the PCV up to the top of active fuel		-While flooding operation started from May 6, consideration of shielding measure of leakage in the PCV is in progress. (Countermeasure [16])	-Flooding measure is under consideration (Countermeasure [3])	-Flooding measure is under consideration (Countermeasure [3])	
			Countermeasure [10]: Reduce the amount of radioactive materials (utilization of standby gas treatment system (filter), etc.) when PCV venting (release of steam containing radioactive materials into the atmosphere)		-Not necessary at this moment	-Not necessary at this moment	-Not necessary at this moment	
			Countermeasure [11] (integrate with countermeasure [15]): Inject nitrogen gas into the PCV		-In progress (from April 6)	-Injection line is under preparation (from April 16)	-Injection line is under preparation (from April 16)	
			Countermeasure [12]: Circulate the accumulated water back into the RPV after processing it		-Site survey was conducted (April 26, May 11) -Preparation of injection line is scheduled to start from May 21	-Injection line is under preparation (from April 9)	-Injection line is under preparation (from April 16)	
			(Countermeasures in Step 2) Countermeasure [45]: Reuse of processed water as reactor coolant		-Same as Countermeasure [12]	-Same as Countermeasure [12]	-Same as Countermeasure [12]	
			Countermeasure [13]: Recover heat exchange function for the reactor		-Installation work is in progress (May 13)	-Basic design is completed. Detailed design is in progress. -Manufacturing heat exchanger	-Basic design is completed. Detailed design is in progress. -Manufacturing heat exchanger	
			Countermeasure [14]: Continue cooling by current minimum water injection rate.		- In progress	- In progress	- In progress	
			Countermeasure [16]: Seal the leakage location in the PCV		-Confirming leakage spot and leaking amount (plant parameter confirmation, site survey, etc)	-Sealing measure is under consideration (Countermeasure [6])	-Confirming leakage status (plant parameter confirmation)	
			Countermeasure [76]: Improve working environment		-Measurement of radiation dose, Removal of debris, Entering into the building (May 9)	-Measurement of radiation dose, Preparation for Entering into the building	-Measurement of radiation dose, Removal of debris, Preparation for Entering into the building	

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I. Cooling	(2) Spent Fuel Pools	Target [4] Stable cooling	Countermeasures started by April 17	Countermeasure [18]: Consideration/implementation of improving reliability of external water injection by concrete pumpers ("Giraffe", etc.)/switch to remote-controlled operation.	-Reliability improvement: manufacturing hoses with enhanced durability (high-spec polyethylene pipe) -Measures to reduce radiation dose: allocated concrete pumping vehicle equipped with remote controllable arm		-Same as Unit 1	-Same as Unit 1
				Countermeasure [19]: Sampling and measurement of steam/pool water by "Giraffe", etc.	-will be considered including the sampling method	- Analyzed water of the pool in skimmer surge tank. Confirmed that most of the fuel were intact.	-Confirmed that most of the fuel were intact by analyzing water in the pool	-Confirmed that most of the fuel were intact by analyzing water in the pool
			Countermeasures in Step 1	Countermeasure [22]: Continuation of water injection by "Giraffe", etc	-Reliability improvement: manufacturing hoses with enhanced durability (high spec polyethylene pipe) -Measures to reduce radiation dose: allocated concrete pumping vehicle equipped with remote controllable arm (2 vehicles)		-Same as Unit 1	-Same as Unit 1
				Countermeasure [23]: Restoration of water injection through normal cooling system.		- Continue water injection through normal cooling system - Addition of heat exchange function is treated in Countermeasure [25,27]		
				Countermeasure [24]: Restoration of normal cooling system	-Radiation measurement by camera and robot(from April 30 to May 6) -Radiation reduction by flushing and shielding facility is under consideration (from May 11)		-Confirmation of power system stability through water level measurement by "Giraffe"etc(from May 8 to May 15) -Water injection through normal cooling system(from May 16)	-Implementing site survey (to the end of May) -Removing debris. Restoration work will start after the removal.
				Countermeasure [25]: Install heat exchangers.	-Manufacturing heat exchanger	-Manufacturing heat exchanger -Removing debris in working environment (from May 4) - Installation work is in progress (from May 17)	-Manufacturing heat exchanger. Installation work will start after it is transferred to the site.	-Manufacturing heat exchanger
				(Countermeasures in Step 2) Countermeasure [27]: Cooling by installation of heat exchangers	-Cooling will start after installing heat exchanger (Countermeasure [25])	-Cooling will start after installing heat exchanger (Countermeasure [25])	-Cooling will start after installing heat exchanger (Countermeasure [25])	-Cooling will start after installing heat exchanger (Countermeasure [25])
			Countermeasures started by April 17	Countermeasure [29]:Identify leakage path and examine and implement preventive measures	- Putting sandbags including radioactive decontaminants (zeolite) into the port (from April 15 to 17: put 10 sets of baskets including sandbags) - Installation of contamination preventive fences (silt fence) in the port (from April 11 to 14: installation) - Shielding between trench and building (April 7: completed in Unit 4) etc.			
				Countermeasure [30]:Transferring accumulated water to facilities that can store it (condenser and Centralized Waste Treatment Facility)	- Unit 2 Turbine Building accumulated water -> condenser (April 13 transfer completed) - Implementation of waterproof work etc. in order to transfer water from Unit 2 Turbine Building to Centralized Radiation Waste Treatment Facility			
				Countermeasure [31]: Preparing decontamination and desalt of transferred accumulated water.	- Selection of decontamination / desalt, consideration of basic design etc.			
				Countermeasure [32]:Preparing to install tanks	- Arrangement of tank, selection of installation place, preparation - Cancellation application of permission and authorization regarding deforestation			
Countermeasure [37]:Utilization of "Centralized Waste Treatment Facility", etc. to store water	- After waterproof check in Centralized Radiation Waste Treatment Facility (High-temperature Incineration Building and Main Process Building), transferring accumulated water in Unit 2 from April 19 - Installation of tanks [For receiving treated water] May 10 : Approx. 11,000 tons - Transferring accumulated water in Unit 2 and 3 into Centralized Waste Treatment Facility (High-temperature Incineration Building and Main Process Building) (start transferring accumulated water in Unit 3 from May 17)							
Countermeasure [38]:Install water processing facilities	- Decontamination / desalt equipments installation work is in progress							
		ace for water with high radiation level						

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II. Mitigation	(3) Accumulated Water	Target [6]: Secure sufficient storage pl	Countermeasures in Step 1	Countermeasure [39]:Examination and implementation of backup measures (installment of additional tanks)	-Installation of tanks [For receiving treated water] late June : Approx. 28,000 tons, Preparing installation place for underground tanks* (from May 16 to Step 2)				
				(Countermeasure in Step 2) Countermeasure [42]:Expansion of additional tanks to store high radiation-level contaminated water	- Consideration of installation of additional tanks to store high radiation-level contaminated water				
				(Countermeasure in Step 2) Countermeasure [43]:Continuation and reinforcement of decontamination and desalt of high radiation-level water	- Consideration and preparation for installation of backup treatment equipments - Preparation for enhancement of desalt equipments				
				(Countermeasure in Step 2) Countermeasure [45]:Reuse of processed water as reactor coolant	- In progress in Countermeasure [12]	- In Progress in Countermeasure [12]	- In Progress in Countermeasure [12]		
				Countermeasure [64]:Mitigation of contamination in the ocean	- installation of silt fence (from April 11 to 14)		<Plan> -Installation of circulate purifying equipments (late May) -Installation of steel pipe sheet pile (continue to Step 2)		
				Countermeasure [65]:Isolation of high-level radioactive water		- Blocking of vertical shaft of turbine trench (planned at the end of May)	- Blocking of vertical shaft of turbine trench (planned at the end of May)	- Completed blocking of vertical shaft of turbine trench (April 7)	
		Target [7]: Store and process water with low radiation level	Countermeasures started by April 17	Countermeasure [33]:Preparing to store with tanks and barges	- Installation of tank (as of May 17 13,200 tons) - Megafloat 10,000 tons (planned to arrive in port of Fukushima Daiichi on May 20)				
				Countermeasure [34]:Preparing for decontamination and desalt of contaminated water	- Decontamination / desalt equipments installation work is in progress				
				Countermeasure [35]: Preparing to install a reservoir	- Planning to use tank instead of reservoir				
				Countermeasure [36]:Preparing to decontaminate sub-drainage water after being pumped up	- Preparing to decontaminate in tank on the ground etc. (zeolite etc.)				
	Countermeasures in Step 1	Countermeasure [40]:Increase storage capacity by adding tanks, barges, Megafloat, etc	- Installation of tanks (May 8 : 2,200 tons) <note> Installation of additional tanks (mid May : 6,200 tons, late May : 6,400 tons, early June : 3,600 tons), Megafloat (late May : 10,000 tons), barges (late June : 1,200 tons and 1,000 tons)						
		Countermeasure [41]:Decontaminating contaminated water using decontaminants to below acceptable criteria	- Use of decontaminants (zeolite) : test operation (from May 3), full operation (from late May)						
	(4) Underground Water	Target [13]: Prevent contamination spread into the sea	Countermeasures in Step 1	Countermeasure [66]:Examination of mitigation measures of groundwater contamination	- Examined mitigation measures of groundwater contamination (countermeasure [67],[68])				
				Countermeasure [67]:Implementation of mitigation measures of groundwater contamination	- Restoration of sub-drain pump (planned in mid June) - Management of sub-drain in accordance with planned expansion of storage and treatment facility (continue to Step 2)				
				Countermeasure [68]:Examination of shielding methods of groundwater	-Choose most appropriate method to shield underground water by evaluating the effect of water shield, earthquake resistance, and durability(Continue to Step 2)				
/ Soil	Active materials on buildings	Countermeasures started by April 17	Countermeasure [47]:Inhibit scattering of radioactive materials by full-scale dispersion of inhibitor after confirming its performance by test	- Confirmed unevenness of dispersion and solidification status of soil by test dispersion - Developed remote-controlled crawler damp for dispersion					
			Countermeasure [48]:Prevent rain water contamination by dispersion of inhibitor	- Started installation of remote-controlled heavy machinery (April 6 test run, April 10 full operation) (Removed debris (volume of 31container of approx. 4m3) (by April 17))					
			Countermeasure [49]:Removal of debris						
			Countermeasure [50]:Examination and implementation of basic design for reactor building cover and full-fledged measure (container with concrete roof and wall, etc.)	Examination of basic design for reactor building cover		Examination of basic design for reactor building cover	Examination of basic design for reactor building cover		

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II. Mitigation	(5) Atmosphere	Target [9]: Prevent scattering of radionuclides and ground	Countermeasures in Step 1	Countermeasure [51]: Consideration of solidification, substitution and cleansing of contaminated soil (mid-term issues.)	- Confirmed solidification of soil by dust inhibitor			
				Countermeasure [52]: Dispersion of inhibitor				
			Countermeasures started by April 17	Countermeasure [53]: Removal of debris	- Approx. 105,000 m ² of plane and slope (as of May 12) - Approx. 49,000 m ² around Units 1 to 4 (as of May 12) <Plan> - Approx. 420,000 m ² of plane and slope (to the end of June) - Approx. 120,000 m ² around Units 1 to 4 (to the end of May)			
				Countermeasure [54]: Installation of reactor building covers				
III. Decontamination / Monitoring	(6) Measurement, Reduction and Announcement	Target [11]: Expand/enhance monitoring	Countermeasures started by April 17	Countermeasure [57]: Monitoring sea water, soil and atmosphere within the site boundary (25 locations.)	- In progress - Implemented atmosphere monitoring when opened the door of reactor building in Unit 1 (May 8, 9)			
				Countermeasure [58]: Monitoring radiation dose at the site boundary (12 locations.)				
				Countermeasure [59]: Consideration of monitoring methods in evacuation order/ planned evacuation/ emergency evacuation preparation areas.				
			Countermeasures in Step 1	Countermeasure [60, 61]: Expansion, enhancement and announcement of monitoring	- Measurement of airborne radiation within 20 km radius from the power plant. Implemented measurement in 128 spots within 2km from main road (April 18). Implemented fixed point measurement in 50 spot (May 6,13)			
Countermeasures started by April 17	Countermeasure [60, 61]: Expansion, enhancement and announcement of monitoring							
IV. Countermeasures against aftershocks, etc.	(7) Tsunami, reinforcement, etc.	Target [15]: Prevent expansion of disaster	Countermeasures started by April 17	Countermeasure [20]: Seismic tolerance assessment of Unit 4.	- Evaluated resistance against earthquake of SFP in Unit 4			
				Countermeasure [21]: Continue monitoring and examine necessary countermeasures				
			Countermeasures in Step 1	Countermeasure [69]: Countermeasures against tsunami	- Transferred emergency power sources to the upland (April 15) - Added redundancy of water injection line (to April 15), Set fire trucks etc. to the upland (to April 18)			
				Countermeasure [70]: Enhancement of countermeasures against tsunami				
				Countermeasure [26]: (Unit 4) Installation of supporting structure under the bottom of the pool	- Installation of temporary tide barriers (the end of June)			
				Countermeasure [71]: Planning/implementation of reinforcement work of each Unit				
				Countermeasure [72]: Preparation of various countermeasures for radiation shielding (application of slurry)	- Soundness of structure was analyzed and evaluated. After removing the wreckage, installation work starts. (around May 23)			
				Countermeasure [73]: Continuation of various countermeasures for radiation shielding				
V. Environment Improvement	(8) Improvement of life/work environment at the site	Target [17]: Enhance the environment improvement	Countermeasures in Step 1	Countermeasure [74]: Improvement of life/work environment of workers	- Improvement of meals, upgrade of lodging facility, securing daily life water, installation of rest station at the site (approx. 600m ²)			
				Countermeasure [75]: Continuation and enhancement of improvement of life/work environment of workers				