

Current Status of “Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO” (Revised edition)

Red colored: newly added to the previous version, ☆: already reported to the government

Issues		As of April 17	Step 1 (around 3 months)	Step 2 (around 3 to 6 months after achieving Step1) current status (as of July 17)	Mid-term issues (around 3 years)
I. Cooling	(1) Reactor	<p>Fresh water Injection</p> <p>Cooling by minimum injection rate (injection cooling)</p> <p>Consideration and preparation of reuse of accumulated water</p> <p>Nitrogen gas injection ☆</p> <p>Improvement of work environment ☆</p>	<p>Circulating Injection Cooling (start) ☆</p> <p>Stable cooling</p>	<p>Circulating Injection Cooling (continued)</p> <p>Cold shutdown condition</p>	<p>Continuous cold shutdown condition</p> <p>Protection against corrosion cracking of structural materials* *partially ahead of schedule</p>
	(2) Spent Fuel Pool	<p>Fresh water injection</p>	<p>Reliability improvement in injection operation / remote-control operation *ahead of schedule</p> <p>Circulation cooling system ☆ (installation of heat exchanger) *partially ahead of schedule</p> <p>Stable cooling</p>	<p>Remote-controlled injection operation</p> <p>Consideration / installation of heat exchanging function</p> <p>More stable cooling</p>	<p>Start of removal work of fuels</p>
II. Mitigation	(3) Accumulated Water	<p>Transferring water with high radiation level</p> <p>Storing water with low radiation level</p>	<p>Installation of storage / processing facilities ☆</p> <p>Installation of storage facilities / decontamination processing</p> <p>Secure storage place</p>	<p>Expansion / consideration of full-fledged processing facilities</p> <p>Decontamination ☆ / desalt processing (reuse), etc</p> <p>Storage ☆ / management of sludge waste etc.</p> <p>Mitigation of contamination in the ocean</p> <p>Reduction of total amount of contaminated water</p>	<p>Installation of full-fledged water processing facilities</p> <p>Continuous processing of accumulated water</p> <p>Research of processing of sludge waste etc.</p> <p>Mitigation of contamination in the ocean</p>
	(4) Ground water		<p>Mitigation of contamination of groundwater</p> <p>Consideration of method of shielding wall of groundwater</p> <p>Mitigate ocean contamination</p>	<p>(Sub-drainage management with expansion of storage / processing facilities)</p> <p>Design / start of implementation of shielding wall of groundwater</p> <p>Mitigate ocean Contamination (continued)</p>	<p>Solidification of contaminated soil, etc</p> <p>Establishment of shielding wall of groundwater</p>
	(5) Atmosphere / Soil		<p>Dispersion of inhibitor</p> <p>Removal of debris</p> <p>Mitigate scattering</p>	<p>Installation of reactor building cover (Unit 1) ☆</p> <p>Removal of debris (top of Unit 3&4 R/B)</p> <p>Consideration of reactor building container</p> <p>Mitigate scattering (continued)</p>	<p>Removal of debris / installation of reactor building cover (Unit 3&4)</p> <p>Start of installation work of reactor building container</p>

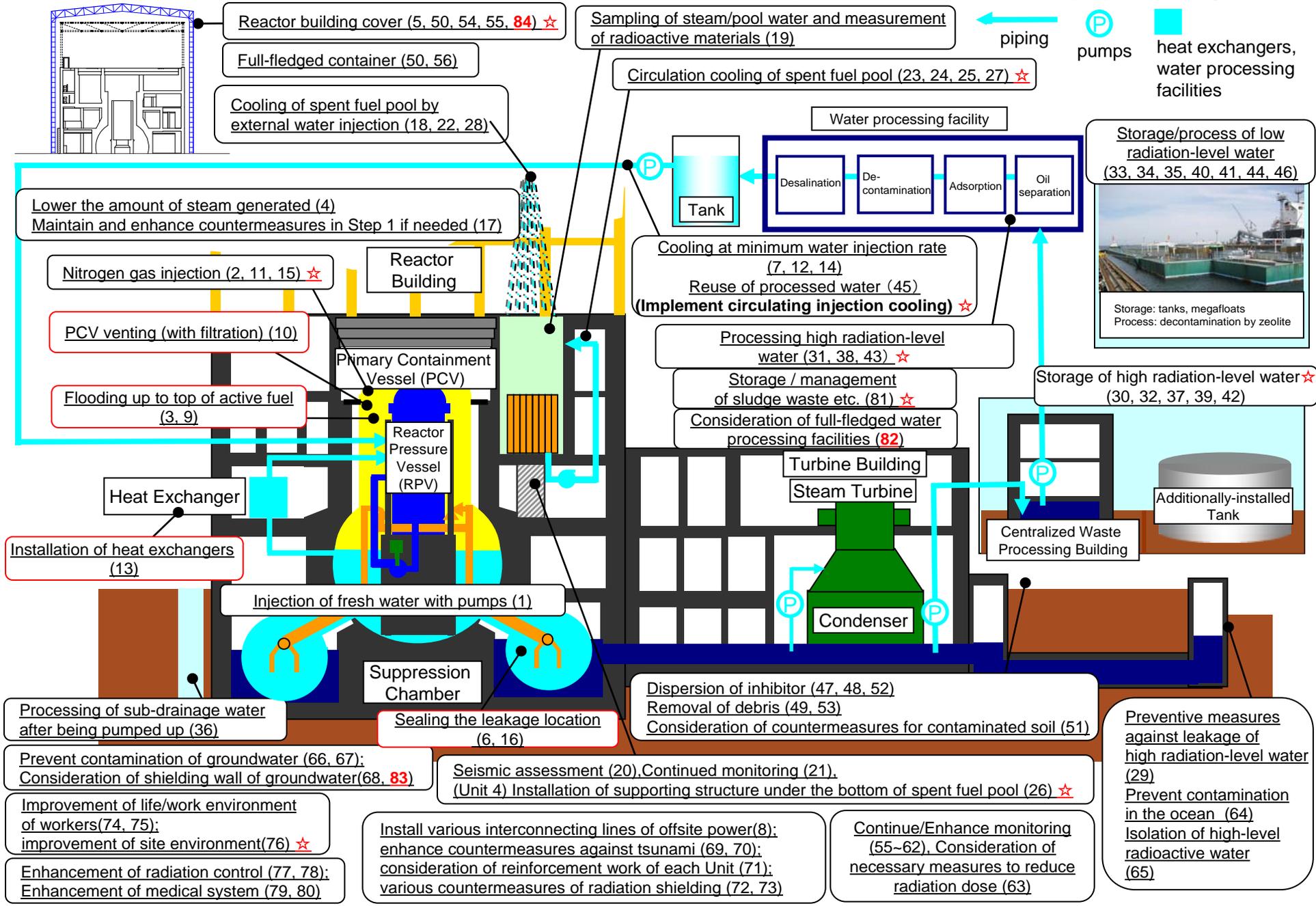
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Issues	As of April 17	Step 1 (around 3 months)	Step 2 (around 3 to 6 months after achieving Step1) current status (as of July 17)	Mid-term issues (around 3 years)	
III. Monitoring/ Decontamination	(㉟) Measurement, Reduction and Announcement	Expansion, enhancement and announcement of radiation dose monitoring in and out of the power station		Decontamination	Continuous environmental monitoring
		Start of full-fledged decontamination			Continuous decontamination
IV. Countermeasures against aftershocks, etc	(㉞) Tsunami, Reinforcement, etc	Enhancement of countermeasures against aftershocks and tsunami, preparation for various countermeasures for radiation shielding		Mitigate disasters	Continue various countermeasures for radiation shielding
		(Unit 4 spent fuel pool) Installation of supporting structure ☆	Consideration / implementation of reinforcement work of each Unit		Reinforcement work of each Unit
V. Environment improvement	(㉟) Life/work environment	Improvement of workers' life / work environment		Enhancement of environment improvement	Improvement of workers' life / work environment
	(㊱) Radiation control / Medical care	Improvement of radiation control / medical system		Enhancement of Healthcare	Improvement of radiation control / medical system
Measures for Mid-term issues			<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">Government's concept of securing safety</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Establishing plant operation plan based on the safety concept</div>	Response based on the plant operation plan	

Overview of Major Countermeasures in the Power Station as of July 17

Red frame: deleted countermeasures, red colored: newly added countermeasures, ☆: already reported to the government



Current Status of Countermeasures (1)

Red frame: progressed countermeasures from the previous version, ☆: already reported to government

Issues	Unit	<Step 1> Previous status (as of June 17)	<Step 2 (about 3 to 6 months from now)> Current status (as of July 17)	Release of radioactive materials is under control and radiation dose is being significantly held down		
I. Cooling	1	Start of circulating injection cooling [Countermeasures 12,14,45] ☆ - water injection started with processed accumulated water	Implementation of circulating injection cooling [Countermeasures 12,14,45] Construction of centralized monitoring system in the main anti-earthquake building, etc.	Target [∞] Cold shutdown condition		
		Nitrogen gas injection [Countermeasure 11] ☆				
	2	Start of circulating injection cooling [Countermeasures 12,14,45] ☆ - water injection started with processed accumulated water	Implementation of circulating injection cooling [Countermeasures 12,14,45] Construction of centralized monitoring system in the main anti-earthquake building etc.		Target [∞] Cold shutdown condition	
		Improvement of work environment ☆ [Countermeasure 76]	Nitrogen gas injection [Countermeasure 11] (from June 28) ☆			
		Consideration of leakage sealing measure of PCV [Countermeasure 6]				
	3	Start of circulating injection cooling [Countermeasures 12,14,45] ☆ - water injection started with processed accumulated water	Implementation of circulating injection cooling [Countermeasures 12,14,45] Construction of centralized monitoring system in the main anti-earthquake building etc.			Target [∞] Cold shutdown condition
		Improvement of work environment ☆ [Countermeasure 76]	Nitrogen gas injection [Countermeasure 11] (from July 14) ☆			

Legend: : Implemented (monitored by government as necessary) ☆ : Safety check by government (report) : Under construction : Field work started : Field work not started yet

Current Status of Countermeasure (2)

Red frame: progressed countermeasures from the previous version, ☆: already reported to government

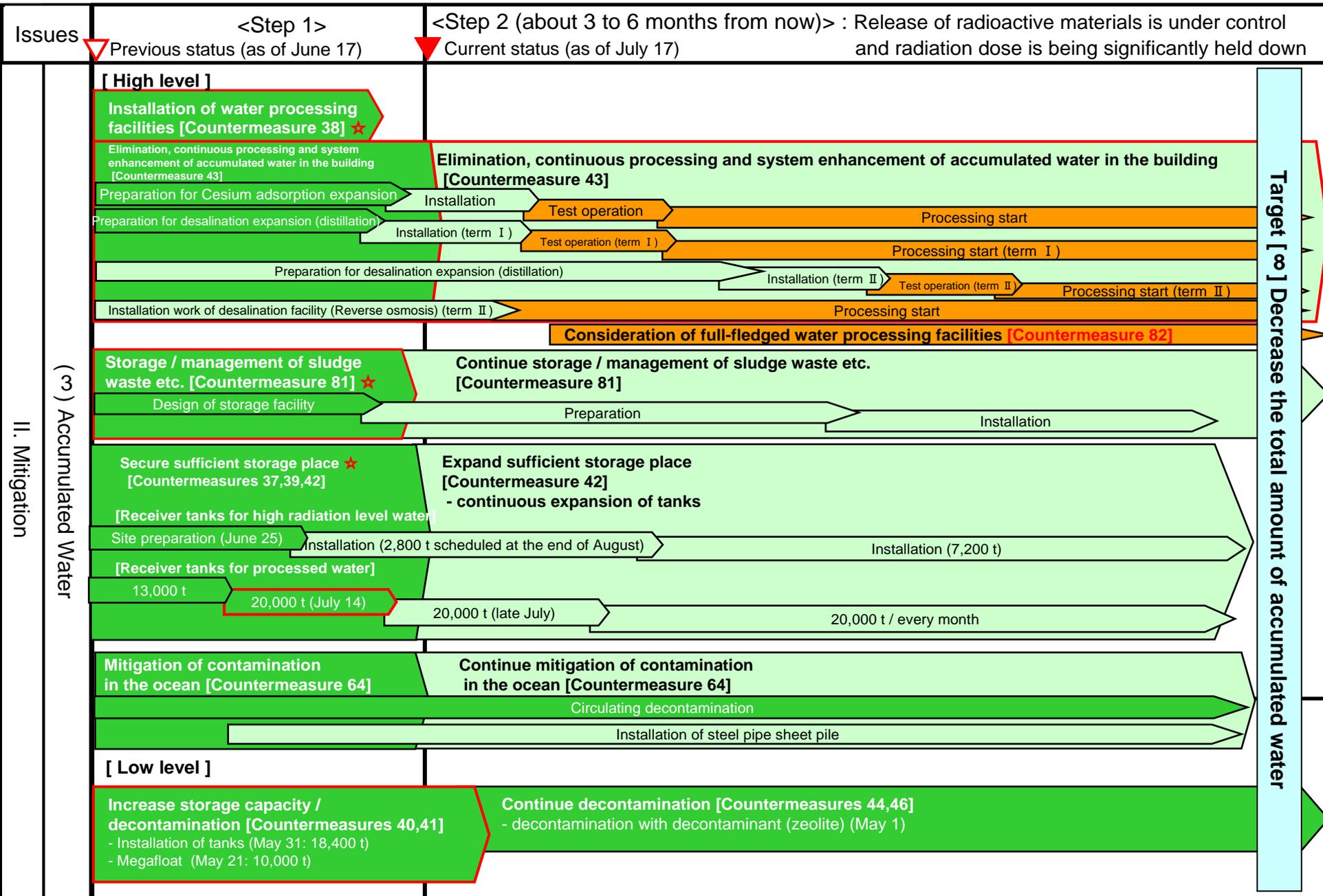
Issues	Unit	<Step 1>	<Step 2 (about 3 to 6 months from now)>	: Release of radioactive materials is under control and radiation dose is being significantly held down	
		Previous status (as of June 17)	Current status (as of July 17)		
1. Cooling	(∞) Spent Fuel Pool	1	Water injection through normal cooling system [Countermeasure 24]		
			Cooling by installation of heat exchanger [Countermeasures 25,27]		
			Consideration / Design	Installation	
		2	Cooling by installation of heat exchanger [Countermeasures 25,27] ☆ - Circulating water cooling operation (from May 31)		
		3	Water injection through normal cooling system [Countermeasure 24]		
			Cooling by installation of heat exchanger [Countermeasures 25,27] ☆ - Circulating water cooling operation (from June 30)		
		4	Restoration of water injection through normal cooling system [Countermeasure 24] - Water injection by installation of alternative system to "Giraffe" (June 17)		
			Cooling by installation of heat exchanger [Countermeasures 25,27]		
			Consideration / Design	Fabrication / Transportation	Installation

Target [5] More stable cooling

Legend : Implemented (monitored by government as necessary) ☆: Safety check by government (report) : Under construction : Field work started : Field work not started yet

Current Status of Countermeasures (3)

Red frame: progressed countermeasures from the previous version, ☆: already reported to government

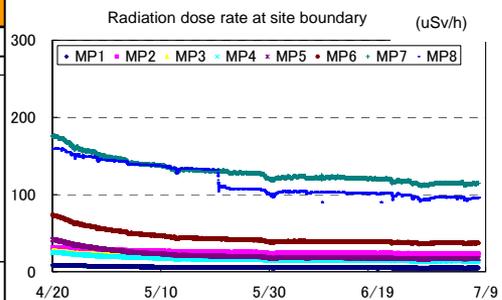
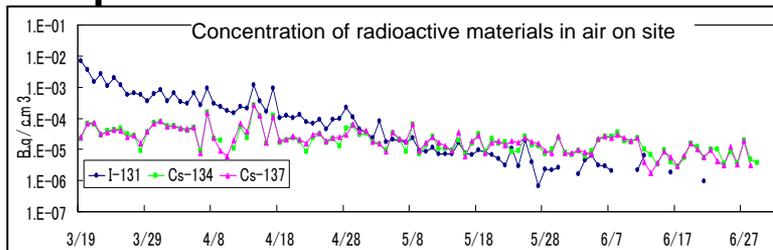


Legend: : Implemented (monitored by government as necessary) ☆ : Safety check by government (report) : Under construction : Field work started : Field work not started yet

Current Status of Countermeasures (4)

Red frame: progressed countermeasures from the previous version, ☆: already reported to government

Issues		<Step 1> Previous status (as of June 17)	<Step 2 (about 3 to 6 months from now)> Current status (as of July 17)	Release of radioactive materials is under control and radiation dose is being significantly held down	
II. Mitigation	(4) Groundwater	Implementation of preventions against expansion of groundwater contamination [Countermeasure 67] - Sub-drainage management with expansion of storage / processing facilities		Target [4] Mitigation of ocean contamination	
		Consideration of method of shielding wall of groundwater [Countermeasure 68]	Design of shielding wall of groundwater [Countermeasure 68]		Begin establishment of shielding wall of groundwater [Countermeasure 83]
	(5) Atmosphere / Soil	Dispersion of inhibitor [Countermeasure 52] -approx. 560,000 m ² completed (June 28) (expanded area)		Confirmation of solidification of inhibitor [Countermeasure 52]	Target [0] Prevent radioactive materials scattering
		Removal of debris [Countermeasure 53] - Collected debris (volume of about 500 containers) (as of July 17)			
		Installation of reactor building cover (Unit 1) [Countermeasures 54,55] ☆ - Unit 1: Preparatory construction work (May 13), ☆Confirmation by the government (June 23), Main structure construction work (June 27)			
		Procurement, manufacturing		On-site construction	
		Removal of debris on top of reactor buildings (Unit 3&4) [Countermeasures 84] - Under preparatory construction (Unit3: June 20, Unit4: June 24), removal of debris on top of reactor buildings			
Consideration of reactor building container [Countermeasure 50]					
III. Monitoring / Decontamination	(6) Measurement, Reduction and Announcement	Expansion, enhancement and announcement of monitoring [Countermeasures 60,61] - Monitoring in and out of the power station - Estimation of released amount		Target [2] Sufficiently reduce radiation dose	
		Implementation of monitoring in cooperation with the government, prefectures, municipalities and operators [Countermeasures 62] Start of full-fledged decontamination [Countermeasures 63]			



Legend: : Implemented (monitored by government as necessary) ☆ : Safety check by government (report) : Under construction : Field work started : Field work not started yet

Current Status of Countermeasures (5)

Red frame: progressed countermeasures from the previous version, ☆: already reported to government

Issues		<Step 1> Previous status (as of June 17)	<Step 2 (about 3 to 6 months from now)> : Release of radioactive materials is under control and radiation dose is being significantly held down Current status (as of July 17)	
IV. Countermeasures against aftershocks, etc	(㇏) Tsunami, reinforcement, etc	Enhancement of countermeasures against tsunami [Countermeasure 70] - Installation of temporary tide barriers (June 30)		Target [㉑] Mitigation of disasters
		(Unit 4) Installation of supporting structure under the bottom of the pool [Countermeasure 26] ☆ - Supporting structure effective (June 18), concrete placement (end of July)	Consideration and implementation of reinforcement work of each Unit [Countermeasure 71] - Seismic resistance is being evaluated	
		Continue various countermeasures for radiation shielding [Countermeasure 73]		
V. Environment improvement	(㉞) Life / work environment	Improvement of workers' life / work environment [Countermeasure 74]	Continuation and enhancement of improvement of workers' life / work environment [Countermeasure 75] From end of June: move to temporary dormitories (by early September)	Target [㉞] Enhancement of environment improvement
		Preparation of temporary dormitories, installation of on-site rest stations	Expansion of temporary dormitories and on-site rest stations / environmental improvement of meals, baths and laundry, etc.	
	(㉟) Radiation control / Medical care	Improvement of radiation control [Countermeasure 77] - Expansion of decontamination facilities - installation of survey areas for rainy days and cleanser decontamination areas - Introduction of bar-code readers for individual APD rental	Continuous reinforcement of radiation control [Countermeasure 78] - Enhanced radiation exposure control by NISA - Expansion of whole-body counters, implementation of monthly internal exposure measurement ☆ - Automated recording of personal radiation dose, written notification of exposure dose ☆, introduction of workers' certificates with photos ☆ - Enhancement of safety training for workers, consideration of long-term healthcare such as establishing database	Target [㉟] Enhancement of healthcare
		Continuous reinforcement of medical system [Countermeasure 80] - Install new emergency medical treatment facility, establish organization with plural resident doctors (on call 24 hours a day), speedy transportation of patients - Intensive preventive measures against heat stroke ☆, countermeasures for mental health - Establish industrial hygiene system such as preventive healthcare		

Legend : Implemented (monitored by government as necessary) ☆ : Safety check by government (report) : Under construction : Field work started : Field work not started yet