

# Progress Status Classified by Countermeasures

Red colored letter: newly added to the previous version,  
Red frame: progressed countermeasures from the previous  
version (revised countermeasures)

Reference 1  
August 17, 2011  
Tokyo Electric Power Company

Legend	<span style="background-color: #008000; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> : Implemented	<span style="background-color: #90EE90; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> : Under Construction	<span style="background-color: #FFFF00; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> : Field work started, but construction not started	<span style="background-color: #FF8C00; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> : Field work not started yet
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Areas	Issues	Target	Countermeasures	Unit 1	Unit 2	Unit 3	Unit 4	
Cooling	(1) Reactors	Cold shutdown condition	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)	- In progress (from June 28)	- In progress (from July 14)	
				Countermeasure [3]: Consideration of flooding the PCV up to the top of active fuel	- Not necessary at this moment	- Not necessary at this moment	- Not necessary at this moment	
				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 after Step 1	Countermeasure [6]: Consideration of sealing the leakage location in the PCV		- Not necessary at this moment		
				Countermeasure [9]: Flood the PCV up to the top of active fuel	- Not necessary at this moment	- Not necessary at this moment	- Not necessary at this moment	
				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)	- In progress (from June 28)	- In progress (from July 14)	
				Countermeasure [12]: Circulate the accumulated water back into the RPV after processing it (Circulating water cooling)	- Circulating water cooling in progress (from June 27)	- Circulating water cooling in progress (from June 27)	- Circulating water cooling in progress (from June 27)	
				(Countermeasures in Step 2) Countermeasure [45]: Reuse of processed water as reactor coolant (Circulating water cooling)	- In progress in Countermeasure [12]	- In progress in Countermeasure [12]	- In progress in Countermeasure [12]	
				Countermeasure [13]: Secure heat exchange function for the reactor	- Not necessary at this moment	- Not necessary at this moment	- Not necessary at this moment	
				Countermeasure [14]: Continue cooling by minimum water injection rate (Circulating water cooling)	- Preparation of water injection for stable cooling	-Preparation of test for stable cooling	-Preparation of test for stable cooling	
				Countermeasure [16]: Seal the leakage location in the PCV	-Not necessary at this moment	- Not necessary at this moment	- Not necessary at this moment	
				Countermeasure [76]: Improve working environment	- Removal of debris, measurement of radiation dose, entering into the building (May 9)	- Measurement of radiation dose, entering into the building, start operation of local exhausters ·purification mode (from June 11 to 19)	- Removal of debris, measurement of radiation dose, entering into the building (June 9) - Cleaning using robots (July 1) - Placing steel plates in truck bay door entrance (July 4)	
				Countermeasure [17]: Maintain and improve countermeasures of Step1 as needed	- Explained in above progress status of countermeasures			

Areas	Issues	Target	Countermeasures	Unit 1	Unit 2	Unit 3	Unit 4	
Cooling	(2) Spent Fuel Pools	More 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: installing 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.	- Analyzed water of the pool in FPC pump drain pipes. Confirmed that most of the fuel were intact	- 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 after Step 1	Countermeasure [22]: Continuation of water injection by "Giraffe", etc	- Reliability improvement: installing 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	- Continue water injection through normal cooling system (from May 29)		- Continue water injection through normal cooling system (from May 16 to June 29)	- Water injection by installing alternative facility to "Giraffe" (from June 17)
				Countermeasure [25]: Install heat exchangers	- Circulating water cooling operation (from Aug. 10)	- Circulating water cooling operation (from May 31)	- Circulating water cooling operation (from June 30)	- Circulating water cooling operation (from July 31)
				(Countermeasures in Step 2) Countermeasure [27]: Cooling by installation of heat exchangers	- Same as Countermeasure [25]	- Same as Countermeasure [25]	- Same as Countermeasure [25]	- Same as Countermeasure [25]
				(Countermeasures in Step 2) Countermeasure [28]: Expand remote-controlled operation area of "Giraffe", etc	- "Elephant 3"(modified as remote-controlled operation) is waiting at 1F (from May 17) - "Mammoth 2"(modified as remote-controlled operation) is waiting at 1F (from June 21)		- Same as Unit 1	- Same as Unit 1

Areas	Issues	Target	Countermeasures	Unit 1	Unit 2	Unit 3	Unit 4	
Mitigation	(3) Accumulated Water [High radiation level]	Decrease total amount of accumulated water	Countermeasures started by April 17	Countermeasure [29]: Identify leakage path and consider / 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 6: 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 Waste Treatment Facility			
				Countermeasure [31]: Preparing decontamination and desalination of transferred accumulated water.	- Selection of decontamination / desalination process, consideration of basic design etc.			
				Countermeasure [32]: Preparing to install tanks	- Arrangement of tanks, selection of installation place, preparation - Cancellation application of permission and authorization regarding deforestation			
			Countermeasures after Step 1	Countermeasure [37]: Utilization of "Centralized Waste Treatment Facility", etc. to store water	- After waterproof check in Centralized Waste Treatment Facility (Main Process Building), transferring accumulated water in Unit 2 from April 19 - After waterproof check in Centralized Waste Treatment Facility (High-temperature Incineration Building), transferring accumulated water in Unit 3 from May 17			
				Countermeasure [38]: Install water processing facilities	- Decontamination facility and desalination equipment in operation			
				Countermeasure [39]: Consideration and implementation of backup measures (installation of additional tanks) (Countermeasure in Step 2)	- Installation of tanks [For receiving treated water] May 10 : 11,000 tons, May 22 : 2,000 tons, July 14 : 20,000 tons, Aug. 13: 20,000 tons <Plan> 20,000 tons / every month (continue to Step 2)			
				Countermeasure [42]: Expansion of additional tanks to store high-level radioactive water (Countermeasure in Step 2)	- Site preparation for installing underground tanks (from May 16 to June 25) - Transportation and installation of underground tanks (from late June to Step 2)			
				Countermeasure [43]: Elimination and continuous processing of contaminated water in the buildings (Countermeasure in Step 2)	- Enhancement of installation of processing equipments (installation of 2nd Cesium Adsorption Instruments (SARRY), operation start scheduled on Aug. 18) - Enhancement of installation of desalination apparatus (installation of Evaporative Concentrated Apparatus (250 tons / day) (Aug. 7, 20), preparation for installing Evaporative Concentrated Apparatus (750 tons / day)			
				Countermeasure [45]: Reuse of processed water as reactor coolant (Circulating water cooling) (Countermeasure in Step 2)	- In progress in Countermeasure [12]	- In progress in Countermeasure [12]	- In progress in Countermeasure [12]	
	Countermeasure [64]: Mitigation of contamination in the ocean	- Putting sandbags including radioactive decontaminants (zeolite) into the port (May 19, put 10 additional sets) - Preparation work for installation of steel pipe sheet pile [removal of curtain wall] (from June 2) - Circulating purifying equipments in operation (from June 13) - Installation of water intake sliding concrete plate (from June 12)		<Plan> - Installation of steel pipe sheet pile (continue to Step 2)				
	Countermeasure [65]: Isolation of high-level radioactive water	- Completed closing of pits etc. (May 17)	- Completed closing of turbine trenches of seawater pipes (June 2) - Completed closing of pits etc. (June 9)	- Completed closing of turbine trenches of seawater pipes (May 26) - Completed closing of pits etc. (June 13)	- Completed closing of turbine trenches of seawater pipes (April 6) - Completed closing of pits etc. (June 13)			
	Countermeasure [81]: Storage / management of sludge waste	- Appropriate storage / management of sludge waste with high-level radioactivity, which derived from the treatment of high-level radioactive water						
	(3) Accumulated Water [Low radiation level]	Prevent contamination spread into the sea (continuation)	Countermeasures started by April 17	Countermeasure [33]: Preparing to store with tanks and barges	- In progress in Countermeasure [40]			
				Countermeasure [34]: Preparing for decontamination and desalination of contaminated water	- In progress in Countermeasure [41]			
				Countermeasure [35]: Preparing to install a reservoir	- Using tanks 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.)			
	(4) Underground Water	Prevent contamination spread into the sea (continuation)	Countermeasures after Step 1	Countermeasure [40]: Increase storage capacity by adding tanks, barges, Mega float, etc	- Mega float docked (May 21 : 10,000 tons), Installation of tanks (May 31: 18,400 tons)			
				Countermeasure [41]: (Integrated with Countermeasures 44 and 46, Countermeasures in Step 2) Decontaminating contaminated water using decontaminants to below acceptable criteria	- Use of decontaminants (zeolite) : full operation (from May 1)			
	(4) Underground Water	Prevent contamination spread into the sea (continuation)	Countermeasures after Step 1	Countermeasure [66]: Consideration 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-drainage pumps around reactor building of Unit 1~4 (to Step 2) - Management of sub-drainage together with the expansion plan of storage / processing facility (to Step 2)				
Countermeasure [68]: Consideration of shielding wall of groundwater				- Considering most appropriate method of impermeable wall of underground water by evaluating the effect of water shield, earthquake resistance, and durability (Continue to Step 2)				

Areas	Issues	Target	Countermeasures	Unit 1	Unit 2	Unit 3	Unit 4	
Mitigation	(5) Atmosphere / Soil	Mitigate scattering of radioactive materials (Continuation)	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 dump trucks 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 31 container of approx. 4m3) (by April 17))			
				Countermeasure [49]:Removal of debris	- Consideration of basic design for reactor building cover - Basic design of container in progress			
				Countermeasure [50]:Consideration and implementation of basic design for reactor building cover and full-fledged measure (container with concrete roof and wall, etc.)	- Consideration of basic design for reactor building cover - Basic design of container in progress			
				Countermeasure [51]:Consideration of solidification, substitution and cleansing of contaminated soil (mid-term issues.)	- Confirmed solidification status of soil by dust inhibitor			
			Countermeasures after Step 1	Countermeasure [52]:Dispersion of inhibitor	- Approx. 400,000 m2 inside of the power station (plane and slope) (as of June 28) - Approx. 160,000 m2 around Units 1 to 4 (as of June 27) - Removed debris (volume of approx. 700 containers) (as of Aug. 17) - Continuation of removal work			
				Countermeasure [53]:Removal of debris	- Started preparation construction work (from May 13) - Started construction (from June 27) - Started steel-frame work for reactor building cover (from Aug. 10)			
				Countermeasure [54]:(Integrated with Countermeasure [55])Installation of reactor building covers				
				Countermeasure [84]:Removal of debris at the upper part of the reactor building (Unit 3 and 4)	- Started preparation construction work (from June 20)			
					- Started preparation construction work (from June 24)			
Monitoring / Decontamination	(6) Measurement, Reduction and Disclosure	Decontamination	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.)	- In progress - Implemented atmosphere monitoring when opened the door of reactor building in Unit 1 (May 8, 9)			
				Countermeasure [59]:Consideration of monitoring methods in evacuation area/ deliberate evacuation area/ evacuation prepared area in case of emergency.	- Measurement of dose rate 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 spots (May 6,13)			
			Countermeasures after Step 1	Countermeasure [60, 61]:(Integrated with Countermeasure 62, Countermeasure in Step 2)Expansion, enhancement and disclosure of monitoring (Countermeasure in Step 2)	< Monitoring inside and outside of the power station area is in progress, and under evaluation of released radioactive nuclide> (to Step 2) - Land area: radiation dose rate in air (50 spots / week), soil survey in progress. Enhancement and improvement of monitoring inside of the site - Sea area: expanding to offshore of Fukushima, Ibaraki and Miyagi prefectures. Considering to introduce marine life monitoring and unmanned survey ship			
				Countermeasure [63]:Consideration and commencement of necessary method of radiation reduction (decontamination of houses and soil surface etc.) <Consultation and cooperation with the Government, Prefectures and municipalities>				
Countermeasures for aftershocks, etc.	(7) Tsunami, reinforcement, etc.	Mitigate disasters	Countermeasures started by April 17	Countermeasure [20]:Seismic tolerance assessment of Unit 4.				
				Countermeasure [21]:Continue monitoring and examine necessary countermeasures	- Evaluated resistance against earthquake of SFP in Unit 4 - Continue surveillance and considered reinforcement work			
			Countermeasures after 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	- Completion of installation of temporary tide barriers (June 30)			
				Countermeasure [26]:(Unit 4) Installation of supporting structure under the bottom of the pool	- Structure already evaluated, installation in progress (from May 20), completion of installation of steel pillar (June 20), supporting structure effective, work completed (July 30)			
				Countermeasure [71]:Planning/implementation of reinforcement work of each Unit	- Evaluation of earthquake resistance in progress (Continue to Step 2)			
				Countermeasure [72]:Preparation of various countermeasures for radiation shielding (application of slurry)	- Completed pipe work and pumping vehicle set (May 17)			
Countermeasure [73]:Continuation of various countermeasures for radiation shielding	- Maintain facilities (to Step 2) - Implemented training of workforce (June 16 and 17) - Develop manual and confirm system (June 30)							

Areas	Issues	Target	Countermeasures	Unit 1	Unit 2	Unit 3	Unit 4	
Environment Improvement	(8) Improvement of living/working environment	Enhance the environment improvement	Countermeasures after Step 1	Countermeasure [74]:Improvement of living/working environment of workers	- Improvement of meals, upgrade of lodging facility, securing daily life water, installation of rest station at the site (10 rest station installed by TEPCO : as of Aug. 10)			
				Countermeasure [75]:Continuation and enhancement of improvement of living/working environment of workers	(Continue to Step 2) - Installation of temporary dormitory : after the end of June until early September, moving to temporary dormitory and increasing temporary dormitory step by step - Increasing available amount of daily life water, expansion of rest station at the site			
	(9) Improvement of radiation control and medical system	Enhancement of healthcare	Countermeasures after Step 1	Countermeasure [77]:Improvement of radiation control	- Installation of decontamination equipment for people and vehicles - Issuance of individual examination certificate (May 7) - Introduction of bar-code reader for individual APD rental			
				Countermeasure [78]:Continue improvement of radiation control	- Expansion of whole-body counters (from July 11), additional expansion (plan to start operation from October) - Expansion of decontamination equipment: installation of survey place in case of rain (from July 15) and cleansing place (from July 31) - Automated recording of individual APD (Fukushima Daiichi; from April 14, J-Village; from June 8, Full operation is planned to start from December)			
Countermeasure [79]:Improvement of medical system				- Considering heat strokes countermeasures in summer, 24-hour doctor's office in the seismic isolation building at Fukushima Daiichi with the aid of the government. (from May 29)				
			Countermeasure [80]:Continue improvement of medical system	- With the aid of the government, open emergency medical facility and 24-hour resident doctors who has knowledge of emergency exposure medical.[Realized plural doctors] (from July 1) - Establishment of sustainable medical system and establishment of industrial hygiene system such as preventive healthcare - Speedy transportation of patients (Enhancement of transportation vehicle and review of transportation rules etc.) - Implementation of countermeasures for mental health (Support and physical checkup by specialists from National Defense Medical College etc.) - Implementation of regular physical checkup and various extraordinary physical checkup [workers who exceeded the dose limit of 100mSv, workers who take potassium iodide, workers who engaged in emergency work for more than one months etc.] - Intensive preventive measures against heat stroke (trainings for new workers etc.)				
(10) Staff personnel allocation / training	Thorough radiation exposure control	Countermeasures after Step 1	Countermeasure [85]:Staff personnel allocation and training considering exposure dose	- Conducting training for staffs engaged in radiation related work, who will be in great demand. • TEPCO has been conducting "radiation survey staff training" targeted for employees and TEPCO group companies employees and has already trained approx. 1,900 personnel. • The government has been conducting "radiation survey staff" and "radiation protection staff" development trainings and will train 250 personnel. • According to affiliated companies needs, launched a new framework of looking for specialized technical workers widely through Japan Atomic Industrial Forum (JAIF).				