

Status of countermeasures for restoring from the accident at Fukushima Daiichi Unit 1 through 4. As of July 7th, 2011. (Estimated by JAIF)




		Unit 1	Unit 2	Unit 3	Unit 4	Notes	
Basic information	Type of plant	BWR-3	BWR-4	BWR-4	BWR-4		
	Electric / Thermal power output	460/1380	784/2381	784/2381	784/2381		
Plant status when hit by the earthquake	Operation status	In service -> Shutdown	In service -> Shutdown	In service -> Shutdown	Outage		
	No. of nuclear fuels loaded in the reactor	400	548	548	0		
	No. of spent fuels stored in the SFP	292	587	514	1331		
	External power supply	Stopped due to the earthquake					
	Emergency power supply	EDGs automatically started up when the external power was lost but stopped later when tsunami hit the plants.					
Reactor cooling	Status	Core and fuel integrity	Damaged (core melt*1)	Damaged (core melt*1)	Damaged (core melt*1)	No fuels loaded	
		RPV structural integrity	Limited damage and leakage	Unknown	Unknown	No damage	
	PCV structural integrity	Damage and leakage suspected	Damage and leakage suspected	Damage and leakage suspected	No damage		
	Core cooling	Not functional	Not functional	Not functional	Not required		
	measures	Goal of STEP 1 (April through July)	Stable cooling (circulating injection cooling reusing accumulated water)			—	
		Cooling by minimum injection rate	Injecting freshwater into the reactor via feed water line at 3.8 m ³ /h [7/6]	Injecting freshwater into the reactor via feed water line at 3.4 m ³ /h [7/6]	Injecting freshwater into the reactor via feed water line at 8.9 m ³ /h [7/6]	—	Decreasing the injection rate to prevent the overflow of the accumulated water in the facilities
		Establishment of circulating injection cooling	Injection line established. Circulation started [6/27-] following the radioactive water process facility starts its operation.			—	
		Nitrogen gas injection into PCV	Injection continued [4/6-]	Injection continued [6/28-]	Work for injection line in progress [4/16-]	—	
		Flooding of PCV after sealing leaks	Studying	Studying	Studying	—	
		Securing heat exchange function	Work for secondary-loop piping in progress (5/13-)	Construction work to be started after improving the work environment	Construction work to be started after improving the work environment	—	
Challenge	Improving work environment	High radiation circumstance is hampering the work to restore reactor cooling. Preparation work such as removing radioactive debris, radiation monitoring is underway in each unit. Large-scale work inside the R/B started at unit-1 and 2 after radioactive substance and humidity in the air inside the R/B dropped.			—		
SFP cooling	Status	Fuel integrity in SFP	Unknown	Most spent fuels not damaged*2	Unknown	Most spent fuels not damaged*2	
		SFP cooling	Injection function recovered	Function recovered	Injection function recovered	Not functional	
	measures	Goal of STEP 1 (April through July)	Stable cooling				
		Reliability improvement in injection operation	Injecting freshwater via SFP coolant clean up line	Switching from freshwater injection via SFP coolant clean up line to circulation cooling	Injecting freshwater via SFP coolant clean up line. Bolic acid added to neutralize the alkalized pool water [6/26,27]	Injecting freshwater via alternative injection line. Preparing system for cooling in a stable manner	Injecting corrosion inhibitor, hydrazine (H ₂ NNH ₂), with freshwater [5/9-]
Challenge	Circulation cooling with Hx	Planned	In operation [5/31-]	In operation [6/30-]	Planned		
Accumulated water	Status	Increase and accumulation of radioactively contaminated water	High level radioactive wastewater is accumulating in the R/B, T/B and RW/B of each unit. (about 99,440m ³ [6/28])				
		Goal of STEP 1 (April through July)	Securing storage place of high level radioactive wastewater				
	measures	Securing storage place	-Storage capacity of 14800m ³ (10,000m ³ + 4,800m ³) for highly radioactive wastewater are secured by using the Centralized Radiation Waste Treatment Facility as water storage place. -Underground tank for high level radioactive wastewater (storage capacity: approx. 10,000m ³) to be installed in the mid August -Storage tanks to receive processed, low to middle level radioactive wastewater with the capacity of approx. 13,000m ³ installed (-5/31). Additional capacity to be installed at 20,000m ³ /month from the end of June.				
		Transfer of radioactive waste water	Highly radioactive wastewater in Unit 2 and unit 3 has been translated the Centralized Radiation Waste Treatment Facility since April 19.				
		Installation of water process facility	-Highly radioactive wastewater treatment system for recycling water that has processing capacity of 1,200m ³ /day is working on a trial basis. Reuse of the processed water, which was decontaminated and desalinated through the system, started for reactor cooling [6/27-].				
	Challenge	Preventing contamination of the sea, etc.	-Silt fences installed. -Seawater circulatory purification system goes into full-scale operation. [6/13] -Blocking the concrete tunnels outside the T/Bs completed [6/10], etc.				
measures	Preventing overflow of high level radioactive waste water	Highly radioactive wastewater treatment system should be operated in stable and effective manner to prevent wastewater accumulated in unit-2 and 3 overflowing.					
Underground water	Status	Radioactive materials in the ground water	Radioactive iodine, I-131, cesium, Cs-134, 137, and Sr-89, 90 were detected from the subdrain, underground water collected and controlled in the facility, and the well water in the Fukushima Daiichi site. [4/7-]				
		Goal of STEP 1 (April through July)	Preventing contaminated underground water from spreading to the sea				
	measures	Mitigation of groundwater contamination	Pumps for correcting underground water called "subdrain" is to be restored in the middle of June. Subdrain is to be treated in accordance with the contaminated water management plan. Construction of wall for underground water isolation is under consideration.				
Radioactive materials in the atmosphere / soil	Status	Scattering of radioactive materials to the outside of the facilities	Radioactive materials and radioactively contaminated debris scattered due to the hydrogen explosion at Unit 1 and 3 R/Bs and other events.			Survey map on the site: http://www.tepco.co.jp/en/nu/fukushima-np/f1/index3-e.html	
		R/B integrity	Severely damaged	Partly opened	Severely damaged	Severely damaged	
	measures	Goal of STEP 1 (April through July)	Preventing scattering of radioactive materials in the facilities and the site				
		Dispersion of inhibitor	Dispersion to the outside of buildings in progress [full operation from 4/26-] Dispersion to the R/Bs and T/Bs [5/27-]				
Tsunami, etc.	measures	Countermeasures against tsunami	-Transferring emergency power sources to the upland [4/15] -Addition of redundant water injection line [-4/15] -Setting fire trucks etc. to the upland [-4/18] -Installing a temporary tide barriers [-6/30]				
		Planning and implementation of reinforcement work of each unit	-Work for installing supporting structure under the bottom of the Unit 4 SFP in progress. Steel pillars installed [6/7-6/20]. Work to be completed by filling concrete and grout by the end of July. -Soundness of structure analysis and evaluation for each unit in progress. Seismic safety confirmed for Unit 1 and 4 [5/28]				
	measures	Various radiation shielding	Pipe work completed, pumping vehicle set [5/17]				
Plant parameters	Reactor	Reactor water level (mm) [7/6 11:00]	A: Below the lower end of gauge, B: -1700**, Mostly steady	A: -1850, B: -2150 Mostly steady**	A: -1850, B: -2250 Mostly steady**	—	
		Reactor pressure (MPa) [7/6 11:00]	A: 0.037, B: -, Mostly steady Measured with temporary pressure indicator [6/4-]	A: 0.028, B: - Mostly steady	A: -0.164, B: -0.102 Mostly steady**	—	
		RPV temperature at feedwater nozzle (°C) [7/6 11:00]	116.9 Mostly steady	112.2 Mostly steady	152.4 Mostly steady	—	
		RPV temperature at the bottom of the vessel (°C) [7/6 11:00]	102.1 Mostly steady	119.9 Mostly steady	124.7 Mostly steady	—	
	PCV	Pressure of drywell (MPa) [7/6 11:00]	0.1431 Mostly steady	0.020 Mostly steady**	0.0994 Mostly steady	—	
		Pressure of suppression pool (MPa) [7/6 11:00]	0.125 Mostly steady	Below the lower end of gauge Instrument failure	0.1822 Mostly steady	—	
	Pool	Water temperature of SFP	Instrument failure	34.0°C [7/6 11:00]	31.6°C [7/6 11:00]	84-85°C [7/5 16:00]	
		Stored volume [7/5]	17,010m ³	26,400m ³	30,900m ³	23,300m ³	
	High level accumulated water	Water level in T/B [7/5]	OP.4.960	OP.3.459	OP.3.723	OP.3.734	OP.: Onahama Bay mean sea level Near-term target: OP. 3,000*4
		Total stored volume [7/5]	97,610m ³ (Approx. 119,460m ³ including the wastewater transferred to the Centralized Radiation Waste Treatment Facility)				
Environmental effect in the vicinity of the station	measures	-Air dose rate: 5-114 μSv/h at the NPS border (Monitoring Post), 332 μSv/h at the south side of the office building, 34 μSv/h at the main gate, 13 μSv/h at the wet gate [7/6 21:00] -Some radioactive materials (I, Cs, Pu, Am Cm and Sr) has been detected in the soil sampled at the site. Radioactive materials have been detected in samples collected from underground water and also seawater at or near the site. Environmental monitoring has been enhanced [4/16-]. Sr-89, 90 exceeding the regulatory limit have been detected from the seawater sampled on 5/16 near the seawater intake.					
		TEPCO is examining some 3,700 workers who have worked at the plant since March 11th for exposure to radiation. Of that number, 3,514 have undergone provisional medical checkups. (100-200mSv: 107 workers, 200-250mSv: 8 workers, 250mSv-: 9 workers) Detailed assessment concluded that 7 workers had received more than 250mSv, two numbers less than in the provisional one.[6/30] Amount of doses that the 2 workers who received most are 643mSv and 678mSv.[6/20] Out of some 4,300 workers, who worked in April, excluding those who had worked in March, 2,342 workers have undergone medical checkups. It turned out that one worker had received radiation dose above 100mSv. *The allowable emergency limit for radiation doses: 250 millisieverts					

- *1 TEPCO's analysis [announced on 5/15]
- *2 TEPCO judged that most spent fuels were not damaged in the Unit 2 and 4 SFPs based on the detailed analysis of the radioactive materials in the pool water. [5/31]
- *3 Rough estimate by TEPCO [announced on 5/31]
- *4 TEPCO set the target so as to reduce the risk of the discharge of the overflowed water into the sea and the leak to the underground water.

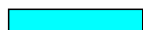
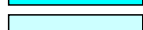
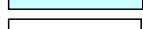
[Source]

Government Nuclear Emergency Response Headquarters: News Release,
 Press conference
 NISA: News Release, Press conference
 TEPCO: Press Release, Press Conference

[Significance judged by JAIF]

-  :Low
-  :High
-  :Severe (Need immediate action)

[Progress of countermeasures]

-  :Completed
-  :Under construction
-  :To be done (including studying and manufacturing)

[Abbreviations]

SFP: Spent Fuel Storage Pool
 EDG: Emergency Diesel Generator
 RPV: Reactor Pressure Vessel
 PCV: Primary Containment Vessel
 R/B: Reactor Building
 T/B: Turbine Building
 RW/B: Radioactive Waste Disposal Building
 RHR: Residual Heat Removal system
 CST: Condensate water Storage Tank
 Hx: Heat exchanger
 NPS: Nuclear power station