

Status of countermeasures for restoring the accident at Fukushima Daiichi Unit 1 through 4. As of June 10th, 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							
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			
	measures	Core cooling	Not functional	Not functional	Not functional	Not required			
		Goal of STEP 1 (April through June)	Stable cooling (circulating injection cooling reusing accumulated water)						
		Cooling by minimum injection rate	Injecting freshwater into the reactor via feed water line at 5.1m ³ /h	Injecting freshwater into the reactor via feed water line at 5.0m ³ /h	Injecting freshwater into the reactor via feed water line at 11.2m ³ /h	—	Total injection flow: 21.3m ³ /h [6/9]		
		Establishment of circulating injection cooling	Work for injection line in progress	Work for injection line in progress [4/9-]	Work for injection line in progress [4/16-]	—			
		Nitrogen gas injection into PCV	Injection continued [4/6-]	Work for injection line in progress [4/16-]	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. TEPCO announced its plan to recirculate and filter the air in the Unit 2 R/B to reduce its radioactivity and then open the door to decrease the humidity in the building, which also hampers the work at Unit 2 [6/8].				
SFP cooling	Status	Fuel integrity in SFP	Unknown	Unknown	Unknown	No severe damage suspected*2			
		SFP cooling	Not functional	Not functional	Not functional	Not functional			
	measures	Goal of STEP 1 (April through June)	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	Spraying freshwater by pump truck	Starting work for injection via SFP coolant cooling line		
Challenge	Circulation cooling with Hx				Planned	In operation	Planned	Planned	Injecting/Spraying corrosion inhibitor, hydrazine (H2NNH2), with freshwater [5/9-]
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 92,000m ³ [5/31])						
		Goal of STEP 1 (April through June)	Securing storage place of high level radioactive wastewater						
	measures	Securing storage place	-Waterproof check of Centralized Radiation Waste Treatment Facility, PMB (storage capacity: approx. 10,000m ³) and MWRTB (storage capacity: approx. 4,800m ³) completed -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	-Unit 2: Concrete tunnel => PMB (4/19-5/26, approx. 9,600m ³ , Transfer suspended and then resumed after revising the storage limit level of the building [6/4-]) -Unit 3: T/B => MWRTB (5/17-5/25, approx. 3,700m ³ , Transfer suspended due to possible leakage), T/B => Unit 3 main steam condenser [6/5-6/9]						
		Installation of water process facility	-Work for installing the water processing facility in progress. Water processing to be started on June 15th (capacity: 1,200m ³ /day) -Desalination of processed radioactive water to be installed (capacity: 480m ³ /day in the late June, then increased step by step) to reuse the water for reactor injection.						
	Challenge	Preventing contamination of the sea, etc.	-Silt fences installed. -Working on installation of seawater circulatory purification system [5/30-]. <u>Test operation conducted [6/9].</u> -Blocking the concrete tunnels outside the T/Bs						
Preventing overflow of high level radioactive waste water		The risk of leakage of the high level radioactive wastewater accumulating in the Unit 2 and 3 T/Bs and concrete tunnels is increasing as the water level in the receiving facility was getting close to its storage limit. It has been decided to use Unit 2 and 3 main steam condensers as a receiving tank while revising the storage limit of the PMB (total increased capacity: approx. 4,300m ³). Further revision of the storage limit of the facility (additional capacity: approx. 2,700m ³) is under consideration.							
measures	Goal of STEP 1 (April through June)	Storing and processing low level radio active wastewater							
	Increasing storage capacity	2,200tons of tanks installed. Approx. 16,000tons of tanks to be installed by the beginning of June. 12,000 tons of receiving capacity to be secured by the end of June.							
Underground water	Status	Radioactive materials in the ground water	Radioactive iodine, I-131, and cesium, Cs-134, 137, 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 June)	Preventing contaminated underground water from spreading to the sea						
	measures	Mitigation of groundwater contamination	Restoring subdrain pumps [the middle of June]. Planning subdrain management according to the enhanced storing and processing plan.						
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.						
		R/B integrity	Severely damaged	Partly opened	Severely damaged	Severely damaged			
	measures	Goal of STEP 1 (April through June)	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-]						
		Removal of debris	Removal of debris using remote-controlled heavy machine in progress [4/10-]						
Challenge	Installing R/B cover	Under construction [5/13-]	—	Designing	Planning				
Isumami, reinforcement, etc.	measures	Goal of STEP 1 (April through June)	Enhancement of countermeasures against aftershocks, etc.						
		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] -Planning to install a temporary tide barriers [by the end of June]						
	Challenge	Planning and implementation of reinforcement work of each unit	-Carry-in and setup of the supporting structure under the bottom of the Unit 4 SFP started. [6/7] -Soundness of structure analysis and evaluation for each unit in progress. Seismic safety confirmed for Unit 1 and 4 [5/28]						
		Various radiation shielding	Pipe work completed, pumping vehicle set [5/17]						
Reactor	measures	Reactor water level (mm) [6/9 11:00]	A: Below the lower end of gauge, B: -1750, Reading mostly steady	A: -1500, B: -2100 Reading mostly steady	A: -1850, B: -2200 Reading mostly steady	—			
		Reactor pressure (MPa) [6/9 11:00]	A: 0.027, B: -, Measured with temporary pressure indicator [6/4-]	A: -0.016, B: -0.009 Reading mostly steady**	A: -0.128, B: -0.104 Reading mostly steady**	—			
		RPV temperature at feedwater nozzle (°C) [6/9 11:00]	115.6 Reading mostly steady**	108.4 Reading mostly steady	149.7 Increasing**	—			
		RPV temperature at the bottom of the vessel (°C) [6/9 11:00]	99.1 Reading mostly steady	107.4 Instrument failure	186.0 Increasing	—			
	Challenge	Pressure of drywell (MPa) [6/9 11:00]	0.1319 Reading mostly steady	0.020 Decreasing	0.1005 Reading mostly steady	—			
		Pressure of suppression pool (MPa) [6/9 11:00]	0.115 Reading mostly steady	Below the lower end of gauge Instrument failure	0.1843 Reading mostly steady	—			
	measures	Water temperature of SFP	Instrument failure	32°C [6/9 11:00]	62°C (5/8)	86-89°C (6/8 19:50)			
		Accumulated water	R/B basement	Volume*3 3,900m ³ [5/31] Radioactivity*3 4.0E+5Bq/cm ³	6,000m ³ [5/31] 1.9E+7Bq/cm ³	6,400m ³ [5/31] 3.8E+5Bq/cm ³	6,500m ³ [5/31] 2.0E+5Bq/cm ³		
	measures	T/B basement	Volume*3 8,400m ³ [5/31] Radioactivity*3 (Dose at water surface) 4.0E+5Bq/cm ³ (60mSv/h[4/28])	11,400m ³ [5/31] 1.9E+7Bq/cm ³ (1,000mSv/h以上[3/28])	13,600m ³ [5/31] 3.8E+5Bq/cm ³ (120~750mSv/h[3/24.4/22])	11,800m ³ [5/31] 2.0E+5Bq/cm ³ (4.5mSv/h[4/21])			
			RW/B basement	Volume*3 1,100m ³ [5/31] Radioactivity*3 4.0E+5Bq/cm ³	2,400m ³ [5/31] 1.9E+7Bq/cm ³	2,300m ³ [5/31] 3.8E+5Bq/cm ³	3,700m ³ [5/31] 2.0E+5Bq/cm ³		
Concrete tunnel outside of T/B		Volume*3 2,800m ³ [5/31] Radioactivity*3 (Dose at water surface) 6.9Bq/cm ³ (0.4mSv/h[3/27])		4,800m ³ [5/31] 1.1E+7Bq/cm ³ (>1,000mSv/h [3/27])	5,800m ³ [5/31] 2.4E+5Bq/cm ³	900m ³ [5/31] 2.0E+5Bq/cm ³			
		measures	Total volume	91,800m ³ (Approx. 105,000m ³ including the wastewater transferred to the Centralized Radiation Waste Treatment Facility)					
Environmental effect in the vicinity of the station	measures	Air dose rate	-Air dose rate: 5~122 μSv/h at the NPS border (Monitoring Post), 366 μSv/h at the south side of the office building, 14 μSv/h at the wet gate [6/10 09:00] -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 corrected from underground water and also seawater at or near the site. Environmental monitoring has been enhanced [4/16-].						
		Radiation exposure of the workers	30 workers have been exposed more than 100 mSv as of 6/7. It was found that two plant operators had taken in high level of radioactive iodine. Evaluation made by a research institute shows that their exposure dose is somewhere between 200mSv and 580mSv, including internal exposure. [announced by TEPCO on 6/3] *Emergency exposure dose limit has been set to 250mSv						

PMB: Process Main Building
MWRTB: Miscellaneous Solid Waste Volume Reduction Treatment Building

Survey map on the site:
<http://www.tepco.co.jp/en/nu/fukushima-np/f1/index3-e.html>

■ "A", "B" shows the group of the redundant instruments
■ Reactor water level shows the length of the fuel not covered with water
■ Trend data of primary parameters are available at Japan Nuclear Technology Institute's Home Page; "http://www.gengikyo.jp/english/shokai/special_4.html".
**Continuously monitoring the status

Air dose rate:
<http://www.tepco.co.jp/en/nu/fukushima-np/f1/index-e.html>
Air, seawater, underground water soil, etc.:
<http://www.tepco.co.jp/en/nu/fukushima-np/f1/index2-e.html>

*1 TEPCO's analysis [announced on 5/15,23]

*2 TEPCO estimated that there was no severe damage to the fuel in the Unit 4 SFP based on the concentration of radioactive materials in the pool and the pictures of the pool. [4/13,28,29]

*3 Rough estimate by TEPCO [announced on 5/31]

[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

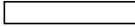
 :High

 :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