

Status of countermeasures for restoring from the accident at Fukushima Daiichi Unit 1 through 4. As of June 16th, 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 June) | Stable cooling (circulating injection cooling reusing accumulated water) | | | — | |
| | | Cooling by minimum injection rate | Injecting freshwater into the reactor via feed water line at 4.5m 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 11.2-11.3m ³ /h | — | Total injection flow: 20.7-20.8m ³ /h[6/16 05:00] |
| | | 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 | — | |
| | Challenge | 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 | — | |
| 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 has begun running air-filtering equipment at the Unit2 R/B to remove airborne radioactive materials.[6/11] | | | — | | |
| 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 Preparing system for cooling in a stable manner | Injecting/Spraying corrosion inhibitor, hydrazine (H2NNH2), with freshwater [5/9-] |
| | Circulation cooling with Hx | Planned | In operation | Planned (Construction to be started in late June) | 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 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. | | | PMB: Process Main Building MWRTB: Miscellaneous Solid Waste Volume Reduction Treatment Building | |
| | | 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), T/B => Unit 3 main steam condenser [6/5-6/9], T/B => PMB [6/11-] | | | | |
| | | Installation of water process facility | -Water treatment system for recycling water was installed. Test-run started on June 14th, aiming for starting operation on June 17. (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. -Seawater circulatory purification system goes into full-scale operation. [6/13] -Blocking the concrete tunnels outside the T/Bs completed [6/10] | | | | |
| | | 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 radioactive 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, 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-] | | | | |
| | | 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. | | | 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 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-] | | | | |
| Isumami, etc. | measures | Removal of debris | Removal of debris using remote-controlled heavy machine in progress [4/10-] | | | | |
| | | Installing R/B cover | Preparation work in progress [5/13-] Installation work of the cover to be started on 6/27 | — | Designing | Planning | |
| | | Goal of STEP 1 (April through June) | Enhancement of countermeasures against aftershocks, etc. | | | | |
| Plant parameters | Reactor | 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] | | | | |
| | | 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] | | | | |
| | | Goal of STEP 1 (April through June) | Enhancement of countermeasures against aftershocks, etc. | | | | |
| | PCV | Reactor water level (mm) [6/16 05:00] | A: Below the lower end of gauge, B: -1600. Reading mostly steady | A: -1500, B: -2100. Reading mostly steady | A: -1850, B: -2250. Reading mostly steady | — | ■ '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 |
| | | Reactor pressure (MPa) [6/16 05:00] | A: 0.027, B: -. Measured with temporary pressure indicator [6/4-] | A: -0.011, B: -0.000. Reading mostly steady** | A: -0.140, B: -0.106. Reading mostly steady** | — | |
| | Pool | RPV temperature at feedwater nozzle (°C)[6/16 05:00] | 113.8. Reading mostly steady** | 108.2. Reading mostly steady | 146.4. Upward trend ending** | — | |
| | | RPV temperature at the bottom of the vessel (°C)[6/16 05:00] | 98.1. Reading mostly steady | 106.6. Instrument failure | 151.5. Upward trend ending | — | |
| | Accumulated water | Pressure of drywell (MPa) [6/16 05:00] | 0.1337. Reading mostly steady | 0.015. Decreasing | 0.1013. Reading mostly steady | — | |
| | | Pressure of suppression pool (MPa) [6/16 05:00] | 0.115. Reading mostly steady | Below the lower end of gauge. Instrument failure | 0.1848. Reading mostly steady | — | |
| Environmental effect in the vicinity of the station | Water temperature of SFP | Instrument failure | 31°C [6/16 05:00] | 62°C (5/8) | 83-85°C (6/15 17:10) | | |
| | | Water temperature of R/B basement | Volume*3 | 3,900m ³ [5/31] | 6,000m ³ [5/31] | 6,400m ³ [5/31] | 6,500m ³ [5/31] |
| | Radioactivity*3 | Volume*3 | 4.0E+5Bq/cm ³ | 1.9E+7Bq/cm ³ | 3.8E+5Bq/cm ³ | 2.0E+5Bq/cm ³ | |
| | | Radioactivity*3 (Dose at water surface) | 8,400m ³ [5/31] | 11,400m ³ [5/31] | 13,600m ³ [5/31] | 11,800m ³ [5/31] | |
| | RW/B basement | Volume*3 | 4.0E+5Bq/cm ³ | 1.9E+7Bq/cm ³ | 3.8E+5Bq/cm ³ | 2.0E+5Bq/cm ³ | |
| | | Radioactivity*3 (Dose at water surface) | (60mSv/h[4/28]) | (1,000mSv/h以上[3/28]) | (120~750mSv/h[3/24,4/22]) | (4.5mSv/h[4/21]) | |
| | Concrete tunnel outside of T/B | Volume*3 | 1,100m ³ [5/31] | 2,400m ³ [5/31] | 2,300m ³ [5/31] | 3,700m ³ [5/31] | |
| | | Radioactivity*3 (Dose at water surface) | 4.0E+5Bq/cm ³ | 1.9E+7Bq/cm ³ | 3.8E+5Bq/cm ³ | 2.0E+5Bq/cm ³ | |
| | Total volume | Volume*3 | 2,800m ³ [5/31] | 4,800m ³ [5/31] | 5,800m ³ [5/31] | 900m ³ [5/31] | |
| | | Radioactivity*3 (Dose at water surface) | 6.9Bq/cm ³ (0.4mSv/h[3/27]) | 1.1E+7Bq/cm ³ (>1,000mSv/h [3/27]) | 2.4E+5Bq/cm ³ | 2.0E+5Bq/cm ³ | |
| 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 | | -Air dose rate: 5-121 μSv/h at the NPS border (Monitoring Post), 361 μSv/h at the south side of the office building, 14 μSv/h at the wet gate [6/16 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 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. | | | 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 | | |
| Radiation exposure of the workers | | TEPCO is examining 3,726 workers who have worked at the plant since March 11th for exposure to radiation. Of that number, 2,367 have undergone medical checkups. It revealed that 102 received radiation doses above 100 mSv. (100-200mSv: 88 workers, 200-250mSv:6 workers, 250mSv-:8 workers) Amount of doses that the 2 workers who received most are 643mSv and 678mSv..[6/13] *The allowable emergency limit for radiation doses: 250 millisieverts | | | | | |

*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]

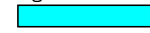
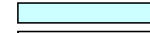

[Source]

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
GST: Condensate water Storage Tank
Hx: Heat exchanger
NPS: Nuclear power station