Status of nuclear power plants in Fukushima as of 21:00 March 22 (Estimated by JAIF)

Power Station	Fukushima Dai-ichi Nuclear Power Station					
Unit	1	2	3	4	5	6
Electric / Thermal Power output (MW)	460 / 1380	784 / 2381	784 / 2381	784 / 2381	784 / 2381	1100 /3293
Type of Reactor	BWR-3	BWR-4	BWR-4	BWR-4	BWR-4	BWR-5
Operation Status at the earthquake occurred	In Service -> Shutdown	In Service -> Shutdown	In Service -> Shutdown	Outage	Outage	Outage
Core and Fuel Integrity	Damaged	Damaged	Damaged	No fuel rods	Not Damaged	Not Damaged
Reactor Pressure Vessel Integrity	Unknown	Unknown	Unknown	Not Damaged	Not Damaged	Not Damaged
Containment Vessel Integrity	Not Damaged	Damage Suspected	Might be "Not damaged"	Not Damaged	Not Damaged	Not Damaged
Core cooling requiring AC power 1 (Injection)	Not Functional	Not Functional	Not Functional	Not necessary	Functional	Functional
Core cooling requiring AC power 2 (Cooling through Heat Exchangers)	Not Functional	Not Functional	Not Functional	Not necessary	Functioning (in cold shutdown)	Functioning (in cold shutdown)
Core cooling not requiring AC power	Not Functional	Not Functional	Not Functional	Not necessary	Not necessary	Not necessary
Building Integrity	Severely Damaged (Hydrogen Explosion)	Slightly Damaged	Severely Damaged (Hydrogen Explosion)	Severely Damaged (Hydrogen Explosion)	Open a vent hole on the rooftop for avoiding hydrogen explosion	
Water Level of the Rector Pressure Vessel	Fuel exposed partially or fully	Fuel exposed partially or fully	Fuel exposed partially or fully	Safe	Safe	Safe
Pressure of the Reactor Pressure Vessel	Stable	Unknown	Unknown	Safe	Safe	Safe
Containment Vessel Pressure	Stable	Stable	Decreasing after increase in Mar., 20th	Safe	Safe	Safe
Water injection to core (Accident Management)	Continuing (Seawater)	Continuing(Seawater)	Continuing(Seawater)	Not necessary	Not necessary	Not necessary
Water injection to Containment Vessel (AM)	(confirming)	to be decided(Seawater)	(confirming)	Not necessary	Not necessary	Not necessary
Containment venting (AM)	Temporally stopped	Temporally stopped	Temporally stopped	Not necessary	Not necessary	Not necessary
Fuel Integrity in the spent fuel pool	Water injection to be considered	Seawater Injection conducted in Mar. 20th	Water level low, Seawater spray continue and certain effect was confirmed	Water level low, Seawater spray continue Hydrogen from the pool exploded	Pool cooling capability was recovered	Pool cooling capability was recovered
Environmental effect	The Main Gate: 277.5 μ Sv/h at 15:30, Mar. 22 North of Service Building: 2015.0 μ Sv/h at 16:30, Mar. 21 Radio nuclides exceeding the national regulatory standard were detected in milk produced in Fukushima prefecture and spinach produced in Ibaraki, Fukushima, Tochigi, and Gunma prefectures. The level of the radioactivity detected is low enough not to do harm to the health of people who take those products for a limited time. Monitoring results of seawater sampled at the front coast of the station showed that radioactive Iodine, I-131, and Cesium, Cs-134, 137, exceeding the regulatory limit were detected.					
Evacuation	20km from NPS ＊People who live between 20km to 30km from the Fukushima Dai-ichi NPS are to stay indoors.					
INES (estimated by NISA)	Level 5	Level 5	Level 5	Level 3	—	—
Remarks	Immediate threat is damage of the fuels in the fuel pool outside the containment vessel. The operation for spraying water to the pool is continuing at Uni t 3 and 4. Work to recover AC power for Unit 1through 6 is in progress. External AC power has reached to Unit 2, 4, 5 and 6 and is now available in all the units. Integrity check of electric equipment is going on in each unit, which must be done before energizing them. External AC power has partly replaced with the power from emergency diesel generator in Unit 5 .					

Power Station	Fukushima Dai-ni Nuclear Power Station			
Unit	1	2	3	4
Electric / Thermal Power output (MW)	1100 / 3293			
Type of Reactor	BWR-5	BWR-5	BWR-5	BWR-5
Operation Status at the earthquake occurred	In Service -> Automatic Shutdown			
Status	All the units are in cold shutdown.			
INES (estimated by NISA)	Level 3	Level 3	—	Level 3
Remarks	Unit-1, 2, 3 & 4, which were in full operation when the earthquake occurred, all shutdown automatically. External power supply was available after the quake. While injecting water into the reactor pressure vessel using make-up water system, TEPCO recovered the core cooling function and made the unit into cold shutdown state one by one. Latest Monitor Indication: 26.4 μ Sv/h at 15:00, Mar. 22 at NPS border Evacuation Area: 10km from NPS			

Power Station	Onagawa Nuclear Power Station		
Unit	1	2	3
Operation Status at the earthquake occurred	In Service -> Automatic Shutdown		
Status	All the units are in cold shutdown.		
Remarks	Safe		

Power Station	Tokai Dai-ni
Operation Status at the earthquake occurred	In Service -> Automatic Shutdown
Status	In cold shutdown.
Remarks	Safe

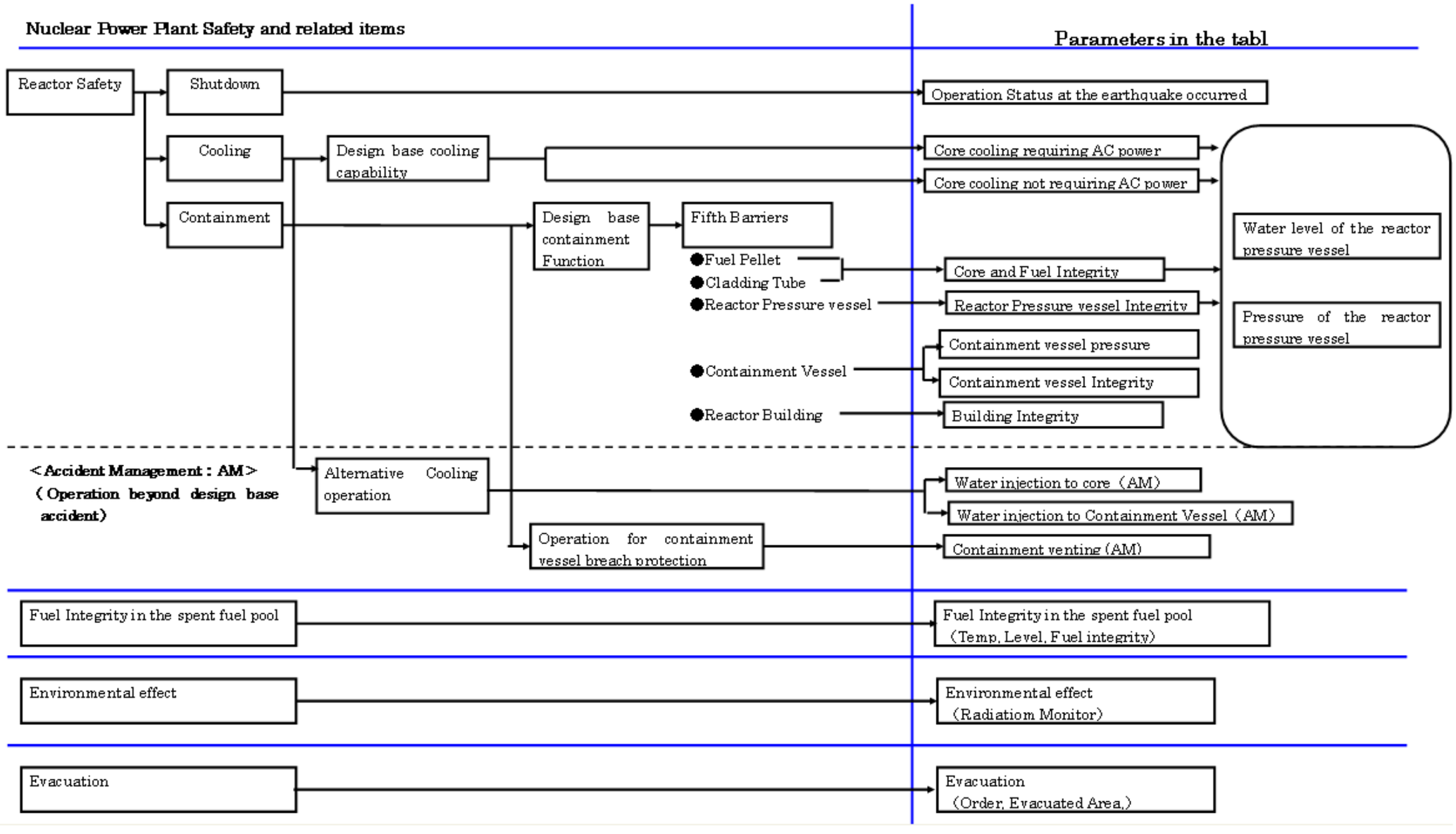
[Significance judged by JAIF]
- Low
- High
- Severe (Need immediate action)

[Source]
Government Nuclear Emergency Response Headquarters: News Release (-3/22 16:00), Press conference
NISA: News Release (-3/22 12:30), Press conference
TEPCO: Press Release (-3/22 15:30), Press Conference

[Abbreviations]
INES: International Nuclear Event Scale
NISA: Nuclear and Industrial Safety Agency
TEPCO: Tokyo Electric Power Company, Inc.

Parameters in the Table

JAIF picks up these parameters to evaluate safety condition of the nuclear plants during this accident from the view point of the principles of nuclear power plant safety, which are "Shutdown", "Cooling" and "Containment". Then we create the chart. The following diagram is to show the correspondence relation of these parameters in the table to nuclear power plant safety.



Accidents of Fukushima Dai-ichi and Fukushima-Dai-ni Nuclear Power Stations

(March 22nd, 2011 13:00)

1. Latest Major Incidents and Actions

<March 20th>
14:30: Unit 5 cold shutdown
19:27: Unit 6 cold shutdown

<March 21st>
15:55 Slightly gray smoke erupted from Unit 3 (18:02 seemingly stopped)
18:22 White smoke erupted from Unit 2

2. Chronology of Nuclear Power Stations

(1) Fukushima Dai-ichi NPS

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5, 6
Major Incidents and Actions **The Act on Special Measures Concerning Nuclear Emergency Preparedness*	11th 15:42 Report IAW Article 10* (Loss of power)	11th 15:42 Report IAW Article 10* (Loss of power)	11th 15:42 Report IAW Article 10* (Loss of power)	14th 04:08 Water temperature in Spent Fuel Storage Pool increased at 84℃	Water temperature in SF Storage Pool is increasing
	11th 16:36 Event falling under Article 15* occurred (Incapability of water injection by core cooling function)	11th 16:36 Event falling under Article 15* occurred (Incapability of water injection by core cooling function)	13th 05:10 Event falling under Article 15* occurred (Loss of reactor cooling functions)	15th 09:38 Fire occurred on 3rd floor (extinguished spontaneously)	18th Vent hole was opened on the rooftop for avoiding hydrogen explosion
	12th 00:49 Event falling under Article 15* occurred (Abnormal rise of CV pressure)	14th 13:25 Event falling under Article 15* occurred (Loss of reactor cooling functions)	13th 08:41 Start venting	16th 05:45 Fire occurred (extinguished spontaneously)	19th 05:00 RHR-pump in the Unit-5 restarted. 19th 22:14 RHR-pump in the Unit-6 restarted
	12th 14:30 Start venting	14th 16:34 Seawater injection to RPV	13th 13:12 Seawater injection to RPV	Since 20th, operation of spraying water to the spent fuel pool continues.	20th 14:30 Reactor cold shutdown at Unit-5 20th 19:27 Reactor cold shutdown at Unit-6
	12th 15:36 Hydrogen explosion	14th 22:50 Report IAW Article 15* (Abnormal rise of CV pressure)	14th 07:44 Event falling under Article 15* occurred (Abnormal rise of CV		
	12th 20:20 Seawater injection to RPV	15th 00:00 Start venting	14th 11:01 Hydrogen explosion		
		15th 06:10 Sound of explosion, Suppression Pool damaged	15th 10:22 Radiation dose 400mSv/h		
		15th 08:25 White smoke reeked	16th 06:40, 08:47 Radiation Dose 400mSv		
		20t 15:05, operation of seawater injection to the spent fuel pool was conducted	16th 08:34, 10:00 White smoke reeked		
			Since 17th, operation of spraying water to the spent fuel pool continues.		
	Work to recover external AC power is in progress. External AC power has reached to Unit 2. Unit 1 is to receive the power from Unit 2. Integrity check of electric equipment is going on in both units.		Work to recover external AC power is in progress. External AC power has reached to Unit 4. Unit 3 is to receive the power from Unit 4. Integrity check of electric equipment is going on in both units.		Work to recover external AC power is in progress. External AC power has reached to the both units and partly replaced with the power from EDG in Unit 5. Integrity check of electric equipment is going on in Unit 6.
Major Data	Water level (22nd 11:20) (A) -1800mm (B) -1750mm	Water level (22nd 11:20) -1350mm	Water level (22nd 10:35) (A) -1575mm, (B) -2350mm	Water temperature of SFP Immeasurable (since 14th 04:08)	Water temperature of SFPool Unit 5 35.8℃ (22nd 01:00) 37.4℃ (22nd 08:00) 37.5℃ (22nd 11:00) Unit 6 30.0℃ (22nd 01:00) 23.5℃ (22nd 08:00) 25.0℃ (22nd 11:00)
	Reactor pressure (22nd 11:20) (A) 0.227MPaG, (B) 0.205MPaG	Reactor pressure (22nd 11:20) (A) -0.018MPaG, (B) -0.018MPaG	Reactor pressure (22nd 10:35) (A) -0.101MPaG, (B) -0.036MPaG		
	CV pressure (22nd 11:20) 0.175MPaabs	CV pressure (22nd 11:20) 0.110MPaabs	CV pressure 0.100MPaabs (22nd 00:15) 0.100MPaabs (22nd 05:30) 0.100MPaabs (22nd 10:35)		
		Water temperature of SFP (22nd 11:20) 53℃			

(2) Fukushima Dai-ni NPPs

All units are cold shutdown (Unit-1, 2, 4 have been recovered from a event falling under Article 15*)

*SFP: Spent Fuel Storage Pool
EDF: Emergency Diesel Generator

3. State of Emergency Declaration

11th 19:03 State of nuclear emergency was declared (Fukushima Dai-ni NPS)
12th 07:45 State of nuclear emergency was declared (Fukushima Dai-ichi NPS)

4. Evacuation Order

11th 21:23 PM direction: for the residents within 3km radius from Fukushima I to evacuate, within 10km radius from Fukushima I to stay in-house
12th 05:44 PM direction: for the residents within 10km radius from Fukushima I to evacuate
12th 17:39 PM direction: for the residents within 10km radius from Fukushima II to evacuate
12th 18:25 PM direction: for the residents within 20km radius from Fukushima I to evacuate
15th 11:06 PM direction: for the residents within 20-30km radius from Fukushima I to stay in-house

Status of the Nuclear Power Plants after the Earthquake

The accident that brings environmental impact is going on at several units in Fukushima Daiichi nuclear power Station after the earthquake occured on March 11th. Other nuclear power plants in Japan are in normal operation or safely shutdown.