Information on Status of Nuclear Power Plants in Fukushima

Policy on information and compilation
This JAIF-compiled information chart represents the situation, phenomena, and operations in which JAIF estimates and guesses the reactors and related facilities are, based on the latest data and information directly and indirectly made available by the relevant organizations when JAIF’s updating works done. Consequently, JAIF may make necessary changes to descriptions in the chart, once (1) new developments have occurred in the status of reactors and facilities and (2) JAIF has judged so needed after reexamining the prior information and judgments. JAIF will do its best to keep tracks on the information on the nuclear power plants quickly and accurately.
### Status of nuclear power plants in Fukushima as of 12:00, May 10th (Estimated by JAIF)

| Unit | Electric / Thermal Power output (MW) | Type of Reactor | Operation Status at the earthquake occurred | Reactor Pressure Vessel structural integrity | Core cooling requiring AC power | Cooling through Heat Exchangers | Core and Fuel Integrity | Fuel assemblies loaded in Core | Water level of the Reactor Pressure Vessel | Water injection to core (Accident Management) | Containment Vessel Pressure Vessel structural integrity | Core cooling requiring AD power 1 | Reactor Pressure Vessel | Safety Condition of Spent Fuel Pool | Fuel Injection to Containment Vessel | Containment Venting (AM) | Remarks |
|------|-------------------------------------|-----------------|---------------------------------------------|---------------------------------------------|-------------------------------|---------------------------------|------------------------|------------------|-----------------------------|----------------------------------------------|---------------------------------------------|-------------------------------|---------------------------------|-----------------------------|-----------------------------|-----------------------------|
| 1    | 460 / 1380                          | BWR-3           | In Service                                  | Unknown                                    | Not Functional                | Functional                      | Damaged                | No fuel rods     | Fuel exposed partially or fully | Not necessary                   | Not Damaged                    | Not necessary                    | Damaged                          | Not necessary                 | Not necessary                                     |
| 2    | 764 / 2381                          | BWR-4           | In Service                                  | Damaged                                    | Not Damaged                   | Functional                      | Damaged                | 304              | Fuel exposed partially or fully | Not necessary                   | Not Damaged                    | Not necessary                    | Damaged                          | Not necessary                 | Not necessary                                     |
| 3    | 764 / 2381                          | BWR-4           | In Service                                  | Damaged                                    | Not Damaged                   | Functional                      | Damaged                | 301              | Fuel exposed partially or fully | Not necessary                   | Not Damaged                    | Not necessary                    | Damaged                          | Not necessary                 | Not necessary                                     |
| 4    | 764 / 2381                          | BWR-4           | Outage                                     | Damaged                                    | Not Damaged                   | Functional                      | Damaged                | 301              | Fuel exposed partially or fully | Not necessary                   | Not Damaged                    | Not necessary                    | Damaged                          | Not necessary                 | Not necessary                                     |
| 5    | 1100 / 3293                         | BWR-5           | Outage                                     | Damaged                                    | Not Damaged                   | Functional                      | Damaged                | 301              | Fuel exposed partially or fully | Not necessary                   | Not Damaged                    | Not necessary                    | Damaged                          | Not necessary                 | Not necessary                                     |
| 6    | 1100 / 3293                         | BWR-5           | Outage                                     | Damaged                                    | Not Damaged                   | Functional                      | Damaged                | 301              | Fuel exposed partially or fully | Not necessary                   | Not Damaged                    | Not necessary                    | Damaged                          | Not necessary                 | Not necessary                                     |

- **Status of No.1 reactor:**
  - Operation: In Service
  - Shutdown: After the explosion on March 15th
  - Reactor Pressure Vessel: Damaged
  - Containment Vessel: Damaged
  - Core cooling: Not necessary

- **Status of No.2 reactor:**
  - Operation: In Service
  - Shutdown: After the explosion on March 15th
  - Reactor Pressure Vessel: Damaged
  - Core cooling: Not necessary

- **Status of No.3 reactor:**
  - Operation: In Service
  - Shutdown: After the explosion on March 15th
  - Reactor Pressure Vessel: Damaged
  - Core cooling: Not necessary

- **Status of No.4 reactor:**
  - Operation: In Service
  - Shutdown: After the explosion on March 15th
  - Reactor Pressure Vessel: Damaged
  - Core cooling: Not necessary

- **Status of No.5 reactor:**
  - Operation: In Service
  - Shutdown: After the explosion on March 15th
  - Reactor Pressure Vessel: Damaged
  - Core cooling: Not necessary

- **Status of No.6 reactor:**
  - Operation: In Service
  - Shutdown: After the explosion on March 15th
  - Reactor Pressure Vessel: Damaged
  - Core cooling: Not necessary

- **Main Control Room Habitability & Operability:**
  - Due to loss of AC power, lighting and parameter monitoring restored in the control room at Unit 1 and 3 on Mar. 24th, at Unit 2 on Mar. 24th, at Unit 4 on Mar. 26th

#### Environmental effect

- **Influence on the people’s life:**
  - Radioactive material was detected from milk, agricultural products and seafood from Fukushima and neighboring prefectures.
  - Government ordered to issue limited shipment and intake of some products.

- **Environmental monitoring has been enhanced:**
  - Radioactive iodine and cesium have been detected in the seawater samples taken 15-20 km far from the plant.
  - Level of radiation is 100 to 1,000 times above normal.

#### Evacuation

- **Evacuation plan:**
  - Shall be evacuated for within 3km from NPS: Shall stay indoors for within 10km from NPS (issued at 21:23, Mar. 11th)
  - Shall be evacuated for within 10km from NPS (issued at 05:44, Mar. 12th)
  - Shall be evacuated for within 20km from NPS (issued at 17:25, Mar. 12th)
  - Shall be evacuated for within 30km from NPS (issued at 11:00, Mar. 15th)
  - Shall be evacuated for within 50km from NPS (issued at 11:00, Mar. 15th)
  - Shall be evacuated for within 100km from NPS (issued at 13:30, Mar. 15th)

#### INES (estimated by NISA)

- Level 3 + 2

#### Remarks

- **Function of containing radioactive material:**
  - It is presumed that radioactive material inside the reactor vessel may be leaked outside.

- **Prevention of the proliferation of radioactively contaminated substance:**
  - TEPCO announced the plan to prevent radioactively contaminated material, dust and soil and radioactive material itself existing on site from spreading.

#### Source

- Government Nuclear Emergency Response Headquarters: News Release (-5/9 17:00) Press conference
- TEPCO: Press Release (-5/10 09:00) Press Conference
- INES: International Nuclear Event Scale
- TEPCO: Tokyo Electric Power Company, Inc.
- MEXT: Ministry of Education, Culture, Sports, Science and Technology
- NISA: Nuclear and Industrial Safety Agency
- NISA: News Release (-5/9 08:00) Press conference
- NISA: Nuclear Safety Convention of Japan
- TEPCO: Press Release (-5/10 09:00) Press Conference

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Significance judged by JAIF

- Low: 1EG-2
- High: 3EG
- Severe (Need immediate action): 5EG
<table>
<thead>
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<th>Operation Status at the earthquake occurred</th>
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<th>Remarks</th>
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<td>No abnormality has been found after an earthquake occurred off the shore of Miyagi prefecture at 23:32, Apr. 7th.</td>
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### Table: Electric / Thermal Power output (MW)

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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.

Nuclear Power Plant Safety and related items

Reactors Safety

- Safety (Temporary shutdown)
  - Design base cooling capability
  - Operation for containment vessel protection against burst

Containment

- Alternative Cooling operation
  - Injection to core (AM)
  - Injection to Containment Vessel (AM)
  - Containment Venting (AM)

- Work environment in main control room
- Environmental effect
- Evacuation

Parameters in the Table

- Operation Status at the earthquake
  - Core cooling requiring AC power1 (Large volumetric freshwater injection)

- Core cooling requiring AC power2 (Cooling through Heat Exchangers)

- Water level of the Reactor Pressure Vessel

- Core and Fuel Integrity
- Reactor Pressure Vessel Integrity
- Containment Vessel Pressure
- Containment Vessel Integrity
- Building Integrity

<Accident Management : AM> (Operation beyond design base accident)

- Safety of the spent fuel pool
  - Fuel Integrity in the spent fuel pool (Fuel Damage)
  - Cooling of the spent fuel pool (Water injection, pool temp, water level)

- Environmental effect (Radiation Monitor, Contamination)

- Environmental effect (Injury, Illness, Disease)
1. Latest major event and response

May 7th
09:00-16:00 Operation to remove rubble by remotely controlled heavy machines conducted today.
10:30-16:00 Operation of spraying synthetic resin to prevent contaminated dust and soil from spreading was conducted.
14:05-16:30 Operation of spraying water to the Unit 4 SFP was conducted.
10:00-15:00 Water accumulated in the basement of Unit 6 was transferred to make/FIT storage tanks.

May 8th

09:00-16:00 Operation to remove rubble by remotely controlled heavy machines conducted today.
10:30-14:00 Operation of spraying synthetic resin to prevent contaminated dust and soil from spreading was conducted.
12:10-14:10 Operation of spraying water to the Unit 3 SFP was conducted.
20:08 Air ducts penetrating the access doors of Unit 1 R/B were cut off, making the doors partly open.

May 9th
04:17 The Access doors of Unit 1 R/B were opened.

5. Major Data

- **Reactor Water level**
  - Unit 1: 9.100 m (A), 2.100 m (B)
  - Unit 2: 9.110 m (A), 2.100 m (B)
  - Unit 3: 9.110 m (A), 2.100 m (B)
  - Unit 4: 9.110 m (A), 2.100 m (B)
  - Unit 5: 9.110 m (A), 2.100 m (B)
  - Unit 6: 9.110 m (A), 2.100 m (B)

- **CV pressure**
  - Unit 1: 0.120 MPa abs CV
  - Unit 2: 0.120 MPa abs CV
  - Unit 3: 0.120 MPa abs CV
  - Unit 4: 0.120 MPa abs CV
  - Unit 5: 0.120 MPa abs CV
  - Unit 6: 0.120 MPa abs CV

- **Water temperature in SFP**
  - Unit 1: 25.0°C
  - Unit 2: 25.0°C
  - Unit 3: 25.0°C
  - Unit 4: 25.0°C
  - Unit 5: 25.0°C
  - Unit 6: 25.0°C

- **SFP water temperature measured with a concrete pump vehicle**
  - Unit 5: 40.8°C (May 9th, 12:00)
  - Unit 6: 40.8°C (May 9th, 12:00)

- **SFP water temperature with RHR-pump started at Unit 5**
  - Unit 5: 20.0°C
  - Unit 6: 20.0°C

- **Fire extinguish line**
  - Unit 1: 20:08 Fire extinguish line was cut off, making the doors partly open.

2. Chronology of Nuclear Power Stations

(Fukushima Dai-ichi NPS)

1. May 2 10:00 The operation of transferring water to the Unit 1 in addition to fire extinguish line started.
2. May 7th
   09:00-16:00 Operation to remove rubble by remotely controlled heavy machines conducted today.
   10:30-16:00 Operation of spraying synthetic resin to prevent contaminated dust and soil from spreading was conducted.
3. May 9th
   04:17 The Access doors of Unit 1 R/B were opened.
   05:00 Cooling SFP with RHR-pump started at Unit 6.
4. May 10th 09:00-16:00 Operation to remove rubble by remotely controlled heavy machines conducted today.
5. May 11th 16:36 Event falling under Article 15* occurred (Incapability of water injection spontaneously)
6. May 12th 14:30 Start venting
   15:36 Hydrogen explosion
7. May 13th 13:25 Event falling under Article 15* occurred (Loss of reactor cooling)
8. May 15th 06:10 Sound of explosion,
   10:30 Transfer of water from the main condenser to the CST completed.
9. May 17th 11:00 Start venting
10. May 19th 10:08 Start transferring highly radioactive water accumulated in the turbine BLDG to the waste tank.
11. May 22nd 11:20 RPV temperature increased
12. May 23rd 10:00 The operation of transferring water in the Unit 1 started in addition to fire extinguish line.
13. May 24th 12:20 Water feeding was temporally switched from to the reactor injection pump.
14. May 26th 16:46 lights in the main control room becomes available
15. May 31st 12:00 Start to transfer the water in the CST to the waste tank.

*1. Latest Major event and response

*2. Chronology of Nuclear Power Stations

*Major incidents and Actions*

*The Act on Special Measures Concerning Nuclear Emergency Preparedness*
Fukushima Dai-ni NPPs
All units are cold shutdown (Unit-1, 2, 4 have been recovered from an event falling under Article 15*)

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
25th  Governmental advise: for the residents within 20-30 km radius from Fukushima I to voluntarily evacuate

Abbreviations:
SFP: Spent Fuel Storage Pool
EDG: Emergency Diesel Generator
RPV: Reactor Pressure Vessel
R/B: Reactor Building
RHR: Residual Heat Removal system
CST: Condensate water Storage Tank
T/B: Turbine Building

*1 Trend data of primary parameters are available at Japan Nuclear Technology Institute’s Home Page: "http://www.genkyo.jp/english/shokai/special_4.html".
*2 Data trend is continuously monitored.

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 occurred on March 11th. Other nuclear power plants in Japan are in normal operation or safely shutdown.