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 16:00, April 14th (Estimated by JAIF)

<table>
<thead>
<tr>
<th>Power Station</th>
<th>Fukushima Dai-ichi Nuclear Power Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>Electric / Thermal Power output (MW)</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>460</td>
</tr>
<tr>
<td>Type of Reactor</td>
<td>BWR-3</td>
</tr>
<tr>
<td>Operation Status at the earthquake occurred</td>
<td>In Service</td>
</tr>
<tr>
<td>Fuel assemblies loaded in Core</td>
<td>460</td>
</tr>
</tbody>
</table>

#### Core and Fuel Integrity (Loaded fuel assemblies)
- **Not Damaged**
- **Damage and Leakage Suspected**
- **Not damaged (estimation)**
- **No fuel rods**
- **Not necessary**
- **damage**

#### Containment Vessel structural integrity
- **Not Damaged**
- **Damage and Leakage Suspected**
- **Not damaged (estimation)**
- **Not Damaged**
- **Not Damaged**
- **Not necessary**

#### Core cooling requiring AC power 1
- **Not Functional**
- **Not Functional**
- **Not Functional**
- **Not necessary**
- **damage**

#### Core cooling requiring AC power 2
- **Not Functional**
- **Not Functional**
- **Not Functional**
- **Not necessary**
- **damage**

#### Building Integrity
- **Severely Damaged**
- **Slightly Damaged**
- **Severely Damaged**
- **Severely Damaged**
- **Severely Damaged**
- **Severely Damaged**

#### Fuel assemblies loaded in Core
- **Not Damaged**
- **Not Damaged**
- **Not Damaged**
- **Not Damaged**
- **Not Damaged**
- **Not Damaged**

#### Core and Fuel Integrity (Loaded fuel assemblies)
- **Damaged (70%)*1**
- **Damaged (30%)*1**
- **Damaged (25%)*1**
- **No fuel rods**
- **No fuel rods**
- **No fuel rods**

#### Containment Vessel structural integrity
- **Not Damaged (estimation)**
- **Damage and Leakage Suspected**
- **Not damaged (estimation)**
- **Not Damaged**
- **Not Damaged**
- **Not Damaged**

#### Functioning (in cold shutdown)
- **Core cooling requiring AC power 1**
- **Core cooling requiring AC power 2**
- **Containment Vessel structural integrity**
- **Fuel assemblies loaded in Core**
- **Fuel assemblies stored in Spent Fuel Pool**
- **Fuel Impresure in the spent fuel pool**

#### Safety
- **Safe**
- **Safe**
- **Safe**
- **Safe**
- **Safe**
- **Safe**

#### Environmental effect
- **Evacuation**
- **Inevitable consequences**
- **Remarks**

#### Remarks
- **Nitrogen gas injection into the Unit 1 containment vessel has been continued to reduce the possibility of hydrogen explosion since Apr. 6th.**
- **The pressure of the vessel has hardly risen for the past a few days and leakage of hydrogen from the pool exploded on Mar. 15th.**
- **Pool cooling capability was recovered.**

#### Source
Government Nuclear Emergency Response Headquarters: News Release (-4/12 17:00), Press conference, NSC: Nuclear Safety Commission of Japan

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#### [Significance judged by JAIF](#)
- **Low**
- **High**
- **Severe (Need immediate attention)**

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**Abbreviations**
- MEXT: Ministry of Education, Culture, Sports, Science and Technology
- INES: International Nuclear Event Scale
- NISA: Nuclear and Industrial Safety Agency
- TEPCO: Tokyo Electric Power Company Inc.
- NSC: Nuclear Safety Commission of Japan

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**[1]** TEPCO's estimation based on the radiation level in the CV
**[2]** Correction: Rating was raised from 5 to 7 for the accident of Unit 1 through 3
**[3]** It is presumed that some of the spent fuel may have been damaged based on radioactive substance detected from the water sample taken from the pool of unit-4.
### Power Station: Fukushima Dai-ri Nuclear Power Station

<table>
<thead>
<tr>
<th>Unit</th>
<th>Electric / Thermal Power output (MW)</th>
<th>Type of Reactor</th>
<th>Operation Status at the earthquake occurred</th>
<th>INES (estimated by NISA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1100 / 3293</td>
<td>BWR-5</td>
<td>In Service -&gt; Automatic Shutdown</td>
<td>Level 3</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>BWR-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>BWR-5</td>
<td>All the units are in cold shutdown</td>
<td>Level 3</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>BWR-5</td>
<td></td>
<td>Level 3</td>
</tr>
</tbody>
</table>

**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.
- No parameter has shown abnormality after the earthquake occurred off the shore of Miyagi prefecture at 23:32, Apr. 7th.
- Latest Monitor Indication: 2.5μSv/h at 21:00, Apr. 13th at NPS border
- Evacuation Area: 10km from NPS

### Power Station: Onagawa Nuclear Power Station

<table>
<thead>
<tr>
<th>Unit</th>
<th>Operation Status at the earthquake occurred</th>
<th>Status</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In Service -&gt; Automatic Shutdown</td>
<td>All the units are in cold shutdown</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
- 3 out of 4 external power lines in service with another line under construction broke down after an earthquake occurred off the shore of Miyagi prefecture at 23:32, Apr. 7th. All 5 external power lines have become available by Apr. 10th. Monitoring posts' readings have shown no abnormality. All SFP cooling systems had been restored after shutting down due to the earthquake.

### Power Station: Tokai Dai-ni

<table>
<thead>
<tr>
<th>Operation Status at the earthquake occurred</th>
<th>Status</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| In Service -> Automatic Shutdown             | In cold shutdown | No abnormality has been found after an earthquake occurred off the shore of Miyagi prefecture at 23:32, Apr. 7th.
Parameters in the Table
JAIJ 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

- Reactor Safety y
  - Shutdown
  - Cooling
    - Design base cooling capability
  - Containment

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
  - Injection to core (AM)
  - Injection to Containment Vessel (AM)
  - Containment Venting (AM)

- 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)

- Work environment in main control room
  - Main Control Room Habitability and Operability (ventilation, Lights, Indicator)

- Environmental effect
  - Environmental effect (Radiation Monitor, Contamination)

- Evacuation
  - Evacuation (Order, Evacuated Area)
### 1. Latest major event and response

**April 12th:**

The significance of the accident at Fukushima Daiichi NPS has been tentatively reevaluated as level 7 on the International Nuclear and Radiological Event Scale, or INES.

**14.07:** After an earthquake centered at Hamadoki, Fukushima prefecture, no abnormality was found with nitrogen gas injection facility of Unit 1, external power supply of Unit 1 through 6, reactor water injection pumps of Unit 1 through 3 and the readings of plant parameters of Unit 1 through 6 and monitoring posts in Fukushima Daiichi NPS. No abnormality was found with Fukushima Daini Unit 1 through 4 and the monitoring posts.

19.35 Transfer of highly radioactively contaminated water accumulated inside concrete tunnel outside the turbine building to the condenser started at Unit 2

**Apr. 13th:**

15:02 Transfer of highly radioactively contaminated water accumulated inside concrete tunnel was stopped at Unit 2. About 660 tons of water has been transferred.

### 2. Chronology of Nuclear Power Stations

**1. Fukushima Dai-ichi NPS**

- **11th 15:42** Report IAW Article 10* (Loss of power)
- **14th 05:20** Start venting
- **0.1047MPa**
- **0.095MPa**
- **CV pressure (Apr. 14 00:00)**
- **At feed water line nozzle**

**2. Chronology of Nuclear Power Stations**

#### Major Data *

- **All units are cold shutdown (Unit-1, 2, 4 have been recovered from an event falling under Article 15*)
- **19th 05:00** Cooling SFP with RHR-pump started at Unit 5
- **19th 12:14** Cooling SFP with RHR-pump started at Unit 6
- **22nd 11:30** Lights in the main control room becomes available
- **22nd 11:30** Transfer of highly radioactively contaminated water accumulated inside concrete tunnel to the condenser started in Unit 6.

#### 3. State of Emergency Declaration

- **11th 19:03** State of nuclear emergency was declared (Fukushima Daiichi NPS)
- **12th 07:45** State of nuclear emergency was declared (Fukushima Daini NPS)

**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: for the residents within 10km radius from Fukushima II to evacuate
- **12th 18:25** PM: for the residents within 20km radius from Fukushima I to evacuate
- **15th 11:06** PM: for the residents within 20-30km radius from Fukushima I to stay in-house
- **23rd Governmental advise:** for the residents within 20-30km radius from Fukushima I to voluntarily evacuate

### 2. Chronology of Nuclear Power Stations

#### (1) Fukushima Dai-ichi NPS

<table>
<thead>
<tr>
<th>Unit: 1</th>
<th>Unit: 2</th>
<th>Unit: 3</th>
<th>Unit: 4</th>
<th>Unit: 5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>11th 15:42</strong> Report IAW Article 10* (Loss of power)</td>
<td><strong>11th 15:42</strong> Report IAW Article 10* (Loss of power)</td>
<td><strong>11th 15:42</strong> Report IAW Article 10* (Loss of power)</td>
<td><strong>14th 04:08</strong> Water temperature in Spent Fuel Storage Pool increased at 84℃</td>
<td><strong>19th 05:00</strong> Cooling SFP with RHR-pump started at Unit 5</td>
</tr>
<tr>
<td><strong>14th 12:35</strong> Event falling under Article 10* occurred</td>
<td><strong>12th 20:41</strong> Start venting</td>
<td><strong>12th 13:25</strong> Event falling under Article 10* occurred</td>
<td><strong>15th 09:38</strong> Fire occurred on 3rd floor (extinguished spontaneously)</td>
<td><strong>20th 14:30</strong> Cold shutdown achieved at Unit 5</td>
</tr>
<tr>
<td><strong>0.1047MPa</strong></td>
<td><strong>0.095MPa</strong></td>
<td><strong>CV pressure (Apr. 14 00:00)</strong></td>
<td><strong>0.083MPa</strong></td>
<td><strong>20th 19:27</strong> Cold shutdown achieved at Unit 6.</td>
</tr>
<tr>
<td><strong>12th 13:05</strong> Hydrogen explosion</td>
<td><strong>13th 16:34</strong> Sea water injection to RPV</td>
<td><strong>13th 13:12</strong> Sea water injection to RPV</td>
<td><strong>13th 08:41</strong> Start venting</td>
<td><strong>22nd 19:41</strong> All power source was switched to external AC power at Unit 5 and 6.</td>
</tr>
</tbody>
</table>

#### 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

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

**Trend data of primary parameters are available at Japan Nuclear Technology Institute's Home Page; “http://www.gengikyo.jp/english/shokai/special_4.html”**
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.

- **Fukushima Daiichi**
  - 1, 2, 3, 4, 5, 6
- **Fukushima Daini**
  - 1, 2, 3, 4
- **Tokai**
  - 2
- **Sendai**
  - 1, 2
- **Shimane**
  - 1, 2
- **Takahama**
  - 1, 2, 3, 4
- **Kashiwazaki Kariwa**
  - 1, 2, 3, 4, 5, 6
- **Shika**
  - 1, 2
- **Tsuruga**
  - 1, 2
- **Mihama**
  - 1, 2, 3
- **Ohi**
  - 1, 2, 3, 4
- **Ohkama**
  - 1, 2, 3, 4
- **Hamaoka**
  - 3, 4, 5
- **Tohoku/Higashidori**
  - 1
- **Tomari**
  - 1, 2, 3
- **Onagawa**
  - 1, 2, 3

**Legend**
- Red: Accident with Nuclear Fuel Damage Suspected
- Orange: Accident without Nuclear Fuel Damage Suspected
- Green: Safe
- Light Purple: Safe (Not affected by the quake)