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.
<table>
<thead>
<tr>
<th>Power Station</th>
<th>Fukushima Dai-ichi Nuclear Power Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td></td>
</tr>
<tr>
<td>Electric / Thermal Power output (MW)</td>
<td>446 / 1380</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>400</td>
</tr>
<tr>
<td>Core and Fuel Integrity</td>
<td>Not Damaged</td>
</tr>
<tr>
<td>Fuel assemblies loaded in Core</td>
<td>548</td>
</tr>
<tr>
<td>Core cooling requiring AC power 1</td>
<td>Not Functional</td>
</tr>
<tr>
<td>Core cooling requiring AC power 2</td>
<td>Not Functional</td>
</tr>
<tr>
<td>Core cooling requiring AC power 3</td>
<td>Not Functional</td>
</tr>
<tr>
<td>Building Integrity</td>
<td>Severely Damaged</td>
</tr>
<tr>
<td>Water Level of the Reactor Pressure Vessel</td>
<td>Fuel exposed partially or fully</td>
</tr>
<tr>
<td>Pressure / Temperature of the Reactor Pressure Vessel</td>
<td>Gradually increased</td>
</tr>
<tr>
<td>Water injection to core (Accident Management)</td>
<td>Continuing (Switch from seawater to freshwater)</td>
</tr>
<tr>
<td>Water injection to Containment Vessel (AM)</td>
<td>To be confirmed</td>
</tr>
<tr>
<td>Fuel assemblies stored in Spent Fuel Pool</td>
<td>292</td>
</tr>
<tr>
<td>Fuel Integrity in the spent fuel pool</td>
<td>Safe</td>
</tr>
<tr>
<td>Cooling of the spent fuel pool</td>
<td>Water spray started (freshwater)</td>
</tr>
<tr>
<td>Main Control Room Habitability &amp; Operability</td>
<td>Poor due to loss of AC power</td>
</tr>
</tbody>
</table>

**Environmental effect**

- Radioactive materials detected from underground water sampled near turbine buildings in Mar. 30th.
- High radiation circumstance hampering the work to restore originally installed pumps for injection. Discharging radioactive water in the basement of the buildings of Unit 1 through 4.
- Small fish caught in waters off the coast of Ibaraki on Apr. 4 have been found to contain radioactive cesium above the legal limit on Apr. 5th.
- People living in the 20 to 30km and other than the expanded evacuation area mentioned above, are asked to get prepared for going and staying indoors or evacuation in an emergency.

**Evacuation**

- Shall be evacuated for within 20km from NPS (issued at 18:25, Mar. 12th)
- Shall stay indoors (issued at 11:00, Mar. 15th)
- Should consider leaving (issued at 11:30, Mar. 25th) for from 20km to 30km from NPS

**INES (estimated by NISA)**

- Level 5: High (Need immediate action)

**Significance judged by JAIF**

- Low
- Severe (Need immediate action)

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**Remarks**

- Function of containing radioactive material
- Prevention of the proliferation of contaminated dust

**References**

- Nuclear Power Plant Status as of 10:00, April 12th
- TEPCO: Press Release (-/4/11 21:00, Press conference)

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**Abbreviations**

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

<table>
<thead>
<tr>
<th>Power Station</th>
<th>Fukushima Dai-ri Nuclear Power Station</th>
<th>Tokai Dai-ri Nuclear Power Station</th>
<th>Onagawa Nuclear Power Station</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit</strong></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Operation Status at the earthquake occurred</strong></td>
<td>In Service -&gt; Automatic Shutdown</td>
<td>In Service -&gt; Automatic Shutdown</td>
<td>In Service -&gt; Automatic Shutdown</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>All the units are in cold shutdown.</td>
<td>All the units are in cold shutdown.</td>
<td>All the units are in cold shutdown.</td>
</tr>
<tr>
<td><strong>Remarks</strong></td>
<td>Unit 1, 2, 3 &amp; 4, which were in full operation when the earthquake occurred, all shutdown automatically.</td>
<td>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.</td>
<td>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 SFP cooling systems had been restored after shutting down due to the earthquake.</td>
</tr>
<tr>
<td><strong>Evacuation Area</strong></td>
<td>10km from NPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type of Reactor</strong></td>
<td>BWR-5</td>
<td>BWR-5</td>
<td>BWR-5</td>
</tr>
<tr>
<td><strong>Electric / Thermal Power output (MW)</strong></td>
<td>1100 / 3293</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Latest Monitor Indication: 2.7μSv/h at 21:00, Apr. 11th at NPS border.
Parameters in the Table
Japan Atomic Energy Research Institute (JAERI) uses the parameters to evaluate safety conditions of nuclear plants during this accident from the viewpoint 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**
  - **Shutdown**
  - **Cooling**
    - Design base cooling capability
  - **Containment**
    - Design base containment function
    - 5 Barriers
      - 1. Fuel Pelot
      - 2. Cladding Tube
      - 3. Reactor Pressure vessel
      - 4. Containment Vessel
      - 5. Reactor Building
    - Alternative operation
    - Operation for containment vessel protection against burst

- **Accident Management (AM)**
  - (Operation beyond design base accident)
    - 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
    - Pressure 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 9th:
03:29 Nitrogen injection valve was closed in order to switch to the high purity nitrogen gas generator. (04:10 The valve was reopened.)
13:10 Transfer of water from the main condenser to the CST was completed at Unit 2.
April 10th:
09:30 Transfer of water from the main condenser to the CST was completed at Unit 1.

2. Chronology of nuclear power stations

1) Fukushima Dai-ichi NPS

<table>
<thead>
<tr>
<th>Date</th>
<th>Event/Action</th>
</tr>
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<tr>
<td>April 9th</td>
<td>03:29 Nitrogen injection valve closed in order to switch to high purity nitrogen gas generator. (04:10 Valve was reopened.)</td>
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<td>April 10th</td>
<td>13:10 Transfer of water from the main condenser to the CST was completed at Unit 2.</td>
</tr>
<tr>
<td>April 11th</td>
<td>09:30 Transfer of water from the main condenser to the CST was completed at Unit 1.</td>
</tr>
</tbody>
</table>

2) Fukushima Dai-ni NPPs

<table>
<thead>
<tr>
<th>Date</th>
<th>Event/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 11th</td>
<td>06:00 Cooling in SFP with RHR-pump started at Unit 5.</td>
</tr>
<tr>
<td>April 11th</td>
<td>22:14 Cooling SFP with RHR-pump started at Unit 6.</td>
</tr>
</tbody>
</table>

3. State of Emergency Declaration
11th 19:03: State of nuclear emergency was declared (Fukushima Dai-ichi NPS)
12th 07:45: State of nuclear emergency was declared (Fukushima Dai-ni 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 I to evacuate
12th 18:25: PM direction: for the residents within 20km radius from Fukushima I to evacuate
15th 11:36: 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
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.