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.

Japan Atomic Industrial Forum, Inc.
### Status of nuclear power plants in Fukushima as of 20:00, April 15th (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>1</td>
<td>784 / 2381</td>
</tr>
<tr>
<td>2</td>
<td>784 / 2381</td>
</tr>
<tr>
<td>3</td>
<td>784 / 2381</td>
</tr>
<tr>
<td>4</td>
<td>784 / 2381</td>
</tr>
<tr>
<td>5</td>
<td>784 / 2381</td>
</tr>
<tr>
<td>6</td>
<td>1100 / 2933</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>
<tr>
<td>Core and Fuel Integrity (Loaded fuel assemblies)</td>
<td>Damaged (41%)</td>
</tr>
<tr>
<td>Reactor Pressure Vessel structural integrity</td>
<td>Unknown</td>
</tr>
<tr>
<td>Containment Vessel structural integrity</td>
<td>Damaged (estimation)</td>
</tr>
<tr>
<td>Core cooling requiring AC power 1 (Large volumetric freshwater injection)</td>
<td>Not functional</td>
</tr>
<tr>
<td>Core cooling requiring AC power 2 (Cooled through Heat Exchangers)</td>
<td>Not functional</td>
</tr>
<tr>
<td>Building Integrity</td>
<td>Severely Damaged (Hydrogen Explosion)</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 increasing / Decreased a little after increasing over 400℃ on Mar. 24th</td>
</tr>
<tr>
<td>Containment Vessel Pressure</td>
<td>Decreased a little after increasing up to 0.4Mpa on Mar. 24th</td>
</tr>
<tr>
<td>Water injection to core (Accident Management)</td>
<td>(To be confirmed)</td>
</tr>
<tr>
<td>Water injection to Containment Vessel (AM)</td>
<td>(To be confirmed)</td>
</tr>
<tr>
<td>Function of containing radioactive material</td>
<td>Continued water spray and injection (Switch from seawater to freshwater)</td>
</tr>
<tr>
<td>Main Control Room Habitability &amp; Operability</td>
<td>Poor due to loss of AC power</td>
</tr>
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</table>

### Environmental effect

- **Radiation level:** 530 μSv/h at the south side of the office building, 70 μSv/h at the Main gate, and 22 μSv/h at the West gate, as of 15:00, Apr. 15th.
- **Small amount of plutonium was detected from the soil sampled at Fukushima Dai-ichi NPS site (3/21-4/4).**
- **Radioactive materials were detected from underground water sampled near the turbine buildings (3/30).** The concentration of the radioactive materials has increased and the monitoring of the underground water is to be expanded (4/16-).
- **There is highly radioactive contaminated water accumulated on the basement of Unit 2 turbine building and in the concrete tunnel for piping outside the building.**
- **Radioactive materials exceeding the regulatory limit have been detected from seawater sample collected in the sea surrounding the Fukushima Dai-ichi NPS since Mar. 21st. 1-131 detected at near the discharge outlet of unit-2 is 2500 times as much as legal limit (4/12).**
- **TEPCO and MEXT has expanded the monitoring for the surrounding sea area since Apr. 4th.**
- **Influence to the people's life:**
  - **Radioactive material was detected from milk and agricultural products from Fukushima and neighboring prefectures.** The government issued order to limit shipment (3/21) and intake (3/23) for some products.
  - **Radioactive iodine, exceeding the provisional legal limit, was detected from tap water sampled in some prefectures.**
  - **Small fish caught in waters off the coast of Ibaraki on Apr. 4 have been found to contain radioactive cesium and iodine above the legal limit (4/5).**
  - **Small amount of strontium was detected from some samples of soil and plants taken in the area that is 20-80 km far from the power station.**

### Nuclear power plants in Fukushima as of 20:00, April 15th

- **Evacuation:**
  - Shall be evacuated for within 3 km from NPS. Shall stay indoors for within 10 km from NPS (issued at 21:23, Mar. 11th).
  - Shall be evacuated for within 20 km from NPS (issued at 21:30, Mar. 16th).
  - Shall be evacuated for within 30 km from NPS (issued at 05:44, Mar. 12th).

### 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

### Source

Government Nuclear Emergency Response Headquarters:

- News Release (-/4/14 17:00), Press conference
- NISA: News Release (-/4/15 08:00), Press conference
- TEPCO: Press Release (-/4/15 09:00), Press Conference

### Status of Nuclear Power Plants

- TEPCO's estimation based on the radiation level in the CV
- 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.

### Environmental Impact

- Small amount of plutonium was detected from the soil sampled at Fukushima Dai-ichi NPS site (3/21-4/4).
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- Concentration of the radioactive materials has increased and the monitoring of the underground water is to be expanded.

### Reactor Pressure Vessel

- Gradually increasing / Decreased a little after increasing over 400℃ on Mar. 24th
- Unknown / Stable
- Stable
- Safe

### Containment Vessel

- Damaged (estimation)
- Damage and Leakage Suspected
- Not damaged (estimation)

### Core and Fuel Integrity

- Damaged (41%)
- Damaged (41%)
- Damaged (41%)

### Fuel assemblies loaded in Core

- 400
- 548
- 548

### Core cooling requiring AC power

- Not functional
- Not functional
- Not functional

### Reactor Pressure Vessel structural integrity

- Unknown
- Unknown
- Unknown

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- Damaged (estimation)
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### Reactor Pressure Vessel Pressure

- Decreased a little after increasing up to 0.4Mpa on Mar. 24th
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### Water Level of the Reactor Pressure Vessel

- Fuel exposed partially or fully
- Fuel exposed partially or fully
- Fuel exposed partially or fully

### Water injection to core (Accident Management)

- (To be confirmed)
- (To be confirmed)
- (To be confirmed)

### Water injection to Containment Vessel (AM)

- (To be confirmed)
- (To be confirmed)
- (To be confirmed)

### Function of containing radioactive material

- Continued water spray and injection (Switch from seawater to freshwater)
- Continued water spray and injection (Switch from seawater to freshwater)
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### Main Control Room Habitability & Operability

- Poor due to loss of AC power
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<td>1100 / 3293</td>
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<td><strong>Type of Reactor</strong></td>
<td>BWR-5</td>
</tr>
<tr>
<td><strong>Operation Status at the earthquake occurred</strong></td>
<td>In Service -&gt; Automatic Shutdown</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>All the units are in cold shutdown</td>
</tr>
<tr>
<td><strong>INES (estimated by NISA)</strong></td>
<td>Level 3</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. 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 an shore of Miyagi prefecture at 23:32, Apr. 7th. Latest Monitor Indication: 2.5 μSv/h at 09:00, Apr. 10th at NPS border</td>
</tr>
<tr>
<td></td>
<td>All the units are in cold shutdown</td>
</tr>
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| Remarks               | All SFP cooling systems had been restored after shutting down due to the earthquake. |                                        |                                        |                                        |

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<th>Onagawa Nuclear Power Station</th>
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<tr>
<td><strong>Unit</strong></td>
<td>1</td>
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<tr>
<td><strong>Operation Status at the earthquake occurred</strong></td>
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<tr>
<td><strong>Status</strong></td>
<td>All the units are in cold shutdown</td>
</tr>
<tr>
<td><strong>Remarks</strong></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 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.</td>
</tr>
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| Remarks               | 2.5 μSv/h at 09:00, Apr. 10th at NPS border |                                        |                                        |

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<td><strong>Status</strong></td>
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<tr>
<td><strong>Remarks</strong></td>
<td>No abnormality has been found after an earthquake occurred off the shore of Miyagi prefecture at 23:32, Apr. 7th.</td>
</tr>
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| Remarks               | 2.5 μSv/h at 09:00, Apr. 10th at NPS border |                                        |                                        |
Parameters in the Table
JAIP picks up these parameters to evaluate safety condition of the 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 y
  + Shutdown
  + Cooling
    + Design base cooling capability
    + S Barriers
      ① Fuel Pellet
      ② Cladding Tube
      ③ Reactor Pressure vessel
  + Containment vessel
  + Alternative operation
  + Operation for containment vessel protection against burst

<Accident Management : AM>
(Operations 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 Exchanger)

Water level of the Reactor Pressure Vessel
  - 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.

April 14th:
2. Chronology of Nuclear Power Stations

(1) Fukushima Dai-ichi NPS

Major Incidents and Actions

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3. Measures Concerning Nuclear Emergency Preparedness

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4. Measures Concerning Nuclear Emergency Preparedness

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5. 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-ichi NPS)

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6. Evacuation Order

12th 05:44 PM direction: for the residents within 10km radius from Fukushima I to evacuate

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

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(2) Fukushima Dai-ichi NPS

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Major Data *1

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

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*2 Data trend is continuously monitored.
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.

- **Accident with Nuclear Fuel Damage Suspected**
- **Accident without Nuclear Fuel Damage Suspected**
- **Safe**
- **Safe (Not affected by the quake)**