# Measures against Tsunami Taken by Nuclear Power Stations to Protect Their Electric Facilities

## Such As Switchyard (List)

<table>
<thead>
<tr>
<th>Licensee</th>
<th>Power station and others</th>
<th>Classification of measures</th>
<th>Specific tsunami protection measures</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Hokkaido Electric Power Co., Inc. | Tomari | Emergency safety measures | ○ The power station in general:  
Construction of a seawall in the vicinity of the gateway of  
the reactor building (by the end of FY 2013)  
○ Power distribution panels in the building  
Improvement of the water-tightness of the areas where  
emergency bus and breakers are installed (already completed) and enhancement of anti-inundation measures (by the end of FY 2013) | (Facilities requiring no measures) ○ Switchyard: 275kV switchyard (T.P.+85 m) ○ Transformer: backup transformer for Unit 3 (T.P.+85 m) |
| Tohoku Electric Power Co. Inc. | Higashidori | Emergency safety measures | ○ In general:  
Construction of tide embankment (by the end of FY 2013)  
○ Power distribution panels in the buildings  
Improvement of the water tightness of the buildings (by June, FY 2011)  
Improvement of the water tightness of the doors of the buildings (by the end of FY 2013) | ○ Switchyard facility  
66-kV switchyard will be relocated to a place 31 m or higher above the sea level (completed by the end of FY 2015)  
○ Transformer  
Backup transformers (for Units 1 and 2) that receive electricity from 66 kV power transmission lines will be relocated to a place 31 m or higher above the sea level (completed by the end of FY 2015).  
○ Others  
Addition of power feeding route connecting Unit 3 emergency bus with Units 1 and 2 emergency bus (completed by the end of FY 2015) |
| | Onagawa | Measures for ensuring the reliability of external power supply | ○ In general:  
Construction of tide embankment (by April, FY 2012)  
○ Power distribution panels in the buildings  
Improvement of the waterproof property of the buildings and the water tightness of their doors (by the end of 2013) | ○ Switchyard facility  
Construction of flood barrier (by the end of FY 2013)  
○ Transformer  
Construction of flood barrier (by the end of FY 2013) |
| Tokyo Electric Power Co. Inc. | Kashiwazaki | Emergency safety measures | ○ Plant in general:  
Tide embankments are constructed along the coast (approximately by the end of the first quarter of FY 2013 [about two years])  
○ Power distribution panels in the buildings  
Water tightness of the doors of the reactor buildings will be enhanced (around the second half of FY 2012)  
○ Switchyard facility  
Flood barriers will be constructed around the Switchyard (66 kV and 500 kV) (around the second half of FY 2012).  
○ Others  
High-voltage distribution panels for emergencies will be newly installed. Permanent cables will be laid and connected to the high-voltage distribution panels for emergencies in the reactor buildings (approximately by the first half of 2012). | ○ Switchyard facility will be established on elevated ground (T.P.+13.2 m or higher) |
| Chubu Electric Power Co., Inc. | Hamaoka | Emergency safety measures | ○ Station in general:  
Construction of seawall (by the end of FY 2013)  
○ Power distribution panels in the reactor buildings  
Waterproof measures for the inside of the reactor buildings | (Facilities requiring no measures) ○ Switchyard facility: 500 kV switchyard (T.P.+25 m) |

*Attachment 2*
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<tr>
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| Hokuriku Electric Power Co.    | Shika                   | Measures for ensuring the reliability of external power supply                              | ○Transformer  
A transformer will be installed on elevated ground in the vicinity of 500-kV switchyard.         | (Facilities requiring no measures)  
○Power distribution panel in the reactor building: 6.9 kV emergency bus (in the reactor building, which is located at T.P.+21 m)  
○Switchyard facility (T.P.+35 m)  
○Transformer: backup power source transformer of Unit 1 (T.P.+35 m) |
| Kansai Electric Power Co., Inc.| Mihama                  | Emergency safety measures                                                                  | ○In general:  
Tide embankment will be constructed at 15 m above the sea level (constructed in the west of the site (sea side)). Flood barrier will be newly constructed 15 m above the sea level around the intake chambers and discharge chambers (in about two years).  
○Power distribution panels in the reactor buildings  
6.9 kV normal buses will be protected by the construction of tide embankment and flood barrier, both 15 m above the sea level (in two years).  
○Transformer  
Transformers installed at 11 m above the sea level will be protected by the installation of tide embankment and flood barrier, both 15 m above the sea level (in two years). |
|                                |                         | Measures for ensuring the reliability of external power supply                              | ○Transformer  
In addition to the countermeasures such as tide embankments and flood barriers, Unit 2 will directly provide electricity to the 6.9 kV emergency bus inside the reactor building located at 21 m from the sea level, through a transformer to be newly built at 35 m from the sea level (a measure described in the instruction matter 2 [implemented in two years]). |
|                                |                         | Emergency safety measures                                                                  | ○Power distribution panels in the reactor buildings  
Relocation (layout changes) of the junction boxes for safety-related high-voltage bus and of the bus ducts (in about three years)  
○Switchyard facility  
Modifying the 77 kV emergency switchyard facility to a gas insulated switchgear (GIS) (in about three years)  
○Transformer  
Relocating the 77 kV emergency transformer indoors |
|                                |                         | Measures for ensuring the reliability of external power supply                              | ○In general:  
Making the seawall higher (by the end of FY 2013)  
○Power distribution panels in the reactor buildings  
Measures for preventing the inundation of the reactor buildings (already completed)  
Making the outer wall doors of the reactor building watertight (by the end of FY 2012)  
Measures for preventing the inundation of the metal-clad switchgear room (already completed)  
○Others  
Reinforcement of the power transmission lines (a long-term issue) |
|                                |                         | Emergency safety measures                                                                  | ○Power distribution panels in the reactor buildings  
Relocation of the junction boxes for 6.6 kV safety-related high-voltage bus and of the bus ducts (in about three years)  
○Switchyard facility  
Making the oil retaining wall (dike) for the 77 kV switchgear higher (in about one year)  
○Transformer |

<Units 1 and 2>
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</table>
| Takahama |                        | Emergency safety measures | Making the oil retaining wall (dike) of the 77 kV backup transformer higher (in about one year)  
<Units 3 and 4>  
○Power distribution panels of the reactor buildings  
Relocation of the junction boxes for 6.6 kV safety-related high-voltage bus and the bus ducts (in about three years) | (Facilities requiring no measures)  
○Switchyard facility: (T.P.+15 m)  
○Transformer: (T.p.+15 m) |
| Shimane  | Chugoku Electric Power Co., Inc. | Measures for ensuring the reliability of external power supply | ○In general:  
Construction of tide embankment (within FY 2011)  
○Power distribution panels in the reactor buildings  
Measures for preventing the inundation of the reactor buildings (already completed)  
Making the outer wall doors of the reactor buildings water tight (by the end of FY 2012)  
Measures for preventing the inundation of the metal clad switchgear room (already completed)  
○Others  
Reinforcement of the power transmission lines (a long-term issue) | (Facilities requiring no measures)  
○Switchyard: (T.P.+15 m or higher) |
| Ikata    | Shikoku Electric Power Co., Inc. | Emergency safety measures | ○Power distribution panels in the reactor buildings  
Sealing of the safety-related circuit breaker rooms (already completed) and enhancement of the measures for preventing inundation (in about two to three years)  
○Others  
Electricity distribution lines will be laid from elevated ground (95 m above the sea level) outside of the site to the power station (by the end of March, 2012). | (Facilities requiring no measures)  
○Switchyard facility: 500 kV outdoor switchyard (T.P.+84 m)  
(Reference)  
○The power station in general: Construction of tide embankment is not scheduled in the emergency safety measures. |
| Genkai   | Kyushu Electric Power Co., Inc. | Emergency safety measures | ○Power distribution panels in the reactor buildings  
Measures for preventing the inundation of the switchgear room of the safety auxiliary system (already completed)  
Enhancement of the measures for preventing the inundation of the switchgear room of the safety auxiliary system (to be completed in about three years) | (Reference)  
○The power station in general: Construction of tide embankment is not scheduled in the emergency safety measures. |
| Sendai   |                        | Emergency safety measures | ○Switchyard facility  
Switchgears will be newly installed at elevated ground, which is 20 m or higher above the sea level, to be used for backup transformers of Genkai Units 1 and 2, so that the emergency buses of all units can be provided with electricity (to be completed by FY 2013).  
○Transformer  
Backup transformers of Genkai Units 1 and 2 will be installed at elevated ground 20 m above the sea level, so that the emergency bus of all units will be provided with electricity (to be completed by FY 2013).  
○Power distribution panels in the reactor buildings  
Measures for preventing the inundation of the switchgear room of the safety auxiliary system (already completed)  
Enhancement of the measures for preventing the inundation | (Reference)  
○The power station in general: Construction of tide embankment is not scheduled in the emergency safety measures. |
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<tbody>
<tr>
<td>Japan Atomic Power Co. Inc.</td>
<td>Tokai Dai-ni</td>
<td>Measures for ensuring the reliability of external power supply</td>
<td>◯Switchyard&lt;br&gt;In comparison with the benchmark inundation height (T.P.+12.2 m), the switchyard is located at T.P.+13.3 m, and therefore requires no additional measures. However, to be on the safe side and along with the update of the switchyard, a new switchyard will be constructed on elevated ground 20 m above the sea level, so that emergency buses of all units can be provided with electricity (to be completed in a few years).&lt;br&gt;◯Transformer&lt;br&gt;In comparison with the benchmark inundation height (T.P.+12.2 m), the transformer is located at T.P.+13.3 m, and therefore requires no additional measures. However, to be on the safe side and along with the update of the transformer, a new transformer will be constructed on elevated ground 20 m above the sea level, so that emergency buses of all units can be provided with electricity (to be completed in a few years).</td>
<td>Notes of the switchgear room of the safety auxiliary system (to be completed in about three years) scheduled in the emergency safety measures.</td>
</tr>
<tr>
<td></td>
<td>Tsuruga</td>
<td>Measures for ensuring the reliability of external power supply</td>
<td>◯Power distribution panels in the buildings&lt;br&gt;Sealing of the penetrations of the reactor buildings (already completed)&lt;br&gt;Making the outer wall doors of the reactor buildings watertight (by around September, FY 2012)&lt;br&gt;&lt;br&gt;◯The power station in general&lt;br&gt;Construction of tide embankment (in about three years)&lt;br&gt;◯Switchyard facility&lt;br&gt;Construction of protection barrier (in about one and a half years)&lt;br&gt;◯Transformer&lt;br&gt;Construction of protection barrier (in about one and a half years)</td>
<td>(Reference) ◯Switchyard facility: Its relocation to a higher place is being considered.</td>
</tr>
<tr>
<td></td>
<td>Oma</td>
<td>Measures for ensuring the reliability of external power supply</td>
<td>◯Power distribution panels in the buildings&lt;br&gt;Sealing of the penetrations of the reactor auxiliary building (already completed)&lt;br&gt;Making the outer wall doors of the reactor auxiliary building watertight (by around September, FY 2012)&lt;br&gt;&lt;br&gt;◯The power station in general&lt;br&gt;Construction of seawall (in about three years)&lt;br&gt;◯Switchyard facility&lt;br&gt;Construction of protection barrier (in about one and a half years)&lt;br&gt;◯Transformer&lt;br&gt;Construction of protection barrier (in about one and a half years)</td>
<td>(Reference) Switchyard facility: Relocation to an elevated place is being considered.</td>
</tr>
<tr>
<td>Electric Power Development Co., Ltd.</td>
<td>Emergency safety measures</td>
<td>(Currently, the power station is not targeted in the emergency safety measures. The power station is taking relevant measures voluntarily.)</td>
<td>(Facilities requiring no measures)&lt;br&gt;◯Switchyard facility: 500 kV switchyard and 66 kV switchyard (T.P.+25 m)&lt;br&gt;◯Transformer: emergency transformer (T.P.+25 m)</td>
<td>(Reference) The following measures will be taken during construction stage as safety improvement measures:&lt;br&gt;・Relocation of backup generators to an elevated place.&lt;br&gt;・Deployment of power source cars and portable generators&lt;br&gt;・Reinforcement of water...</td>
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<tr>
<td>Monju</td>
<td>Emergency safety measures</td>
<td>◯ Others Improvement of the watertightness of the doors of the buildings (by the end of FY 2011) Reinforcement of the waterproof barrier around the sea water pumps (by the end of FY 2011)</td>
<td>(Facilities requiring no measures) ◯ Power distribution panels in the buildings: (T.P.+29 m or higher) ◯ Switchyard facility: (T.P.+31 m) ◯ Transformer: startup transformer (T.P.+21 m) and emergency transformer (T.P.+31 m)</td>
<td></td>
</tr>
<tr>
<td>Incorporated Administration Agency, Japan Atomic Energy Agency (JAEA)</td>
<td>Measures for ensuring the reliability of external power supply</td>
<td>No measures required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tokai Nuclear Fuel Reprocessing Plant</td>
<td>Emergency safety measures</td>
<td>◯ Power distribution panels in the buildings Sealing of power distribution panel (already completed) Relocation to an elevated place (within FY 2011) ◯ Others Sealing of the doors to the rooms where cooling water pumps are installed (already completed) Maintenance of electric cables (within FY 2011)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measures for ensuring the reliability of external power supply</td>
<td>◯ For the reprocessing plant in general: Construction of tide embankment is being considered. ◯ Power incoming units New incoming units will be installed at an elevated place (20 m or higher above the sea level) (by the end of FY 2013) A cut-off wall will be constructed around the existing extra-high-voltage power incoming units (by the end of FY 2012) ◯ Each reprocessing facility: By installing watertight doors, relocating air supply and exhaust openings to higher places, and by sealing off windows, damage to electric facilities caused by tsunami can be prevented (by the end of FY 2012)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan Nuclear Fuel Limited</td>
<td>Emergency safety measures</td>
<td>No measures required</td>
<td>Tsunami is not expected (T.P.+55 m). (Tsunami heights recorded during the Meiji Sanriku Tsunami and Showa Sanriku Tsunami: 3 to 4.5 m)</td>
<td></td>
</tr>
<tr>
<td>Rokkasho Reprocessing Plant</td>
<td>Measures for ensuring the reliability of external power supply</td>
<td>No measures required</td>
<td></td>
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</tr>
</tbody>
</table>

- tanks
- ◯ Provision of portable power pumps and additional deployment of fire engines
- ◯ Provision of spare parts for sea water pump motors