Application for Examination as to Compliance with the New Regulatory Standards of Kashiwazaki-Kariwa Nuclear Power Station Units 6 and 7

<Reference>
September 27, 2013
Tokyo Electric Power Company

1. Our efforts after the Fukushima Daiichi NPS accident and key points in complying with the new regulatory standards

Since the accident occurred at Fukushima Daiichi Nuclear Power Station in March 2011, we have continuously implemented additional measures to enhance the safety of Kashiwazaki-Kariwa Nuclear Power Station.

(Representative additional measures)

- Deployment of fire engines, power supply vehicles, etc. and conduction of training (the implementation status was reported to the government on April 21, 2013)
- Installation of a seawall (completed in June, 2013)
- Deployment of air-cooled gas turbine generator vehicles, etc. (completed in March 2012)
- Deployment of alternative heat exchanger vehicles (completed in March 2013)

Recognizing the importance of receiving the NRA's objective evaluation of the measures implemented so far, we decided to submit the application for the compliance examination to the NRA for its judgment on compliance of the Units 6 and 7 with the new regulatory standards.

Safety measures of relatively high significance in terms of compliance with the new regulatory standards include the following:

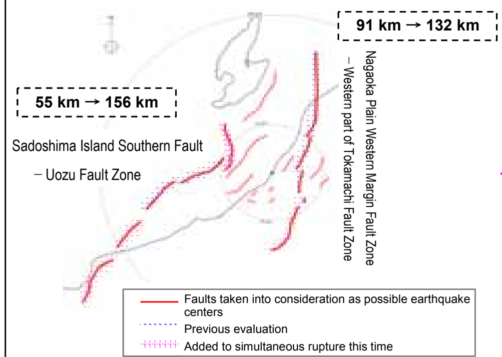
- Countermeasures against natural phenomena (earthquakes, tsunami, and other natural phenomena (such as tornados and volcanic activities))
- Countermeasures against flooding inside buildings
- Countermeasures against fires
- Measures to reinforce systems to receive power from outside the plant
- Countermeasures against severe accidents*

* A **severe accident** is an accident in which a reactor core or a contained fuel body is severely damaged. The countermeasures include damage prevention measures and effect mitigation measures to be taken after damage has occurred.

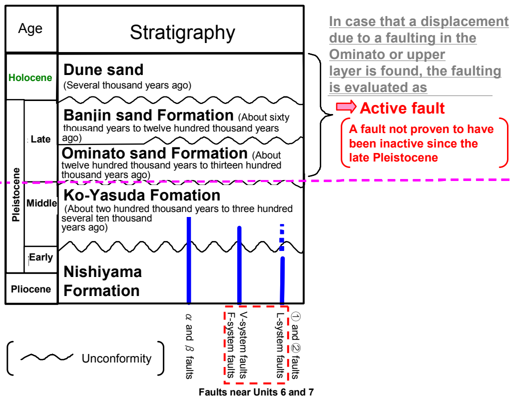
2. Countermeasures against natural phenomena

(1) Countermeasures against earthquakes

- Our previous evaluation of simultaneous rupture of faults was based on an opinion of the specialized governmental agency (Headquarters for Earthquake Research Promotion) and geologic structures. The opinion of the agency is such that faults requiring consideration are those each being 5 km or less apart from another fault. Recently, we started referring to opinions of a wider range of experts. Reflecting their opinions into the standard earthquake movement Ss on the safety side, we confirmed that this earthquake movement would not affect the anti-seismic safety of the Units 6 and 7.
- We found all of the faults within the power station site to have stopped in the Ko-Yasuda Formation, and found no fault activities that occurred after the end of deposition of the Ko-Yasuda Formation (after about 200,000 years ago).



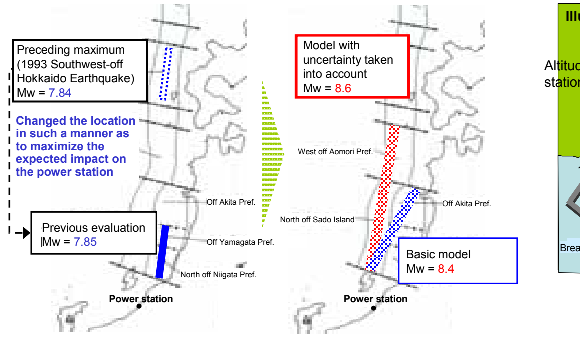
Evaluation of simultaneous rupture of active faults around the power station



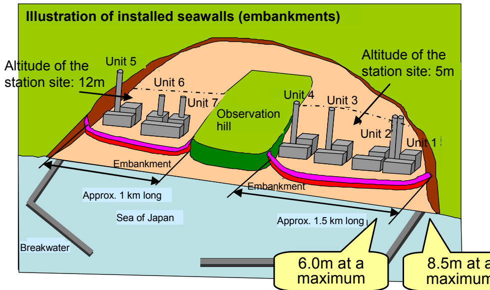
Evaluation of faults in the NPP site

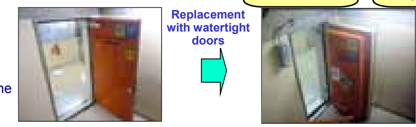
(2) Countermeasures against tsunami

- Our evaluation of the effects of tsunami on the power station reflects the new regulatory standards and lessons learnt from the Tohoku-Chihou-Taiheiyou-Oki Earthquake. Specifically, we adopted **a safety side assumption regarding simultaneous rupture of faults, and reassessed the sizes of faults**.
- **A simulation assuming concurrent occurrence of tsunami caused by an earthquake and a sea floor landslide shows that a tsunami likely to reach the power station, which has an extremely low chance of occurrence, would not run up on R/B ground level. This is because, while the Units 6 and 7 are located at the level of 12m, such a tsunami would be 6.0m high at the highest point when reaching the front side of the water intake and would run up to a point as high as 8.5m.**
- We, as the operator, are voluntarily making efforts, such as installation of a seawall and replacement of the doors of important buildings with watertight doors, to ensure the safety even in case of a 15m high tsunami.



Assumed wave sources along the eastern margin of the Japan Sea
(Simultaneous rupture of active faults in the Japan sea around the power station other than the above are assumed in the same manner as "(1) Countermeasures against earthquakes".)





(3) Countermeasures against natural phenomena (such as tornados and volcanic activities))

Countermeasures against tornados

- **We established the design standard assuming the occurrence of <u>a Fujita Scale Level 2 tornado (with a maximum instantaneous wind speed of 69 m/s)</u>, based on the tornado impact assessment guide from the Nuclear Regulation Authority.**

<Grounds for the design standard>

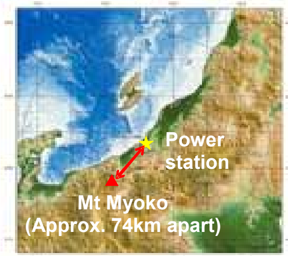
Reference item		Tornado intensity (wind speed)
Observation record (From 1961 to June 2012)	Maximum level of tornado observed in Niigata Prefecture	Fujita Scale Level 1 (33 – 49 m/s)
	Maximum level of tornado observed on the Japan Sea side of Honshu	**<u>Fujita Scale Level 2 (50 – 69 m/s)</u>**
Annual exceedance probability	10^{-5} (Once in 100,000 years)	**<u>Fujita Scale Level 2 (50 – 69 m/s)</u>**

➢ Impact assessment
- **We confirmed that the soundness of the buildings, which contain facilities important for safety, will not be damaged by a tornado (specifically, wind pressure, atmospheric pressure difference and flying objects).**

Countermeasures against volcanic activities

- **Based on the volcanic impact assessment guide by the Nuclear Regulation Authority, we established the design standard to withstand 30cm pile of volcanic ash assuming that an eruption, as large as that of Mt. Fuji (Hoei Eruption), occurs to Mt. Myoko.**

<Verification of the design standard>
- We assessed the activities of volcanoes located within a radius of 160km.
- Since there is no trace of lava or pyroclastic flow around the site, the possibility of them to reach the power station is sufficiently small.
- **<u>The distance from the nearest volcano (Mt. Myoko), which may affect the power station by ash fall, is approx. 74km.</u>**



➢ Impact assessment
- **We confirmed that the soundness of the buildings will not be damaged by sedimentation of volcanic ash.**
- **Air conditioning system of central control room will not be affected by volcanic ash by operating in circulation mode. Also, we can prevent volcanic ash from affecting the emergency diesel generator by replacement of filter (intake port of the emergency diesel generator has ash-preventive structure). Therefore, we confirmed that there is no problem with safety.**

3. Countermeasures against flooding inside buildings

- We will implement water-stop measures (water-stop work at pipes and cables penetrating walls, and replacement of doors with watertight doors) at points through which water likely flows into facilities important to safety.

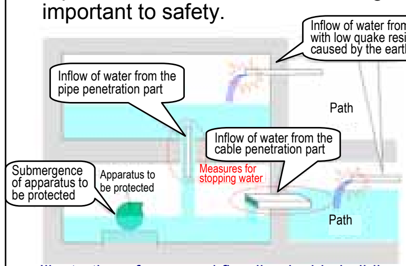
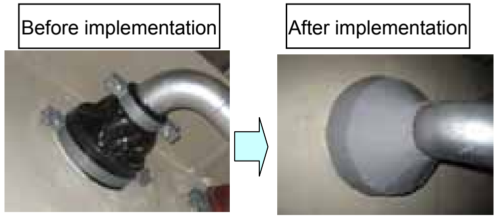


Illustration of assumed flooding inside buildings



Water-stop work performed on penetrations at a pipe

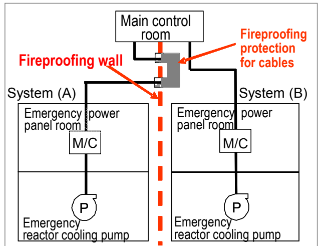
4. Countermeasures against fires

- **Based on the following 3 principles, we carry out our countermeasure against fires for the purpose of safe shutdown of reactors in case of a fire.**

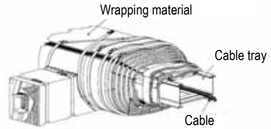
➢ **We prevent fire**
  - We adopt flame-resistant materials (flame-resistant cables have been adopted since construction).
  - We carry the minimum amount of lubricant oil and combustibles into the site, and keep them under strict control.

➢ **We detect and extinguish quickly**
  - We install fire detectors that sense heat as well as smoke, and detect a fire quickly and exactly.
  - We extinguish fire with remote-controllable fire extinguishers equipped permanently and a self-organized fire brigade who is standby on site for 24 hours.

➢ **We prevent spread of fire with fire barrier**
  - We will prevent spread of fire with fire barrier and make sure that at least 1 set of facilities necessary for the reactor shutdown and cooling can survive.



In case of a fire in the system A [B], the system B [A] will be protected by the fireproofing wall.

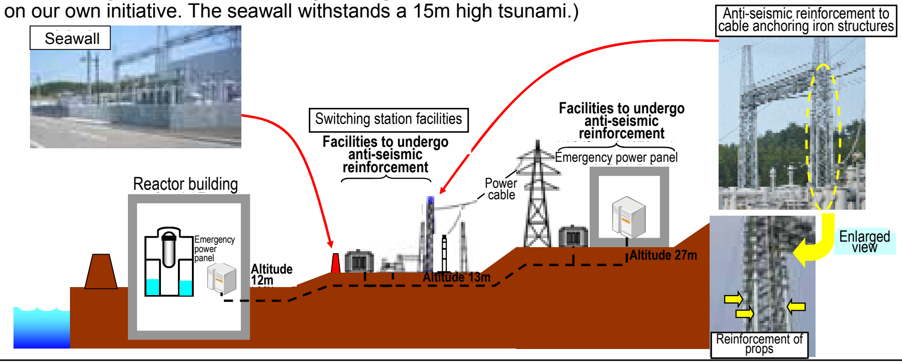


An example of cable protection: Wrapping with fireproofing materials

5. Reinforcement of electricity systems (external-power receiving systems)

- **We reinforce the emergency external-power receiving systems so that we can receive external power in case of an earthquake or a tsunami.**

➢ Securing external power receiving devices (5 circuits in 3 routes) so that at least 1 power receiving system can survive in any circumstance.
➢ Installing new emergency power panels and multiplexing power supply circuits within the station for power received from outside.
➢ Ensuring the earthquake resistance of the switching station equipment and the transformers, which are necessary for receiving external power supplies.
➢ Placing the switching station at a location high enough safe from tsunami. (We, as the operator, installed a seawall on our own initiative. The seawall withstands a 15m high tsunami.)

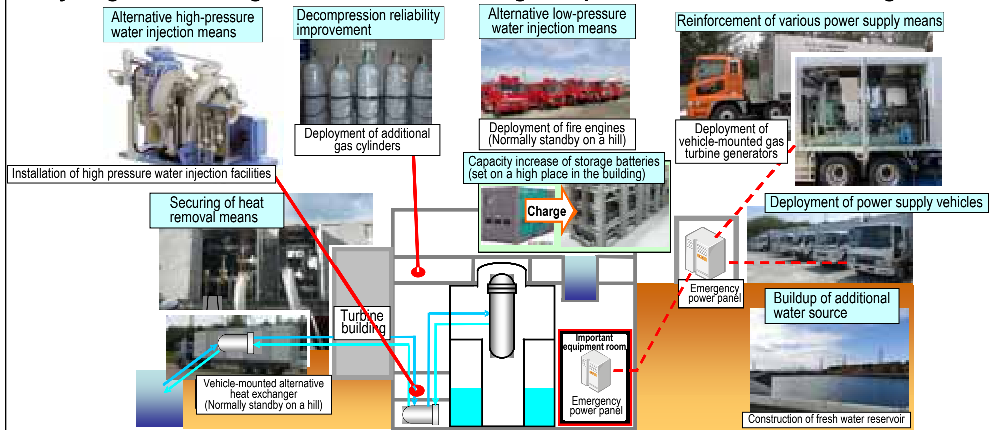


6. Measures to prevent serious accidents and assessment of effectiveness

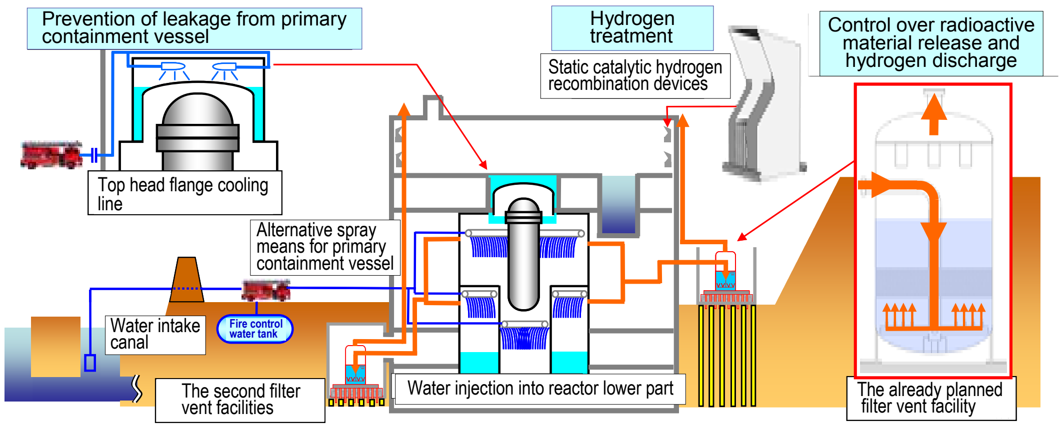
- **We secured means to enable reactor water injection and cooling in case of loss of all power supplies.**
- **To prevent long-lasting land contamination with radioactive cesium, which is one of the main issues brought by the Fukushima Daiichi NPS accident, we will install a filter vent designed to reduce the release of granular radioactive materials (radioactive cesium, etc.) as much as possible in case the reactor core is damaged. The filter vent is capable of removing at least 99.9% of the granular radioactive materials.**
- **We conducted radiation exposure evaluation and emission estimation on the filter vent based on the examination guide* from the Nuclear Regulation Authority, and the filter vent was confirmed to satisfy the evaluation items.** (*** Examination guide regarding the effectiveness assessment of preventive measures against reactor core damage and PCV failure).**

  ➢ We assessed radiation exposure from release of rare gas and iodine due to filter venting to be performed to prevent reactor core damage (prior to reactor core damage). The radiation dose at the station boundary was assessed as approximately 0.042mSV, which is lower than a reference value (approximately 5mSV) of the examination guide.
  ➢ The total emission of cesium137 due to filter venting to be performed to prevent a primary containment vessel failure in a scenario, such as overpressure after reactor core damage, that may lead to such a failure was assessed as approximately 0.0025TBq, which is lower than a reference value (approximately 100TBq) of the examination guide.

- **In addition to the already planned filter vent, the second filter vent will be installed for backfitting.**
  (We included the fundamental policy in the application document for the permission for changes in reactor installation. We will apply for the permission for the work schedule after holding a conference based on a safety pact.)
- **We are to implement measures to work in case of reactor core damage to prevent produced hydrogen from leaking from a primary containment vessel into a reactor building and prevent hydrogen from being accumulated and leading to explosion in case of such leakage.**



Example measures for reactor water injection and reactor cooling at the time of total power loss



Countermeasure against release of radioactivity material in case of core damage/primary containment vessel