Revamping Procedures and Emergency Response Measures

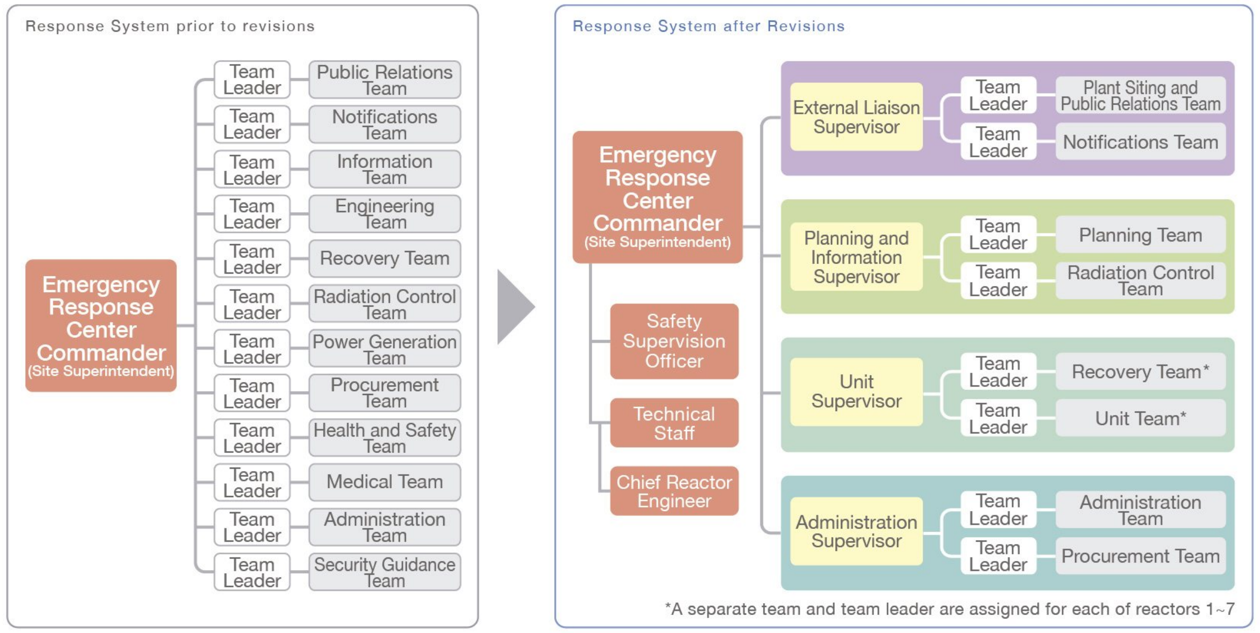
Training is repeatedly conducted to enhance the ability of power station personnel to respond to an accident

11 Revamping an Emergency Response System

When responding to the Fukushima Daiichi Nuclear Power Station Accident the Site Superintendent was inundated with all sorts of information making it impossible to make quick and accurate decisions. Learning from this experience we have revamped our emergency response system and employed the Incident Command System (ICS*) by which teams responsible for each department function are formed and each team leader reports to the Site Superintendent. This enables a quick and accurate emergency response.

**Incident Command System*

The standard system for responding to emergency situations employed in the United States. A commander is at the top of the command chain and the number of people under the commander's direct supervision is limited to seven or less.



12 Emergency Response Training

Training on undisclosed scenarios is conducted so that trainees can not only become accustomed to enhanced and newly installed equipment, but also flexibly respond to the conditions of a severe accident. And, an Emergency Response Center used to respond to an accident has been established in the Unit 5 reactor building.


General Training

Site personnel have been licensed on the operation of large vehicles and construction machinery so that debris can be quickly removed, roads repaired and coolant injected directly into the reactors. Training is conducted repeatedly to ensure that personnel can adeptly operate wheel loaders and fire pump trucks.


Debris Removal Training


Fire Pump Truck Operation Training

※The information in this pamphlet is correct as of December 2017.

TEPCO

Primary Measures for Kashiwazaki-Kariwa NPS Units 6/7 to comply with the New Regulatory Requirements

Tokyo Electric Power Company Holdings

Primary Measures for Kashiwazaki-Kariwa NPS Units 6/7 to comply with the New Regulatory Requirements

At the Kashiwazaki-Kariwa Nuclear Power Station we have formulated various safety measures based on the lessons learned from the Fukushima Daiichi Nuclear Power Station Accident. The following is an introduction of the primary measures that have been implemented in order to comply with the New Regulatory Requirements.

Countermeasures for Natural Disasters

We have formulated several countermeasures for natural disasters, such as earthquakes and tsunamis.

1 Earthquake Countermeasures

We have added additional supports and reinforcements to pipes and electrical conduits inside buildings.

Pipe supports

2 Tsunami Countermeasures

We have installed watertight doors on rooms that house important equipment in order to protect them from flooding. Furthermore, we have waterproofed locations where pipes and cable trays pass through walls by filling the gaps in with silicone rubber.

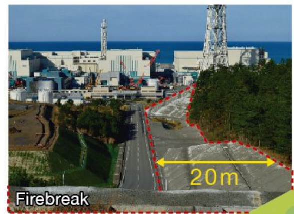

Watertight doors


Pipe anti-flooding measures

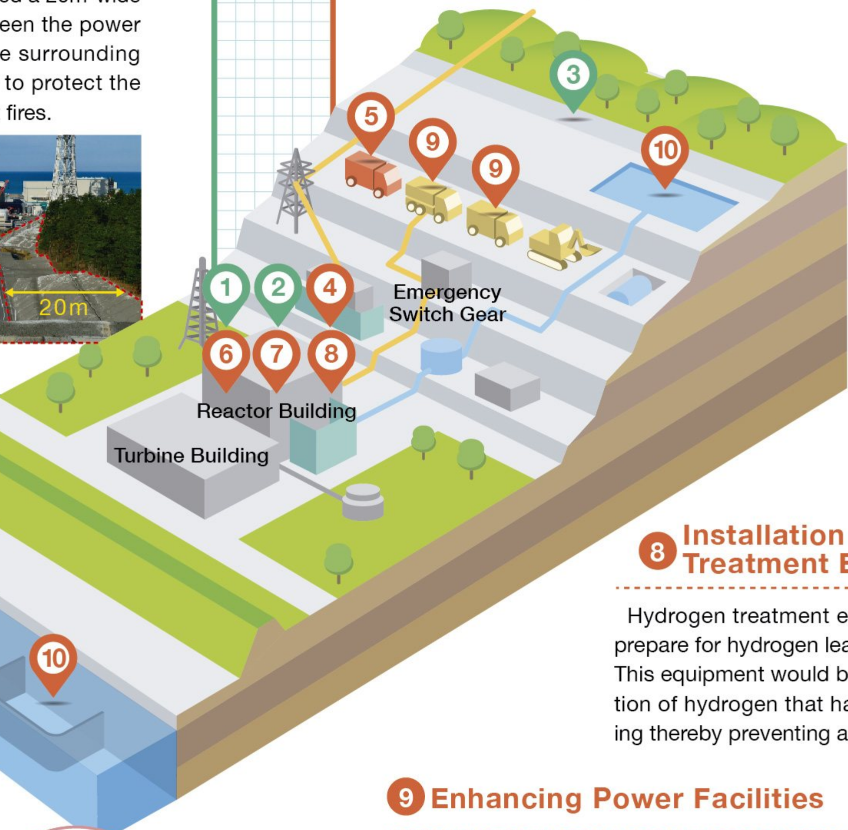

Cable anti-flooding measures

3 Forest Fire Countermeasures

We have created a 20m-wide firebreak between the power station and the surrounding forest in order to protect the site from forest fires.



Firebreak



Severe Accident Countermeasures and Effectiveness Assessments

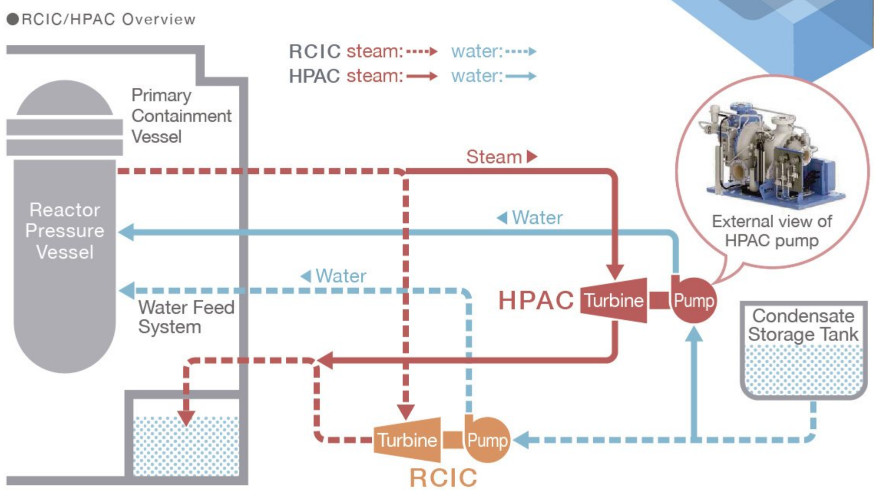
We have formulated multilayered countermeasures to prevent an accident from escalating into a severe accident in the rare case that one was to occur.

4 Enhancement of High Pressure Coolant Injection System

In the event of a loss of power the Reactor Core Isolation and Cooling System (RCIC) would activate. A turbine driven by steam from the pressure vessel is directly connected to a pump that would pump water from the condensate storage tank into the pressure vessel thereby cooling the fuel.

Furthermore, to prepare for RCIC activation/operation failure, a High-Pressure Alternative Cooling System Pump (HPAC), which operates under the same principles and can be started up quickly, has been installed. This has resulted in redundant systems for high-pressure coolant injection.

●RCIC/HPAC Overview



5 Enhancing the Low Pressure Coolant Injection System

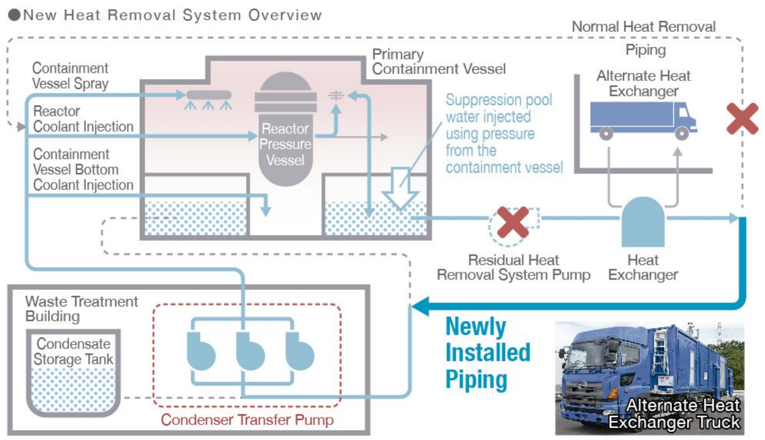
In order to prepare for a total loss of power that renders motorized low-pressure coolant injection equipment inoperable, 42 fire pump trucks have been dispersed on high ground. This should enable coolant to be injected into the pressure vessel even if there is no power.

Fire pump trucks

6 Enhancing Heat Removal Methods

We have developed and installed a new heat removal system (alternate circulation cooling system) for cooling the pressure vessels and containment vessels in the event of an emergency. This system would remove heat from the containment vessel and prevent rises in pressure and temperature inside the containment vessel even if the existing heat removal system was inoperable. This should eliminate the need to vent the containment vessel except in the direst of circumstances.

●New Heat Removal System Overview



7 Enhancing Functions to Mitigate Environmental Impacts

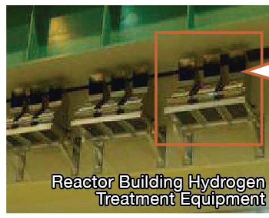
In the event that the new heat removal system (alternate circulation cooling system) is inoperable, the containment vessel would be vented in order to lower the pressure inside the containment vessel and avoid a severe accident resulting from rupture of the containment vessel. In this instance, over 99.9% of radioactive particles and over 98% of radioactive iodine gases (excluding noble gases) would be removed from the discharged gases by passing them through filtered venting equipment.


Filtered Venting Equipment


Iodine Filter

8 Installation of Hydrogen Treatment Equipment

Hydrogen treatment equipment has been installed to prepare for hydrogen leaks from the containment vessel. This equipment would be used to reduce the concentration of hydrogen that has leaked into the reactor building thereby preventing a hydrogen explosion.


Reactor Building Hydrogen Treatment Equipment

9 Enhancing Power Facilities

In preparation for the case where electricity from off-site supplied via transmission lines and electricity from emergency diesel generators is lost, three gas turbine generator trucks and 24 high-voltage power trucks have been dispersed throughout the site on high ground in order to supply the power required to inject coolant and cool the pressure vessels and containment vessels. Storage batteries and rechargeable batteries have also been additionally placed in locations unlikely to be affected by a tsunami. This should enable the required power to be supplied to equipment control devices and instruments in the Main Control Rooms even in the event of a station blackout.

High-Voltage Power Trucks


Gas Turbine Generator Trucks

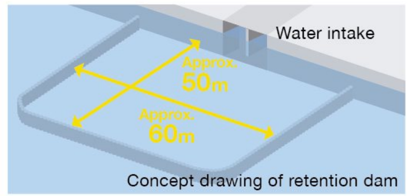

Storage Batteries

10 Securing Water Sources

A reservoir has been built on high ground to ensure that there is enough freshwater to be used for cooling during an emergency (approx. 20,000 tons).


Reservoir

And, a retention dam has been built around the water intake to ensure that there is enough seawater left to be used for cooling purposes if necessary even if the ocean recedes in conjunction with a tsunami.



Concept drawing of retention dam