Countermeasures against Tsunami at Kashiwazaki Kariwa Nuclear Power Station

May 12, 2011

Tokyo Electric Power Company

Kashiwazaki Kariwa Nuclear Power Station

TEPCO 東京電力

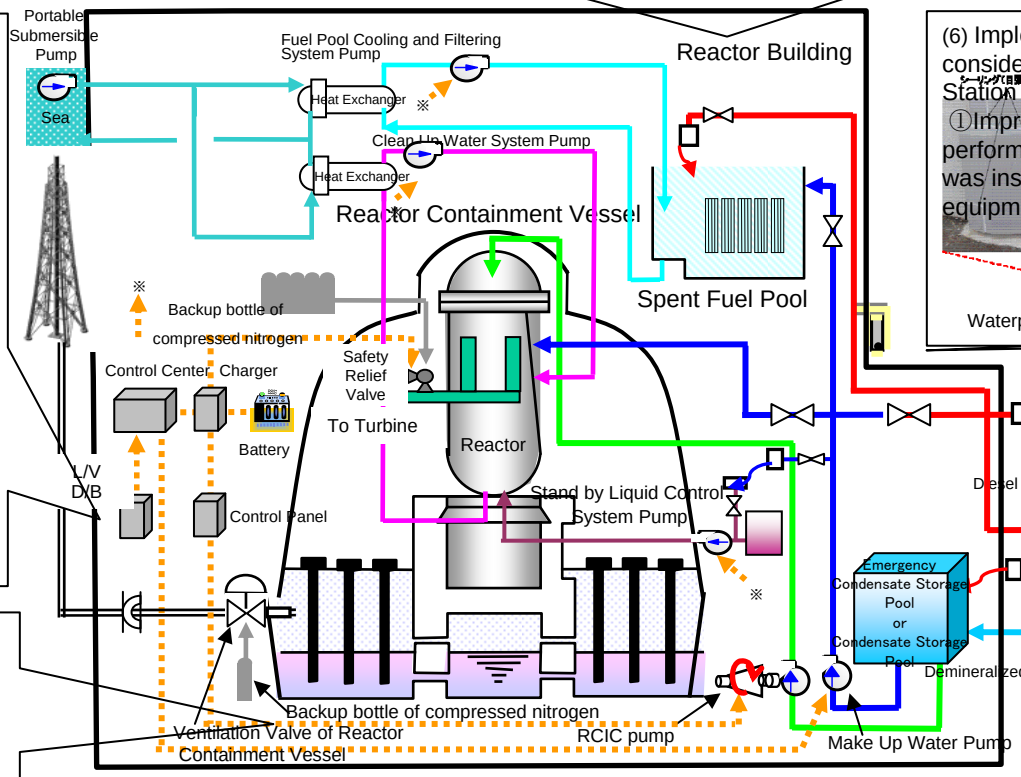
Outline of Emergency Safety Measures at Kashiwazaki-Kariwa Nuclear Power Station

We have completed following emergency safety measures to prevent damages of reactor core and spent fuel, even if three functions such as function of all facilities that supplies AC power, function of all facilities that cools reactor facility and function of all facilities that cools spent fuel pool by seawater are lost by tsunami by April 20th, 2011.

(1) Emergency Inspection
①Confirmation of critical equipment for safety by periodic inspections
②Implementation of emergency inspection of equipments and facilities
(2) Implementation of review and training on emergency response plan
①Establishment response plan in an emergency
②Implementation of training on emergency response plan

(4) Securing of definitive heat removal function in emergencies
①Enhancement of water injection and cooling function (deployment of fire truck)
②Securing of source of fresh water
④Securing of cooling function by portable submersible pump
(5) Securing of cooling of spent fuel pool in emergencies
①Establishment of procedure to continue inject water and cooling function
②Deployment of necessary equipments

(3) Securing of power source in emergencies
①Establishment of procedure of power supply by power-supply car in case of outage AC power sources
②Deployment of necessary power-supply car and equipments



(6) Implementation of immediate countermeasures taken in consideration of the configuration of the Nuclear Power Station
①Improvement of water proof performance at the building that was installed safety significance equipment

Waterproofing Outside Door

Waterproofing Building Hole

(4) Securing of definitive heat removal function in emergencies
③Securing of supply of nitrogen for depressurization in reactor containment vessel

Legend
- Fire Protection System Line
- Fuel Pool Cooling and Filtering System Line
- Make-Up Water System Line
- Clean Up Water System Line
- Reactor Core Isolation Cooling System Line
- Power Supply Line

(6) Implementation of immediate countermeasures taken in consideration of the configuration of the Nuclear Power Station
②Deployment of heavy equipment to ensure access by the road in the Nuclear Power Station (rubble removal, plow)

Implementation Status of Emergency Countermeasures for Safety at Kashiwazaki Kariwa Nuclear Power Station (1/2)

As of May 11th, 2011

Emergency countermeasures for safety	Contents	Implementation status
(1) Emergency inspection	①Confirmation of critical equipment for safety by periodic inspections	Finished on April 1st
	②Implementation of review on emergency response and inspection of facilities	Finished on April 19th
(2) Implementation of review and training on emergency response plan	①Establishment of response plan (manual) in an emergency	Finished on April 20th
	②Implementation of training on emergency response plan	Finished 1st time : comprehensive training at Unit 1 on April 11th 2nd time : comprehensive training at several Units on April 20th 3rd time : comprehensive training at all the Units on April 28th
(3) Securement of power source in emergencies	①Establishment of procedure to supply power by power-supply cars in case of outage AC power source	Finished on April 20th
	②Deployment of necessary power-supply car and equipment ・Power-supply car ・Generator with engine	Deployed 4 cars on March 29th Deployed 5 generators on March 31st

Implementation Status of Emergency Countermeasures for Safety at Kashiwazaki Kariwa Nuclear Power Station (2/2)

As of May 11th, 2011

Emergency countermeasures for safety	Contents	Implementation status
(4) Securement of definitive heat removal function in emergencies	①Enhancement of water injection and cooling function in reactor（Deployment of fire engines etc.）	Deployed 5 units on April 7th （Secured 8 units including spars）
	②Establishment of procedure to secure fresh water source	Finished on April 20th
	③Securement of function to supply nitrogen to the air operated valve for depressurization in reactor containment vessel ・Spare cylinder	Deployed 35 units on April 13th
	④Securement of cooling function by portable submersible pump	Deployed 4 units on April 1st
(5) Securement of the function to cool the spent fuel pool in emergencies	①Establishment of procedure to continue water injection and cooling function	Finished on April 20th
	②Deployment of necessary equipment (Deployment of fire engines etc.)	Deployed 5 units on April 7th （Secured 8 Units including spars）
(6) Implementation of immediate countermeasures considering the Nuclear Power Station configuration	①Improvement of water proof performance at the building that contains safety significance equipment ・Waterproofing outside door ・Waterproofing building hole	Reactor buildings and heat exchanger buildings at Unit 1 – Unit 7 Implemented at 83 sites on March 30th Implemented at 69 sites on April 4th
	②Deployment of heavy equipment to ensure access by the road in the Nuclear Power Station (debris removal, snow blower)	Deployed 2 units on April 7th

Outline of Countermeasures against Tsunami at Kashiwazaki Kariwa Nuclear Power Station

Ⅰ. Installation of seawalls

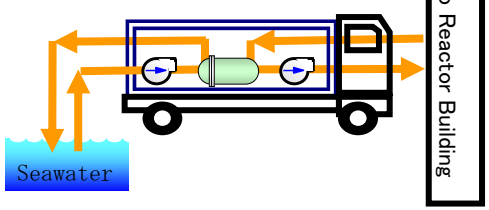
To install seawalls to prevent Tsunami from invading the site and to protect light oil tanks, buildings, and other facilities in the power station.

(Image of seawalls)

Ⅲ. Enhanced heat removal and cooling function

(4) Installation of alternative submerged pump and heat exchanger

– To install alternative submerged pump and other equipment to continue to operate residual heat removal system even if cooling function using seawater is lost.



Ⅲ. Enhanced heat removal and cooling function

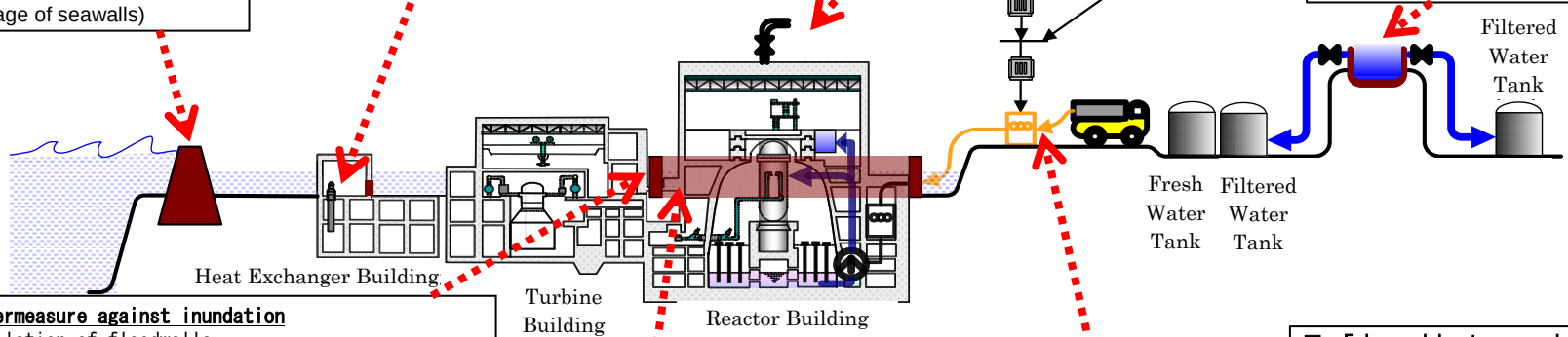
(5) Installation of top venting on reactor buildings

– To install top venting system to prevent hydrogen from piling up in a reactor building.

Ⅲ. Enhanced heat removal and cooling function

(1) Installation of water source

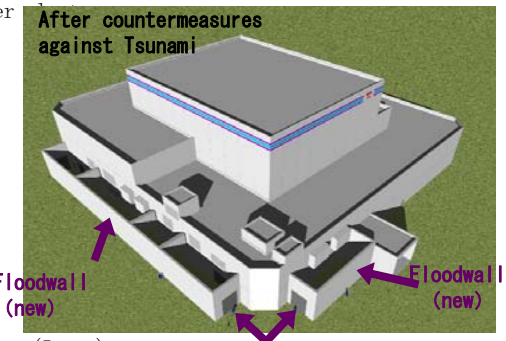
– To install a fresh water reservoir in the power station to secure stable supply of coolant water for reactors and spent fuel pools.



Ⅱ. Countermeasure against inundation

(1) Installation of floodwalls

To install floodwalls around reactor buildings containing critical equipment in order to prevent Tsunami from damaging power facilities and diesel generators for emergency and to secure safety of the power [illegible]



(Image)

Ⅱ. Countermeasure of inundation into buildings

(2) Installation of water proofing gates

– To install water proofing gate at reactor buildings and turbine buildings to protect equipment from water.

Ⅲ. Enhanced heat removal and cooling function

(7) Installation of a warehouse for emergency on a hill

– To install of a warehouse containing facilities for emergency in case of Tsunami.

Ⅲ. Enhanced heat removal and cooling function

(2) Additional installation of gas turbine generation vehicle

– To install large capacity gas turbine generation vehicles to supply electricity to residual heat removal system in case of outage of all AC power.

(3) Installation of medium voltage switchgear for emergency and permanent cables for reactor buildings

– To install medium voltage switchgear for emergency and permanent cables for reactor buildings to secure power supply in case of outage of all AC power, and to supply power to residual heat removal system.

Ⅲ. Enhanced heat removal and cooling function

(6) Additional environment monitoring cars

– To prepare additional monitoring cars to continuously measure radiation dose at the site, for taking all possible measures to ensure gathering of information in emergency situations.

Progress Status of Countermeasures against Tsunami at Kashiwazaki Kariwa Nuclear Power Station

As of May 11, 2011

Items	Status	Schedule		
		FY 2011	FY 2012	FY 2013
Ⅰ. Installation of Seawalls	Design study	Design → Due to be commenced in the latter half of FY2011 → Due to be completed in the first quarter of FY 2013		
Ⅱ. Countermeasure against inundation				
(1) Installation of seawalls (incl. countermeasures against inundation, such as air supply openings)	Commencement of construction of Unit 1	Commencement of construction in April → Due to be completed in the latter half of FY 2012		
(2) Installation of water proofing gates	Detail design study	Design → Due to be commenced in June → Due to be completed in the latter half of FY 2012		
Ⅲ. Enhanced heat removal and cooling function				
(1) Installation of water source	Design study	Design → Due to be commenced in the latter half of FY2011 → Due to be completed in the first half of FY 2012		
(2) Additional installation of gas turbine generation vehicle	One vehicle in place Another planned to be arranged	Due to be arranged in the late May → Due to be arranged in the latter half of FY 2011		
(3) Installation of medium voltage switchgear for emergency and permanent cables for reactor buildings	Detail design study	Design/production → Due to be commenced in August → Due to be completed in the first half of FY 2012		
(4) Installation of alternative submerged pump and heat exchanger	Detail design study	Design → Due to be commenced in July → Due to be completed in the first half of FY 2012		
(5) Installation of top venting on reactor buildings	Detail design study	Design → Due to be commenced in July → Due to be completed in the first half of FY 2012		
(6) Additional environment monitoring cars ・Addition of monitoring cars	Detail consideration	Design/ arrangement → Due to be completed in the first half of FY 2011		
(7) Installation of a warehouse for emergency on a hill	Consideration of design conditions	Design → Due to be commenced in December → Due to be completed in the first half of FY 2012		

Reliability Improvement on Countermeasures for Tsunami in Kashiwasaki-Kariwa Nuclear Power Station

Countermeasures against water exposure to important facilities in the case of securing of losing all power (Reactor Core Isolation Cooling System, Storage Battery, Emergency Power Panel and Main Control Room) and countermeasures for Tsunami at Unit 1 to gain more reliability are to be taken by the end of May.

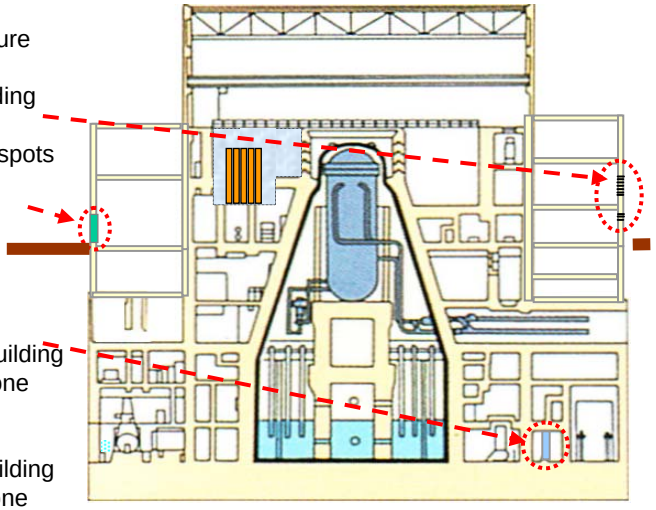
Spots countermeasures installed against water exposure

（１）Air inlet in reactor building
Void closure：4 spots
Waterstop intallation：7 spots

（２）Doors into reactor building
8 spots

（３）Doors inside reactor building
27 spots - Installation done

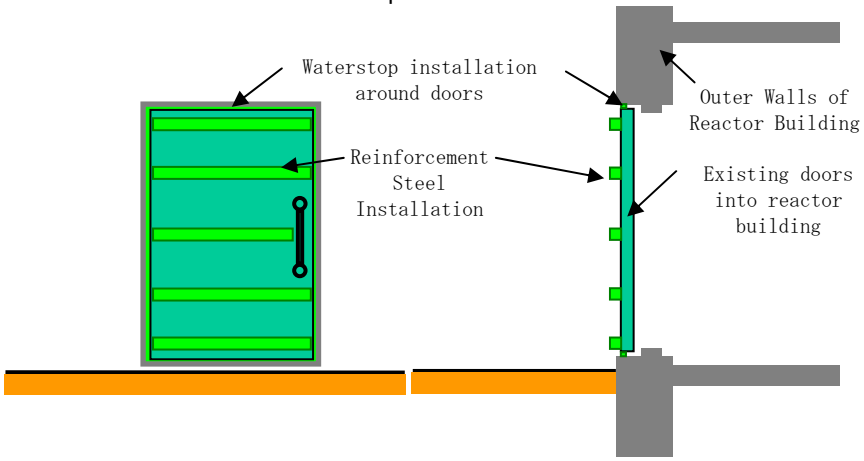
In turbine building connecting to reactor building
8 spots - Installation done



Reactor Building (Unit 1)

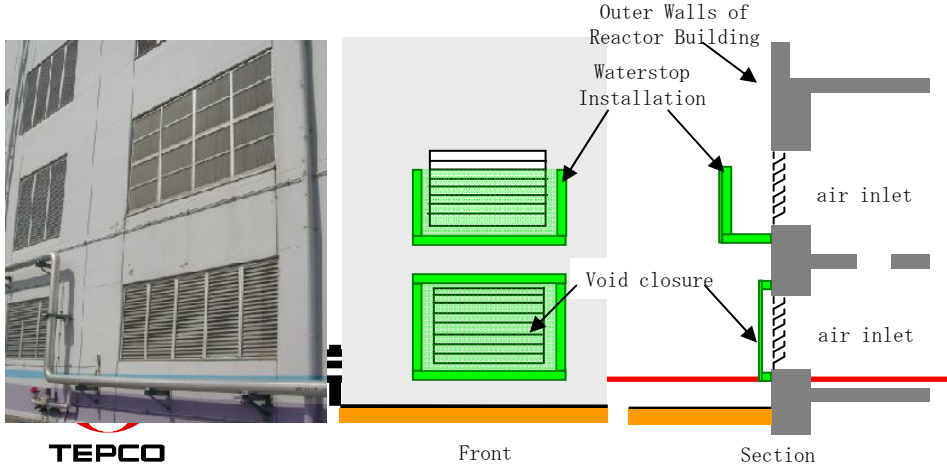
２．（１）Reliability improvement against water exposure on doors into reactor building

Countermeasure against water exposure for doors into reactor building is to install additional reinforcement steel and waterstop around doors.



１．Reliability improvement against water exposure on air inlet in the reactor building

Countermeasure against water exposure for the the air inlet at the height less than 15 meters above sea level in the Reactor Building is to close the void or to install waterstop.



２．（２）Reliability improvement against water exposure on doors inside reactor building

Countermeasure against water exposure to important facilities is to install additional reinforcement steel and waterstop to some parts of doors.

Reinforcement Steel Installation

Waterstop Installation

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