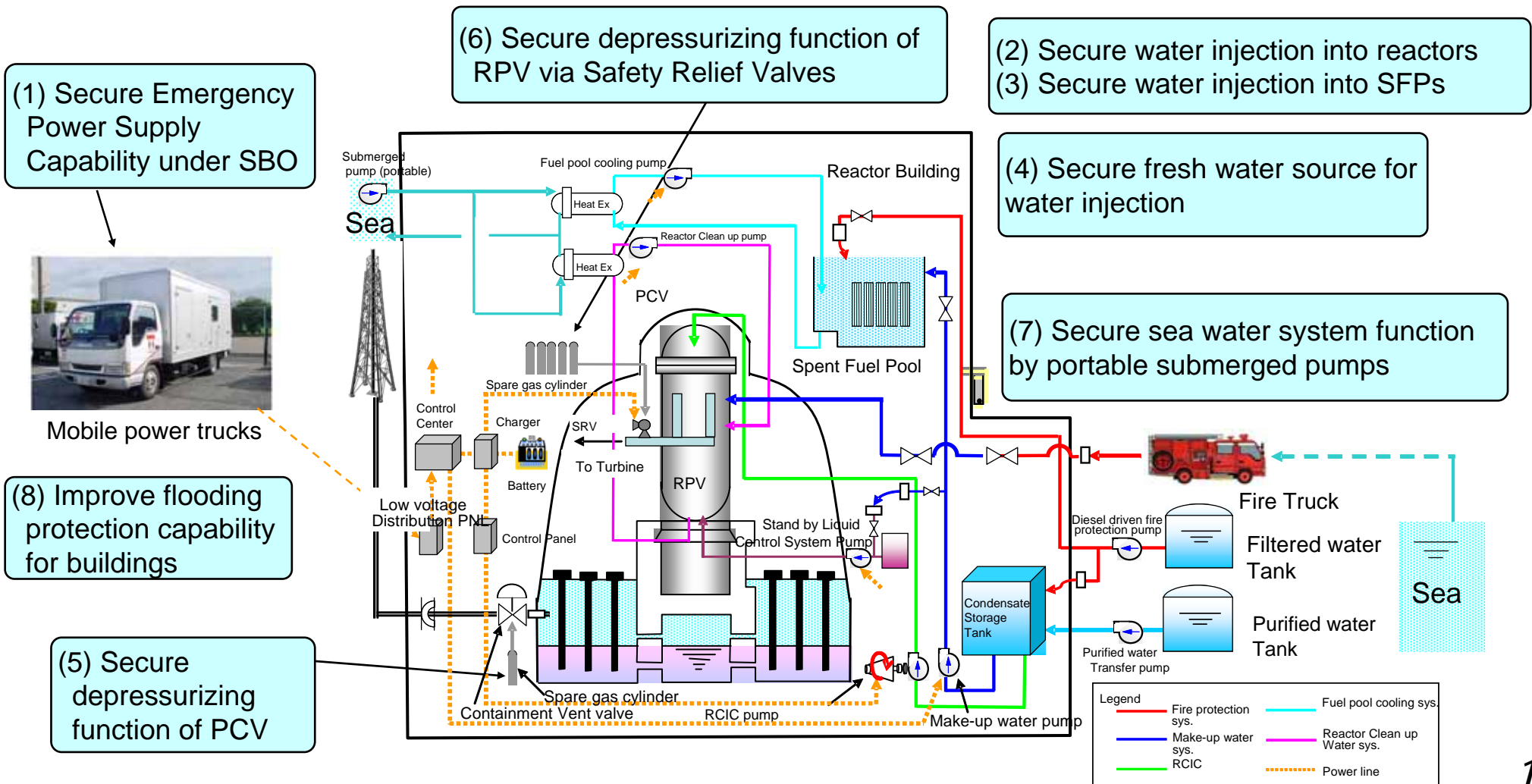

5. Lessons Learned and Countermeasures

(1) Safety Countermeasures

Overview of the Safety Countermeasures at Nuclear Power Stations

The government, NISA instructed electric power companies to implement emergency safety countermeasures based on the lessons learned from the accident. Each electric power company has implemented necessary countermeasures for their own nuclear power stations.



Safety Countermeasures at Nuclear Power Stations (Emergency Response Drills)



Emergency Response HQ



Air-cooled and on-board Gas Turbine Generator (4500kVA)

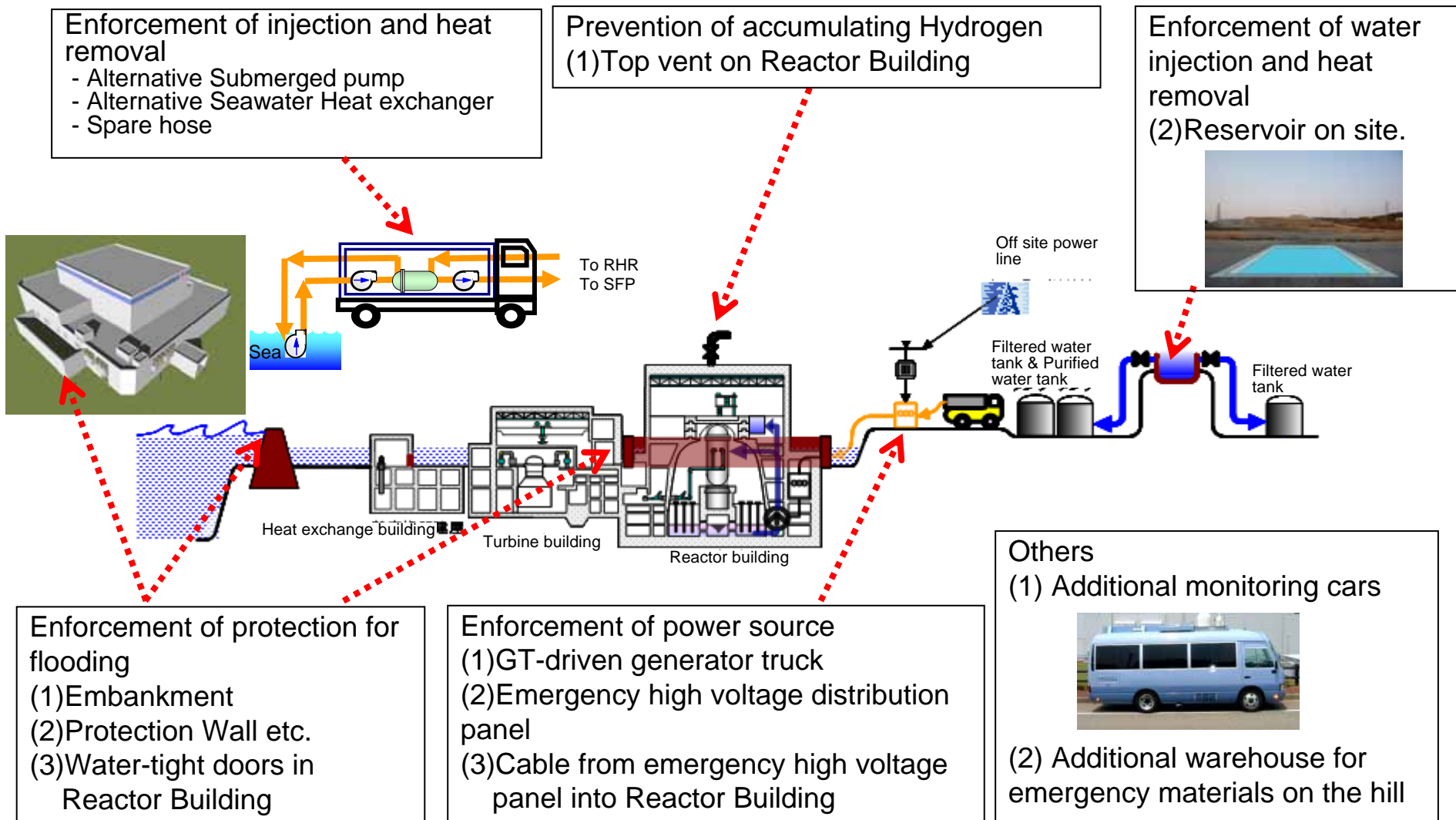


Power Cables



Rubble Clearing Vehicle

Further Tsunami Countermeasures at the Kashiwazaki-Kariwa NPS (1)



In order to improve emergency safety countermeasures, on a mid-and-long term basis, we will implement additional tsunami countermeasures such as accelerating cold shutdown procedures.

Further Tsunami Countermeasures at the Kashiwazaki-Kariwa NPS (2)

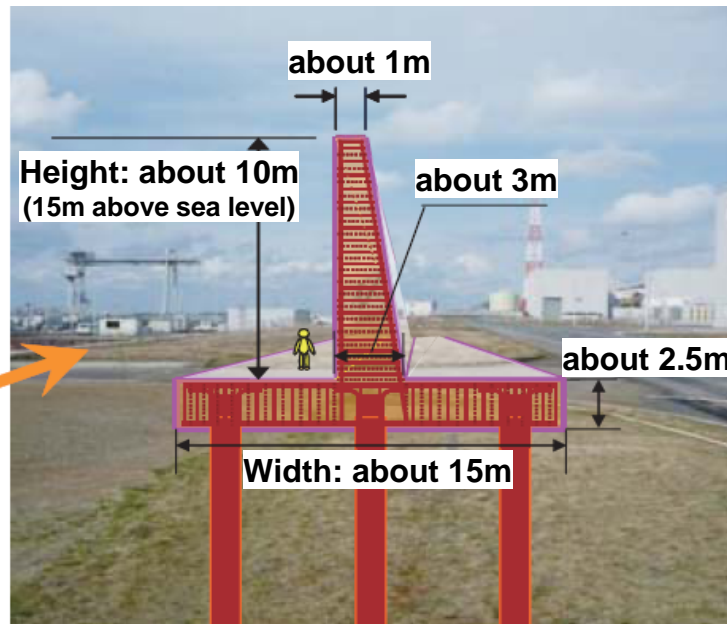
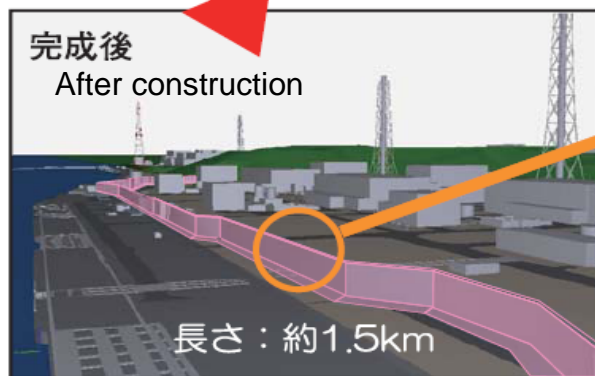
In order to improve emergency safety countermeasures, on a mid-and-long term basis, we will implement additional tsunami countermeasures such as accelerating cold shutdown procedures.



Alternative Water Injection (8 fire engines)



14 Power Supply Vehicles (500-750kVA) and
2 On-board Gas Turbine Generators (4500kVA)



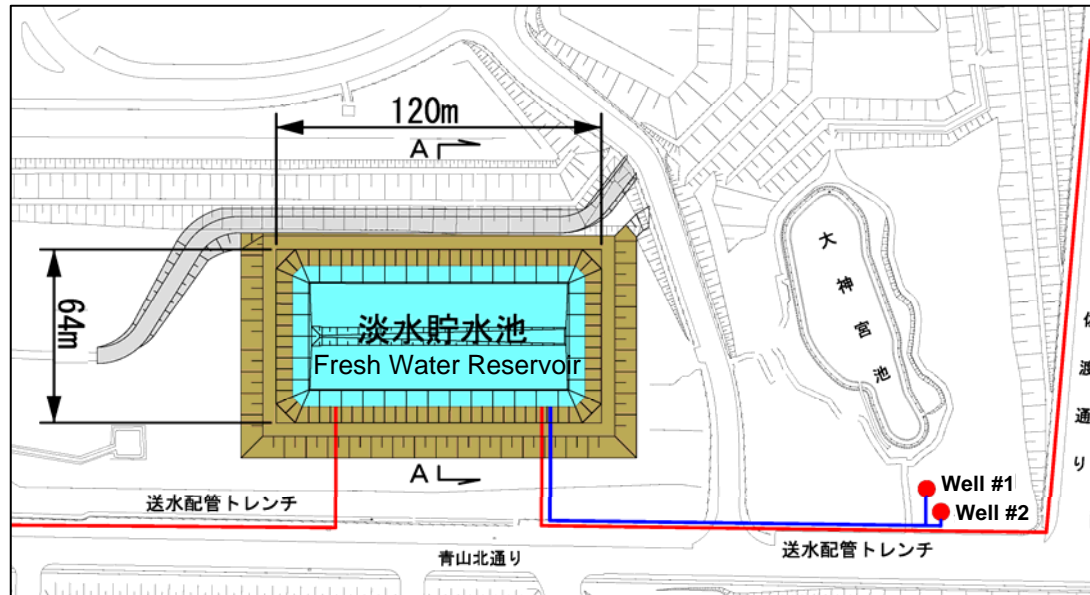
Construction of 10-meter (ASL:15-meter) Seawalls



Water-tight Doors

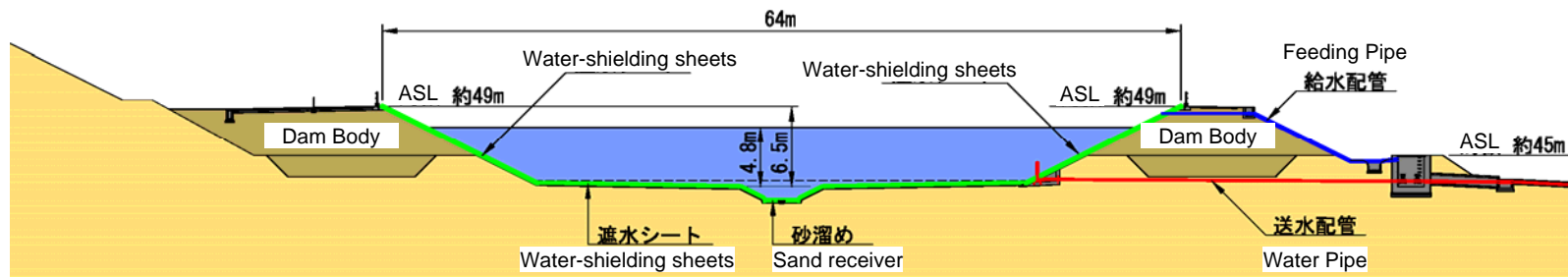
Further Tsunami Countermeasures at the Kashiwazaki-Kariwa NPS (3)

Overview of Fresh Water Reservoir

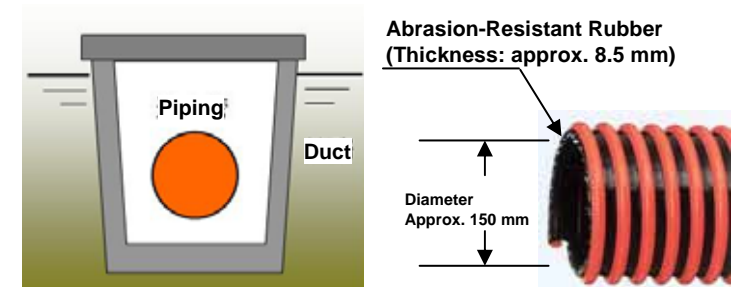


Location of Fresh Water Reservoir and Wells
— Water Pipe Line (Image)
— Feeding Pipe Line (Image)

A-A Cross-section Surface



Cross-section image of Fresh Water Reservoir



Example of pressure-proof and abrasion-resistant hose

Water Pipe (Image)

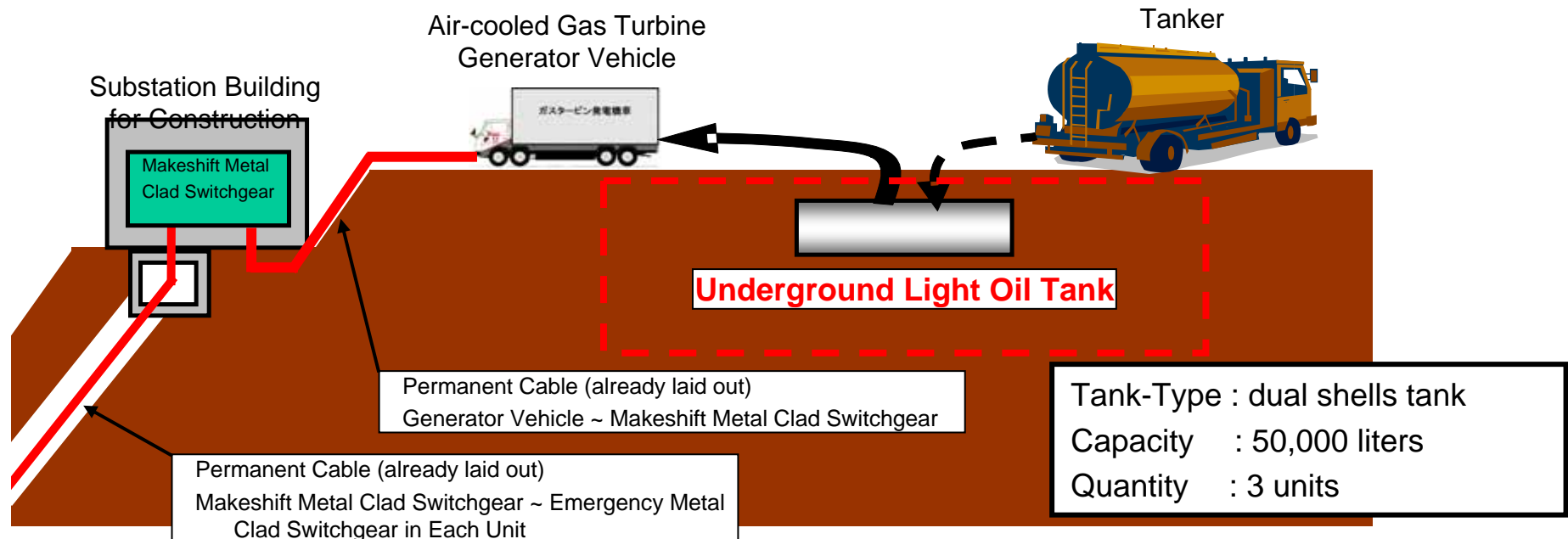
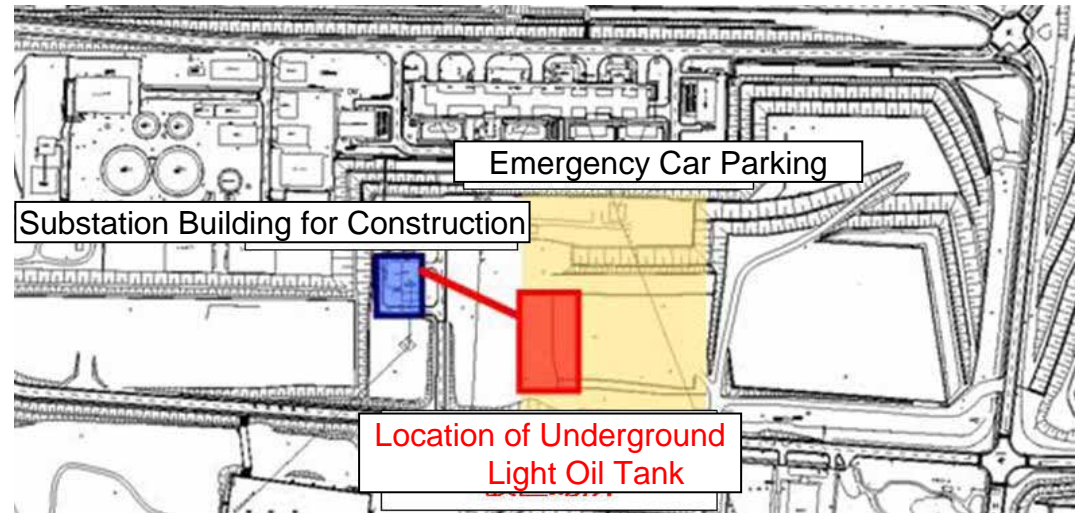
Fresh Water Reservoir
 64 m X 120 m X 6.5 m
 Max Depth: 4.8 m
 Capacity: Approx. 20,000 m³ (18,000 m³ effective)

Water Pipe
 Material: Abrasion-resistant rubber
 (thickness: approx. 8.5 mm)
 Diameter: Approx. 150 mm (ID)

Further Tsunami Countermeasures at the Kashiwazaki-Kariwa NPS (4)

Overview of Underground Light Oil Tank

- We have lined up a standing back-up power source in case of SBO; we laid power cables from makeshift metal clad (M/C) switchgear to emergency M/Cs.
- We also laid permanent power cables from an air-cooled gas turbine generator vehicle to makeshift M/C.
- We installed underground light oil tanks in order to secure fuels for air-cooled gas turbine generator vehicle.



Implementation Status of the Safety Countermeasures at Kashiwazaki Kariwa NPS

As of October 10, 2012

Items	Overall Schedule		
	FY2011	FY2012 ▼As of October 10	FY2013
I. Tide Barrier Installation	Design	Construction from November	Complete around 1st quarter of FY 2013
II. Flooding Protection to the Buildings			
(1) Tide Barrier Installation (including barrier panel)		Construction from April	Complete around 2nd half of FY 2012
(2) Retrofitting the Doors in the Reactor Buildings etc. with Water Tightness	Design	Construction from September	Complete around 2nd half of FY 2012
(3) Flooding Protection to the Heat Exchange Buildings		Design Construction from June	Complete around March 2013
(4) Installing Tide Barrier to the Switchyards		Design Construction from September 2012	Complete around February 2013
(5) Reliability Improvement of Flooding Protection		Design Construction from September	Complete around May 2013
III. Reinforcing Heat Removal and Cooling Function etc.			
(1) Installing Water Source	Design	Construction from February 2012	Complete around December 2012
(2) Additional Deployment of Air-cooled Gas Turbine Generator Vehicle etc.		Procurement from July	Completed in March 2012
(3) Installing emergency Metal Clad (M/C) Switchgears and Laying Permanent Cables in the Reactor Buildings	Design / Manufacturing	Construction from August	Completed in April 2012
(4) Installing Alternative Underwater Pumps and Alternative Heat Exchangers	Design	Construction from August	Complete around 2nd half of FY 2012
(5) Installing Top Venting Facilities to the Reactor Buildings	Design	Construction from October	Complete around December 2012
(6) Reinforcing Environmental Monitoring Equipment, and Increasing the number of Monitoring Cars		Design / Procurement	Completed in October 2011
(7) Building Storehouse for Emergency Equipment to the Upland		Design	Construction from March 2013 Complete around 1st quarter of FY 2013
(8) Improving Earthquake-resistance of Pure Water Tanks at Ominato		Design Construction from October 2012	Complete around 1st quarter of FY 2013
(9) Deployment of Concrete-pump Vehicle		Procurement Procurement	1 vehicle within 2012, 2 vehicles around 1st quarter of FY 2013
(10) Reinforcing the Access Roads		Design Construction from November 2012	Complete around March 2013
(11) Environmental Improvement of the Seismic Isolation Building		Design Construction from November 2012	Complete around May 2013

* We will implement further safety measures to improve reliability.

Implementation Status of the Safety Countermeasures at Kashiwazaki Kariwa NPS

As of October 10, 2012

Items	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
I. Tide Barrier Installation	Under Construction				Completed (Surroundings under construction)		
II. Flooding Protection to the Buildings							
(1) Tide Barrier Installation (including barrier panel)	Completed	Under Construction	Under Construction	Under Construction	No opening under 15m above sea level		
(2) Retrofitting the Doors in the Reactor Buildings etc. with Water Tightness	Completed	Designing	Designing	Designing	Completed	Completed	Completed
(3) Flooding Protection to the Heat Exchange Buildings	Under Construction	Under Construction	Under Construction	Under Construction	Completed	-	
(4) Installing Tide Barrier to the Switchyards	Under Construction						
(5) Reliability Improvement of Flooding Protection	Under Construction	Under Consideration	Under Consideration	Under Consideration	Under Construction	-	
III. Reinforcing Heat Removal and Cooling Function etc.							
(1) Installing Water Source	Under Construction						
(2) Additional Deployment of Air-cooled Gas Turbine Generator Vehicle etc.	Deployed						
(3)-1 Installing emergency Metal Clad (M/C) Switchgears	Completed						
(3)-2 Laying Permanent Cables in the Reactor Buildings	Completed	Completed	Completed	Completed	Completed	Completed	Completed
(4) Installing Alternative Underwater Pumps and Alternative Heat Exchangers	Deployed	In Upcoming Outage	In Upcoming Outage	In Upcoming Outage	Deployed	Deployed	Deployed
(5) Installing Top Venting Facilities to the Reactor Buildings	Completed	Under Construction	Under Construction	Under Construction	Completed	Completed	Completed
(6) Reinforcing Environmental Monitoring Equipment, and Increasing the number of Monitoring Cars	Deployed						
(7) Building Storehouse for Emergency Equipment to the Upland	Designing						
(8) Improving Earthquake-resistance of Pure Water Tanks at Ominato	-				Under Construction		
(9) Deployment of Concrete-pump Vehicle	Under Procurement						
(10) Reinforcing the Access Roads	Designing	Under Consideration	Under Consideration	Under Consideration	Under Consideration	Under Consideration	Designing
(11) Environmental Improvement of the Seismic Isolation Building	Designing						

Designing / Under Preparation
 Under Construction
 Completed

* We will implement further safety measures to improve reliability.

(2) Decontamination Efforts

Monitoring Efforts towards Decontamination (Cabinet Office, MEXT and TEPCO)

The Government have implemented Model Decontamination Project and Expert Dispatch Program that support the development of decontamination plans by municipalities. TEPCO has assigned employees to the Expert Dispatch Program.



Soil Sampling



Ambient dose rate measurement



Basic data collection monitoring



Wide-Area Monitoring



Ambient dose rate measurement via monitoring car

TEPCO's Efforts towards Decontamination

- From November 2011 to April 2012, TEPCO supported Ministry of Environment (MOE) to develop decontamination plans and conduct detailed monitoring for actual implementation. (approximately 590 man-days of TEPCO employees Implemented the monitoring)
- TEPCO participated in Cabinet Office's Model Decontamination Project via radiation management and work supervision (39 personnel at maximum).
- TEPCO 36 personnel participated in decontamination of municipal offices by Self Defense Force (SDF), supporting for monitoring, decontamination technology, drainage water treatment and waste management.
- TEPCO supported decontamination activities by municipalities in Fukushima. (approximately 650 man-days of TEPCO employees joined in the activities as of the end of May, 2012)



Assisting Self Defense Force for Decontamination



Decontamination in Ohkuma
(Photo: as of Nov.4, 2011)

(3) Efforts towards Stable Power Supply

Efforts towards Stable Power Supply (Speedy Restoration of Damaged Thermal Power Plants)

Restoration of damaged Thermal Power Stations		
Power Station	Capacity (MW)	Restoration
Kashima #1-#6	4400	Summer 2011
Hitachinaka #1	1000	Summer 2011
Hirono #1-#5	3800	Summer 2011
Ohi #1-#3	1050	March 2011
Chiba #2-1	360	March 2011
Goi #4	265	March 2011
Yokohama #8-4	350	March 2011
Higashiougishima #1	1000	March 2011
Kashima Kyodo	1050	Summer 2011
Souma Kyodo	2000	Winter 2011
Joban Nakoso #7-#9	1050	Summer 2011



Hirono Thermal Power Station



Hitachinaka Thermal Power Station

Efforts towards Stable Power Supply (Installation of Emergency Generation Capacity)

Emergency Installation Capacity		
Location	Capacity (MW)	Commissioning
Anegasaki	6	Summer 2011
Sodegaura	110	Summer 2011
Chiba	330 x 2	Summer 2011
Chiba	330 x 1	Summer 2012
Chiba C.C.	500	Summer 2014
Ohi	210	Summer 2011
Kawasaki	130	Summer 2011
Yokosuka	330	Summer 2011
Hitachinaka	250	Summer 2011 Decommissioned Mar. 2012
Kashima	800	Summer 2012
Kashima C.C.	450	Summer 2014



(4) Sharing Knowledge

Sharing Knowledge



Mr. Eric BESSON
Minister in charge of Industry, Energy and Digital Economy, France



Mr. Yasuhiro SONODA
Parliamentary Secretary of Cabinet Office, Japan

Mr. Goshi HOSONO
Minister for the Restoration from and Prevention of Nuclear Accident, Japan



Mr. John V. ROOS
U.S. Ambassador to Japan



Mr. Yukiya AMANO
Director General of the International Atomic Energy Agency



Mr. Gregory JACZKO
Chairman, Nuclear Regulatory Commission, US



Mr. Laurent STRICKER
Chairman, World Association of Nuclear Operators