Hintergrundinformationen zu ausgewählten Themen zum nuklearen Störfall in Japan

Nr. 053
(27.05.2011, 14:00 Uhr)

Daten von TEPCO und JAIF zum Status der Kernkraftwerke am Standort Fukushima I

(CSO-4 KIT)

Der Betreiber TEPCO (Tokyo Electric Power Company) hat auf seiner Internet-Seite http://www.tepco.co.jp/en/nu/fukushima-np/index-e.html#anchor02 Informationen in Form von Powerpoint Präsentationen und Texten/Tabellen in englischer Sprache zusammengestellt, die den Zustand der Kernkraftwerke am Standort Fukushima I darstellen sowie die aktuellen und geplanten Maßnahmen erläutern, die zur Sicherung der Reaktoren getroffen werden.

Der Fortschritt der aktuellen Arbeiten in Fukushima wird den Planungen gegenüber gestellt. Die im Folgenden zusammengestellten Text- und Bilddokumente veranschaulichen eindrücklich die Leistungen der Arbeiter vor Ort. Die Dokumente auf der TEPCO-Internet-Seite erfahren regelmäßig ein Update. Die aktuellen Dokumente sind vom 16., 17. und 27. Mai 2011.

Die Hintergrundinformation gliedert sich wie folgt:

- Progress Status ‚Roadmap towards restoration from the accident at Fukushima Daiichi NPP' (Seite 1)
- Current status of roadmap (issues / targets / major countermeasures) (Seiten 2-9)
- Progress status of countermeasures (Seiten 10-13)
- Progress status of cooling (Seiten 14-21)
- Implementation status of mitigation (Seiten 22-27)
- Progress status of decontamination and monitoring (Seiten 28-29)
- Progress status of countermeasures against aftershocks (Seiten 30-31)
- Progress status of environment improvement (Seiten 32)
- Overview of the earthquake & tsunami and nuclear accident (Powerpoint - Seiten 33-45)
- Current Status of Fukushima Daiichi and Fukushima Daini nuclear power plant (ppt - Seiten 46-62)
- Roadmap towards restoration from the accident (Powerpoint - Seiten 63-76)
- Excerpt: Roadmap towards restoration from the accident (Powerpoint –Seiten 77-99)
- Information on status of nuclear power plants in Fukushima (Seiten 100-105)

Das Dokument hat eine Größe von 25MB.

May 17, 2011
Tokyo Electric Power Company

Progress Status of "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station"

Progress made during last one month following the disclosure of "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station" on April 17 is summarized below:

1. Basic policy (no change)

By bringing the reactors and spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials, we will make every effort to enable evacuees to return to their homes and for all citizens to be able to secure a sound life.

2. Targets (no change)

- Based on the basic policy, two steps set as targets in the previous roadmap remain the same:
  - Step 1: Radiation dose is in steady decline.
  - Step 2: Release of radioactive materials is under control and radiation dose is being significantly held down.
  - (Note) Issues after Step 2 will be categorized as "Mid-term Issues"
- Target achievement dates tentatively set in the previous roadmap remains the same, although there will still be various uncertainties and risks:
  - Step 1: targeting mid July
  - Step 2: around 3 to 6 months (after achieving Step 1)

3. Summary of progress made in the last one month and planned actions (main changes)

Please refer to the attached "Current status of Roadmap (issues/targets/major countermeasures)

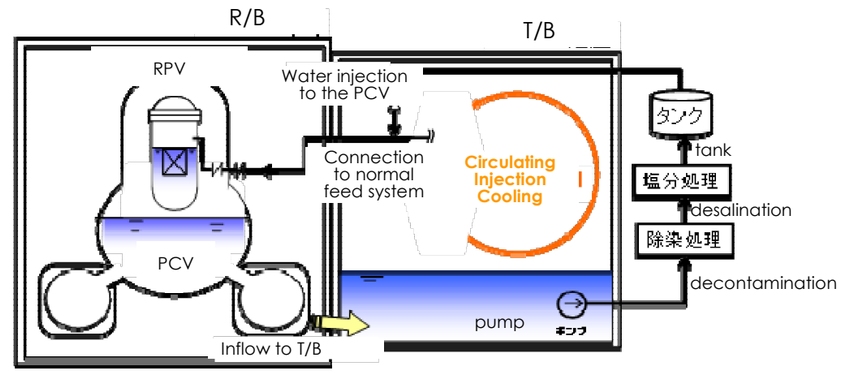
1. Added areas and issues

- The previous roadmap set 3 areas ("Cooling", "Mitigation", "Monitoring /Decontamination") and 5 issues ("Reactors", "Spent fuel pools", "Accumulated water", "Atmosphere, Soil", "Measurement, Reduction, Announcement")
- Reflecting progress made in the last one month, 2 areas ("Countermeasures against aftershock", "Environment improvement") and 3 issues ("Groundwater", "Tsunami, reinforcement, etc", "Life/work environment" were newly added, resulting in 5 areas and 8 issues.
- Number of countermeasures against issues increased to 76 from 63 accordingly.

2. "Issue 1. Reactors": revision of prioritized countermeasures due to the coolant leakage

- Entered into R/B in Unit1 after improving work environment. Confirmed status of R/B and calibrated instrumentations (reactor water level, etc.)
- As a result, it turned out that the coolant leakage from PCV occurred in Unit 1 as well as in Unit 2. There will be the same risk in Unit 3.
- Accordingly, as a major countermeasures to achieve "cold shutdown" in Step 2, revision was made to prioritize "establishment of circulating injection cooling (please refer to the figure in upper right)" over flooding operation (flooding the PCV up to the top of active fuel). In circulating injection cooling, contaminated water accumulated in buildings is reused to be injected into the PCV after being processed.

Image of Circulating Injection Cooling



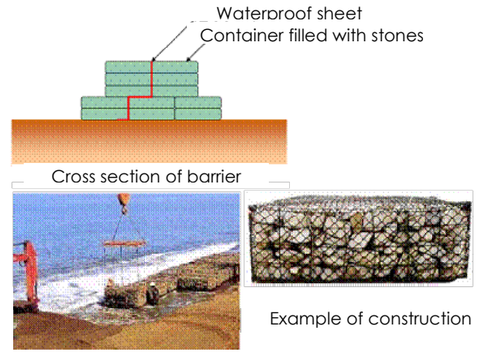
3. "Issue 2. SFP": Implementation of several measures ahead of schedule

- Progress has been made relatively as scheduled. "Remote controlled operation" of "Giraffe", etc in Unit 1, 3, and 4 were implemented ahead of schedule. Installation of heat exchanger in SFP previously scheduled in Step 2 is expected to be implemented in Step 1.

4. "Issue 3. Accumulated water": Steady increase until operation of processing facilities

- Accumulated water increases as new water is found in R/B in Unit 1. While additional storage is secured as a tentative measure, operation of processing facilities and early establishment of circulating injection cooling to control accumulated water are key items.
- Countermeasures to prevent contamination spreading into the sea are reinforced.
- Set "mitigation of groundwater contamination" as a new issue. Added new measures such as "sub-drain management" and "shielding method of underground water"

Image of Temporary Tide Barrier



5. "Issue 7. Aftershocks, Tsunami": countermeasures are reinforced

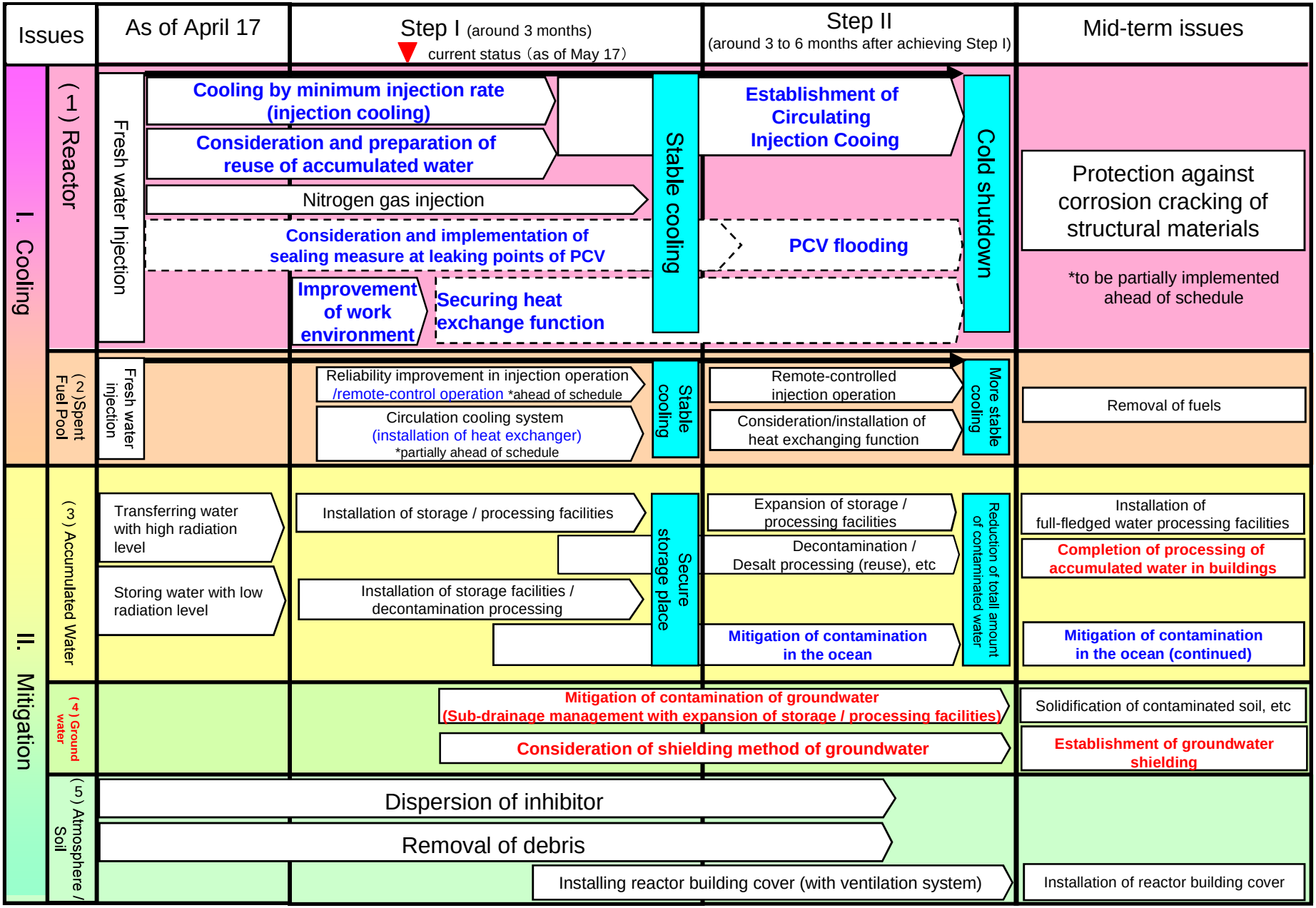
- Potential aftershocks and tsunami are reset as issues
- Set "installment of temporary tide barriers" as a countermeasure in addition to "adding redundancy of power source", "transfer of emergency power source to the upland", and "adding redundancy of water injection line"
- In addition to SFP in Unit 4, reinforcement work of each unit is under consideration.

6. "Issue 8. Life/work environment: progress is being made step by step

- Set as new area/issue reflecting the fact that improvement of life/work environment of workers in summer season has been initiated.
- Necessary measures will be taken in addition to previously implemented "improvement of meal" and "installation of rest station"

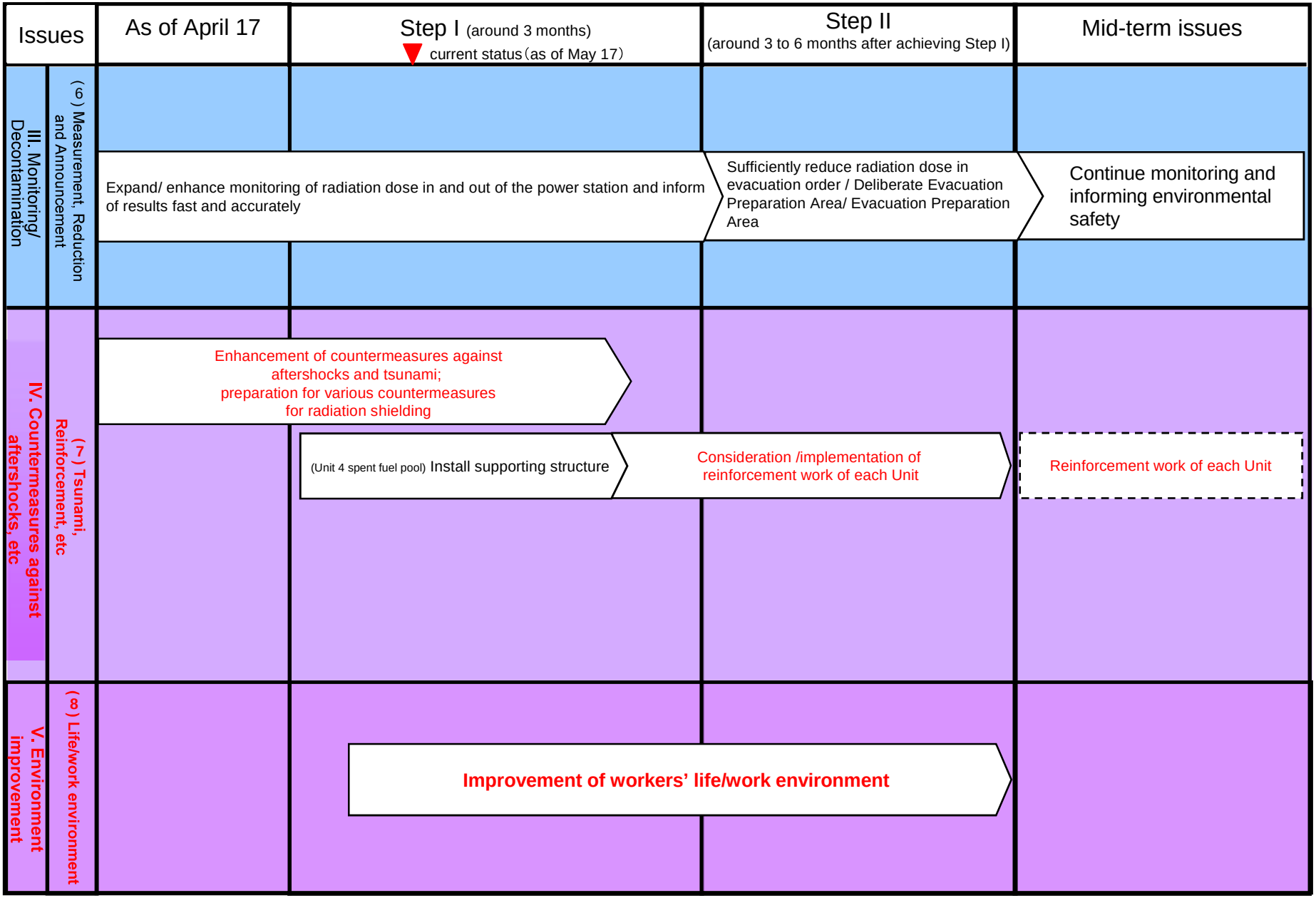
Current Status of Roadmap (issues/targets/major countermeasures) as of May 17

Red colored: newly added to the previous version, Blue colored: modified from the previous version



Current Status of Roadmap (issues/targets/major countermeasures) as of May 17

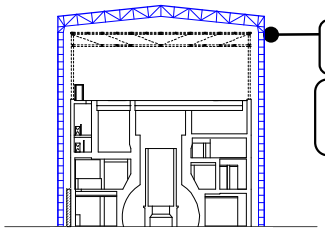
Red colored: newly added to the previous version



Overview of Major Countermeasures in the Power Station as of May 17

Red colored: newly added to the previous version

piping　pumps　heat exchangers, water processing facilities



Reactor building cover (5, 50, 54, 55)

Begin detailed design of full-fledged container (56)

Cooling of spent fuel pool by external water injection (18, 22, 28)

Sampling of steam/pool water and measurement of radioactive materials (19)

Circulation cooling of spent fuel pool (23, 24, 25, 27)

Lower the amount of steam generated (4)
Maintain and enhance countermeasures in Step 1 if needed (17)

Processing high radiation-level water (31,34,38,41,43,44)

Storage/process of low radiation-level water (33, 35, 40, 46)

Storage: tanks, megafloats, barges
Process: decontamination by zeolite

Tank Lorry

Nitrogen gas injection (2, 11, 15)

Reactor Building

Tank

Water processing facility (Decontamination and desalt processing)

PCV venting (with filtration) (10)

Primary Containment Vessel (PCV)

Cooling at minimum water injection rate (7,12,14)
Reuse of processed water (45)
(Establish circulation cooling system)

Storage of high radiation-level water (30, 32, 37, 39, 42)

Flooding up to top of active fuel (3, 9)

Reactor Pressure Vessel (RPV)

Turbine Building

Steam Turbine

Heat Exchanger

Additionally-installed Tank

Centralized Waste Processing Building

Installation of heat exchangers (13)

Condenser

Injection of fresh water with pumps (1)

Suppression Chamber

Dispersion of inhibitor (47, 48, 52)
Removal of debris (49, 53)
Consideration of countermeasures for contaminated soil (51)

Processing of sub-drainage water after being pumped up (36)

Sealing the leakage location (6, 16)

Seismic assessment (20),Continued monitoring (21),
(Unit 4) Installation of supporting structure under the bottom of spent fuel pool (26)

Preventive measures against leakage of high radiation-level water (29)
Prevent contamination in the ocean (64)
Isolation of high-level radioactive water (65)

Prevent contamination of groundwater (66,67); consideration of shielding groundwater(68)

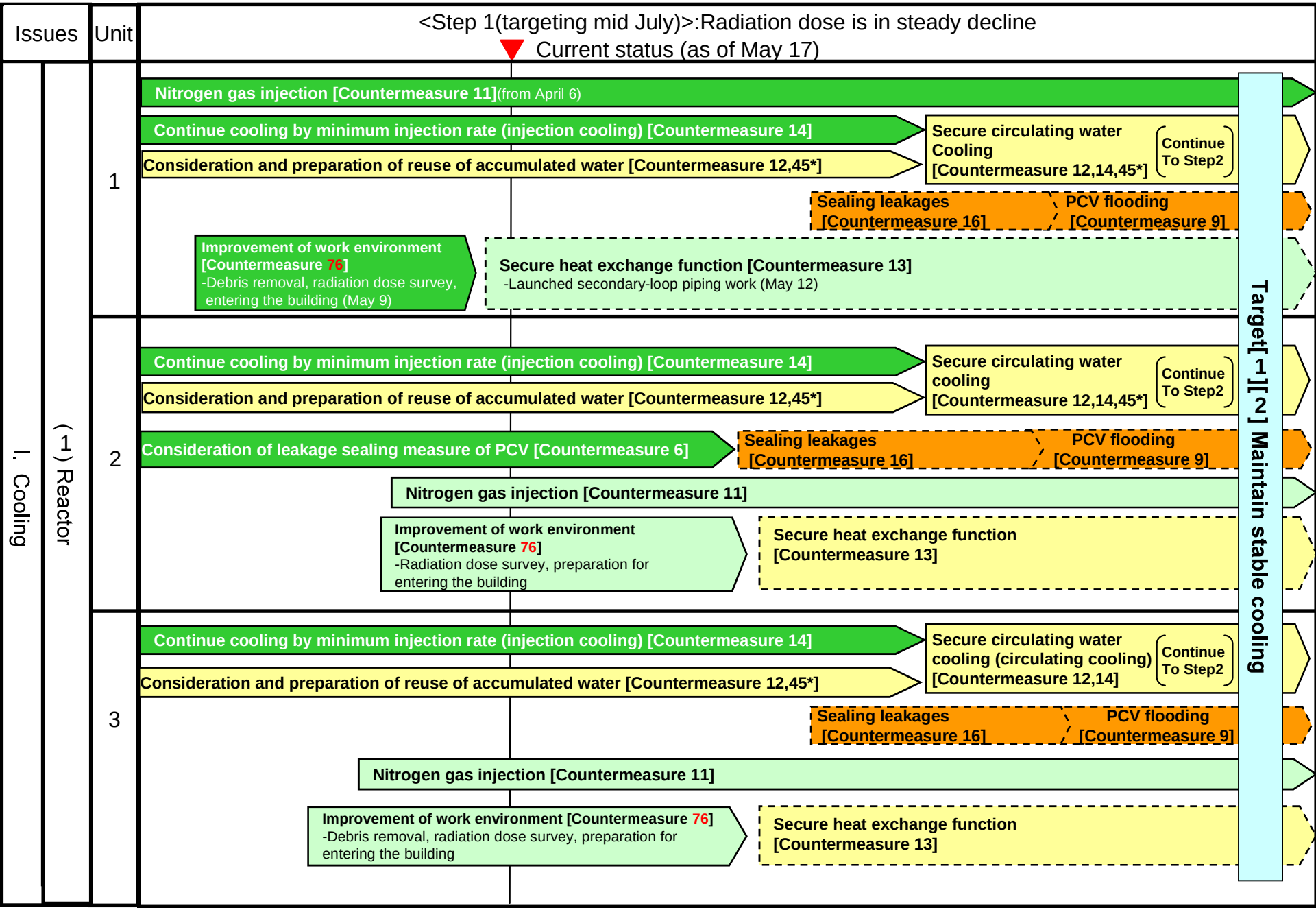
Improvement of life/work environment of workers(74,75); improvement of site environment(76)

Install interconnecting lines of offsite power(8); enhance countermeasures against tsunami (69,70); planning of reinforcement work of each Unit (71); various countermeasures of radiation shielding (72,73)

Enhance/enforce monitoring (55~62), Consideration of necessary measures to reduce radiation dose (63)

Current Status of Countermeasures (1)

Red colored: newly added to the previous version



*(countermeasure 45 to be implemented ahead of schedule from Step2)

Legend: : Implemented : Under construction : Field work started : Field work not started yet

Current Status of Countermeasure (2)

Red colored: newly added to the previous version

Issues: I. Cooling (2) Spent Fuel Pool

<Step 2(targeting mid July)>:Radiation dose is in steady decline

Current status (as of May 17)

Unit 1

Continuation of water injection by "Giraffe", etc [Countermeasure 22]
-reliability improvement: enhanced durability of hoses
-measures to reduce radiation dose: switch to remote-controlled operation

Restoration of normal cooling system [Countermeasure 24]
-radiation measurement by γ camera and robot (April30 to May6)
-radiation reduction by flushing and shielding facility (May 11 to May 15)

***countermeasure 27 to be implemented ahead of schedule from Step2**

Installation of heat exchanger [Countermeasure 25,27*]
Consideration / Design → Fabrication / Transportation → Installation

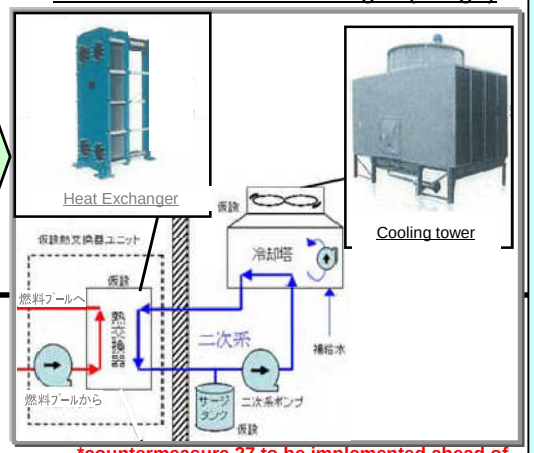
Unit 2

Restoration of water injection through normal cooling system [Counter measure 23]

***countermeasure 27 to be implemented ahead of schedule from Step2**

Installation of heat exchanger [Countermeasure 25,27*]
Consideration / Design → Fabrication / Transportation → Installation

Installation of heat exchanger (image)



***countermeasure 27 to be implemented ahead of schedule from Step2**

Unit 3

Continuation of water injection by "Giraffe", etc [Countermeasure 22]
-reliability improvement: enhanced durability of hoses
-measures to reduce radiation dose: switch to remote-controlled operation

Restoration of normal cooling system [Countermeasure 24]
-confirmation of power system stability through water level measurement by "Giraffe," etc (May 8 to May 15)
-water injection through normal cooling system (ongoing from May 16)

Installation of heat exchanger [Countermeasure 25,27*]
Consideration / Design → Fabrication / Transportation → Installation

Unit 4

Continuation of water injection by "Giraffe", etc [Countermeasure 22]
-reliability improvement: enhanced durability of hoses
-measures to reduce radiation dose: switch to remote-controlled operation

Restoration of normal cooling system [Countermeasure 24]
-implementing site survey (the end of May)
-removing debris. restoration work will be started after the removal.

***countermeasure 27 to be implemented ahead of schedule from Step2**

Installation of heat exchanger [Countermeasure 25,27*]
Consideration / Design → Fabrication / Transportation → Installation

Target[4] Maintain stable cooling

Legend: Implemented | Under construction | Field work started | Field work not started yet

Current Status of Countermeasures (3)

Red colored: newly added to the previous version

Issues

<Step 1(targeting mid July)> :Radiation dose is in steady decline
Current status (as of May 17)

II. Mitigation

(3) Accumulated Water

[High level]

Secure sufficient storage place [Countermeasure 37,39]
Transfer after waterproof check of centralized Waste Processing Facilities (Process Main Building and High-temperature Incineration Building)
Transfer (Unit 2 trench to Process Main Building)
Waterproof check etc. (Incineration Building)
-Installation of tanks [For receiving processed water]
May 10 : approx. 11,000 t

Continue to Secure sufficient storage place [Countermeasure 37,39,42*]
***(Countermeasure 42 to be implemented ahead of schedule from Step 2)**
Transfer (from Unit3 Turbine Building to Incineration Building)
- Installation of tanks [For receiving processed water] late June : approx. 28,000 t, preparing installation place for underground tanks* (from May 16 to step 2)

Target [①] Secure sufficient storage place

Mitigation of contamination in the ocean [Countermeasure 64]
- Installation of silt fence

Continuing mitigation of contamination in the ocean [Countermeasure 64]
- Installation of circulating decontamination system (end of May), Installation of steel sheet pile (to Step 2)

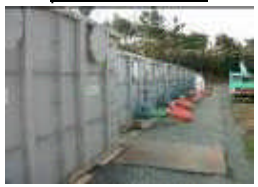
Isolation of high-level radioactive Water [Countermeasure 65]
- Closing of Unit 2 &3 Turbine trenches (end of May)

Installation of water processing facilities [Countermeasure 38]
Consideration / Design
Manufacturing / Transportation
Installation of Decontamination / salinity processing equipment
Test Operation

Continuing water processing of contaminated water [Countermeasure 38,43, 45*]
Middle of June: processing start
*(Countermeasure 43, 45 to be implemented ahead of schedule from Step 2)
Operation: processed water to be reused (to Step 2)

Underground Tank

Receiving tank for processed water



Installation of decontamination equipment

Megafloat

Water processing by zeolite

Target [②] Store and process water

[Low level]

Increase storage capacity / decontamination [Countermeasure 40,41]
Installation of tanks (May 8 :2,200 t)
-Use of decontaminant (zeolite) :
test operation (from May 3)

Continue to increase storage capacity / decontamination [Countermeasure 40,41]
- Installation of tanks（mid May :6,200t, late May : 6,400 t, early June : 3,600 t ）, Megafloat（late May : 10,000 t ）, barges（late June : 1,200 t and 1,000 t ）
- Start of full operation of decontaminant (zeolite) (from late May)

(4) Groundwater

Consideration of mitigation of groundwater contamination [Countermeasure 66]

Implementation of mitigation of groundwater contamination [Countermeasure 67]
Restoration of subdrain pumps (middle of June)
Subdrain management with expansion of storage / processing facilities (to Step 2)

Consideration of groundwater shielding method [Countermeasure 68] (to Step 2)

Target [③] Mitigation of groundwater contamination

Legend: Implemented / Under construction / Field work started / Field work not started yet

Current Status of Countermeasures (4)

Red colored: newly added to the previous version

Issues

<Step 1(targeting mid July)> :Radiation dose is in steady decline
▼ Current status (as of May 17)

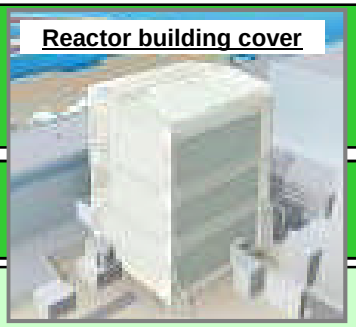
II. Mitigation

(5) Atmosphere / Soil

Dispersion of inhibitor [Countermeasure 52]
- Plane and slope : approx. 105,000 m² (May 12)
- Around Units 1 to 4 : approx. 49,000 m² (May 12)

Continuing dispersion of inhibitor [Countermeasure 52](to step2)
- Plane and slope : approx. 420,000 m² (until late June)
- Around Units 1 to 4 : approx. 120,000 m² (until late May)

Reactor building cover



Removal of debris [Countermeasure 53] (from April 6)
- Removal of debris (equivalent of 127 containers with approx. 4 m³ volume) (May 10)

Installing reactor building cover [Countermeasure 54]
-Unit 1 : Started preparation construction work (from May 13)
Design → Procurement, Manufacturing → On-site construction (including preparation) (to Step 2)
-Units 3 & 4 : Now designing (to Step 2)

Target [①] Prevent scattering of radioactive materials

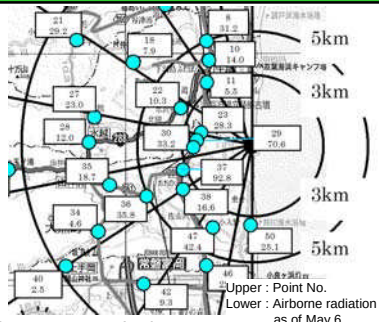
III. Monitoring/Decontamination

(6) Measurement, Reduction and Announcement

Expand/enhance monitoring and announcement [countermeasure 60,61]
-Continue monitoring in and out of the power station

[Land Area]
- Monitoring within 20km radius of the periphery:
 (1) Monitoring of airborne radiation at 128 points, and dust concentration at 12 points by the collaboration between MEXT, Power Support Team and TEPCO (April 18)
 (2) Monitoring of airborne radiation at 50 points by Power Support Team (from May 6, weekly)
- Monitoring at 5 points between 3 and 5 km radius of the periphery at the timing of entry in the building of Unit 1 (open the airlock) (May 8,9)

(Map on the right indicates the collecting points within approx. 10km)



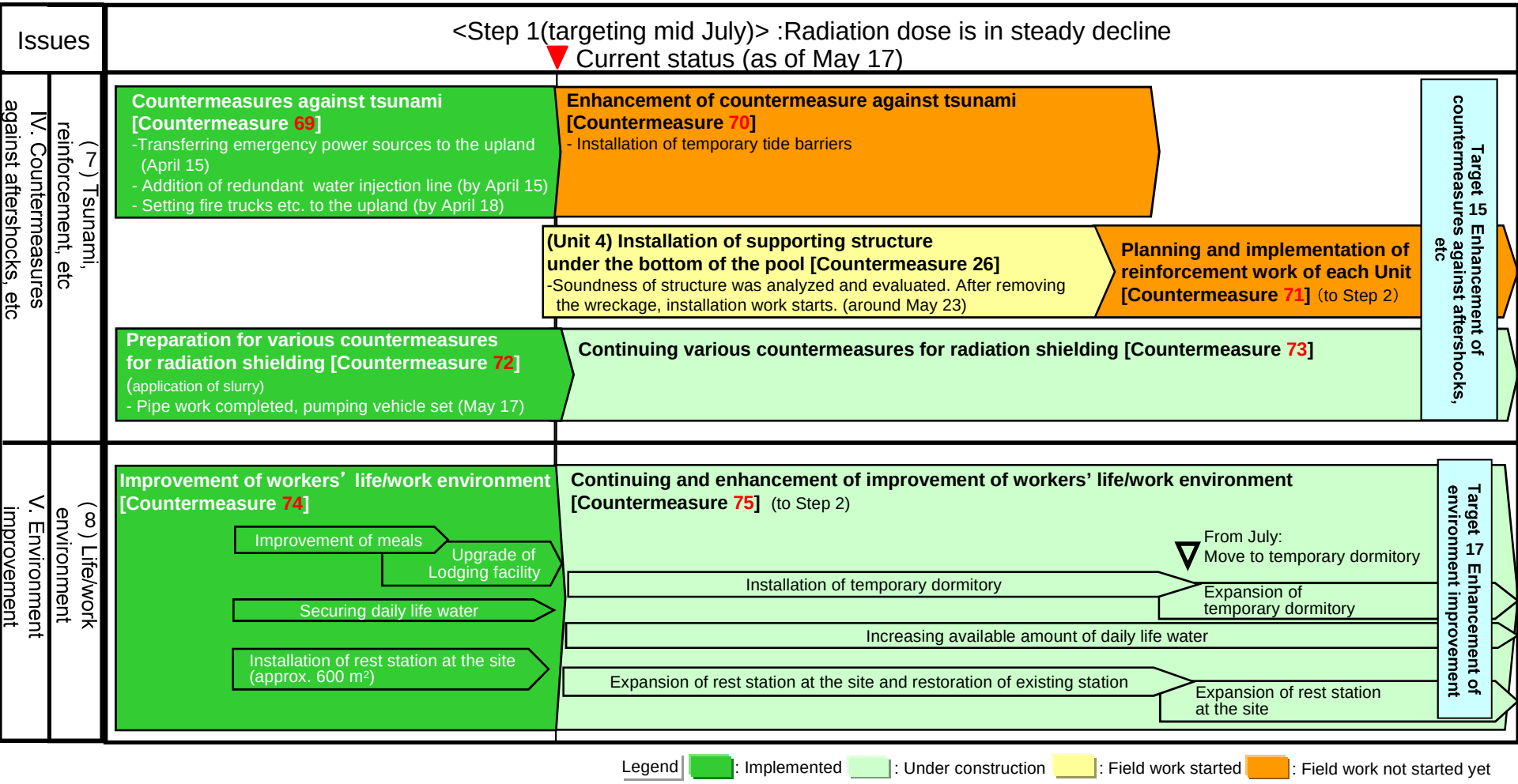
[Ocean Area]
-Start monitoring sea water at 22 points (from May 5) and marine soil at 2 points (from April 29) off the coast of Fukushima (Increased from sea water at 16 points (as of April 17))
-Start monitoring sea water at 5 points off the coast of Ibaraki (from April 29)
(Map on the right indicates the collecting points within approx. 30km)

Target [①]: Expand/enhance monitoring etc.

Legend: : Implemented : Under construction : Field work started : Field work not started yet

Current Status of Countermeasures (5)

Red colored: newly added to the previous version



Progress Status of Countermeasures

Legend: : Implemented | :Under construction | : Filed work started, but construction not started | :Field work not started yet

Areas	Issues	Target	Countermeasures		Unit 1	Unit 2	Unit 3	Unit 4
I. Cooling	(1) Reactors	Target [1] Stable cooling	Countermeasures started by April 17	Countermeasure [1]: Injecting fresh water into the RPV by pumps	-In progress (from March 25)	-In progress (from March 26)	-In progress (from March 25)	
				Countermeasure [2]: Injecting nitrogen gas into the PCV (start from Unit1)	-In progress (from April 6)	-Injection line is under preparation (from April 16)	-Injection line is under preparation (from April 16)	
				Countermeasure [3]: Consideration of flooding the PCV up to the top of active fuel	-Under consideration (from April 13)	-Under consideration (from April 13)	-Under consideration (from April 13)	
				Countermeasure [4]: Lower the amount of steam generated by sufficiently cooling the reactor (to be achieved by countermeasures in Step1 and Step2)	-Various countermeasures have been taken	-Various countermeasures have been taken	-Various countermeasures have been taken	
				Countermeasure [5]: Consideration of shielding the leakage by covering the reactor building	-Consideration is completed		-Designing is in progress (continue to Step 2)	-Designing is in progress (continue to Step 2)
				Countermeasure [7]: Cooling at minimum water injection rate (control the leakage of contaminated water)	-In progress	-In progress	-In progress	
				Countermeasure [8]: Install interconnecting lines of offsite power soon	-Installation completed			
			Countermeasures in Step 1	Countermeasure [6]: Consideration of sealing the leakage location in the PCV		-Under consideration (various tests of grout materials are in progress)		
				Countermeasure [9]: Flood the PCV up to the top of active fuel	-While flooding operation started from May 6, consideration of shielding measure of leakage in the PCV is in progress. (Countermeasure [16])	-Flooding measure is under consideration (Countermeasure [3])	-Flooding measure is under consideration (Countermeasure [3])	
				Countermeasure [10]: Reduce the amount of radioactive materials (utilization of standby gas treatment system (filter), etc.) when PCV venting (release of steam containing radioactive materials into the atmosphere)	-Not necessary at this moment	-Not necessary at this moment	-Not necessary at this moment	
				Countermeasure [11] (integrate with countermeasure [15]): Inject nitrogen gas into the PCV	-In progress (from April 6)	-Injection line is under preparation (from April 16)	-Injection line is under preparation (from April 16)	
				Countermeasure [12]: Circulate the accumulated water back into the RPV after processing it	-Site survey was conducted (April 26, May 11) -Preparation of injection line is scheduled to start from May 21	-Injection line is under preparation (from April 9)	-Injection line is under preparation (from April 16)	
				(Countermeasures in Step 2) Countermeasure [45]: Reuse of processed water as reactor coolant	-Same as Countermeasure [12]	-Same as Countermeasure [12]	-Same as Countermeasure [12]	
				Countermeasure [13]: Recover heat exchange function for the reactor	-Installation work is in progress (May 13)	-Basic design is completed. Detailed design is in progress. -Manufacturing heat exchanger	-Basic design is completed. Detailed design is in progress. -Manufacturing heat exchanger	
				Countermeasure [14]: Continue cooling by current minimum water injection rate.	- In progress	- In progress	- In progress	
				Countermeasure [16]: Seal the leakage location in the PCV	-Confirming leakage spot and leaking amount (plant parameter confirmation, site survey, etc)	-Sealing measure is under consideration (Countermeasure [6])	-Confirming leakage status (plant parameter confirmation)	
				Countermeasure [76]: Improve working environment	-Measurement of radiation dose, Removal of debris, Entering into the building (May 9)	-Measurement of radiation dose, Preparation for Entering into the building	-Measurement of radiation dose, Removal of debris, Preparation for Entering into the building	

Progress Status of Countermeasures

Areas	Issues	Target	Countermeasures		Unit 1	Unit 2	Unit 3	Unit 4
I. Cooling	(2) Spent Fuel Pools	Target [4] Stable cooling	Countermeasures started by April 17	Countermeasure [18]: Consideration/implementation of improving reliability of external water injection by concrete pumpers (“Giraffe”, etc.)/switch to remote-controlled operation.	-Reliability improvement: manufacturing hoses with enhanced durability (high-spec polyethylene pipe) -Measures to reduce radiation dose: allocated concrete pumping vehicle equipped with remote controllable arm		-Same as Unit 1	-Same as Unit 1
				Countermeasure [19]: Sampling and measurement of steam/pool water by “Giraffe”, etc.	-will be considered including the sampling method	- Analyzed water of the pool in skimmer surge tank. Confirmed that most of the fuel were intact.	-Confirmed that most of the fuel were intact by analyzing water in the pool	-Confirmed that most of the fuel were intact by analyzing water in the pool
			Countermeasures in Step 1	Countermeasure [22]: Continuation of water injection by “Giraffe”, etc	-Reliability improvement: manufacturing hoses with enhanced durability (high spec polyethylene pipe) -Measures to reduce radiation dose: allocated concrete pumping vehicle equipped with remote controllable arm (2 vehicles)		-Same as Unit 1	-Same as Unit 1
				Countermeasure [23]: Restoration of water injection through normal cooling system.		- Continue water injection through normal cooling system - Addition of heat exchange function is treated in Countermeasure [25,27]		
				Countermeasure [24]: Restoration of normal cooling system	-Radiation measurement by γcamera and robot(from April 30 to May 6) -Radiation reduction by flushing and shielding facility is under consideration (from May 11)		-Confirmation of power system stability through water level measurement by "Giraffe"etc(from May 8 to May 15) -Water injection through normal cooling system(from May 16)	-Implementing site survey (to the end of May) -Removing debris. Restoration work will start after the removal.
				Countermeasure [25]: Install heat exchangers.	-Manufacturing heat exchanger	-Manufacturing heat exchanger -Removing debris in working environment (from May 4) - Installation work is in progress (from May 17)	-Manufacturing heat exchanger. Installation work will start after it is transferred to the site.	-Manufacturing heat exchanger
				(Countermeasures in Step 2) Countermeasure [27]: Cooling by installation of heat exchangers	-Cooling will start after installing heat exchanger (Countermeasure [25])	-Cooling will start after installing heat exchanger (Countermeasure [25])	-Cooling will start after installing heat exchanger (Countermeasure [25])	-Cooling will start after installing heat exchanger (Countermeasure [25])
		ace for water with high radiation level	Countermeasures started by April 17	Countermeasure [29]:Identify leakage path and examine and implement preventive measures	- Putting sandbags including radioactive decontaminants (zeolite) into the port (from April 15 to 17: put 10 sets of baskets including sandbags) - Installation of contamination preventive fences (silt fence) in the port (from April 11 to 14: installation) - Shielding between trench and building (April 7: completed in Unit 4) etc.			
				Countermeasure [30]:Transferring accumulated water to facilities that can store it (condenser and Centralized Waste Treatment Facility)	- Unit 2 Turbine Building accumulated water -> condenser (April 13 transfer completed) - Implementation of waterproof work etc. in order to transfer water from Unit 2 Turbine Building to Centralized Radiation Waste Treatment Facility			
				Countermeasure [31]: Preparing decontamination and desalt of transferred accumulated water.	- Selection of decontamination / desalt, consideration of basic design etc.			
				Countermeasure [32]:Preparing to install tanks	- Arrangement of tank, selection of installation place, preparation - Cancellation application of permission and authorization regarding deforestation			
				Countermeasure [37]:Utilization of “Centralized Waste Treatment Facility”, etc. to store water	- After waterproof check in Centralized Radiation Waste Treatment Facility (High-temperature Incineration Building and Main Process Building), transferring accumulated water in Unit 2 from April 19 - Installation of tanks [For receiving treated water] May 10 : Approx. 11,000 tons - Transferring accumulated water in Unit 2 and 3 into Centralized Waste Treatment Facility (High-temperature Incineration Building and Main Process Building) (start transferring accumulated water in Unit 3 from May 17)			
				Countermeasure [38]:Install water processing facilities	- Decontamination / desalt equipments installation work is in progress			

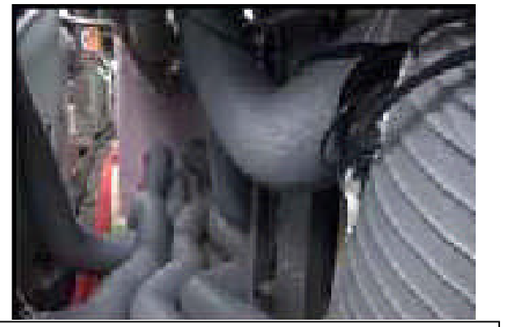
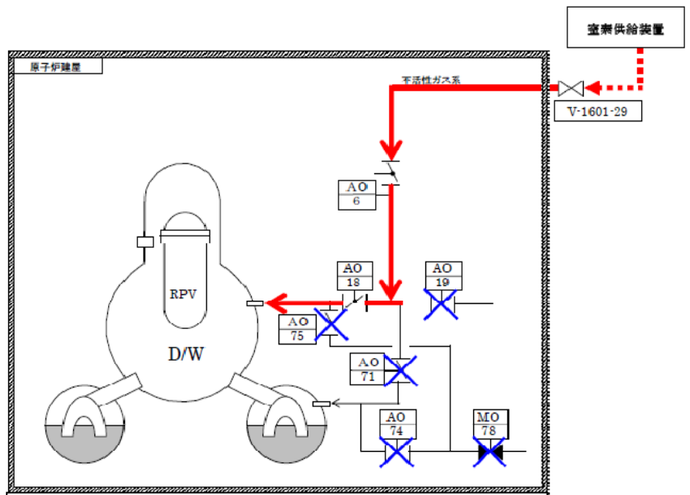
Progress Status of Countermeasures

Areas	Issues	Target	Countermeasures		Unit 1	Unit 2	Unit 3	Unit 4
II. Mitigation	(3) Accumulated Water	Target [6]: Secure sufficient storage pl	Countermeasures in Step 1	Countermeasure [39]:Examination and implementation of backup measures (installment of additional tanks)	-Installation of tanks [For receiving treated water] late June : Approx. 28,000 tons, Preparing installation place for underground tanks* (from May 16 to Step 2)			
				（Countermeasure in Step 2） Countermeasure [42]:Expansion of additional tanks to store high radiation-level contaminated water	- Consideration of installation of additional tanks to store high radiation-level contaminated water			
				（Countermeasure in Step 2） Countermeasure [43]:Continuation and reinforcement of decontamination and desalt of high radiation-level water	- Consideration and preparation for installation of backup treatment equipments - Preparation for enhancement of desalt equipments			
				（Countermeasure in Step 2） Countermeasure [45]:Reuse of processed water as reactor coolant	- In progress in Countermeasure [12]	- In Progress in Countermeasure [12]	- In Progress in Countermeasure [12]	
				Countermeasure [64]:Mitigation of contamination in the ocean	- installation of silt fence (from April 11 to 14)		<Plan> -Installation of circulate purifying equipments (late May) -Installation of steel pipe sheet pile (continue to Step 2)	
				Countermeasure [65]:Isolation of high-level radioactive water		- Blocking of vertical shaft of turbine trench (planned at the end of May)	- Blocking of vertical shaft of turbine trench (planned at the end of May)	- Completed blocking of vertical shaft of turbine trench (April 7)
		Target [7]: Store and process water with low radiation level	Countermeasures started by April 17	Countermeasure [33]:Preparing to store with tanks and barges	- Installation of tank (as of May 17 13,200 tons) - Megafloat 10,000 tons (planned to arrive in port of Fukushima Daiichi on May 20)			
				Countermeasure [34]:Preparing for decontamination and desalt of contaminated water	- Decontamination / desalt equipments installation work is in progress			
				Countermeasure [35]: Preparing to install a reservoir	- Planning to use tank instead of reservoir			
				Countermeasure [36]:Preparing to decontaminate sub-drainage water after being pumped up	- Preparing to decontaminate in tank on the ground etc. (zeolite etc.)			
			Countermeasures in Step 1	Countermeasure [40]:Increase storage capacity by adding tanks, barges, Megafloat, etc	- Installation of tanks (May 8 : 2,200 tons) <note> Installation of additional tanks (mid May : 6,200 tons, late May : 6,400 tons, early June : 3,600 tons), Megafloat (late May : 10,000 tons), barges (late June : 1,200 tons and 1,000 tons)			
				Countermeasure [41]:Decontaminating contaminated water using decontaminants to below acceptable criteria	- Use of decontaminants (zeolite) : test operation (from May 3), full operation (from late May)			
	(4) Underground Water	Target [13]: Prevent contamination spread into the sea	Countermeasures in Step 1	Countermeasure [66]:Examination of mitigation measures of groundwater contamination	- Examined mitigation measures of groundwater contamination (countermeasure [67],[68])			
				Countermeasure [67]:Implementation of mitigation measures of groundwater contamination	- Restoration of sub-drain pump (planned in mid June) - Management of sub-drain in accordance with planned expansion of storage and treatment facility (continue to Step 2)			
				Countermeasure [68]:Examination of shielding methods of groundwater	-Choose most appropriate method to shield underground water by evaluating the effect of water shield, earthquake resistance, and durability(Continue to Step 2)			
n	/ Soil	ctive materials on buildings	easures started by April 17	Countermeasure [47]:Inhibit scattering of radioactive materials by full-scale dispersion of inhibitor after confirming its performance by test	- Confirmed unevenness of dispersion and solidification status of soil by test dispersion - Developed remote-controlled crawler damp for dispersion			
				Countermeasure [48]:Prevent rain water contamination by dispersion of inhibitor				
				Countermeasure [49]:Removal of debris	- Started installation of remote-controlled heavy machinery (April 6 test run, April 10 full operation) (Removed debris (volume of 31container of approx. 4m3) (by April 17))			
				Countermeasure [50]:Examination and implementation of basic design for reactor building cover and full-fledged measure (container with concrete roof and wall, etc.)	Examination of basic design for reactor building cover		Examination of basic design for reactor building cover	Examination of basic design for reactor building cover

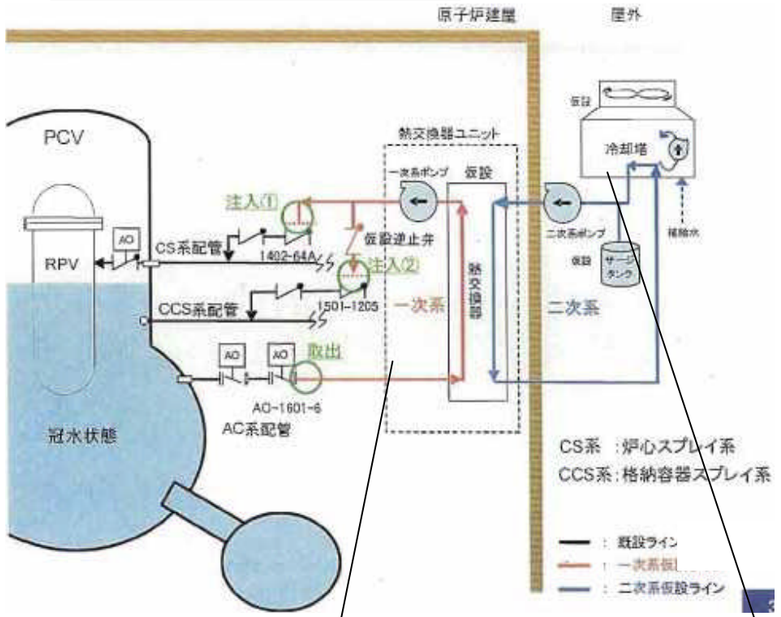
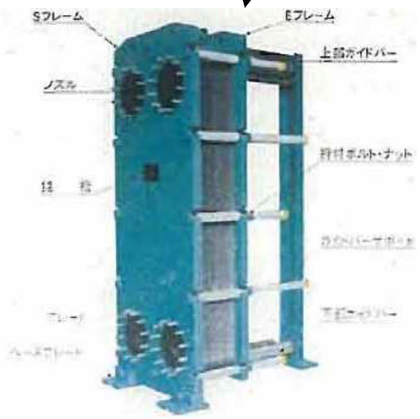
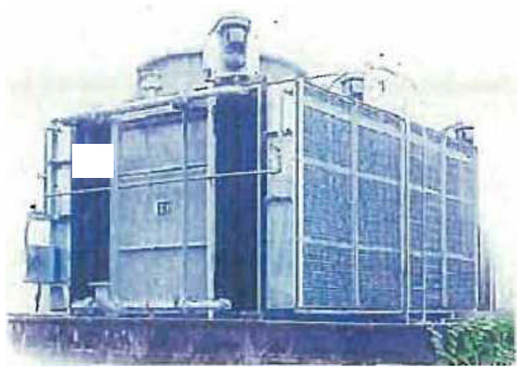
Progress Status of Countermeasures

Areas	Issues	Target	Countermeasures		Unit 1	Unit 2	Unit 3	Unit 4
II. Mitigatio	(5) Atmosphere	Target [9]: Prevent scattering of radioa and ground	Countermeasures started by April 17	Countermeasure [51]:Consideration of solidification, substitution and cleansing of contaminated soil (mid-term issues.)	- Confirmed solidification of soil by dust inhibitor			
			Countermeasures in Step 1	Countermeasure [52]:Dispersion of inhibitor	-Approx. 105,000 m2 of plane and slope (as of May 12) -Approx. 49,000 m2 around Units 1 to 4 (as of May 12) <Plan> -Approx. 420,000 m2 of plane and slope (to the end of June) -Approx. 120,000 m2 around Units 1 to 4 (to the end of May)			
				Countermeasure [53]:Removal of debris	- Removed debris (volume of 127 containers of approx. 4m3) (from April 6 to May 10) - Continuation of removal work			
				Countermeasure [54]:Installation of reactor building covers	- Started preparation construction work (from May 13)		- Designing is in progress(Continue to Step 2)	
III. Decontamination / Monitoring	(6) Measurement, Reduction and Announcement	Target [11]: Expand/enhance monitoring	Countermeasures started by April 17	Countermeasure [57]:Monitoring sea water, soil and atmosphere within the site boundary (25 locations.)	- In progress - Implemented atmosphere monitoring when opened the door of reactor building in Unit 1(May 8, 9)			
				Countermeasure [58]:Monitoring radiation dose at the site boundary (12 locations.)	- In progress - Implemented atmosphere monitoring when opened the door of reactor building in Unit 1(May 8, 9)			
				Countermeasure [59]:Consideration of monitoring methods in evacuation order/ planned evacuation/ emergency evacuation preparation areas.	- Measurement of airborne radiation within 20 km radius from the power plant. Implemented measurement in 128 spots within 2km from main road (April 18). Implemented fixed point measurement in 50 spot (May 6,13)			
			Countermeasures in Step 1	Countermeasure [60, 61]:Expansion, enhancement and announcement of monitoring	-Continue monitoring in and around the power station (to Step 2)			
IV. Countermeasures against aftershocks, etc.	(7) Tsunami, reinforcement, etc.	Target [15]: Prevent expansion of disaster	Countermeasures started by April 17	Countermeasure [20]:Seismic tolerance assessment of Unit 4.				-Evaluated resistance against earthquake of SFP in Unit 4
				Countermeasure [21]:Continue monitoring and examine necessary countermeasures				-Continue surveillance and considered reinforcement work
			Countermeasures in Step 1	Countermeasure [69]:Countermeasures against tsunami	- Transferred emergency power sources to the upland (April 15) - Added redundancy of water injection line (to April 15), Set fire trucks etc. to the upland (to April 18）			
				Countermeasure [70]:Enhancement of countermeasures against tsunami	- Installation of temporary tide barriers (the end of June)			
				Countermeasure [26]:(Unit 4) Installation of supporting structure under the bottom of the pool				- Soundness of structure was analyzed and evaluated. After removing the wreckage, installation work starts. (around May 23)
				Countermeasure [71]:Planning/implementation of reinforcement work of each Unit	- Plan to evaluate earthquake resistance (Continue to Step 2)			
				Countermeasure [72]:Preparation of various countermeasures for radiation shielding (application of slurry)	- Pipe work completed, pumping vehicle set (May 17)			
				Countermeasure [73]:Continuation of various countermeasures for radiation shielding	(Continue to Step 2)			
V. Environment Improvement	(8) Improvement of life/work environment at the site	Target [17]: Enhance the environment improvement	Countermeasures in Step 1	Countermeasure [74]:Improvement of life/work environment of workers	- Improvement of meals, upgrade of lodging facility, securing daily life water, installation of rest station at the site (approx. 600m2)			
				Countermeasure [75]:Continuation and enhancement of improvement of life/work environment of workers	(Continue to Step 2) - Installation of temporary dormitory (move to the dormitory from July), increasing available amount of daily life water, expansion of rest station at the site and restoration of existing station (continue to expand after July as well)			

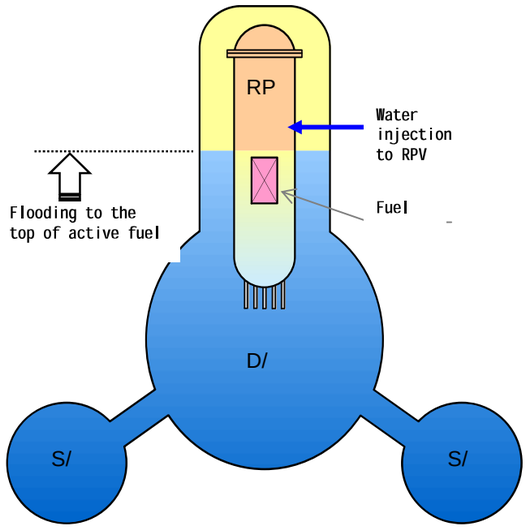
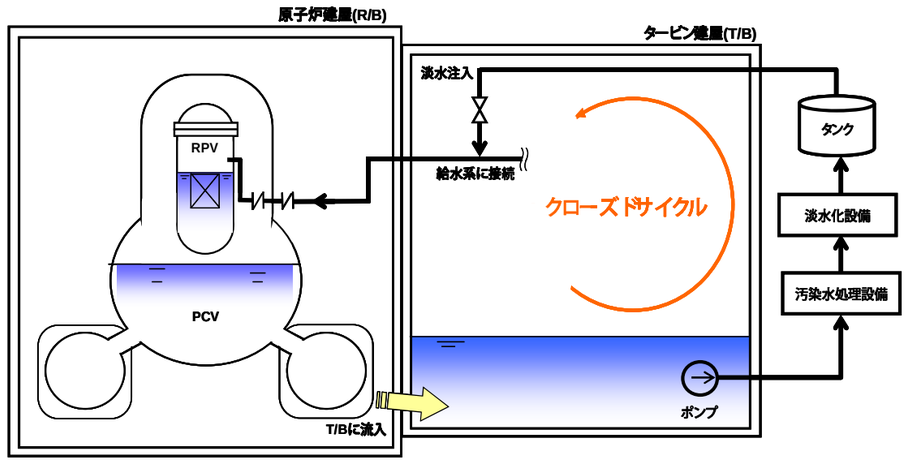
Progress status of cooling (reactors) (Description)

Issues			Countermeasures	Implementation Status	Photos and figures
I. Cooling	(1) Cooling the Reactors	Unit 1	Countermeasure [76] Improvement of work environment	Measurement of radiation dose, Enter into the building (May 9)	 Checking inside of the reactor buildings by Packpot  Measuring radiation dose inside of reactor building   Improvement of work environment by local exhauster
			Countermeasure [11] Inject nitrogen gas into the PCV	Implementing from April 6	Nitrogen supply apparatus  System outline of nitrogen injection 

Progress status of cooling (reactors) (Description)

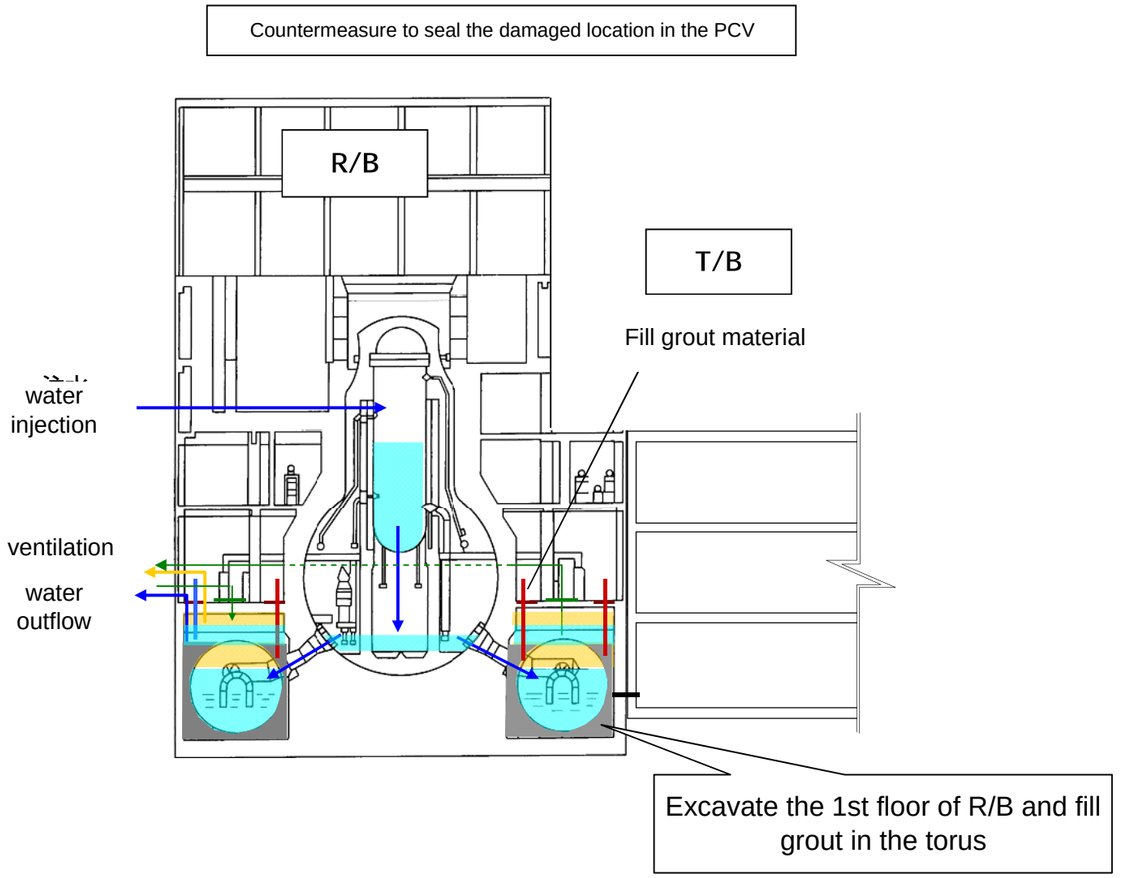
Issues			Countermeasures	Implementation Status	Photos and figures
I. Cooling	(1) Cooling the Reactors	Unit 1	Countermeasure [13] Recover heat exchange function for the reactor	- Start building secondary heat exchange line (May 13)	Outline of alternative reactor cooling system  Demolished and removed debris at the carry-in gate for large stuff, which would be obstacle for installation of alternative facility (from May 10 to May15)  Unit 1 reactor inside (in front of the gate at 1fl)  Plate-type heat  air-fin cooler

Progress status of cooling (reactors) (Description)

Issues		Countermeasures	Implementation Status	Photos and figures
I. Cooling	(1) Cooling the Reactors	Countermeasure[14] Continue cooling by current minimum water injection rate		Image of flooding PCV  Inspection of water gauge 
		Countermeasure[16] Seal the leakage location in the PCV		
		Countermeasure [9] Flood the PCV up to the top of active fuel		
	Unit 1	Countermeasure [12, 45] Reuse of processed waters reactor coolant	- site survey (April 26, May 11) - construction of injection line (May 21) - operation will start when accumulated water process starts	 System outline of water reuse as reactor coolant by processing accumulated water
		Countermeasure [12, 45] Establishment of circulating injection cooling	continue to Step 2	

Progress status of cooling (reactors) (Description)

Issues			Countermeasures	Implementation Status	Photos and figures
I. Cooling	(1) Cooling the Reactors	Unit 2	Countermeasure [76] Improvement of work environment	Measurement of radiation dose, Preparation to enter into the building	
			Countermeasure [11] Inject nitrogen gas into the PCV	Installed piping to the entrance of the building (May 7)	
			Countermeasure [13] Recover heat exchange function for the reactor	-site survey completed (May 8)	
			Countermeasure[6] Consideration of sealing the leakage location in the PCV	- Testing the sealing measure at laboratory <next step> '-based on the result of test at laboratory, move on to countermeasure [16]	
			Countermeasure[16] Seal the leakage location in the PCV	- Construction will start after checking the feasibility of sealing method	
			Countermeasure [9] Flood the PCV up to the top of active fuel		
			Countermeasure[14] Continue cooling by current minimum water injection rate.	- Injecting water to the extent that enable to store leaked water	
			Countermeasure [12, 45] Reuse of processed water as reactor coolant	-Implementing injection line work (ongoing from April 9) -In service with the launch of accumulated water treatment	
			Countermeasure [12, 14, 45] Establishment of circulating injetion cooling	Continue to Step 2	



Progress status of cooling (reactors) (Description)

Issues			Countermeasures	Implementation Status	Photos and figures
I. Cooling	(1) Cooling the Reactors	Unit 3	Countermeasure [76] Improvement of work environment	-Removal of debris, Measurement of radiation dose, Preparation to enter into the building	Demolished and removed debris at the carry-in gate for large stuff, which would be obstacle for installation of alternative facility (from May 9 to the end of May)
			Countermeasure [11] Inject nitrogen gas into the PCV	Installed piping to the entrance of the building (May 11)	
			Countermeasure [13] Recover heat exchange function for the reactor	-Installation work of heat exchanger will start after the improvement of work environment	
			Countermeasure[6] Consideration of sealing the leakage location in the PCV	-Will confirm the leakage status/temperature etc and choose countermeasure [16] or [14]	
			Countermeasure[16] Seal the leakage location in the PCV		
			Countermeasure [9] Flood the PCV up to the top of active fuel		
			Countermeasure[14] Continue cooling by current minimum water injection rate.		
			Countermeasure [12, 45] Reuse of processed water as reactor coolant	-Implementing injection line work (ongoing from April 16) -In service with the launch of accumulated water treatment	
			Countermeasure [12, 14, 45] Establishment of circulating injection cooling	Continue to Step 2	

Broken pillars at the carry-in gate for large stuff in Unit 3

Inside of the carry-in gate for large stuff in Unit 3

unmanned facilities for debris removal

Internal Survey

talon (USA)

brokk 90 (Sweden)

Demolition of broken pillars

image of demolition

nibbler

Removal of debris

brokk 330 (Sweden)

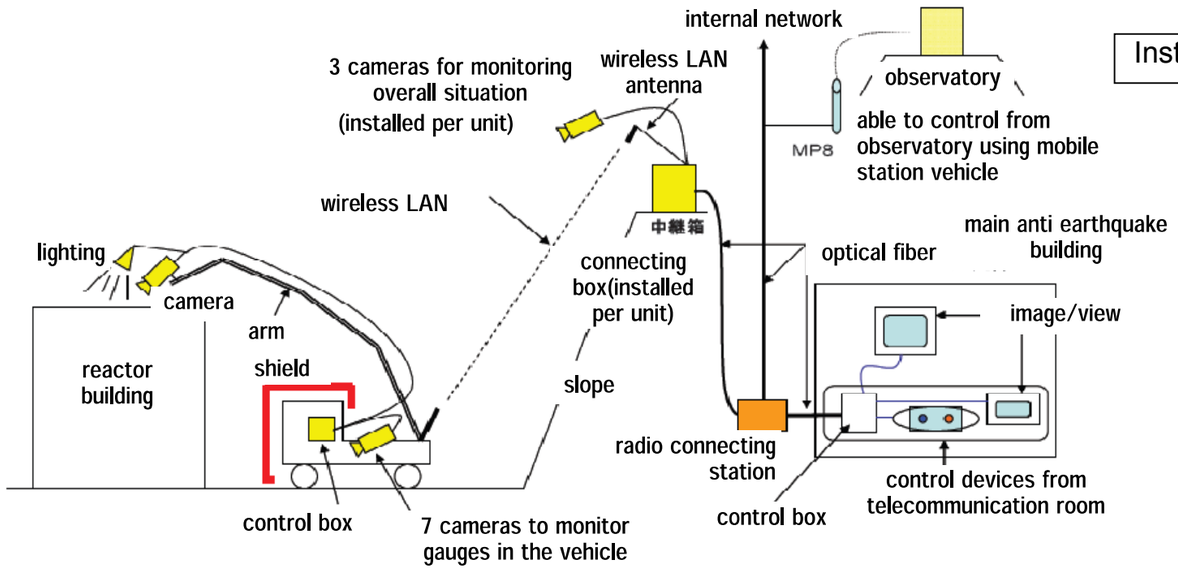
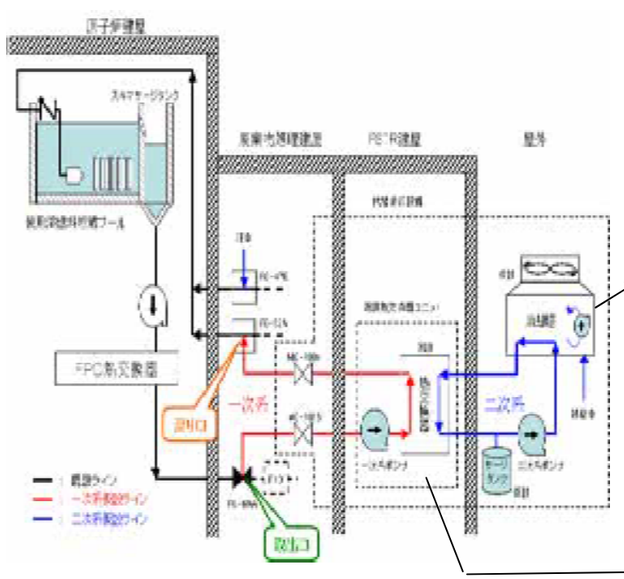
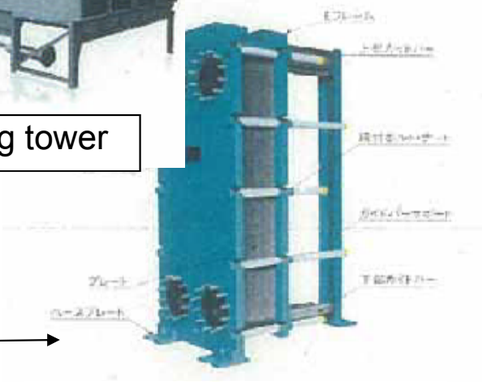
bob cat (USA)

Vehicle to control unmanned facilities

wireless control vehicle

wired control vehicle

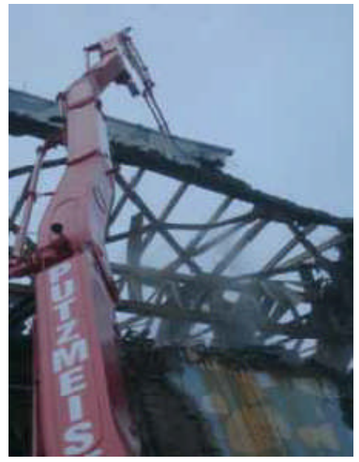
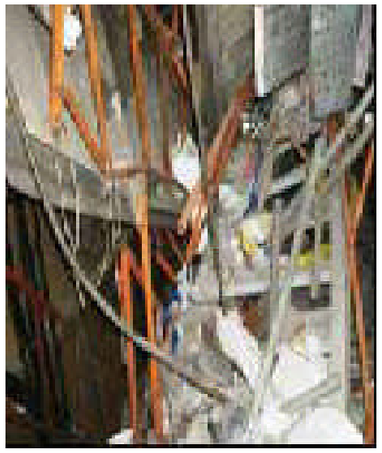
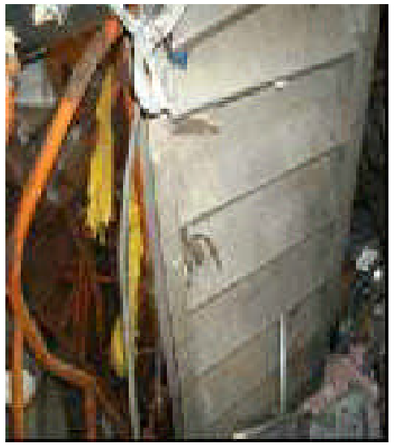
Progress status of cooling (Spent Fuel Pool) (Description)

Issues			Countermeasures	Implementation status	Photos and figures
I. Cooling	(2) Spent Fuel Pools	Unit 1	Countermeasure[22] Continuation of water injection by "Giraffe", etc	-Reliability improvement: enhanced durability of hoses -Measures to reduce radiation dose: switch to remote-controlled operation (arm, water injection operation)	Image of remote control operation of concrete pumping vehicle 
			Countermeasure[24] Restoration of normal cooling system	-Radiation measurement by γcamera and robot(from April 30 to May 6) -Radiation reduction by flushing and shielding facility(from May 11 to May 15)	Installation of camera at the top of the arm 
			Countermeasure[25,27] Install heat exchanger	-Manufacturing heat exchanger	 Overview of SFP cooling function  cooling tower  plate type heat exchanger

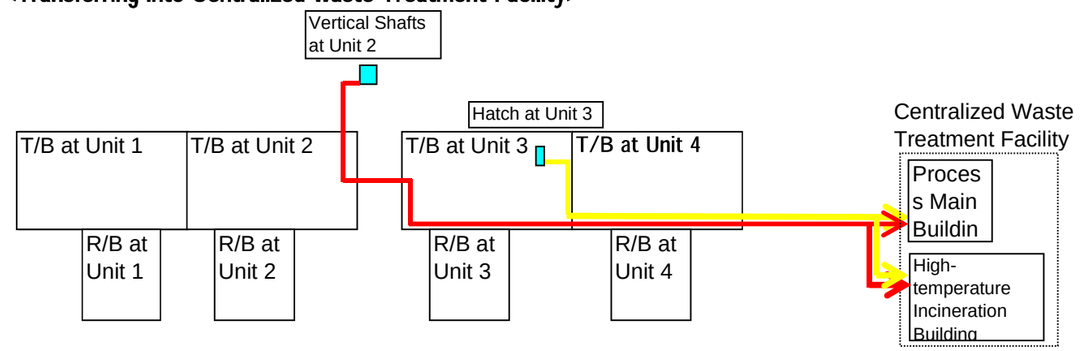
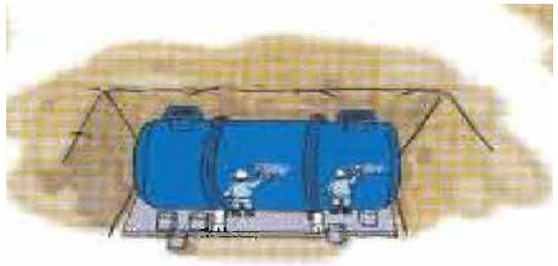
Progress status of cooling (Spent Fuel Pool) (Description)

Issues			Countermeasures	Implementation status	Photos and figures
I. Cooling	(2) Spent Fuel Pool	Unit 2	Countermeasure[23] Restoration of water injection through normal cooling system		 Status of debris in Radwaste Building of Unit 2
			Countermeasure[23,27] Install heat exchanger	-Manufacturing heat exchanger -Removed debris in the working area (May 11) -Installation work is under way(from May 16 to the end of May)	
		Unit 3	Countermeasure[22] Continuation of water injection by "Giraffe" etc	-Reliability improvement: enhanced durability of hoses -Measures to reduce radiation dose: switch to remote-controlled operation	Lifting up sampled water from SFP  * This is a picture of the unit 4. Actual picture of the unit 3 may
			Countermeasure[24] restoration of normal cooling system	-Confirmation of power system stability through water level measurement by "Giraffe", etc(from May 8 to May 15) -Water injection through normal cooling system(ongoing from May 16)	
			Countermeasure[25,27] Install heat exchanger	-Manufacturing heat exchanger. installation work will start after it is transferred to the site.	

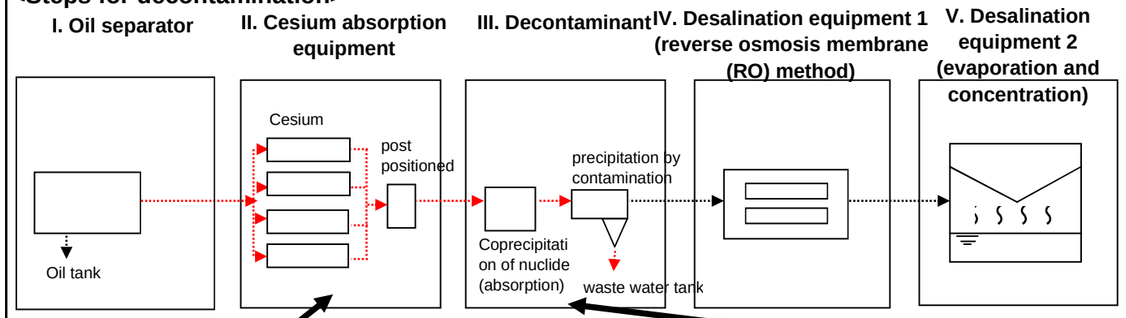
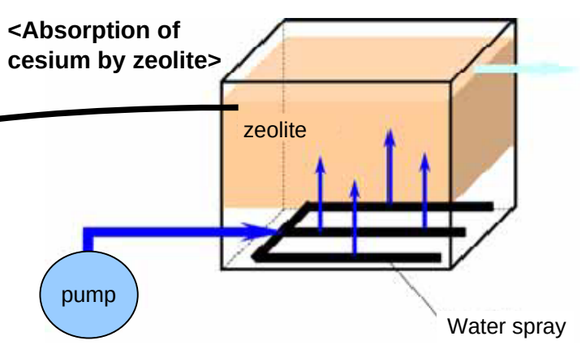
Progress status of cooling (Spent Fuel Pool) (Description)

Issues			Countermeasures	Implementation status	Photos and figures
I. Cooling	(2) Spent Fuel Pool	Unit 4	Countermeasure[22] Continuation of water injection by "Giraffe", etc	-Reliability improvement: enhanced durability of hoses -Measures to reduce radiation dose: switch to remote-controlled operation	   Water injection by "Elephant No. 2" in Unit 4
			Countermeasure[24] Restoration of normal cooling system	-Implementing site survey (from April 19 to the end of May) -Removing debris. restoration work will be started after the removal.	
			Countermeasure[25,27] Install heat exchanger	-Manufacturing heat exchanger	  Status of stairs connecting 2nd and 3rd floor in Unit  Status of SFP inside

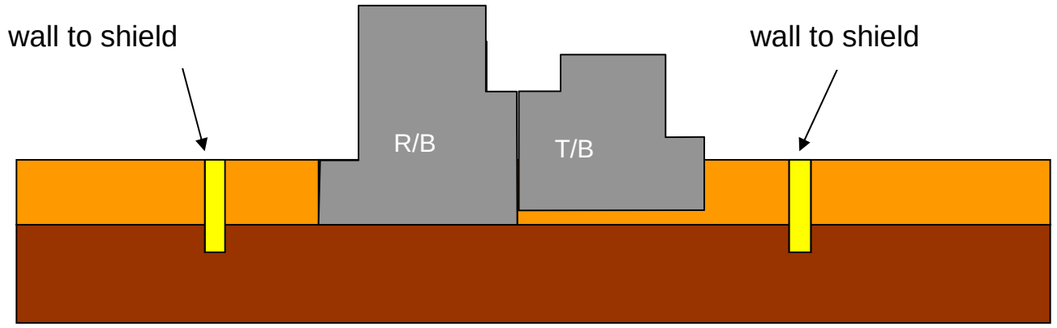
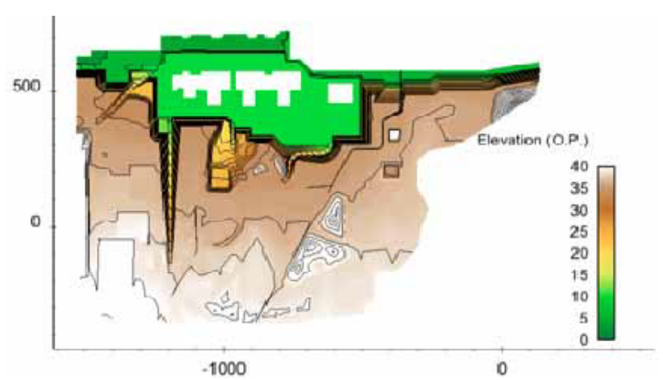
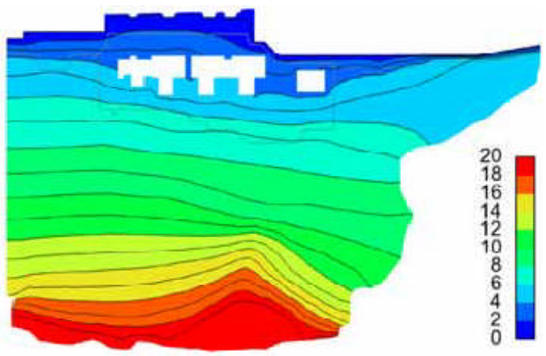
Implementation status of mitigation (Accumulated Water) (Description)

Issues			Countermeasures	Implementation Status	Photos and figures
II. Mitigation	(3) Accumulated Water	High level	Countermeasure [37, 39, 42] Securing places to store contaminated water	[Transferring into Centralized Waste Treatment Facility] -Process Main Building: After conducting waterproof check etc., transport from vertical shafts in Unit 2 started. (April 19) -High-temperature Incineration Building: Now conducting waterproof check etc.	<Transferring into Centralized Waste Treatment Facility> 
				[Installation of tanks] -For receiving treated water approx. 11,000t (May 10) <Implementation hereafter> -For receiving treated water approx. 28,000t (late June) land preparation for underground tanks (from May 16)	 Underground tank for highly contaminated water  Tanks to receive treated water
			Countermeasure [64] Mitigation of contamination in the ocean	- Setting up silt fence - Setting up circulating purification system (end of May) <Implementation hereafter> - Planning for setting up steel sheet pile	
			Countermeasure [65] Isolation of high-level radioactive water	- closure of Unit 4 turbine vertical shaft (April 6) - closure of Unit 2&3 turbine vertical shafts (end of May)	

Implementation status of mitigation (Accumulated Water) (Description)

Issues		Countermeasures	Implementation Status	Photos and figures
II. Mitigation	(3) Accumulated Water High level	Countermeasure [38, 43, 45] Install water processing facilities/treat and store water	[Function to decontaminate contaminated water] -Cesium absorption equipment (Kurion, Inc.): Equipment being manufactured *TEPCO staff residing at the factory is supervising to secure the performance and the schedule Start of foundation work at Site (May 8) Treatment tanks, pumps being installed, piping work underway. -Radioactivity treatment equipment (Areva SA): Equipment arrival at Site (May 8) Equipment being installed, piping work underway [Function to desalinate contaminated water] -Desalination equipment (RO method):	<Steps for decontamination>   Inspection of parts by TEPCO supervisor (At factory of Kurion, Inc in USA)  Installation of equipments at Fukushima Daiichi Nuclear Power Station
	Low level	Countermeasure [40, 41] Increase storage capacity, Decontaminate contaminated water	Increase storage capacity, removal of contaminated water -Installation of tanks: 2,200 t (May 8) 6,200 t (mid May) 6,400 t (late May) <implementation hereafter> - Installation of tanks: 3,600 t (early June) - Megafloat: 10,000 t (late May) - barge: 1,200 t (late June) 1,000 t (late June)	<Megafloat> 
			Utilization of decontaminant (zeolite) - Installation in the water, absorption of Cesium by zeolite by self circulation - Decontaminate accumulated water in T/B of Unit 6 after transferred to storage tanks for low level contaminated water - Test Operation (from May 3) - Planned full-scale operation (late May)	 Decontaminant (zeolite) <Absorption of cesium by zeolite> 

Progress Status of Mitigation (Groundwater) (Description)

Issues		Countermeasures	Implementation Status	Photos and Figures
II. Mitigation	(4) Groundwater	Countermeasure [66] Examination of mitigation measures of groundwater contamination	- Implementation of closing work for northern vertical shaft of sea water pipe on Unit 2	 Input of crashed  Concrete  Mortar placement
		Countermeasure [67] Implementation of mitigation measures of groundwater contamination	-Restoration of sub drain pump (mid June) - Sub drain management along with expansion plan of storage/processing facility	 image of measure to shield groundwater
		Countermeasure [68] Examination of shielding methods of groundwater	- Considering underground water flow based on seepage analysis <next step> choose most appropriate method to shield underground water by evaluating water shield effect, earthquake resistance, durability	 Seepage analysis model  example: result of Seepage analysis (underground water level)

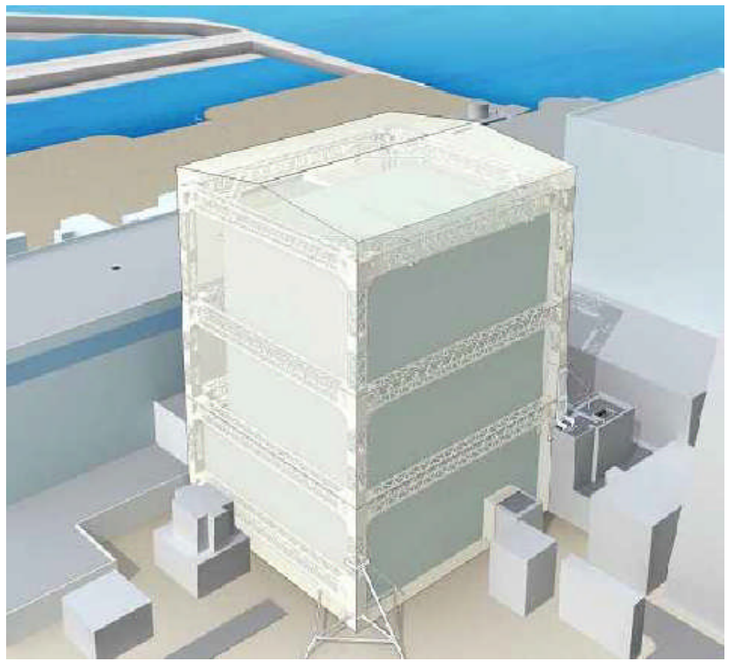
Progress status of mitigation (Atmosphere/ soil) (Description)

Issues		Countermeasures	Implementation Status	Photos and figures
II. Mitigation	(5) Atmosphere / Soil	Countermeasure [52] Dispersion of inhibitors	Continue dispersion of inhibitor - Test dispersion of inhibitors in the Power Station (from April 1to April 25) - Full-dress dispersion of inhibitors in the Power Station (from April 26) (Record of dispersion of inhibitors up to May 12) - In the Power Station (flat land and slope): Dispersion in approx. 105,000 m2 - Around Units 1 to 4: Dispersion in approx. 49,000 m2 <Plan for further implementation> - In the Power Station (flat land and slope): Dispersion in approx.420,000 by the end of June - Around Units 1 to 4: Dispersion in approx. 12,000 m2 by the end of May	 Dispersion of inhibitors in the Power Station (flat land)  Dispersion of inhibitors around turbine buildings of Units 1 to 4  Dispersion of inhibitors in the Power Station (flat land)  Dispersion of inhibitors in the Power Station (flat land)  Dispersion of inhibitors in the Power Station (slope)  After dispersion of inhibitors in the Power Station (slope)

Progress status of mitigation (Atmosphere/ soil) (Description)

Issues		Countermeasures	Implementation Status	Photos and figures
II. Mitigation	(5) Atmosphere / Soil	Countermeasure [53] Removal of debris	- In order to mitigate exposure dose of the workers and improve work efficiency at the site, we have started removing the debris after storing them in the containers using remote-controlled heavy machinery(hydraulic shovel, crawler dump, bulldozer). (from April 6) - The debris at highly-radioactive area(around the turbine buildings of Units 1 to 4) are removed in preference. (Record of removing debris as of May 10) - 127 containers* of debris are removed. *: (Capacity: 3.2*1.6*1.1m, Approx. 4m3) <Plan for further implementation> We will finish removing the debris outside in the highly-radioactive area by the end of May.	 Removing debris with remote-controlled heavy machinery  (Container: 3.2*1.6*1.1m, Approx. 4m3) Before removal Around turbine building of Unit 1 After removal      Temporary containers for collecting debris

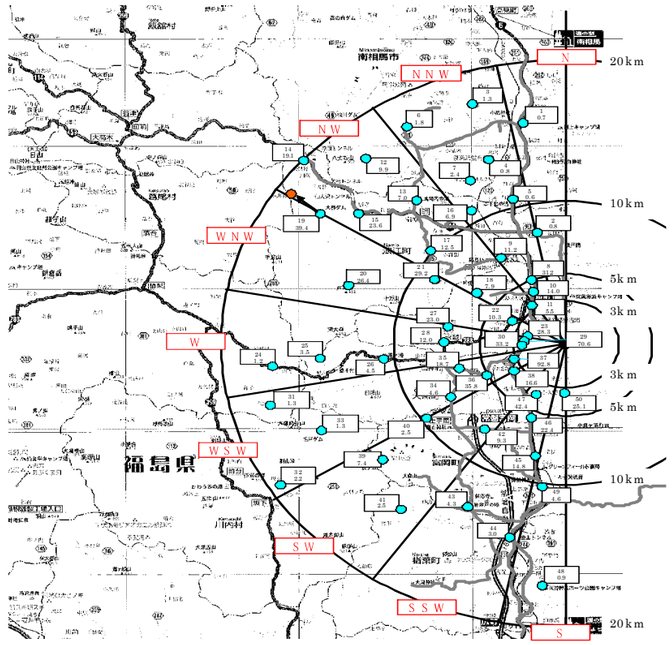
Progress status of mitigation (Atmosphere/ soil) (Description)

Issues		Countermeasures	Implementation Status	Photos and figures
II. Mitigation	(5) Atmosphere / Soil	Countermeasure [54] Installation of reactor building cover	《Unit 1》 - Start of preparation work * (from May 13) * - Maintenance of road for crane - Creation of slope for moving of crane - Maintenance of Shallow Draft Quay	 Image of install of reactor building cover for Unit 1
			《Unit 3,4》 - On the process of designing	  Preparation work for installing reactor containment cover for Unit1

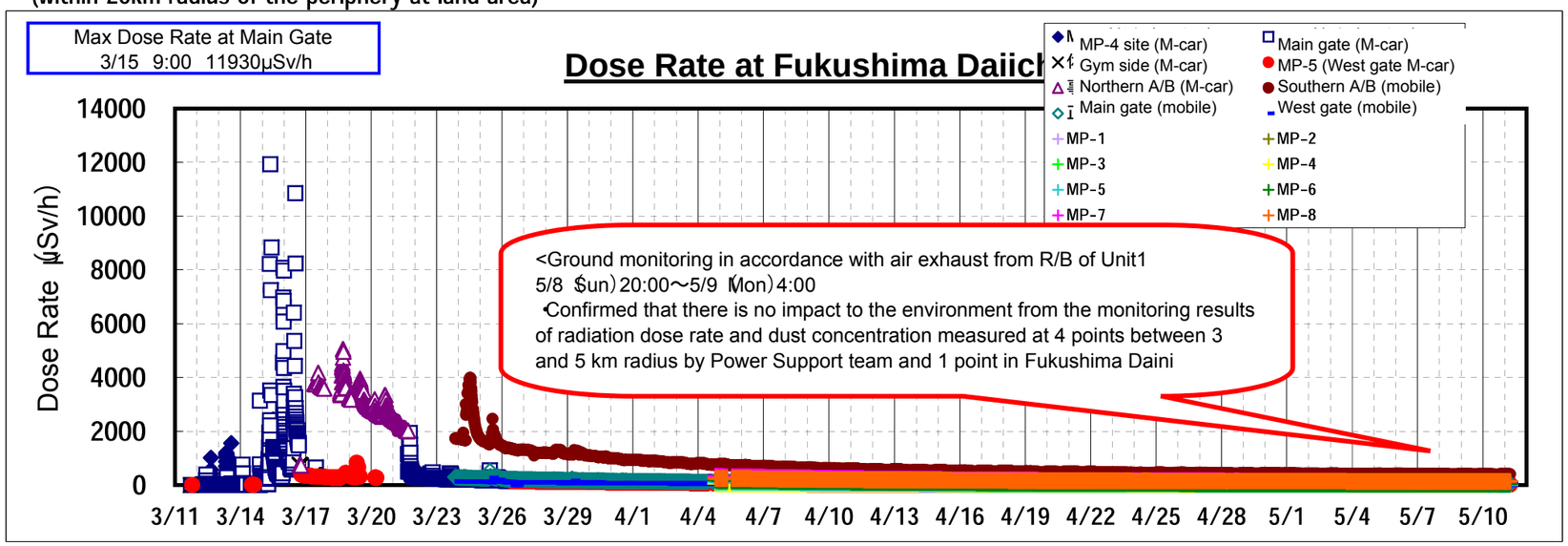
Progress status of decontamination and monitoring (Description)

Issues		Countermeasures	Implementation Status	Photos and figures
III. Decontamination/ Monitoring	(6) Measurement, Reduction and Announcement	Countermeasure [60, 61] Expansion, enhancement and announcement of monitoring	Continue monitoring in and out of the power station [Land Area] <Monitoring within 20km radius of the periphery> - Monitoring of airborne radiation at 128 points, and dust concentration at 12 points by the collaboration between MEXT, Power Support Team and TEPCO (April 18) - Monitoring of airborne radiation at 50 points by Power Support Team (from May 6, weekly) - Monitoring at 5 points between 3km and 5km radius of the periphery at the timing of entry in the building of Unit 1 (open the airlock) (May 8 and 9)	Result record of airborne radiation (May 6,

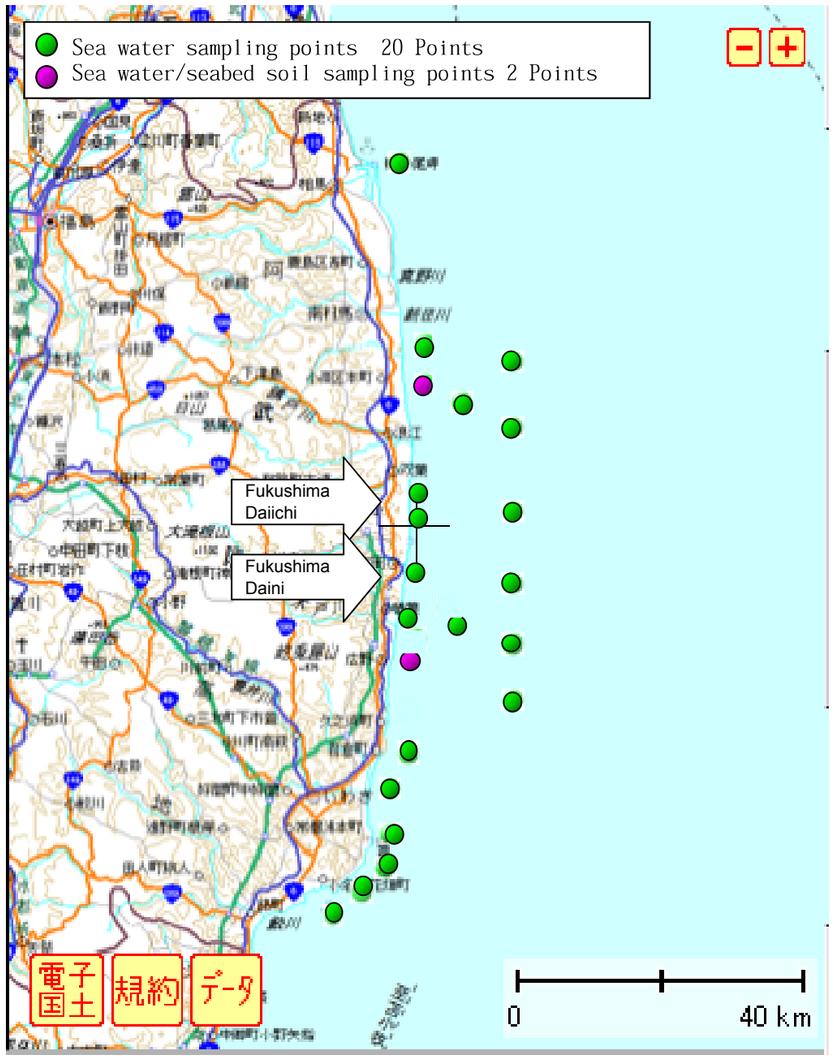
Monitoring of airborne radiation by Power Support Team
(within 20km radius of the periphery at land area)



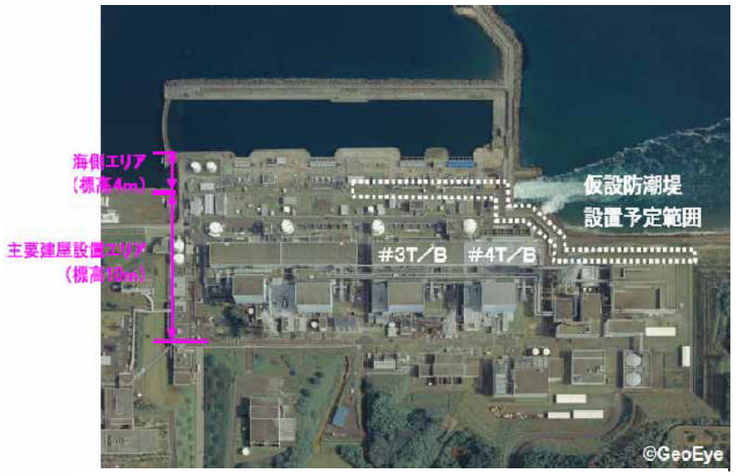
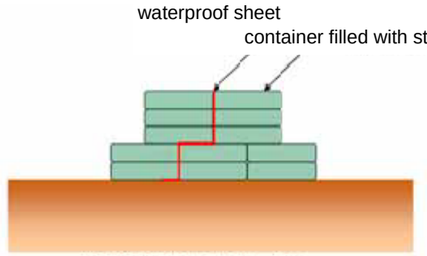
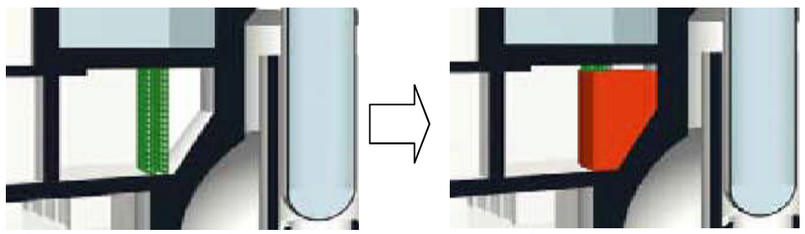
Location of environment monitoring point within 20km radius of the periphery of
Fukushima Daiichi Nuclear Power Station



Progress status of decontamination and monitoring (Description)

Issues		Countermeasures	Implementation Status	Photos and figures
III. Decontamination/ Monitoring	(6) Measurement, Reduction and Announcement	Countermeasure [60, 61] Expand/ enhance monitoring and announce	[Ocean Area] <Fukushima Prefecture> - Monitoring of sea water at 16 points (as of April 17) -> Increase the number of the collecting points to 22 for sea water(from May 5) and 2 points for marine soil(from April 29) <Ibaraki Prefecture> - Start monitoring of sea water at 5 points (from April 29)	-Fukushima Prefecture Sampling points at front sea area-  -Ibaraki Prefecture Sampling points at front sea area- 

Progress status of countermeasures against aftershocks, etc. (Description)

Issues			Countermeasures	Implementation Status	Photos and figures
IV. Countermeasures against aftershocks, etc.	(7) Tsunami, reinforcement, etc.		Countermeasure [69] Countermeasures against tsunami	- Distribution switchboard and temporary DG ware moved to the upland (April 15) - Multiplication of water injection line (until April 15) - Setting fire engines in the upland (until April 18)	 planned temporary tide barrier (white dotted line)  fire engines in the upland  仮設防潮堤断面図（イメージ）   Example of construction
		Unit 4	Countermeasure [26] Installation of supporting structure under the bottom of the fuel pool	- Soundness of structure was analyzed and evaluated - Removing debris - After removing the debris, installation work starts (around May 23)	Outline of supporting structure  Steel pillar installation Concrete wall Removing debris  Before the work After the work
		Countermeasure [70] Enhancement of countermeasures against tsunami	- Installation of temporary tide barrier (target: middle of June)		

Progress status of countermeasures against aftershocks, etc. (Description)

Issues			Countermeasures	Implementation Status	Photos and figures
IV. Countermeasures against aftershocks, etc.	(7) Tsunami, reinforcement, etc.		Countermeasure [72] Preparation of various countermeasures for radiation shielding	<Application of slurry> - Pipe work completed, concrete pumping vehicle arranged (May 17)	**Practical training at Fukushima Daini**  Full view of the plant  Slurry production facility (mobile batcher plant)   Situation of pipe laying  **Material/equipment preparation at Fukushima Daiichi**  Preparation of material (sand)  Situation of pipe laying  Preparation of material  "Elephant No.3"
			Countermeasure [73] Continuation of various countermeasures for radiation shielding		

Progress status of environment improvement (Description)

Issues		Countermeasures	Implementation Status	Photos and figures
V. Environment Improvement	(8) Life/work environment	Countermeasure [74] Improvement of life/work environment of workers	- Improvement of meals, Upgrading of lodging facility - Security of daily life water - Installation of rest station at the site (approx. 600m2)	 Rest station (in front of Main Anti-Earthquake Building) Area space: 270m2 Capacity 50 personnel
		Countermeasure [75] Continuation and enhancement of improvement of life/work environment of workers	- Installation of temporary dormitory - Increasing available amount of daily life water - Expansion of rest station at the site and restoration of existing station	 entrance of main anti earthquake building (unit house to manage in-out of workers)  entrance of main anti earthquake building (view from inside)  radiation measurement inside the building

The Great East Japan Earthquake and Current Status of Nuclear Power Stations

東京電力 TEPCO

Table of contents

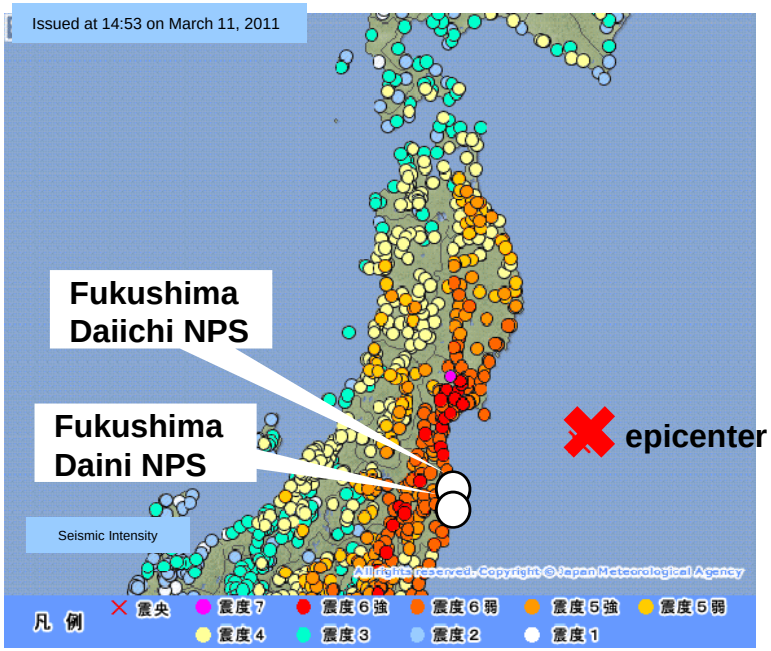
1. Overview of the Earthquake & Tsunami and Nuclear Accident

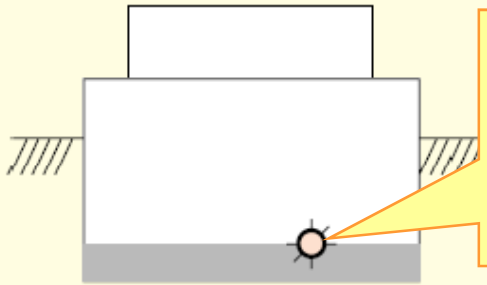
(updated May 18, 2011)

Tohoku Pacific Ocean Earthquake

- **Time:** 2:46 pm on Fri, March 11, 2011.
- **Place:** Offshore Sanriku coast (northern latitude of 38 degrees, east longitude of 142.9), 24km in depth, Magnitude 9.0
- **Intensity:** **Level 7** at Kurihara in Miyagi Miyagi prefecture
  Upper 6 at Naraha, Tomioka, Okuma, and Futaba in Fukushima pref.
  Lower 6 at Ishinomaki and Onagawa in Miyagi pref., Tokai in Ibaraki pref.
  Lower 5 at Kariwa in Niigata pref.
  Level 4 at Rokkasho, Higashidori, Mutsu and Ohma in Aomori pref., Kashiwazaki in Niigata pref.

【Epicenter】





Seismic Acceleration at Fukushima Daiichi Unit 2
Horizontal： 550gal
Vertical： 302gal
(provisional value)

Seismometer

* gal: a unit of acceleration defined as cm/s².

Seismic Observed Data

Comparison between Basic Earthquake Ground Motion and the record of intensity

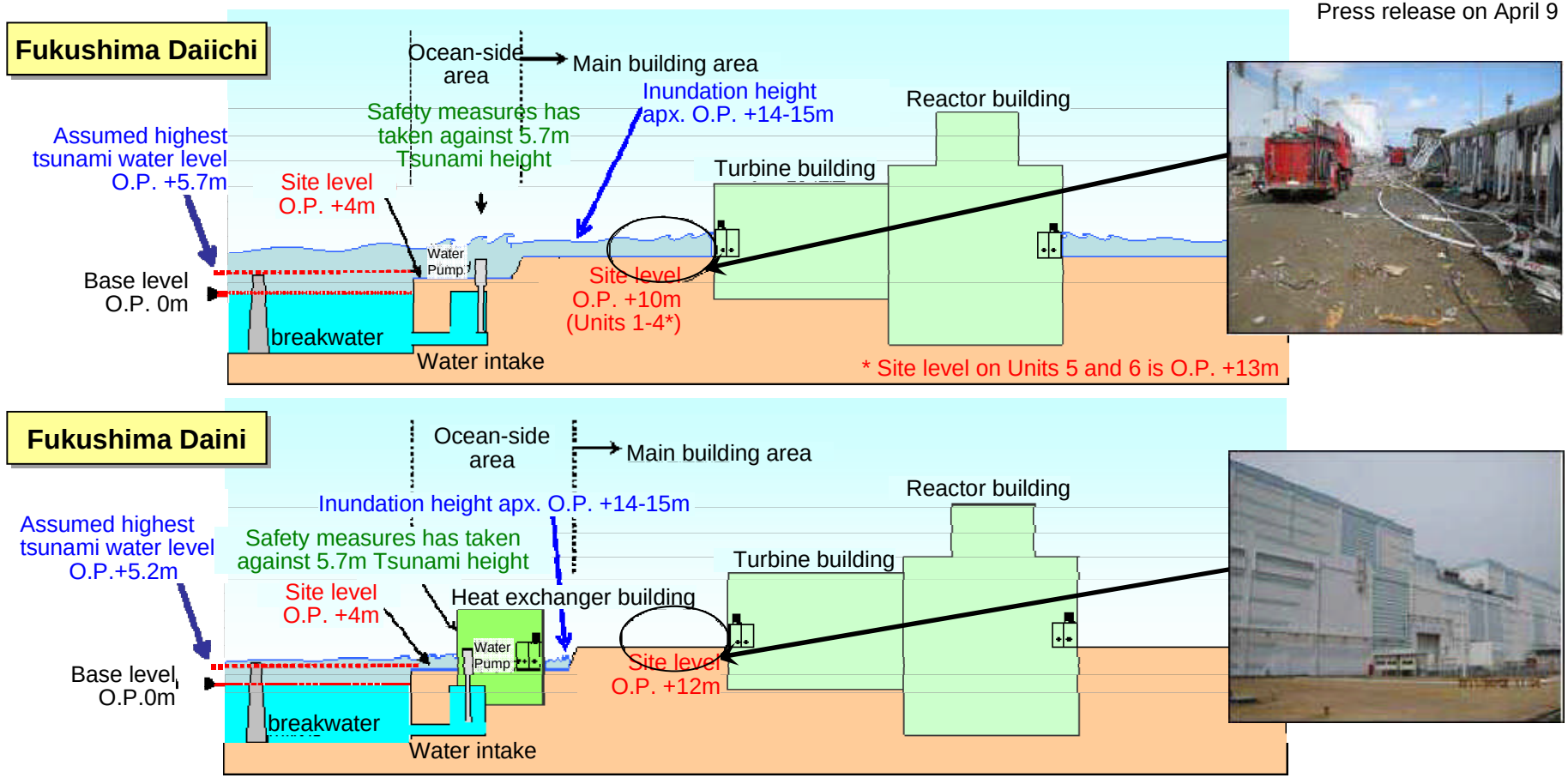
Observation Point (The lowest basement of reactor buildings)		Observed data (*interim) Maximum Response Acceleration (gal)			Maximum Response Acceleration against Basic Earthquake Ground Motion (Gal)		
		Horizontal (N-S)	Horizontal (E-W)	Vertical	Horizontal (N-S)	Horizontal (E-W)	Vertical
Fukushima Daiichi	Unit 1	460*2	447*2	258*2	487	489	412
	Unit 2	348*2	550*2	302*2	441	438	420
	Unit 3	322*2	507*2	231*2	449	441	429
	Unit 4	281*2	319*2	200*2	447	445	422
	Unit 5	311*2	548*2	256*2	452	452	427
	Unit 6	298*2	444*2	244	445	448	415
Fukushima Daini	Unit 1	254	230*2	305	434	434	512
	Unit 2	243	196*2	232*2	428	429	504
	Unit 3	277*2	216*2	208*2	428	430	504
	Unit 4	210*2	205*2	288*2	415	415	504

*1: The data above is interim and is subject to change.
*2: The recording time was about 130-150 seconds

Height of Tsunami

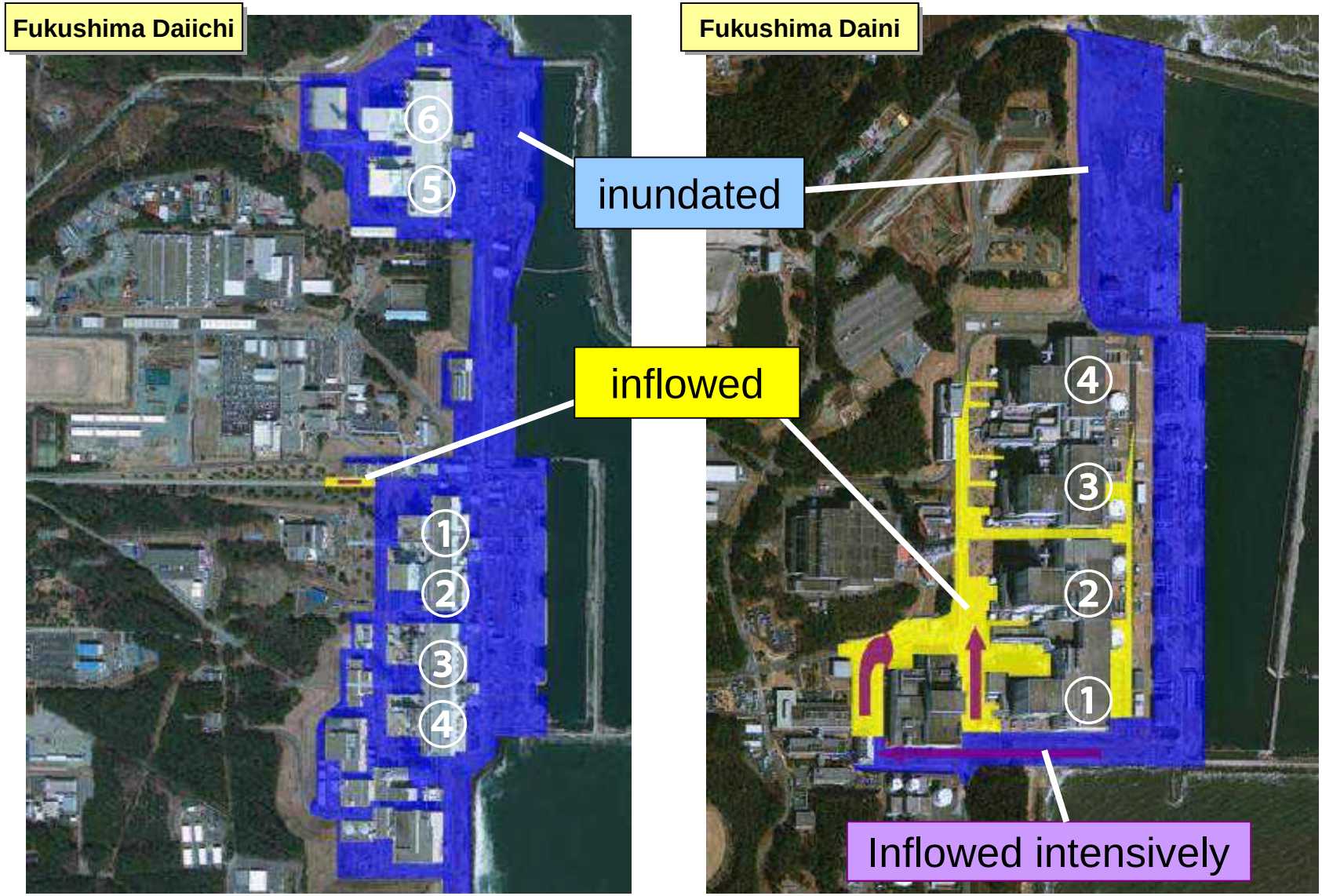
- Based on the evaluation method by the Japan Society Civil Engineers revised on 2002, we conducted an assessment regarding Tsunami of O.P. 5.1～5.7m, and based on this evaluation, we have taken safety measures.
- At Fukushima Daiichi Nuclear Power Station, inundation with inundation height of approximately O.P. + 14 to 15 meters and inundation depth approximately 4 to 5 meters occurred in most of the area.
- At Fukushima Daini Nuclear Power Station, inundation with inundation height of approximately O.P. + 6.5 to 7 meters occurred in the ocean-side areas, however, only surrounding areas of Unit 1 and 2 buildings and the south side of Unit 3 building was inundated within the main building area.
- **Accordingly, we have confirmed that the impact of tsunami was relatively larger in Fukushima Daiichi Nuclear Power Station than Fukushima Daini Nuclear Power Station.**

Press release on April 9



O.P.：Onahama bay construction base level

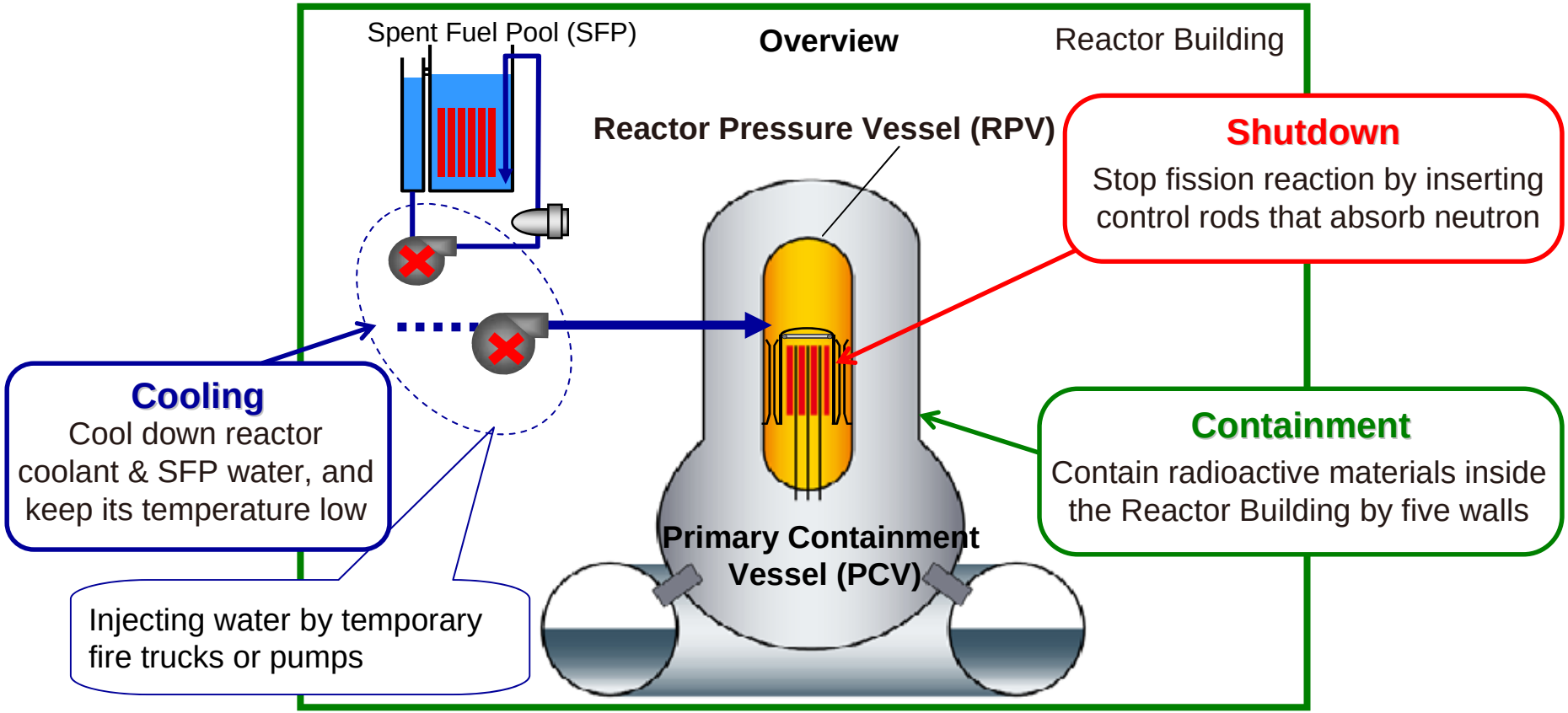
Inundated and Inflowed Area at Fukushima Daiichi and Daini Site



© GeoEye

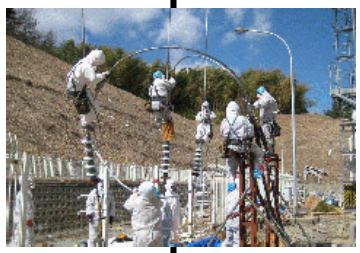
Impacts for Safety Function

- "Shutdown" was secured by automatically with all control rods inserted immediately after the first hit of the quake.
- Transmission lines were damaged by the quake; diesel generators started generating but subsequently were lost due to the Tsunami, leading Station Black Out.
- Most of the "Cooling" function of reactor and spent fuel pool were lost by the loss of power supply caused by Tsunami
- High level contaminated water has been found in turbine buildings, "Containment" function is presumed to be impaired.



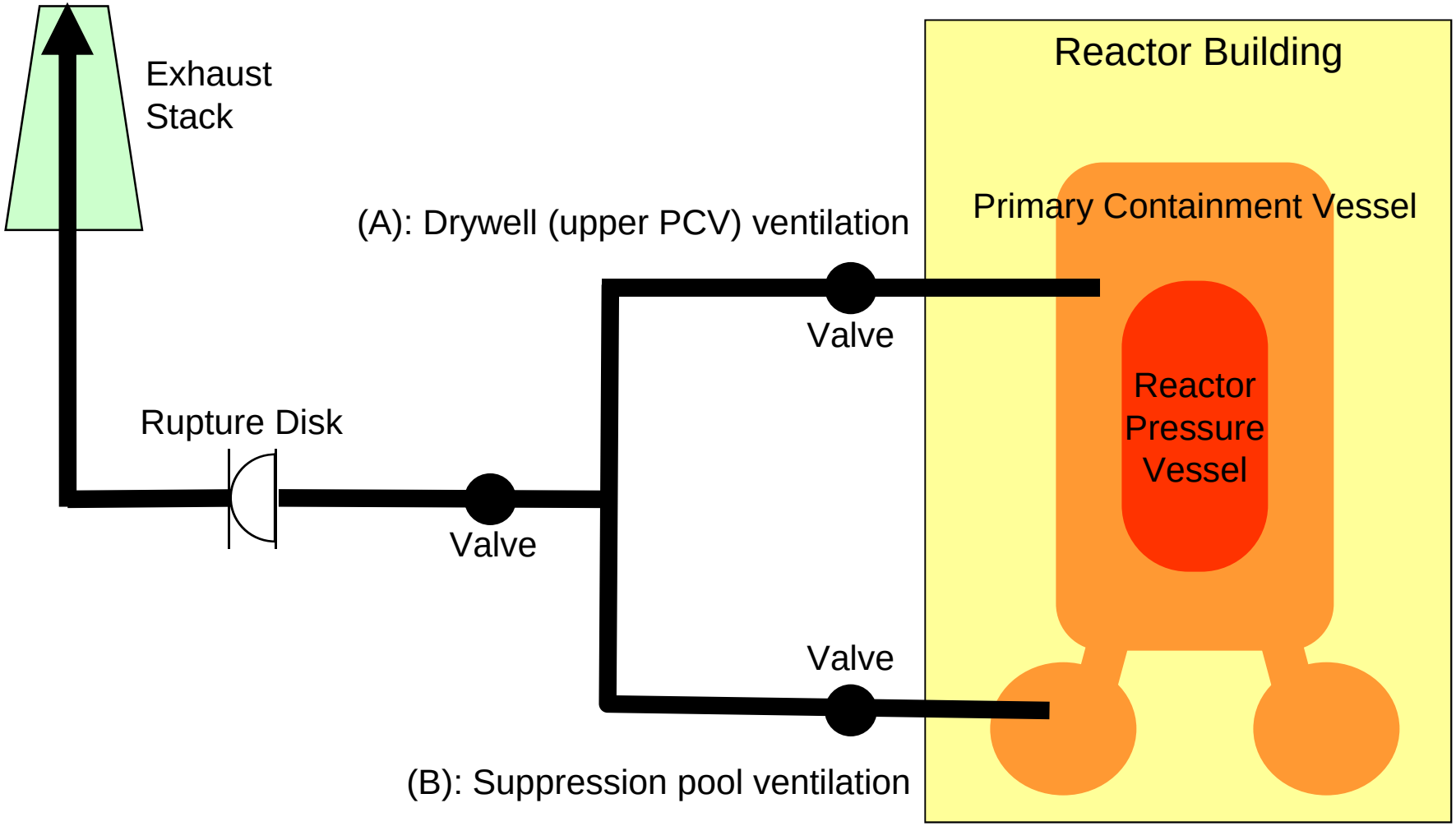
Chronology of Fuel Cooling (Fukushima Daiichi)

SF Pool | Reactor | Power Supply

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5-6	Common SF Pool
March 11, 14:46	**Earthquake**					
11th	11 Cooling by injecting fresh water				One D/G survived	
12th	12 Start injecting sea water		13 Start injecting sea water			
13th						
14th		14 Start injecting sea water				
17th			17 Start watering (sea water, fresh water)	20 Start watering (sea water, fresh water)	20 Reactor cooling shutdown	
20th		20 Start injecting sea water				
21th				22 Power Center (P/C) energized from Offsite Power	20～21 Switched from D/G to offsite power	21 Fresh water injection
22th			23 Recover Main Control Room lighting			
23th	24 Recover Main Control Room lighting					24 Received electricity from offsite
24th		26 Recover Main Control Room lighting				24 Start cooling by existing system
25th	25 Switch from sea water to fresh water		25 Switch from seawater to fresh water	29 Recover Main Control Room lighting		
26th		26 Switch from sea water to fresh water				
27th			29 Switch from seawater to fresh water	30 Switch from sea water to fresh water		
31st	31 Start watering fresh water	29 Switch from sea water to fresh water				

Measure to Decrease Pressure of PCV (Ventilation)

- Implemented ventilation to reduce the pressure of Primary Containment Vessel (PCV) in Unit 1-3



Recovery Status (Main Control Room)

- Main Control Room Power recovered as the first step of restoration
  - March 22 at 22:45 Unit 3 Main Control Room lights turned on
  - March 24 at 11:30 Unit 1 Main Control Room lights turned on
  - March 26 at 16:46 Unit 2 Main Control Room lights turned on
  - March 29 at 11:50 Unit 4 Main Control Room lights turned on

Unit 1 Main Control Room lights turned on
（Light covers came off due to the earthquake）

Unit 4 Main Control lights turned on

INES (International Nuclear Event Scale) Evaluation

- On April 12, Nuclear and Industrial Safety Agency released as below:
  - Tentatively assigned Level 7 on INES for the accident at Fukushima Daiichi Nuclear Power Station.
  - The amount of released radioactive material is one-tenth as much as the accident at Chernobyl.

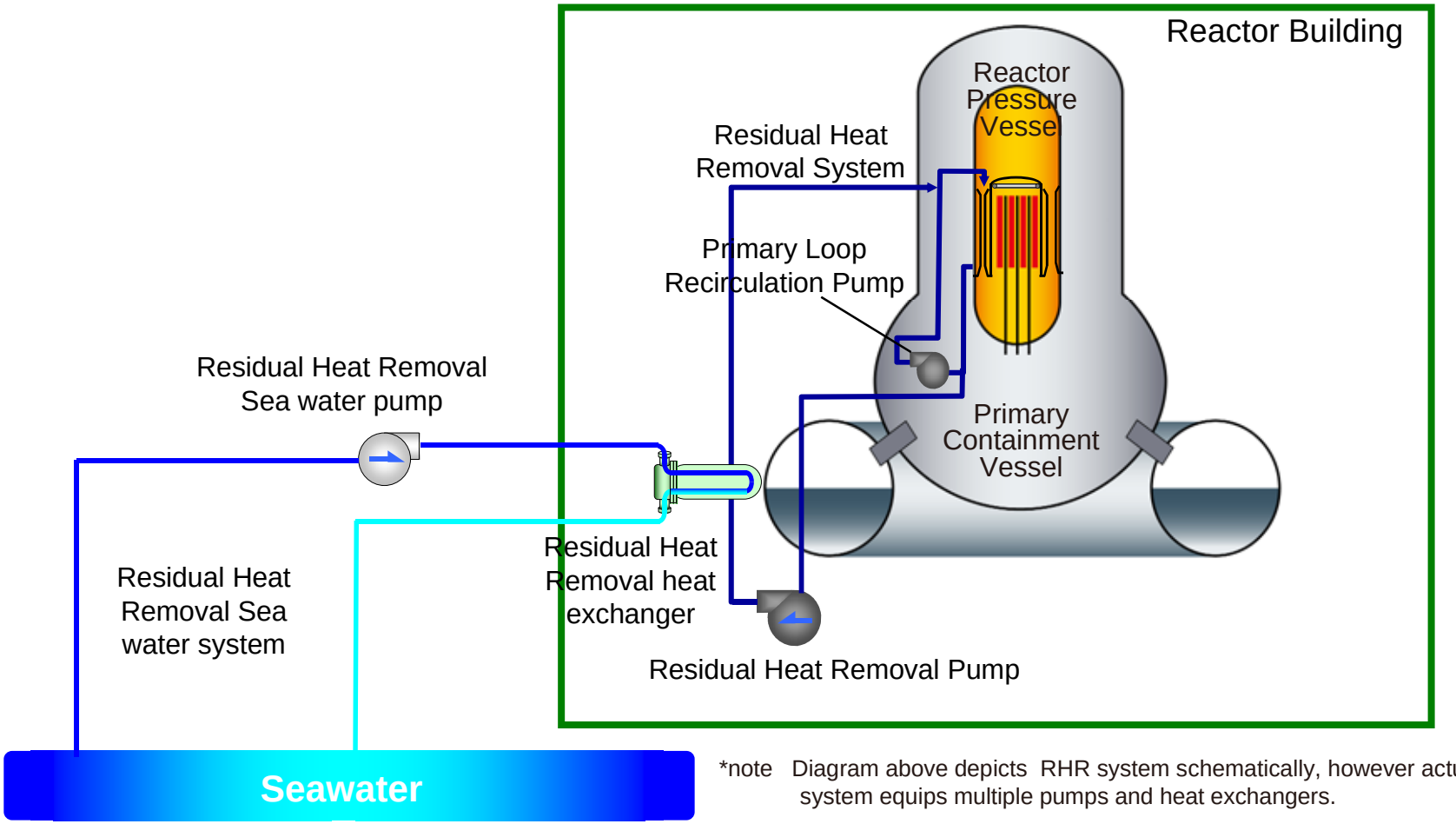
	Estimated release from Fukushima Daiichi		(Reference) Release from Chernobyl
	by NISA	by Nuclear Safety Commission	
Iodine 131 (a)	130 thousands T Bq ($1.3X10^{17}$Bq)	150 thousands T Bq ($1.5X10^{17}$Bq)	1,800 thousands T Bq ($1.8X10^{18}$Bq)
Cesium 137	6 thousands T Bq ($6.1X10^{15}$Bq)	12 thousands T Bq ($1.2X10^{16}$Bq)	85 thousands T Bq ($8.5X10^{16}$Bq)
Iodine value conversion (b)	240 thousands T Bq ($2.4X10^{17}$Bq)	480 thousands T Bq ($4.8X10^{17}$Bq)	3,400 thousands T Bq ($3.4X10^{18}$Bq)
(a) + (b)	**370 thousands T Bq ($3.7X10^{17}$Bq)**	**630 thousands T Bq ($6.3X10^{17}$Bq)**	**5,200 thousands T Bq ($5.2X10^{18}$Bq)**

INES level 7 equivalent : over 10 thousands Tera Becquerel (T Bq) (over 10^{16}Bq)

Source: Nuclear and Industrial Safety Agency

[Reference] Core Cooling System under Normal Shutdown

- Nuclear fuels continue to generate decay heat even after stop of fission by control rod insertion
- In order to remove decay heat, “Residual Heat Removal System (RHR)” is installed. RHR pumps circulate reactor coolant and remove heat by sea water through heat exchanger in “Residual Heat Removal Sea water System”
- This will enable fuels in reactors to be kept in stabilized cooling state (under 65℃).



*note Diagram above depicts RHR system schematically, however actual system equips multiple pumps and heat exchangers.

2. Current Status of Fukushima Daiichi and Fukushima Daini Nuclear Power Station

(as of May 16, 2011)

東京電力 TEPCO

Plant Status: Fukushima Daiichi

- Units 1-3: Injecting fresh water by temporary motor-driven pumps in order to cool the fuels in reactors.
- Units 1-4: Injecting fresh water from the top or via Fuel Pool Cooling System intermittently in order to cool the fuels in spent fuel pool.
- Units 1-3: Found contaminated water with high radioactive materials in turbine buildings. Pumping out of the water into the condensers, etc. is in progress.
- Unit 1: Injecting N_2 into PCV to lower the possibility of hydrogen explosion. Also scheduled for Units 2&3.
- Units 5&6: Under cold shutdown.
- Incidents assumed to be hydrogen explosion occurred at Unit 1 on March 12 and at Unit 3 on March 14. At that time it is also pointed that hydrogen explosion might have occurred at Unit 4; however, this is assumed to be caused by hydrogen gas generated at Unit 3 that flowed into Unit 4.

			#1 460MW	#2 784MW	#3 784MW	#4 784MW	#5 784MW	#6 1,100MW
Pre-Earthquake Status			Operating			Shutdown for Outage		
After Earthquake	Shutdown		○ Automatic Shutdown			—	—	—
	Cooling	Reactor	△ Offsite Power Freshwater	△ Offsite Power Freshwater	△ Offsite Power Freshwater	– Fuels have been removed	○ Cold Shutdown	○ Cold Shutdown
		Pool	△	△	△	△	○	○
	*Containment		X Highly contaminated water	X Highly contaminated water	X Highly contaminated water	△	○	○

○ :functioning △: non-functioning (work in progress) X: non-functioning (not working)

*There are damages on upper part of the Reactor buildings of Unit 1,3 and 4. There is a possibility of malfunction of containment in suppression chamber of Unit2. Holes were drilled on the roof of reactor buildings of Units 5 and 6 to prevent hydrogen accumulation.

*Results of the provisional analysis show that the fuel pellets of Unit 1melted and fell to the bottom of RPV at a relatively early stage after the tsunami reached the plant. However, as the temperature of the RPV of Unit 1 is in the range of 100℃ - 120℃, stable cooling is being achieved.

Plant Status: Fukushima Daini

- Unit1-4: Automatic Shutdown, although operating at the time of the earthquake.
- Unit 3: Cold Shut down in 22hrs after the quake.
- Unit1,2 & 4: Although offsite power maintained, heat removal facilities for reactors were submerged due to the Tsunami. The heat removal functions were restored by the following recovery work.

		# 1 1,100MW	# 2 1,100MW	# 3 1,100MW	# 4 1,100MW
Pre-Earthquake Status		Operating			
After Earthquake	Shutdown	○			
	Cooling	○ (Cold Shutdown)			
	Containment	○			

○ :functioning △: non-functioning (work in progress) X: non-functioning (not working)

Plant Parameters (Fukushima Daiichi) as of May 16 at 6:00

RPV Pressure [MPa-g]

Unit 1	Unit 2	Unit 3
1.350	-0.020	-0.087

RPV Temp [℃]

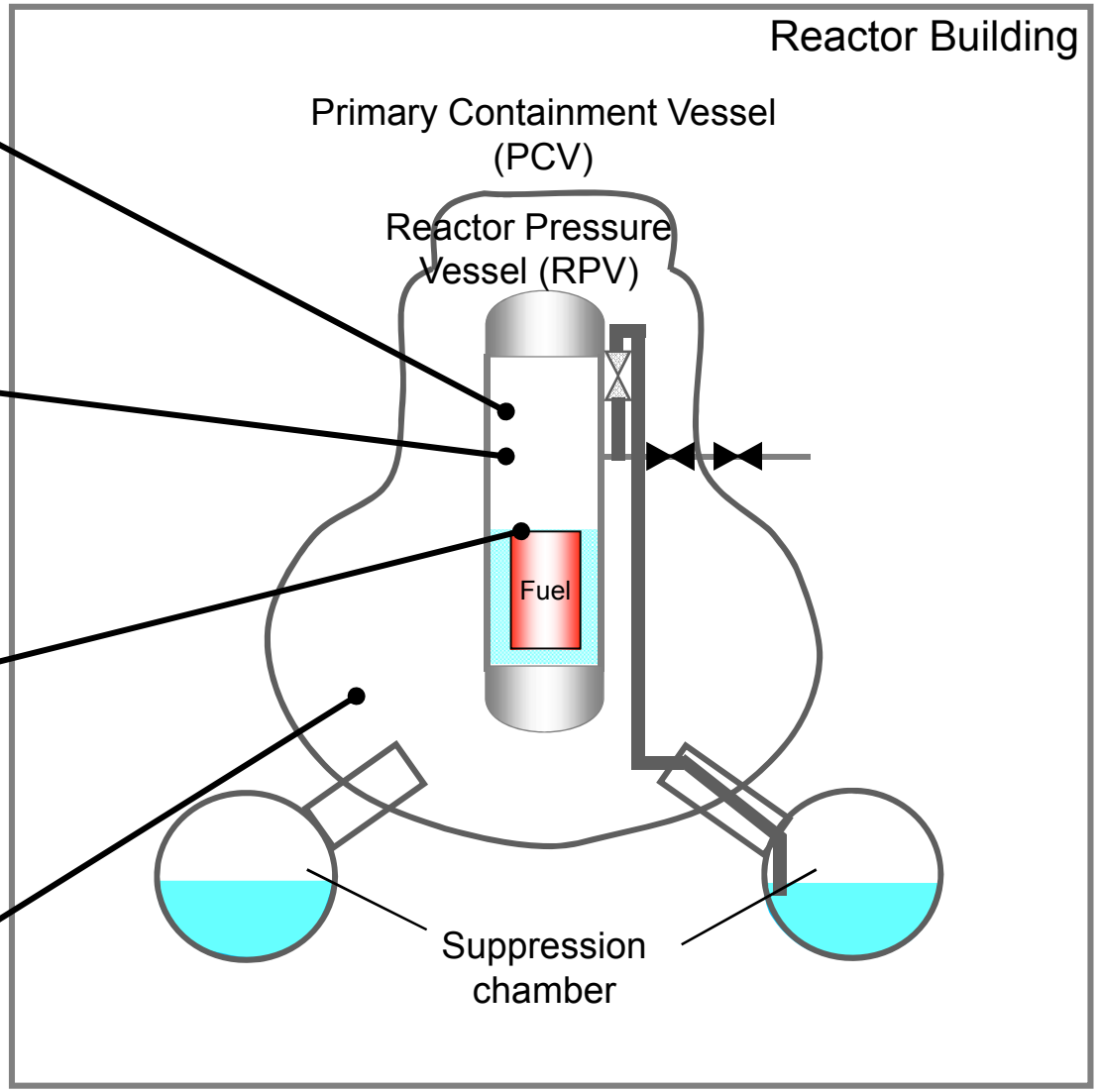
Unit 1	Unit 2	Unit 3
95.1 (Feedwater Nozzle)	113.5 (Feedwater Nozzle)	141.3 (bottom of RPV)

Reactor water level [mm]

Unit 1	Unit 2	Unit 3
Below the range	-2,100	-2,300

Drywell pressure [MPa-abs]

Unit 1	Unit 2	Unit 3
0.1178	0.055	0.1027



Pressure conversion: Gauge pressure (MPa-g)=absolute pressure (MPa-abs)-atmospheric pressure(0.1013Mpa)

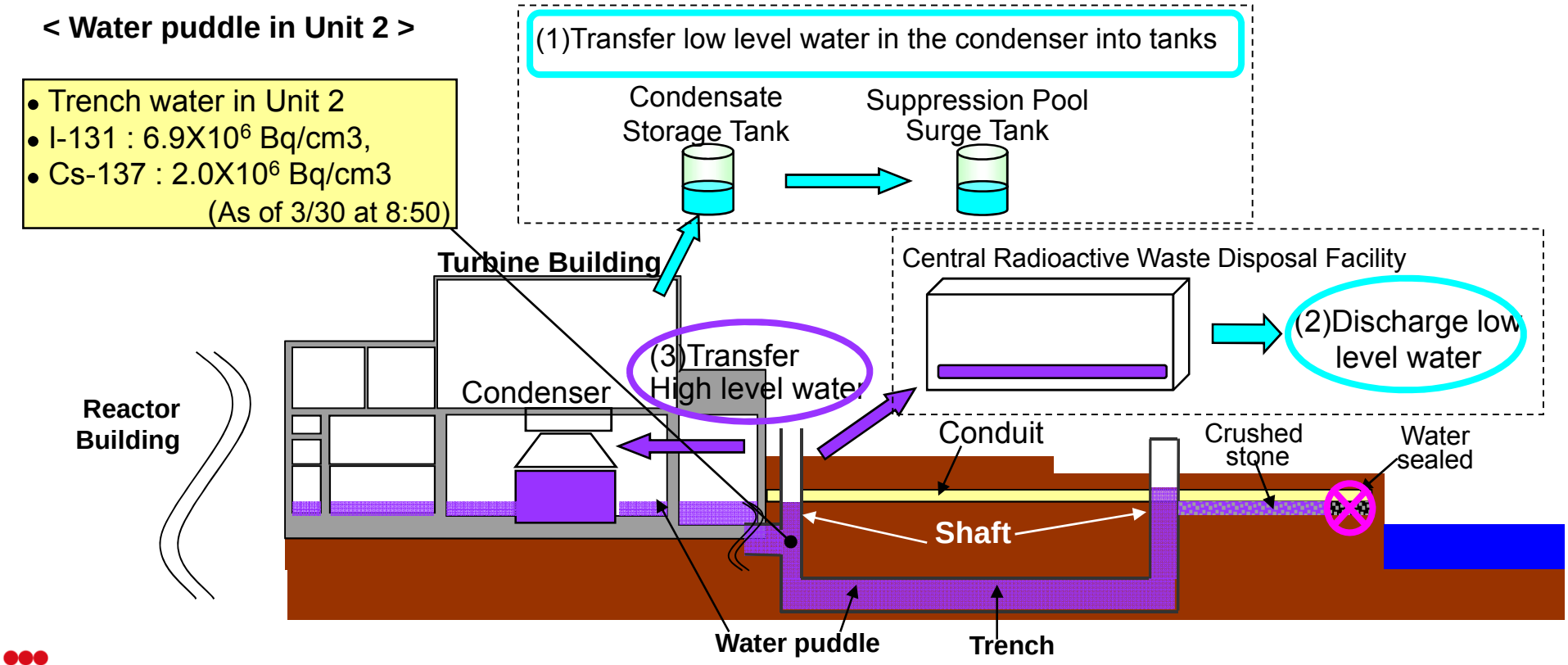
*Posted in one gauging

Measures against Water Puddles at Fukushima Daiichi

- Contaminated water with high radioactive materials has been found in large quantity in turbine buildings of Units 1-3 etc. Following measures will be taken to store them safely.
- Transfer the water to the condenser or Central Radioactive Waste Disposal Facility (CRWDF) and store them safely to prevent it from running off outside the boundary.
  - ✓ Transferred low level radioactive waste water stored in the condenser to the tanks outside (1).
  - ✓ Discharged 10,000 tons of low level radioactive water stored in CRWDF into the sea (2).
    (Radioactivity in 10,000 tons of the low level water is equivalent to 10 litter of high level water in Unit 2.)
  - ✓ Transferred high level water into the condenser. Begun transferring the water in the trench to CRWDF in Unit 2 (3).

< Water puddle in Unit 2 >

- Trench water in Unit 2
- I-131 : 6.9×10^6 Bq/cm3,
- Cs-137 : 2.0×10^6 Bq/cm3
  (As of 3/30 at 8:50)



Countermeasures to Prevent Diffusion of Radioactive Materials

- Sprayed dust inhibitor agents to reduce spreading of powder dust containing radioactive materials on the ground. (Had been spraying intermittently since April 1st. Have been spraying at full-scale since April 26).
- Took following measures in order to prevent radioactive contaminated water from running off into the sea.
  - ✓ Injected coagulants from the holes near the shaft. Have confirmed the outflow from the crack on the concrete wall of the pit stopped. (at 5:38 am, April 6)
  - ✓ Installed a rubber plate and jig to enhance water sealing.
  - ✓ Monitoring continuously for any existence of leakage.
- Took following measures in order to prevent contaminated water from running off from the plant's port .
  - ✓ Launched construction of installing large sandbags around the breakwater at southern part of the site.
  - ✓ Installed silt fences, etc. around the breakwater or in front of screens at southern part of the site.

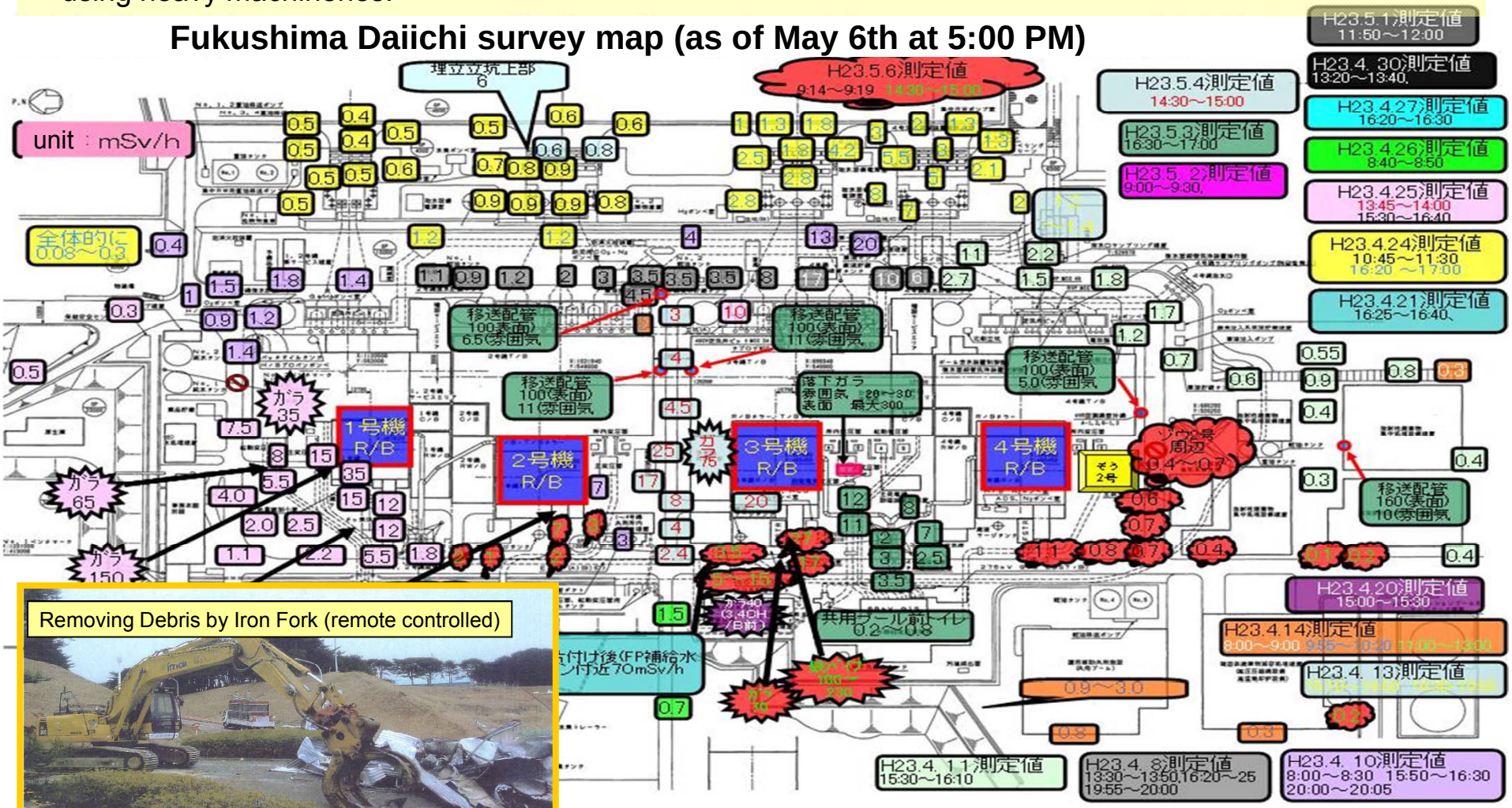
Spraying dust inhibitor agents

Coagulant injection to stop outflow

Measurement of Radiation Dose at the Power Station and Removal of Debris

- Onsite dose map has been compiled and attention has been called upon workers to reduce exposure during works on the site.
- Many debris are on the site and some of them are high radiation dose. These debris are being removed by using heavy machineries.

Fukushima Daiichi survey map (as of May 6th at 5:00 PM)



Radiation Protection for Workers

- Under high radiation circumstance at all area of Fukushima-Daiichi nuclear power station, we are managing and controlling radiation dose.
- It was confirmed that the effective exposure dose of two female employees were exceeded the statutory dose limit from May 1, 2011. We drew up and submitted recurrence prevention measures to the government at May 2.
- We will review the radiation control which was conducted at the time of earthquake and take the following actions in order to make a safer situation for the restoration work.

Radiation Protection Equipment and Control of Work

- Equipment for radiation protection： tyvek and glove is wore for working. Inhaler is wore when density of radioactive substances in the air exceeds the notification level. In addition, anorack etc. are also considered according to weather and pollution situation of a work site.
- Work management：When making working plans, we conduct thorough pre-survey and inform to secure safety, and avoid exposure as much as possible by appropriate management such as indication of high radioactive area by rope.

Main Anti-Earthquake Building

External Radiation Dose Control

- When employees work outdoors, we will make them carry their dosimeters to manage their radiation dose. We will procure the required number of dosimeters soon and, until then, we will make a representative carry his dosimeter and we will conduct evaluations.

Internal Radiation Dose Control

- To reduce internal exposure, all the staffs are periodically measured once in a month (normally once in 3 months).

Compliance with Radiation Limitation

- In case that external exposure exceeds 100 mSV → Internal exposure is evaluated by a whole body counter.
- In case that external exposure exceeds 150 mSV → Judgment for continuation of work is made.
- In case that total exposure (external and internal) exceeds 200 mSv → They are not assigned for work.

statutory dose limit ※

Male：50mSv / 1year and 100mSv / 5year, Female：5mSv / 3month

※At Fukushima-daiichi nuclear power station, dose limit has raised up to 250 mSv limited to unavoidable emergency case.

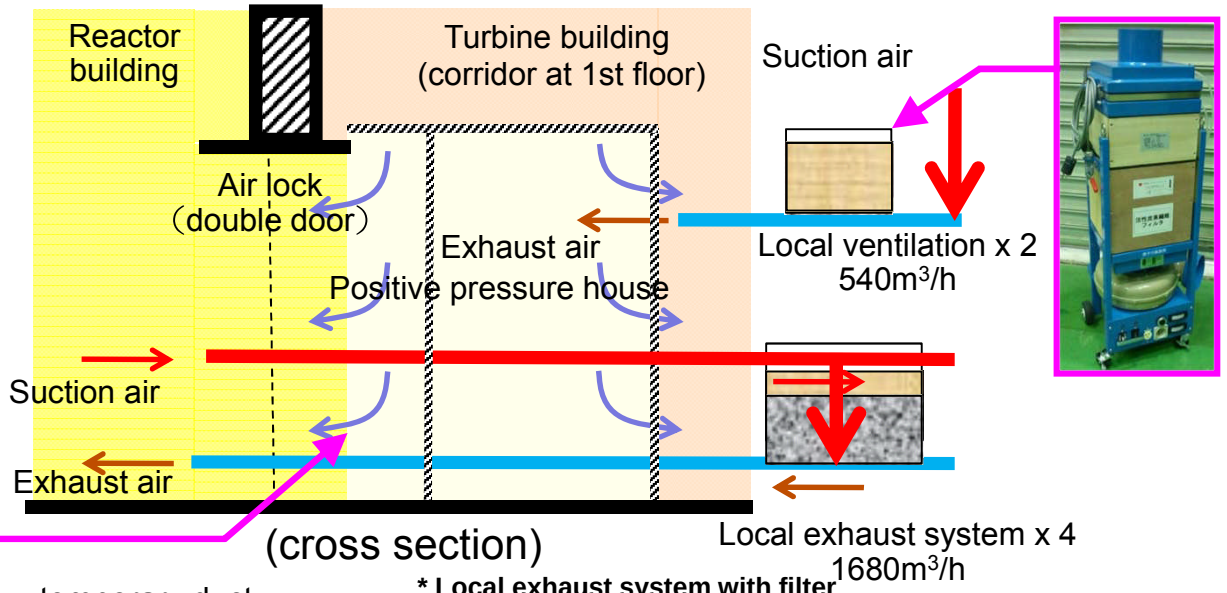
Ventilation by Local Exhaust System and Entrance into the Unit 1 Reactor Building

- In order to enable workers to enter into the building for installation work of the reactor circulating cooling system, etc., work conditions are being improved by reducing concentration of radioactivity, etc.
- Local exhausters were installed to remove radioactive materials by filter at unit1.
- After measuring radioactivity in the reactor building and confirming that external impact was sufficiently low, the double doors of the reactor building were opened on May 9 and workers entered into the reactor building and begun dose measurement, etc. in preparation of future works.

Entering into the reactor building

- **Installed local exhaust system with filter* in the corridor on the first floor of the turbine building.**
- Installed **a positive-pressure house** in front of north air lock of the reactor building.
  - Ventilation of the reactor building will be done in a way that positive pressure will constantly be applied from the turbine building to the reactor building.


Installing temporary duct



*** Local exhaust system with filter equipment to clean up the air by letting in the air in the work area and removing impurity through the filter**

Survey inside Reactor Buildings by Robots

- Measurements of dose, etc were carried out by remote control robots inside the Double Doors (D/D) of reactor buildings (R/B) of Units 1-3, where previously it was assumed to be impossible to enter due to anticipated high dose.
- Examining how to utilize robots for field surveys such as measuring radiation dose indoors and outdoors.

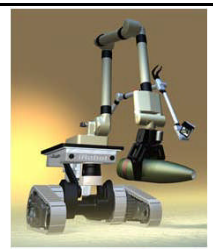
Opening a double door (April 18)

<Measurement Results>

	Unit 1	Unit 2	Unit 3
Date	4/17 16:00~17:00	4/18 13:42~14:33	4/17 11:30~14:00
Measuring Area	R/B 1st floor Northern D/D ~ Elevator	R/B 1st floor Around southern D/D	R/B 1st floor Around southern D/D
Radiation dose	49mSv/h(Max) 10mSv/h(Min)	4.1mSv/h (D/D opened)	57mSv/h(Max) 28mSv/h(Min)
Temperature	Approx. 28~29℃	Approx. 34~41℃	Approx. 19~22℃
Humidity	Approx. 49~56%	Approx. 94~99%	Approx.32~35%
Oxygen density	Approx. 21%	Approx.19~20%	Approx. 21%

(provisional figure)

<List of Robots Provided to TEPCO>

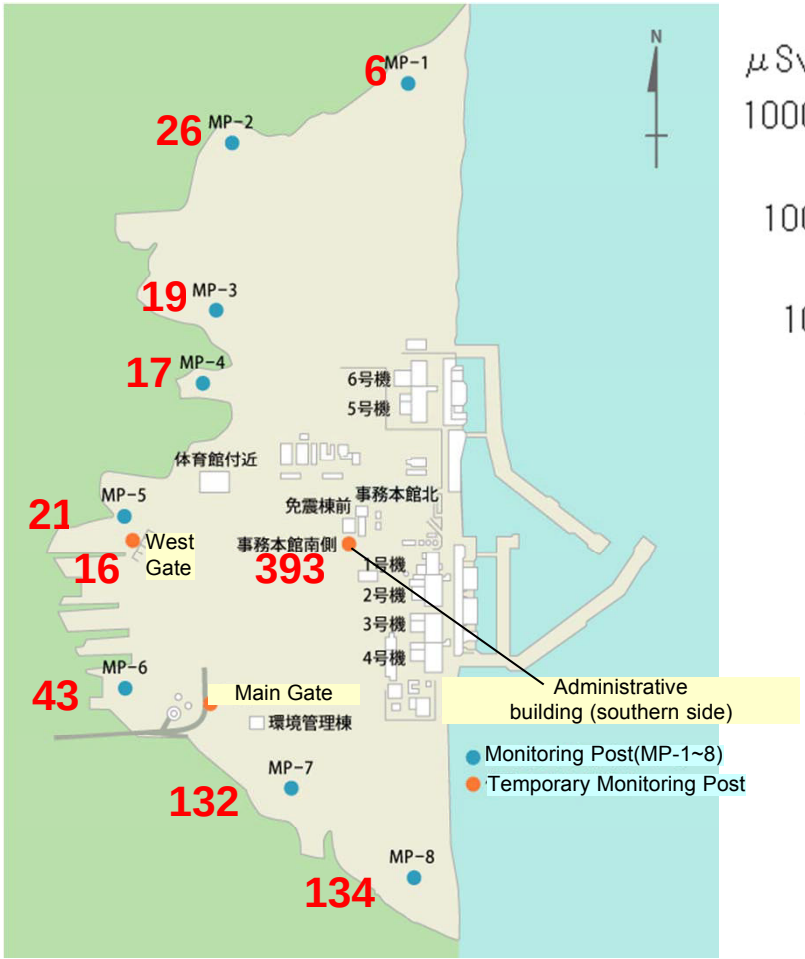
Manufactures	Robots by iRobot		Robots by QinetiQ	
				
Name	Packbot	Warrior	Talon	Dragon Runner
Monitoring function	image	Image only	image	Image only
	Radiation etc.	—	Radiation etc.	—
Arm retention capability	○	◎	○	○

Monitoring Data (at Site Boundary of Fukushima Daiichi)

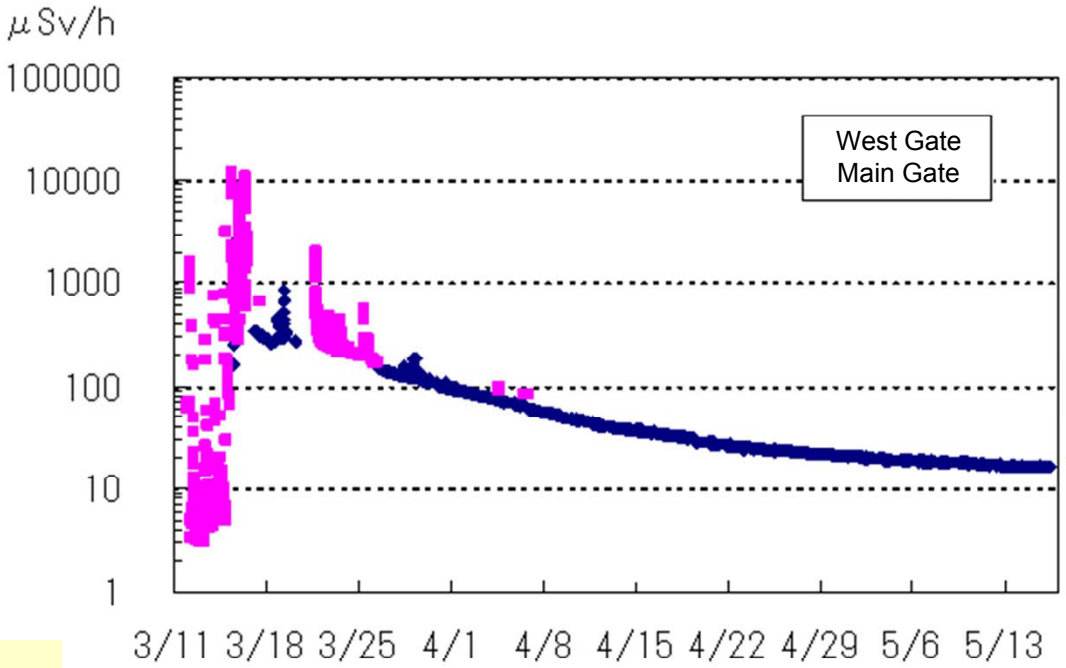
- Monitoring data at the site boundary of Fukushima Daiichi.
- We Continue to monitor the surrounding environment.

Monitoring post air dose rate

:μSv/h as of 9:00 pm on May 16th, 2011



Dose Rate Trend at the Site Boundary of Fukushima Daiichi



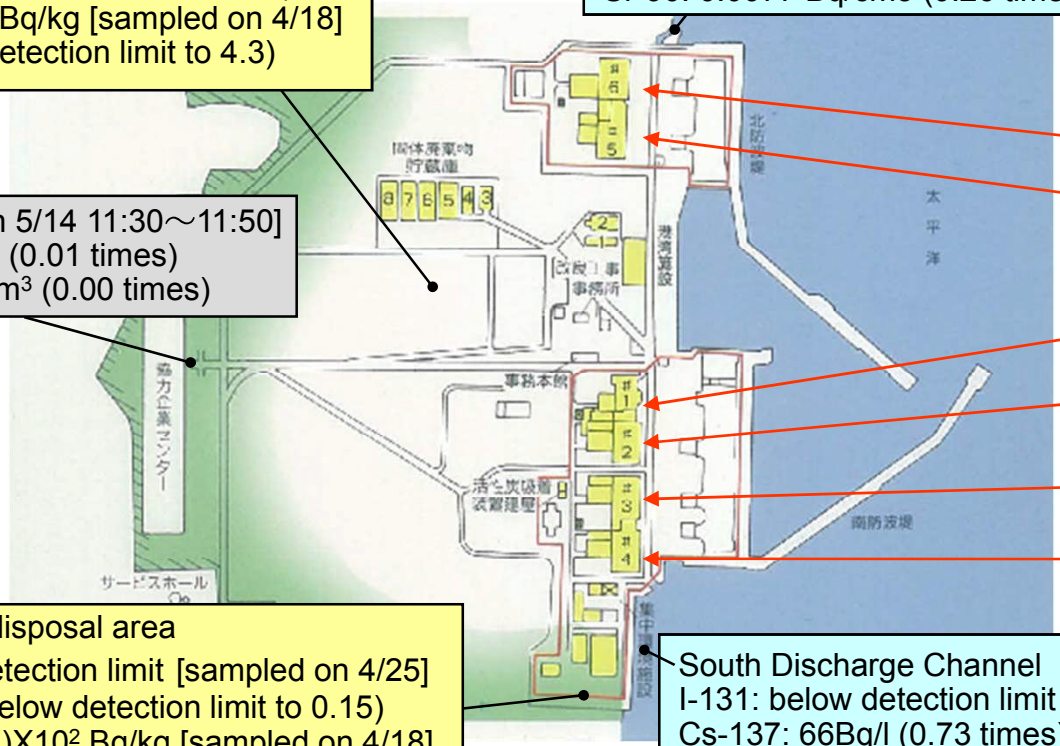
Nuclide Analysis Data Sampled in and Near the Site

- Plutonium and strontium were detected from the soil at the site.
- We continue to monitor the surrounding environment.

Ground
Pu-238: 0.11±0.012 Bq/kg [sampled on 4/25]
(normal level is below detection limit to 0.15)
Sr-90: (4.0±0.05)X10^2 Bq/kg [sampled on 4/18]
(normal level is below detection limit to 4.3)

North Discharge Channel of Units 5~6
I-131: 11Bq/l (0.28 times) [sampled on 5/14 14:15]
Cs-137: 120 Bq/l (1.3 times) [sampled on 5/14 14:15]
Sr-90: 0.0077 Bq/cm3 (0.26 times) [sampled on 4/18]

West gate [sampled on 5/14 11:30～11:50]
I-131: 7.1X10^{-6} Bq/cm^3 (0.01 times)
Cs-137: 9.2X10^{-6} Bq/cm^3 (0.00 times)



Industrial waste disposal area
Pu-238: below detection limit [sampled on 4/25]
(normal level is below detection limit to 0.15)
Sr-90: (5.7±0.06)X10^2 Bq/kg [sampled on 4/18]
(normal level is below detection limit to 4.3)

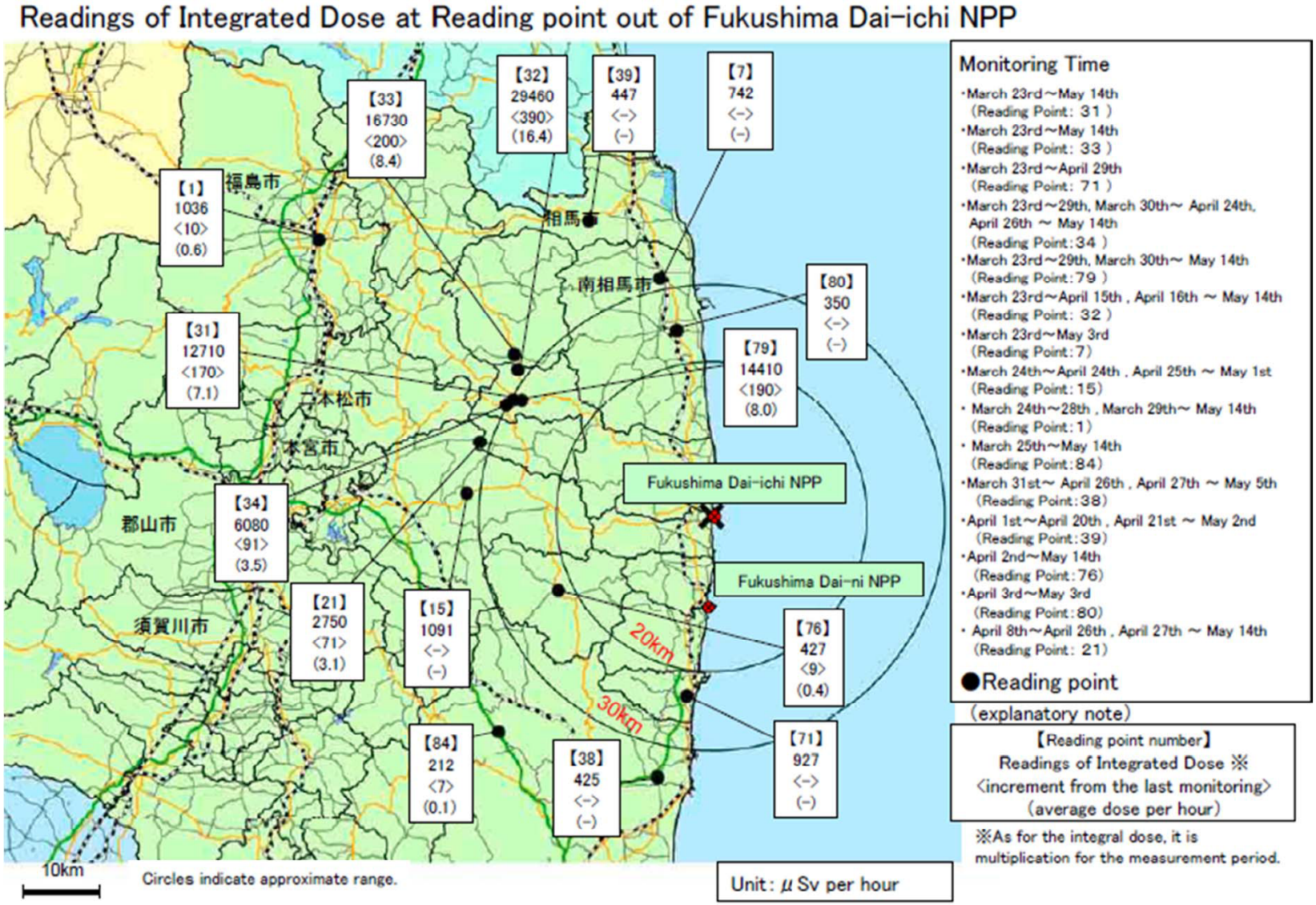
South Discharge Channel
I-131: below detection limit [sampled on 5/14 13:55]
Cs-137: 66Bq/l (0.73 times) [sampled on 5/14 13:55]
Sr-90: 0.0058 Bq/cm^3 (0.19times) [sampled on 4/18]

*Representative nuclides concentration described out of detected nuclides
(times in the bracket is the ratio of concentration limit by law)

: sea water : air : soil
I : Iodine, Cs : Cesium, Pu : Plutonium, Sr : Strontium

Monitoring Data (Surroundings of Fukushima Daiichi)

- Accumulated dose in surrounding areas of Fukushima Daiichi (～15 May)



Source: Ministry of Education, Culture, Sports, Science and Technology

Evacuation

- The government took measures such as taking shelters or evacuation as follows based on the reports from Fukushima Daiichi & Daini.

Fri, 11 March

14:46 The earthquake occurred
19:03 Emergency Declaration by the Gov't (Daiichi)
21:23 3 km radius evacuation (Daiichi)
10 km radius taking shelter (Daiichi)

Sat, 12 March

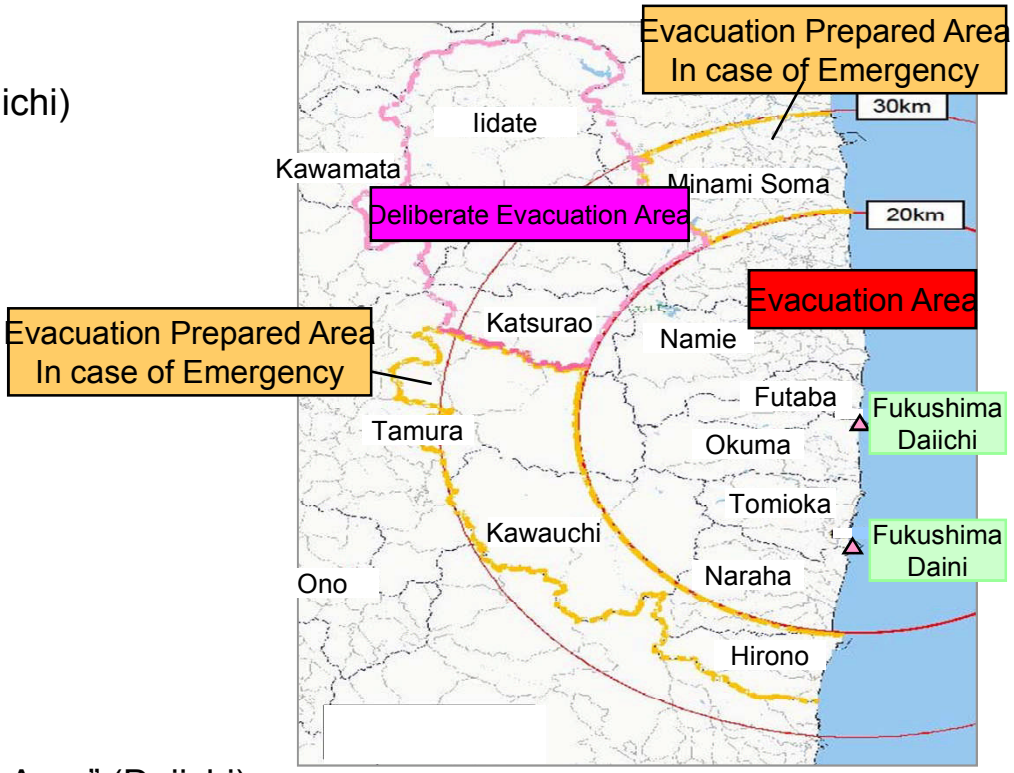
5:44 10 km radius evacuation (Daiichi)
7:45 3 km radius evacuation (Daini)
10 km radius taking shelter (Daini)
17:39 10 km radius evacuation (Daini)
18:25 20 km radius evacuation (Daiichi)

Tue, 15 March

11:00 20-30 km radius taking shelter (Daiichi)

Thu, 21 April

11:00 20 km radius is designated as "Restricted Area" (Daiichi)



Source: NISA website

Fri, 22 April

9:44 20-30 km radius taking shelter has been lifted (Daiichi)
Establishment of "Planned Evacuation Area" and "Emergency Preparation Area"

Impacts to Food and Water

- Since March 21, radioactive materials that exceed provisional standard set by the Ministry of Health, Labour and Welfare have been detected from vegetables, milk and tap water, which led to the restriction of food distribution, etc.

Vegetables, milk, fish		Fukushima pref.		Ibaraki pref.	Tochigi pref.	Gunma pref.	Chiba pref.
		All area	By region	Kitaibaraki city, Takahagi city			
Non-head leaf vegetables	spinach	D.R. , C.R.	Lifted*1	D.R.	—	—	—
	All other Non-head leaf vegetables			—	—	—	—
head leaf vegetables		D.R. , C.R.	Lifted*2	—	—	—	—
flowerhead brassicas		D.R. , C.R.	Lifted*3	—	—	—	—
turnip		D.R.	Lifted*4	—	—	—	—
parsley, celery		—	—	—	—	—	—
log-grown shiitake (grown outdoor)		—	D.R.*5, C.R.*6	—	—	—	—
Bamboo shoot		—	D.R.*7	—	—	—	—
Ostrich Fern		—	D.R.*8	—	—	—	—
sand lance (juvenile)		D.R. , C.R.	—	—	—	—	—
raw milk		D.R.	Lifted*9	—	—	—	—
Tap water		—	—	—	—	—	—

D.R.: Distribution Restricted, C.R.: Consumption Restricted (as of May 16, 2011)　Voluntary restraint is excluded

*1 Shirakawa, Iwaki, Yabuki, Tanagura, Yamatsuri, Hanawa, Nishigo, Izumizaki, Nakajima, Samekawa, Aizuwakamatsu, Nishiaizu, Bandai, Inawashiro, Aizubange, Yanaizu, Mishima, Aizumisato, Shimogou, Tadami, Minamiaizu, Kitashiobara, Yugawa, Syouwa, Hinoemata, were lifted.

*2 Aizuwakamatsu, Kitakata, Nishiaizu, Bandai, Inawashiro, Aizubange, Yanaizu, Mishima, Kaneyama, Aizumisato, Shimogou, Tadami, Minamiaizu, Kitashiobara, Yugawa, Syouwa, Hinoemata, Koriyama, Sukagawa, Tamura(excluding area within 20 km of the Fukushima Daiichi), Iwaki, Kagamiishi, Ishikawa, Asakawa, Furudono, Miharu, Ono, Tenei, Tamakawa, Hirata, Fukushima, Nihonmatsu, Date, Motomiya, Kori, Kunimi, Kawamata (excluding Yamakiya area), Otama, Shirakawa, Yabuki, Tanagura, Yamatsuri, Hanawa, Nishigo, Izumizaki, Nakajima, Samekawa were lifted.

*3 Shirakawa, Yabuki, Tanagura, Yamatsuri, Hanawa, Nishigou, Izumizaki, Nakajima, Samegawa, Iwaki, Koriyama, Sukagawa, Tamura(excluding area within 20 km of the Fukushima Daiich), Kagamiishi, Ishikawa, Asakawa, Furudono, Miharu, Ono, Tenei, Tamakawa, Hirata were lifted.

*4 Fukushima, Nihonmatsu, Date, Motomiya, Koriyama, Sukagawa, Tamura(excluding area within 20 km of the Fukushima Daiich), Iwaki, Kori, Kunimi, Kawamata (excluding Yamakiya area), Kagamiishi, Ishikawa, Asakawa, Furudono, Miharu, Ono, Otama, Tenei, Tamakawa, Hirata were lifted.

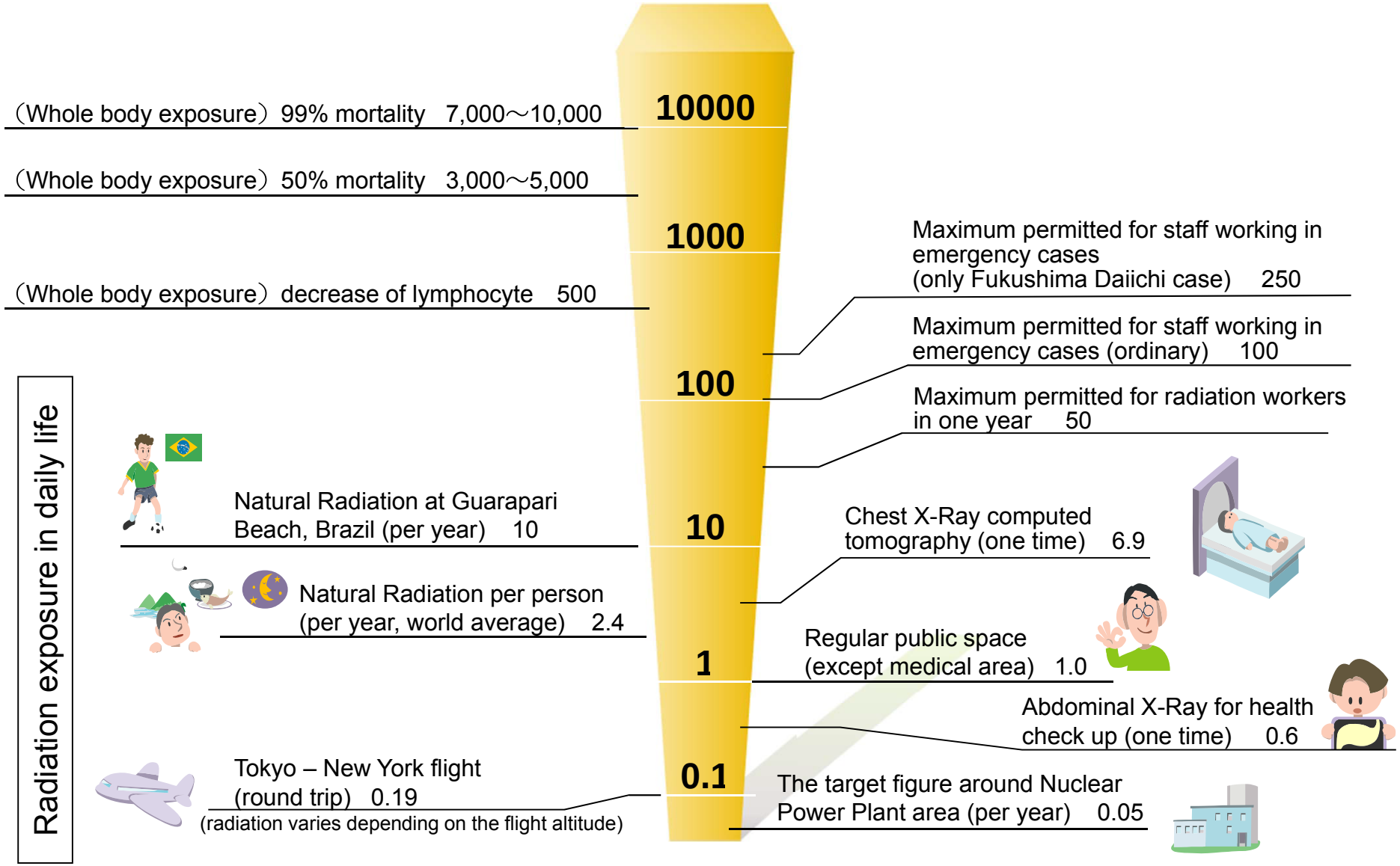
*5 Date, Iidate, Soma, Minamisoma, Namie, Futaba, Okuma, Tomioka, Naraha, Hirono, Kawamata, Katsurao, Tamura (limited within 20 km of the Fukushima Daiich), Kawauchi, Fukushima, Motomiya

*6 Iidate　*7 Date, Soma, Iwaki, Miharu, Tenei, Hirata , Minamisoma, Motomiya, Kori, Kunimi, Kawamata, Nishigo　*8 Fukushima, Kori

*9 Kitakata, Bandai, Inawashiro, Mishima, Aizumisato, Shimogo, Minamiaizu, Fukushima, Nihonmatsu, Date, Motomiya, Kunimi, Otama, Koriyama, Sukagawa, Tamura（excluding miyakoji area）, Miharu, Ono, Kagamiishi, Ishikawa, Asakawa, Hirata, Furudono, Shirakawa, Yabuki, Izumizaki, Nakajima, Nishigo, Samekawa, Hanawa, Yamatsuri, Iwaki, Soma, Shinchi, Minamisoma (limited to Kashima-ku excluding Karasuzaki, Ouchi, Kawago and Shionosaki area), Kawamata (excluding Yamakiya area) were lifted.

Source : web site by the Ministry of Health, Labour and Welfare

Relationship between Health and Radiation Dose



(Note) The amount of natural radiation is including the effect of inhalation of Radon.
(source) UNSCEAR 2000 Report, "Sources and Effects of Ionizing Radiation" etc.

Government's Guidance of Compensation for Nuclear Damages and Payment of "Temporary Compensation"

- The government's " Economic Damage Response Headquarters" decided to make TEPCO pay expenses needed at the moment as Temporary Compensation to the people forced to evacuate due to the accident. Pursuant to the decision, TEPCO is disbursing 1 million yen per household and 750 thousand yen per individual's household as Temporary Compensation as appropriation to damages caused by the evacuation. Intended areas for payment of Temporary Compensation are: Evacuation Area; Indoors Evacuation Area; Deliberate Evacuation Area; Evacuation Prepared Area in Case of Emergency.

- The guidance of compensation was discussed at the Nuclear Damages Compensation Dispute Committee set up under MEXT on April 11th and the first guidance was announced on April 28th.
- Intended damages covered by the first guidance about deciding damage:
  - Damages caused by government's evacuation directions : evacuating expense, business losses, losses accompanied by being unable to work, losses or decreases of the value of estates, inspection expenses (person, possession), damages to the life or body, mental damages
  - Damages caused by government's directions for danger area for cruise : business losses, losses accompanied by being unable to work
  - Damages caused by government's directions for the restriction of distribution: business losses, losses accompanied by being unable to work

On April 28th 2011, the "Fukushima Nuclear Compensation Office" was established to provide consultation concerning financial compensation related to the damage caused by the nuclear accident.

In addition, "Compensation Consultation Center (Call center)" under the Fukushima Nuclear Compensation Office to handle matters related to losses caused by the nuclear accident including temporary compensations and regional consultation centers to handle consultations concerning visitations have been established.

3. Roadmap towards Restoration from the Accident

(Updated May 18, 2011)

東京電力 TEPCO

Progress Status of “Roadmap towards Restoration from the Accident”

- Progress and plan made during last one month following the disclosure of “Roadmap towards Restoration from the Accident” on April 17 is summarized as below;
- By bringing the reactors and spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials, we will make every effort to enable evacuees to return to their homes and for all citizens to be able to secure a sound life.

＜Summary of progress made in the last one month and planned actions（main changes）＞

1.Added areas and issues

2 areas (“Countermeasures against aftershock”, “Environment improvement”) and 3 issues (“Groundwater”, “Tsunami, reinforcement, etc”, “Life/work environment”) were newly added.

2. “Issue 1. Reactors” : revision of prioritized countermeasures due to the coolant leakage

Postpone the Circulating Injection Cooling has been initiated, consideration of sealing at leaking points. Prioritized establishment of Circulating Injection Cooling.

3. “Issue 2. SFP” : Implementation of several measures ahead of schedule

Progress has been made relatively as scheduled. “Remote controlled operation” of “Giraffe”, etc were implemented ahead of schedule.

4. “Issue 3. Accumulated water” : Steady increase until operation of processing facilities

Countermeasures to prevent contamination spreading into the sea area are reinforced. Set “mitigation of groundwater contamination” as a new issue.

5. “Issue 7. Aftershocks, Tsunami” : countermeasures are reinforced

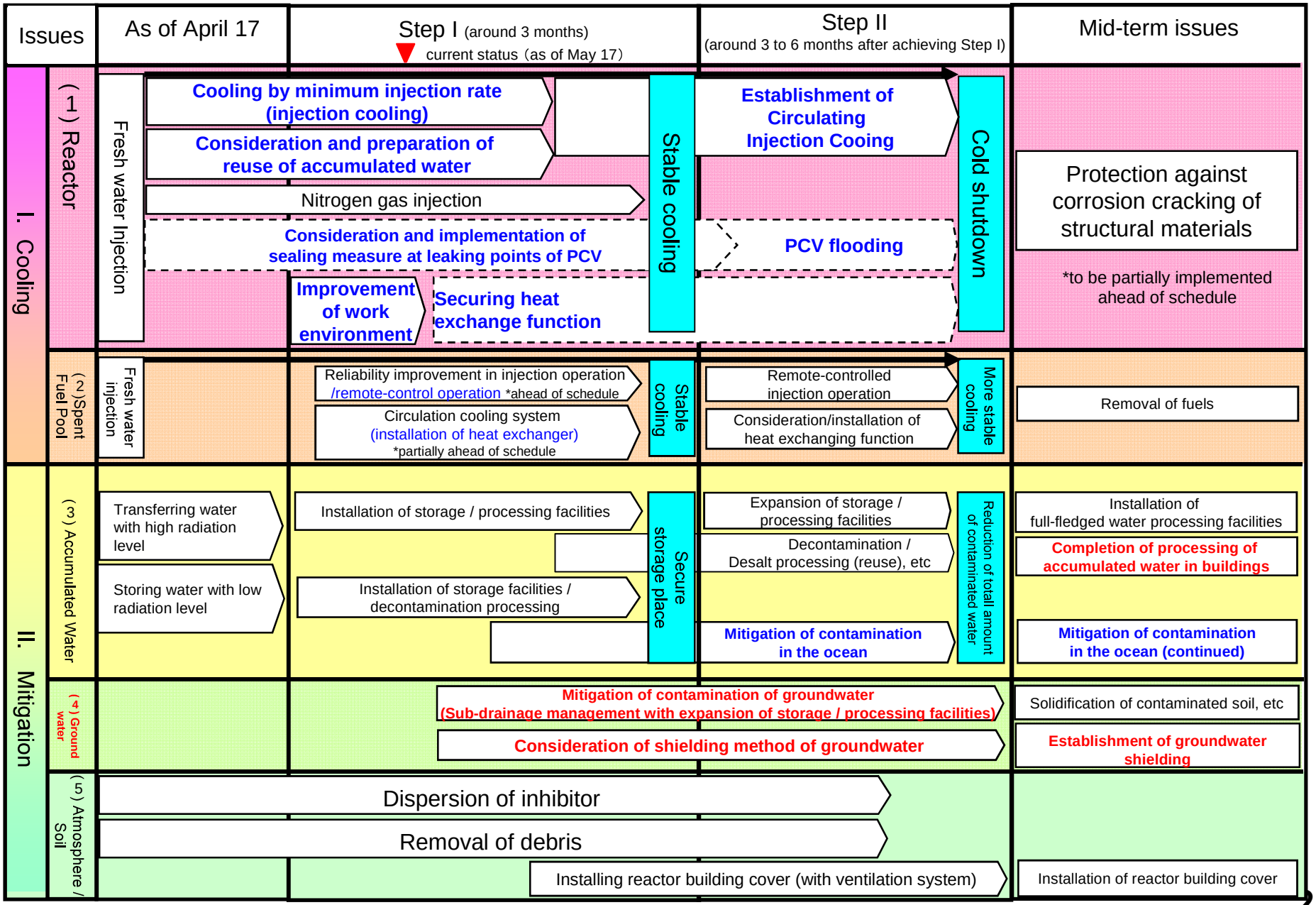
Potential aftershocks and tsunami are reset as issues.

6. “Issue 8. Life/work environment” : progress is being made step by step

Added improvement of life/work environment of workers under severe working environment.

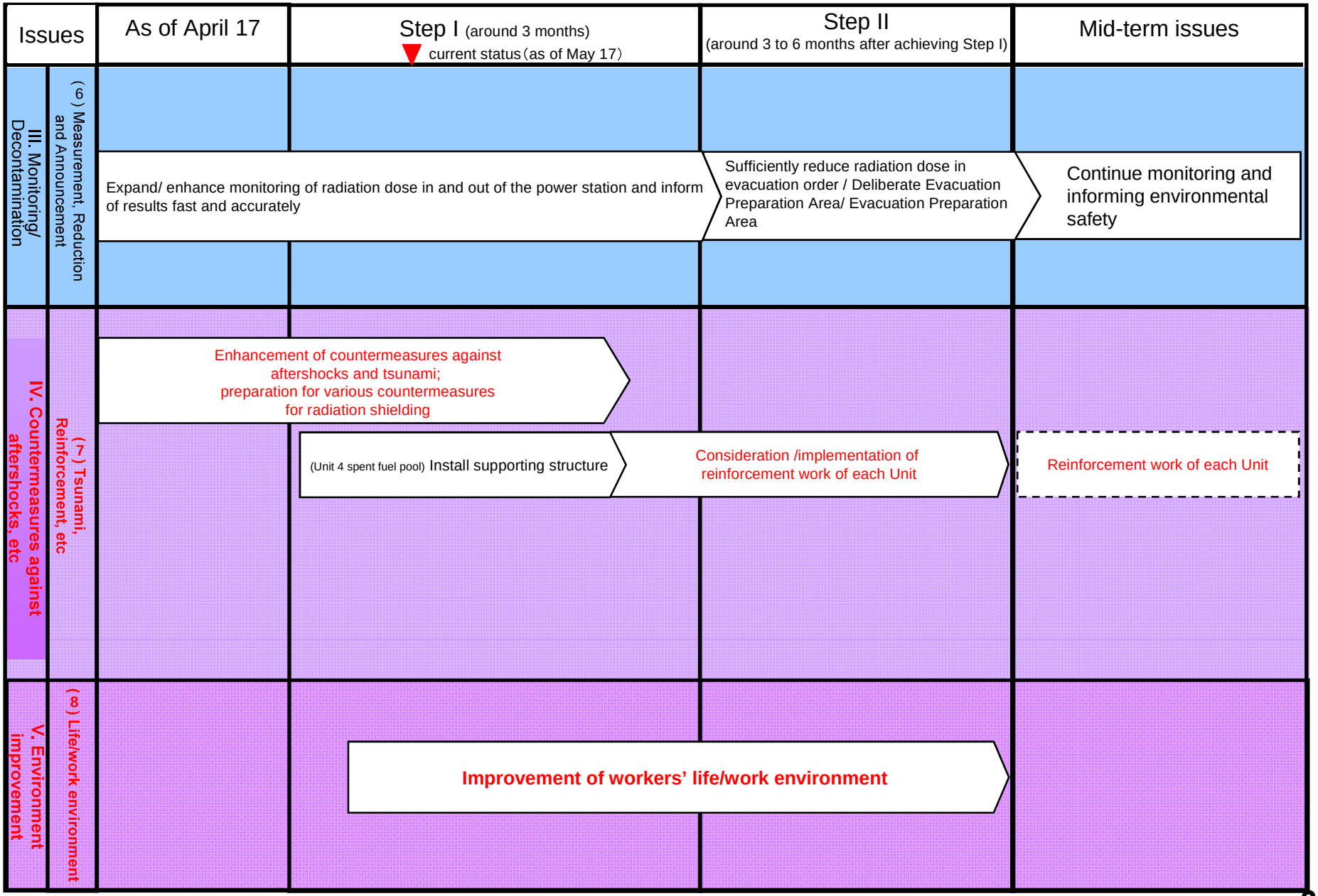
Current Status of Roadmap (issues/targets/major countermeasures) as of May 17

Red colored: newly added to the previous version, Blue colored: modified from the previous version



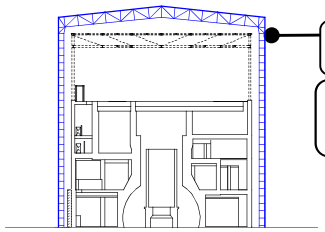
Current Status of Roadmap (issues/targets/major countermeasures) as of May 17

Red colored: newly added to the previous version



Overview of Major Countermeasures in the Power Station as of May 17

Red colored: newly added to the previous version



Reactor building cover (5, 50, 54, 55)

Begin detailed design of full-fledged container (56)

Cooling of spent fuel pool by external water injection (18, 22, 28)

piping

pumps

heat exchangers, water processing facilities

Sampling of steam/pool water and measurement of radioactive materials (19)

Circulation cooling of spent fuel pool (23, 24, 25, 27)

Storage/process of low radiation-level water (33, 35, 40, 46)

Storage: tanks, megafloats, barges
Process: decontamination by zeolite

Lower the amount of steam generated (4)
Maintain and enhance countermeasures in Step 1 if needed (17)

Processing high radiation-level water (31,34,38,41,43,44)

Nitrogen gas injection (2, 11, 15)

Reactor Building

Tank

Water processing facility (Decontamination and desalt processing)

Tank Lorry

PCV venting (with filtration) (10)

Primary Containment Vessel (PCV)

Cooling at minimum water injection rate (7,12,14)
Reuse of processed water (45)
(Establish circulation cooling system)

Storage of high radiation-level water (30, 32, 37, 39, 42)

Flooding up to top of active fuel (3, 9)

Reactor Pressure Vessel (RPV)

Turbine Building

Steam Turbine

Heat Exchanger

Additionally-installed Tank

Centralized Waste Processing Building

Installation of heat exchangers (13)

Condenser

Injection of fresh water with pumps (1)

Suppression Chamber

Dispersion of inhibitor (47, 48, 52)
Removal of debris (49, 53)
Consideration of countermeasures for contaminated soil (51)

Sealing the leakage location (6, 16)

Processing of sub-drainage water after being pumped up (36)

Seismic assessment (20),Continued monitoring (21),
(Unit 4) Installation of supporting structure under the bottom of spent fuel pool (26)

Preventive measures against leakage of high radiation-level water (29)
Prevent contamination in the ocean (64)
Isolation of high-level radioactive water (65)

Prevent contamination of groundwater (66,67); consideration of shielding groundwater(68)

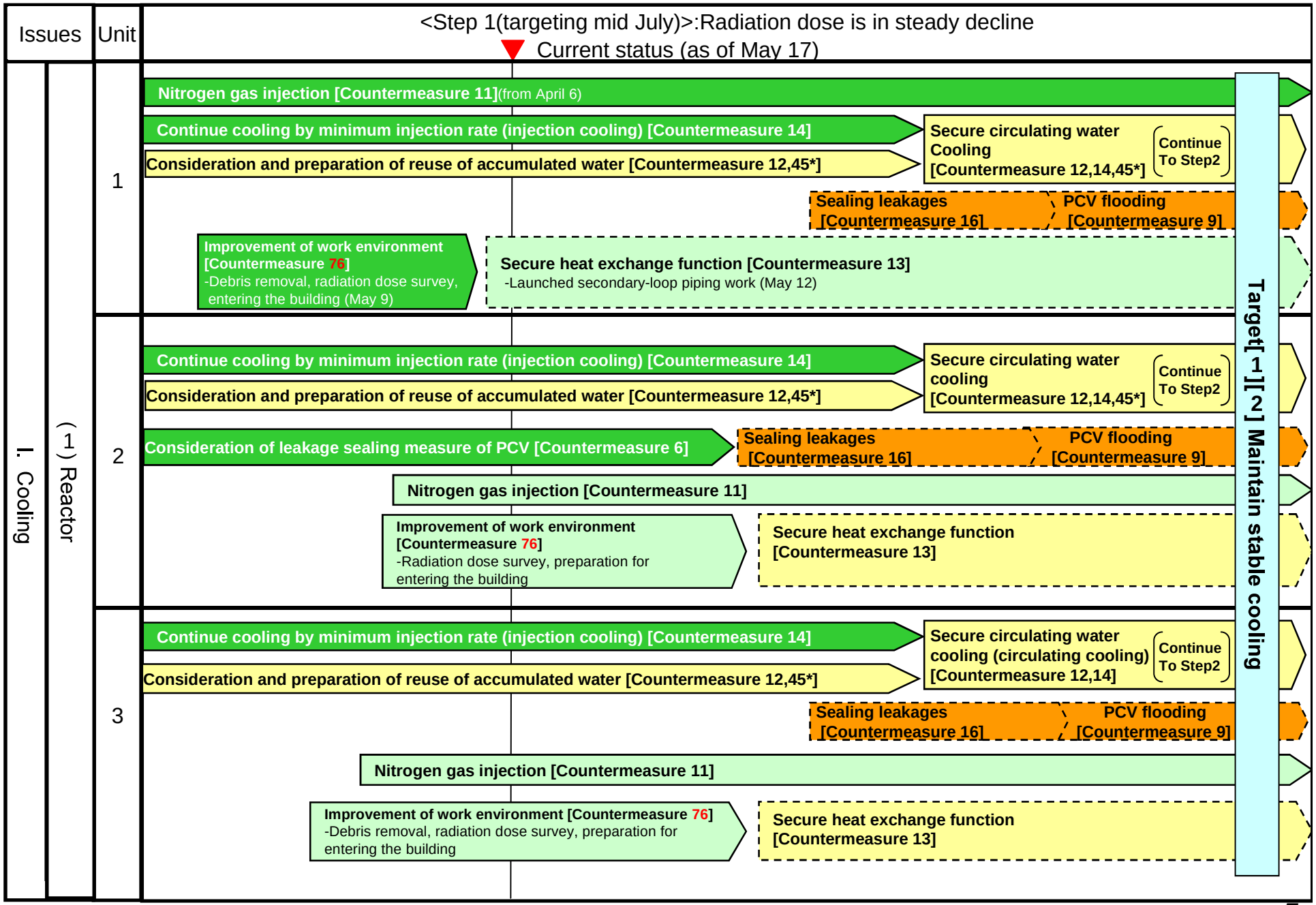
Improvement of life/work environment of workers(74,75); improvement of site environment(76)

Install interconnecting lines of offsite power(8); enhance countermeasures against tsunami (69,70); planning of reinforcement work of each Unit (71); various countermeasures of radiation shielding (72,73)

Enhance/enforce monitoring (55~62), Consideration of necessary measures to reduce radiation dose (63)

Step1 Current Status of Countermeasures (1)

Red colored: newly added to the previous version



*(countermeasure 45 to be implemented ahead of schedule from Step2)

Legend: : Implemented : Under construction : Field work started : Field work not started yet

Step1 Current Status of Countermeasure (2)

Red colored: newly added to the previous version

Issues: I. Cooling (2) Spent Fuel Pool

<Step 2(targeting mid July)>:Radiation dose is in steady decline

Current status (as of May 17)

Unit 1

Continuation of water injection by "Giraffe", etc [Countermeasure 22]
-reliability improvement: enhanced durability of hoses
-measures to reduce radiation dose: switch to remote-controlled operation

Restoration of normal cooling system [Countermeasure 24]
-radiation measurement by γ camera and robot (April30 to May6)
-radiation reduction by flushing and shielding facility (May 11 to May 15)

***countermeasure 27 to be implemented ahead of schedule from Step2**

Installation of heat exchanger [Countermeasure 25,27*]
Consideration / Design → Fabrication / Transportation → Installation

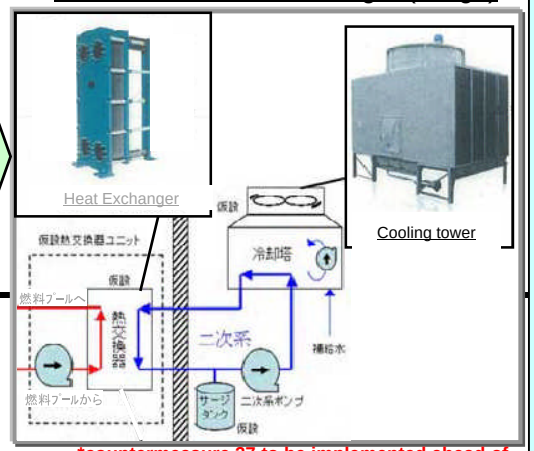
Unit 2

Restoration of water injection through normal cooling system [Counter measure 23]

***countermeasure 27 to be implemented ahead of schedule from Step2**

Installation of heat exchanger [Countermeasure 25,27*]
Consideration / Design → Fabrication / Transportation → Installation

Installation of heat exchanger (image)



*countermeasure 27 to be implemented ahead of schedule from Step2

Unit 3

Continuation of water injection by "Giraffe", etc [Countermeasure 22]
-reliability improvement: enhanced durability of hoses
-measures to reduce radiation dose: switch to remote-controlled operation

Restoration of normal cooling system [Countermeasure 24]
-confirmation of power system stability through water level measurement by "Giraffe," etc (May 8 to May 15)
-water injection through normal cooling system (ongoing from May 16)

Installation of heat exchanger [Countermeasure 25,27*]
Consideration / Design → Fabrication / Transportation → Installation

Unit 4

Continuation of water injection by "Giraffe", etc [Countermeasure 22]
-reliability improvement: enhanced durability of hoses
-measures to reduce radiation dose: switch to remote-controlled operation

Restoration of normal cooling system [Countermeasure 24]
-implementing site survey (the end of May)
-removing debris. restoration work will be started after the removal.

***countermeasure 27 to be implemented ahead of schedule from Step2**

Installation of heat exchanger [Countermeasure 25,27*]
Consideration / Design → Fabrication / Transportation → Installation

Target[4] Maintain stable cooling

Legend: Implemented / Under construction / Field work started / Field work not started yet

Step1 Current Status of Countermeasures (3)

Red colored: newly added to the previous version

Issues

<Step 1(targeting mid July)> :Radiation dose is in steady decline
▼ Current status (as of May 17)

II. Mitigation

(3) Accumulated Water

[High level]

Secure sufficient storage place [Countermeasure 37,39]
Transfer after waterproof check of centralized Waste Processing Facilities (Process Main Building and High-temperature Incineration Building)
Transfer (Unit 2 trench to Process Main Building)
Waterproof check etc. (Incineration Building)
-Installation of tanks [For receiving processed water]
May 10 : approx. 11,000 t

Continue to Secure sufficient storage place [Countermeasure 37,39,42*]
***(Countermeasure 42 to be implemented ahead of schedule from Step 2)**
Transfer (from Unit3 Turbine Building to Incineration Building)
- Installation of tanks [For receiving processed water] late June : approx. 28,000 t,
preparing installation place for underground tanks* (from May 16 to step 2)

Target [ㅇ] Secure sufficient storage place

Mitigation of contamination in the ocean [Countermeasure 64]
- Installation of silt fence

Continuing mitigation of contamination in the ocean [Countermeasure 64]
- Installation of circulating decontamination system (end of May), Installation of steel sheet pile (to Step 2)

Isolation of high-level radioactive Water [Countermeasure 65]
- Closing of Unit 2 &3 Turbine trenches (end of May)

Installation of water processing facilities [Countermeasure 38]
Consideration / Design
Manufacturing / Transportation
Installation of Decontamination / salinity processing equipment
Test Operation

Continuing water processing of contaminated water [Countermeasure 38,43, 45*]
Middle of June: processing start
*(Countermeasure 43, 45 to be implemented ahead of schedule from Step 2)
Operation: processed water to be reused (to Step 2)

Underground Tank

Receiving tank for processed water

Installation of decontamination equipment

Megafloat

Water processing by zeolite

Target [ㄱ] Store and process water

[Low level]

Increase storage capacity / decontamination [Countermeasure 40,41]
Installation of tanks (May 8 :2,200 t)
-Use of decontaminant (zeolite) :
test operation (from May 3)

Continue to increase storage capacity / decontamination [Countermeasure 40,41]
- Installation of tanks（mid May ：6,200t, late May ： 6,400 t, early June : 3,600 t ）,
Megafloat（late May ： 10,000 t ）, barges（late June ： 1,200 t and 1,000 t ）
- Start of full operation of decontaminant (zeolite) (from late May)

(4) Groundwater

Consideration of mitigation of groundwater contamination [Countermeasure 66]

Implementation of mitigation of groundwater contamination [Countermeasure 67]
Restoration of subdrain pumps (middle of June)
Subdrain management with expansion of storage / processing facilities (to Step 2)

Consideration of groundwater shielding method [Countermeasure 68] (to Step 2)

Target [ㄴ] Mitigation of groundwater contamination

Legend: Implemented | Under construction | Field work started | Field work not started yet

Step1 Current Status of Countermeasures (4)

Red colored: newly added to the previous version

Issues

<Step 1(targeting mid July)> :Radiation dose is in steady decline

▼ Current status (as of May 17)

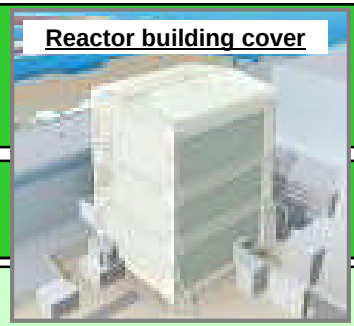
II. Mitigation

(5) Atmosphere / Soil

Dispersion of inhibitor [Countermeasure 52]
- Plane and slope : approx. 105,000 m² (May 12)
- Around Units 1 to 4 : approx. 49,000 m² (May 12)

Continuing dispersion of inhibitor [Countermeasure 52] (to step2)
- Plane and slope : approx. 420,000 m² (until late June)
- Around Units 1 to 4 : approx. 120,000 m² (until late May)

Reactor building cover



Removal of debris [Countermeasure 53] (from April 6)
- Removal of debris (equivalent of 127 containers with approx. 4 m³ volume) (May 10)

Installing reactor building cover [Countermeasure 54]
-Unit 1 : Started preparation construction work (from May 13)

Design → Procurement, Manufacturing → On-site construction (including preparation) (to Step 2)

-Units 3 & 4 : Now designing (to Step 2)

Target [①] Prevent scattering of radioactive materials

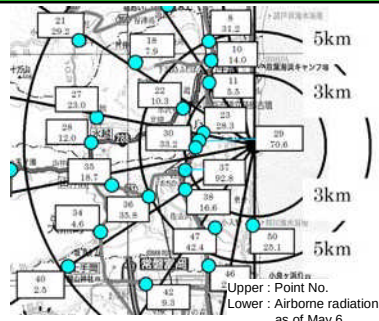
III. Monitoring/Decontamination

(6) Measurement, Reduction and Announcement

Expand/enhance monitoring and announcement [countermeasure 60,61]
-Continue monitoring in and out of the power station

[Land Area]
- Monitoring within 20km radius of the periphery:
  (1) Monitoring of airborne radiation at 128 points, and dust concentration at 12 points by the collaboration between MEXT, Power Support Team and TEPCO (April 18)
  (2) Monitoring of airborne radiation at 50 points by Power Support Team (from May 6, weekly)
- Monitoring at 5 points between 3 and 5 km radius of the periphery at the timing of entry in the building of Unit 1 (open the airlock) (May 8,9)

(Map on the right indicates the collecting points within approx. 10km)



Upper : Point No.
Lower : Airborne radiation as of May 6

[Ocean Area]
-Start monitoring sea water at 22 points (from May 5) and marine soil at 2 points (from April 29) off the coast of Fukushima (Increased from sea water at 16 points (as of April 17))
-Start monitoring sea water at 5 points off the coast of Ibaraki (from April 29)

(Map on the right indicates the collecting points within approx. 30km)

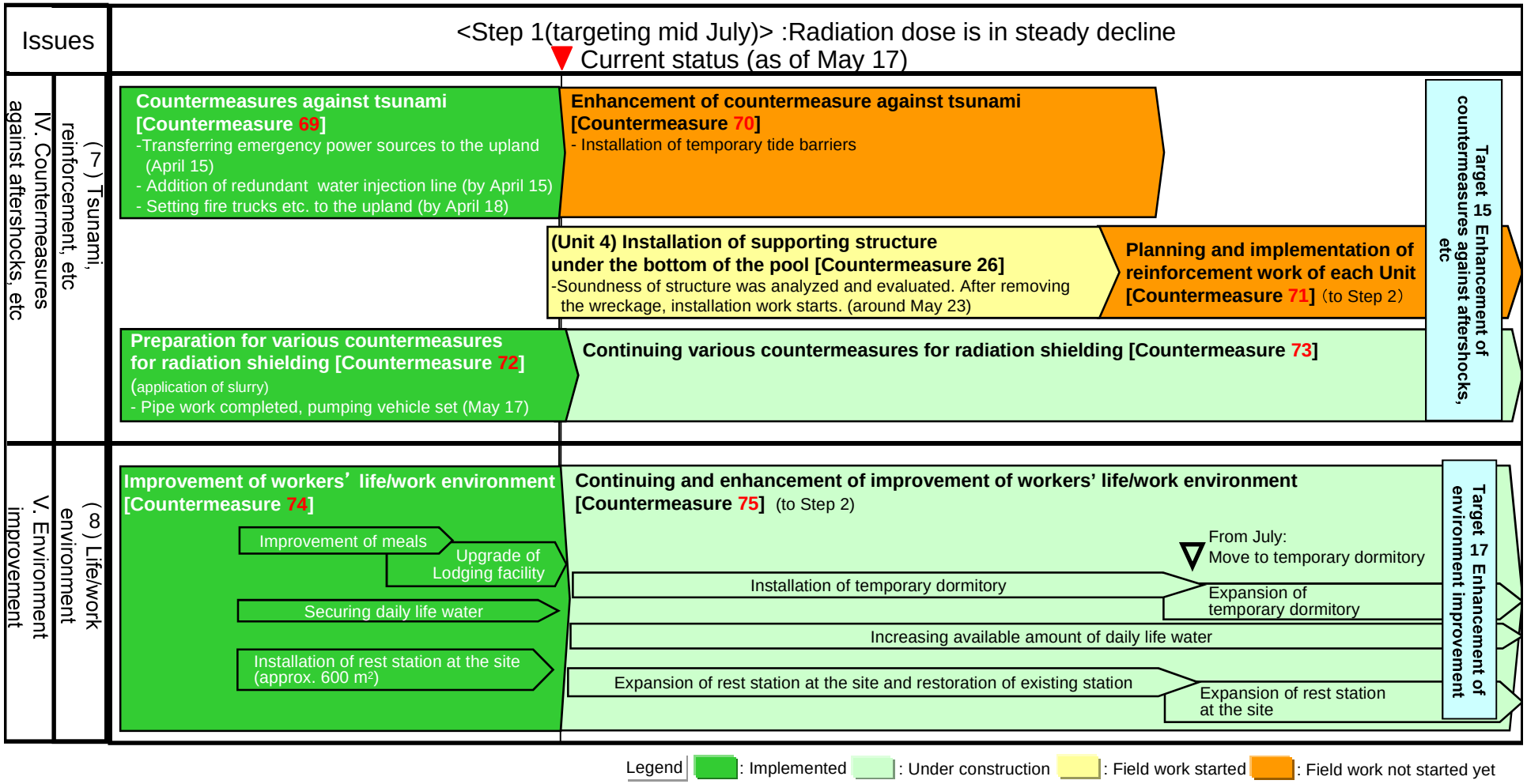
● :Sea water collecting points
● :Sea water and marine soil collecting points

Target [①]: Expand/enhance monitoring etc.

Legend: : Implemented : Under construction : Field work started : Field work not started yet

Step1 Current Status of Countermeasures (5)

Red colored: newly added to the previous version



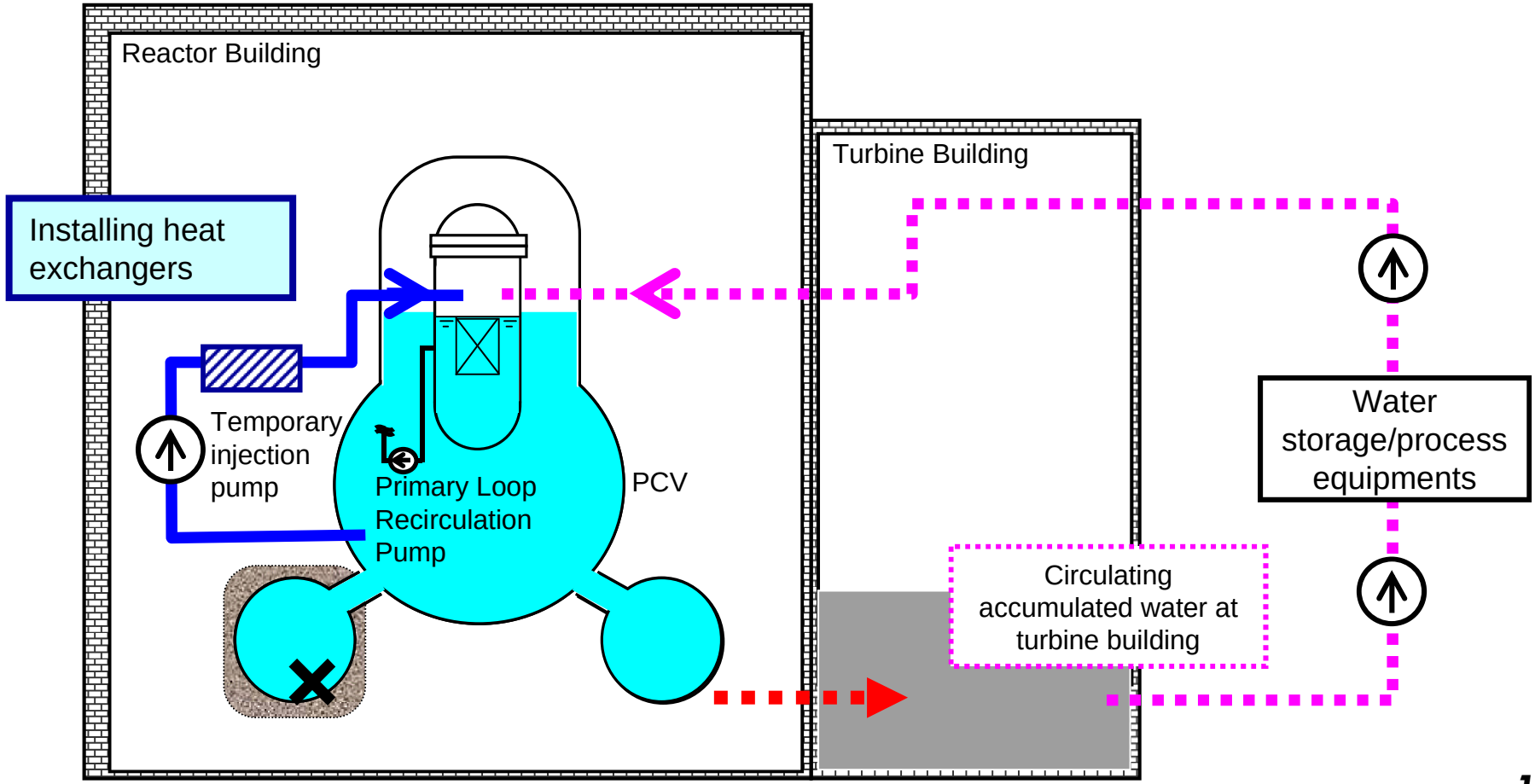
Securement of Circulating Water Cooling and Heat Removal Function

Future Strategies

- Install heat exchangers and restore the heat removal function.

<Risk Countermeasures>

- Circulating accumulated water at the turbine buildings in preparation to continue/increase of outflow of leakage into the turbine buildings.



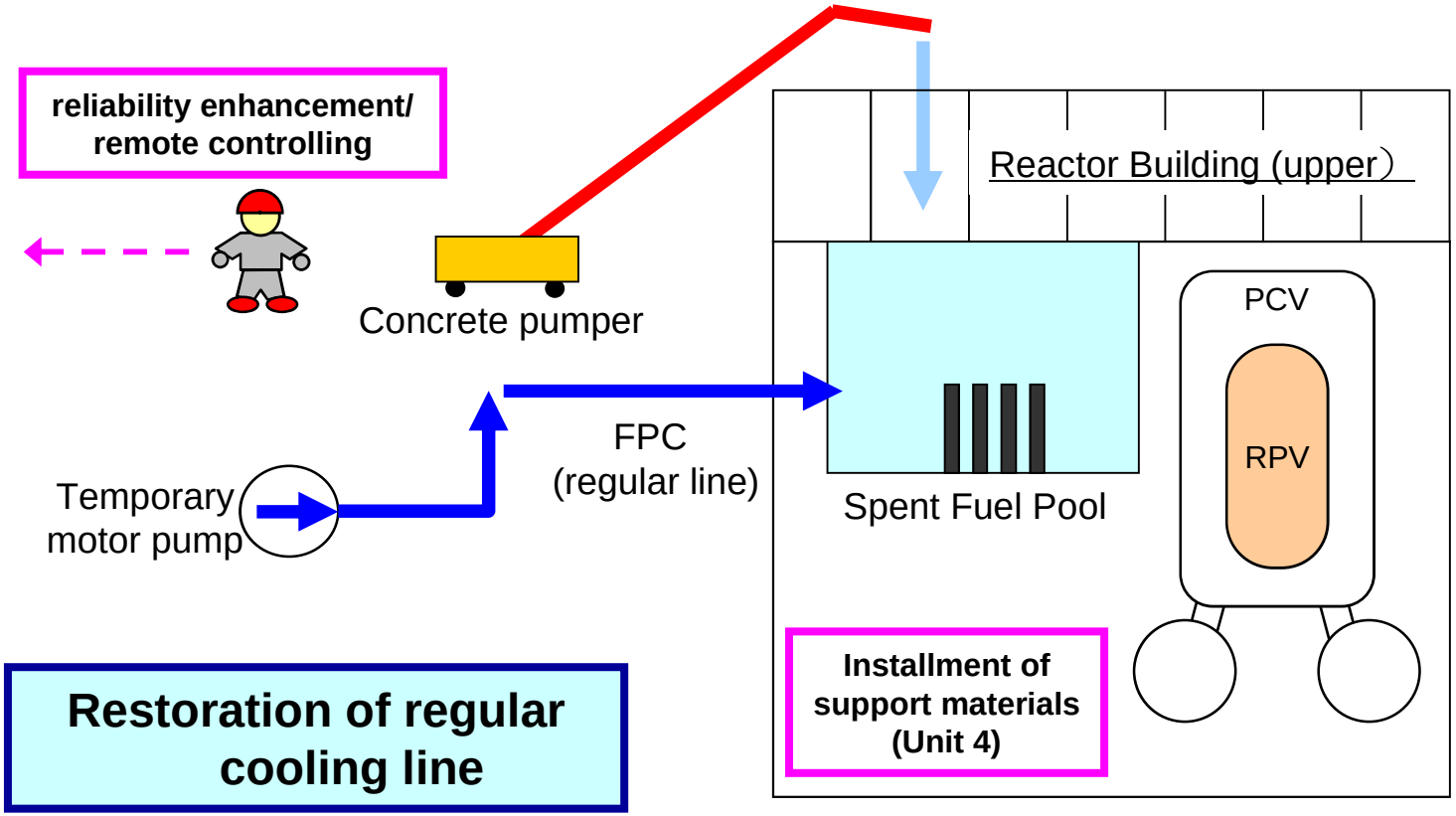
Remote Controlling of Concrete Pumpers

Future Strategies

Switch the watering from concrete pumpers to regular cooling line after restoring it.

<Risk Countermeasures>

- Enhance the reliability and implement remote controlling of concrete pumpers in preparation for cases where regular cooling line can't be restored.
- Install support materials under the pool to reinforce it, since the walls of the building supporting the pool have been damaged. (Unit 4)



Restoration of regular cooling line

Prevent Scattering of Radioactive Materials

Future Strategies

➢Continue scattering dust inhibitor or removing debris to make radiation dose in steady decline.

◆ Scattering dust inhibitors

->Full-fledged dispersion of dust inhibitors by unmanned crawler dump (dispersing from April 26)

Remote controlled crawler dump

◆ Removing debris

→Continue removal of debris by unmanned heavy machine.

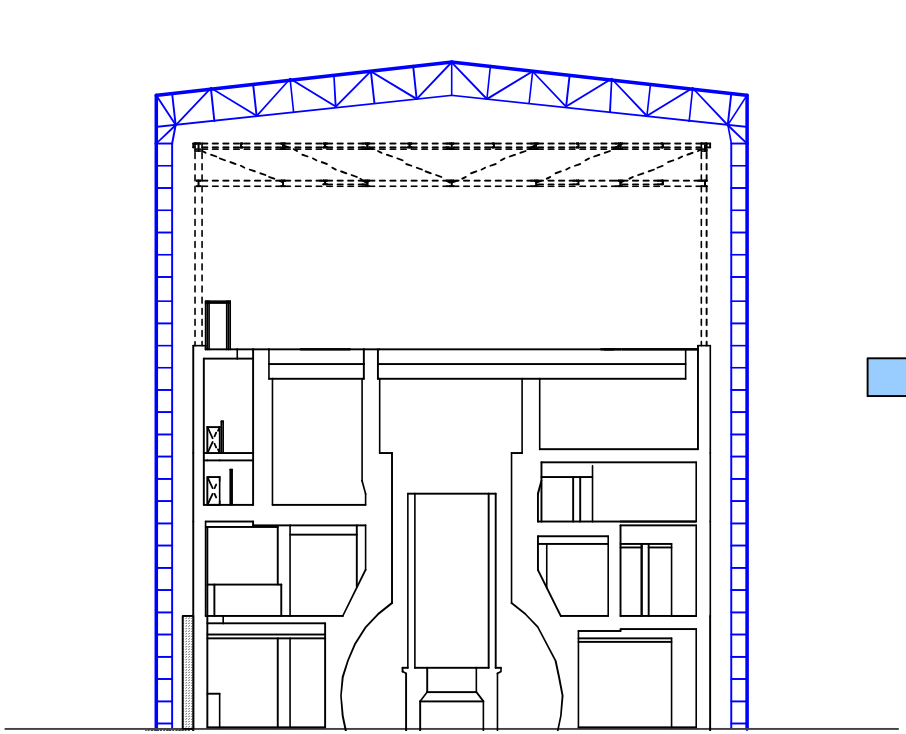
removal of debris by remote controlling

removal of debris

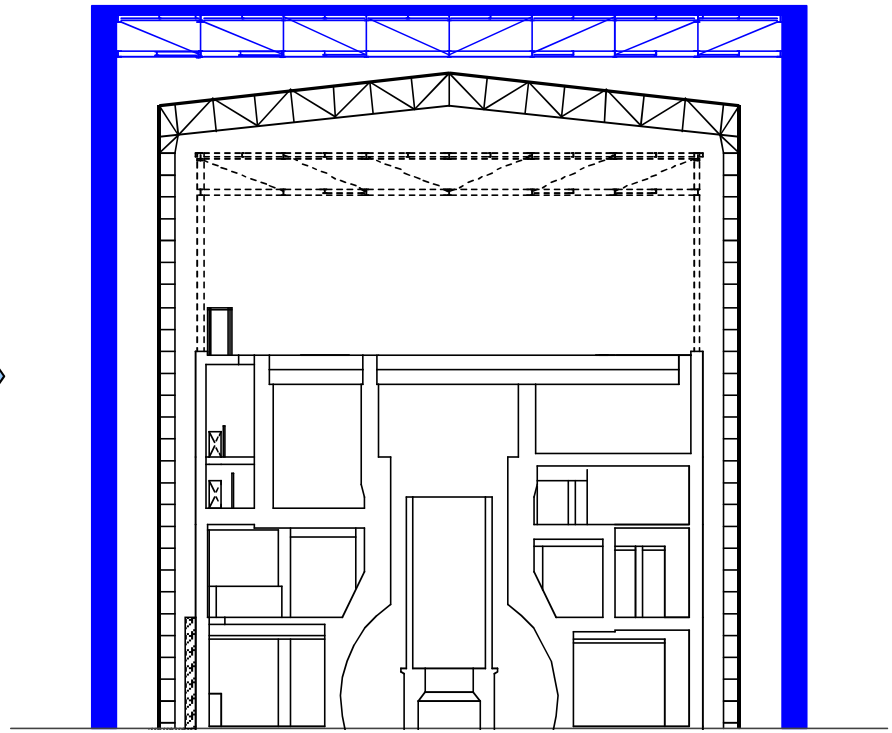
Containment by Covers

Future Strategies

- Prevent releasing of radioactive materials by installing reactor building covers (Units 1, 3, 4.)
- After installing the covers, launch detailed design of a container (with roof and outer wall of concrete, etc.) as a full-fledged measure



Accomplish installing reactor building covers



After installing the covers, launch detailed design of full-fledged measures such as container.

[Exhibit]
Roadmap towards Restoration from the Accident

This handout illustrates major targets, issues or countermeasures towards the restoration with the aid of figures or pictures. It could be modified depending on the outcome of the investigation.

Tokyo Electric Power Company

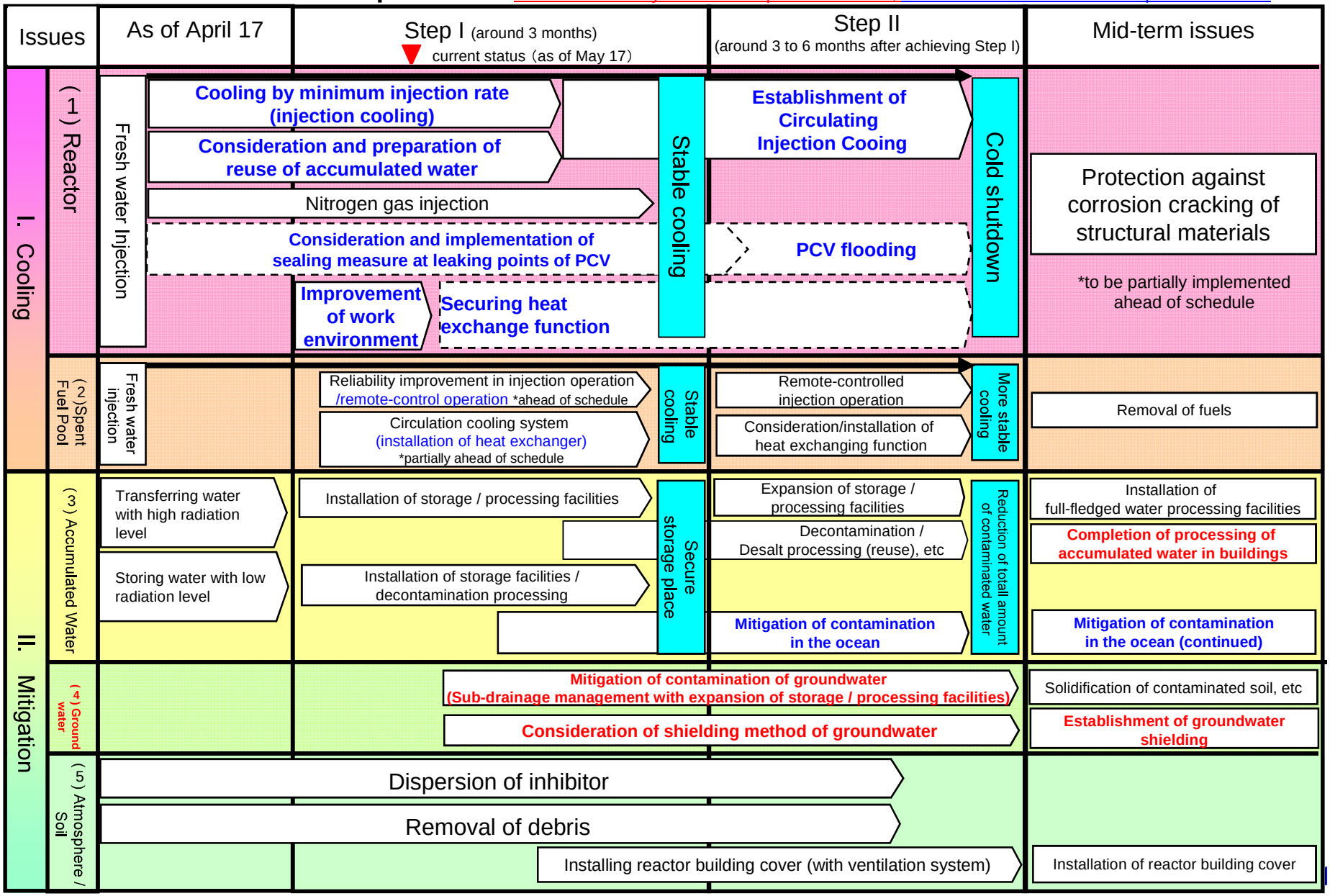
Updated May 18, 2011

Basic Policy (1)

- We will make every effort to mitigate the release of radioactive materials by bringing the reactors and spent fuel pools to a stable cooling condition

<Current Status of Roadmap>

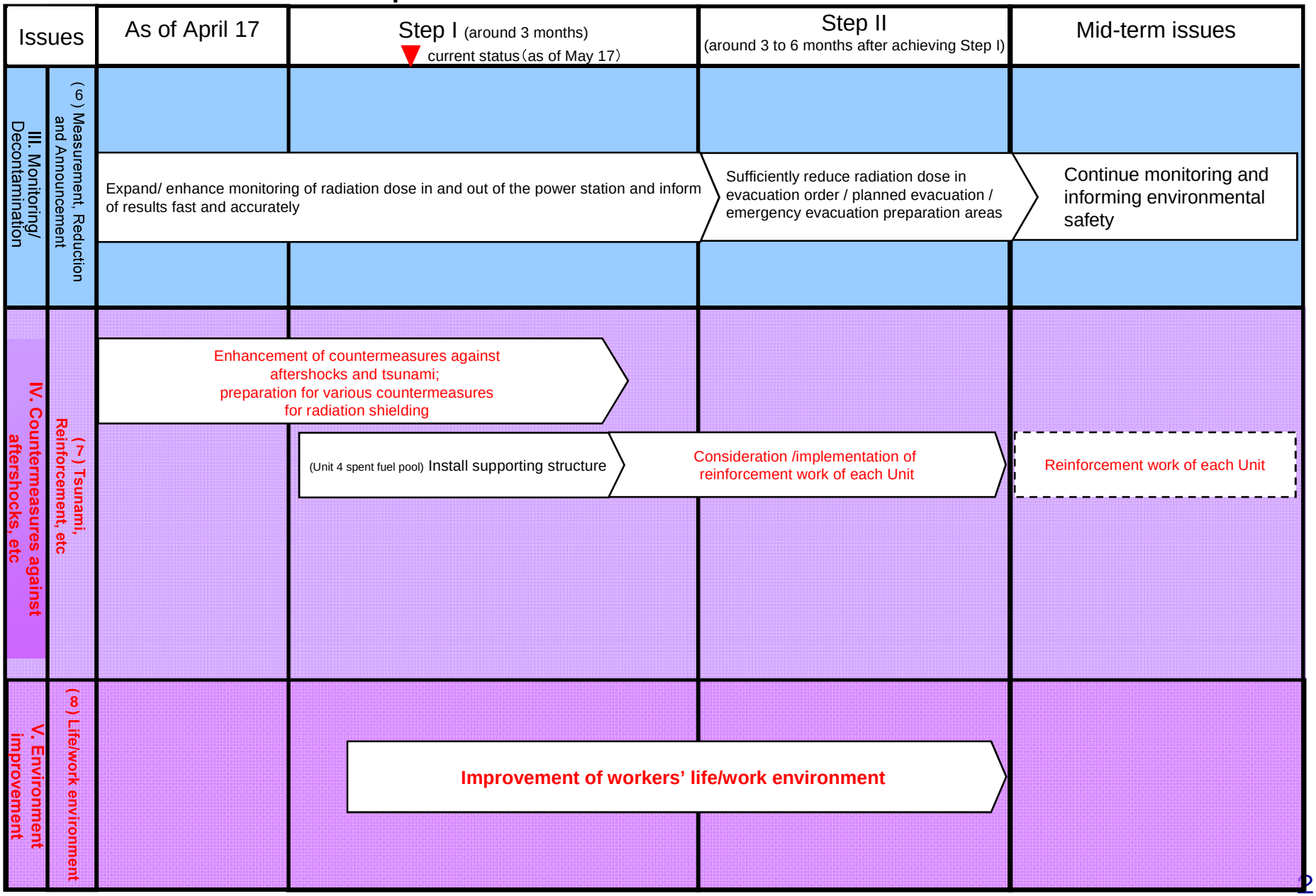
Red colored: newly added to the previous version, Blue colored: modified from the previous version



Basic Policy (2)

<Current Status of Roadmap>

Red colored: newly added to the previous version



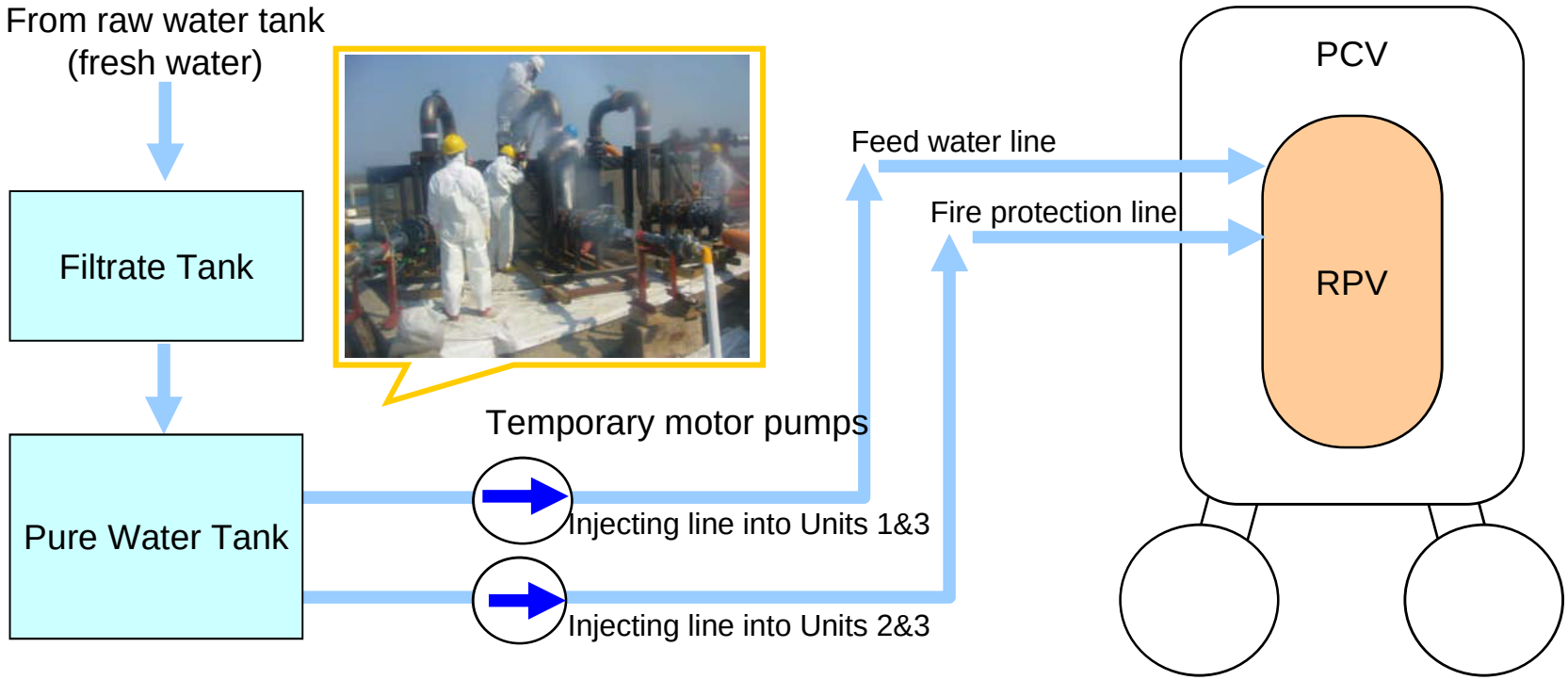
Targets and Progress

Targets

- Step1: Maintain stable cooling
- Step2: Achieve cold shutdown

Progress

- Continue to inject cooling water into the reactors by fire trucks or temporary motor pumps, etc.
- Enhanced the reliability of water injection into the reactors by switching over to the power system or moving distribution panels for pumps and back up power sources(power supply cars/emergency generators) to upland against tsunamis.



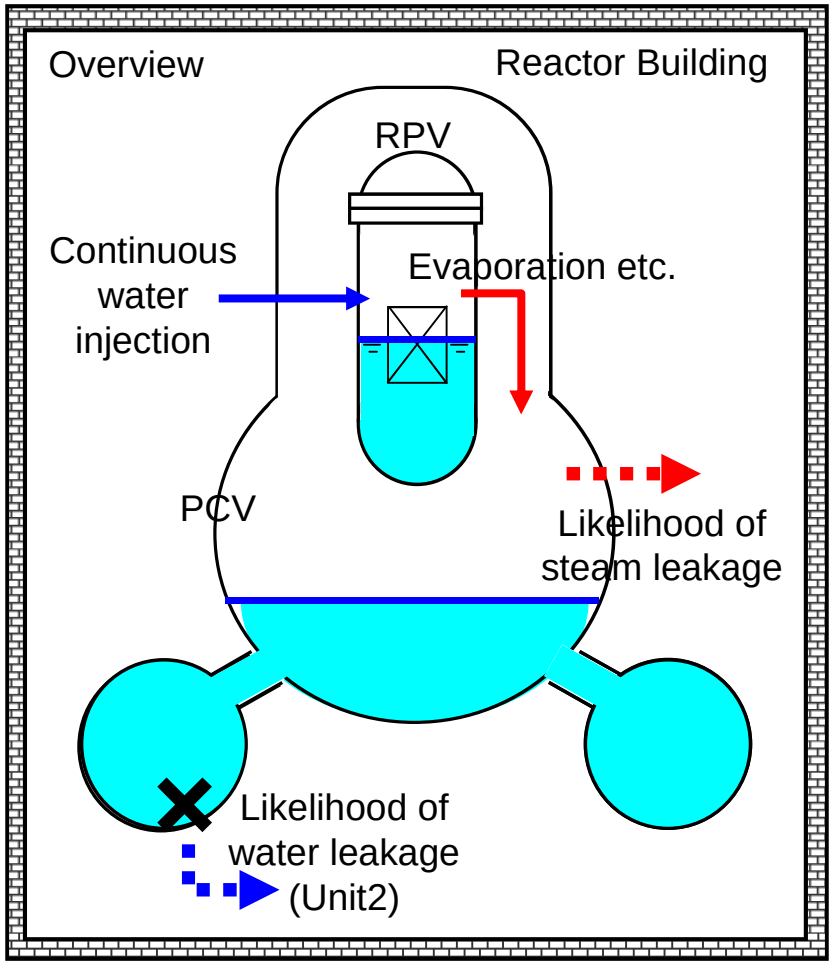
Current Status

Current Status

○ Reactor is being cooled by continuous water injection

× Likelihood of steam and water leakage from the PCV.

- Likelihood of small steam leakage containing radioactive materials from the gap of the PCV caused by high temperatures
- Likelihood of water leakage due to the damage in the PCV of Units 1&2



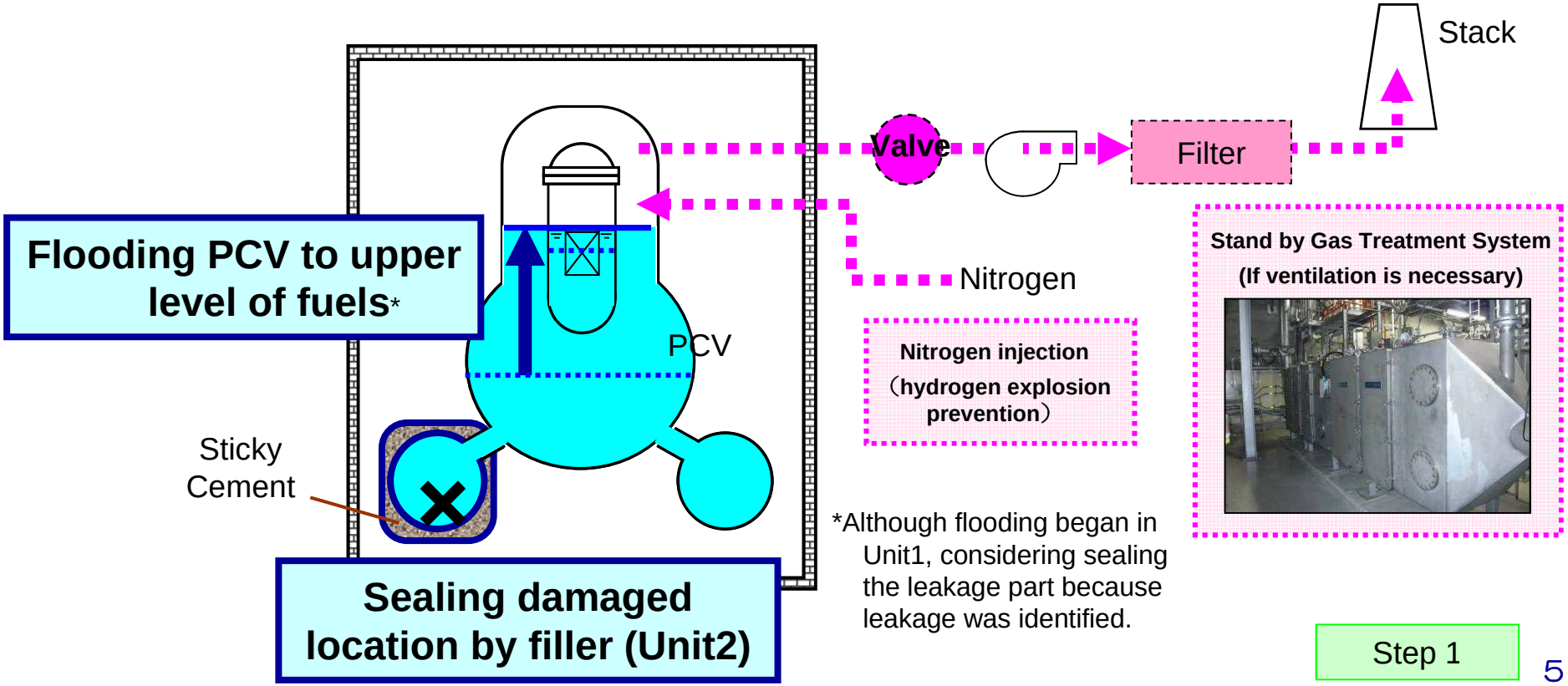
➡ Achieve “cold shutdown” by ensuring the necessary water level and implementing stable heat removal

Future Strategies ("Flooding")

Future Strategies

- Considering flooding the PCV up to the upper level of fuels for stable cooling.
- As for Unit 2 which is likely damaged in the PCV, implement flooding after sealing the damaged part

<Risk Countermeasures>
- Inject nitrogen into the PCV in order to prevent hydrogen explosions.
- In case PCV ventilation is required, implement reduction countermeasures of radioactive materials emission such as utilizing a Standby Gas Treatment System (SGTS) (filters).



*Although flooding began in Unit1, considering sealing the leakage part because leakage was identified.

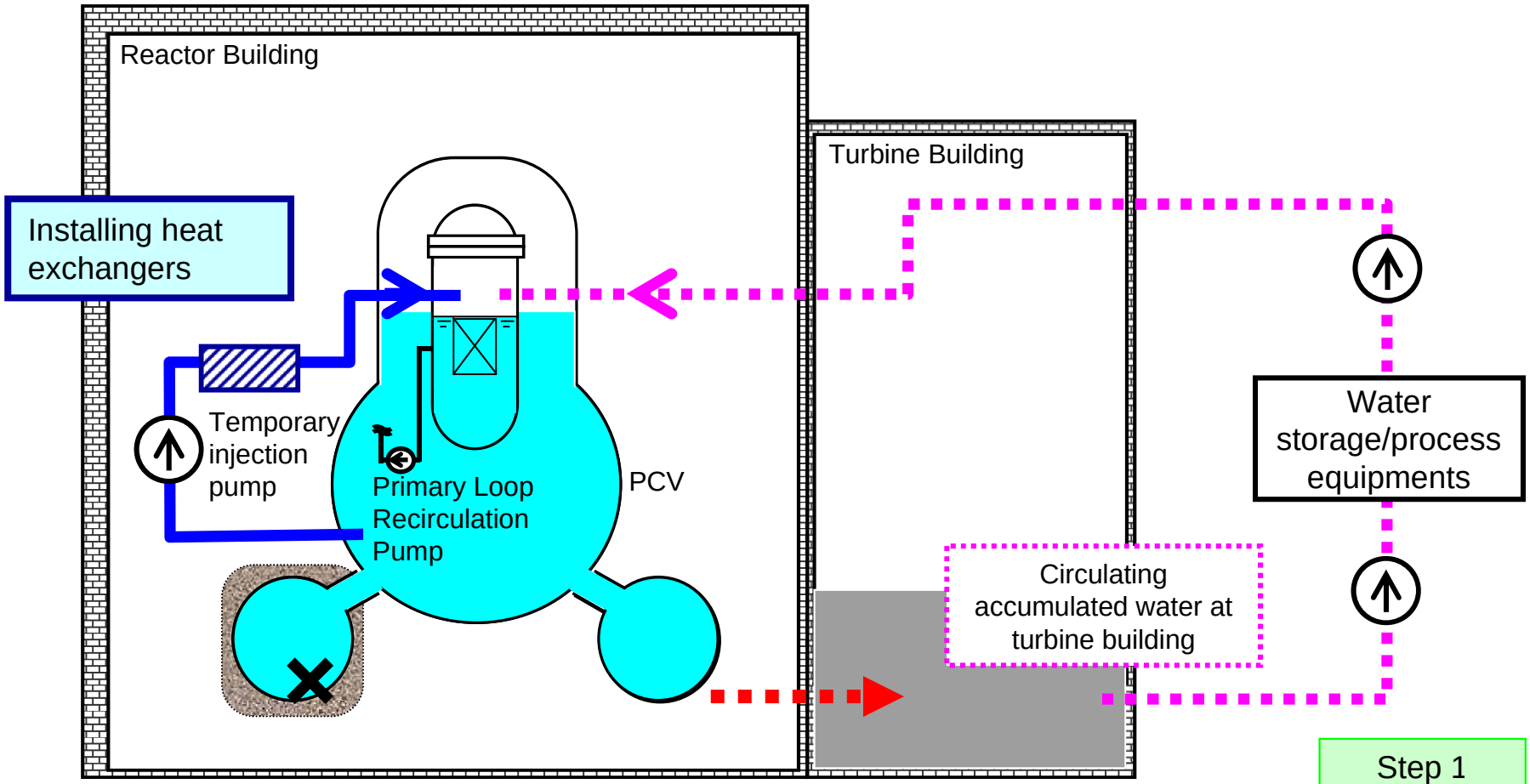
Step 1

Future Strategies ("Heat Removal")

Future Strategies

➢ Install heat exchangers and restore the heat removal function.

<Risk Countermeasures>
➢ Circulating accumulated water at the turbine buildings in preparation to continue/increase of outflow of leakage into the turbine buildings.



(Step2 is maintain and enhance of Step1)

Ⅰ. Cooling(2) Spent Fuel Pool　Targets and Progress

Targets

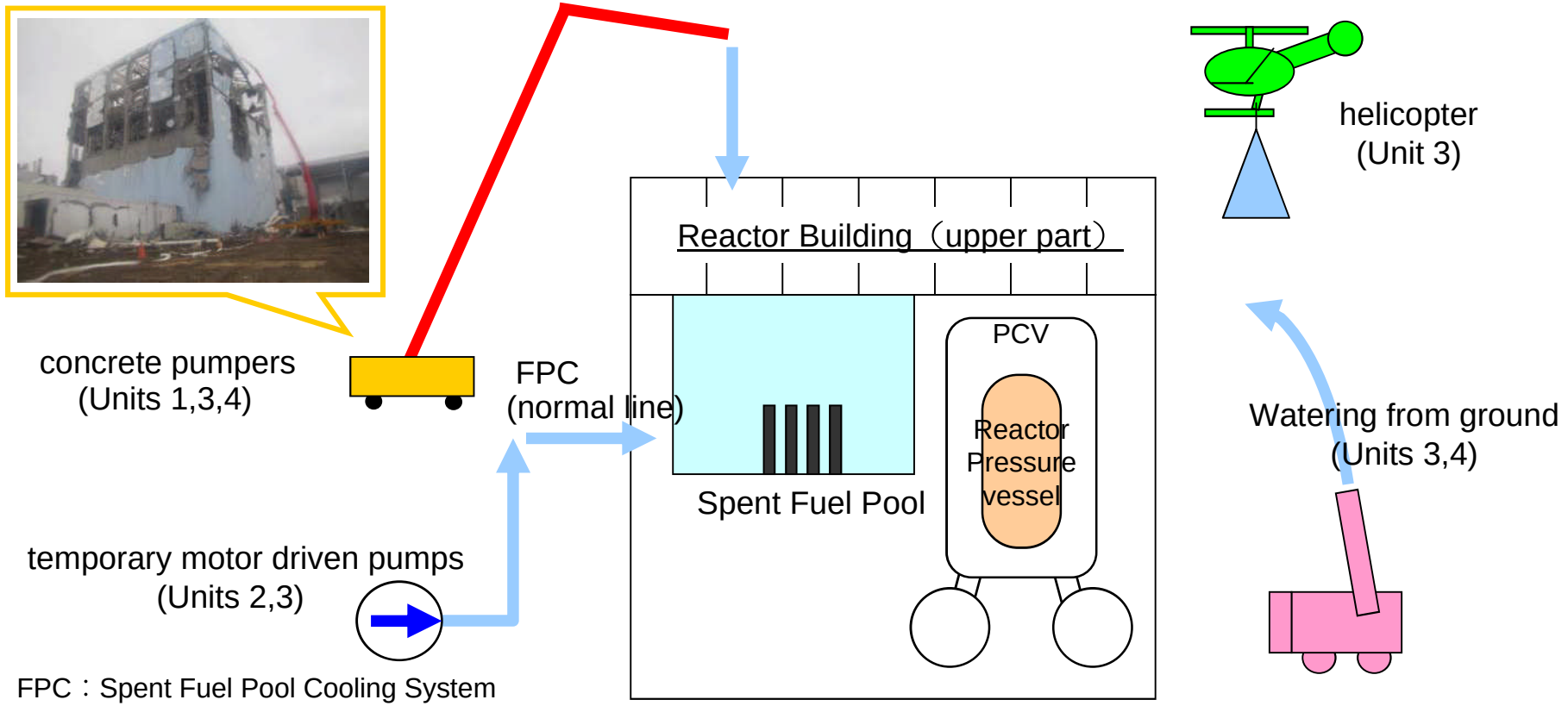
Step1：Maintain stable cooling

Step2：Increase stabilization of the cooling function by keeping a certain level of water.

Progress

➢Implemented external watering by helicopter or fire truck etc with the support of Self Defense Forces and the Fire and Disaster Management Agency etc.

➢Injecting water by concrete pumpers or temporary motor driven pumps



FPC：Spent Fuel Pool Cooling System

Current Status

Current Status

○Injecting fresh water from outside for Units 1&4 and from the regular cooling line for Units 2&3.

○Was confirmed that the fuels in Unit 4 which have the highest temperatures did not sustain damages.*

×Walls of the building supporting the pool have been damaged.

Injecting water by concrete pumpers

Unit 3

Unit 4

Confirming soundness of Spent Fuel Pools

*Some debris dropped into the spent fuel pool at Unit 3. However, it was confirmed that the possibility of severe damage is low according to the radiation level.

➡ Will maintain stable cooling by highly reliable measures as well as switch the operation over to remote controlling.

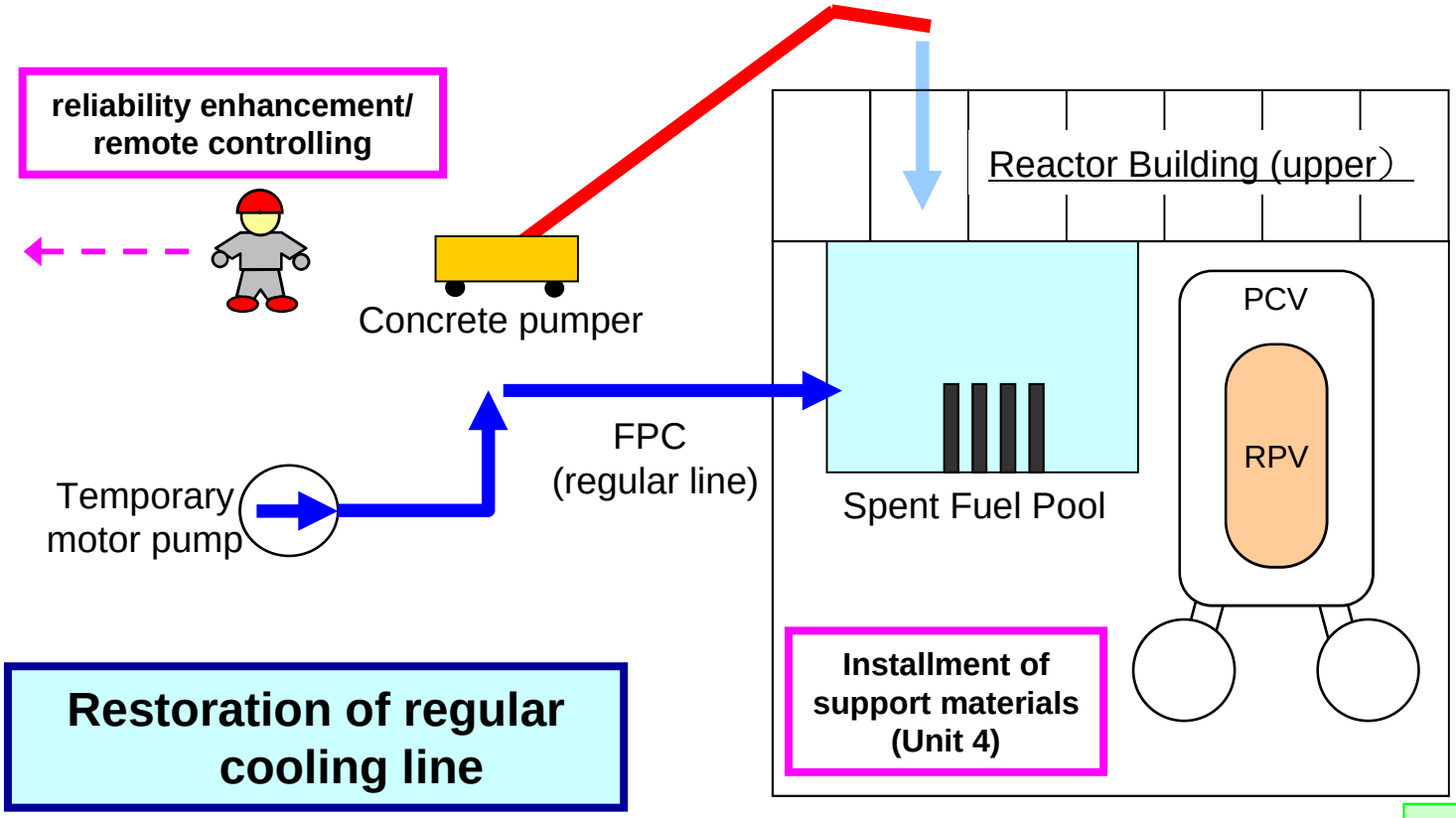
Future Strategies ("Stable Cooling")

Future Strategies

Switch the watering from concrete pumpers to regular cooling line after restoring it.

<Risk Countermeasures>

- Enhance the reliability and implement remote controlling of concrete pumpers in preparation for cases where regular cooling line can't be restored.
- Install support materials under the pool to reinforce it, since the walls of the building supporting the pool have been damaged. (Unit 4)



Restoration of regular cooling line

Step 1

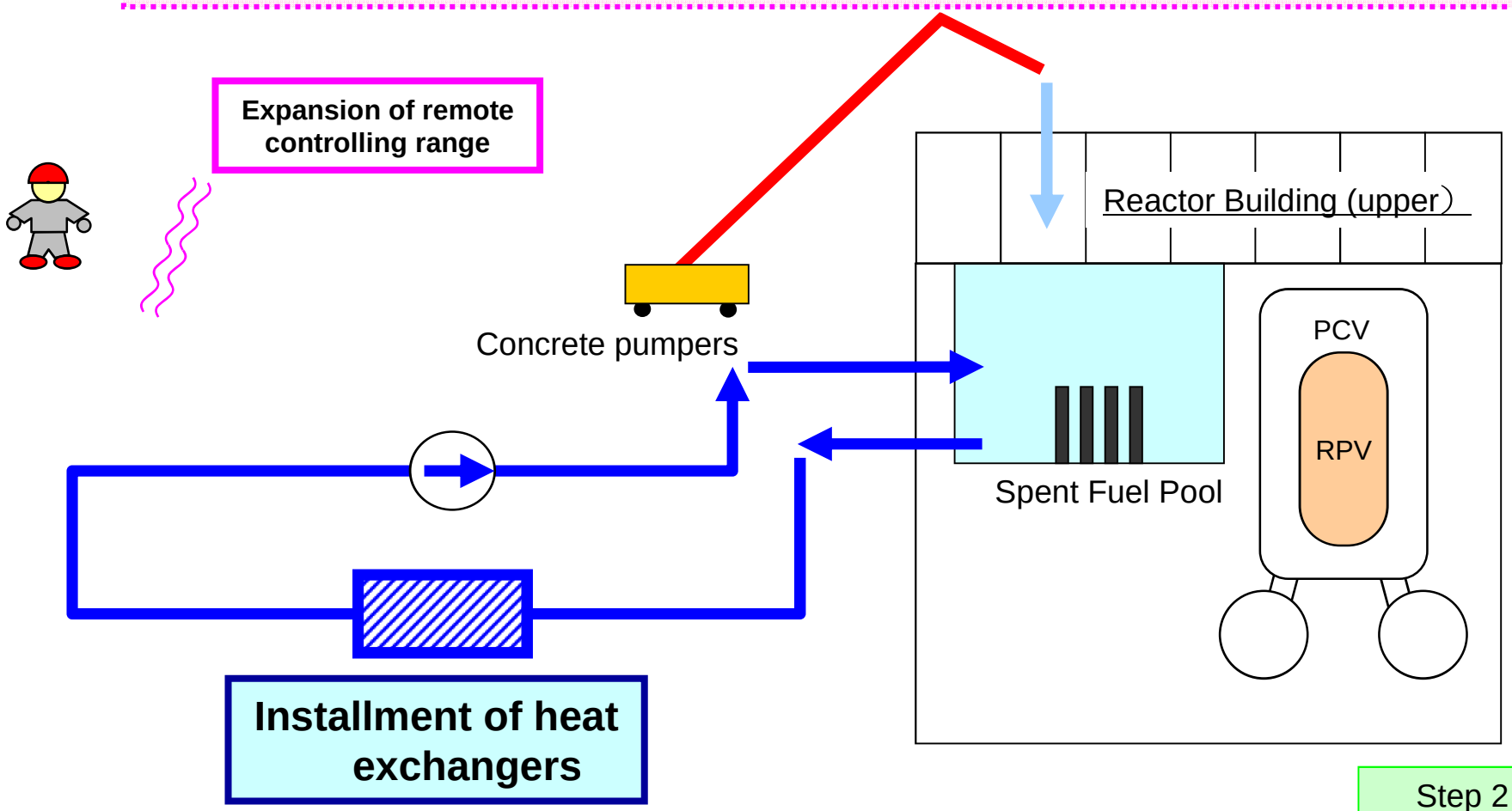
Future Strategies ("Heat Removal")

Future Strategies

Install heat exchangers and maintain stable cooling.

<Risk Countermeasures>

- Expand the remote controlling range of concrete pumpers in preparation for those cases where the regular line cannot be restored or the line is to be suspended.



Step 2

Targets and Progress

Targets

STEP1: Secure sufficient storage place to prevent water with high radiation level from being released outside of the site boundary, and store / process low level contaminated water

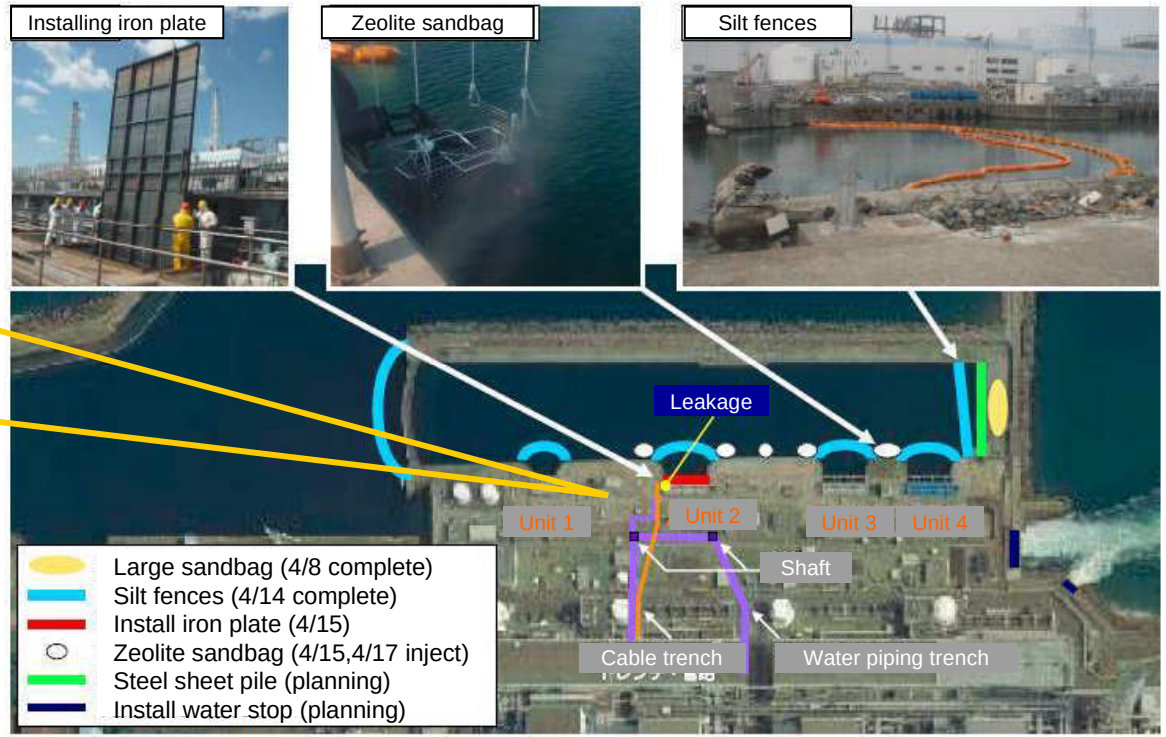
STEP2: Decrease the total amount of contaminated water

Progress

➢There was a leakage of high radiation-level contaminated water assumed to have originated from the Unit 2 reactor, but it was stopped.

➢Outflow prevention was implemented by radioactive material adsorbent (Zeolite) or silt fences.

Leakage prevention by coagulator (Unit 2)



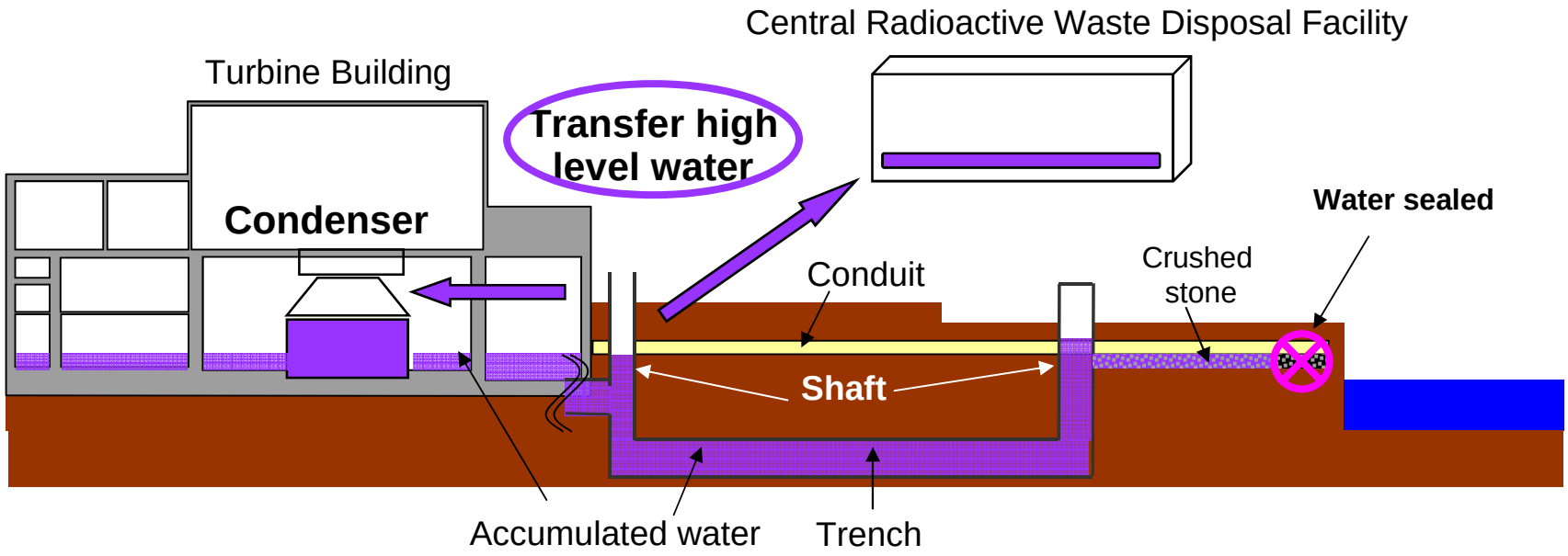
Outflow prevention

Current Status

Current Status

- ○ Transferring high level radioactive water accumulated in the turbine building and shaft/trench in Unit2 into the storage place (Condenser or Central Radioactive Waste Disposal Facility)
- × The amount of low radiation-level contaminated water storage has been increasing.
- × Groundwater (sub-drain water) around the buildings is suspected to be contaminated.

Accumulated water in Unit 2

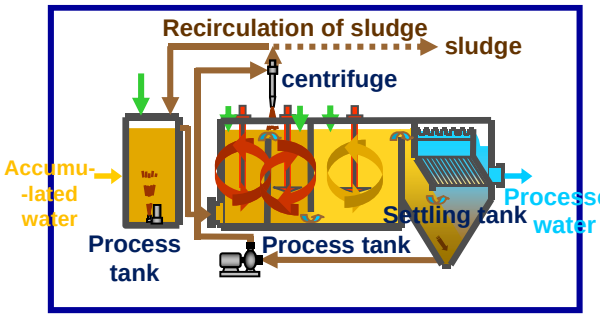


Securing sufficient storage place and reducing radiation levels by processing of accumulated water are necessary

Future Strategies

- Utilize the Central Radioactive Waste Disposal facility as a storage place.
- Install a water process facility to decontaminate and desalt high-level contaminated water and store them in tanks.

<Risk Countermeasures>
Install additional tanks/pools or implement leakage prevention measures by using a coagulator in preparation for installment delays or if the water process facility becomes inoperative.



Outline of water process system
(one part)

High level water in Units 1~3 (sea water contaminated)

Accumulated water in R/B or T/B

R/B: Reactor Building

T/B: Turbine Building

Trench/Shaft

Condenser

Central Radioactive Waste Disposal Building

Sludge

Decontamination (AREVA, etc)

Processed water

High level sludge

Storage in buildings

Desalination

Salty water

Fresh water

-Reuse for reactor coolant
-Filtrate tank

Additional Ground Tank

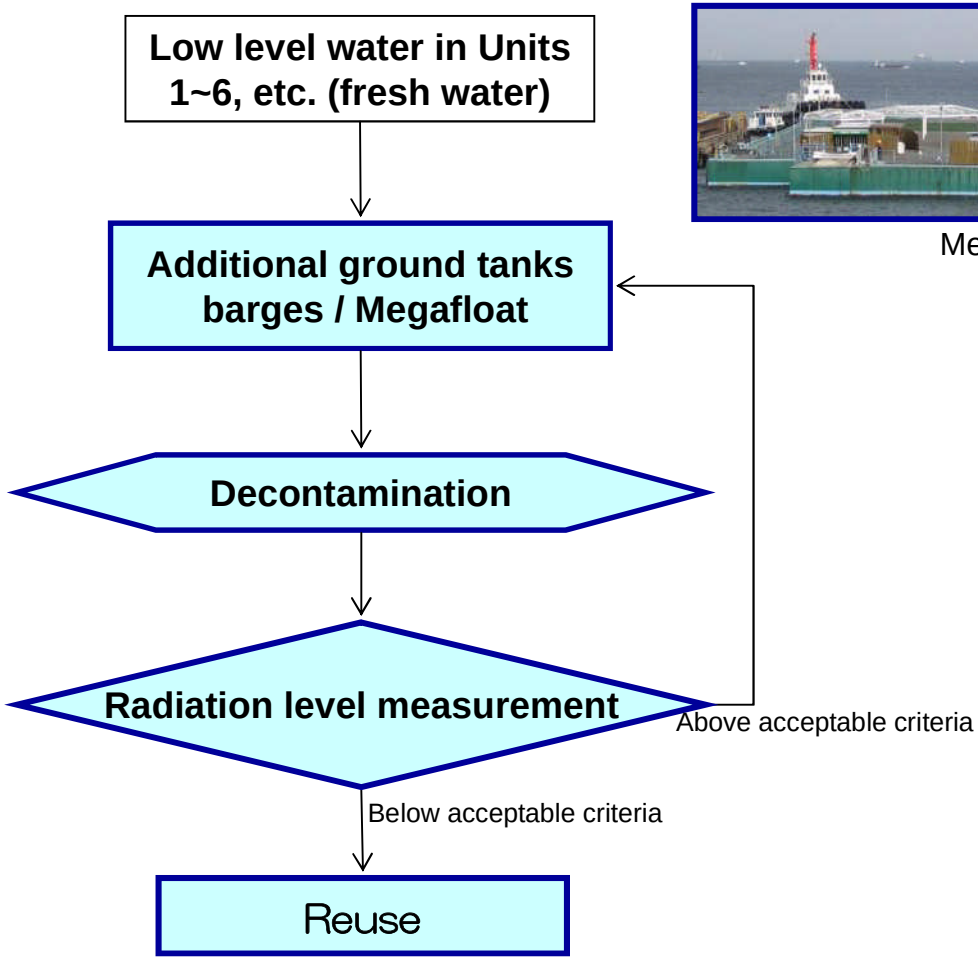
Step 1, Step2

Future Strategies

- Enlarge storage capacity by utilizing tanks, barges, Megafloat, etc.
- Decontaminate low level contaminated water until it is below acceptable criteria by decontaminants.


Megafloat


Temporary storage tanks



Step 1, Step2

Targets and Progress

Targets

Step1: Prevent scattering of radioactive materials on the buildings and ground

Step2: Cover the entire buildings (as temporary measure)

Progress

➢Scattered dust inhibitor on trial base and removed debris within the site.

Scattering dust inhibitor

Loading debris into a container by a heavy machinery

Moving a container by a crawler dump

Current Status

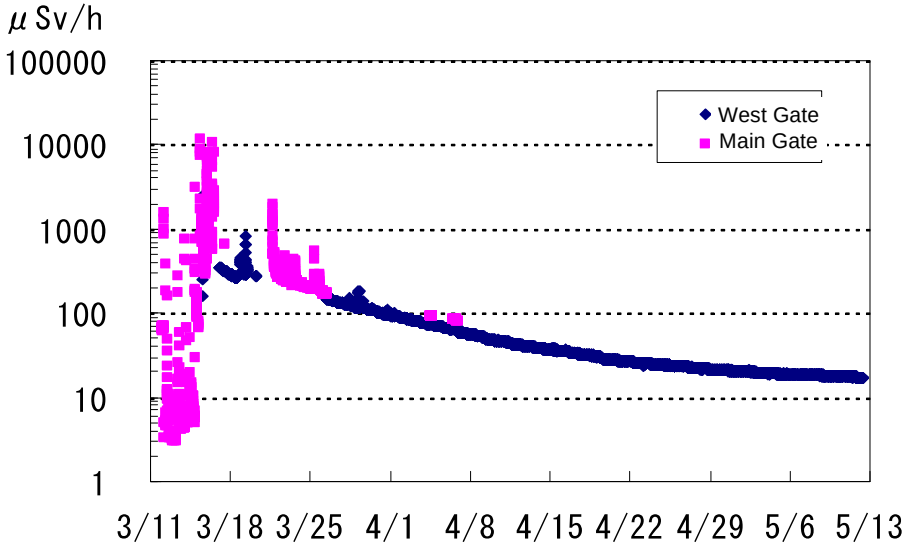
Current Status

○Radiation dose at the site boundary is in decline.

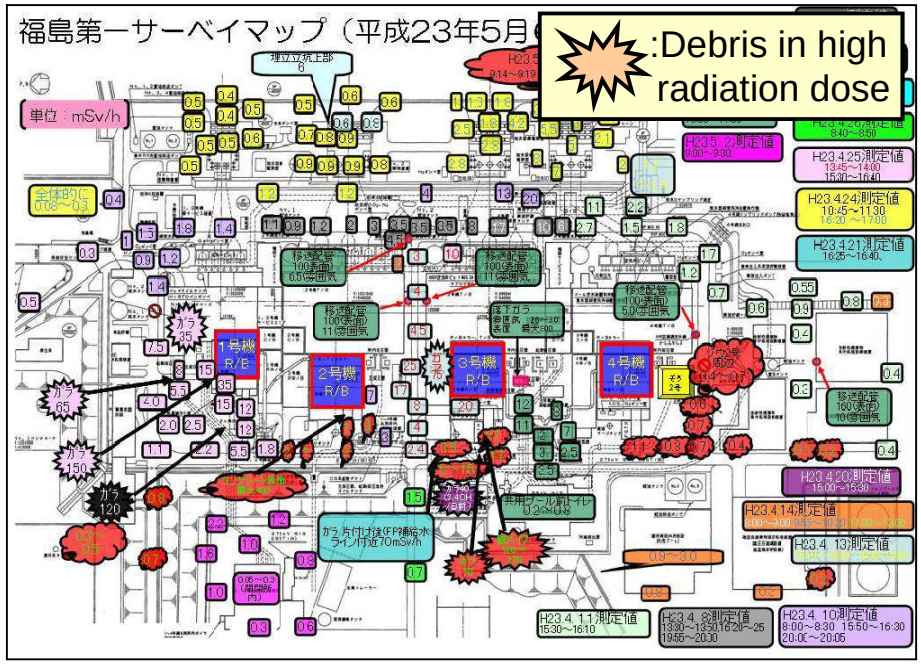
○Periodically implementing radionuclide analysis for air and soil within the site boundary.

×Debris contaminated by high radioactive materials are still remaining within the site.

Dose Rate Trend at the Site Boundary of Fukushima Daiichi



Survey map in Fukushima Daiichi



As of May 6th at17:00

Continuation of preventing scattering of radioactive materials on buildings and ground is necessary

Future Strategies (“Prevent Scattering”)

Future Strategies

➢Continue scattering dust inhibitor or removing debris to make radiation dose in steady decline.

◆ Scattering dust inhibitors

->Full-fledged dispersion of dust inhibitors by unmanned crawler dump (dispersing from April 26)

Remote controlled crawler dump

◆ Removing debris

→Continue removal of debris by unmanned heavy machine.

removal of debris by remote controlling

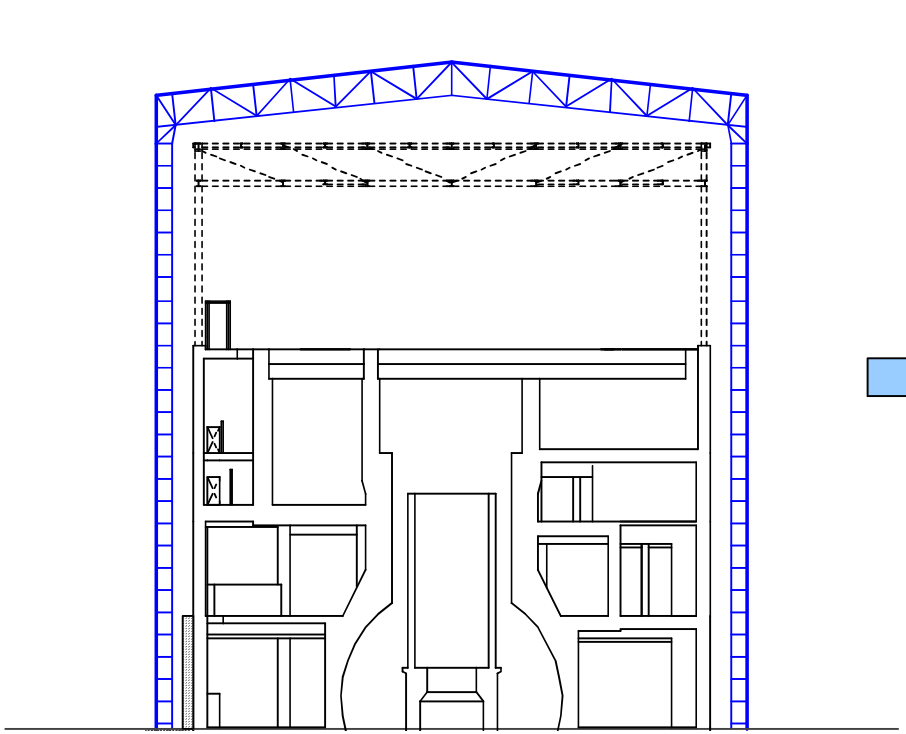
removal of debris

Step 1

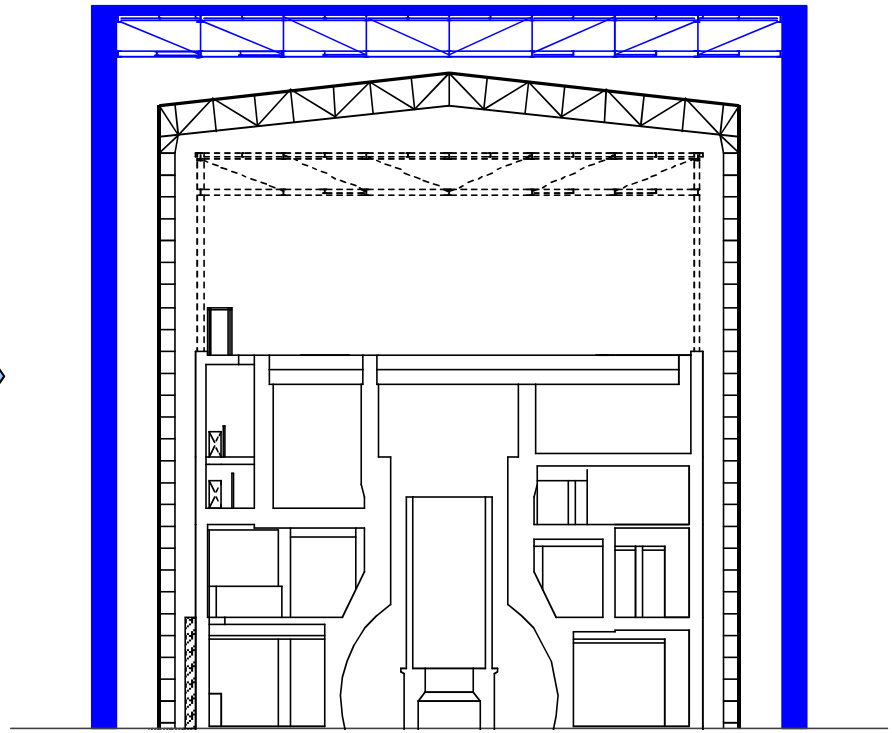
Future Strategies ("Containment by covers")

Future Strategies

- Prevent releasing of radioactive materials by installing reactor building covers (Units 1, 3, 4.)
- After installing the covers, launch detailed design of a container (with roof and outer wall of concrete, etc.) as a full-fledged measure



Accomplish installing reactor building covers



After installing the covers, launch detailed design of full-fledged measures such as container.

Step 2

Targets and Progress

Targets

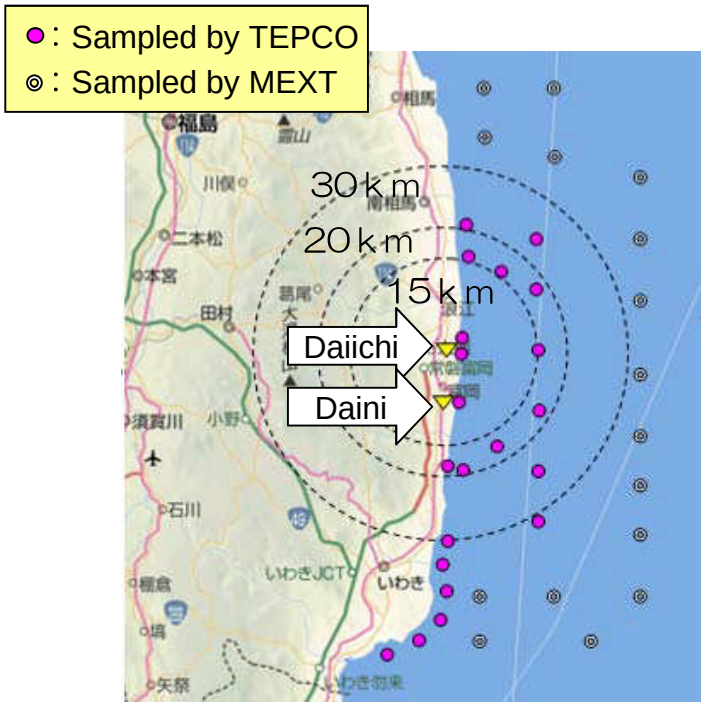
Step1: Expand/enhance monitoring and inform of results fast and accurately.

Step2: Sufficiently reduce radiation dose in evacuation area / deliberate evacuation area /evacuation prepared area in case of emergency

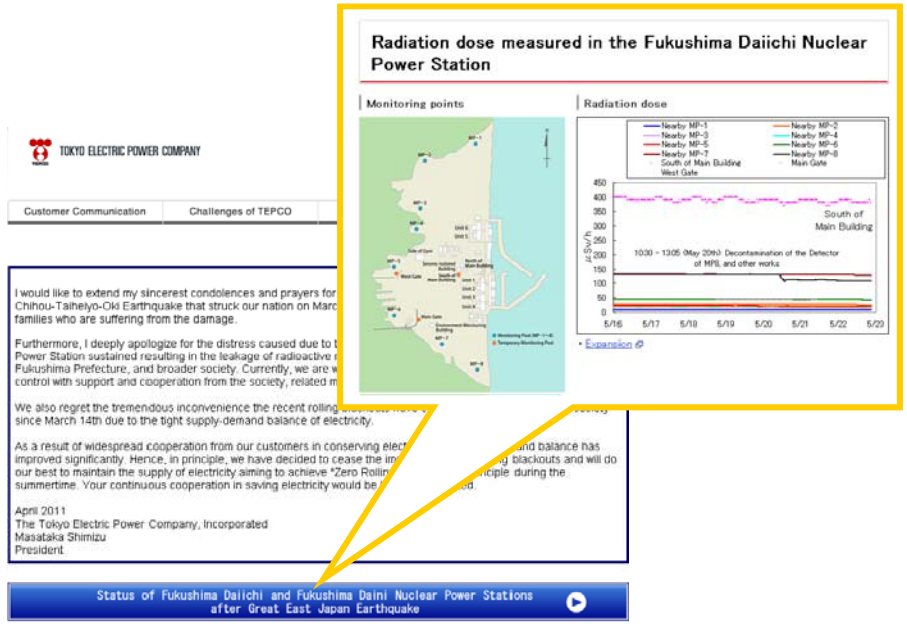
Progress

Monitoring radiation dose in and out of the power station and informing of results promptly

- Monitoring sea water, soil and atmosphere within the site boundary
- Monitoring radiation dose at the site boundary



Sampling points on and off the coast (as of May 9)



Publish monitoring data on the TEPCO's website

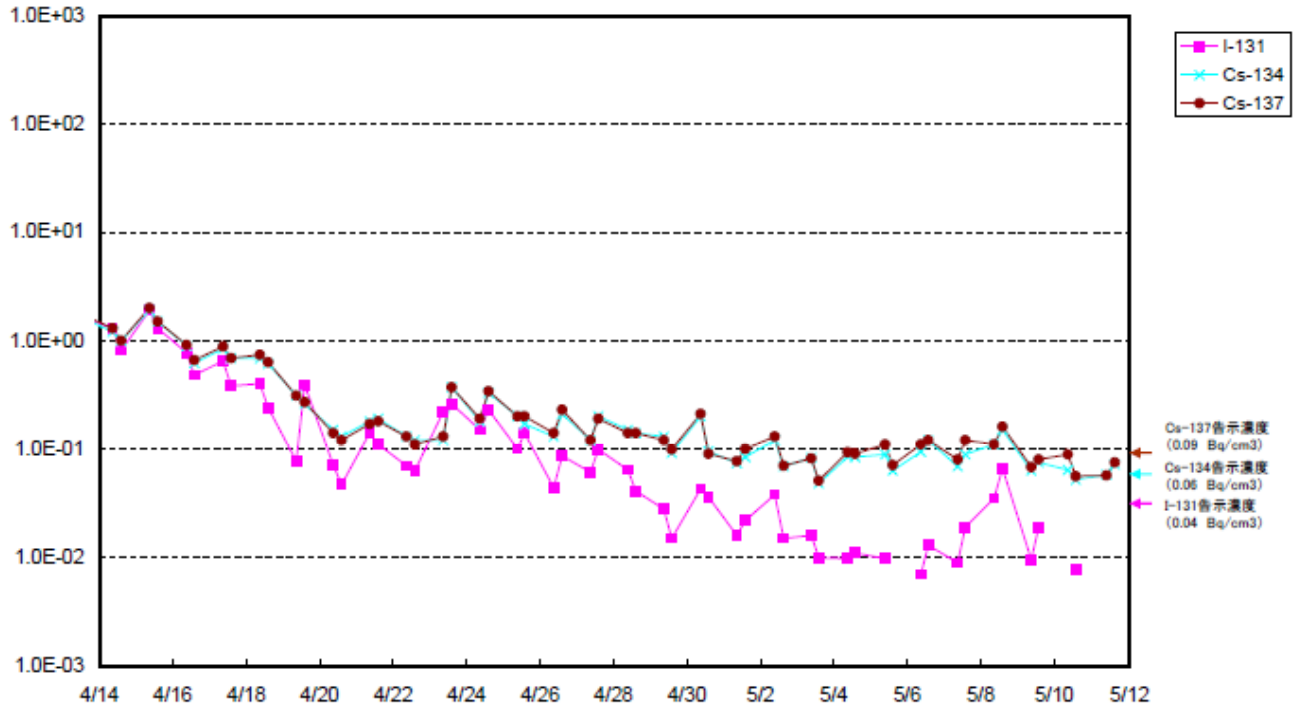
Current Status

○Dose rate at the site boundary and in seawater is in steady decline.

○Periodically implementing radionuclide analysis for air and soil within the site boundary.

×Since some errors were found in the measurement records of radioactive materials, prevention measures have been developed.

Radioactive concentration at the point of 30km north from discharge channel of Units 5&6



Enhancing monitoring and informing of results fast and accurately are necessary

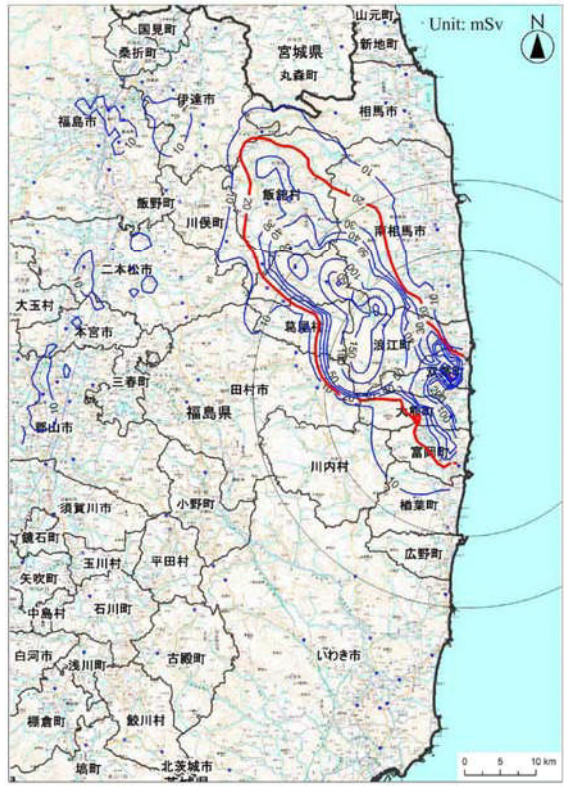
Future Strategies

- Consider / Launch monitoring and decontamination of evacuation area / deliberate evacuation area /evacuation prepared area in case of emergency

Dose map
(As of April 24, 2011)

Using the latest data released in the press on April 24 at 10:00 and 13:00
(Corresponding value included)

Accumulated dose estimation map
(Accumulate dose until March 11, 2011)



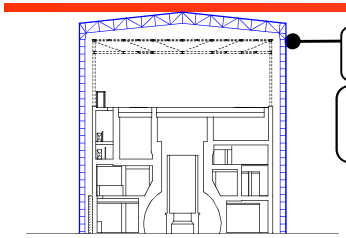
Using actual value measured up until April 21, 2011 at 24:00

Source: Ministry of Education, Culture, Sports, Science and Technology

Step 1, Step2

[Reference] Overview of Major Countermeasures in the Power Station as of May 17

Red colored: newly added to the previous version



Reactor building cover (5, 50, 54, 55)

Begin detailed design of full-fledged container (56)

Cooling of spent fuel pool by external water injection (18, 22, 28)

piping Ⓟ pumps heat exchangers, water processing facilities

Sampling of steam/pool water and measurement of radioactive materials (19)

Circulation cooling of spent fuel pool (23, 24, 25, 27)

Storage/process of low radiation-level water (33, 35, 40)

Storage: tanks, megafloats, barges
Process: decontamination by zeolite

Lower the amount of steam generated (4)
Maintain and enhance countermeasures in Step 1 if needed (17)

Processing high radiation-level water (31,34,38,41,43,44)

Nitrogen gas injection (2, 11, 15)

Reactor Building

Tank

Water processing facility (Decontamination and desalt processing)

Tank Lorry

PCV venting (with filtration) (10)

Primary Containment Vessel (PCV)

Cooling at minimum water injection rate (7,12,14)
Reuse of processed water (45)
(Establish circulation cooling system)

Storage of high radiation-level water (30, 32, 37, 39, 42)

Flooding up to top of active fuel (3, 9)

Reactor Pressure Vessel (RPV)

Turbine Building

Steam Turbine

Additionally-installed Tank

Heat Exchanger

Centralized Waste Processing Building

Installation of heat exchangers (13)

Condenser

Injection of fresh water with pumps (1)

Suppression Chamber

Dispersion of inhibitor (47, 48, 52)
Removal of debris (49, 53)
Consideration of countermeasures for contaminated soil (51)

Sealing the leakage location (6, 16)

Processing of sub-drainage water after being pumped up (36)

Seismic assessment (20),Continued monitoring (21),
(Unit 4) Installation of supporting structure under the bottom of spent fuel pool (26)

Preventive measures against leakage of high radiation-level water (29)
Prevent contamination in the ocean (64)
Isolation of high-level radioactive water (65)

Prevent contamination of groundwater (66,67); consideration of shielding groundwater(68)

Improvement of life/work environment of workers(74,75); improvement of site environment(76)

Install interconnecting lines of offsite power(8); enhance countermeasures against tsunami (69,70); planning of reinforcement work of each Unit (71); various countermeasures of radiation shielding (72,73)

Enhance/enforce monitoring (55~62), Consideration of necessary measures to reduce radiation dose (63)

Information on Status of Nuclear Power Plants in Fukushima

Japan Atomic Industrial Forum, Inc.

Policy on information and compilation
This JAIF-compiled information chart represents the situation, phenomena, and operations in which JAIF estimates and guesses the reactors and related facilities are, based on the latest data and information directly and indirectly made available by the relevant organizations when JAIF's updating works done. Consequently, JAIF may make necessary changes to descriptions in the chart, once (1) new developments have occurred in the status of reactors and facilities and (2) JAIF has judged so needed after reexamining the prior information and judgments.
JAIF will do its best to keep tracks on the information on the nuclear power plants quickly and accurately.

Status of nuclear power plants in Fukushima as of 12:00, May 25th (Estimated by JAIF)

Power Station	Fukushima Dai-ichi Nuclear Power Station					
Unit	1	2	3	4	5	6
Electric / Thermal Power output (MW)	460 / 1380	784 / 2381	784 / 2381	784 / 2381	784 / 2381	1100 /3293
Type of Reactor	BWR-3	BWR-4	BWR-4	BWR-4	BWR-4	BWR-5
Operation Status at the earthquake occurred	In Service -> Shutdown	In Service -> Shutdown	In Service -> Shutdown	Outage	Outage	Outage
Fuel assemblies loaded in Core	400	548	548	No fuel rods	548	764
Core and Fuel Integrity (Loaded fuel assemblies)	Damaged (core melt*2)	Damaged (core melt*2)	Damaged (core melt*2)	No fuel rods	Not Damaged	
Reactor Pressure Vessel structural integrity	Limited Damage and Leakage	Unknown	Unknown	Not Damaged	Not Damaged	
Containment Vessel structural integrity	Damage and Leakage Suspected	Damage and Leakage Suspected	Damage and Leakage Suspected	Not Damaged	Not Damaged	
Core cooling requiring AC power 1 (Large volumetric freshwater injection)	Not Functional	Not Functional	Not Functional	Not necessary	Functional	
Core cooling requiring AC power 2 (Cooling through Heat Exchangers)	Not Functional	Not Functional	Not Functional	Not necessary	Functioning (in cold shutdown)	
Building Integrity	Severely Damaged (Hydrogen Explosion)	Partly opened	Severely Damaged (Hydrogen Explosion)	Severely Damaged (Hydrogen Explosion)	Open a vent hole on the rooftop for avoiding hydrogen explosion	
Water Level of the Rector Pressure Vessel	Lower than the bottom of fuels	Fuel exposed partially or fully	Fuel exposed partially or fully	Safe	Safe	
Pressure / Temperature of the Reactor Pressure Vessel	Gradually increasing / Gradually decreasing	Unknown / Stable	Unknown / Gradually decreasing after an increase	Safe	Safe	
Containment Vessel Pressure	Stable	Stable	Stable	Safe	Safe	
Water injection to core (Accident Management)	Continuing (Switch from seawater to freshwater)	Continuing (Switch from seawater to freshwater)	Continuing (Switch from seawater to freshwater)	Not necessary	Not necessary	
Water injection to Containment Vessel (AM)	Feed water to fill up the CV (started 4/27)	Feed water to fill up the CV (planned)	Feed water to fill up the CV (planned)	Not necessary	Not necessary	
Containment Venting (AM)	Temporally stopped	Temporally stopped	Temporally stopped	Not necessary	Not necessary	
Fuel assemblies stored in Spent Fuel Pool	292	587	514	1331	946	876
Fuel Integrity in the spent fuel pool	Unknown	Unknown	Damage Suspected	No severe damage suspected*1	Not Damaged	
Cooling of the spent fuel pool	Water spray continues (freshwater)	water injection continues (Switch from seawater to freshwater)	Water spray and injection continues (Switch from seawater to freshwater)	Water spray and injection continues (Switch from seawater to freshwater)	Pool cooling capability was recovered	
Main Control Room Habitability & Operability	Poor due to loss of AC power (Lighting and parmaeter monitoring restored in the control room at Unit 1 and 3 on Mar. 24th, at Unit 2 on Mar. 26th, at Unit 4 on Mar. 29th)				Not damaged (estimate)	
Environmental effect	●Status in Fukushima Dai-ichi NPS site Radiation level: 384 μ Sv/h at the south side of the office building, 15 μ Sv/h at the West gate, as of 09:00, May 25th, 42 μ Sv/h at the Main gate, as of 10:30, May 21st. Some radioactive nuclides (I, Cs, Pu, Am Cm and Sr) has been detected in soil sampled at the Fukushima site. Radioactive materials continues to be detected in samples corrected from underground water and sea water at or near the site. Environmental monitoring has been enhanced. Radioactive Iodine and cesium have been detected in the seabed samples taken 15-20 km far from the plant from 15-20m deep. Level of radiation is 100 to 1,000 times above normal. (5/4) ●Influence to the people's life Radioactive material was detected from milk, agricultural products and seafood from Fukushima and neighboring prefectures. The government issued order to limit shipment and intake of some products. Radioactive iodine, exceeding the provisional legal limit for drinking water, was detected from tap water sampled in some prefectures. All the restrictions of intake of the water, which was once issued by the govedrment, have been lifted by May 10th. Radioactive cesium was detected in the sludge from a sewage treatment plants, one of which is 50 km far from the power station. Small amount of strontium was detected in some samples of soil and plants collected in the area 20-80 km away from the power station. Radioactive Cs above the legal limits have been detected in tea leaves harvested in some prefectures. The pref governments have asked the municipalities and the local farmers' association to voluntarily halt shipments.(5/13-)					
Evacuation	<1> Shall be evacuated for within 3km from NPS, Shall stay indoors for within 10km from NPS (issued at 21:23, Mar. 11th) <2> Shall be evacuated for within 10km from NPS (issued at 05:44, Mar. 12th) <3> Shall be evacuated for within 20km from NPS (issued at 18:25, Mar. 12th) <4> Shall stay indoors (issued at 11:00, Mar. 15th), Should consider leaving (issued at 11:30, Mar. 25th) for from 20km to 30km from NPS <5>The 20km evacuation zone around the Fukushima Daiichi NPS is to be expanded so as to include the area, where annual radiation exposure is expected to be above 20mSv. People in the expanded zone are ordered to evacuate within a month or so. People living in the 20 to 30km and other than the expanded evacuation area mentioned above, are asked to get prepared for staying indoors or evacuation in an emergency (announced on Apr. 11th and issued on Apr. 22nd).					
INES (estimated by NISA)	Level 7*2 ※Cumulative amount of radioactivity from Fukushima Diichi NPS has reached the level to be classified as level 7. Total amount of radioactive materials released to the environment in this accident is one tenth as much as one in the Chernobyl accident so far.			Level 3 *2	–	–
Remarks	●Progress of the work to restore cooling function TEPCO announced its plan to bring the damaged reactors to stable condition known as "cold shutdown" in about 6 to 9 months, a situation in which water temperatures inside the reactors have been stably brought below 100 C.(4/17, revised on 5/17) High radiation circumstance hampering the work to restore reactor cooling function. Discharging radioactive water in the basement of the buildings and concrete tunnels outside the buildings counties at unit 2 and 3. Works inside the reactor bldg becomes available after radiation inside were forcibly decreased through air purification. Emergency power generators were moved to higher ground in order to prevent the reactors' cooling systems from failing in case of major tsunami hits. External power source becomes more reliable after connecting 3 power lines with each other, which are for Unit 1/2, for Unit 3/ 4 and for Unit 5/6. The damaged containment vessel of unit 2 is need to be repaired before the work to restore reactor cooling function. TEPCO has been working to create a system to decontaminate and circulate water back into the reactors to cool them down since the discovery that water level in reactor No1 is very low. TEPCO announced the results of the core damage analyses, which showed the fuel pellets have melted and fallen to the bottom of the reactor vessel at Unit 1 while at Unit 2 and 3 the core had been stayed at the fuel area in the vessel, without damaging the vessel, even though the part of the core had melted (5/15, 23). Another analysis, which was performed assuming that the reactor water level had not recovered after dropping below the bottom of the fuel at Unit 2 and 3, showed that the most of the core had melted and fallen to the bottom of the reactor, causing a limited damage to the vessel. TEPCO also predicts that an event associated with large amount of radioactive material release is not likely to happen in the future since the reactors have been cooled by means of water injection.*2 ●Function of containing radioactive material It is presumed that radioactive material inside the reactor vessel may leaked outside. Nitrogen gas injection into the Unit 1containment vessel to prevent hydrogen explosion started on April 6th and continues. Preparation work for covering the reactor building was started at Unit 1 (5/13). Operation for Installing the the cover over the building is scheduled to start in June. ●Cooling the spent fuel pool (SFP) Injecting and/or spraying water to the SFP continues for the purpose of cooling and makeing up water evaporated. Corrosion inhibitor, Hydrazine (H2NNH2), has been injected into the SFP (5/9-). Work for structural reinforcement to support the SFP is in progress at unit 4 prior to heat exchanger insulation for SFP cooling. Construction work to install heat exchangers to cool the SFP is in progress at unit 2. ●Prevention of the proliferation of radioactively contaminated substance: TEPCO announced the plans to prevent radioactively contaminated water, dust and soil and radioactive material itself existing on site from spreading on Apr 17. Full operation of spraying synthetic resin to contain contaminated dust started on Apr. 26th and continues. ●Worker's exposure dose: 30 workers has been exposed to radiation more than 100 mSv as of 5/11. *Emergency exposure dose limit has been set to 250mSv.					

[Source]
Government Nuclear Emergency Response Headquarters:
News Release (-5/23 17:00), Press conference
NISA: News Release (-5/24 12:00), Press conference
TEPCO: Press Release (-5/25 09:00), Press Conference

[Abbreviations]
MEXT: Ministry of Education, Culture, Sports, Science and Technology
INES: International Nuclear Event Scale
NISA: Nuclear and Industrial Safety Agency
TEPCO: Tokyo Electric Power Company, Inc.
NSC: Nuclear Safety Commission of Japan

*1 TEPCO estimated that severe damage of spent fuels is not likely in the Unit 4 spent fuel pool after examing the radioactive substance detected from the pool and some pictures of the pool. (4/13, 28, 29)
*2 TEPCO announced the results of the core damage analyses of Unit 1through 3 (5/15, 23).

[Significance judged by JAIF]
Low
High
Severe (Need immediate action)

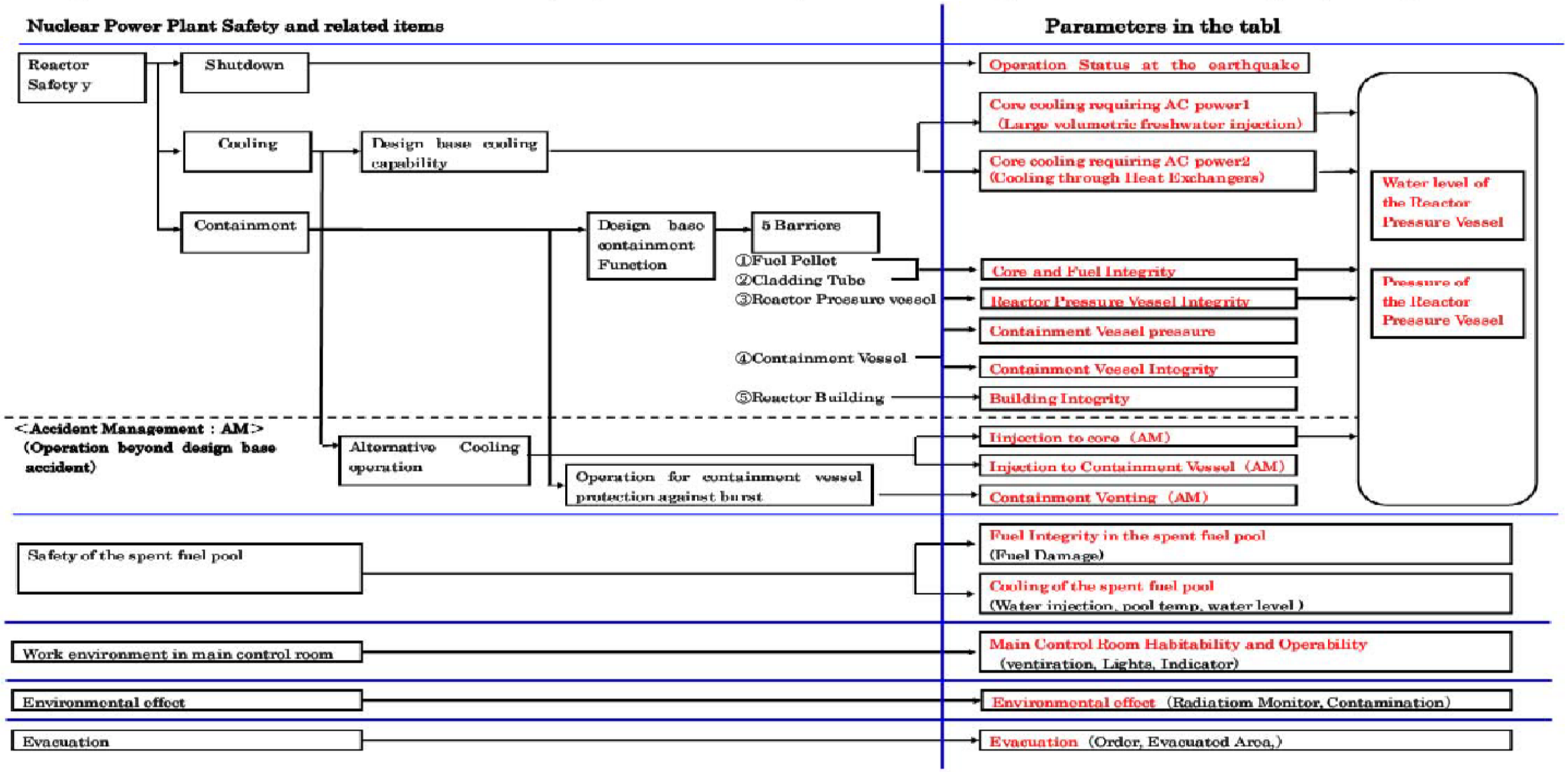
Power Station	Fukushima Dai-ni Nuclear Power Station			
Unit	1	2	3	4
Electric / Thermal Power output (MW)	1100 / 3293			
Type of Reactor	BWR-5	BWR-5	BWR-5	BWR-5
Operation Status at the earthquake occurred	In Service -> Automatic Shutdown			
Status	All the units are in cold shutdown.			
INES (estimated by NISA)	Level 3	Level 3	—	Level 3
Remarks	Unit-1, 2, 3 & 4, which were in full operation when the earthquake occurred, all shutdown automatically. External power supply was available after the quake. While injecting water into the reactor pressure vessel using make-up water system, TEPCO recovered the core cooling function and made the unit into cold shutdown state one by one. No parameter has shown abnormality after the earthquake occurred off an shore of Miyagi prefecture at 23:32, Apr. 7th. Latest Monitor Indication: 1.6 μ Sv/h at 09:00, May 23rd at NPS border Evacuation Area: 3km from NPS(3/12 7:45), 10km from NPS(3/12 17:39), 8km from NPS(4/21)			

Power Station	Onagawa Nuclear Power Station		
Unit	1	2	3
Operation Status at the earthquake occurred	In Service -> Automatic Shutdown		
Status	All the units are in cold shutdown.		
Remarks	3 out of 4 external power lines in service with another line under construction broke down after an earthquake occurred off the shore of Miyagi prefecture at 23:32, Apr. 7th. All 5 external power lines have become available by Apr. 10th. Monitoring posts' readings have shown no abnormality. All SFP cooling systems had been restored after shutting down due to the earthquake.		

Power Station	Tokai Dai-ni
Operation Status at the earthquake occurred	In Service -> Automatic Shutdown
Status	In cold shutdown.
Remarks	No abnormality has been found after an earthquake occurred off the shore of Miyagi prefecture at 23:32, Apr. 7th.

Parameters in the Table

JAIF picks up theee parameters to evaluate safety condition of the nuclear plants during this accident from the view point of the principles of nuclear power plant safety, which are "Shutdown", "Cooling" and "Containment". Then we create the chart. The following diagram is to show the correspondence relation of these parameters in the table to nuclear power plant safety.



Accidents of Fukushima Daiichi Nuclear Power Stations

as of 17:00, May 23rd

1. Latest Major event and response

May 22nd

13:02-14:40 Hydrazine added freshwater was injected into the SFP at Unit 2 using concrete pump vehicle.

15:33-17:09 Water was sprayed to the No1 spent fuel pool

May 23rd

11:31 Volume of water to No.3 Reactor injected through fire extinguishing line was changed to 5 m3/h from 6 m3/h.

14:08 Volume of water to No.3 Reactor injected through fire extinguishing line was changed to 4 m3/h from 5 m3/h.

2. Chronology of Nuclear Power Stations

(1) Fukushima Dai-ichi NPS

	Unit 1		Unit 3	Unit 4	Unit-5 and 6
Major Incidents and Actions **The Act on Special Measures Concerning Nuclear Emergency Preparedness*	11th 15:42 Report IAW Article 10* (Loss of power)	11th 15:42 Report IAW Article 10* (Loss of power)	11th 15:42 Report IAW Article 10* (Loss of power)	14th 04:08 Water temperature in Spent Fuel Storage Pool increased at 84℃	19th 05:00 Cooling SFP with RHR-pump started at Unit 5 19th 22:14 Cooling SFP with RHR-pump started at Unit 6
	11th 16:36 Event falling under Article 15* occurred (Incapability of water injection by core cooling function)	11th 16:36 Event falling under Article 15* occurred (Incapability of water injection by core cooling function)	12th 20:41 Start venting	15th 09:38 Fire occurred on 3rd floor (extinguished spontaneously)	
	12th 00:49 Event falling under Article 15* occurred (Abnormal rise of CV pressure)	13th 11:00 Start venting	13th 05:10 Event falling under Article 15* occurred (Loss of reactor cooling functions)	16th 05:45 Fire occurred (extinguished spontaneously)	20th 14:30 Cold shutdown achieved at Unit 5. 20th 19:27 Cold shutdown achieved at Unit 6.
	12th 14:30 Start venting	14th 13:25 Event falling under Article 15* occurred (Loss of reactor cooling functions)	13th 08:41 Start venting	Since 20th, operation of spraying water to the spent fuel pool continues.	22nd 19:41 All power source was switched to external AC power at Unit 5 and 6.
	12th 15:36 Hydrogen explosion	14th 16:34 Seawater injection to RPV	13th 13:12 Seawater injection to RPV	29th 11:50 lights in the main control room becomes available	
	12th 20:20 Seawater injection to RPV	14th 22:50 Report IAW Article 15* (Abnormal rise of CV pressure)	14th 05:20 Start venting		Apr. 1st 13:40 Start transferring pooled water in the Unit 6 radioactive waste process facility to the Unit 5 condenser.
	22nd 11:20 RPV temperature increased	15th 00:02 Start venting	14th 07:44 Event falling under Article 15* occurred (Abnormal rise of CV pressure)	Apr. 13 13:50 Installation of silt fences in front of the Unit 3 and 4 seawater screen completed	
	22nd 02:33 Seawater injection through feed water line started in addition to fire extinguish line	15th 06:10 Sound of explosion, Suppression Pool damage suspected	14th 11:01 Hydrogen explosion	May 5 12:19 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May1 14:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank started.
	24th 11:30 lights in the main control room becomes available	15th 08:25 White smoke reeked	15th 10:22 Radiation dose 400mSv/h		
	25th 15:37 Freshwater injection to the reactor started.	20th 15:05 operation of spraying water to the spent fuel pool started.	16th 08:34, 10:00 White smoke reeked	May 6 12:38 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May2 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted. May 2 11:03 The Residual heat removal pump temporally stopped while start up transformer testing
	27th 08:30 Continuing to transfer the water in the basement of the turbine building	26th 10:10 Freshwater injection to the reactor started.	Since 17th, operation of spraying water to the spent fuel pool continues.		
	31st 09:20-11:25 Work to remove the water in the trench	26th 16:46 lights in the main control room becomes available	21st 15:55 Slightly gray smoke erupted (18:02 settled)	May 7 14:05 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May3 14:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
	31st 12:00 Start to transfer the water in the CST to the surge tank (- 15:27, Apr. 2)	29th 16:45 Start to transfer the water in the CST to the surge tank	22nd 22:46 lights in the main control room becomes available		
	31st 13:03 Start water injection to SFP	Apr. 2nd 16:25 Start injecting concrete to stop water leakage from the pit near the intake	25th 18:02 Freshwater injection to the reactor started.	May 9 16:05 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May7 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
	Apr. 3rd 12:18 Switch power supply for water injection pumps to the RPV from power supply vehicles to originally equipped power source	Apr. 2nd 17:10 Start transferring water in the condencer to the CST	28th 17:40 Start to transfer the water in the CST to the surge tank		
	Apr. 7th 01:31 Injection of Nitrogen gas started after opening all valves through the line.	Apr. 3rd 12:18 Switch power supply for water injection pumps to the RPV from power supply vehicles to originally equipped power source	Apr. 3rd 12:18 Switch power supply for water injection pumps to the RPV from power supply vehicles to originally equipped power source	May 11 16:07 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May9 14:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
	Apr. 10th 09:30 Transfer of water from the main condenser to the CST completed.	Apr. 5th 15:07 Regarding leakage from the pit that is closed to discharge outlet of unit-2, hardening agent was injected to hole dug surrounding the pit. (Apr. 6 05:38 It was confirmed that water flow stopped	Apr. 13 13:50 Installation of silt fences in front of the Unit 3 and 4 seawater screen completed	May 13 16:04 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May10 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
	Apr. 14 12:20 Installation of silt fences in front of the Unit 1and 2 seawater screen and intake completed	Apr. 9th 13:10 Transfer of water from the main condenser to the CST completed.	Apr 17 11:30 Start investigation of the inside of R/B using a remote-controlled robot.	May 15 16:25 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May10 11:00 The operation of transferring water accumulated in reactor bldg of unit-6 to the waste processing facility conducted.
	Apr 17 16:00 Start investigation of the inside of R/B using a remote-controlled robot.	Apr. 13th 17:04 Transfer of highly radioactively contaminated wafter accumulated in the trench outside the turbine building to the condenser completed	May 8 12:10 Water injected the SFP by temporally installed motor driven pump conducted.	May 17 16:14 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May11 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
	Apr. 29 11:36 The inside of the building was inspected. It was confirmed that there is no water significant leakage from the CV.	Apr. 14 12:20 Installation of silt fences in front of the Unit 1and 2 seawater screen and intake completed	May 9 12:14 Water injected the SFP by originally installed clean up system conducted.	May 19 16:30 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May11 11:00 The operation of transferring water accumulated in reactor bldg of unit-6 to the waste processing facility conducted.
	May 2 12:58 Water feeding was temporally switched from to the reactor injection pump to the fire pump to install alarm device to the reactor injection pump.	Apr. 15th 14:15 Installation of steel plate in front of Unit 2 seawater screen completed	May 15 14:33 180kg of boric acid injection to No3 Reactor started.	May 21 16:00 Operation of spraying water to the spent fuel pool with concrete pump truck conducted.	May12 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
	May 5 11:32-16:36 Ventilators to clean the highly radioactive air inside the reactor building were installed and started.	Apr 18 13:42 Start investigation of the inside of R/B using a remote-controlled robot.	May 17 10:11 Volume of water through feed water line and fire extinguishing lineto No.3 Reactor increased		May12 10:30 The operation of transferring water accumulated in reactor bldg of unit-6 to the waste processing facility conducted.
	May 11 08:58 N2 injection to the CV temporally stopped while the work for restoring one of external power sources being conducted. It resumed later.	Apr. 19 10:08 Start transferring highly radioactive water accumulated in the turbine building and the concrete tunnel to the waste processing facility	May 17 18:04 Start transferring water accumulated in the turbine building and the concrete tunnel to the waste processing facility		May13 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
	May 12 05:00 Instrumental reading of the water gage of the reactor No1 went off the scale on the lower side after adjusting the gage.	Apr. 30 14:05 Start transferring highly radioactive water accumulated in the vertical part of the concrete tunnel outside the turbine BLDG to the waste processing facility	May 18 16:30 Examine the reactor BLDG prior to nitrogen injection		May 13 11:00 Water accumulated in the room for high pressure injection system discharged to other space.
	May 17 11:50 Volume of water injected was changed to 6 m3/h from 10 m3/h.	May 1 13:35 The work to block the vertical concrete tunnel outside the turbine bldg started.	May 20 14:15 Volume of water through feed water line and fire extinguishing lineto No.3 Reactor changed (increase)		May14 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
	May 20 15:06 Water injected to the SFP	May 2 12:58 Water feeding was temporally switched from to the reactor injection pump to the fire pump to install alarm device to the reactor injection pump.	May 20 17:39 Volume of water through feed water line and fire extinguishing lineto No.3 Reactor changed (increase)		
	May 22 15:33 Water injected to the SFP	May 6 09:36 Water injected to the SFP	May 23 11:31 Volume of water through feed water line and fire extinguishing lineto No.3 Reactor changed (decrease)		May15 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.

		May 7 09:22 Operation of discharging water accumulated in the concrete tunnel outside turbine bldgtto he waste processing facility temporally stopped while piping work for feeding water into the reactor being conducted.	May 23 14:08 Volume of water through feed water line and fire extinguishing lineto No.3 Reactor changed (decrease)		
		May 10 13:09 Water injected the SFP conducted			May16 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
		May 12 15:20 Operation of discharging water accumulated in the concrete tunnel outside turbine bldg to the waste processing facility temporally restarted,			
		May 14 13:00 Water injected to the SFP			May17 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
		May 18 09:23 4 workers entered the reactor BLDG to measure radiation			May18 10:00 The operation of transferring water accumulated in Turbine bldg of unit-6 to the makeshift tank conducted.
		May 18 13:10 Hydrazine added freshwater was injected into the SFP at Unit 2 using concrete pump vehicle.			May 18 10:30 transferring water accumulated in the reactor bldg to the waste processing facility conducted
		May 22 13:02 Hydrazine added freshwater was injected into the SFP at Unit 2 using concrete pump vehicle.			
Major Data *1	Reactor Water level (May 23 11:00) (A) (Lower beyond lower end of the gauge , (B) -1600mm	Reactor Water level (May 23 11:00) (A) -1500mm, (B) -2100mm	Reactor Water level (May 23 11:00) (A) -1800mm, (B) -2250mm	SFP water temperature measured with a concrete pump vehicle Apr. 12 : about 90℃ 22 before spray: about 91℃ 23 before spray: about 83℃ 23 after spray : about 66℃ 24 before spray: about 86℃ 24 after spray : about 81℃	Water temperature of SFP Unit 5 43.5℃ (May 23 12:00) Unit 6 39.0℃ (May 23 12:00)
	Reactor pressure (May 23 11:00) (A) 0.545MPaG, (B) 1.468MPaG*2	Reactor pressure (May 23 11:00) (A) -0.016MPaG*2, (B) -0.020MPaG*2	Reactor pressure (May 23 11:00) (A) -0.121MPaG*2, (B) -0.113MPaG*2		
	CV pressure (May 23 11:00) 0.1333MPaabs	CV pressure (May 23 11:00) 0.040MPaabs	CV pressure (May 23 11:00) 0.1008MPaabs		
	RPV temperature (May 23 11:00) 117.2℃*2 at feed water line nozzle	RPV temperature (May 23 11:00) 112.5℃ at feed water line nozzle	RPV temperature (May 23 11:00) 105.8℃*2 at feed water line nozzle		
		Water temperature in SFP (May 23 11:00) 70.0 ℃			
	Thermography (Apr. 26 23:00) CV: 25℃, SFP: 23℃	Thermography (Apr. 26 07:30) Top of R/B: 24℃	Thermography (Apr. 26 07:30) CV: 26℃, SFP: 56℃		

(2) Fukushima Dai-ni NPPs
All units are cold shutdown (Unit-1, 2, 4 have been recovered from a event falling under Article 15*)

3. State of Emergency Declaration
11th 19:03 State of nuclear emergency was declared (Fukushima Dai-ni NPS)
12th 07:45 State of nuclear emergency was declared (Fukushima Dai-ichi NPS)

4. Evacuation Order
11th 21:23 PM direction: for the residents within 3km radius from Fukushima I to evacuate, within 10km radius from Fukushima I to stay in-house
12th 05:44 PM direction: for the residents within 10km radius from Fukushima I to evacuate
12th 17:39 PM direction: for the residents within 10km radius from Fukushima II to evacuate
12th 18:25 PM direction: for the residents within 20km radius from Fukushima I to evacuate
15th 11:06 PM direction: for the residents within 20-30km radius from Fukushima I to stay in-house
25th Governmental advise: for the residents within 20-30 km radius from Fukushima I to voluntarily evacuate

Abbreviations:
SFP: Spent Fuel Storage Pool
EDG: Emergency Diesel Generator
RPV: Reactor Pressure Vessel
R/B: Reactor Building
RHR: Residual Heat Removal system
CST: Condensate water Storage Tank
T/B: Turbine Building

*1 Trend data of primary parameters are available at Japan Nuclear Technology Institute's Home Page; "http://www.gengikyo.jp/english/shokai/special_4.html".
*2 Data trend is continuously monitored.