News Release

Extract

August 16, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 231st Release)

(As of 14:00 August 16, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai No.2 Power Station, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

・ Fukushima Dai-ichi NPS (TEPCO)

- ・ The accumulated water in the trench of the turbine building of Unit 2 was transferred to the Radioactive Waste Treatment Facilities (from 16:47, August 10 till 11:43, August 16).
- ・ The water injection rate into the reactor of Unit 2 was adjusted to 3.8m^3/h due to the decrease to 3.4m^3/h (at 21:48, August 15).
- ・ The accumulated water in the basement of the turbine building of Unit 3 was transferred to the Radioactive Waste Treatment Facilities (from 08:42, August 5 till 16:46, August 15).
- ・ The accumulated water in the basement of the turbine building of Unit 6 was transferred to a temporary tank (from 11:00, August 15 till 9:00, August 16).
- ・ The Circulating Seawater Decontamination System was suspended for periodic maintenance (from 09:30, August 13 till 09:30, August 15).
- ・ The Water Treatment Facility was suspended for the test operation of the second Cesium Adsorption Device (from 12:04, August 16).

For more information: NISA English Home Page
http://www.nisa.meti.co.jp/english/index.html

News Release

Extract

経済産業省 Ministry of Economy, Trade and Industry

August 17, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 232nd Release)

(As of 12:00 August 17, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai No.2 Power Station, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

・ Fukushima Dai-ichi NPS (TEPCO)

- Fresh water (about 25t) was injected into the spent fuel pool of Unit 4 via a temporary spraying facility (from 16:15 to 17:03, August 16).
- The Alternative Cooling System for the spent fuel pool of Unit 4 was suspended due to the replacement of the hose of primary line of the system (at 07:58, August 17).
- The Water Treatment Facility was suspended for the test operation of the second Cesium Adsorption Device (from 12:04, August 16), and vessels in the Water Treatment Facility were exchanged (from 13:28 to 13:40, August 16).
- The accumulated water was transferred from the building of the miscellaneous solid waste volume reduction facilities to the process main building (from 08:50, August 17).

2. Actions taken by NISA and other organizations

The Ministry of Education, Culture, Sports, Science and Technology and the Local Nuclear Emergency Response Headquarters anounced a detailed version of a distribution map of radiation dose for areas around major points such as schools and areas with extended points measured by an unmanned helicopter, in addition to the measurement results of the Radiation Monitoring Action Plan aimed at lifting the instruction of the Evacuation-Prepared Areas in Case of Emergency, which was announced on August 9.

For more information: NISA English Home Page
http://www.nisa.meti.co.jp/english/index.html

News Release

Extract

経済産業省 Ministry of Economy, Trade and Industry

August 18, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 233rd Release)

(As of 13:30 August 18, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai No.2 Power Station, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

・ Fukushima Dai-ichi NPS (TEPCO)

- The water injection rate into the reactor of Unit 2 was adjusted to 3.8m^3/h due to the decrease to 3.5m^3/h (at 15:46, August 17).
- The hydrazine was injected into the spent fuel pool of Unit 3 via the Alternative Cooling System for the spent fuel pool (from 11:06 to 13:00, August 18).
- The flow control valve was additionally installed and replaced for the injection of water into the reactor of Unit 3 (from around 08:15 to 12:20, August 18).
- The water injection rate into the reactor of Unit 3 was adjusted from 9.0m^3/h to 8.0m^3/h (at 12:20, August 18).
- The Alternative Cooling System for the spent fuel pool of Unit 4 was suspended due to the replacement of the hose of primary line of the system (from 07:58 to 15:00, August 17).
- Fresh water (about 10t) was injected into the spent fuel pool of Unit 4 via a temporary spraying facility (from 15:38 to 16:00, August 17).
- The test operation of the pump of component cooling seawater system (A) of Unit 6 was started (at 08:35, August 18). The pump was manually shut off due to the identification of the leakage from the pipe (at around 10:06 of the same day).
- The accumulated water in the basement of the turbine building of Unit 6 was transferred to a temporary tank (from 10:00, August 18).

- Water was supplied from the Filtrate Tank to the buffer tank because water level of the tank reached near the controlled lower limit (from 11:28, August 18).
- The accumulated water was transferred from the building of the miscellaneous solid waste volume reduction facilities to the process main building (from 08:50 to 17:25, August 17).
- The transfer pump for concentrated water of Evaporation-Concentration Device of the Water Treatment Facility was suspended due to the identification of the leakage from the pump (at 10:40, August 17).

2. Actions taken by NISA and other organizations

The “Roadmap towards Restoration from the Accident at Fukushima Dai-ichi Nuclear Power Station, TEPCO” and “Roadmap for Immediate Actions for the Assistance of Residents Affected by the Nuclear Incident" were formulated as action plans for the immediate issues regarding responses to the residents and local governments affected by the nuclear accident.

On August 17, the Nuclear Emergency Response Headquarters announced the revised versions, explaining the progress status of the actions thus far.

<Situation of resident evacuation>

Resident evacuation is almost complete in all 5 municipalities that were wholly or partially designated as Deliberate Evacuation Areas (Iitate Village, Kawamata Town, Katsurao Village, Namie Town, Minamisoma City) as of August 9.

<Temporary access into Restricted Areas>

On August 18, vehicles were retrieved from Minamisoma City and Namie Town.

For more information: NISA English Home Page
http://www.nisa.meti.co.jp/english/index.html

News Release

経済産業省
Ministry of Economy, Trade and Industry

Extract

August 19, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 234th Release)

(As of 14:00 August 19, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai No.2 Power Station, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

・ Fukushima Dai-ichi NPS (TEPCO)

- ・ Fresh water (about 10t) was injected into the spent fuel pool of Unit 2 via the fuel pool cooling and clean-up line for filling water in the skimmer surge tank (from 14:10 to 15:18, August 18).
- ・ The accumulated water in the trench of the turbine building of Unit 2 was transferred to the radioactive waste treatment facilities (from 16:19, August 18).
- ・ The accumulated water in the basement of the turbine building of Unit 3 was transferred to the radioactive waste treatment facilities (from 08:51, August 19).
- ・ Fresh water (about 15t) was injected into the spent fuel pool of Unit 4 via a temporary spraying facility (from 17:19 to 17:50, August 18).
- ・ The alarm went off regarding a low suction pressure of the circulating pump (the secondary system) of Alternative Cooling System (A) for the spent fuel pool of Unit 4. However, the operation of the system and the pump were continued (at 05:00, August 19).
- ・ The accumulated water in the basement of the turbine building of Unit 6 was transferred to a temporary tank (from 10:00 to 17:00, August 18 and from 10:00 to 13:00, August 19).
- ・ Rubble (an amount equivalent to three containers) was removed using remote-controlled heavy machinery (from 08:45 to 16:15, August 18).

- The Water Treatment Facility was suspended due to a trial run of the second Cesium Adsorption Device (from 12:04, August 16 to 14:43, August 18), and at the same time vessels in the Water Treatment Facility were exchanged (from 13:28 to 13:40, August 16). Thereafter, the rated flow was reached (at 15:50 of the same day). The second Cesium Adsorption Device was operated in parallel with the former system and then the Water Treatment Facility was suspended in order to confirm the performance of the second Device alone (at 14:00, August 19).
- The transfer pump for concentrated water of Evaporation-Concentration Device of the Water Treatment Facility was suspended due to the identification of the leakage from the pump (from 10:40, August 17 to 09:43, August 19).
- Filtrate was supplied from the filtrate tank to the buffer tank due to the water level of the tank reached near the controlled lower limit (from 11:28 to 17:11, August 18).

<Temporary access into Restricted Areas>

On August 19, vehicles were retrieved from Minamisoma City and Namie Town.

For more information: NISA English Home Page
http://www.nisa.meti.co.jp/english/index.html

News Release

経済産業省
Ministry of Economy, Trade and Industry

Extract

August 20, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 235th Release)

(As of 14:00 August 20, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai No.2 Power Station, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

・ Fukushima Dai-ichi NPS (TEPCO)

- ・ The water injection rate into the reactor of Unit 2 was adjusted to 3.8m^3/h due to the decrease to 3.4m^3/h (at 15:30, August 19).
- ・ The water injection rate into the reactor of Unit 3 was adjusted from 8.0m^3/h to 7.0m^3/h (at 13:00, August 20).
- ・ A trial run of the desalination device for the spent fuel pool of Unit 4 was started (at 10:24, August 20). The device was suspended because the malfunction alarm went off (at 10:42 of the same day). Thereafter, the trial run of the desalination device was resumed (at 11:08 of the same day). After being confirmed that the device had no malfunction, the full-fledged operation of the device was started (at 11:34 of the same day).
- ・ Rubble (an amount equivalent to four containers) was removed using remote-controlled heavy machinery (from 08:45 to 15:00, August 19).
- ・ The Water Treatment Facility was started up except the second Cesium Adsorption Device after preparation for parallel operation (at 15:44 of the same day). After the stabilization of flow rate (at 15:54 of the same day), the second Cesium Adsorption Device (B) was started up (at 19:33 of the same day). After the confirmation of reaching the rated flow, parallel operation was started (at 19:41 of the same day).
- ・ Water was supplied from the Filtrate Tank to the buffer tank because the Evaporation-Concentration Device of the Water Treatment Facility was

suspended due to the work for exchanging the inlet pipe of the Device (from 14:26 to 19:00, August 19).

<Temporary access into Restricted Areas>

On August 20, residents were allowed temporary access into Minamisoma City, Naraha Town, Tomioka Town and Namie Town.

<Instructions on Food and Drink>

- Lifting the suspension of shipment and the restriction of intake
- The suspension of shipment was lifted regarding the cattle raised in Miyagi Prefecture that is managed in accordance with the shipment and inspection policy established by the Prefecture.

For more information: NISA English Home Page
http://www.nisa.meti.co.jp/english/index.html

News Release

経済産業省 Ministry of Economy, Trade and Industry

Extract

August 22, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 236th Release)

(As of 12:00 August 22, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai No.2 Power Station, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

・ Fukushima Dai-ichi NPS (TEPCO)

- ・ The accumulated water in the basement of the turbine building of Unit 3 was transferred to the Radioactive Waste Treatment Facility (from 08:51, August 19 to 09:28, August 21).
- ・ The accumulated water in the basement of the turbine building of Unit 3 was transferred to the building of the miscellaneous solid waste volume reduction facilities (from 09:39, August 21).
- ・ The alarm went off regarding a low suction pressure of the circulating pump (the secondary system) of the Alternative Circulating Cooling System (A) for the spent fuel pool of Unit 4. However, it was confirmed that the system and the pump had no malfunction and the operation of the system was continued (at 05:00, August 19). Thereafter, the entire secondary system was pressurized to increase the suction pressure of secondary system of the Alternative Cooling System for the spent fuel pool (from 14:16 to 14:19, August 20).
- ・ Rubble (an amount equivalent to eight containers) was removed using remote-controlled heavy machinery (from 08:45 to 15:00, August 20, from 08:45 to 16:15, August 21).
- ・ Vessels in the Water Treatment Facility were exchanged (the Water Treatment Facility was not suspended.) (from 11:00 to 14:54, August 20 and from 11:02 to 11:30, August 21).

- The accumulated water was transferred from the site banker building to the main building (from 10:20 to 14:31, August 21).
- Desalination devices (1A and 1B) of the Water Treatment Facility were started up for increasing the flow rate of the desalination device (at 09:30, August 21). Thereafter, it was confirmed that there was no problem in their operating state (at 10:30 of the same day).
- The second Cesium Adsorption Device was suspended in order to exchange vessels (from 07:07, August 21).

<Temporary access into Restricted Areas>

On August 21 and 22, vehicles were retrieved from Futaba Town, Okuma Town, Tomioka Town and Naraha Town.

For more information: NISA English Home Page
http://www.nisa.meti.co.jp/english/index.html

News Release

経済産業省 Ministry of Economy, Trade and Industry

Extract

August 23, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 237th Release)

(As of 14:00 August 23, 2011)

The Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa Nuclear Power Station (NPS), Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai No.2 Power Station, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows:

1. Nuclear Power Stations (NPSs)

・ Fukushima Dai-ichi NPS (TEPCO)

- ・ The desalination device for the spent fuel pool of Unit 4 shut off because the alarm went off regarding a low water level of the concentrated water tank (from 10:34 to 18:26, August 22).
- ・ The accumulated water in the basement of the turbine building of Unit 6 was transferred to a temporary tank (from 10:00, August 23).
- ・ Rubble (an amount equivalent to four containers) was removed using remote-controlled heavy machinery (from 08:45 to 16:15, August 22).
- ・ Vessels in the Water Treatment Facility were exchanged (the Water Treatment Facility was not suspended.) (from 11:30 to 14:34, August 22).
- ・ The Second Cesium Adsorption Device was suspended in order to exchange the vessels (at 07:07, August 22). While the Device was washed, a spot with high radiation dose was identified in the pipe, and dissolved away by continuing to wash. After finishing washing, the Second Cesium Adsorption Device was started up and the water treatment was started (at 20:15 of the same day).
- ・ The Second Cesium Adsorption Device was suspended in order to exchange vessels (at 07:10, August 23).

For more information: NISA English Home Page
http://www.nisa.meti.go.jp/english/index.html

Appendix 1

August 17, 2011
Nuclear Emergency Response Headquarters
Government-TEPCO Integrated Response Office

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

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 and achievement date, etc.

[Step2: Release of radioactive materials is under control and radiation dose is being significantly held down]

- There is no change in the target and the achievement date. Regarding the fuel pools, the Step2 Target has been achieved (Aug. 10).
- Regarding the accumulated water, stable operation of the processing facilities will be endeavored with the aim of reducing the total volume of accumulated water.
- After reducing the accumulated water, increase injection water rate by continuous and reinforced circulating injection cooling, thus bringing the reactors to a "cold shutdown condition" monitoring temperatures at the bottom of RPV, etc.
- Improve monitoring accuracy and continue assessing current release of radioactive materials.
- Bring the reactors etc. to a more stable cooling and control and mitigate the release of radioactive materials by the above measures.
- Newly added [Issue (10) Staff training/personnel allocation]

3. Summary of the last one month and future plans (major changes)

[Issue (1) Reactors]: Confirm functional securement of the water injection system

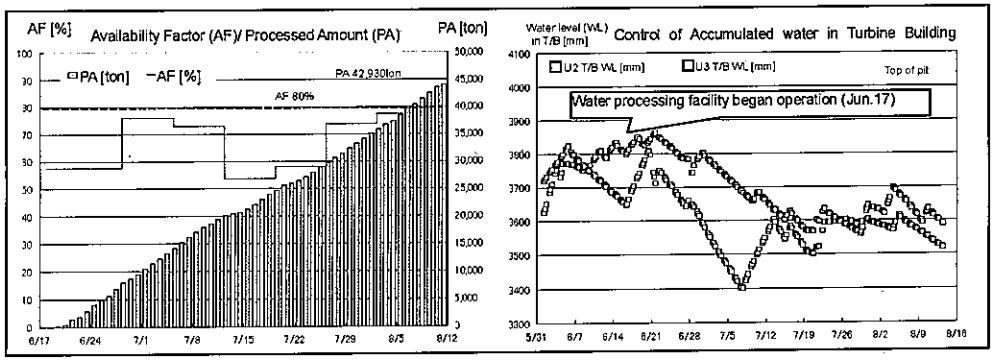
- Assessed functions of the water injection system: (a) structural strength and seismic safety of facilities; (b) cooling capacity; (c) operations and maintenance management; (d) countermeasures against loss of functions (Aug. 3, 4.)
- Hereafter, change water injection rate on a trial basis and verify the water injection rate needed to achieve the "cold shutdown condition."

[Issue (2) Spent fuel pools]: Achieved "more stable cooling" for all Units 1 to 4

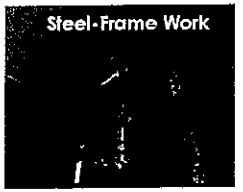
- Achieved "more stable cooling" set in Step2 with regard to Units 1 and 4 as well by starting circulating cooling (Aug. 10 for Unit 1 and Jul. 31 for Unit 4.)

[Issue (3) Accumulated water]: Implementing reliability enhancement measures towards stable processing

- Total volume of accumulated water processed to date is approx. 44,020 tons. Availability factor for the last one week was 77 % (as of Aug. 9.) The water level of the accumulated water sufficiently dropped under the top of pit.



- Implemented reliability enhancement measures towards stable processing.
  - Implemented maintenance work for the processing facilities such as installing a by-pass line to secure water flow (Aug. 4.)
  - Augmented the facility such as installing cesium adsorption facility (SARRY) (operation planned to commence on Aug. 18.)
  - Augmented desalination processing facilities by augmentation of the evaporative concentration apparatus (two lines, Aug. 7and 20.)
- Hereafter, will steadily process the accumulated water in order to reduce it.



[Issue (4) Groundwater]: Preparing installation of underground water shielding walls

- Designed water-proof steel plate piles to be installed in front of existing seawalls for Units 1~4 in order to ensure prevention of expanding seawater contamination due to underground water.

[Issue (5) Atmosphere/Soil]: Began steel-frame work for the Unit 1 reactor building cover (Aug. 10)

[Issue (6) Measurement, Reduction, and Disclosure]: Continue to assess current release of radioactive materials

- TEPCO has assessed current value of released amount from Unit 1 to 3 thorough the same way as announced on Jul. 19:
  - The release rate on the assumption that all measured radioactivity arises from the current emission from the reactor buildings is evaluated to be approximately two-hundred-million Bq/hour (This is approximately ten millionth of the emission rate after the accident.)
  - Excluding the effect of already released radioactive materials, evaluation of exposure doses at the site boundary using the current release rate showed that the maximum exposure dose is 0.4 mSv/year
- Analyze the effect of reducing release as well as improve accuracy of estimated exposure doses through measures including measuring the radioactive materials concentration around the reactor buildings, measuring radioactive materials newly falling at survey points, etc.
- Consider and start full-fledged decontamination.

[Issue (7) Tsunami, Reinforcement, etc.]: Installed support structures at the bottom of the fuel pool of Unit 4 (Jul. 30)

[Issue (8) Living/working environment]: Improve Living/working environment for workers

- Plan to build temporary dormitories capable of accommodating approx. 1,600 people; approx. 1,200 people have already moved in (as of Aug. 15.)
- Sixteen on-site rest stations have been established (approx. 3,500m² in size with a capacity to accommodate approx. 1,200 people) (as of Aug. 15.)

[Issue (9) Radiation control/Medical care]: Improve worker health care

- Increase the number of whole body counters as planned (6 units have already been added as of Aug. 11.)
- Announced the creation of database as well as a framework of comprehensive long-term health care as a "Grand Design" (Aug. 3.)
- Consideration with relevant organizations regarding the provision of a speedy transportation of patients.

[Issue (10) Staff training/personnel allocation]: Sort out as new issues

- Promote staff training, etc. in conjunction with the government and operators in order to train and deploy staffs systematically.
  - Conducting training for staffs engaged in radiation related work, who will be in great demand.
  - According to affiliated companies needs, launched a new framework of looking for specialized technical workers widely through Japan Atomic Industrial Forum (JAIF).

Appendix 2

"Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO"

Progress Status

August 17th, 2011

Nuclear Emergency Response Headquarters

Government-TEPCO Integrated Response Office

I. Cooling

(1) Reactor

1. Target for Step 2: "Cold Shutdown Condition"

- Circulating water cooling will be continued and enforced, thus bringing the reactors to a "Cold Shutdown Condition" monitoring the RPV temperatures, etc.
- Maintain stable operation of accumulated water processing facility. (Implementation items are stated in II. (3))
- NISA to continue confirming operating status and related matters.

Definition of "Cold Shutdown Condition"

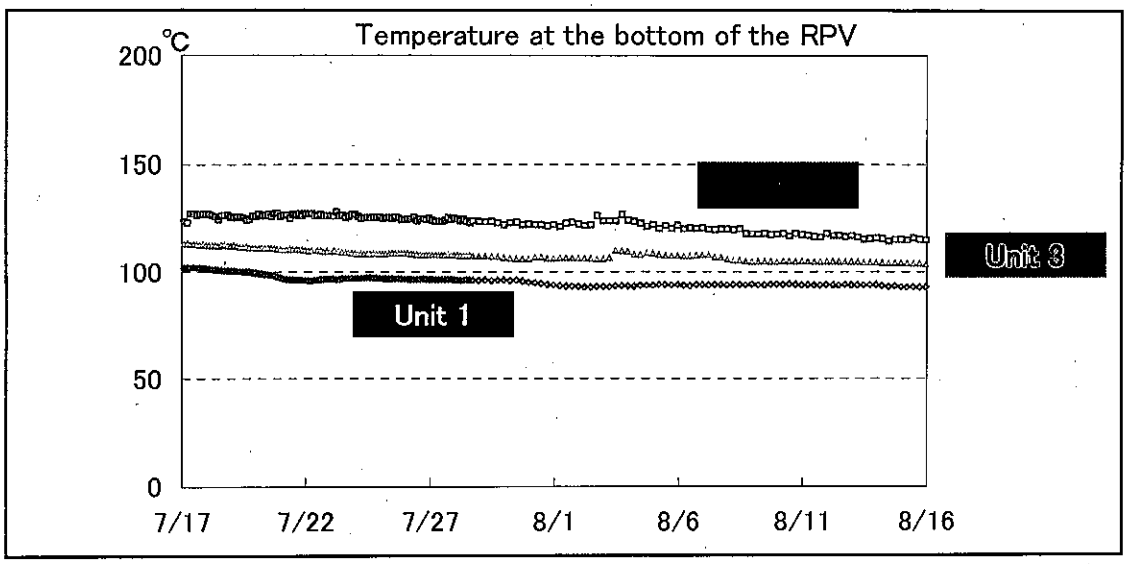
- Temperature of RPV bottom is below approximately 100 degrees Celsius.
- Release of radioactive materials from PCV is under control and public radiation exposure dose by additional release is being significantly held down.

In order to keep satisfying the above two conditions, secure mid-term safety of the circulating water cooling system (reliability of parts and materials, redundancy and independency, assessment of margin time in abnormal case, detection of failure and trouble, confirmation of restoration measures and recovery time.)

2. Current status and works implemented

① Evaluation of necessary flow rate of injecting water for "Cold Shutdown Condition" [Countermeasures 12, 14, 45]

- Re-evaluated minimum flow rate of injecting water for cooling heat produced in the reactor (decay heat) (flow rate equivalent to decay heat) by simulation analysis: 1.1m^3/h for Unit 1, 1.7 m^3/h for Unit 2, 1.7 m^3/h for Unit 3 (as of Aug. 1.)
- Actual flow rates (as of Aug. 1) are, approx. 3.5 m3/h for Unit 1, approx. 3.5 m3/h for Unit 2, and approx. 9.0 m3/h for Unit 3, which are above the flow rate equivalent to decay heat. Temperatures are trending in a stable manner (see figure below.)
- Reactors are being sufficiently cooled with the current flow rates; however towards "Cold Shutdown Condition," for Units 2 and 3, whose temperatures of RPV bottom are above 100 degrees Celsius, it is planned to evaluate the necessary flow rate to achieve Cold Shutdown Condition by changing flow rates on a trial-basis and confirming the change of reactor temperature.



② Installation of centralized monitoring system in the Main Anti-Earthquake Building [Countermeasures 12, 14, 45]

- Developing a system that will enable monitoring various parameters such as injection flow rate, injection pressure, buffer tank water level, from monitors installed in the Main Anti-Earthquake Building.

③ Submission request for report on maintenance of water injection into reactors [Countermeasures 12, 14, 45]

- NISA instructed TEPCO to submit report on maintenance of water injection into reactors (Aug. 2.)
- TEPCO submitted a report on reactor water injection system, including: (a) structural strength and seismic safety of facilities; (b) cooling capacity; (c) operations and maintenance management; (d) countermeasures against loss of functions (Aug. 3.) NISA confirmed it (Aug. 4.)

(a) Structural strength and seismic safety of facilities

Seismic strength of the water injection pump unit (injection pumps, power sources, and main piping such as steel pipes) has been improved by implementing countermeasures against falling such as fixation by bolts, etc.

Polyethylene pipes, pressure-resistant hoses and fire hoses have flexibility.

(b) Cooling capacity (as mentioned in the above ①)

Water is being injected at a rate of approximately 16 m^3/h in total for Units 1-3 in comparison to an injection rate of 4.5 m^3/h which is equivalent to decay heat.

Temperatures at the bottom of reactor pressure vessels do not show

continuous increasing trend, indicating sufficient cooling.

(c) Operations and maintenance management

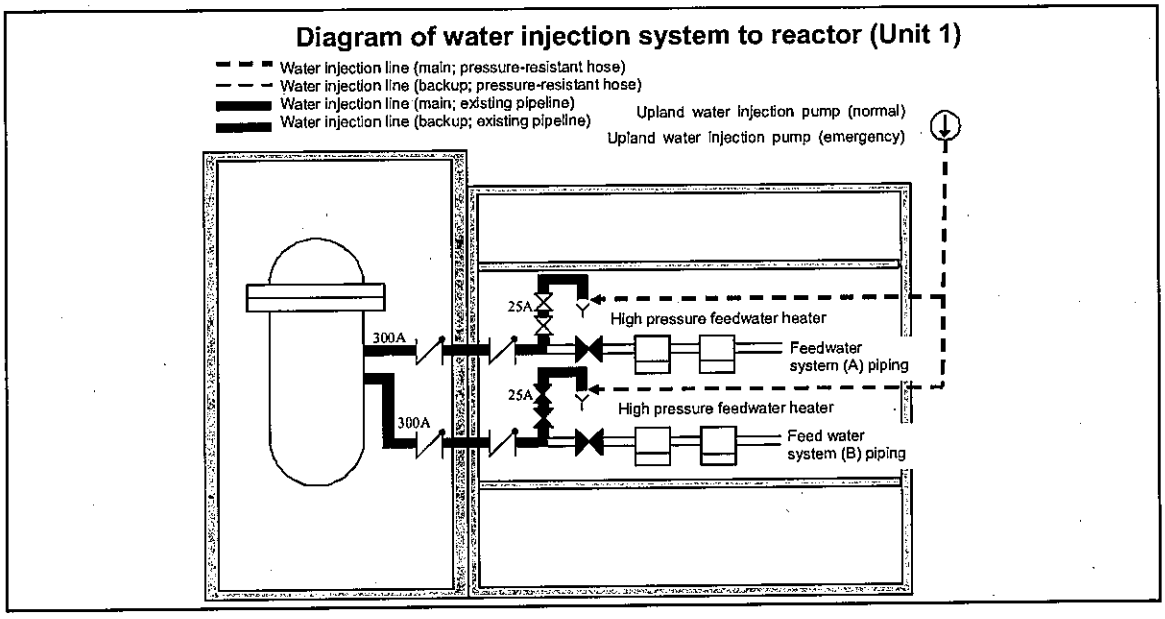
Parameters such as injection flow rate, injection pressure, and buffer tank water level are being monitored from the Main Anti-Earthquake Building.

Procedures to cope with abnormal events have been prepared and managed and training was conducted.

Spare parts for the water injection pump unit have been secured and expendable components are replaced as necessary.

(d) Countermeasures against loss of function

In preparation for loss of injection system function, redundancy has been secured for power source, water source and water injection lines, enabling to restart water injection within about 1 hour after loss of function.



(2) Spent Fuel Pool

1. Target for Step 2: "More stable cooling"

- "More stable cooling" (target for Step 2) for Units 2 and 3 was achieved by the end of Step 1 by having installed heat exchangers and maintaining pool water level.
- Circulating cooling systems for Units 1 and 4 have been installed and thus have achieved the target for Step 2.

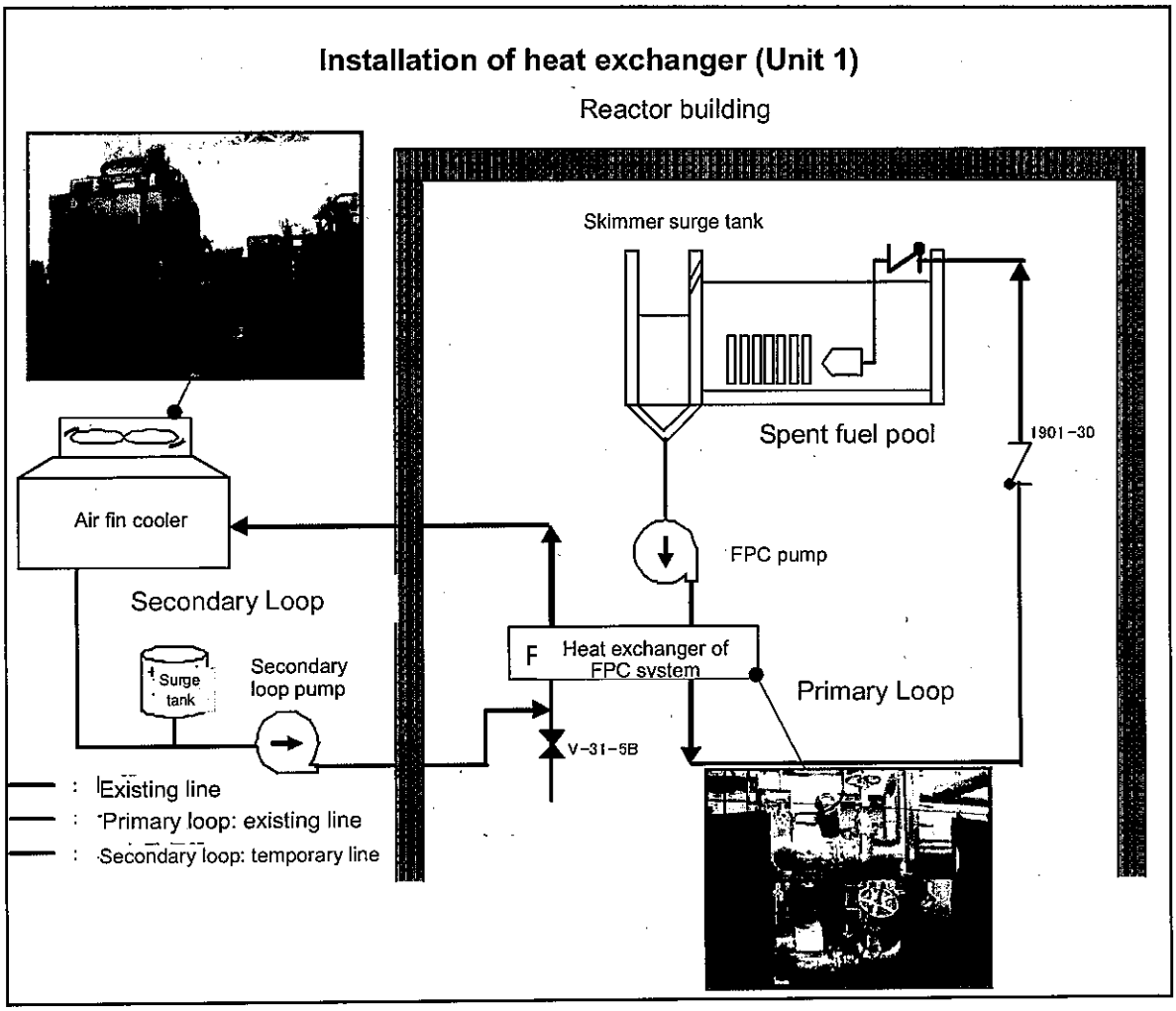
2. Current status and work implemented

① Installation of heat exchangers and start of circulating cooling

[Countermeasures 25, 27]

- Regarding the circulating cooling systems, TEPCO submitted to NISA the final report on the effectiveness of the systems with respect to stable cooling and on confirmation based on safety evaluation (Jul. 28) NISA evaluated and verified the contents of the report on the same day.
- Circulating cooling for Units 1 and 4 also started (Unit 1: Aug. 10, Unit 4: Jul. 31)
- By the start of circulating cooling for both units, the target for Step 2 for the spent fuel pools has been achieved.
- Unit 1: 34 degrees Celsius, Unit 2: 37 degrees Celsius, Unit 3: 34 degrees Celsius, Unit 4: 43 degrees Celsius (as of Aug. 16)

Installation of heat exchanger (Unit 1)



II. Mitigation

(3)Accumulated Water

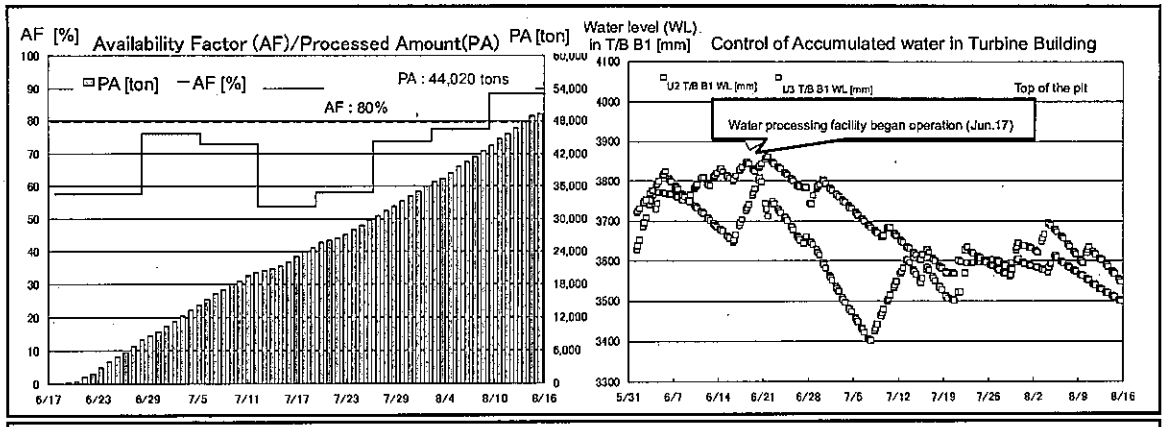
1. Target for Step 2: "Reducing total amount of accumulated water"

- Reduction of the total amount of accumulated water by processing the accumulated water in the buildings via the stable operation of processing facility.
- Augmentation of reuse by expansion of high-level contaminated water processing facility, steady operation and desalination of decontaminated water.
- Begin consideration of full-scale water processing facilities for high-level contaminated water.
- Storage/management of sludge waste generated from high-level contaminated water processing facility.
- Implement installation work for steel pipe sheet pile at the port to mitigate contamination to the ocean.

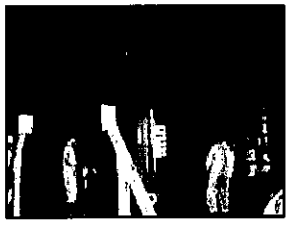
2. Current status and work implemented

①Status of the accumulated water processing

- Total volume of accumulated water processed to date is approx. 49,230 tons (as of Aug. 16.) Average availability factor for one week was88% (as of Aug. 16.) The water level of the accumulated water sufficiently dropped under the top of pits (already covered the top on the pits).
- Decontamination factor* of the processing facility for cesium is 10^6; chlorine concentration was decreased from 6,600 ppm to approx. 20ppm (both results are as of Jul. 28.)
  *Decontamination factor = cesium concentration of a sample before processing / cesium concentration of a sample after processing
- Implemented reliability enhancement measures towards stable processing.
  - Implemented maintenance work for the processing facilities such as installing a by-pass line to secure water flow (Aug. 4.)
  - Augmented the facility such as installation of SARRY (cesium adsorption facility; operation planned to commence on Aug.18.)
  - Augmented desalination processing facility by expansion of the evaporative concentration apparatus (two lines, Aug. 7 and 20)
- Hereafter, accumulated water will be processed stably with the aim of reducing the volume of it .



- Installation work of SARRY


②Storage/management of sludge waste, etc. [Countermeasure 81]

- Properly securing and managing sludge waste with high radioactive concentration derived from processing high level contaminated water in the centralized waste processing building.
- Designing storage facility for sludge waste in order to expand storage capacity for sludge waste.

③Securing storage [Countermeasure 42]

- Implementing installation of tanks for high level contaminated water in order to expand storage facility for high level contaminated water.
- Continuing to decontaminate low level contaminated water by using zeolite.

④Prevent contamination in the ocean [Countermeasure 64]

- Shipping steel pipe sheet pile the port in order to implement translucent prevention work and repair the blocks damaged by tsunami at the south side of intake canal of Unit 1 to 4 (Aug. 10.)

Shipping steel pipe sheet pile

(4)Groundwater

1. Target for Step2: "Mitigating contamination to the ocean"

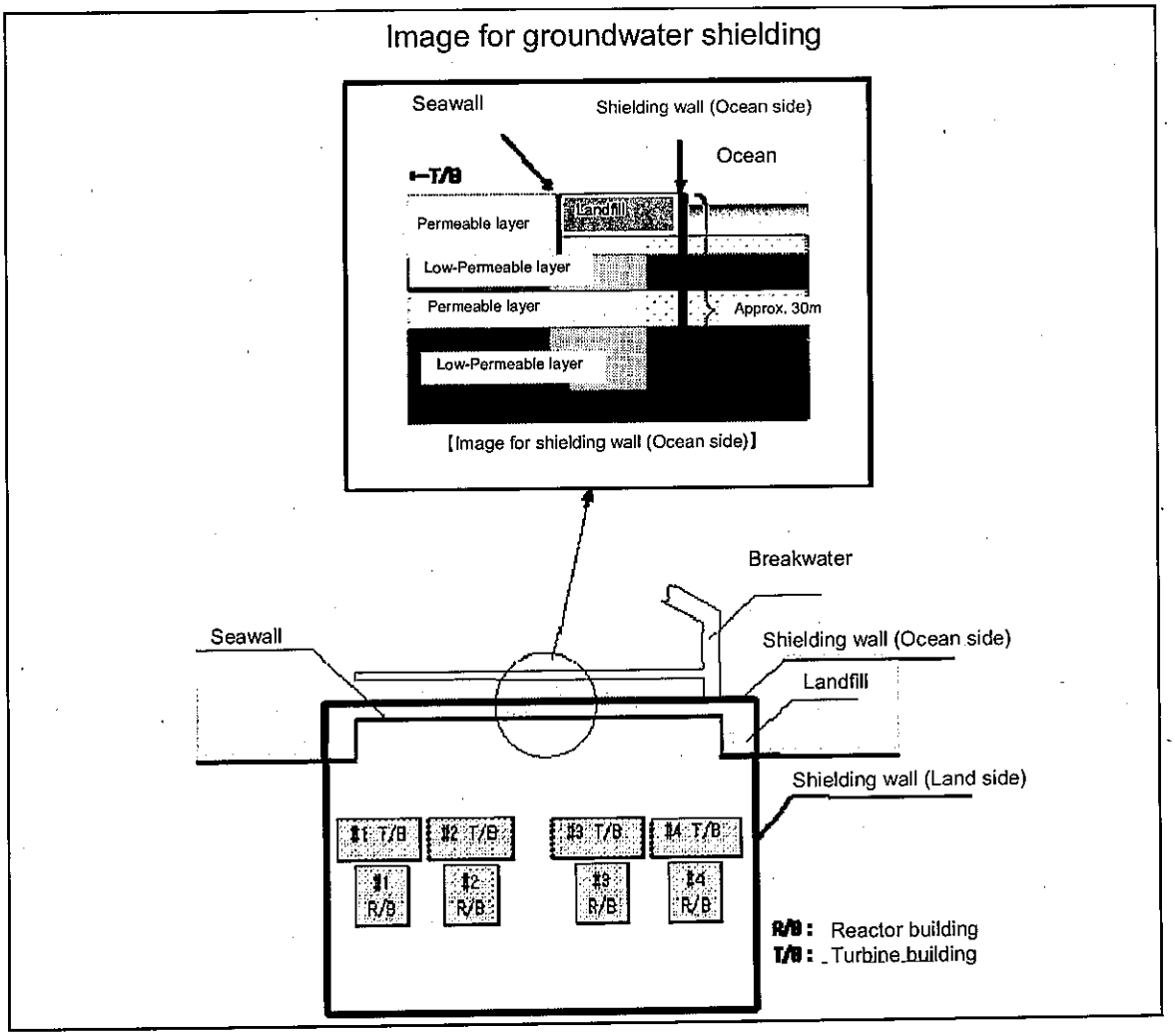
- Mitigate contamination in groundwater as well as contamination to the ocean via groundwater by controlling accumulated water inflow into groundwater.
- Commencing installation work for shielding wall in front of existing seawalls of Units 1 to 4, with the expectation of mitigating contamination in the ocean via groundwater.

2. Current status and work implemented

①Consideration of shielding wall of groundwater [Countermeasure 68]

- In the process of designing water-proof steel pipe sheet piles to be installed in front of existing seawalls of Units 1 to 4 in order to further ensure prevention against expanding seawater contamination due to underground water.

Image for groundwater shielding



② Implementing prevention against expansion of contamination of groundwater [Countermeasure 67]

- Install pumps at sub-drainage pit on the turbine building side. Seven places completed (Jul. 29.)
- Under consideration of the places to install sub-drainage pump on the reactor building side.

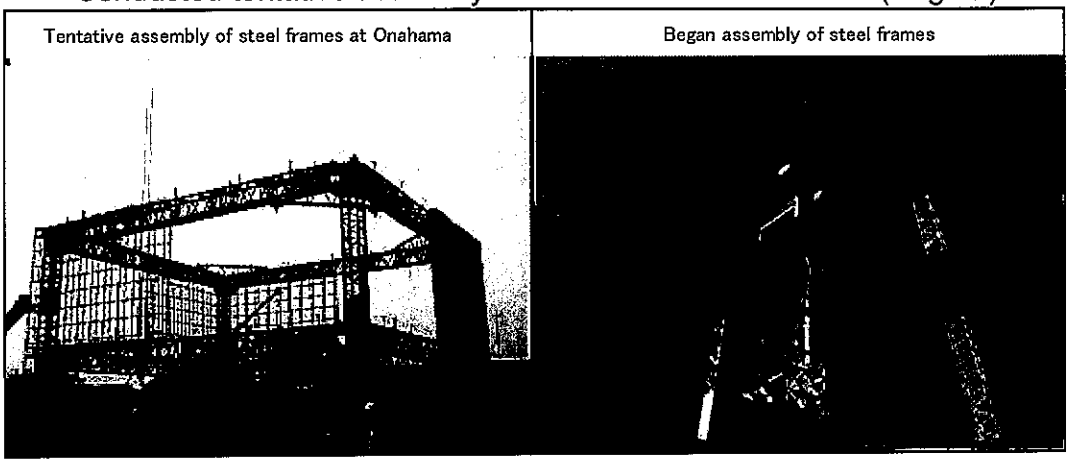
(5)Atmosphere/Soil

1. Target for Step 2: "Mitigating dispersion of radioactive materials"
   - Reduce dispersion of radioactive materials deposited in the site.
   - Continue dust inhibitor spraying as well as removal of debris.
   - Installation of the reactor building cover (Unit 1); commencing removal of debris on top of the reactor buildings (Units 3 and 4.)
   - Consideration of containers for the reactor buildings.

2. Current status and work implemented

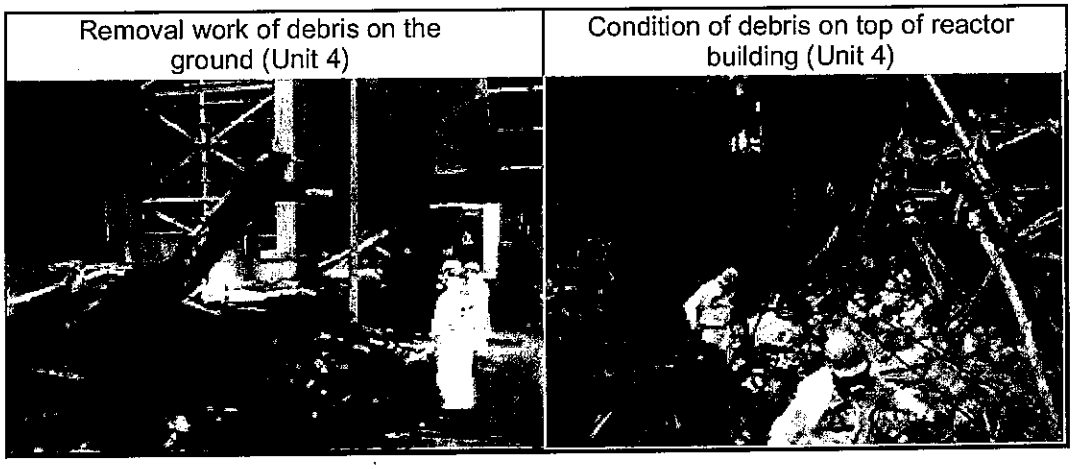
①Installation work for the Unit 1 reactor building cover [Countermeasures 54, 55]

- Conducted tentative assembly of steel frames at Onahama (Aug. 1.)



②Preparation work for removal of debris on top of the reactor building (Units 3 and 4) [Countermeasure 84]

- Preparing basic design for both units. Removing debris on the ground and dismantling obstacles. Road improvement for cranes as well as carrying in heavy equipment and their assembly is under way.
- Began assembling the bottom part of the frame at Unit 3.



III. Monitoring and decontamination

(6) Measurement, reduction, disclosure

1. Target for Step 2: "sufficient reduction of radiation dose"

- Expansion and enhancement of monitoring, and continuation of disclosure.
- Monitoring by government, prefecture, municipalities and operators.
- Commencement of full-scale decontamination.

2. Current status and work implemented

① Implement monitoring [Countermeasures 60・61・62]

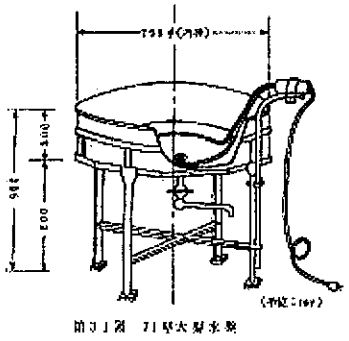
- Monitoring continuously from Step 1. Since airborne radioactivity concentration has been decreasing, monitoring has been continued by gradually lowering the detection limit (from Aug. 6.)
- Implementing additional sampling at land and sea as below:

[Land]

- In addition to around West Gate per Step 1, airborne radioactivity concentration at 12 points within the site will be measured (once a week / once a month.)
- Sampling of radioactive fallout will be conducted from August (sampling method is as per below figure.)
  <Within the site: one point>
  <Outside: 5km / 10km from NPS, 5 directions, 10 points in total>

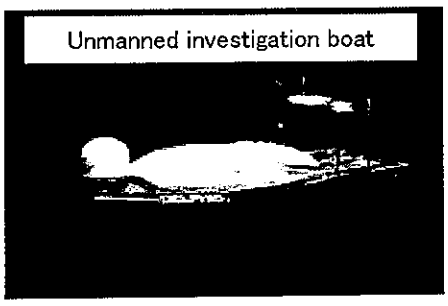
Sampling method of radioactive fallout (water basin)

- Place the sampling equipment (water basin) at the sampling point.
- Sample radioactive fallout in the water basin periodically (once or twice a month)
- Measure the amount of radioactive materials.



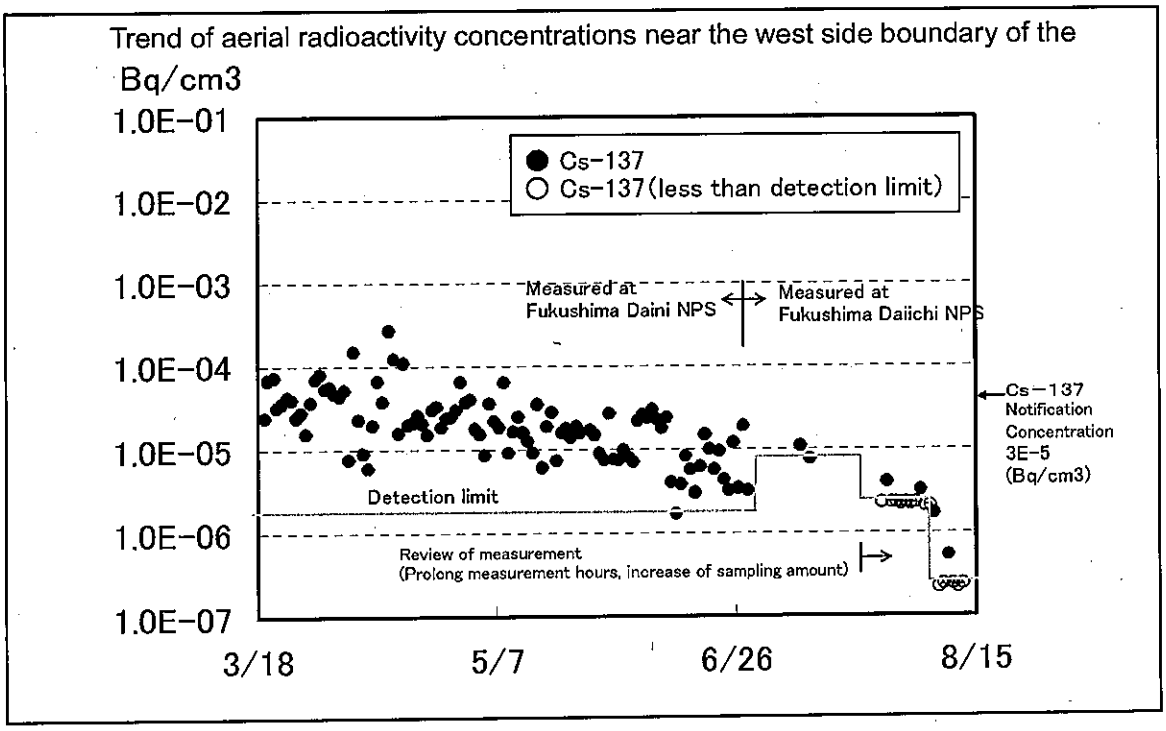
[Sea]

- Introduction of an unmanned survey boat a few km offshore of the front of NPS (late August.) Planning to sample and measure radiation dose of seawater and marine soil.

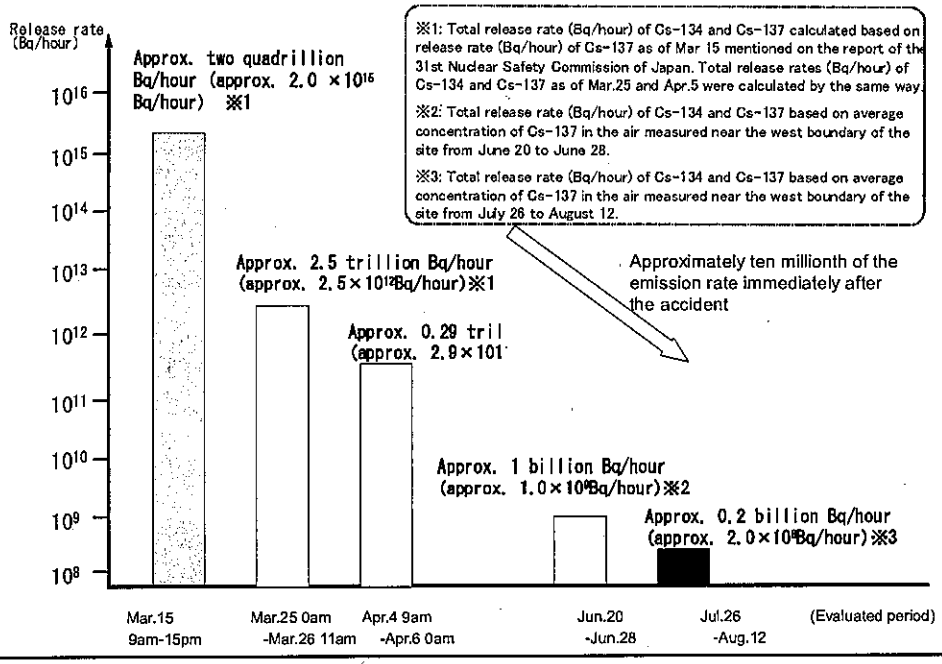


② Evaluate the amount of radioactive materials currently released [Countermeasures 60・61]

- Monitoring continuously from Step 1 in order to confirm the declining tendency.
  - Measuring airborne radioactivity concentration at 12 points in addition to around West Gate within the site.
  - Measuring radioactive fallout at one point within the site and plan to begin measuring radioactive fallout at 10 points outside of the site.
- TEPCO has assessed current value of released amount from Units 1 to 3 through the same method as announced on July 19.
  - The release rate on the assumption that all measured radioactivity arises from the current emission from the reactor buildings is evaluated to be approximately two-hundred-million Bq/hour (This is approximately ten millionth of the emission rate after the accident.)
  - Excluding the effect of already released radioactive materials, evaluation of exposure doses at the site boundary using the current release rate showed that the maximum exposure dose is 0.4 mSv/year.
- Analyze the effect of reducing release as well as improve accuracy of estimated exposure doses through measures including measuring the radioactive materials concentration around the reactor buildings, measuring radioactive materials newly falling at survey points, etc.



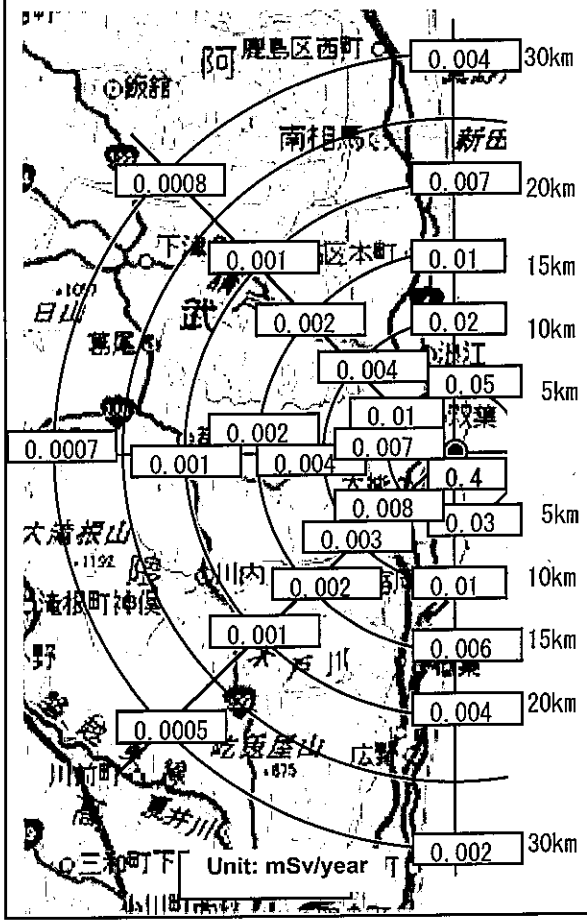
Release rates of radioactive materials from Units 1 to 3 at the Fukushima Daiichi



Exposure doses in case that the current release rate from the power station Units 1 to 3 continues for one year (mSv/year)

(Excluding the effect of already released radioactive materials)

[Map Source: "Digital Japan" URL http://cyberjapan.jp/]



(Overview of the evaluated figures)

Site boundary: Less than or equal to approx. 0.4 mSv/year

5km radius : Less than or equal to approx. 0.05 mSv/year

10km radius : Less than or equal to approx. 0.02 mSv/year

20 km radius : Less than or equal to approx. 0.007 mSv/year

As a reference, the dose limit by reactor facilities at an outside of a nuclear power station is 1 mSv/year.

③Consider and start full-fledged decontamination [Countermeasure 63]

- Plan to formulate emergency decontamination basic policy including basic view of an emergency countermeasure for decontamination.
- Plan to formulate decontamination manual through demonstration etc. of decontamination way at schools, parks, roads, farmland, forests and facilities etc.
- Based on the consideration results, start full-fledged decontamination.

IV. Countermeasures for aftershocks, etc.

(7) Tsunami and reinforcement, etc.

1. Target for Step 2 "Mitigation of further disasters"

- Prevent situation from deterioration by mitigating disasters with countermeasures against emergency (earthquakes and tsunami, etc.)
- Consideration of reinforcement work of each unit as necessary
- Continue implementing various radiation shielding measures

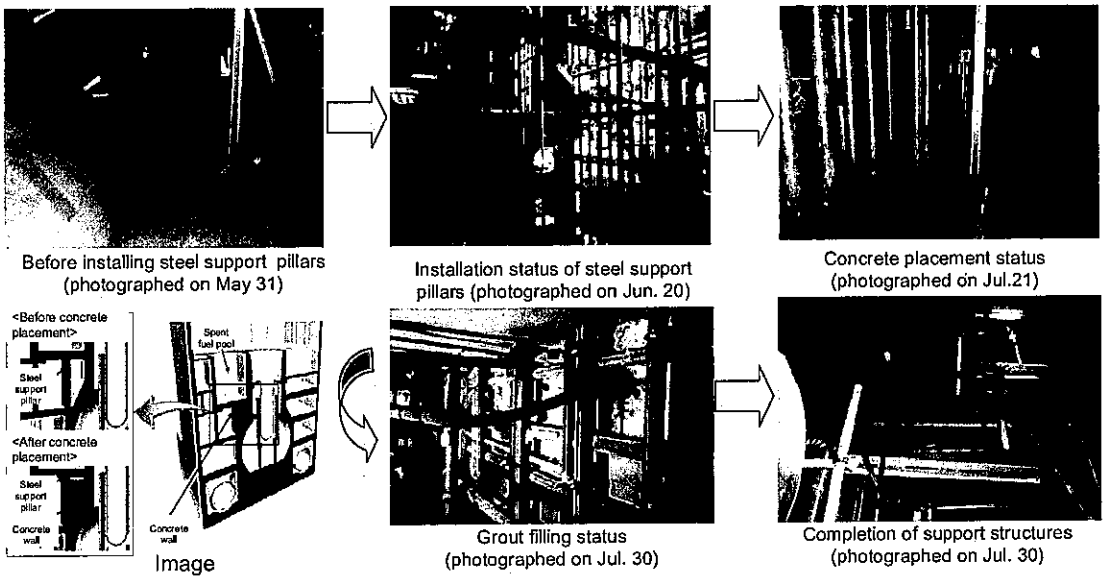
2. Current status and work implemented

① Installed support structures at the bottom of the fuel pool of Unit 4

[Countermeasure 26]

- Support structures were installed at the bottom of the spent fuel pool to enhance margin of safety
- Completed installation work of steel support pillars (Jun. 20) and decrease in loading weight took effect
- Concrete and grout were filled to further ensure the effect (Jul. 30)

Installation status of support structures



Before installing steel support pillars (photographed on May 31)

Installation status of steel support pillars (photographed on Jun. 20)

Concrete placement status (photographed on Jul.21)

Grout filling status (photographed on Jul. 30)

Completion of support structures (photographed on Jul. 30)

V. Environment improvement

(8) Living/ working environment

1. Target for Step 2 "Enhancement of Environment Improvement"

- Improve workers' Living/ working environment that had been harsh during the initial phase of the accident, thus leading to maintaining workers' motivation
- Expansion of temporary dormitories and on-site rest stations
- Improvement of environment such as meals, bath, laundry, etc.

2. Current status and works implemented

① Expansion status of temporary dormitories [Countermeasure 75]

- Plan to build temporary dormitories capable of accommodating approximately 1,600 people; approx. 1,200 people have already moved in (as of Aug. 15.)

② Establishment status of on-site rest stations [Countermeasure 75]

- Sixteen on-site rest stations have been built (approx. 3,500m^2 in size with a capacity to accommodate approx. 1,200 people.) (As of Aug. 15) Air showers and restrooms as well as drinking water equipments have been installed in part of them.

Exterior (left) and interior (right) appearances of on-site rest stations

Inside of on-site rest stations (from left: drinking water, etc., restroom and air shower)

(9) Radiation Control/Medical Care

1. Target for Step 2 "Enhancement of Healthcare"

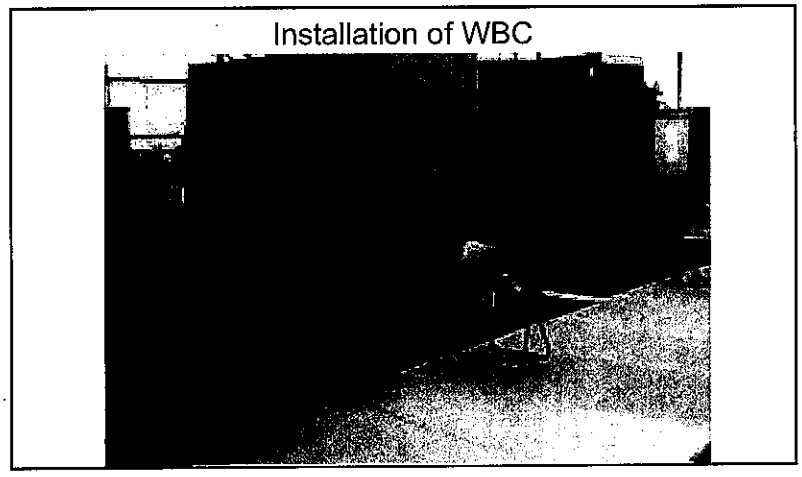
- Thorough radiation exposure control and countermeasures against heat stroke
- Reinforcement of radiation control by NISA
- Increase in the number of whole body counters, monthly measurement of internal exposure
- Automated recording of personal radiation dose, report of personal exposure dose in writing, introduction of workers' certificates with photos
- Consideration of a long-tem healthcare such as enhancement of workers' safety training and establishment of a database

2. Current status and works implemented

① Expansion of whole body counters (WBC) [Countermeasure 78]

- Installing WBCs as planned (6 units have already been added as of Aug. 11.)

Installation of WBC



② Consideration for long-tem healthcare such as establishing database [Countermeasure 78]

- Announced the creation of database as well as a framework of comprehensive long-term health care as a "Grand Design" (Aug. 3.) Continue considering the concept of long-term healthcare.

③ Speedy transportation of patients [Countermeasure 80]

- Confirm rules for patient survey etc. at the Unit 5/6 emergency medical service room.
- Conducted decontamination of patient transportation vehicle and preparing decontamination facility at the Unit 5/6 emergency medical service room.

(10) Staff training/personnel allocation

1. Target for Step 2 "Systematic staff training and personnel allocation".
   - Promotion of staff training etc. in conjunction with the Government and operators.

2. Current status and work implemented

① Promote staff training, etc. in conjunction with the government and operators in order to train and mobilize staffs systematically.

[Countermeasure 85]

- Conducting training for staffs engaged in radiation related work, who will be in great demand.
- TEPCO has been conducting "radiation survey staff training" targeted for employees and TEPCO group companies' employees and has already trained approx. 1,900 personnel.
- The government has been conducting "radiation survey staff" and "radiation protection staff" development trainings and will train 250 personnel.
- According to affiliated companies needs, launched a new framework of looking for specialized technical workers widely through Japan Atomic Industrial Forum (JAIF).

Photos from radiation protection staff training

VI. Countermeasures against midterm issues

1. Target for Step 2

- Mid-term safety securement policy to be drafted by the government
- Plant operation plans to be developed by the operator based on the above policy

2. Current status and work implemented

①"Mid-term safety securement policy" is under consideration by NISA

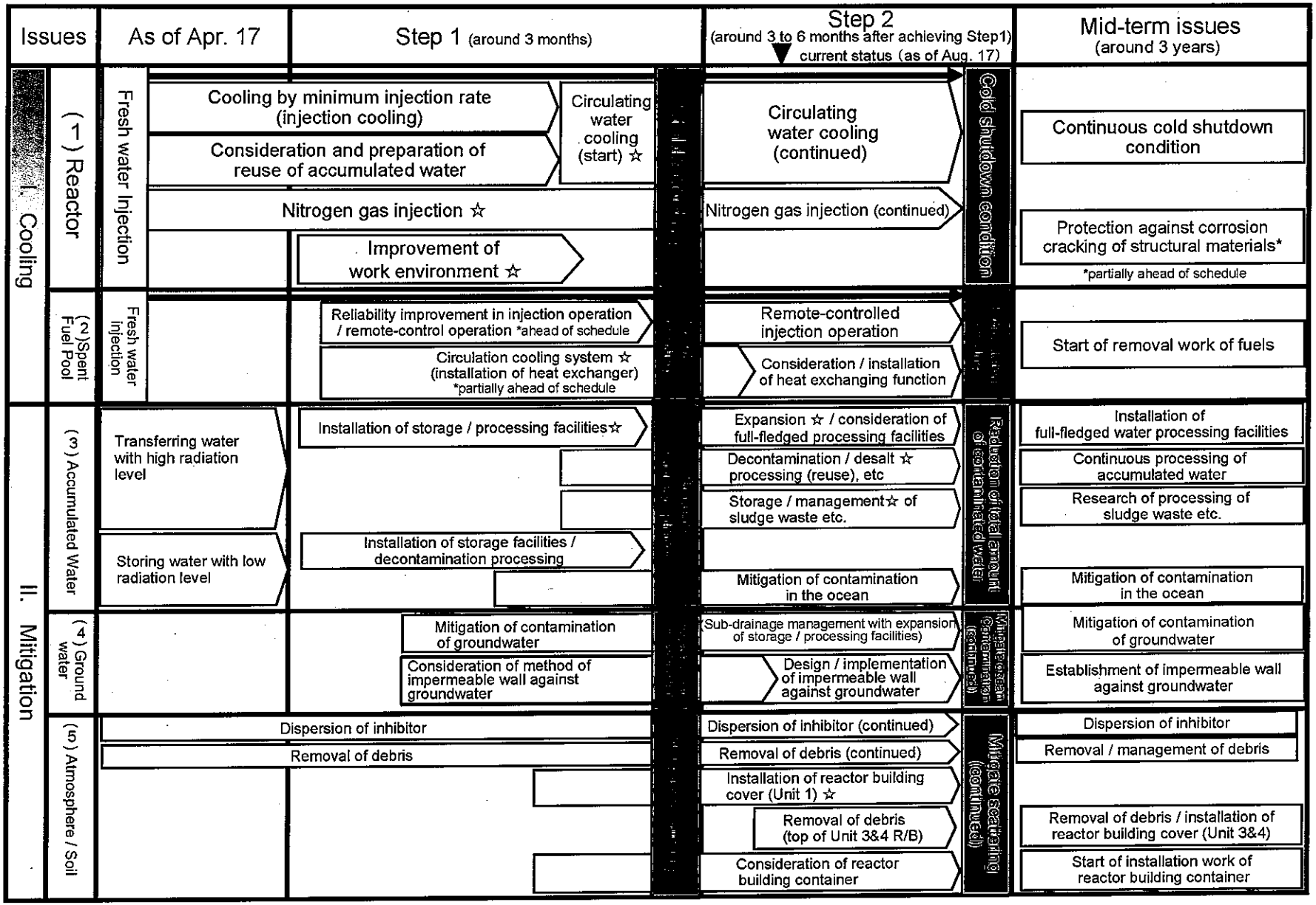
END

Current Status of "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO" (Revised edition)

Appendix 3

August 17, 2011
Nuclear Emergency Response Headquarters
Government-TEPCO Integrated Response Office

Red colored letter: newly added to the previous version, ☆: already reported to the government, Green colored shading: achieved object



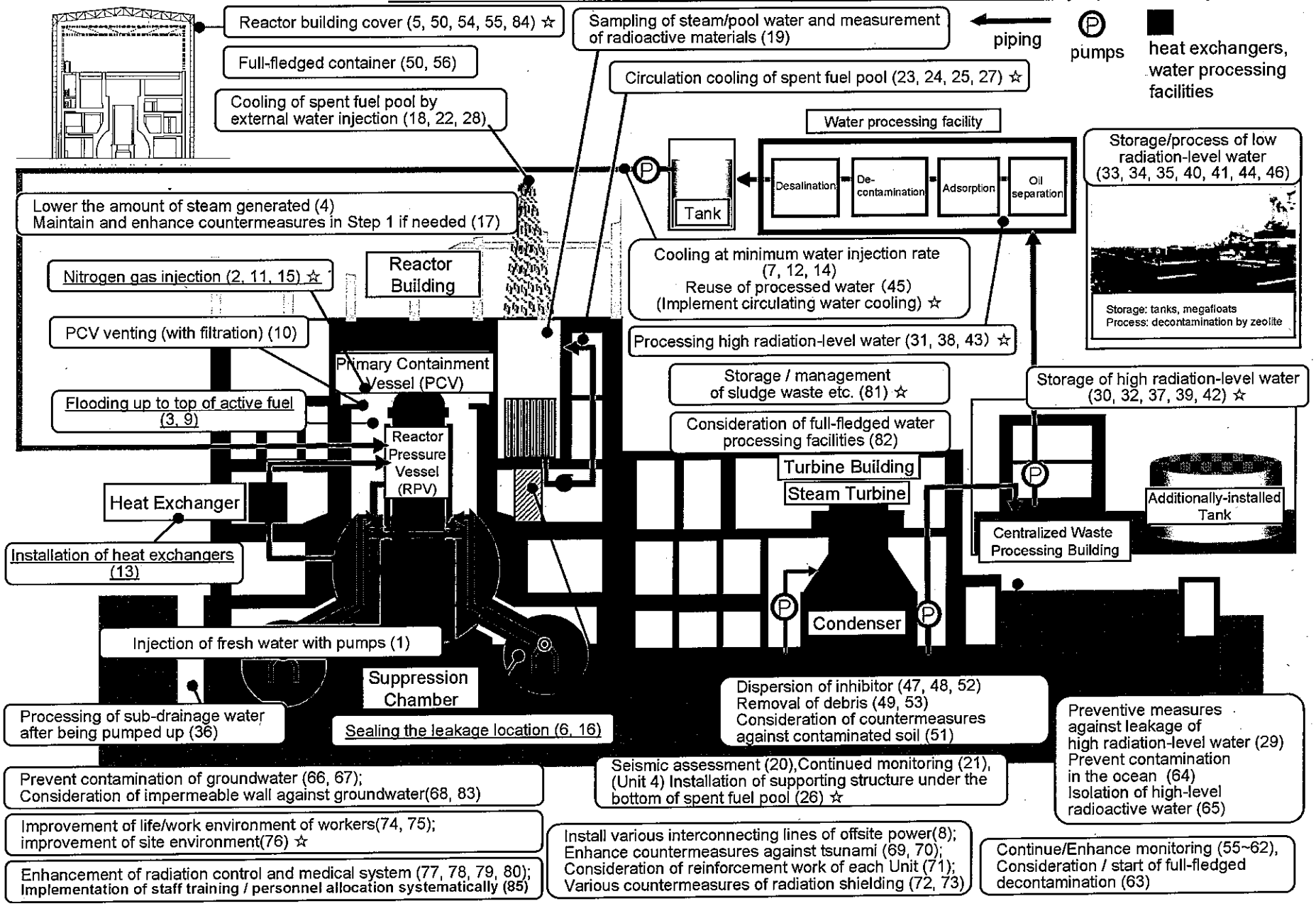
Current Status of "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station, TEPCO" (Revised edition)

Red colored letter: newly added to the previous version, ☆: already reported to the government, Green colored shading: achieved object

Issues		As of Apr. 17	Step 1 (around 3 months)	Step 2 (around 3 to 6 months after achieving Step1) ▼current status (as of Aug. 17)		Mid-term issues (around 3 years)
III. Monitoring/ Decontamination	(6) Measurement, Reduction and Disclosure	Expansion, enhancement and disclosure of radiation dose monitoring in and out of the power station		Consideration / start of full-fledged decontamination	Decontamination	Continuous environmental monitoring Continuous decontamination
IV. Countermeasures for aftershocks, etc	(7) Tsunami Reinforcement, etc	Enhancement of countermeasures against aftershocks and tsunami, preparation for various countermeasures for radiation shielding	(Unit 4 spent fuel pool) Installation of supporting structure ☆	Consideration / implementation of reinforcement work of each Unit	Mitigate disasters	Continue various countermeasures for radiation shielding Reinforcement work of each Unit
V. Environment improvement	(8) Life/work environment		Improvement of workers' living / working environment		Enhancement of Environment Improvement	Improvement of workers' life / work environment
	(9) Radiation control / Medical care		Improvement of radiation control / medical system		Enhancement of Healthcare	Improvement of radiation control / medical system
	(10) Staff Training / personnel allocation			Implementation of staff training / personnel allocation systematically	Extensive radiation dose control	Implementation of staff training / personnel allocation systematically
Measures for Mid-term issues				Government's concept of securing safety Establishing plant operation plan based on the safety concept		Response based on the plant operation plan

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

Under line: deleted countermeasures, red colored: newly added countermeasures, ☆: already reported to the government



Current Status of Countermeasures (1)

Red frame: progressed countermeasures from the previous version, ☆: already reported to government

Issues: I. Cooling / (1) Reactor

Unit

<Step 2 (around 3 to 6 months after achieving Step1)> : Release of radioactive materials is under control and radiation dose is being significantly held down

Start of Step 2 (Jul. 17) ▼ Current status (as of Aug. 17)

Unit 1

Implementation of circulating water cooling [Countermeasures 12,14,45]

Construction of centralized monitoring system in the seismic isolation building, etc.

Injection of water required to achieve "stable cooling"

Injection of water enough to achieve cold shutdown

Nitrogen gas injection [Countermeasure 11]

Unit 2

Implementation of circulating water cooling [Countermeasures 12,14,45]

Construction of centralized monitoring system in the seismic isolation building, etc.

Injection of water required to achieve "stable cooling"

Change flow rate experimentally, and inject water while confirming transition of temperature in the reactor

Injection of water enough to achieve cold shutdown

Nitrogen gas injection [Countermeasure 11]

Unit 3

Implementation of circulating water cooling [Countermeasures 12,14,45]

Construction of centralized monitoring system in the seismic isolation building, etc.

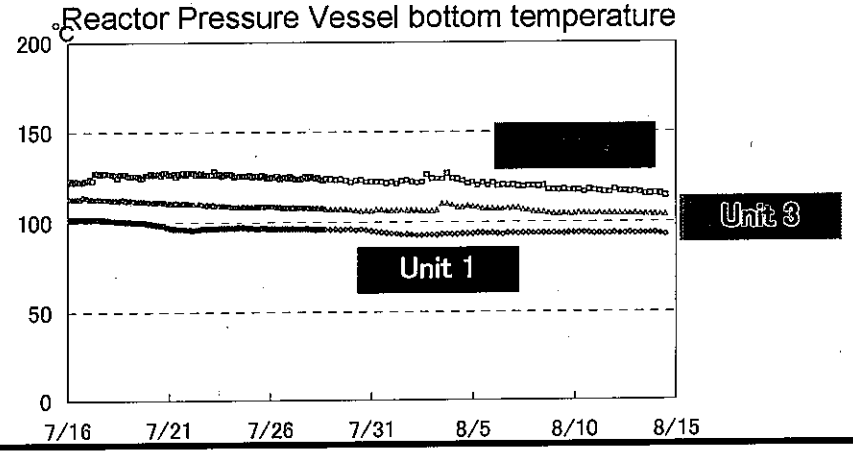
Injection of water required to achieve "stable cooling"

Change flow rate experimentally, and inject water while confirming transition of temperature in the reactor

Injection of water enough to achieve cold shutdown

Nitrogen gas injection [Countermeasure 11]

Reactor Pressure Vessel bottom temperature

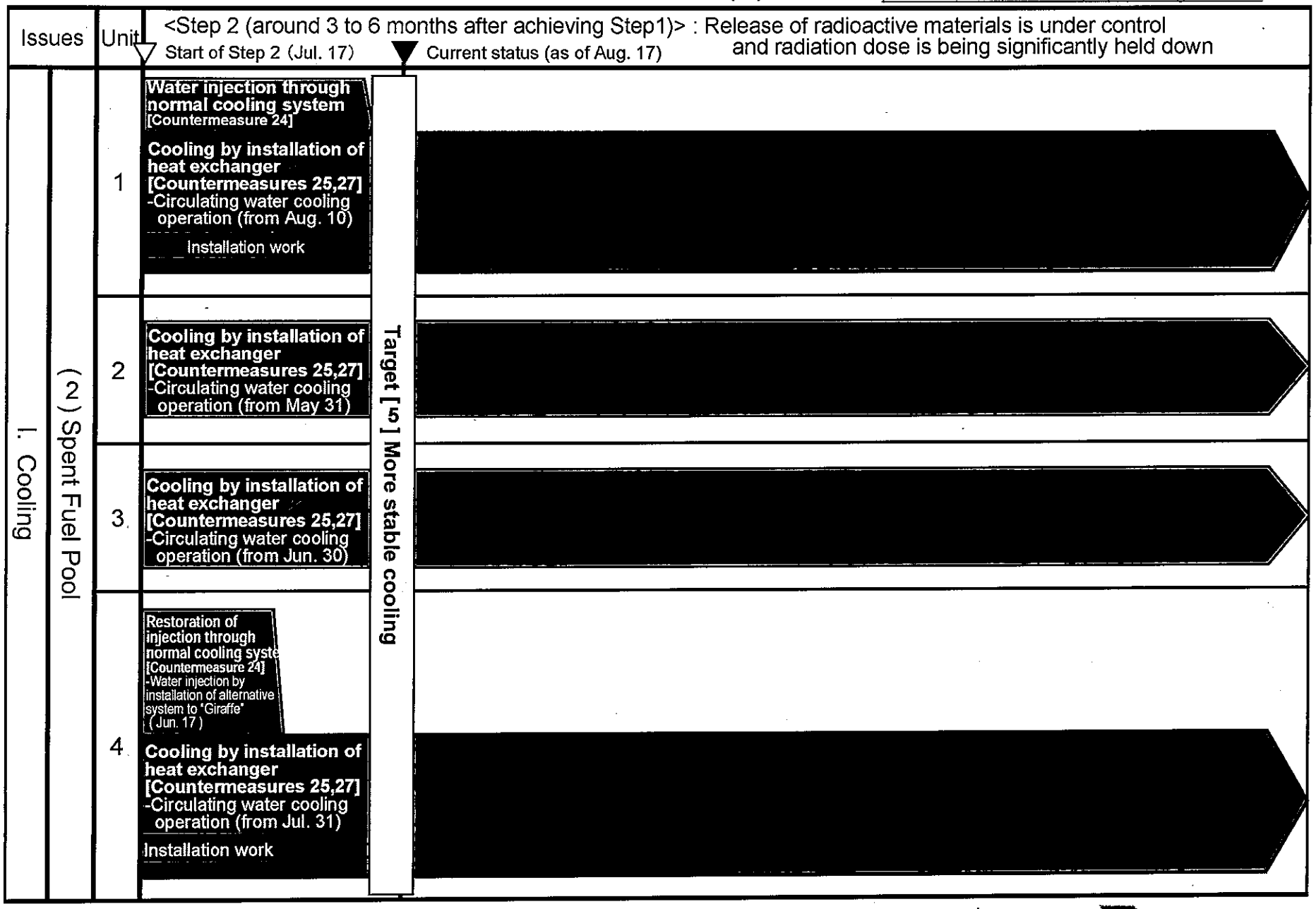


Target [3] Cold shutdown condition

Legend: ■: Implemented (monitored by government as necessary) ☆: Safety check by government (report) ▭: Under construction ▭: Field work started ■: Field work not started yet

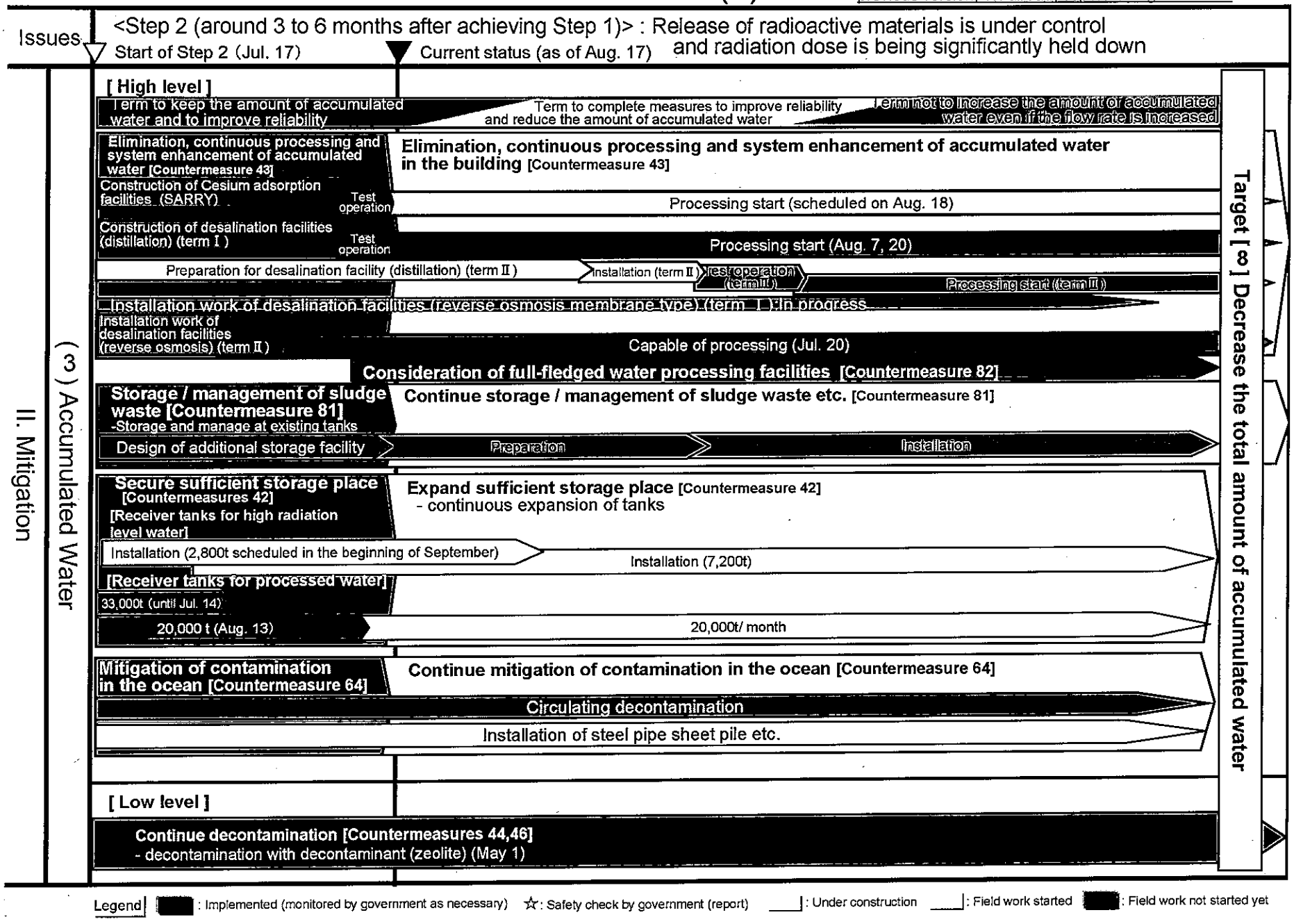
Current Status of Countermeasure (2)

Red frame: progressed countermeasures from the previous version, ☆: already reported to government



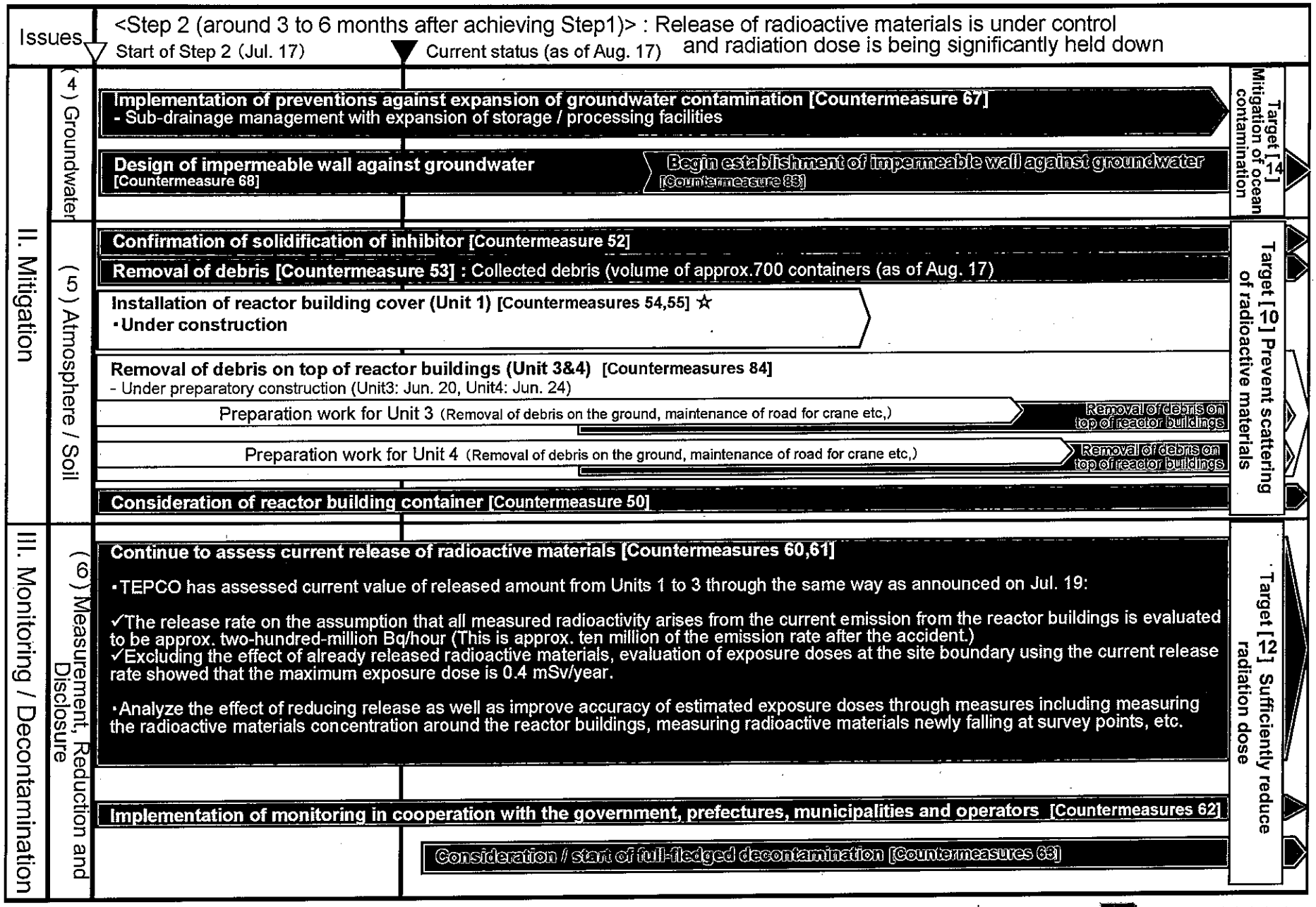
Current Status of Countermeasures (3)

Red frame: progressed countermeasures from the previous version, ☆: already reported to government



Current Status of Countermeasures (4)

Red colored letter: newly added to the previous version, Red frame: progressed countermeasures from the previous version, ☆: already reported to government



Current Status of Countermeasures (5)

Red colored letter: newly added to the previous version, Red frame: progressed countermeasures from the previous version, ☆: already reported to government