Appendix 1-②

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

Progress Status

July 19th, 2011

Nuclear Emergency Response Headquarters

Government-TEPCO Integrated Response Office

I. Cooling

(1)Reactor

1. Target for Step 1: “Stable cooling”

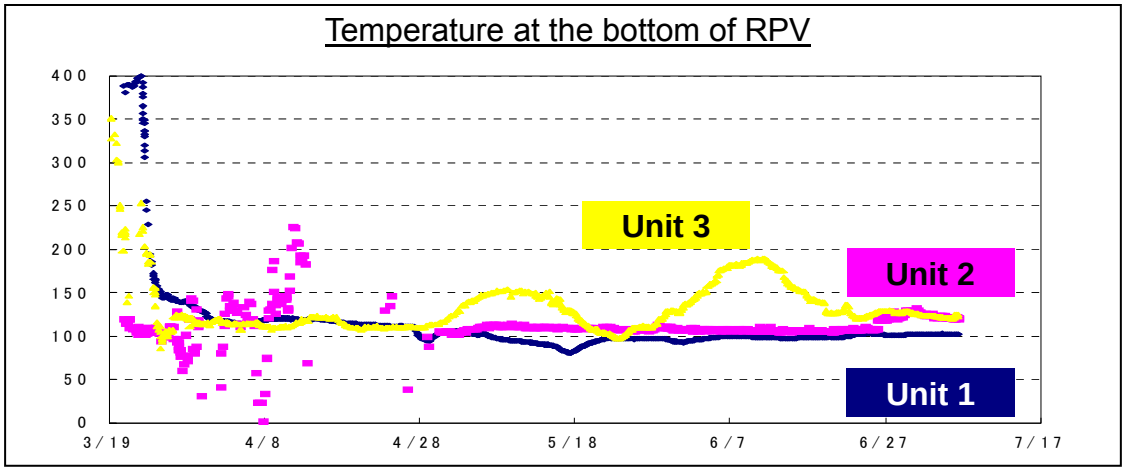
Achieve Step 1 target “radiation dose is in steady decline” by stable cooling the reactor and reducing the amount of steam generated, leading to reduction of release in radioactive materials.

2. Current status and work implemented

① Step 1 completed: Achieved “stable cooling”

- The target of “stable cooling” is considered to be achieved based on the following status:

  - ✓ Temperature at the bottom of Reactor Pressure Vessel (RPV) does not show an upward trend and the heat generated in reactors (decay heat) is being steadily removed.
  - ✓ Water processing facility is in operation and water is injected without increasing the volume of accumulated water (circulating injection cooling).
  - ✓ Reliability of water injection (countermeasures against abnormal conditions, multiple water injection measures, etc.) is secured.
  - ✓ Hydrogen explosion is avoided by injecting nitrogen gas into the Primary Containment Vessel (PCV).



② Work implemented: Improvement of work environment [Countermeasure 76] (preparation for work inside the reactor buildings)

- Airlocks were opened on May 8 (Unit 1) and Jun. 19 (Unit 2) after NISA conducting an environmental impact assessment utilizing SPEEDI and confirming that there is no issue.
- In order to minimize the exposure dose of workers, robots and other methods were used to check the conditions inside the buildings. Work environment was improved by removing debris and installing local exhausters.
- Measurement of radioactivity concentration was conducted before carrying out works.

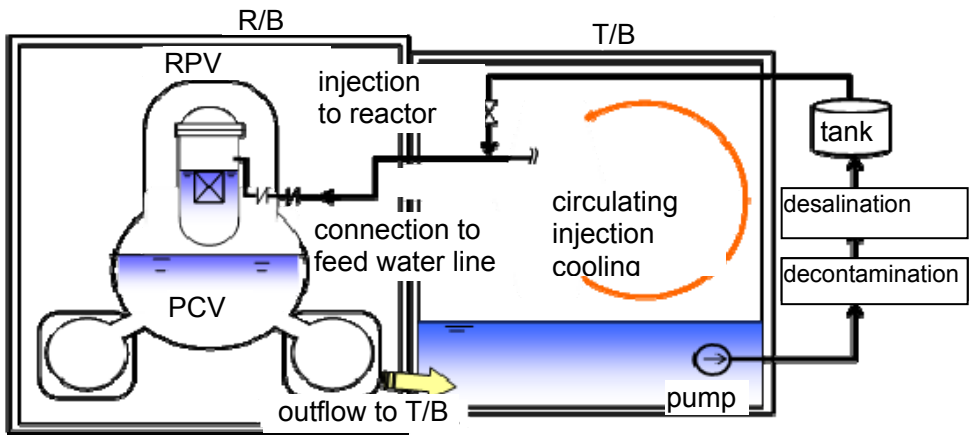
Measuring radiation dose

Installation of temporary gauge

③ Work implemented: Circulating injection cooling [Countermeasures 12, 14, 45]

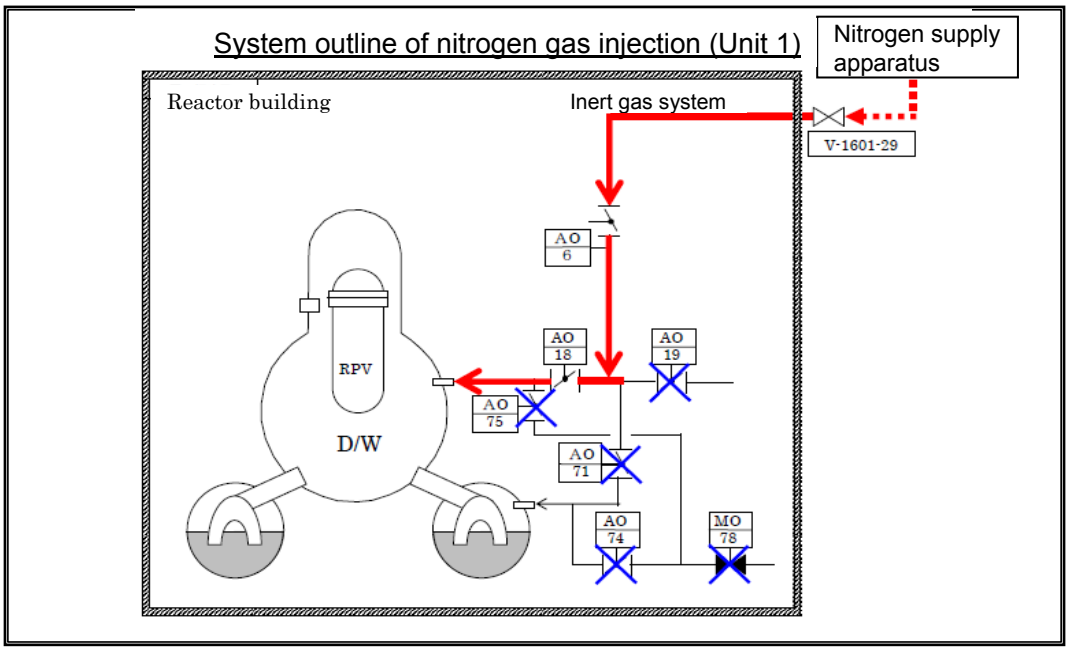
- "Circulating injection cooling (the figure below)", which reuses the processed contaminated water (accumulated water) in the buildings as reactor coolant, began operation (Jun. 27).
- NISA confirmed the status of the operation.
- Other emergency measures such as multiplexing injection lines to reactor, managing spares and transferring pumps to the upland were also implemented.

Image of circulating injection cooling



④ Work implemented: Nitrogen gas injection [countermeasure 11]

- In order to avoid the risk of unexpected hydrogen explosion, nitrogen gas injection was implemented into the PCV in Unit 1 (Apr. 7), Unit 2 (Jun. 28), Unit 3 (Jul. 14). NISA confirmed the safety in advance.
- Before the work, implement measures to reduce exposure dose such as decontamination by cleaning and placement of steel boards on the floors. For the assured and efficient implementation, check the site using robots in advance. Implement construction work including duct connection procedures after reviewing the work procedure fully.



⑤ Work implemented: Analysis of reactor core status

- Due to calibration of instrumentation at the Unit 1 PCV, the water level of Reactor Pressure Vessel (RPV) was confirmed (May 11).
- TEPCO carried out reactor core analysis and submitted the result to NISA (May 23).
- Based on the report from TEPCO on topics including plant's operation, accident record and safety evaluation, NISA carried out reactor core analysis, and announced the result (Jun. 6).
- These results were reflected in the report for the IAEA Ministerial Conference.

3. Target for Step 2 "More stable cooling"

- Continue and enforce the circulating injection cooling, properly monitor the RPV temperature, etc., thus bringing the reactors to a "cold shutdown condition."
- Maintain stable operation of accumulated water processing facility.

- NISA to continue confirming operating status and related matters.

Definition of “Cold shutdown condition”

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

In order to keep satisfying the above two conditions, secure the mid-term safety of the circulating injection 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 necessary time, etc.).

(2) Spent Fuel Pool

1. Target for Step 1: “Stable cooling”

Prevent release of radioactive materials due to additional damage of fuels by stable cooling of spent fuels by either external water injection by “Giraffe (concrete pumper)”, etc. or injection through restored existing line into the spent fuel pool.

2. Current status and work implemented

① Step 1 completed: Achieved “stable cooling” (particularly as for Units 2 and 3, the target for Step 2, “more stable cooling,” have been achieved)

- Water injection using normal line has begun in Unit 1 (May 29). In Unit 4 an external injection facility was installed (Jun.17) as an alternative to normal line and has achieved “stable cooling.”
- Circulating cooling using heat exchanger has begun in Units 2 and 3 in fulfillment of the “more stable cooling” target set in Step 2 (May 31 for Unit 2, Jun. 30 for Unit 3). NISA has confirmed effect and safety (May 21 for Unit 2, Jun. 15 for Unit 3).

② Work implemented: Water injection by “Giraffe”, etc. [Countermeasure 22]

- “Remote control operation of “Giraffe” etc.” (planned to be implemented in Step 2 on the original schedule) which have been used for the water injection to the spent fuel pool of Units 1,3 and 4, has been implemented ahead of schedule.

Water injection by “Giraffe”

③ Work implemented: Restoration of normal cooling system [Countermeasure 24]

- Due to the damage of the building caused by hydrogen explosion, debris were scattered around the access way (stairs) to the spent fuel pool. Debris removal was implemented and the normal cooling system was restored.

Debris on access path

・ For Unit 4, the installation of alternative line to normal cooling system was implemented (Jun. 16).

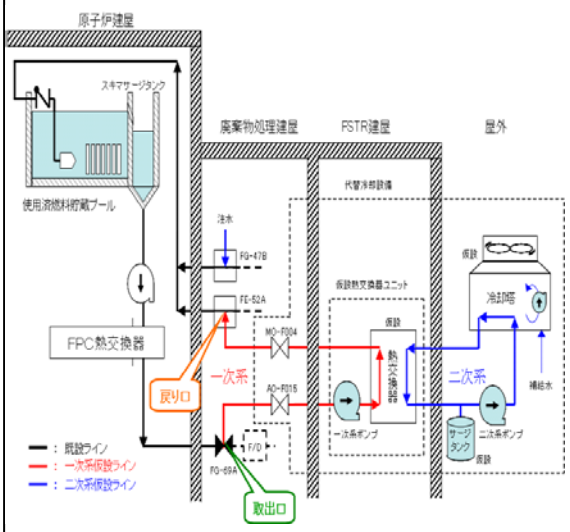
④ Work implemented: Installment of heat exchangers [Countermeasures 25,27]


heat exchanger unit

・ In Units 2 and 3, after restoration of normal cooling system, heat exchanger was installed (May 31 for Unit 2, Jun. 30 for Unit 3). Upon installation, NISA confirmed effect and safety (May 21 for Unit 2, Jun. 15 for Unit 3).

・ Also in Units 1 and 4, aiming to establish circulating cooling system, TEPCO submitted the report (Jul.13) and NISA confirmed safety etc. (Jul.15) Start of operation is planned in the beginning of August.

Installation of heat exchanger




Cooling Tower

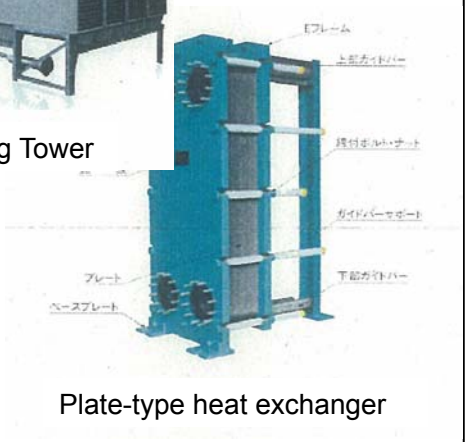


Plate-type heat exchanger

3. Target for Step 2 “More stable cooling”

- In Units 2 and 3, the heat exchangers have already been installed, the water level of the pools is kept, thus achieving “more stable cooling” (Target for Step 2).
- Early installation of heat exchangers is targeted also for Unit 1 and 4.

Ⅱ.Mitigation

(3) Accumulated water

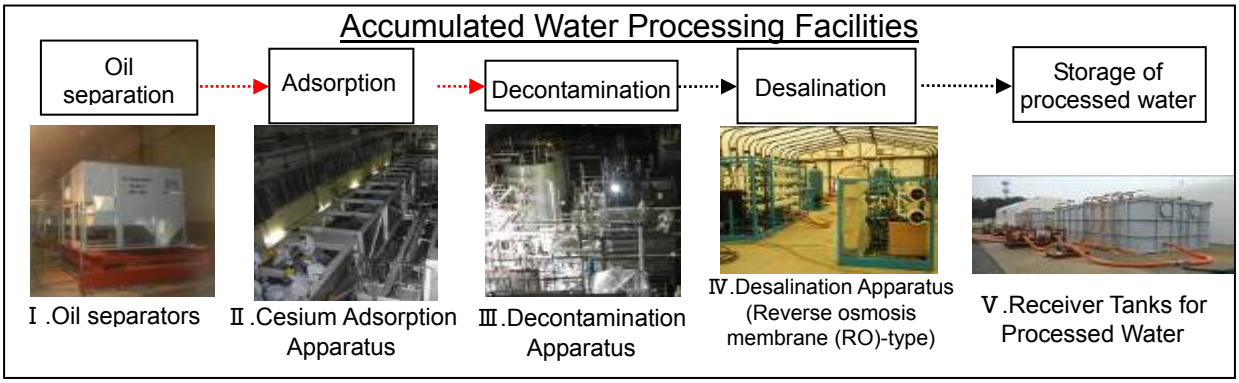
1. Target for Step1: “Secure Storage”

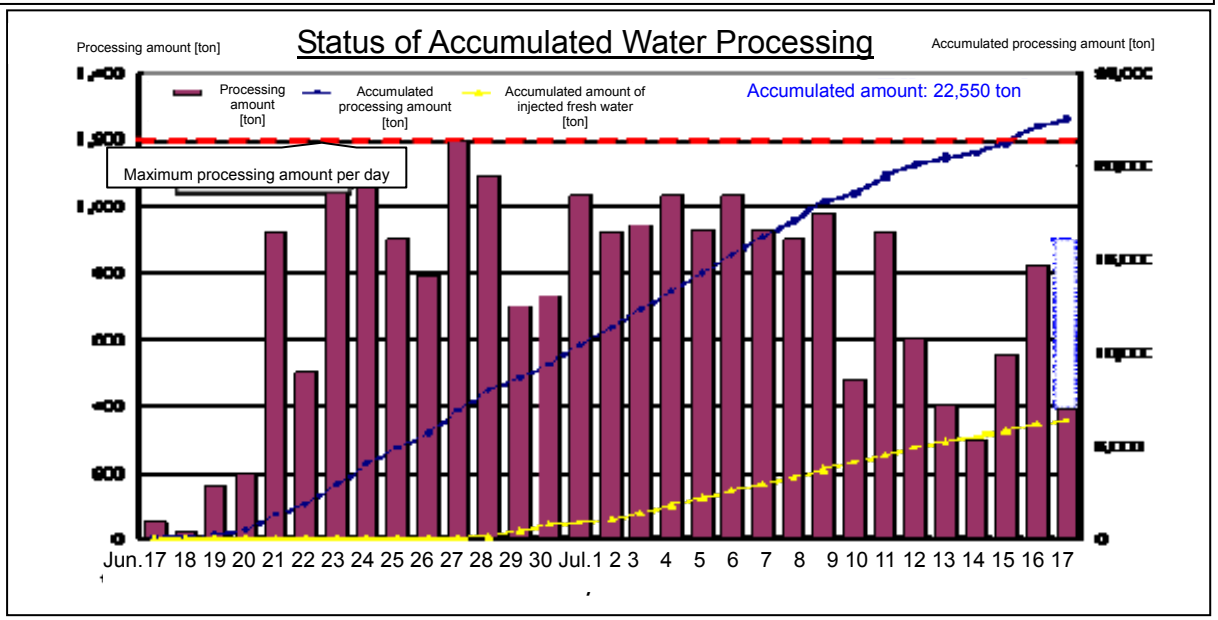
Secure sufficient storage to prevent high-level radioactive water from being released out of the site boundary. Mitigate the risk of unintentional leakage to the environment by operating processing facility and processing the accumulated water in the buildings. Store and process low radiation level water.

2. Current status and work implemented

① Step1 Achieved: Secured storage and began operation of processing facility

- Secured various storage [Countermeasures 37, 39, 40, 41]
- NISA confirmed decontamination effect as well as safety measures for installation regarding the processing facility for high-level radioactive water. (Jun.9)
- TEPCO installed processing facility as shown below. Operation of the facility began (Jun.17) [Countermeasures 38, 45.] NISA had confirmed its safety.
- Properly secure sludge waste with high radioactive concentration derived from processing.

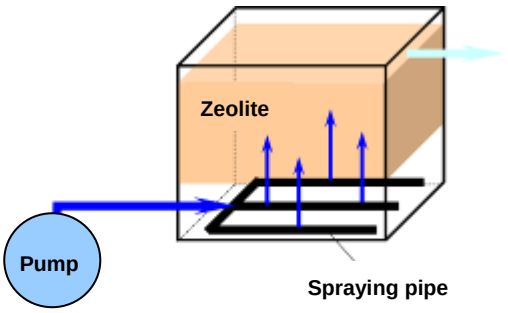




② Work implemented: Mitigation of contamination in the ocean [Countermeasure 64]

- Seawater inside the plant port where high-level radioactive water flowed in was purified using zeolite (a material that adsorbs cesium) (Jun. 13.)
- Contaminated water inflow into the port was prevented by inserting concrete plates at intake canal and filling in pits near port, etc. Silt fences were installed to prevent diffusion of contaminated water that had flowed into the port.

Adsorption filtering system of cesium by zeolite



③ Work implemented: Isolation of high-level radioactive water, etc. [Countermeasure 65]

- NISA conducted impact assessment regarding leakage of high-level radioactive water from Units 2 and 3 (Unit 2 on Apr. 2, Unit 3 on May 11) as well as discharge of low-level radioactive water to the sea conducted in April（May 24）. NISA instructed TEPCO to submit plans for countermeasures against leakage, enforcement of monitoring and storage/processing of contaminated water. TEPCO submitted the report (Jun.1, Jun.2.）
- Transfer of high-level radioactive water from Unit 2 and 3 to centralized radioactive waste treatment building is being continued after NISA confirmed its safety.

3. Target for Step 2 “Reduction of total amount of contaminated water”

- Expand high-level radioactive water processing facility, operate stably and expand reuse of decontaminated water by desalination.
- Consider full-fledged water processing facility for high-level radioactive water.
- Store and manage sludge waste generated from the high-level radioactive water processing facility.
- Implement construction for installing steel pipe sheet pile to mitigate contamination in the ocean.

(4) Groundwater

1. Target (Common in Step1 and Step 2): “Mitigation of contamination in the ocean”

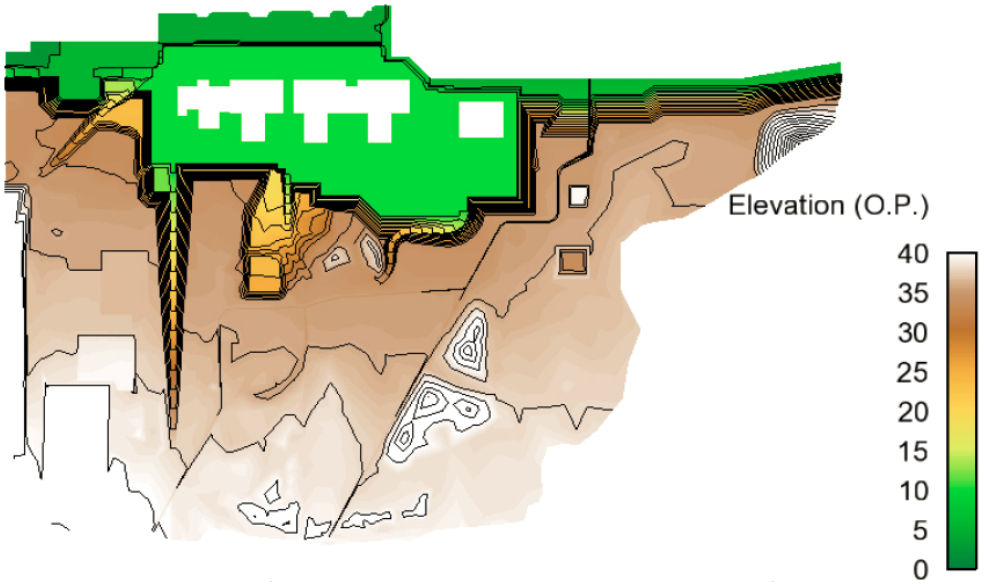
Prevent contamination in groundwater as well as contamination in the ocean via groundwater by controlling accumulated water inflow into groundwater.

2. Current status and work implemented

① Work implemented: Preventions against expansion of groundwater contamination [Countermeasures 66,67]

- Implement analysis of radiation of sub-drainage and management of the amount of water.
- As accumulated water in buildings decrease, restore pumps gradually in order to discharge sub-drainage.
- Optimal shielding wall for groundwater based on evaluations on water shielding, seismic design and durability is now under consideration.
- Consideration for groundwater flow characteristics based on seepage flow analysis is being continued.

Example of the Seepage Flow Analysis Model



3. Target for Step 2 “Mitigation of contamination in the ocean”

- Implement investigation of groundwater level, water quality, etc. by boring survey.
- Establish optimal construction method for shielding ground water based on evaluation on water shielding, seismic design and durability.
- Design and launch shielding cross section and layout plan, etc.

(5) Atmosphere /Soil

1. Target (Common in Step1 and Step 2): “Mitigation of dispersion”

Reduce dispersion amount of radioactive materials accumulated in the power station and prevent increase of radiation dose at the area around the site.

2. Current status and work implemented

① Work implemented : Dispersion of inhibitor [Countermeasure 52]

- Inside the power station (flat/slope) : Approx. 400,000m^2 (planned area) completed (Jun. 28)
- Around the buildings : Approx. 160,000m^2 (planned area) completed (Jun. 27)

② Work implemented : Removal of debris [Countermeasure 53]

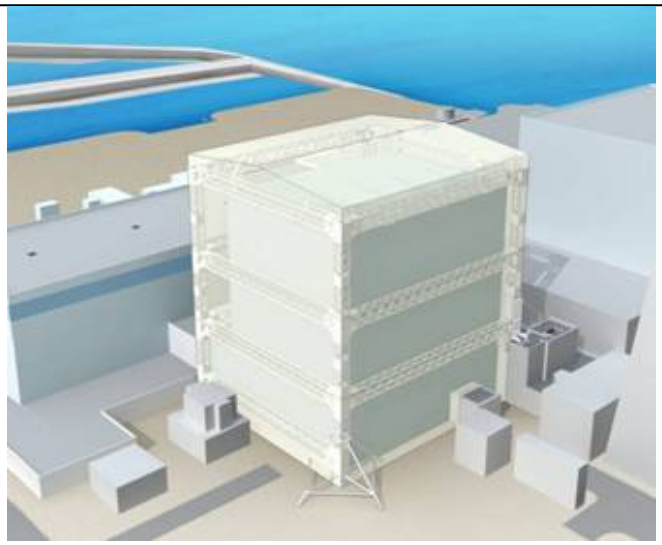
- Debris was collected (volume of approx. 500 containers) (as of Jul. 17.)
- Having collected and received information from various institutions both domestic and international, supported consideration for additionally introducing remote-controlled robots for debris removal.

③ Work implemented : Started construction of Unit 1 reactor building cover [Countermeasure 54]

- Installation work of Unit1 reactor building cover is under way from Jun. 28 after safety confirmation by NISA.

3. Target for Step 2 “Mitigation of dispersion”

- Dispersion of inhibitor and removal of debris
- Installation of reactor building covers (Unit 1)
- Removal of debris on top of reactor buildings (Units 3 and 4)
- Consideration of reactor building containers



Installation Image of the Unit 1 Reactor Building Cover

Ⅲ. Monitoring / Decontamination

(6) Measurement, reduction and announcement

1. Target for Step1: “Expansion, enhancement and announcement of radiation dose monitoring inside and outside of the power station”

By means of radiation dose monitoring, observe the release of radioactive materials and contribute to studies of countermeasures for reducing radiation dose.

2. Current status and work implemented

① Continuing to Step 2: Expansion, enhancement and announcement of monitoring

- Monitoring scope/sampling number have been expanded, measured and announced.
- Values such as radiation dose indicated by monitoring posts, etc. as well as radioactivity concentration in the seawater, etc. are in declining trend.
- On the other hand, since the radioactivity concentration in the seawater in the plant port is still high, decontamination is being conducted utilizing circulation-type seawater processing apparatus.

[Land Area]
＜Monitoring within 20km radius of the periphery＞

- Monitoring of radiation dose rate at 50 points by Utility Support Team (once a week)
- Land sampling at 50 points and additional points (approx. 50 points) by Utility Support Team (once in 2 months)
- Monitoring at the time of nitrogen injection to the PCV of Unit 2（Jun. 28 to Jul. 12)
- Monitoring at the time of nitrogen injection to the PCV of Unit 3（Jul. 13 to Jul. 29)

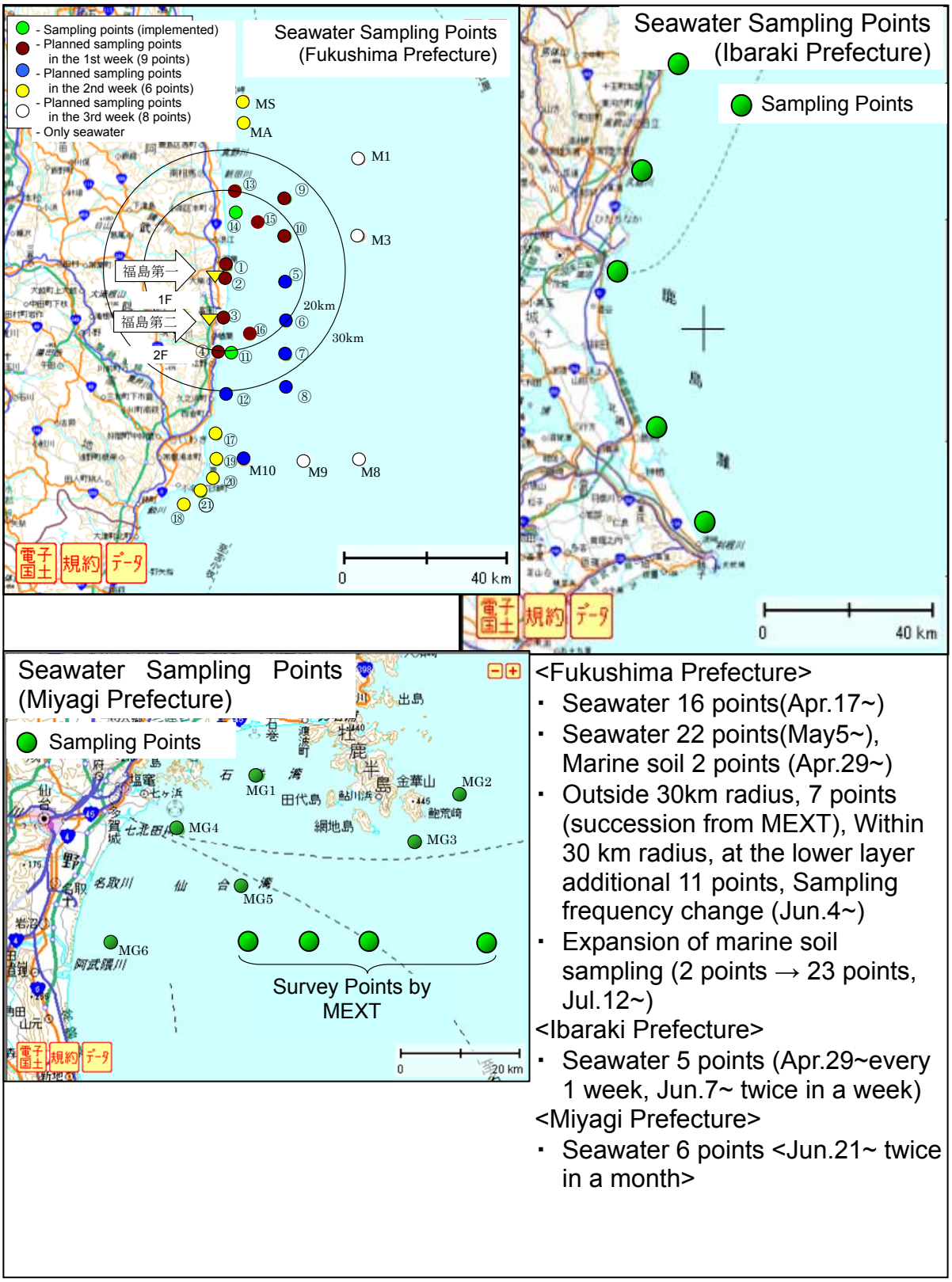
＜Monitoring within the site＞

- Monitoring of airborne radioactive material concentration near the West Gate (everyday)
- Monitoring of radioactive material concentration at the upper part of reactor buildings with a concrete pumper, etc.(every 1 month)：
  Unit 1（May 22)，Unit 4（May 23, Jun. 18)，Unit 3（Jun. 13, Jul. 13)，Unit 2（after Jul. 14）
- Monitoring of radioactive material concentration at the west part of the hill located in the north side of the reactor building（every 1 week）
- Monitoring of radioactive material concentration at the monitoring posts, etc. (once a week)
- Mitigation measures on backgrounds of monitoring posts (mitigation from the impact of land)：MP8（May 20)，MP3（May 23)，MP2（after July）

Sampling by concrete pumper

Land Sampling by Utility Support Team
(20 km radius of the periphery)

【Ocean Area】



<Fukushima Prefecture>
- Seawater 16 points(Apr.17~)
- Seawater 22 points(May5~), Marine soil 2 points (Apr.29~)
- Outside 30km radius, 7 points (succession from MEXT), Within 30 km radius, at the lower layer additional 11 points, Sampling frequency change (Jun.4~)
- Expansion of marine soil sampling (2 points → 23 points, Jul.12~)

<Ibaraki Prefecture>
- Seawater 5 points (Apr.29~every 1 week, Jun.7~ twice in a week)

<Miyagi Prefecture>
- Seawater 6 points <Jun.21~ twice in a month>

3. Target for Step 2 “Sufficient reduction of radiation dose”

- Implement monitoring by the government, prefectures, municipalities and operators.
- Begin full-fledged decontamination.

IV. Countermeasures against aftershocks, etc.

(7)Tsunami, reinforcement, etc.

1. Target (Common in Step1 and Step 2): “Mitigation of further disasters”

Prevent situation from deterioration by mitigating disasters with countermeasures against emergency (earthquakes and tsunami, etc.)

2. Current status and work implemented

① Continuing to Step 2: Mitigation of disasters

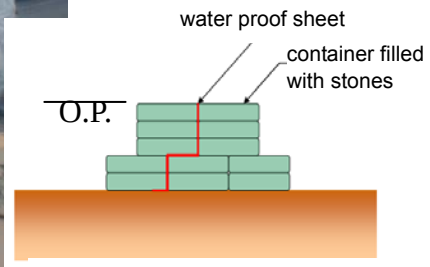
- Based on a report by TEPCO, NISA confirmed that the current seismic safety of reactor buildings of Unit 1, 3 and 4 are secured and that of spent fuel pool of Unit 4 is also sound. (Unit 1 and 4: May 28, Unit 3: Jul. 13)
- TEPCO currently is investigating the seismic safety of the reactor building of Unit 2 and NISA will confirm it upon completion.

② Work implemented: Countermeasures against tsunami

【Countermeasures 69,70】

- Transferring emergency power source to the upland (Apr. 15); addition of redundant water injection line (Apr. 15); setting fire trucks on the upland, etc. (Apr. 18)
- Installation work of supporting structure under the bottom of the pool of Unit 4 is under way.
- Installation of temporary tide barriers from May 18; completed at the end of June.

Temporary Tide Barrier



Cross-Section of Temporary Tide Barrier (image)

3. Target for Step 2 “Mitigation of further disasters”

- Consideration of reinforcement work of each Unit as necessary.
- Continue various countermeasures for radiation shielding.

V. Environment improvement

(8) Life / work environment

1. Target (Common in Step1 and Step 2): “Enhancement of environment improvement”

Improve workers’ life/work environment that had been harsh during the initial phase of the accident, thus leading to maintaining workers’ motivation.

2. Current status and work implemented

① Continuing to Step 2: Enhancement of environment improvement

- Rest stations with a capacity of approx. 1,000 workers were installed at Fukushima Daiichi Nuclear Power Station of TEPCO (as of Jul. 8).
- At Fukushima Daini Nuclear Power Station of TEPCO and J-Village, provision of box lunch for lunch and dinner started from May, and showers became available at lodging facilities.
- Also, temporary dormitories were built in J Village, and approx. 100 workers from Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station moved into the dormitory since Jun. 25 (as of Jul. 7).

Drinking water in the rest station

Inside the rest station

3. Target for Step 2 “Enhancement of environment improvement”

- Expansion of temporary dormitories and on-site rest stations
- Improvement of environment such as meals, bath, laundry, etc.

(9) Radiation control/Medical care

1. Target (Common in Step1 & Step 2): "Enhancement of healthcare"

Thorough radiation control and countermeasures against heat stroke during the summer

2. Current status and work implemented

① Continuing to Step 2: Enhancement of healthcare

<Radiation Control>

- Enhanced radiation exposure control and development of measures on recurrence prevention based on the instruction by NISA and Ministry of Health, Labour and Welfare in light of the lessons learnt from the event that radiation exposure of workers had exceeded the dose limit.
- TEPCO was instructed by NISA to enhance radiation control in accordance with the event that radiation exposure of woman workers had exceeded the dose limit. TEPCO's countermeasures were evaluated (May 25).
- Afterwards, it was revealed that radiation exposure of workers had exceeded dose limit of 250 mSv. NISA issued a strict warning to TEPCO and instructed to analyze the cause and to develop measures on recurrence prevention (Jun. 10). TEPCO submitted the report (Jun. 17). NISA instructed TEPCO to improve 8 items (Jul.13). It was confirmed that the number of workers who exceeded 250 mSv was 6 (Jul. 13).
- After the instruction (May 23) from Ministry of Health, Labour and Welfare to TEPCO on radiation control for external exposure including periodical report to the company where the worker belongs to, TEPCO provided all workers with their IDs and introduced an automatic recording system of personal dose that utilizes bar codes (Jun. 8).
- TEPCO reported internal exposure measurement results for 3,514 out of 3,639 workers engaged in emergency activities in March and 2,242 out of 4,325 workers in April. As measurement and evaluation is delayed, TEPCO was instructed to swiftly implement the measurement (Jun. 30.) Afterwards, TEPCO conducted investigation, measurement and evaluation, then reported internal exposure measurement results for 3,538 out of 3,771 workers engaged in emergency activities in March and 3,254 out of 4,567 workers in April (Jul. 13).
- TEPCO was instructed to submit a work plan report for those works that the effective dose might exceed 1mSv per day (May 23.) For the 141 reports submitted by TEPCO (Jul. 7) , improvements was asked to be made and for 92 cases, it was confirmed to be free of issues.

<Healthcare>

- TEPCO was instructed to conduct temporary medical check for workers who

exceeded the dose limit of 100mSv and have been engaged in emergency works for more than one month (Apr. 25). 1,016 out of the 1,027 relevant workers have taken the medical check (as of Jun. 10).

- As a result of instruction to TEPCO for prevention of heat stroke (Jun. 10), countermeasures such as restriction and intermission of work time, wearing of cool vests, supply of water and salt and medical check have been introduced.

<Long-term healthcare>

- Expert session was held (Jun. 27) to discuss establishment of a database for the long-term healthcare of workers engaged in emergency works and concrete plan is currently studied.

② Work implemented: Enhancement of medical system 【Countermeasures 79,80】

- One doctor used to be stationed on a 24h-basis in the Main Anti-Earthquake Building at Fukushima Daiichi Nuclear Power Station (May 29). An emergency medical treatment facility was opened, and more than one doctor, deployed with the support by Ministry of Education, Culture, Sports, Science and Technology and Ministry of Health, Labour and Welfare are stationed there on a 24h-basis. (Jul. 1)

Emergency medical room in the Service Building of Units 5/6

3. Target for Step 2 “Enhancement of healthcare”

- Reinforcement of radiation control by NISA.
- Increase in the number of whole body counters and monthly measurement of internal exposure.
- Automated recording of personal radiation dose, report of personal exposure dose in writing and introduction of workers’ certificates with photos.
- Consideration of long-term healthcare such as enhancement of workers’ safety training and establishing a database.