

Events and highlights on the progress related to recovery operations at TEPCO's Fukushima Daiichi Nuclear Power Station

August 2022

The Government of Japan

Section 1: Summary of updates from March 2022 through June 2022

1.1: Decommissioning and Contaminated Water management

Since the last report, there has been progress on the decommissioning and contaminated water management at TEPCO's Fukushima Daiichi Nuclear Power Station (hereinafter "Fukushima Daiichi NPS") as detailed below. For specifics please refer to section 2.

1. Unit 2 Trial fuel debris retrieval equipment is being improved

During the test to verify the performance of the trial retrieval equipment, points for which improvement is expected are being checked. For the robot arm, to reduce the contact risk detected in the test to verify the capability to penetrate, the operational accuracy and other aspects are being improved. For the dual arm manipulator, other improvements made include modifying the tool structure. (For further details please refer to Page 12-14)

2. Meeting between Minister Hagiuda and the IAEA Director General Grossi

On May 18, 2022, Mr. Hagiuda Koichi, Minister of Economy, Trade and Industry, held a meeting with H.E. Mr. Rafael Mariano Grossi, Director General of IAEA. They confirmed to continue to work closely together, including on the review of the safety aspects of ALPS treated water. On May 19, Director General Grossi visited the Fukushima Daiichi Nuclear Power Plant.

3. Unit 1 As part of the PCV internal investigation, the deposit thickness was measured

During March 14-16 and May 17-22, the underwater robot (ROV-A2) was inserted to commence a detailed visual inspection.

During June 7-11, the thickness of deposits was measured using the other underwater robot (ROV-C). (For further details please refer to Page 11-12)

1.2: Monitoring results

There were no significant changes in the monitoring results of air dose rates, dust, soil, seawater, sediment and marine biota during the period from March to June 2022. For further details please refer to the section 3.

1.3: Off-site Environmental Remediation

The Ministry of the Environment (MOE) completed the whole area decontamination in the Special Decontamination Area (SDA) by the end of March 2017 as planned, while decontamination conducted by the municipalities in the Intensive Contamination Survey Area (ICSA) was also completed on March 19th, 2018. This means that the whole area decontamination based on the Act on Special Measures was completed, excluding the *Restricted area*. For further details please refer to the section 4.

1.4: Food products

Japan has a robust control system which prevents the distribution of food exceeding the Japanese maximum levels (JMLs), conservatively set on the safe side. Monitoring and inspections of radionuclides in food are continuously being conducted, and restrictions on food distribution and the removal of these restrictions are taken based on monitoring results. Restrictions on vegetables, fruits and mushrooms were lifted during the period March to June 2022.

Monitoring data from the major food products in FY2021 in Japan show that all are below the JMLs. According to the Total Diet Study for Japanese food, the effective dose in latter 2021 is estimated as far below 1 mSv/year (0.0005-0.0008 mSv/year). These results confirm the safety of Japanese food.

For further details please refer to the section 5.

1.5: Radiation protection of worker

The Ministry of Health, Labour and Welfare (MHLW) has provided guidance on the prevention of radiation hazards to workers engaged in the decommissioning work at Fukushima Daiichi NPS or decontamination and related work; additionally, the Ministry has taken relevant and necessary measures such as the provision of long-term healthcare for emergency workers. For further details please refer to the section 6.

Section 2: Decommissioning, contaminated water and treated water management at Fukushima Daiichi NPS

2.1: Mid-and-Long-Term Roadmap

Decommissioning work at Fukushima Daiichi NPS has been conducted by the following milestones described in the “Mid-and-Long-Term Roadmap” with safety as the priority.

The entire decommission process will take 30 to 40 years, and the decommissioning is an unprecedented work with technical challenges. Therefore, the Government of Japan and TEPCO have prioritized each task and set the goal to achieve them.

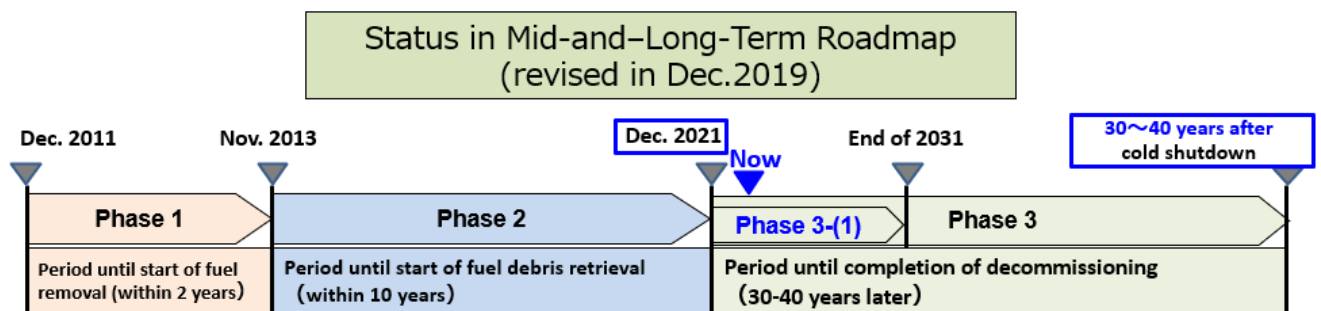
Mid-and-Long-Term Roadmap towards the Decommissioning of Fukushima Daiichi NPS (revised on December 27, 2019)

<Outline of the Mid-and-Long-Term Roadmap>

https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20191227_1.pdf

<The Mid-and-Long-Term Roadmap>

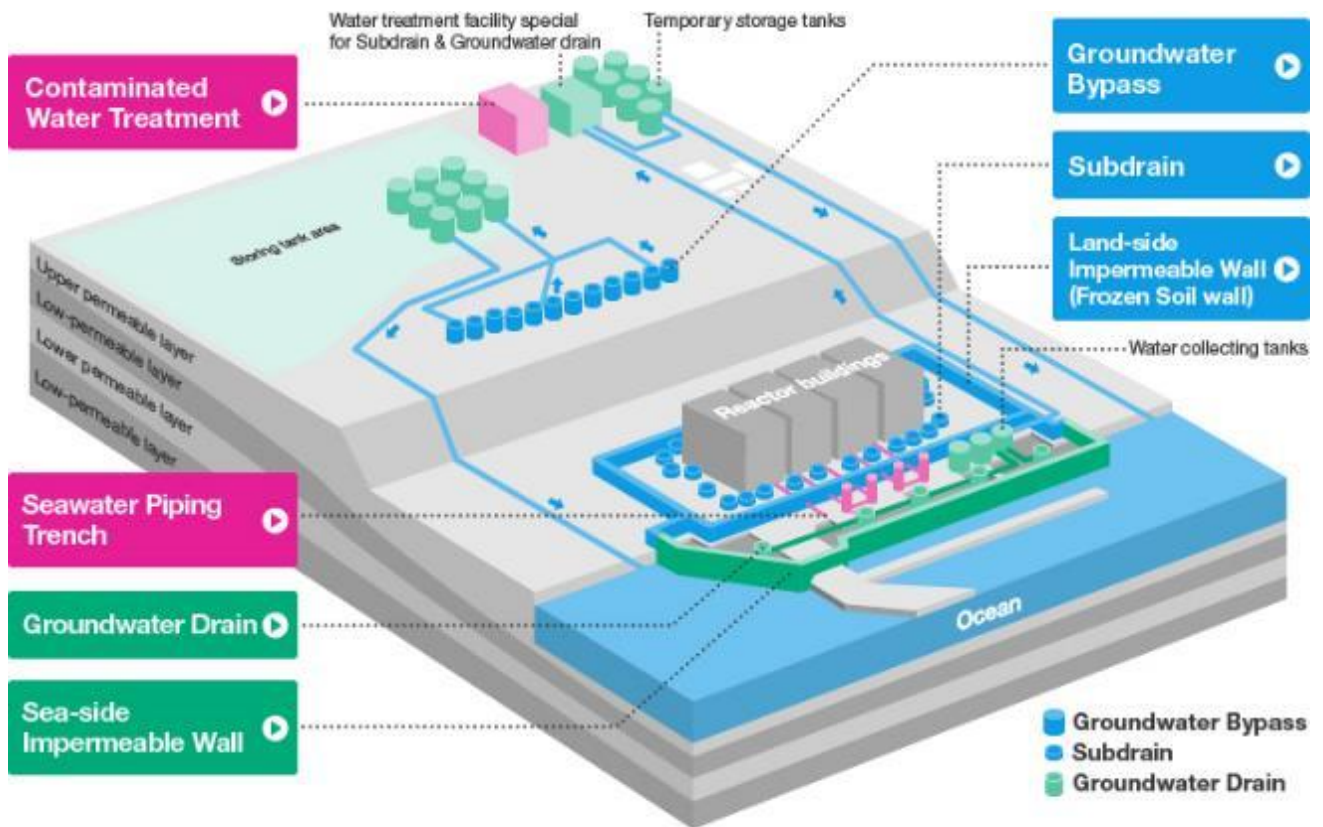
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20191227_3.pdf



2.2: Water management

1. Major initiatives for water management

The preventive and multi-layered measures against contaminated water issue are implemented based on the three principles; “Removing contamination sources”, “Redirecting ground water from contamination source” and “Preventing leakage of contaminated water”.



Source: TEPCO

(1) Groundwater bypass

(a) Objective

The groundwater bypass function is to isolate water from contamination by pumping it and reducing its inflow into the reactor buildings.

(b) Mechanism

Clean groundwater is pumped from the wells installed on the mountain-side area of the reactor buildings and then discharged into the port area after confirming that water quality met the operational targets.

(c) Recent situations

Up until June 28, 2022, 430 releases were conducted. The pumped-up groundwater was temporarily stored in tanks and released after TEPCO and a third-party organization had confirmed that the quality met the operational targets. The pumps are inspected and cleaned as necessary to operate appropriately.

The result of sea area monitoring shows that the radiation level of seawater outside the port area remains low enough compared to the density limit specified by the Reactor Regulation and WHO guidelines for drinking water quality, in addition significant change in the radioactivity has not been observed.

TEPCO's website related to groundwater bypass:

<http://www.tepco.co.jp/en/decommision/planaction/groundwater/index-e.html>

Detailed analysis results regarding the water quality of the groundwater being pumped out for by-passing at Fukushima Daiichi NPS (published by Ministry of Economy, Trade and Industry (METI))

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202203.pdf>

(March 2022)

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202204.pdf>

(April 2022)

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202205.pdf>

(May 2022)

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202206.pdf>

(June 2022)

(2) Sub-drain and groundwater drain systems

(a) Objective

The function of the sub-drain system is to prevent clean groundwater from being contaminated by pumping it and reducing its inflow into the reactor buildings, and thus it is reducing the generation of contaminated water.

The function of the groundwater drain system is to prevent leakage of groundwater that contains slight radioactivity by pumping it before flowing into the port.

(b) Mechanism

Groundwater that contains slight radioactivity is pumped from the wells installed in the vicinity of the reactor buildings (called sub-drain) and the wells installed in the bank protection area (called groundwater drain) and then the groundwater treated through special purification equipment to meet the stringent operational targets set by TEPCO. The purified groundwater is discharged into the port area after passing water quality inspections.

(c) Recent situations

The operation of the sub-drain and groundwater drain systems started in September 2015. The effects of the sub-drain system are measured by two markers: the water level of the sub-drain, and the difference between the water level of the sub-drain and that of the reactor buildings.

Up until June 21, 2022, 1,884 releases were conducted after TEPCO and a third-party organization confirmed that the quality met the operational targets. The result of sea area monitoring confirms that the radiation level of seawater outside the port area remains low enough compared to the density limit specified by the Reactor Regulation, and no significant change in the radioactivity level has been observed.

TEPCO's website related to the sub-drain and groundwater drain systems:

<http://www.tepco.co.jp/en/decommision/planaction/sub-drain/index-e.html>

Detailed analysis results regarding the water quality of the groundwater pumped up by sub-drain and purified at Fukushima Daiichi NPS (published by METI)

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202203.pdf>

(March 2022)

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202204.pdf>

(April 2022)

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202205.pdf>

(May 2022)

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202206.pdf>

(June 2022)

(3) Land-side impermeable wall (Frozen soil wall)

(a) Objective

The installation of the land-side impermeable wall aims to prevent clean groundwater from being contaminated. This will be achieved by surrounding the reactor buildings with an in-ground frozen barrier and blocking groundwater from flowing into the buildings.

(b) Mechanism

An approximately 1,500 meters long wall, composed of frozen pipes driven into the ground, surrounds the Unit 1-4 reactor buildings. The barrier will be formed around the buildings to block groundwater inflow by supplying chilled brine (a freezing material) through the pipes and freezing the soil.

(c) Recent situations

After the installation work was completed, freezing began in March 2016, and construction of the land-side impermeable walls was completed in September 2018,. At the 21st Committee on Countermeasures for Contaminated Water Treatment, held on March 7, 2018, which evaluated that “a water-level management system, which keeps groundwater isolation from the buildings, had been established and it had allowed a significant reduction in the amount of contaminated water generated”.

The groundwater level in the inner area of the land-side impermeable walls has been decreasing year by year, and the difference between the inner and outer water levels is maintained on the mountain side, although there are some fluctuations due to rainfall. The water level in the groundwater drain observation well is well below the ground surface.

TEPCO’s website related to the land-side impermeable wall:

<http://www.tepco.co.jp/en/decommision/planaction/landwardwall/index-e.html>

(4) Sea-side impermeable wall

(a) Objective

The installation of the sea-side impermeable wall aims to prevent the leakage of contaminated water into the ocean. This was achieved by installing a wall to block groundwater from flowing into the port area, and thus protecting the marine environment against pollution.

(b) Mechanism

A wall, approximately 780 meters long and composed of 594 steel pipes with a diameter of 1.1 meters and a length of 30 meters, were installed around the bank protection area near the reactor buildings. The groundwater flowing from the site is blocked by the wall and pumped by the sub-drain and the groundwater drain systems. Consequently, the wall prevents groundwater from flowing into the port area and also reduces the risk of contaminated water flowing into the ocean in case of any leakage.

(c) Situations

In October 2015, the sea-side impermeable wall construction was completed. It has been confirmed that the radiation level of seawater inside the port area substantially decreased. In addition to the operation of the sub-drain and the groundwater drain systems, the completion of the wall marks major progress in water management at Fukushima Daiichi NPS.

TEPCO's website related to the sea-side impermeable wall:

<http://www.tepco.co.jp/en/decommision/planaction/seasidewall/index-e.html>

(5) Completion of waterproofing and closure work of seawater piping trench

Highly concentrated contaminated water was generated because of the accident and it became stagnant inside the seawater piping trench of Unit 2, 3 and 4. In order to prevent the risk of the contaminated water leaking into the ocean, the stagnant water was removed and the seawater piping trench was waterproofed.

The work at Unit 2 was completed in 2017, following the work at Unit 3 and 4, which was completed in 2015. No stagnant water inside the seawater piping trench is in each unit.

(6) Progress of stagnant water removal and treatment in buildings

To reduce the risk of stagnant water in the basement buildings, water levels in the Unit 1-4 buildings are being lowered sequentially. The connecting part between Unit 1 and 2 was separated on September 13, 2018. And separation of the connecting part between Unit 3 and 4 was completed in December 2017.

Towards the floor-surface exposure of basement of the buildings, excluding the Unit 1-3 Reactor Buildings, Process Main Building and the High Temperature Incinerator Building within 2020, which is a milestone (main target process) of the Mid-and-Long-Term Roadmap, levels of contaminated water in buildings were reduced. On December 24, 2020, the achievement of the milestone was confirmed. To achieve another milestone set for FY2022-2024 to reduce the amount of stagnant water in the reactor buildings to about half of the amount at the end of 2020, ongoing efforts to manage contaminated water will be continued.

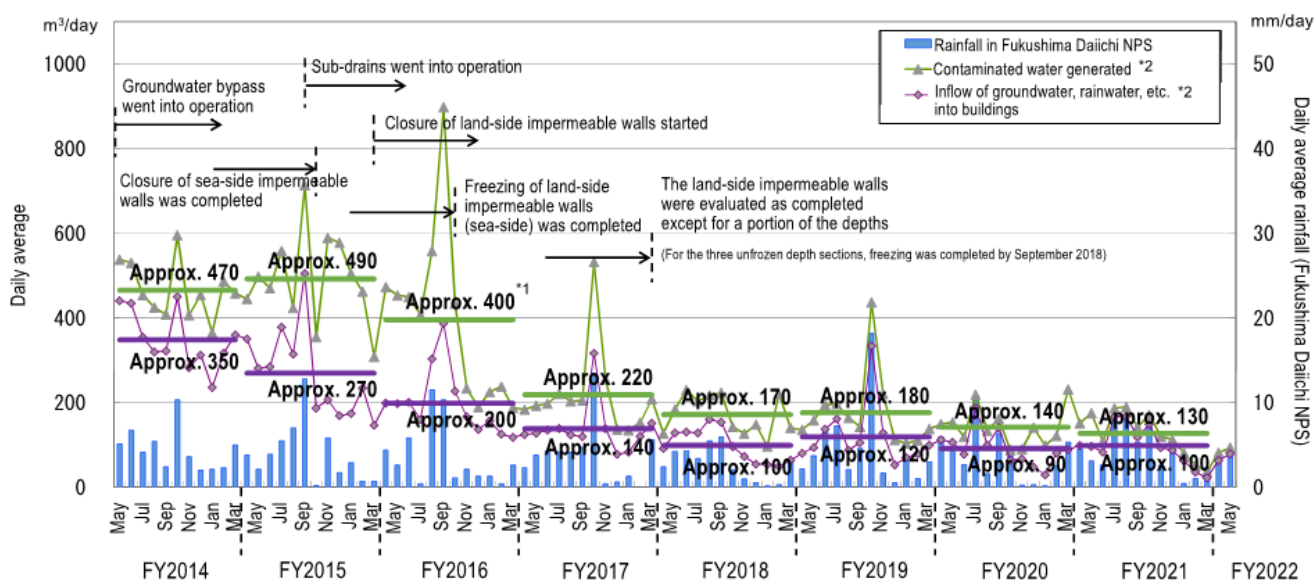
(7) Control of the generation of contaminated water

Multi-layered measures, including pumping up by sub-drains and land-side impermeable walls, which were implemented to control the continued generation of contaminated water, reduced the groundwater inflow into buildings.

Following the steady implementation of measures (groundwater bypass, sub-drains, land-side impermeable walls, etc.), the inflow of the groundwater and rainwater into buildings reduced from approx. 350 m³/day (in FY2014) to approx. 90 m³/day (in FY2020), though it depends on rainfall.

Subsequently, the generation of contaminated water decreased from approx. 470 m³/day (in FY2014) to approx. 140 m³/day (in FY2020). With this, the milestone (150 m³/day within 2020) set by the Roadmap has been achieved.

Measures will continue to further reduce the volume of contaminated water generated.



*1 Values differ from those announced at the 20th Committee on Countermeasures for Contaminated Water Treatment (held on August 25, 2017) because the method of calculating the contaminated water volume generated was reviewed on March 1, 2018. Details of the review are described in the materials for the 50th and 51st meetings of the Secretariat of the Team for Countermeasures for Decommissioning and Contaminated Water Treatment.

*2: The monthly daily average is derived from the daily average from the previous Thursday to the last Wednesday, which is calculated based on the data measured at 7:00 on every Thursday.

2. Purification treatment of contaminated water and management of treated water

(1) Objective

The purification treatment of contaminated water aims to remove sources of contamination.

(2) Mechanism

Contaminated water that accumulated at the site of Fukushima Daiichi NPS is treated at multiple facilities including Multi-nuclide Removal Facility (Advanced Liquid Processing System = ALPS). In this process, after the concentration of cesium and strontium in the contaminated water is reduced, ALPS removes most of the radioactive materials except tritium and radioactive materials are reduced to about one millionth, compared to the water before purification.

(3) Recent situations

As of June 23, 2022, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 484,000, 738,000 and 103,000 m³, respectively.

TEPCO's website related to purification treatment of contaminated water:

<https://www.tepco.co.jp/en/decommission/progress/watertreatment/index-e.html>

ALPS treated water, which is treated to remove most of the radioactive materials except tritium, is stored in tanks located on the hill at the site. The total amount of the ALPS treated water is approx. 1.30 million tons as of June 23, 2022. Regarding the total amount of tritium stored in the tanks, TEPCO estimated it was to be about 780 trillion Bq as of April 2021.

TEPCO conducted a secondary treatment test and analysis of some of the tanks of treated water on December, 2020. As a result, it was confirmed that all radionuclides other than tritium met the regulatory standards. In addition, third-party analysis of the tanks with high concentrations was also conducted after secondary treatment. The results were the same as those confirmed by TEPCO, confirming that the tanks meet the regulatory standards.

Fukushima Daiichi Nuclear Power Station Results from secondary treatment performance confirmation tests on water treated with multi-nuclide removal equipment (final report)

<https://www.tepco.co.jp/en/decommission/progress/watertreatment/images/201224.pdf>

(4) Management of treated water

On 13 April 2021, the GOJ announced its basic policy, based on which preparation for discharging the ALPS treated water of FDNPS into the sea will be started. Discharge of the ALPS treated water into the sea will be implemented at FDNPS, on the condition that full compliance with the laws and regulations is observed, and measures to minimize adverse impacts on reputation.

On 17 November 2021, TEPCO released “Radiological Impact Assessment Report Regarding the Discharge of ALPS Treated Water into the Sea (Design stage)”. The report was subject to public comments from general public, both within and outside Japan, which was conducted from November to December 2021.

On 21 December 2021, TEPCO submitted the “Application Documents for Approval to Amend the Implementation Plan” for the basic design of the ALPS treated water dilution/discharge facility and related facilities to the NRA. The application was reviewed in detail at NRA’s meetings, which were held 13 rounds and open to the public.

On 28 December 2021, GOJ announced “Action Plan for the Continuous Implementation of the Basic Policy on Handling of ALPS Treated Water”. It was formulated to further accelerate efforts to ensure safety assurance, fostering understanding, and measures for reputational damage. Revisions and adjustments will be made as necessary, taking into account the progress of measures, as well as opinions of local public entities, organizations

From 14 to 18 February 2022, an IAEA delegation visited Japan as part of an ongoing review of safety aspects of the handling of ALPS treated water. This review mission was conducted based on the Terms of Reference (TOR) on a comprehensive framework for cooperation on the handling of ALPS treated water, which was signed with the IAEA July 2021. The IAEA and international experts assessed and reviewed the safety of discharging ALPS treated water into the sea based on international safety standards during this mission, which will be followed by others as part of IAEA assistance to be provided before, during and after the discharge.

On April 28, 2022, TEPCO applied for revision of the application to which the revised report of assessment of radiological impact on humans and the environment is attached reflecting comments and indications from NRA, the IAEA and the public. The assessment found that effects of the discharge of ALPS treated water into the sea on the public and the environment is minimal as calculated doses were significantly less than the dose limits for the general public and the values specified by international organizations for each species.

On April 29, 2022, the report of the IAEA review mission conducted in February 2022 was published. The report includes a summary of the Task Force’s review and assessment

activities across a range of topics such as the characteristics of ALPS treated water, safety related aspects of the system built to discharge the water.

On May 18, 2022, Mr. Hagiuda Koichi, Minister of Economy, Trade and Industry, held a meeting with H.E. Mr. Rafael Mariano Grossi, Director General of the IAEA. They confirmed to continue to work closely together, including on the review of the safety aspects of ALPS treated water, and exchanged views on further strengthening cooperation between the IAEA and the government of Japan. Also, the NRA published a draft review results document on May 18th after examining and reviewing the application at the review meetings which are open to the public. Then, the NRA has solicited public comments for 30 days, and is now looking into the submitted comments.

On May 19, Director General Grossi visited the Fukushima Daiichi Nuclear Power Plant.

<Background>

For more than six years, the handling of the water has been studied by Tritiated water Task Force and ALPS subcommittee. The subcommittee report was published in February 2020. After publication of this report, hundreds of meetings were held with local municipalities and relevant people in agricultural, forestry and fishery industries and various other parties concerned. Seven “meeting for hearing opinions” were held, with the attendance of vice ministers of related ministries. In addition, more than 4,000 opinions have been received through public comment.

The GOJ selects discharge into the sea, based on achieving certain and consistent compliance with their regulatory standards set forth based on the recommendation of the ICRP and considering the successful precedence in Japan, as well as in conducting secure and sound monitoring.

The discharge of the ALPS treated water into the sea will be conducted after i) purification/re-purification to meet regulatory standards set based on international standards with an exception of tritium and ii) to allay the concerns of the consumers, the target concentration of tritium should be the same as the operational target (less than 1,500 Bq/L, that is less than 1/40 of the regulatory standard value for tritium) by sufficient dilution (more than 100 times) by sea water, prior to the discharge into the sea, and iii) The total annual amount of tritium to be discharged will be at a level below the operational target value for tritium discharge of the Fukushima Daiichi NPS before the accident (22 trillion Bq/year).

By taking such measures, the safety of the public, environment, agricultural, forestry and fishery products and others in the surrounding areas will be ensured as it was always been. In addition, the Government and TEPCO will strengthen and enhance monitoring before and after the discharge by activities including newly introduced monitoring of tritium at fishing ground, swimming beaches and other areas. And all measures will be taken so as to gain national and international understanding regarding the discharge.

Since no technology for separating tritium has yet been found as being immediately practical use at the Fukushima Daiichi NPS. However, new technological trends will be carefully and continuously monitored, and if a viable technology emerges, it will be implemented as rapidly as practicable.

Basic Policy on handling of ALPS treated water at the Tokyo Electric Power Company Holdings' Fukushima Daiichi Nuclear Power Station:

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Action Plan for the Continuous Implementation of the Basic Policy on Handling of ALPS Treated Water

https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/action_plan_202112.pdf

Application for approval to amend the Implementation Plan (Overview)

<https://www.tepco.co.jp/en/hd/newsroom/press/archives/2022/pdf/220428e0302.pdf>

Radiological Impact Assessment Report by TEPCO (Overview)

<https://www.tepco.co.jp/en/hd/newsroom/press/archives/2022/pdf/220428e0303.pdf>

3. Fuel removal and fuel debris retrieval from the reactor buildings

(1) Basic information

At the time of the accident in March 2011, the nuclear power station operator of Unit 1, 2 and 3 were unable to maintain the cooling of the reactor cores due to power loss. This resulted in the generation of a huge amount of hydrogen gas from the melted fuel. The pressure in the containment buildings continued to increase from the accumulation of hydrogen which eventually caused hydrogen explosions in Units 1, 3 and 4, resulting in structural damage. However, since November 2011, the nuclear power station operator has been maintaining these units in a stable condition with no significant release of radioactive material to the environment.

The most important tasks in the decommissioning process are the fuel removal from the spent fuel pools and the retrieval of fuel debris (melted and solidified fuel) from the Primary Containment Vessels (PCV). Currently, various measures are being implemented in order to make progress towards these goals, including removal of rubble accumulated in the buildings and investigation of the condition inside the PCV through the use of state-of-the-art technologies.

(2) Unit 1

In July 2015, TEPCO started to dismantle the building cover of the reactor building as a step towards starting fuel removal from the spent fuel pool (SFP). Removal of roof panels and dismantling of wall panels were completed by November 2016. On March 2019, the creation of an access route from the west working floor was completed. From April 2019, rubble removal in the same area began using a remote-controlled heavy machine. The dismantling of the reactor building cover is continuing steadily and is scheduled to be completed in the first half of FY 2021.

With regard to fuel removal from the SFP, before removing the fallen roof on the south side, the surface of the SFP will be covered by a bag filled with air mortar. In preparation for this, the transparency of the pool water was investigated in the summer of 2019, and it was confirmed that an underway camera could provide visibility of approximately 7 meters. It was also confirmed that rubble had accumulated in one part of the area.

Before retrieving fuel debris, an investigation of the condition inside the PCV was conducted since 2015 using cameras and robots. TEPCO surveyed and collected important information such as radiation levels and temperatures, and also captured images from inside. Based on these results, a self-propelled investigation device was used in March 2017 to collect information on the status of debris spread on the first underground level outside the pedestal

and to estimate the distribution of fuel debris. The investigation identified that the existing structures such as steel or valves did not suffer severe distortion and damage. In addition, deposits of constant thickness were confirmed at the PCV bottom. There has been no effect to the surrounding environment, and no significant change was identified in the monitoring data due to the investigation.

Toward investigating the inside the PCV of Unit 1, an access route is being constructed. Creation of the three holes in the inner door was completed on April 2020. The first remotely operated underwater robot (that is called "ROV-A") was inserted on February 8 to install "guide rings" which will facilitate the investigation. On February 9, installation of four guide rings has been completed. Moreover, the deposits that could be fuel debris was visually confirmed at the bottom of the PCV.

From March 14, the second remotely operated underwater robot (ROV-A2) was inserted to commence a "detailed visual inspection of the outside perimeter of the pedestal." This investigation until March 16 newly detected deposits and others. However, as a decline in the PCV water level was confirmed after the earthquake on March 16, the investigation was temporarily suspended.

To obtain the water level necessary for the investigation, the water injection rate into the reactor increased. The increased water level was confirmed but on March 29, the image was inappropriate due to water infiltrating the camera of ROV-A2.

After securing the necessary PCV water level and implementing countermeasures to resolve the loss of image transmission, the detailed visual investigation of the pedestal periphery resumed from May 17 to 22.

During June 7-11, the thickness of deposits was measured using the third remotely operated underwater robot (ROV-C). In this investigation, to detect where deposits with different characteristics, such as powdery, muddy, plate-shaped or massy were located and how thick they were, measurement was made at 13 points within the pedestal peripheral. At present, evaluation of three points was completed and the process continues.

(3) Unit 2

As for Unit 2, a hydrogen explosion did not occur and therefore the building remained undamaged. However, TEPCO concluded that it would be better to dismantle the upper part of the reactor building to help facilitate the fuel removal from the spent fuel pool. Currently, TEPCO is proceeding with preparation work, such as the removal of rubble around the reactor the building and building of scaffolding.

In November 2018, before the investigation into formulating a work plan to dismantle the Reactor Building rooftop, etc., work to move and contain the remaining objects on the operating floor (1st round) was completed. In February 2019, an investigation into measuring radiation doses on the floor, walls and ceiling inside the operating floor and confirm the contamination status was completed. After analysing the investigative results, the "contamination density distribution" throughout the entire operating floor was obtained, based on which the airborne radiation dose rate inside the operating floor could be evaluated. A shielding design and measures to prevent radioactive material scattering, etc. will be examined. From April 2019, work to move and contain the remaining objects on the operating floor (2nd round), such as materials and equipment which may hinder fuel removal work commenced. The 2nd round included placing the remaining objects in the container and cleaning the floor to suppress dust scattering, all of which were not scheduled in the 1st round. The status of dust density, etc. is being monitored to steadily implement the work with safety first.

An investigation to capture the location of fuel debris inside the Unit 2 was conducted from March to July 2016. This operation applied the muon transmission. These operations used a small device developed through the "Development of Technology to Detect Fuel Debris inside the Reactor" project funded by a government subsidy.

The results of the investigation indicate that high-density materials which are considered as fuel debris are at the bottom of the RPV as well as the lower part and outer periphery of the reactor core.

From January to February 2017, an investigation inside the Unit 2 PCV has been conducted to identify the status of debris inside the RPV pedestal (The base supporting the RPV).

In January 2018, the status below the platform inside the pedestal was inspected using an investigative device with a hanging mechanism. From the analytical results of images obtained during the investigation, deposits which probably included fuel debris were found at the bottom of the pedestal.

In February 2019, a contact investigation on the detected deposits inside the PCV was conducted to determine their characteristics (hardness, fragility, etc.). This contact investigation confirmed that the pebble-shaped deposits, etc. could be moved and that hard rock-like deposits that could not be gripped may exist. In addition, images of radiation dose and temperature data that would help determine the contour and size of the deposits could be collected by moving the investigative unit closer to the deposits.



Image: Before and while touching the deposit at the investigation of Unit 2

Regarding retrieval of fuel debris, in the trial retrieval plan, a robot arm will be used to access the PCV, obstacles inside the PCV will be removed by the cutting equipment and powder fuel debris will be collected by metal-brush type adhering equipment or vacuum-container type suction equipment. For remotely operated work in a severe environment with high exposure to radiation and within a confined space, tests and training will be implemented using a realistic mock-up in advance and work will be implemented steadily with safety first. Fuel debris retrieved from the trial will be placed in closed metal transportation casks to be transported to the existing analysis facility.

Equipment (robot arm) for the Unit 2 trial fuel debris retrieval, which had been developed in the UK, transferred from the UK in July 2021. A performance verification test and operational training in the domestic facility (in Kobe) was finished on January 21. The equipment was transported to Naraha Center for Remote Control Technology Development of the Japan Atomic Energy Agency (JAEA), where the test to verify the operation of the robot arm started from February 14.



Image: Equipment for the Unit 2 trial fuel debris retrieval

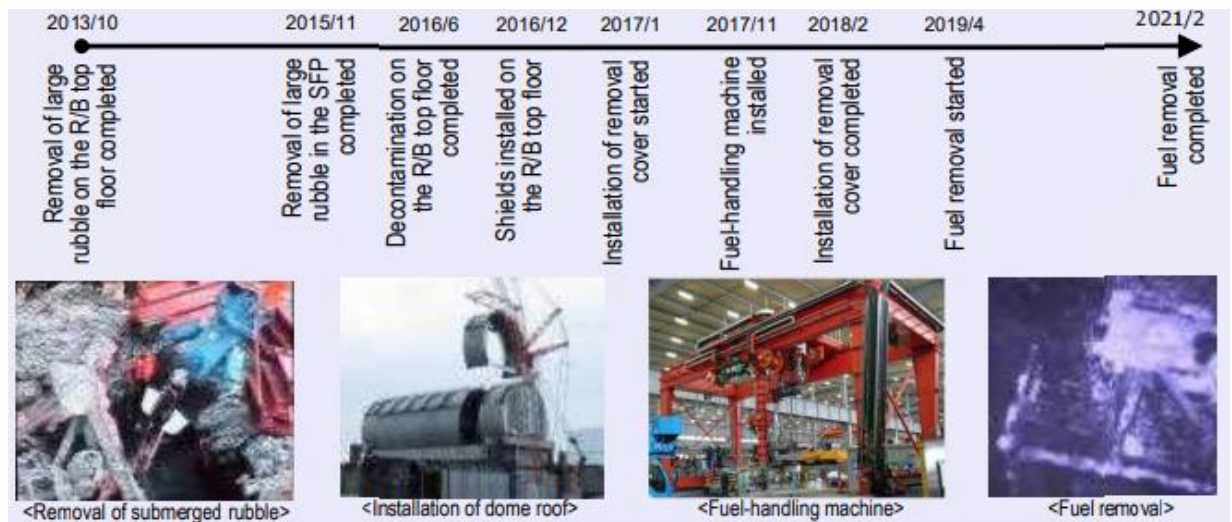
During the test to verify the performance of the trial retrieval equipment, points for which improvement is expected are being checked. For the robot arm, to reduce the contact risk detected in the test to verify the capability to penetrate the X-6 penetration, the operational accuracy and other aspects are being improved. For the dual arm manipulator, other improvements made include modifying the tool structure.

As preparation for opening the lid of the X-6 penetration into which the robotic arm will be inserted, when the installation status of the isolation room which blocks the radioactive material inside the PCV from leaking outside was checked, damage was detected in the rubber housing the handle of the X-6 penetration. Moreover, when the shielding door of the isolation room was opened and closed, a malfunction was also detected because of Fukushima Prefecture Offshore Earthquake in March 2022. In response to these things, the isolation room was removed, and other measures such as replacement are being considered.

(4) Unit 3

In 28 February, 2021, removal of 566 fuel assemblies remaining in the spent fuel pool was completed. As the top floor of the Unit 3 Reactor Building, where the spent fuel pool was located, was in a high-dose environment, fuel assemblies were removed by remote operation.

Despite various problems encountered during work, partner companies and TEPCO collaborated on an ongoing basis to improve matters and subsequently finished the planned work.



(5) Unit 4

Despite a hydrogen explosion, the fuel assemblies of Unit 4 were not damaged, as the nuclear power station was in cold shutdown status and all the fuel had been stored in the spent fuel pool before the accident. The fuel assemblies in the pool were taken out and transferred to the common pool located within the station site. This fuel removal operation started on November 2013 and was safely completed in December 2014.

(6) Unit 5 and 6

These reactors were not operating at the time of the accident, but the fuel remained in the reactor. In addition, unlike the case of Units 1, 2 and 3, the reactors of Unit 5 and 6 did not encounter power loss and the reactor cores were successfully cooled off.

Given that the conditions of the buildings and the equipment for storing the fuel are stable and risks of causing any problem in the decommissioning process are estimated to be low compared to the other Units, the fuel assemblies of Units 5 and 6 are safely stored in the spent fuel pool in each building for the time being. The milestone is to complete the fuel removal within 2031, and from now on, fuel will be carefully removed fuel from the spent fuel pools without impact on fuel removal from Units 1, 2 and 3.

(7) Completion of dismantling plan for the Unit 1/2 exhaust stack

The dismantling of the Unit 1/2 exhaust stack, which was entrusted to Able Co., Ltd., was completed in May 2020. This work improved the seismic tolerance of the exhaust stack and reduced risks.

4. Waste management

As of the end of May 2022, the total storage volume of the concrete and metal rubble was approx. 325,600m³ (+200 m³ compared to the end of April 2022, with an area-occupation rate of 87%). The total storage volume of trimmed trees was approx. 133,400 m³ (with an area-occupation rate of 76%). The total storage volume of used protective clothing was approx. 30,300m³ (+700 m³, with an area-occupation rate of 58 %).

As of June 2, 2022, the total storage volume of waste sludge was 422 m³ (area-occupation rate: 60%), while that of concentrated waste fluid was 9,357 m³ (area-occupation rate: 91%). The total number of stored spent vessels, High-Integrity Container (HIC) for multi-nuclide removal equipment, etc., was 5,375 (area-occupation rate: 84 %).

5. Working environment

In order to achieve a long-term decommissioning, it is important to ensure a stable workforce (In the last two years, about 3,000-4,200 workers per day). TEPCO has implemented the improvement of the working environment such as (1) providing warm food, (2) setting up a large rest area, and a convenience store, (3) developing emergency medical facilities and systems, and ensuring workplace safety which starts from the reduction of radiation exposure. By the decontamination work including pavement and contaminated water management, the ordinary clothing area which does not require wearing protective clothing and full-faced masks, is expanded to about 96% of the site.

6. The 5th IAEA peer review mission

Japan receives regular reviews from the IAEA on the Fukushima Daiichi decommissioning efforts. From June 30 to August 27, 2021, the 5th IAEA Review was conducted including the visit to Japan. On August 27, the last day of the review, Japan received a report from the IAEA Review mission.

The IAEA Review team find many significant progresses in many areas. From organizational point of view, re-organization of the Fukushima Daiichi Decontamination and Decommissioning Engineering Company (FDEC) is strengthening the project management and safety functions. In risk reduction, fuel removal from Unit 3 spent fuel pool has completed and site management works against flooding, earthquake and tsunami are developing. In addition, significant R&D efforts have been accomplished to access PCV internals including the design, development, prototype and delivery of a robotic arm for the trial fuel debris retrieval.

The IAEA review team appreciates Japan's efforts concerning the advisory points of the previous reviews. Especially, the IAEA Review team appreciates the decision making of the Government of Japan regarding a basic policy on handling of the ALPS treated water as it will facilitate the implementation of the whole decommissioning plan.

Major advisory points are (i) encouraging FDEC to continue focusing on strengthening of engineering and project management functions as well as human resource development, (ii) developing planning scenarios for the entire decommissioning programme including all Fukushima Daiichi units, (iii) continuing exploring technologies and approaches to remove difficult-to-handle damaged fuel, (iv) developing a comprehensive feasibility and risk analysis of the retrieval options of fuel debris, (v) D&D Safety and Quality Office should be engaged early on in the R&D process to address any risk and safety issues with new technologies, (vi) encouraging TEPCO to perform an analysis of the site water balance considering the large volume of water that has been treated and stored.

Full report of 5th review:

<https://www.meti.go.jp/press/2021/08/20210827004/20210827004-2.pdf>

2.3: Organizations related to decommissioning and contaminated water and treated water management

1. Fukushima Daiichi Decontamination & Decommissioning (D&D) Engineering Company

In April 2014, TEPCO established a company for the purpose of clarifying the responsibilities and authorities inside the company, and streamlining the process of decision making regarding decommissioning and contaminated water management at Fukushima Daiichi NPS.

In addition, the company invited nuclear specialists from outside TEPCO, such as high ranking nuclear executives of manufacturers, in order to collect and share expertise and technology of manufacturers.

This company is playing an important role on the frontline of decommissioning and contaminated water management.

TEPCO's website related to Fukushima Daiichi D&D Engineering Company:

<http://www.tepco.co.jp/en/decommision/team/index-e.html>

2. Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF)

In August 2014, the Nuclear Damage Compensation Facilitation Fund, originally established in 2011 to support the compensation for nuclear damage resulted from the Fukushima Daiichi NPS accident, was reorganized into Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF).

NDF's mission is to support decommissioning activities at Fukushima Daiichi NPS. As an example, it formulates decommissioning strategies and develops plans for the research and development (R&D) program on technology necessary for decommissioning.

NDF published the "Technical Strategic Plan 2021 for Decommissioning of the Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Company Holdings, Inc." on October 29, 2021; aiming to provide a firm technical basis for the government's "Mid- and-Long-Term Roadmap" and facilitate the smooth and steady implementation of decommissioning. This plan presents the prospect of a processing/disposal method of solid waste and technology related to its safety, strategies for minimizing delays in the trial fuel debris retrieval caused by Covid-19 infection and selecting methods for further expansion of the retrieval, as well as introducing efforts for the ALPS-treated water.

In October 31 and November 1, 2021, NDF held the 5th International Forum on the Decommissioning of the Fukushima Daiichi NPS to listen to locals and provide them with easily understandable information on the decommissioning of the Fukushima Daiichi NPS and widely share the latest progress on the decommissioning work and technical outcomes with Japanese and foreign experts. The forum was attended by nearly 500 people both online and in person.

NDF's booklet:

https://www.ndf.go.jp/files/user/soshiki/pamph_e.pdf

Technical Strategic Plan 2021 for Decommissioning of the Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Company Holdings, Inc.:

https://www.dd.ndf.go.jp/files/user/pdf/en/strategic-plan/book/20211210_SP2021eFT.pdf

The 5th International Forum on the Decommissioning of Fukushima Daiichi NPS (2021):

<https://ndf-forum.com/en/>

3. International Research Institute for Nuclear Decommissioning (IRID)

In August 2013, IRID was established by 18 corporations and organizations related to R&D of technology for the decommissioning of Fukushima Daiichi NPS. In accordance with the Mid-and-long-term Roadmap written by the Government of Japan, IRID is conducting R&D on removal of fuel from the spent fuel pools, removal of fuel debris from the PCVs and disposal

of radioactive wastes, and gathering domestic and international expertise. The methods developed at IRID are helping decommissioning efforts.

IRID's website:

<http://irid.or.jp/en/>

4. Collaborative Laboratories for Advanced Decommissioning Science (CLADS)

In April 2015, Japan Atomic Energy Agency (JAEA) established the CLADS, based on the Acceleration Plan of Reactor Decommissioning R&D for Fukushima Daiichi NPS, TEPCO, proposed by Ministry of Education, Culture, Sports, Science and Technology (MEXT). This institution is aimed at being an international hub for R&D on decommissioning, and promoting cooperation in R&D and human resource development (HRD) among government, industry and academia.

CLADS main building was established in Tomioka-machi, Fukushima in April 2017, which is a central facility of CLADS where educational and research institutions at home and abroad work together to conduct R&D on decommissioning.

CLADS is expected to collaborate on research activities with the following JAEA's centers in Fukushima. Naraha Center for Remote Control Technology Development, which started operation in April 2016, and Okuma Analysis and Research Center, which consists of an Administrative Building, Radioactive Material Analysis and Research Facilities. The Administrative Building started operation in March 2018 and Laboratory-1 began to operate in June 2022.

CLADS has held a series of Fukushima Research Conference (FRC) on Decommissioning Research and Development since 2015.

FRCs on themes such as "OECD/NEA TCOFF final workshop" (December, 2021) and "Workshop of Joint Research between the UK and Japan-" (January, 2022) were successfully held online with the positive participation of young researchers including from foreign countries.

JAEA's website related to the CLADS:

<https://clads.jaea.go.jp/en/>

2.4: Communication

(1) Briefing session

The Government of Japan has held briefing sessions periodically on Fukushima Daiichi NPS to the Diplomatic missions in Tokyo. Most recently, the 117th session was held by video conference on June 21, 2022.

Press Release by MOFA:

https://www.mofa.go.jp/press/release/press3e_000411.html

(2) parties concerned on handling of ALPS treated water

As described in 2.2, the ALPS Subcommittee published its report on 10 February 2020 which shows the options for discharge of the ALPS treated water.

Based on the report, the Government of Japan has been holding meetings as an opportunity to receive opinions from a wide variety of parties concerned, including

representatives of local municipalities and associations in the fields of agriculture, forestry and fisheries. GoJ held the seven7th “Meetings as Opportunities for Receiving Opinions” on October 8. In addition, public comments were made from April to July, and about 4,000 opinions were received.

<Outline of the report>

https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20200210_alps_sum.pdf

<Report>

https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/20200210_alps.pdf

(Reference: IAEA, Final report of the follow-up review mission)

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/4fu-report.pdf>

(3) Side event at IAEA General Conference

In September 2021, METI and MAFF held “Progress in 10 years at Fukushima Daiichi Nuclear Power Station” remotely at the 65th IAEA General Conference. Over 140 people from several countries, regions, and international organizations registered.

Presentation materials:

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html#iaea>

Section 3: Monitoring results

3.1: Onsite monitoring results reported by TEPCO

(1) Outline of the item

On-going monitoring of the air at the site of Fukushima Daiichi NPS has detected no significant increase in radiation levels.

Results of radioactive nuclide analysis are published for the samples of groundwater at the site and seawater at the port in order to monitor the source.

(2) Noteworthy change in data during the period from July to September 2021

The monitoring result is ND (ND indicates that the measurement result is below the detection limit). In this regard, no announcement has been made by TEPCO for this item.

(3) Monitoring result data

The monitoring results in the air at the site and the monitoring results of the seawater near the NPS as well as sampling data from sub-drain and groundwater drain are available in the following webpage.

<https://www4.tepco.co.jp/en/nu/fukushima-np/f1/smp/index-e.html>

TEPCO also publishes the data on radioactive concentration in seawater measured by seawater radiation monitors as well as air dust monitors near the site boundary in real time.

3.2: Offsite monitoring results

1. Monitoring results of air dose rates obtained within the 20 km zone around Fukushima Daiichi NPS

(1) Outline of the item

The monitoring of air dose rates within the 20 km zone around Fukushima Daiichi NPS has been conducted. The air dose rates within the 20 km zone have gradually declined over time since May 2011 (soon after the accident at Fukushima Daiichi NPS on March 11, 2011).

(2) Noteworthy updates in the past months

As described in (1) above, the air dose rates within the 20 km zone around the NPS have been on a downward trend, and the monitored air dose rates were stable in June 2022. Based on these results, no further announcement was made on this item (e.g., a significant rise of air dose rates within the 20 km zone) during this period.

(3) Monitoring results

The following URL leads to the monitoring results of air dose rates in Fukushima prefecture including the 20 km zone around Fukushima Daiichi NPS:

<https://www.erms.nsr.go.jp/nra-ramis-webg/>
<https://radioactivity.nsr.go.jp/en/list/239/list-1.html>

2. Monitoring results of dust in air and soil within the 20 km zone around Fukushima Daiichi NPS

(1) Dust

The monitoring results of dust obtained in June 2022 shown that the concentrations of dust were either ND (ND indicates that the measurement result is below the detection limit) or very low. Based on the results, no further announcement was made on this item (e.g., a significant rise of the activity concentrations obtained from dust samples) during this period.

(2) Soil

Radiation monitoring of soil is conducted as appropriate. The most recent monitoring of soil was conducted in November 2021.

(3) Monitoring results

The following URL provides the monitoring results (from April 2011 to the present):

<https://radioactivity.nsr.go.jp/en/list/240/list-1.html>

3. Converted values and measured values of environmental radiation dose rates at 1m height from the ground surface in 46 prefectures in total other than Fukushima Prefecture

(1) Outline

The air dose rates measured using the monitoring stations located in other prefectures have mostly returned to the same level of the air dose rates before the accident.

(2) Updates from March to June 2022

The converted and measured values were relatively stable from March to June 2022. Based on the results, no further announcement was made on this item (e.g., a significant rise of the converted and measured values) during this period.

(3) Monitoring results

The following URL leads to the estimated and measured values, and new monitoring results are uploaded:

<https://radioactivity.nsr.go.jp/en/list/282/list-1.html>

3.3: Sea area monitoring results of seawater, sediment and biota

1. Outline

Sea area monitoring results in the area around Fukushima Daiichi NPS have indicated that the radioactivity levels obtained from outside of the port or in the open sea have been relatively stable.

2. Updates during the period from March to June 2022

As described above, the sea area monitoring results were relatively stable from March to June 2022. Based on the results, any further announcement was not made on this item (e.g., a significant rise of sea area monitoring results) during this period.

3. Related information

Sea area monitoring is classified to be conducted in 5 areas (Area 1: Sea area close to Fukushima Daiichi NPS, Area 2: Coastal area, Area 3: Off-shore area, Area 4: Outer sea area, and Area 5: Tokyo bay area), and this information is available under the “Monitoring of sea water”, section of the NRA webpage entitled “Readings of Sea Area Monitoring”. This webpage also includes monitoring results of sediment under the “Monitoring of marine soil” section, and it is also classified into 4 areas (Area 1: Sea area close to Fukushima Daiichi NPS, Area 2: Coastal area, Area 3: Off-shore area, Area 4: Tokyo bay area). The NRA has been providing report on sea area monitoring results. The “Readings of Sea Area Monitoring” webpage covers various issues and the webpage’s information is periodically updated on a weekly basis. The following URLs lead to the webpage and report on sea area monitoring:

Readings of Sea Area Monitoring

<https://radioactivity.nsr.go.jp/en/list/205/list-1.html>

Sea Area Monitoring (Monthly Report)

<https://radioactivity.nsr.go.jp/en/list/295/list-1.html>

Section 4: Off-site Environmental Remediation

4.1: Decontamination

The whole area decontamination in the Special Decontamination Area (SDA) was completed in the end of March 2017 as planned under the responsibility of the Government of Japan. The decontamination conducted by the municipalities in the Intensive Contamination Survey Area (ICSA) was also completed on March 19th, 2018. This means that the whole area decontamination based on the Act on Special Measures was completed, excluding the “Restricted Area”. The air dose rates in the environment have been continuously decreasing.

In accordance with the above fact, the designation of ICSEA of 24 municipalities had been lifted by the end of June 2022 and in Tamura City, both designation of SDA and ICSEA had been lifted.

4.2: Interim Storage Facility (ISF)

As for the Interim Storage Facility (ISF), in which the soil generated from decontamination activities in Fukushima (hereinafter referred to as “removed soil”) is stored intensively and safely, MOE has been processing land acquisitions to secure the necessary areas. Approximately 80% of the total sites sought (over 90% privately owned) have been acquired as of the end of June 2022. Construction of the ISF was started in November 2016. The storage of the removed soil and waste started in October 2017 after the completion of the soil storage facilities.

As of the end of June 2022, approximately 13,150,000 m³ of removed soil and waste has been transported to the ISF.

4.3: Recycling of Removed Soil

MOE has to take necessary measures to complete the final disposal outside Fukushima Prefecture within 30 years from the start of ISF operation, which is determined by the law. As the amount of final disposal outside Fukushima Prefecture should be reduced, MOE is making efforts for volume reduction and recycling. Currently flowering pots using the removed soil generated by decontamination in Fukushima Prefecture were placed in Government Office Building No.5. There is no change in the air dose rate before and after installation.

The following URL leads to MOE’s website, in which updated information related to the Environmental Remediation is posted.

<http://josen.env.go.jp/en/>

Section 5: Food products

5.1: Summary of testing

Food samples are routinely monitored to ensure that they are safe for all members of the public.

During the month of March 2022, 3,272 samples were taken and analysed. Among these samples, 10 samples were found to be above the limits*. This represents 0.31 percent of all samples.

During the month of April 2022, 1,942 samples were taken and analysed. Among these samples, 12 samples were found to be above the limits. This represents 0.62 percent of all samples.

During the month of May 2022, 1,268 samples were taken and analysed. Among these samples, 1 sample was found to be above the limits. This represents 0.08 percent of all samples.

Restrictions will be imposed on the distribution of food products, if the level of radioactive contaminants of the food product exceeds the limit (caesium-134+caesium-137: 100 Becquerel/kg). Restrictions are to be removed, when the level of radioactive contaminants of the food product is constantly below the limit for a certain period of time. Therefore, the products, on which the distribution restrictions are newly imposed, are the products whose radioactive contaminants level exceeded the limit in the past month. By the same logic, the products whose restrictions are newly removed are the products whose radioactive contaminants level has been lower than the limit for a certain period of time.

*limits: caesium-134+caesium-137: 100 Becquerel/kg of general foods, 10 Becquerel/kg of drinking water, 50 Becquerel/kg of milk, 50 Becquerel/kg of infant foods.

5.2: Results of monitoring food products

1. The current situation and protective measures

A fact sheet uploaded in the link below is the summary of the current situation and the measures taken by the Government of Japan:

http://www.mhlw.go.jp/english/topics/2011eq/dl/food-130926_1.pdf

2. Noteworthy updates in the past months (during the period from March to June 2022)

The lists of food products, whose status on the restrictions was changed, are as follows.

(1) Products whose distribution was newly restricted in March 2022

- None

(2) Products whose restrictions were removed in March 2022

- Bamboo shoots produced in Oshu-city, Iwate prefecture.

- Yuzu produced in Fukushima-city, Fukushima prefecture.

- Bamboo shoots produced in Marumori-town, Miyagi prefecture.

(3) Products whose distribution was newly restricted in April 2022

- None

(4) Products whose restrictions were removed in April 2022

- Non-head type leafy vegetables, Head type leafy vegetables, Flowerhead brassicas and Turnips produced in Futaba-town and Katsurao-village, Fukushima prefecture.

(5) Products whose distribution was newly restricted in May 2022

- None

(6) Products whose restrictions were removed in May 2022

- Log-grown pholiota nameko (outdoor cultivation) produced in Ichinoseki-city, Iwate prefecture.

(7) Products whose distribution was newly restricted in June 2022

- None

(8) Products whose restrictions were removed in June 2022

- Bamboo shoots produced in Yaita-city, Tochigi prefecture.

3. Monitoring results data

See the link below (new monitoring results are added once a month):

http://www.mhlw.go.jp/english/topics/2011eq/index_food_radioactive.html

4. Information focused on the safety of the fishery product

(1) Summary of monitoring on fishery products

According to the monitoring results of fishery products, from March to June 2022, in marine fish species, the excess ratio* was 0% (No sample that exceeding the JML out of 4,062 samples) and in freshwater fish species, the excess ratio was 0% (No sample that exceeding the JML out of 693 samples).

*excess ratio: (Number of samples containing more than 100 Bq/kg) / (Total number of samples)

Further information, including monitoring data and actions to ensure the safety of fishery products, is available on the Fisheries Agency's website.

<http://www.jfa.maff.go.jp/e/inspection/index.html>

(2) Report on the Monitoring of Radionuclides in Fishery Products

Since the accident at the Fukushima Daiichi NPS, the Government of Japan and local authorities have cooperated closely with relevant bodies to secure the safety of fishery products. With an aim to promote accurate understanding on the safety of Japanese fisheries products at home and abroad, the data and information accumulated by monitoring in the last three years was evaluated comprehensively in the report, which was published in May 2014.

In October 2017, the Fisheries Agency of Japan released an updated report, which reflects the latest data and recent research results. It shows that, after six years since the accident, the level of radioactive Cs in fishery products has declined substantially.

The Report is available at the following URLs:

Japanese version, full Report

<http://www.jfa.maff.go.jp/j/housyanou/attach/pdf/kekka-240.pdf>

Japanese version, summary

<http://www.jfa.maff.go.jp/j/housyanou/attach/pdf/kekka-216.pdf>

English translation, full report

<http://www.jfa.maff.go.jp/e/inspection/attach/pdf/index-34.pdf>

English translation, summary

<http://www.jfa.maff.go.jp/e/inspection/attach/pdf/index-35.pdf>

5.3: Total Diet Study

The dietary intake of radionuclides in 15 areas across Japan including Fukushima, is surveyed biannually, and the effective dose is estimated as far below 1 mSv/year (0.0005-0.0008 mSv/year, in latter 2021).

Japanese version, press releases

https://www.mhlw.go.jp/shinsai_jouhou/shokuhin.html

Japanese version, summary of the latest version is available at the following URL (page 27)

<https://www.mhlw.go.jp/content/000495158.pdf>

English translation, summary of the latest version is available at the following URL (page 20, to be updated)

http://www.mhlw.go.jp/english/topics/2011eq/dl/food-130926_1.pdf

Section 6: Radiation Protection of Workers

Information pertaining to radiation protection of workers involving TEPCO's Fukushima Daiichi NPP Accident is updated on the following website of the Ministry of Health, Labour and Welfare (MHLW):

<https://www.mhlw.go.jp/english/topics/2011eq/workers/index.html>

6.1: Regulations and Guidelines, etc.

Regulations and Guidelines, etc. from the MHLW on radiation protection of workers are available on the following webpage:

<https://www.mhlw.go.jp/english/topics/2011eq/workers/ri/index.html?no=tab1>

6.2: TEPCO's Fukushima Daiichi NPS

Status of the exposure dose, health care management and radiation protection of the workers at TEPCO's Fukushima Daiichi NPS are as follows:

<https://www.mhlw.go.jp/english/topics/2011eq/workers/tepc/index.html?no=tab1>

1. Status of Radiation Exposure

Exposure doses of the workers at TEPCO's Fukushima Daiichi NPS are reported to the MHLW once a month. The latest monthly report is available on the following webpage:

<https://www.mhlw.go.jp/english/topics/2011eq/workers/tepc/index.html?no=tab1>

2. Radiation Protection

Information on radiation protection of the workers at TEPCO's Fukushima Daiichi NPS : https://www.mhlw.go.jp/english/topics/2011eq/workers/ri/gr/gr_210928.pdf

Measures for occupational safety and health management are enhanced at the TEPCO Fukushima Daiichi Nuclear Power Plant - A guideline was formulated - (Updated on August 26, 2015)

https://www.mhlw.go.jp/english/topics/2011eq/workers/tepc/rp/pr_150826.html

3. Long-term Health Care

Information on long-term health care of emergency workers including health examination and guidelines:

"Guidelines on Maintaining and Improving Health of Emergency Workers at Nuclear Facilities, etc." is available on the following webpage. (Updated on August 31, 2015)

https://www.mhlw.go.jp/english/topics/2011eq/workers/tepc/rp/pr_150831_attachment06.pdf

4. Good Practices in Radiation Exposure Controls

Updated Information on Good Practices in Radiation Exposure Dose Reduction Measures (Commissioned by the Ministry of Health, Labour and Welfare in FY2020Project) (Updated on Mar, 2021)

https://www.mhlw.go.jp/english/topics/2011eq/workers/tepc/gre/gre_2101.pdf

5. Other Related Topics;

Updated Information on Healthcare of Workers at the Fukushima Daiichi Nuclear Power Plant (Updated on Apr 27, 2022)

https://www.mhlw.go.jp/english/topics/2011eq/workers/tepc/ort/ort_220427.pdf

Start of a weekly on-site consultation desk to address health matters of decommissioning workers, etc. (Updated on June 24, 2016)

https://www.mhlw.go.jp/english/topics/2011eq/workers/tepcort/ort_160624.html

6.3: Decontamination/Remediation

The status of radiation protection of the workers engaged in decontamination and remediation of contaminated materials derived from Fukushima Daiichi NPS Accident is as follows.

<https://www.mhlw.go.jp/english/topics/2011eq/workers/dr/index.html?no=tab1>

1. Decontamination/Remediation

Information on decontamination/remediation including guidelines:

<https://www.mhlw.go.jp/english/topics/2011eq/workers/dr/index.html?no=tab2>

2. Waste Disposal

Information on waste disposal work including guidelines:

<https://www.mhlw.go.jp/english/topics/2011eq/workers/dr/index.html?no=tab3>

3. Other Related Topics

Other related information:

<https://www.mhlw.go.jp/english/topics/2011eq/workers/dr/index.html?no=tab4>

6.4: Other Information

Statistics on radiation exposure doses of decontamination workers and other items are as follows:

<https://www.mhlw.go.jp/english/topics/2011eq/workers/ors/index.html?no=tab1>

Dose Statistical Data Based on the Information Registered with the System of Registration and Management of Radiation Exposure Doses for Decontamination and Related Work (2020) (by Radiation Effects Association) (Updated on May 19, 2021)

http://www.rea.or.jp/chutou/koukai_jyosen/2021nen/English/honbun_jyosen-2021-English.html

Section 7: Other issues on recovery operations

7.1: Public communication

1. Provision of updates to the IAEA

The Government of Japan has actively been strengthening its communication process to ensure timely dissemination of accurate information on the current status of activities onsite in multiple languages for the international community. Japan provides updates in a timely manner and all of the updates provided to the IAEA are available on this webpage:

<https://www.iaea.org/newscenter/focus/fukushima/status-update>

2. Lifting of evacuation orders

Current condition of evacuation order areas of Fukushima Daiichi NPS (as of June 2021)

In Tamura city, the order of Preparation areas for lift of evacuation order was lifted on April 1st2014. In Naraha town, the order of Preparation areas for lift of evacuation order was lifted on September 5th 2015. In Katsurao village, the order of Habitation restricted areas and Preparation areas for lift of evacuation order were lifted on June 12th 2016. In Kawauchi village, the order of Preparation areas for lift of evacuation order was lifted on June 14th2016. In Minamisoma city, the order of Habitation restricted areas and the order of Preparation areas for lift of evacuation order were lifted on July 12th2016. In Iitate village, Kawamata town and Namie town, the orders of Habitation restricted areas and Preparation areas for lift of evacuation order were lifted on March 31st 2017. In Tomioka town, the orders of Habitation restricted areas and the order of Preparation areas for lift of evacuation order were lifted on April 1st 2017. In Okuma town, the order of Habitation restricted areas and the order of Preparation areas for lift of evacuation order were lifted on April 10th 2019. Except for the Evacuation Orders of Futaba town, all of the orders of Habitation restricted areas and the orders of Preparation areas for lift of evacuation order were lifted by spring 2019. The evacuation orders were lifted for parts of Futaba Town on March 4th, 2020, Okuma Town on March 5th, and Tomioka Town on March 10th. As a result, the evacuation orders were lifted for all areas except for the Restricted areas by March 2020. The JR Joban line also resumes full operation from March 14th, 2020. The evacuation orders were lifted for the specified reconstruction and revitalization base areas of Katsurao village on June 12th 2022, and Okuma town on June 30th. The evacuation order for the specified reconstruction and revitalization base areas of Futaba town are also going to be lifted on August 30th.

As for cities, towns, and villages, where evacuation orders were lifted, it was confirmed that annual cumulative dose, the total radiation dose which residents in the cities, towns, and villages would receive per year, was surely below 20mSv, and also the reconstruction of infrastructure necessary for people's daily life and decontamination were steadily advancing. In the wake of consultation with these cities, towns, and villages and adequate explanation to the residents through briefing sessions and by other means, the above-mentioned lift of the evacuation orders was determined.

<Reference> Classification of evacuation orders:

- Preparation areas for lift of evacuation order
Entry into the area is permitted. Overnight stay in the area is generally prohibited. Business activities are permitted except those to be provided for residents living inside the area.

- Habitation restricted areas
Entry into the area is permitted.
Overnight stay in the area is prohibited in principle. Business activities are permitted but limited in some cases.

- Restricted area

Entry into the area is prohibited in principle, and staying in this area is also prohibited.

- Restricted area effective from March 10, 2020
<https://www.meti.go.jp/english/earthquake/nuclear/roadmap/index.html>

3. Relevant activities in disseminating information to the public

(1) Press Conference

Recovery operations at the Fukushima Daiichi NPS including contaminated water issues are one of the major issues which the Government of Japan has been focusing on. Since progress has been made frequently, there are updates arising on a daily basis. To explain the updates to the public, the Government of Japan disseminates the relevant information through press conferences. The Chief Cabinet Secretary and the Minister of Economy, Trade and Industry are the main briefers of the press conference, but other ministers or press secretaries may also be the briefer, depending on the subject.

(2) Information delivery to media

The government has been providing relevant information for both the domestic and the foreign press including those stationed in Tokyo and for other media, using various means such as press conferences, press briefings, press tours and press releases. As an example, the Fisheries Agency has conducted a media tour to a radioactivity monitoring site for fishery products (Marine Ecology Research Institute) in order to facilitate better understanding for monitoring on fishery products.

(3) Providing information to foreign nations

The Ministry of Foreign Affairs sends out a notification with relevant information to all foreign missions stationed in Tokyo and IAEA, in principle once a month. The same information is conveyed to all Japanese embassies, consulate generals, and missions. If necessary, the information would be shared with foreign nations and relevant organizations through these diplomatic channels.

In addition, the Government of Japan has held briefing sessions periodically on Fukushima Daiichi NPS to the Diplomatic missions in Tokyo. Most recently, the 117th session was held on June 21, 2022.

Press Release by MOFA:

https://www.mofa.go.jp/press/release/press3e_000411.html

Furthermore, the Ministry of Economy, Trade and Industry (METI) has produced a short video clip on the current situation in Fukushima Daiichi NPS and a brochure entitled “Important stories on Decommissioning Fukushima Daiichi Nuclear Power Station. Now and in the future”.

The video clip and the brochure are available at the following link:

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html>

(4) Measures taken by TEPCO

TEPCO has been disseminating information on the situation at the FDNPS both domestically and internationally via its website and social media. TEPCO is also conducting a site visit to the FDNPS with the aim of allowing people to experience the actual situation by visiting and observing the actual site. In addition, a virtual tour is available on the website.

< Inside Fukushima Daiichi >

<https://www.tepco.co.jp/en/insidefukushimadaiichi/index-e.html>

(5) Disseminating information to Japanese populations

In general, the information is shared with Japanese populations through the channels shown above in (1)-(2). In addition to these efforts, the Government of Japan has improved public communication by enriching the content of relevant ministries' webpages and by hosting local briefing sessions on a case by case basis. METI regularly informs the progress of the decommissioning activities and contaminated water countermeasures to Fukushima prefecture and 13 local municipalities surrounding the site through video conference and direct visits.

4. Efforts on eliminating negative reputation impact and risk communication

(1) The Strategy for the Enhancement of the Elimination of Negative Reputation Impact and Risk Communication

In December 2017, the Government of Japan formulated the "The Strategy for the Enhancement of the Elimination of Negative Reputation Impact and for Risk Communication", based on a thorough review of the past efforts by relevant ministries and agencies, in order to clear up negative reputation impact which lacks in scientific grounds, and unfounded prejudice and discrimination.

In addition to the risk communication with the affected people, this strategy, focusing on providing information to the general public in a simple manner, specifies objects and contents for information in order of importance, from three perspectives, that is, "To inform", "To treat" and "To invite", and examines concrete ways of delivering information. Under this strategy, relevant ministries and agencies cooperate in a unified manner both at home and abroad.

(a) To inform

To inform the general public, mostly schoolchildren, their parents, and expectant and nursing mothers, of basic points of radiation, health effects of radiation, the safety of foods and drinking water made in Fukushima, the status of the affected areas in which the recovery is in progress, etc.

(b) To treat

To inform retailers, distributors, consumers, embassies in Tokyo, and foreign VIPs, press, residents and tourists, of the appeal and tastiness of Fukushima products, system of ensuring the safety of foods and drinking water, the standards of radioactive substances, the control system of foods at production stage, etc.

(c) To invite

To inform teachers, those involved with a Parent-Teacher Association, travel agencies, foreign tourists, VIPs and press, and visitors from outside Fukushima, of the attraction of Fukushima as a destination, air dose rate and the safety of foods in Fukushima, and the supports for educational travels provided by Fukushima Prefecture.

(2) The Policy Package on Radioactive Risk Communication for Evacuees Returning to Their Homes

In February 2014, the Government of Japan compiled “The Policy Package on Radioactive Risk Communication for Evacuees Returning to Their Homes”, in order to promote the implementation of detailed risk communication in response to the concerns of individuals. Relevant ministries and agencies also work together to promote measures including the organization of follow-up meetings on the policy package, focusing on the viewpoints of (a) dissemination of accurate and easy-to-understand information, (b) continuous development of risk communication on a national scale, and (c) improving detailed risk communication.

(3) Practical measures for evacuees to return their homes by NRA

NRA formulated practical measures of radiation protection for the evacuees, who will return to their homes, from scientific and technological points of view in cooperation with other governmental organizations. The practical measures continue to address the difficulties which the evacuees have been facing. It is expected that the practical measures will be helpful for the evacuees to make decisions on whether they will return to their homes or not.

The detail of these measures taken by NRA are available at the following link:

<https://www.nsr.go.jp/data/000067234.pdf>

7.2: Websites for your reference

Further information on each section above is available at the following websites:

The Prime Minister’s Office

<http://japan.kantei.go.jp/ongoingtopics/waterissues.html>

The Food Safety Commission (FSC)

http://www.fsc.go.jp/english/emerg/radiological_index_e1.html

The Reconstruction Agency (RA)

<http://www.reconstruction.go.jp/english/>

The Ministry of Foreign Affairs (MOFA)

http://www.mofa.go.jp/j_info/visit/incidents/index.html

The Ministry of Health Labour and Welfare (MHLW)

http://www.mhlw.go.jp/english/topics/2011eq/index_food.html

The Ministry of Agriculture, Forestry and Fisheries (MAFF)

<https://www.maff.go.jp/e/policies/market/reference/reference.html>

The Fisheries Agency (FA)

<http://www.jfa.maff.go.jp/e/index.html>

The Ministry of Economy, Trade and Industry (METI)

<http://www.meti.go.jp/english/earthquake/nuclear/decommissioning/index.html>

<https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/atw.html>

<https://www.meti.go.jp/english/earthquake/nuclear/roadmap/>

The Ministry of the Environment (MOE)

<http://iosen.env.go.jp/en/>

The Nuclear Regulation Authority (NRA)

<http://www.nsr.go.jp/english/index.html>

The Japan Atomic Energy Agency (JAEA)

<http://www.jaea.go.jp/english/index.html>

Tokyo Electric Power Company (TEPCO)

<http://www.tepco.co.jp/en/nu/fukushima-np/index-e.html>

Fukushima Daiichi Decontamination & Decommissioning Engineering Company

http://www.tepco.co.jp/en/press/corp-com/release/2014/1235009_5892.html

Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF)

http://www.ndf.go.jp/soshiki/pamph_e.pdf

International Research Institute for Nuclear Decommissioning (IRID)

<http://irid.or.jp/en/>

The Collaborative Laboratories for Advanced Decommissioning Science (CLADS)

<https://clads.jaea.go.jp/en/>

IAEA assessment on aspects presented in the August 2022 report ‘Events and highlights on the progress related to recovery operations at Fukushima Daiichi Nuclear Power Station’

Improvements to the equipment for trial retrieval of fuel debris from Unit 2

Japan reported that improvements are being made to the robotic arms and the dual arm manipulator used at the Japan Atomic Energy Agency (JAEA) Naraha Center close to the Fukushima Daiichi site, where operational tests are being conducted. Studies are underway to address challenges related to the insertion of this equipment through a penetration of the Primary Containment Vessel (PCV) of Unit 2.

The IAEA acknowledges the progress made and considers that this may enable future activities towards the trial retrieval of fuel debris from Unit 2.

Measurement of deposit thickness in the PCV of Unit 1

Japan reported that an underwater robot was inserted in the PCV of Unit 1 to conduct a visual inspection and measure the thickness of sediments.

The IAEA acknowledges the progress made on the visual investigation of the in-vessel conditions in Unit 1 and considers it may contribute to the planning and implementation of a concrete decommissioning work plan in the future.

Management of ALPS treated water

Japan reported that the Tokyo Electric Power Company (TEPCO) revised its assessment of Advanced Liquid Processing System (ALPS) treated water radiological impact on humans and the environment. TEPCO’s assessment found that effects of the discharge of ALPS treated water into the sea on the public and the environment is minimal as calculated doses were significantly less than the dose limits for the general public and the values specified by international organizations for each species.

The IAEA acknowledges that TEPCO has revised the assessment of radiological impacts on humans and the environment taking into account IAEA comments¹. The review of this revised impact assessment by the IAEA task force is ongoing.

Sea area monitoring results

Japan reported that the results of the marine environmental radioactivity monitoring at locations outside of the port and in the open sea around Fukushima Daiichi Nuclear Power Station (NPS) indicate that levels have been relatively stable during the reporting period (March 2022 to June 2022). Monitoring results continue to be published regularly by the Nuclear Regulation Authority (NRA) of Japan and TEPCO. The data shows that the levels of the radionuclides included in Japan’s Sea Area Monitoring Plan in seawater, sediment and biota in the areas around TEPCO’s Fukushima Daiichi NPS have not been adversely affected by decommissioning and contaminated water management activities on-site. In particular, the water discharged to the sea from the

¹ See [IAEA Review of Safety Related Aspects of Handling ALPS Treated Water at TEPCO’s Fukushima Daiichi Nuclear Power Station](#)

groundwater bypass and the sub-drain and groundwater drain systems continues to have no detectable effect on the levels of radioactivity measured in the marine environment in these areas.

Japan further reported that, out of a total of 4,062 samples tested during the reporting period, the ongoing monitoring of marine fish had identified no samples for which levels of radiocaesium were above the Japanese national standard limit of 100 Bq/kg.

Based on the information provided by Japan, the IAEA acknowledges that no significant changes were observed in the monitoring results for seawater, sediment and marine biota, including fishery products, during the period covered by this report. The levels measured by Japan in the marine environment are low and relatively stable. For the purpose of public reassurance, the IAEA encourages the continuation of sea area monitoring. Furthermore, the IAEA considers that the ongoing data quality assurance programme that is in place is key for ensuring the accuracy and the quality of the results of the monitoring programme. It also enhances transparency and contributes to building stakeholders' confidence.

Food products

As reported by Japan, there is a comprehensive food monitoring programme and national regulatory limits for radionuclides of caesium remain in place. Areas where food is found to be above these national regulatory limits are subject to restrictions to prevent such food from entering the food supply chain. Furthermore, the authorities in Japan report biannual dietary studies to calculate the dietary intake of radionuclides of caesium (Cs-137 and Cs-134) from the food supply in 15 areas of Japan including Fukushima. These dietary studies indicate that annual effective doses from exposure to radioactive caesium in foods is very low (0.0008 mSv/year or lower in latter 2021).

Based on the information provided by Japan, the situation regarding the safety of the food supply, fishery and agricultural production continues to remain stable. Food restrictions continue to be revised and updated as necessary in line with food monitoring results. Many thousands of food and fishery samples were collected and analyzed over the reporting period and this indicates the continued vigilance of the authorities in Japan and their commitment to protecting consumers and trade. Food monitoring, dietary surveys, appropriate regulatory action and public communication are helping to maintain confidence in the safety of the food supply.

Based on the information that has been made available from Japan, the Joint FAO/IAEA Centre understands that measures to monitor and respond to issues regarding radionuclide contamination of food are appropriate, and that the food supply chain is controlled effectively by the relevant authorities and that the public food supply is safe.