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

February 2021

The Government of Japan

Section 1: Summary of updates from September through December 2020

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. Two of the milestones (major target processes) of the Mid-and-Long-Term Roadmap for the water management have been achieved.

   First, the milestone to complete the removal/treatment of stagnant water in target buildings, excluding the Unit 1-3 Reactor Buildings, Process Main Building and the High Temperature Incinerator Building was achieved. Second, the amount of contaminated water generated was 140 m^3/day (average of 2020), which is below the target value of 150m^3/day. (For further details please refer to Page 7.)

2. Analysis of secondary treatment performance confirmation tests and measurement of the radionuclides were completed

   From September, 2020, secondary treatment test was performed for 1000m3 of water from each of two tank groups in order to evaluate secondary treatment performance of ALPS. The analysis was completed on December 24, 2020, and the results shows that the concentration of radionuclides other than tritium were below the regulatory standards for discharge. In the future, analysis of secondary processing samples will be conducted by an independent third-party organization, and issues related to the analysis will be identified. (For further details please refer to Page 8.)

3. Steady progress in Unit 3 fuel removal

   Fuel removal from Unit 3 proceeded as planned. As of December 24, 441 fuel assemblies were removed. Work continues with safety first to complete fuel removal by the end of FY2020. (For further details please refer to Page 14.)

4. Trial fuel debris retrieval from Unit 2 will be delayed due to the COVID-19 situation

   Trial fuel debris retrieval from Unit 2 will be delayed due to the delay in development of the robotic arm. Toward the trial retrieval, efforts will be continued to minimize the process delay within almost one year, with safety first. (For further details please refer to Page 13.)

5. Publication of the Technical Strategic Plan 2020

   The Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF) published the "Technical Strategic Plan 2020 for Decommissioning of the Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Company Holdings, Inc." on October 6, aiming to provide a firm technical basis for the government's "Mid- and-Long-Term Roadmap" and to serve

as an aid for smooth and steady implementation of decommissioning and achievement of targets of the risk reduction map. (For further details please refer to Page 17.)

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 September 2020 to December 2020. 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 in March 19th, 2018. This means that the whole area decontamination based on the Act on Special Measures was completed, excluding "Difficult-to-Return Zones" (DRZ). 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 in the safe side. Monitoring and inspections of radioactive materials 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 several agricultural products and fishery products were lifted during the period September to December 2020.

Monitoring data from the major food products in FY2019 in Japan show that all are below the JMLs. According to the Total Diet Study for Japanese food, the effective dose in CY2019 is estimated as far below 1 mSv/year (0.0005-0.0010 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 and contaminated water management at Fukushima Daiichi NPS

2.1: Mid-and-Long Term Roadmap

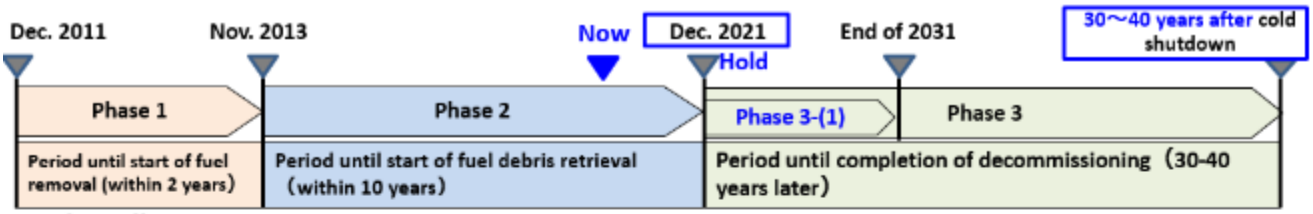
Decommissioning work at Fukushima Daiichi NPS has been conducted by the following milestones described in the "Mid-and-Long Term Roadmap" with safety as the priority.

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



Major milestones

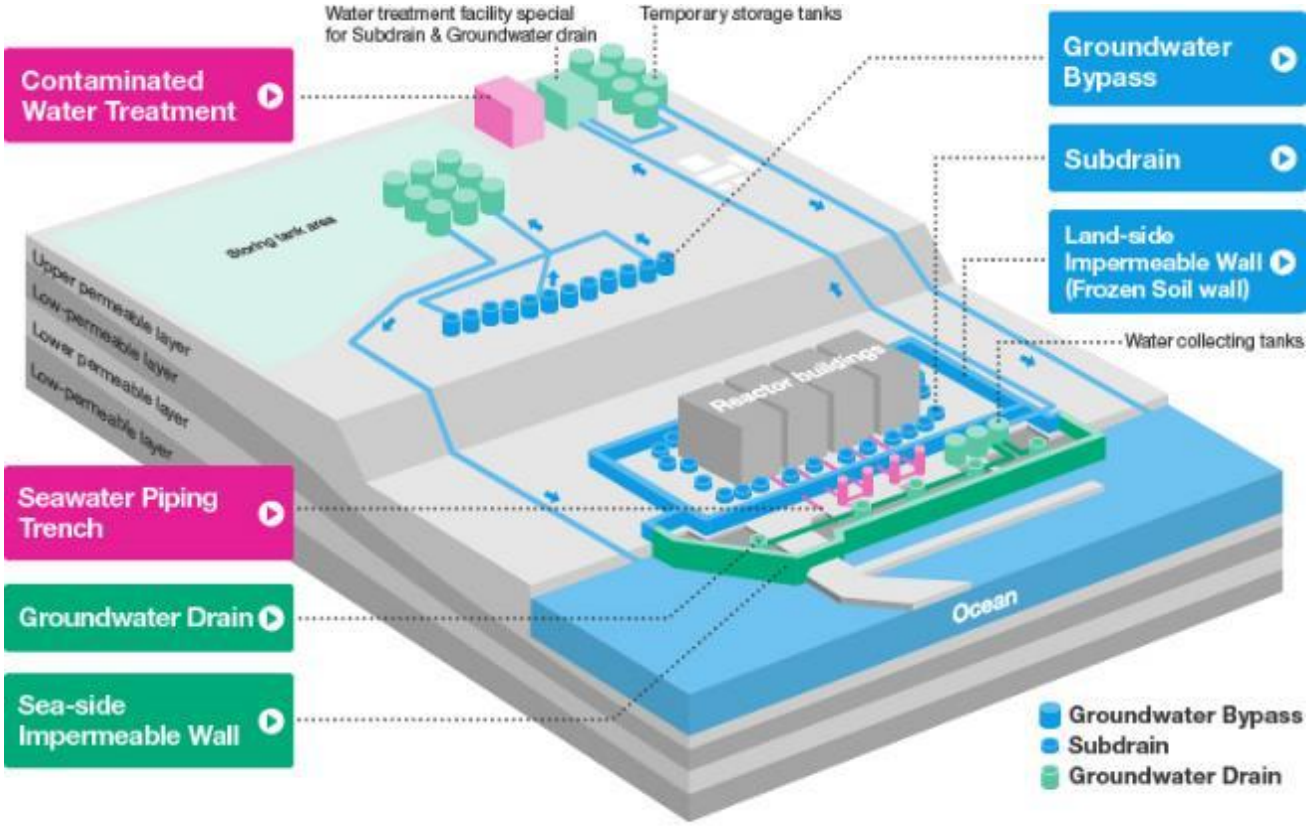
		Revised Roadmap	
Contaminated water management	Reduce to about 150 m³/day	Within 2020	achieved
	Reduce to about 100m³/day or less (Further reduction of generation)	**Within 2025**	**NEW**
Stagnant water removal / treatment	Complete stagnant water removal / treatment in buildings* (Excluding the reactor buildings of Units 1-3, Process Main Buildings, and High Temperature Incineration building.)	Within 2020(*)	achieved
	Reduce the amount of stagnant water in reactor buildings to about a half of that in the end of 2020	**FY2022 - 2024**	**NEW**
Fuel removal	**Complete of fuel removal from Unit 1-6**	**Within 2031**	**NEW**
	Complete of installation of the large cover at Unit 1	**Around FY2023**	**NEW**
	Start fuel removal from Unit 1 (Methods have changed to ensure safety and prevent dust scattering)	**FY2027 – 2028**	**REVISED**
	Start fuel removal from Unit 2	**FY2024 - 2026**	**REVISED**
Fuel debris retrieval	Start fuel debris retrieval from the first Unit (Start from Unit 2, expanding the scale gradually)	Within 2021	*Expected to be delayed by approximately 1 year
Waste management	Technical prospects concerning the processing/disposal policies and their safety	Around FY2021	
	Eliminating temporary storage areas outside for rubble and other waste	**Within FY2028**	**NEW**

* Excluding the reactor buildings of Units 1-3, process main buildings, and High temperature incineration building.

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

As of December 23, 2020, 607,063m³ of clean groundwater was released into the ocean. 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/sd_202010.pdf
(September 2020)
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202011r.pdf
(October 2020)
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202012.pdf
(November 2020)
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202101.pdf
(December 2020)
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(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 contaminated groundwater 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 December 22, 2020, 1,029,129m³ was drained 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/sd_202010.pdf (September 2020)
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202011r.pdf (October 2020)
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202012.pdf (November 2020)
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/sd202101.pdf (December 2020)

(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

An operation to maintain the land-side impermeable walls and to prevent the frozen soil from thickening, further continued from May 2017 on the north and south sides and started from November 2017 on the east side. On these sides, sufficient thickness of frozen soil was confirmed. The area of the maintenance operation was expanded in March 2018.

In March 2018, the construction of the land-side impermeable walls was completed, except for a portion of the depth, based on a monitoring result showing that the underground temperature declined below 0 ℃ in almost all areas, while, on the mountain side, the difference between the inside and outside increased to approx. 4-5 m. The 21st Committee on Countermeasures for Contaminated Water Treatment, held on March 7, 2018, which evaluated that together with the function of sub-drains, etc., 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.

A supplementary method was implemented for the unfrozen depth and it was confirmed that the temperature of this portion declined below 0 ℃ by September 2018.

The groundwater level in the area inside the land-side impermeable walls declined every year. Even in the case of Typhoon No.19 (Hagibis), the average water level difference inside and outside the frozen wall in mountain-side was 2 to 3 meters, and the groundwater level in the revetment area was kept at t.p.1.9m.

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 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.

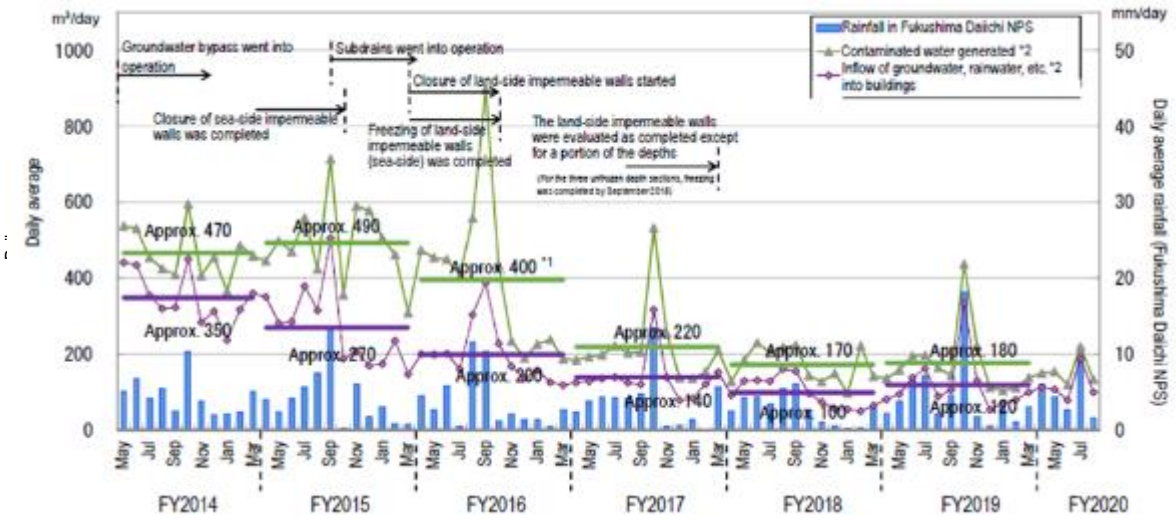
(7) Control of the generation of contaminated water

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 m^3/day (in FY2014) to approx. 120 m^3/day (in FY2019), though it depends on rainfall.

Subsequently, the generation of contaminated water decreased from approx. 470 m^3/day (in FY2014) to approx. 140 m^3/day (in FY2020). With this, the milestone (150 m^3/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 caesium 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 December 17, 2020, the volumes treated by existing, additional and high-performance multi-nuclide removal equipment were approx. 457,000, 688,000 and 103,000 m^3, respectively.

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

http://www.tepco.co.jp/en/decommision/planaction/alps/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. 1.24 million tons as of December 17, 2020.

Secondary treatment and analysis of 1000 m3 of water from each of two tank group area (J1-C and J1-G area) was completed on December 24, 2020. In both areas, it was confirmed that radionuclides other than tritium meet the regulatory standard for discharge * as follows:

- J1-C [before] 2,406 [after] 0.35
- J1-G [before] 387 [after] 0.22

* "The regulatory standards for discharge" is the limit applicable to release the radioactive waste to the environment, which is stipulated in the ordinance of the Reactor Regulation Act. If the radioactive waste contains multiple radionuclides, the sum of the ratios of each radionuclides concentration to the regulatory standards for them should be 1 or less.

In the future, analysis of secondary processing samples will be conducted by an independent third-party organization, and issues related to the analysis will be identified.

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

Within the scope of the current construction plan, the tanks storing the ALPS treated water are expected to be full around the summer of 2022. Since the actual amount of contaminated water generated in 2020 was less than the assumption made in February last year, the forecast of the full water supply period is also expected to be shifted back, at least for that amount. In any case, GOJ are carefully examining and reviewing the situation.

A series of advisory committees of the Government of Japan have been studying the solution to the problem of contaminated water, including handling of ALPS treated water, since 2013.

On 27 September 2016, the Committee on Countermeasures for Contaminated Water Treatment established the ALPS Subcommittee on Handling ALPS Treated Water (hereinafter referred to as the "ALPS Subcommittee") to discuss the handling of the ALPS treated water from a wide-range of viewpoints, including societal perspectives, based on the options presented in the Tritiated Water Task Force Report. The ALPS Subcommittee published the report of its findings on 10 February 2020. The ALPS Subcommittee concluded its report to show available options for discharge of the ALPS treated water and submitted it to the

Government of Japan. The report outlines the potentially available options for the discharge of the ALPS treated water.

Based on the report, the Government of Japan has been holding meetings 7 times 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. And GOJ conducted a public comment and received over 4,000 opinions.

Also, Team for Contaminated Water and Decommissioning Issues was held on October 23 to sort out the comments received. The relevant ministries and agencies are currently deepening their deliberations on how to respond.

3. Fuel removal 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). In October of the same year, the removal of roof panels was completed without any significant change in radiation dose rates around the reactor building. The removal work of the roof panels proceeded carefully and anti-scattering measures were implemented to reduce the spread of contamination. In September 2016, dismantling of wall panels (18 in total) began and was completed in November of the same year. Installation of windbreak fences to further reduce dust scattering during rubble removal from the operating floor was completed on December 19, 2017, and the removal of the rubble on the operating floor started on January 22, 2018. No significant variation attributable to this work has been identified at the dust monitors installed on the workplace and near the boundary of the site. Before formulating a plan to remove rubble around the SFP, an onsite investigation started from July 23, 2018 and was completed on August 2, 2018. To create an access route for preparatory work to protect the SFP, etc., work to remove four sections of X-braces (one each on the west and south sides and two on the east side, respectively) started from September 19, 2018 and all four planned sections had been removed by December 20, 2018. On March 6, 2019, the creation of an access route from the west working floor was completed and the floor opening was covered to prevent small rubble falling from the operating floor during the work. From March 18, 2019, the removal of

small rubble using pliers and suction equipment in the east-side area around the SFP was underway. From April 2, 2019, rubble removal in the same area began using a remote-controlled heavy machine.

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, the transparency of the pool water was investigated on August 2 and September 27 2019. The investigation confirmed that by installing lightning and a scope to create an environment to investigate the upper part of the pool using an underway camera, a view of approx. 7 meters would be available. This investigation also detected an accumulation of rubble on the upper surface of the fuel rack in a part of the cables of the fuel-handling machines submerged in water.

Before retrieving fuel debris, an investigation of the condition inside the PCV was commenced. From February to May 2015, TEPCO investigated the inside of the PCV by using "muon", a kind of cosmic rays, and studied the condition of fuel debris inside. In addition, in April 2015, TEPCO sent robots into the PCV to investigate and collect important information such as radiation level and temperature and also took images from inside. Based on the results of the investigation in April 2015, the status of debris spreading to the basement floor outside the pedestal was inspected using a self-propelled investigation device from March 18 to 22, 2017. The purpose of the investigation was to identify the status inside the Unit 1 PCV and to make progress towards fuel debris retrieval. In this investigation, cameras and a robot were inserted into the PCV by remote control. A dosimeter and an underwater camera were suspended from the 1st floor, where grid-like scaffold is installed, to collect information to infer 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.

As part of the work to create an access route for the internal investigation of the PCV, scheduled for the first half of FY2019, drilling on the outside of X-2 penetration, a penetration with doors through which workers enter or exit the PCV, started on April 8, 2019, and the inner door of the X-2 penetration, which included doors through which workers entered or exited the PCV, was drilled (for about five minutes) on June 4, 2019. Monitoring data during this work showed no significant change.

Concerning fuel removal from the spent pool, the well plug, which is considered as having been misaligned from the normal position due to the influence of the hydrogen explosion at the time of the accident, was investigated during the period of July 17 to August 26 2019, by taking photos using a camera, measuring the air-dose rate, and collecting 3D images.

The investigation checked the positional relation of the upper and intermediate plugs, detected an inclination of the plug and confirmed that the air-dose rates peaked near the plug centre.

In order to resume the access route construction for the internal investigation of the PCV, examination is underway based on the data acquired thus far to optimize the cutting time and monitor the dust density near the PCV more intensively. Specifically, the additional of a dust monitor using piping installed near the PCV head was considered.

Toward investigating the inside of the Unit 1 PCV, an access route is being constructed. Creation of the three holes in the inner door was completed on April 22, 2020.

(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.

On November 6, 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. On February 1, 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 8, 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 22 to July 22, 2016. This operation applied the muon transmission method of which effectiveness was demonstrated in its appliance for locating the debris inside Unit 1. 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. It is assumed that most of the fuel debris existed at the bottom of the RPV.

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). From 26 January to 16 February 2017, a camera and a robot were inserted closely to the RPV by remote control. The internal situation was understood through the digital images. From the result of this investigation, fallen scaffolding below the RPV and the status of deposits were identified directly for the first time. Moreover, the actual radiation dose rate and temperature inside the PCV was measured resulting in big progress towards the decommissioning of Fukushima Daiichi NPS.

On January 19, 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.

On February 13, 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. The result of this investigation will be utilized in the internal investigation in the second half of FY 2019, examination of the retrieval method.

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

Regarding retrieval of fuel debris, toward starting the trial retrieval of Unit 2 fuel debris scheduled in 2021, retrieval equipment is being developed in the UK. However, development in the UK has been delayed due to the spreading COVID-19 infection and transporting to Japan scheduled for January 2021 has been delayed. To avoid further delay, it was decided that among the performance verification test and others planned in the UK, those that may be conducted in Japan will be relocated to Japan. Toward the trial retrieval, efforts will continue with safety first to minimize the process delay within almost one year.

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.

During the period April 2-16, 2019, a water injection reduction test (STEP 1) was conducted. Through this test, the water injection rate into the reactor was temporarily changed for check the temperature variation, in order to take the heat release in the air into consideration. When the water injection rate was changed from 3.0 to 1.5 m^3/h, the maximum temperature increase at the RPV bottom was up by 5℃ from about 20℃ at the test start. It was confirmed that the overall temperature variation, including other parameters, was almost within predictions.

To optimize the emergency response procedures, a test (STEP 2) involving temporarily suspending water injection to the reactor (3.0 to 0.0 m^3/h) was conducted on May 13 2019 (and terminated on May 24, 2019). The graph below shows the changes in RPV bottom temperature during the test to suspend water injection to the reactor. The test confirmed that the temperature increase rate at the RPV bottom was at the same level of 0.2℃/h or less as predicted and that the temperatures at the RPV bottom and inside the PCV during the test also varied almost within expectations. No abnormality was detected in other parameters such as the dust density. The difference between the prediction data and the test data and the behavior variation depending on the location where the thermometer was installed will be evaluated to utilize the results in optimizing emergency response procedures.

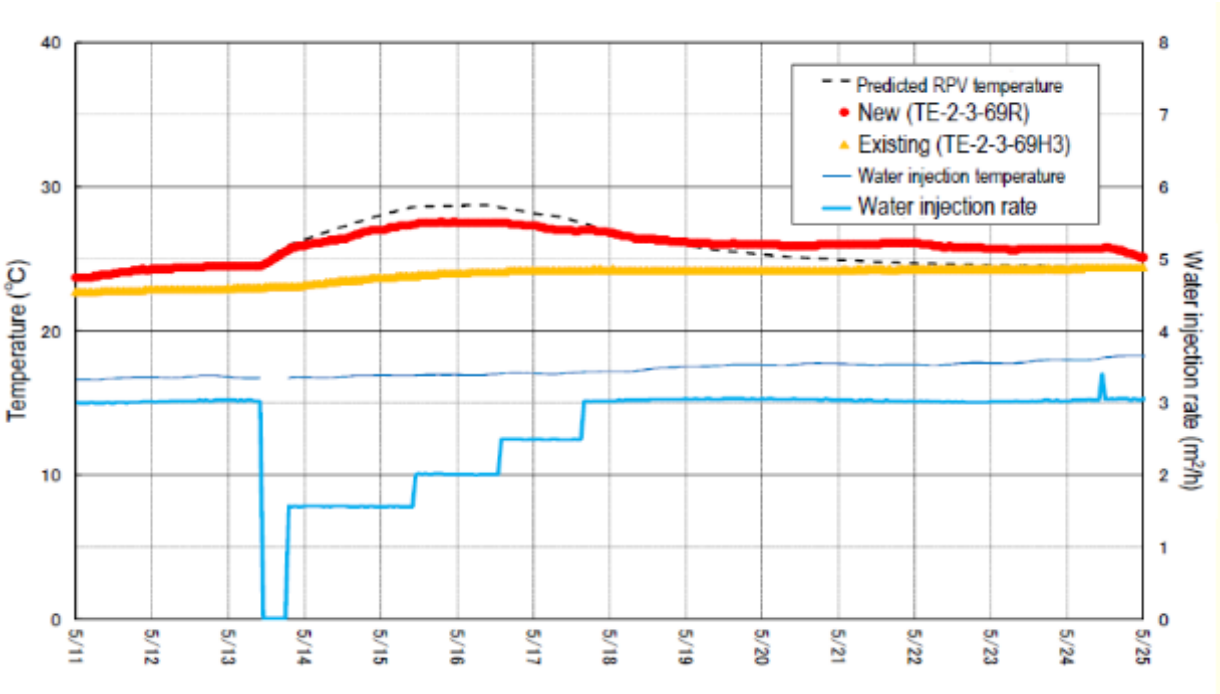


Figure. Changes in PRV bottom temperature during the test to suspend water injection

(4) Unit 3

In August 2015, TEPCO completed the removal of the Fuel Handling Machine (FHM) rubble from the spent fuel pool. By the end of November 2015, all rubble remaining in the pool was removed. Equipment to cover the upper part of the building as well as a crane has been installed since August 2017 to start removing spent fuel from the pool.

Regarding the FHM and crane, consecutive defects have occurred since the test operation started on March 15, 2018. On September 29, 2018, to determine the risks of defects in fuel-handling facilities, the FHM was temporarily recovered and a safety inspection (operation check and facility inspection) started. For 14 defects detected in the safety inspection, measures were completed on January 27, 2019. On February 8, 2019, a function check after cable replacement was completed.

From April 15, 2019, removal of 566 fuel assemblies including 52 non-irradiated fuel assemblies stored in the spent fuel pool started. As of December 24, 2020, 441 assemblies including 52 non-irradiated fuel assemblies were removed from Unit 3.

Concurrent with the above activities, investigation of the current condition inside the PCV is underway. In October 2015, robots were sent into the PCV and successfully collected useful information. The images taken by the robots confirmed that the main structure and walls inside the PCV had not been damaged.

The image inside of the pedestal was acquired by using underwater ROV from 19 to 22, July 2017. As a result, in the pedestal it was confirmed that there was solidified molten materials and damage to some parts of the structure such as housing support and grating. In November 2017, analysis of image data obtained during the investigation was released. It identified damage to multiple structures and the supposed core internals.

Investigation using the muon cosmic ray to identify the existence of fuel debris has been implemented from May to September 2017. The final report was presented and there is no large mass of fuel debris in the core of the RPV.

To understand the overall picture inside the pedestal, videos obtained while investigating inside Unit 3 PCV in July 2017 were reproduced in 3D. Based on the reproduced images, the

relative positions of the structures, such as the rotating platform slipping off the rail with a portion buried in deposits, were visually understood.

To optimize the emergency response procedures at the time when water injection to the reactor is suspended, a test involving temporarily suspending water injection to the reactor was conducted at Unit (suspension period: February 3–5, 2020 (approx. 48 hours*)).

(*The test continued until February 17, including the period of sequentially recovering the injection volume after the suspension.)

The increase in temperature during the suspension period was almost within the assumed range with increases of approx. 0.6 and 0.7 ℃ at the RPV bottom and PCV respectively. In addition, no abnormality was detected in the dust density of the PCV gas control facility and other parameters. The difference between the obtained results and the assumption will be evaluated to help examination toward optimizing emergency response procedures.

(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. Fully utilizing this successful experience, the fuel assemblies remaining in the spent fuel pools of Units 1, 2 and 3 will be removed.

(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

Regarding work to dismantle the Unit 1/2 exhaust stack, which started from August 1, 2019 and was entrusted to Able Co., Ltd., the scheduled dismantling from a height of 120m to 59m was completed by April 29. On May 1, a lid was subsequently installed on top of the stack to prevent rainwater infiltration and all processes of the work were completed. This work improved the seismic tolerance of the exhaust stack and reduced risks.

4. Waste management

As of the end of November 2020, the total storage volume of the concrete and metal rubble was approx. 307,400 m³ (+2,400 m³ compared to the end of October, with an area-occupation rate of 74%). The total storage volume of trimmed trees was approx. 134,400 m³ (with an area-occupation rate of 77%). The total storage volume of used protective clothing was approx. 31,100 m³ (+13,500 m³, with an area-occupation rate of 45 %).

As of December 3, 2020, the total storage volume of waste sludge was 437 m^3 (area-occupation rate: 62%), while that of concentrated waste fluid was 9,345 m^3 (area-occupation rate: 91%). The total number of stored spent vessels, High-Integrity Containers (HICs) for multi-nuclide removal equipment, etc., was 4,980 (area-occupation rate: 78 %).

5. Working environment

In order to achieve a long-term decommissioning, it is important to ensure a stable workforce (about 3,400-4,400 workers per day after 2018FY). 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.

Considering the latest situation, countermeasures are being implemented to prevent the COVID-19 infection spreading, such as requiring employees to take their temperature prior to coming the office, wear masks at all times and avoid the "Three Cs" (Closed spaces, Crowded places, Close-contact settings) by shift-use of the rest house, etc. 3 patients were confirmed to be infected as of December 31, 2020, but no significant influence on work, such as a delay to the work processes, was identified.

6. The 4th IAEA peer review mission & the Follow-up review

Japan received the 4th visit of the review mission team from the International Atomic Energy Agency (IAEA) during the period November 5-13 2018 (after three and half years since February 2015).

The main findings and conclusions in the summary report of the review mission reads: "The IAEA Review Team considers that significant progress has already been accomplished to move Fukushima Daiichi from an emergency situation to a stabilized situation. Many improvements have been recorded since the previous mission in 2015."

For the full version of the Report of IAEA International Peer Review Mission on Mid-and-Long-Term Roadmap towards the decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station:

https://www.iaea.org/newscenter/pressreleases/iaea-issues-final-report-on-fourth-review-of-fukushima-decommissioning

As described in 2.2 2. (4), the ALPS Subcommittee published the report on 10 February 2020 to show available options for discharge of the ALPS treated water. Taking into account the advisory point "The IAEA Review Team holds that a decision on the disposition path for the stored ALPS treated water containing tritium and other radionuclides, after further treatment as needed, must be taken urgently, engaging all stakeholders, to ensure the sustainability of the decommissioning activities and of the safe and effective implementation of other risk reduction measures." which was provided by IAEA in 4th Review mission, the Government of Japan provided IAEA the report as informing progress on the advisory point and requested IAEA to review the progress made in water management, including a review of the ALPS Subcommittee report.

The IAEA Review Report on management of ALPS treated water and the ALPS Subcommittee Report was published on April 2, 2020. In this report, the IAEA team noted that "the two options (namely controlled vapor release and controlled discharge into the sea, the latter of

which is routinely used by operating nuclear power plants and fuel cycle facilities in Japan and worldwide) selected out of the initial five options are technically feasible and would allow the timeline objective to be achieved". The IAEA Review Team also notes that "the ALPS treated water will be further purified as necessary to meet the regulatory standards for discharge before dilution". Regarding the tritium separation technology, "the IAEA Review Team is not aware of a solution currently available for the separation of tritium commensurate with the concentration and the volume of ALPS treated water". The IAEA Review Team holds the view that "a decision on the disposition path for the stored ALPS treated water containing tritium and other radionuclides, after further treatment as needed, must be taken urgently, considering safety aspects and engaging all stakeholders".

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

2.3: Organizations related to decommissioning and contaminated 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 2020 for Decommissioning of the Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Company Holdings, Inc." on October 6, 2020; 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 defines the concept of how to ensure safety in which perspectives in terms of the safety and operator are reflected in the decommissioning, and describes about the setting of requirements (boundary conditions) in association with the further expanded fuel debris retrieval and an enhanced management system for R&D.

In August 2019, NDF held the 4th 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 1,297 people from 10 countries. The 5th forum was scheduled for August 2020, but was postponed due to COVID-19.

NDF's booklet:

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

Technical Strategic Plan 2020 for Decommissioning of the Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Company Holdings, Inc.:

http://www.dd.ndf.go.jp/en/strategic-plan/book/20201214_SP2020eFT.pdf

The 4th International Forum on the Decommissioning of Fukushima Daiichi NPS (2019):

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.

CLADS has held a series of Fukushima Research Conference (FRC) on Decommissioning Research and Development since 2015. In 2020, FRCs on themes such as "Workshop on JAEA Nuclear Energy S&T and Human Resource Development Project; Matching Seeds from Academia with On-site Needs (November)"and "OECD/NEA Specialist Workshop on Advanced Measurement Method and Instrumentation for enhancing Severe Accident Management in

an NPP addressing Emergency, Stabilization and Long-term Recovery Phases; SAMMI-2020 (December)" were held webinars 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 107th session was held by video conference on October 28, 2020.

Briefing material:

https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/bs20201028rr.pdf

Press Release by MOFA:

https://www.mofa.go.jp/press/release/press4e_002957.html

(2) Communication with 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 7th "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 2020, METI and NDF held "the Side event on Fukushima Daiichi Decommissioning & off-site Decontamination" remotely at the 64rd IAEA General Conference. Over 360 people from 41 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 September 2020 to December 2020

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.

https://www7.tepco.co.jp/responsibility/decommissioning/1f_newsroom/data/index-e.html

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 March 2020. 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:

http://radioactivity.nsr.go.jp/map/ja/ (in Japanese)
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 December 2020 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 September 2020.

(3) Monitoring results

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

http://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 September to December 2020

The converted and measured values were relatively stable from September to December 2020. 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:

http://radioactivity.nsr.go.jp/en/list/192/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 September to December 2020

As described above, the sea area monitoring results were relatively stable from September to December 2020. 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
http://radioactivity.nsr.go.jp/en/list/205/list-1.html

Sea Area Monitoring (Monthly Report)
http://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 in March 19th, 2018. This means that the whole area decontamination based on the Act on Special Measures was completed, excluding "Difficult-to-Return Zones" (DRZ). The air dose rates in the environment have been continuously decreasing.

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. The soil storage facility started operation in October 2017.

As of December 2020, approximately 10,000,000 m^3 of removed soil and waste has been transported to the ISF. Almost all of the removed soil will be delivered to the ISF by the end of March, 2022.

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 demonstration project of recycling has been conducted in farmland development in Iitate Village in Fukushima Prefecture. From 2019, for example, flowering plants and energy crops are being grown, and from 2020, food crops such as tomatoes, cucumbers, and corns are being grown on a trial basis. In Minamisoma City, MOE is also constructing test embankments and monitoring them to confirm their safety.

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 September 2020, 4,699 samples were taken and analysed. Among these samples, 3 samples were found to be above the limits*. This represents 0.06 percent of all samples.

During the month of October 2020, 3,916 samples were taken and analysed. Among these samples, 17 samples were found to be above the limits. This represents 0.43 percent of all samples.

During the month of November 2020, 4,072 samples were taken and analysed. Among these samples, 32 samples were found to be above the limits. This represents 0.79 percent of all samples.

During the month of December 2020, 4,980 samples were taken and analysed. Among these samples, 13 samples were found to be above the limits. This represents 0.26 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 contaminant level exceeded the limit in the past month. By the same logic, the products whose restrictions are newly removed are the products whose radioactive contaminant 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 September 2020 to December 2020)

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

(1) Products whose distribution was newly restricted in September 2020

- None

(2) Products whose restrictions were removed in September 2020

- Wild mushrooms (limiting to late fall oyster mushroom) produced in Aizuwakamatsu-shi and wild mushrooms (limiting to pholiota nameko) produced in Aizumisato-machi, Fukushima prefecture.

(3) Products whose distribution was newly restricted in October 2020

- None

(4) Products whose restrictions were removed in October 2020

- - Bamboo shoot produced in Hokota-shi, Ibaraki prefecture.

- Bear meat obtained after capturing in Tokamachi-shi and Joetsu-shi which are controlled under the policy for shipment and inspection set by Niigata prefecture.

(5) Products whose distribution was newly restricted in November 2020
- Wild mushrooms produced in Hitachi-shi, Hitachiota-shi, Kasama-shi and Daigo-machi, Ibaraki prefecture.

(6) Products whose restrictions were removed in November 2020
- None

(7) Products whose distribution was newly restricted in December 2020
- Wild mushrooms produced in Kesennuma-shi and Minamisanriku-cho, Miyagi prefecture.
- Wild mushrooms produced in Ishioka-shi and Tsukuba-shi, Ibaraki prefecture.

(8) Products whose restrictions were removed in December 2020
- Chars (Iwana)(excluding farmed fish), Japanese daces, Crucian carps (excluding farmed fish) and Land-locked cherry salmons (Yamame)(excluding farmed fish) captured in Onogawa Lake, Hibara Lake and rivers flowing into these lakes (including its branches) in Fukushima 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 August to November 2020, in marine fish species, the excess ratio* was 0% (There is no sample that exceeding the JML out of 3,102 samples) and in freshwater fish species, the excess ratio was 0 % (There is no sample that exceeding the JML out of 698 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
Error! Hyperlink reference not valid. 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 (0.0005-0.0010 mSv/year, CY2019).

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 14)
https://www.mhlw.go.jp/content/000495158.pdf

English translation, summary of the latest version is available at the following URL (page 10)
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):

http://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

6.2: TEPCO's Fukushima Daiichi NPS

The status on 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/tepco/index.html

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:

   http://www.mhlw.go.jp/english/topics/2011eq/workers/irpw/index.html

2. Radiation Protection

Ensuring occupational safety and health of specified skilled foreign workers for the TEPCO Fukushima Daiichi Nuclear Power Plant (Updated on May 21, 2019)

https://www.mhlw.go.jp/english/topics/2011eq/workers/ri/gr/gr_190521.pdf

Results of supervision and instruction activities for employers of decommissioning workers at the TEPCO Fukushima Daiichi Nuclear Power Plant and employers of decontamination workers in Fukushima Prefecture (for 2019) (Updated on August 3, 2020)

https://www.mhlw.go.jp/english/topics/2011eq/workers/ri/gr/gr_200630.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)

http://www.mhlw.go.jp/english/topics/2011eq/workers/tepco/rp/pr_150826.html

3. Long-term Health Care

Updated 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)

http://www.mhlw.go.jp/english/topics/2011eq/workers/tepco/rp/pr_150831_attachment06.pdf

4. Good Practices in Radiation Exposure Controls

Good Practices in Radiation Exposure Dose Reduction Measures (Commissioned by the Ministry of Health, Labour and Welfare in FY2018Project) (Updated on Aug, 2020)

https://www.mhlw.go.jp/english/topics/2011eq/workers/tepco/gre/gre_2001.pdf

5. Other Related Topics

Updated other related information on the workers at TEPCO's Fukushima Daiichi NPS:

Healthcare of Workers at the Fukushima Daiichi Nuclear Power Plant (Updated on Nov 13, 2020)

https://www.mhlw.go.jp/english/topics/2011eq/workers/tepco/ort/ort_201029.pdf

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

http://www.mhlw.go.jp/english/topics/2011eq/workers/tepco/ort/ort_160624.html

6.3: Decontamination/Remediation

The status on 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

1. Decontamination/Remediation

Updated Information on decontamination and remediation including guidelines and results of labour inspection:

Results of supervision and instruction activities for employers of decommissioning workers at the TEPCO Fukushima Daiichi Nuclear Power Plant and employers of decontamination workers in Fukushima Prefecture (for 2018) (Updated on August 3, 2020)

https://www.mhlw.go.jp/english/topics/2011eq/workers/ri/gr/gr_200630.pdf

2. Waste Disposal

Information on waste disposal work including guidelines:

http://www.mhlw.go.jp/english/topics/2011eq/workers/dr/index.html#wd

3. Other Related Topics

Other related information on waste disposal work:

http://www.mhlw.go.jp/english/topics/2011eq/workers/dr/index.html#ort

6.4: Other Information

Statistics on Radiation Exposure Doses of Decontamination Workers and Other Items Have Been Announced.

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

1. Related Information
https://www.mhlw.go.jp/english/topics/2011eq/workers/ors/index.html#ri

2. Other Institutions
https://www.mhlw.go.jp/english/topics/2011eq/workers/ors/index.html#io

3. Other Institutions
Dose Statistical Data Based on the Information Registered with the System of Registration and Management of Radiation Exposure Doses for Decontamination and Related Work (2019) (by Radiation Effects Association) (Updated on Jul 21, 2020)

http://www.rea.or.jp/chutou/koukai_jyosen/2019nen/English/honbun_jyosen-2019-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 October 2019)

In Tamura city, the order of *Preparation Areas for Lift of Evacuation Order* was removed on April 1st2014. In Naraha town, the order of *Preparation Areas for Lift of Evacuation Order* was removed on September 5th 2015. In Katsurao village, the order of *Habitation Restricted Areas* and *Preparation Areas for Lift of Evacuation Order* were removed on June 12th 2016. In Kawauchi village, the order of *Preparation Areas for Lift of Evacuation Order* was removed on June 14th2016. In Minamisoma city, the order of *Habitation Restricted Areas* and the order of *Preparation Areas for Lift of Evacuation Order* were removed 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 removed 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 removed 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 removed 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 designated areas where returning is difficult by March 2020. The JR Joban line also resume full operation from March 14th, 2020.

As for cities, towns, and villages, where evacuation orders were removed, 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.

- Areas where Returning is Difficult

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

- Areas where returning is difficult 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 107th session was held on October 28, 2020.

Briefing material:
https://www.meti.go.jp/english/earthquake/nuclear/decommissioning/pdf/bs20201028rr.pdf

Press Release by MOFA:

https://www.mofa.go.jp/press/release/press4e_002957.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/export/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/roadmap/

The Ministry of the Environment (MOE)
http://josen.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 February 2021 report *'Events and highlights on the progress related to recovery operations at Fukushima Daiichi Nuclear Power Station'*

This assessment has been performed on aspects presented in the February 2021 report 'Events and highlights on the progress related to recovery operations at Fukushima Daiichi Nuclear Power Station'. It does not include recent developments that will be taken into consideration in a next report.

Achieving the milestone of completing the removal and treatment of stagnant water in the target buildings

Japan reported completion of stagnant water removal and treatment in all buildings at the Fukushima Daiichi Nuclear Power Station (NPS), except the Unit 1 and Unit 3 Reactor Buildings, the Process Main Building and the High Temperature Incinerator Building. The milestone set in the current Mid-and-Long-Term Roadmap towards the Decommissioning of Fukushima Daiichi NPS ("Mid-and-Long-Term Roadmap") for the removal and treatment of the stagnant water in the target buildings within 2020 has been reached.

The IAEA acknowledges that the removal and treatment of the stagnant water in the target buildings has been successfully completed and that the associated milestone has been achieved.

Achieving the milestone of reducing the amount of generated contaminated water and completion of analysis of ALPS secondary treatment performance confirmation tests

Japan reported that the amount of generated contaminated water was 140 m^3/day on average in 2020, which was below the target value of 150 m^3/day. Therefore, the associated milestone set for 2020 in the Mid-and-Long-Term Roadmap was achieved. Japan also reported that the concentration of radionuclides in the secondary water treated by the Advanced Liquid Processing System (ALPS), except tritium, is significantly reduced. In the future, the analysis of secondary treated water samples will be conducted by an independent third-party organization.

The IAEA acknowledges that the milestone of reducing the amount of generated contaminated water has been achieved. The IAEA acknowledges that ALPS secondary treatment showed good performance. The Agency considers that both results will have a positive impact on realistic and sustainable contaminated water management including decision on the disposition path. The IAEA notes that, in the future, a third-party organization will conduct analyses of samples from the ALPS secondary treatment.

Delay in the trial fuel debris retrieval from Unit 2 due to COVID-19 pandemic in the United Kingdom

Japan reported a delay in the development, and transport to Japan, of the robotic arm that is prepared in the United Kingdom, due to the spread of the COVID-19 pandemic. As a consequence, the trial of fuel debris retrieval from Unit 2, which was scheduled to start in 2021 in the Mid-and-Long-Term Roadmap, will be delayed for up to one year.

The IAEA notes the delay in trial of fuel debris retrieval from Unit 2 and acknowledges Japan's efforts to minimize the process delay within nearly one year.

Fuel removal from the Spent Fuel Pool in Unit 3

Japan reported the progress on fuel removal from the Spent Fuel Pool (SFP) in Unit 3. As of 24 December 2020, 441 assemblies, including 52 non-irradiated fuel assemblies, out of a total of 566 fuel assemblies (514 spent fuel assemblies and 52 non-irradiated fuel assemblies) initially stored in the SFP of Unit 3, have been removed.

The IAEA acknowledges the ongoing progress towards completion of fuel removal from the SFP in Unit 3.

Sea area monitoring results

Japan reported that the results of sea area monitoring around Fukushima Daiichi NPS have indicated that the radioactivity levels at locations outside of the port and in the open sea have been relatively stable during the period September 2020 to December 2020. Monitoring results continue to be published regularly by the Nuclear Regulation Authority (NRA) of Japan and the Tokyo Electric Power Company (TEPCO). The data shows that radioactivity levels in the marine environment (seawater, sediment and biota) in the areas around Fukushima Daiichi NPS have not been adversely affected by decommissioning and contaminated water management activities on-site. In particular, the monitored groundwater continues to have no detectable effect on the levels of radioactivity measured in the marine environment in these areas. It is further noted that ongoing monitoring of marine fish demonstrated that all samples measured were below the Japanese national regulatory limit during the reporting period.

Based on the information provided by Japan, the IAEA notes 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 important for facilitating transparency and promoting confidence in the accuracy and quality of the results of the monitoring programme to all stakeholders.

Food products

As reported by Japan, national regulatory limits for radionuclides of caesium remain in place and there is a comprehensive programme to monitor foods, including seafood. 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.

According to the information received, the Ministry of Health, Labour and Welfare undertake regular total diet surveys in fifteen areas across Japan (three locations in Fukushima Prefecture and other locations in Hokkaido, Ibaraki, Iwate, Kanagawa, Kochi, Miyagi, Niigata, Nagasaki, Osaka, Saitama, Tochigi and Tokyo). These total diet studies are undertaken twice a year and are based on typical standard meals. The study results are used to calculate ingestion doses received from radiocaesium (Cs-134 and Cs-137). The most recent survey results for 2019 have been reported by the Ministry of Health Labour and Welfare and range from 0.0005 mSv/year to 0.0010 mSv/year by the ingestion of radiocaesium (radiocaesium constitutes the majority of radiation dose derived from the accident[1]).

Based on the information provided by Japan, it is noted that an assessed effective ingestion radiation dose for radiocaesium of less than 0.0010 mSv/year is less than 0.1 % of the 1 mSv/year dose criterion for radionuclides

[1] Pharmaceutical Safety and Environmental Health Bureau Ministry of Health, Labour and Welfare https://www.mhlw.go.jp/stf/houdou/0000205937_00006.html

in food specified in International Basic Safety Standards [2]. In addition, an ingestion dose of less than 0.0010 mSv/year is a small fraction of the doses that arise from the ingestion of naturally occurring radionuclides in food. For example:

- *International assessments of typical doses received from the consumption of natural radionuclides have been published by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and calculate a worldwide average ingestion dose of 0.31 mSv/year with a typical range estimated at 0.2 – 0.8 mSv/year[3]. Most of this dose is assessed as being due to the naturally occurring radionuclides of lead-210, polonium-210 and potassium-40. The radiocaesium ingestion doses calculated by the Japanese Ministry of Health Labour and Welfare from their duplicate diet study of 2019 are less than approximately 0.3 percent of the worldwide average annual dose from the ingestion of natural radioactivity.*
- *A duplicate diet study[4] undertaken in the Aomori Prefecture of Japan during 2006 to 2010 (before the accident at the Fukushima Daiichi nuclear power plant) reported a mean annual ingestion dose of 0.47 mSv/year with most of this ingestion dose being attributed to the naturally occurring radionuclides: lead-210, polonium-210 and potassium-40. The radiocaesium ingestion doses calculated by the Japanese Ministry of Health Labour and Welfare from their duplicate diet study of 2019 are less than approximately 0.2 % of this mean annual ingestion dose for background levels of radioactivity.*

Based on the information provided by Japan, it is noted that 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. Approximately four thousand results are reported each month for food samples collected over the reporting period and this attentiveness to monitoring levels of radiocaesium in food products continues to indicate the vigilance of the authorities in Japan and their commitment to protecting consumers and trade. Monitoring, 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, the Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture understands that measures to monitor and respond to issues regarding radionuclide contamination of food are appropriate, that the food supply chain is controlled effectively by the relevant authorities and that the public food supply is safe.

[2] Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014). See more particularly Requirement 51.
[3] UNSCEAR, Sources and Effects of Ionizing Radiation, Vol. I, Annex B (2000) https://www.unscear.org/unscear/en/publications/2000_1.html
[4] Y Ohtsuka *et al* Daily radionuclide ingestion and internal radiation doses in Aomori Prefecture, Japan. Health Physics 105, 4, 340 – 350 (2013)