Important Stories on Decommissioning

2019

Fukushima Daiichi Nuclear Power Station, now and in the future

Ministry of Economy, Trade and Industry
Agency for Natural Resources and Energy

Introduction

At the TEPCO Fukushima Daiichi Nuclear Power Station, thanks to the daily efforts of on-site personnel, decommissioning work is currently being carried out with safety as the top priority.

This booklet provides answers to your questions regarding Fukushima in easy-understand manner,
as well as information about the current status and future actions regarding the decommissioning process,
together with recent topics.

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Operating floor where investigation was carried out in preparation for fuel removal at Unit 2.

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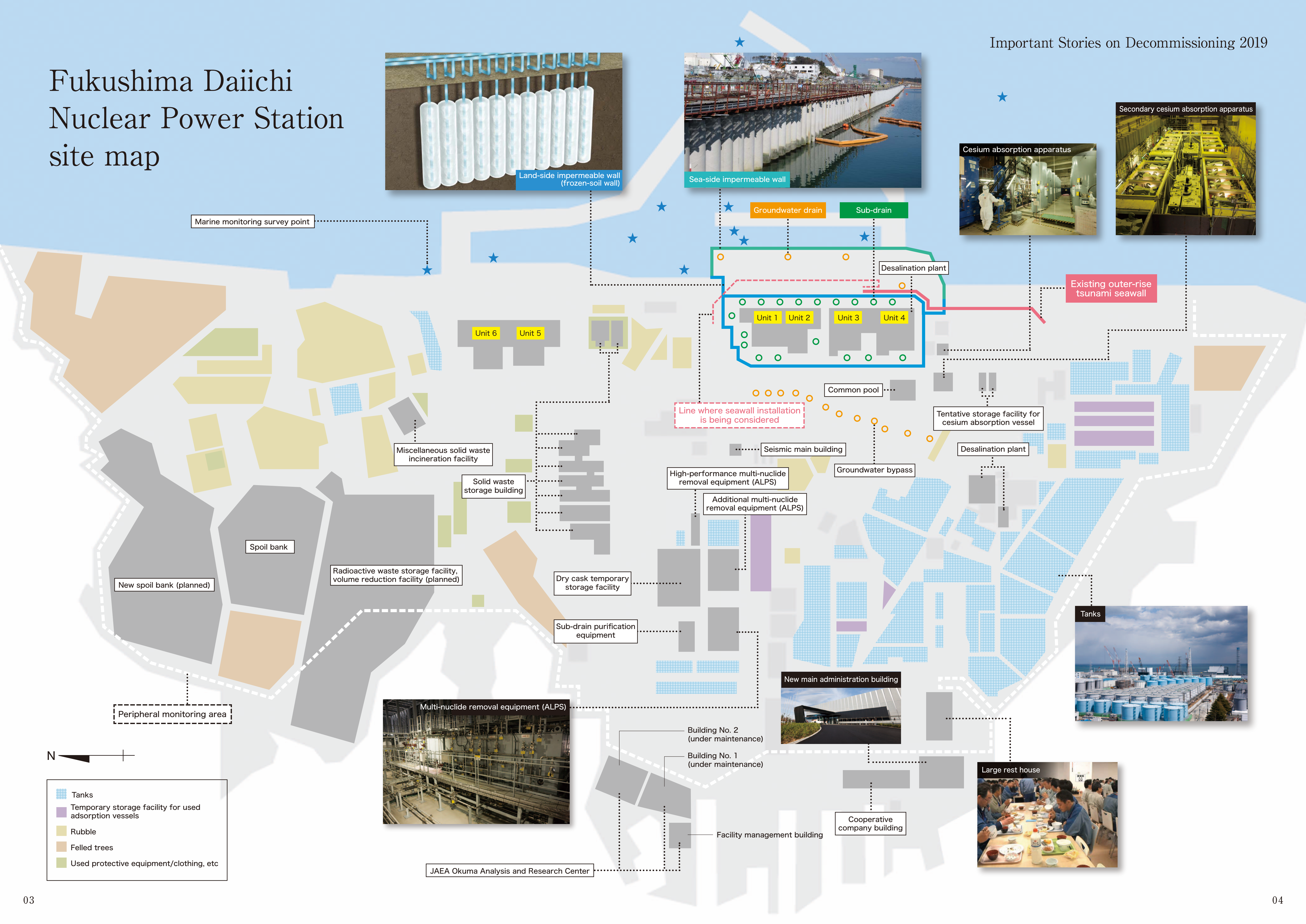
120m-hight exhaust stack. Dismantling is planned to proceed with the cooperation of local companies to prepare for earthquakes.

5 Self-driving EV bus
The first self-driving EV bus in practical service in Japan. Operating on part of the site of the Fukushima Daiichi Nuclear Power Station.

Fukushima Daiichi Nuclear Power Station site map



What is decommissioning of the Fukushima Daiichi Nuclear Power Station?

The process of lowering risks to the local community and the environment caused by radioactive materials, etc., and dismantling of reactor facilities, and other tasks.

Efforts are focused primarily on the following 4 types of work.

★Fuel removal ●Dismantling of reactor facilities, and other tasks

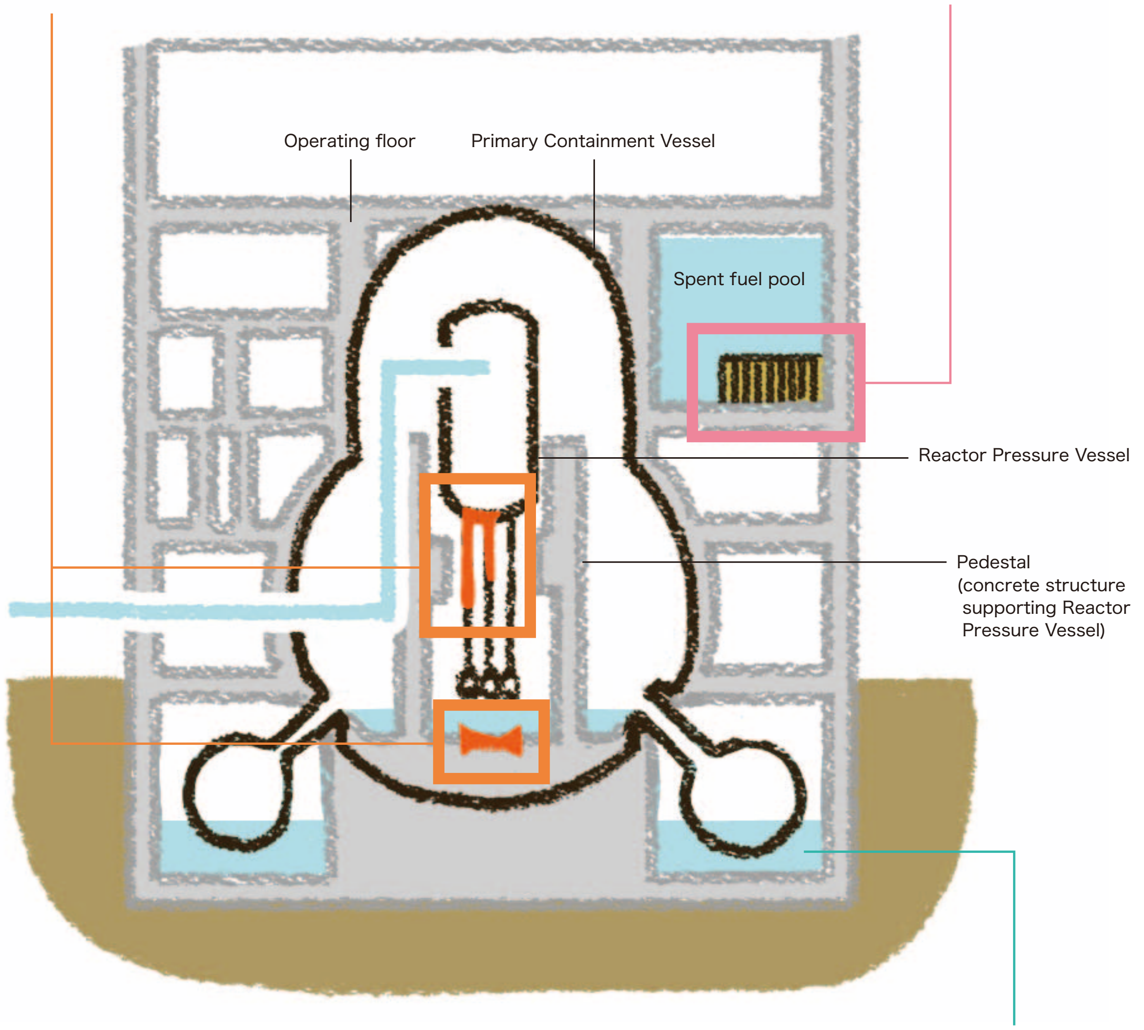
◉Fuel debris retrieval ■Management of contaminated water

*For details, see P.17, 18 *For details, see P. 15, 16

◉Retrieve fuel debris

*Fuel debris: Solidified fused materials composed of fuel, structures, etc.

★Remove fuel from spent fuel pool



Reactor building (schematic)

■Management of contaminated water

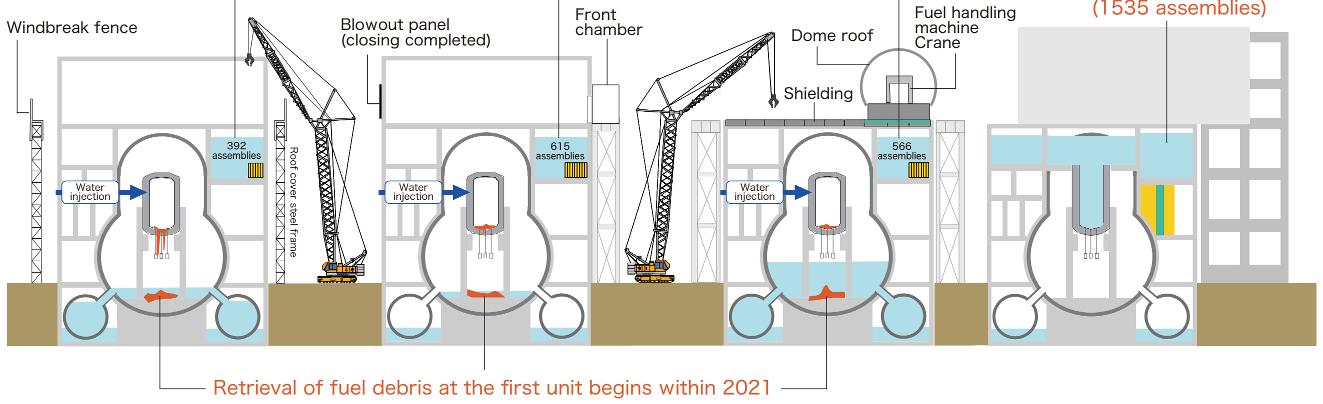
Decommissioning will be carried out safely and steadily over 30 to 40 years.

December 2011 · November 2013 (Unit 4) · Today · Within 2021

- Efforts to achieve stabilization: Achievement of cold shutdown state, significant suppression in emissions
- Phase 1: ★Period up to start of fuel removal (within 2 years)
- Phase 2: ◉Period up to start of fuel debris retrieval (within 10 years)
- Phase 3: Period up to end of decommissioning (within 30-40 years)

Current situation at each unit

Unit 1 Start in FY2023 · Unit 2 Start in FY2023 · Unit 3 Start in April 2019 · Unit 4 Removal was completed in December 2014 (1535 assemblies)



Overall process of decommissioning

★Fuel removal

Rubble removal → Installation of fuel removal equipment → Fuel removal → Storage / Transportation

Unit 2, Unit 1 (Rubble removal); Unit 3 (Fuel removal); Unit 4 (Storage / Transportation)

◉Fuel debris retrieval

Understanding of the situation inside the Primary Containment Vessel / Consideration of retrieval methods, etc. → Fuel debris retrieval → Storage / Transportation

Units 1-3

●Dismantling of reactor facilities, etc.

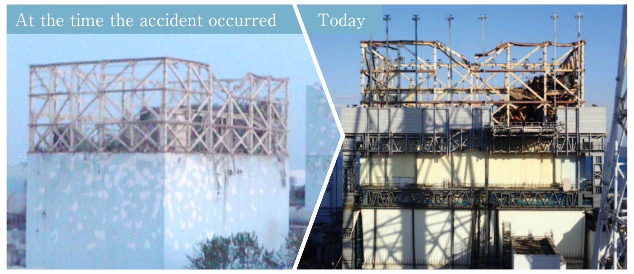
Consideration of scenarios and technologies → Design and construction of equipment → Dismantling and other tasks

Units 1-4

Current status at the Fukushima Daiichi Nuclear Power Station

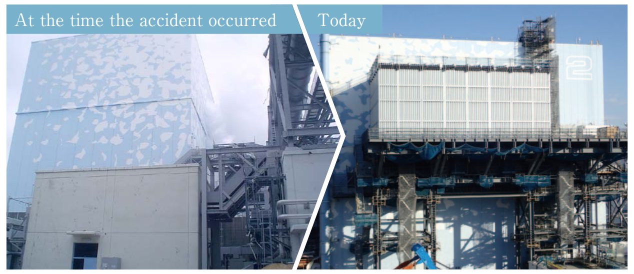
Situation inside the power station

Unit 1



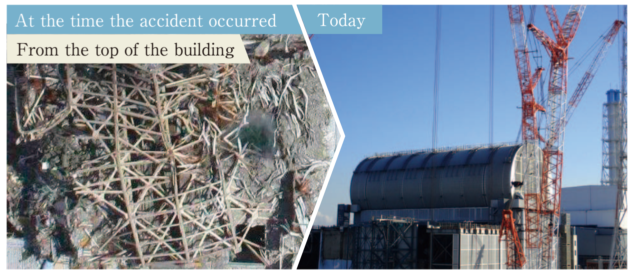
Removal of rubble is in progress with thorough measures to prevent scattering of dust in preparation for fuel removal.

Unit 2



A survey on the contamination situation over the entire area of upper part of building has been taking place in order to remove fuel.

Unit 3



There were troubles during installation of fuel removal equipment, while preparations were being made. Fuel removal has started on April 2019 after a safety inspection.

Unit 4

All fuel removal has been finished, and the fuel has been transferred to the common pool or other places and is being stored and managed safely.

Sea-side impermeable wall

Quality of seawater around the plant has been improved by installing steel piles on the sea-side.

Storage tanks

Contaminated water, which has been purified, is stored in approx. 900 tanks.

Working conditions for workers

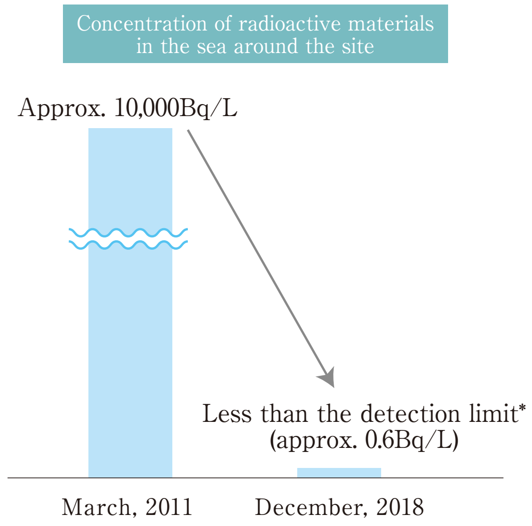
A cafeteria and a convenience store are provided at the large rest house

Emergency physicians are on duty 24/7

Effects on surrounding areas

Sea

From the efforts that have been made so far, major progress has been made in management of contaminated water, and water quality in the sea around the plant has been greatly improved. Contamination level has been confirmed to be sufficiently low, even compared to international quality standards for drinking water.



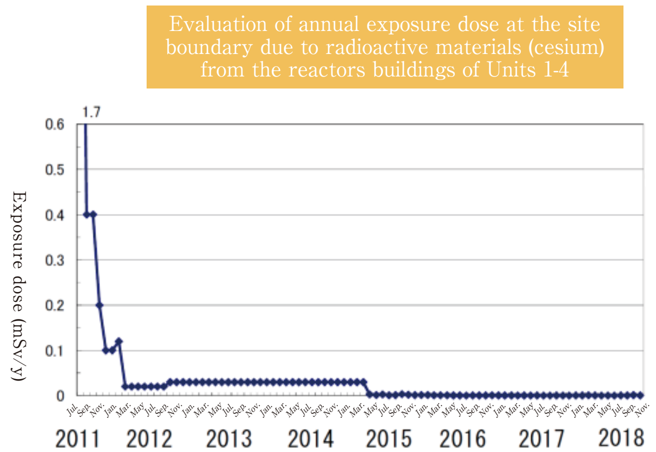
*The concentration of radioactive materials in the sea around the plant refers to the Cs-137 level near the south discharge channel
*The international standard for drinking water quality is 10Bq/L

In the sea around the plant

Use of quay for mooring ships has resumed in February 2017 (Namie Town)

Air

The amount of emissions of radioactive materials from reactor buildings are limited, and there are no effects even at the site boundary.
Dust is also constantly measured at the site boundary, and is far below the standard value where an alert is issued.



Site inspection is available from a hill near the buildings with ordinary clothes.

In surrounding areas

Resumed agriculture in May 2018 (Naraha Town)

Reopened J-Village Stadium in July 2018 (Naraha Town, Hirono Town)

Decommissioning Q&A

1. Isn't there a possibility of another accident (recriticality)?

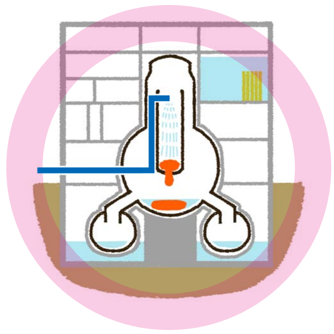
The reactors are being kept in stable condition, and thus the probability of another accident is thought to be exceedingly low.

At the time the accident occurred

The accident cut off the water supply to the reactors.
As a result, the fuel generated heat, and hydrogen explosions occurred.

Today

Reactors are being kept stable.



- When generating power under ordinary conditions, a reactor maintains criticality where a chain reaction of uranium continues, and the temperature in the reactor core reaches several hundred degrees Celsius. However, the affected reactors lose its functions to control criticality, and thus it is crucial to strictly keep the situation under control.
- Should a reactor go recritical, the production of gases called noble gases will increase. Accordingly, these gases are monitored around the clock. The amount of generated noble gasses is stable, which means that the reactors have not reached recriticality.
- As the reactors are maintained in a stable state without reaching recriticality, the probability of another accident occurring is considered to be exceedingly low. Additionally, boric acid water injection system, measures to suppress nuclear fission, have been put in place in preparation for the unlikely event of recriticality.

For more information on the situation inside the reactors →

2.What will happen if cooling stops?

Temperature will not suddenly rise, therefore, there is a plenty of time to consider what measures can be taken.

- At present, temperature in the reactor is maintained at about 15-35°C. Heat in the fuel has been greatly reduced, and its situation is stable.
- Considering the current situation of various instruments, even if water injection is stopped, it is likely to take about 2 weeks to reach the limit temperature (80°C). Therefore, it should be possible to respond with extra time.
- At Unit 2, which has the largest amount of spent fuel in the pool, the cooling of the pool was suspended for one month. This trial test confirmed that the water temperature remains below the limit (65°C) due to natural heat release.

Decommissioning Q&A

3.Have any preparations been made for another earthquake or tsunami? Is there an evacuation plan?

Various measures have been taken to prepare for an emergency. Also, evacuation plans have been formulated by Fukushima Prefecture and each municipality.

Measures against flooding due to Tsunami

Existing seawall (2.4-4.2 m)

Installation of doors to prevent inflow of water

Before measures taken

After measures taken

Securing the cooling function in case of an emergency

A drill for water injection

A power supply vehicle

Fire engines

- To guard against a tsunami, there is a plan to install a new seawall in addition to the existing seawall. As for Tsunami prevention measures, some works have been done, such as closing of all openings of the buildings, preparing a back-up power supply for instance, power supply vehicles, and water injection instruments for instance, fire engines have been put on the hill, out of reach of Tsunami.
- Other various measures have also been taken, such as drills to remove rubble (heavy equipment operation) in preparation for a situation where rubble has been scattered by a tsunami.
- A computer analysis has confirmed the ability of critical buildings to withstand an earthquake in the class of the Great East Japan Earthquake.
- Fukushima Prefecture has formulated a Region-wide Evacuation Plan covering 13 municipalities* around the nuclear power station, which details the methods of communicating information and the evacuation sites and routes to be used by each municipality. Also, each municipality has established a district-specific evacuation plan.
- In addition, Fukushima Prefecture and the 13 municipalities have concluded an agreement with TEPCO, so that they will be notified immediately in the event of any anomalies at the power station.
- At each municipality, there is a system for notifying residents via disaster prevention wireless broadcasting and other means, in accordance with the situation.

*Iwaki City, Tamura City, Minamisoma City, Kawamata Town, Hirono Town, Naraha Town, Tomioka Town, Okuma Town, Futaba Town, Namie Town, Kawauchi Village, Katsurao Village, Iitate Village

For more on the Region-wide Evacuation Plan of Fukushima Prefecture →

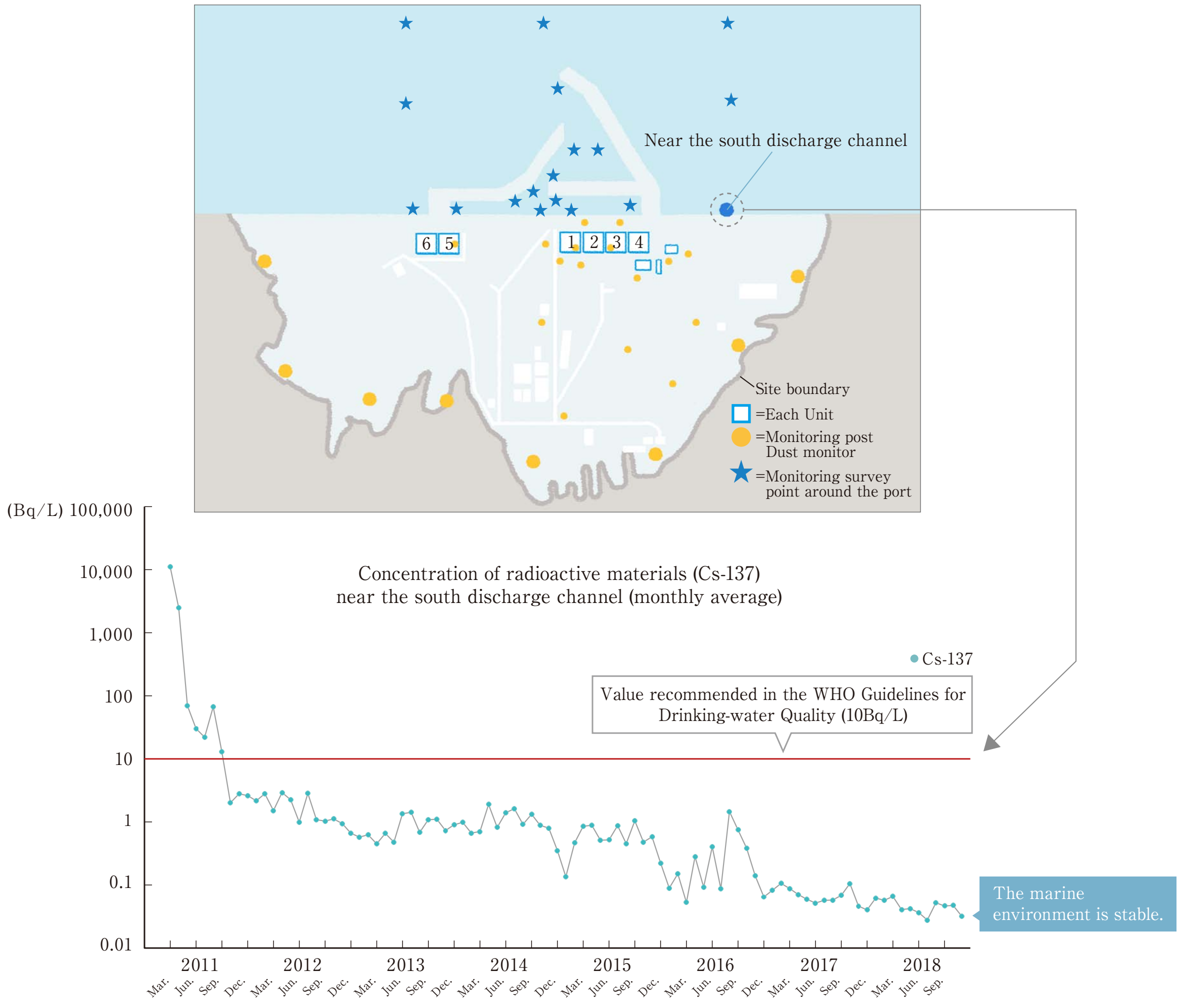
Decommissioning Q&A

4. Won't there be effects on places where people live?

Water and air are constantly being monitored in the area around the site boundary of the power station, and effects on daily life have been confirmed to be sufficiently low.

- Work such as the removal of rubble from the tops of the reactor buildings toward fuel removal has been carried out carefully while preventing scattering of radioactive materials. The concentration of radioactive materials is strictly monitored at each work site.
- A system has been put in place to ensure immediate notification and response in the unlikely event of an unusual rise in the air dose rate or the concentration of radioactive materials in dust.

Positions of monitoring posts and dust monitors at the site boundary and the surrounding sea area



In Fukushima Prefecture, TV channels broadcast figures every day for the dose measured in each part of the prefecture and the concentration of radioactive materials in surrounding sea areas.

- The International Atomic Energy Agency (IAEA) reviewed that on-site workers, the public, and the environment are protected through management of contaminated water.

For more on the readings of radioactivity levels in the air and seawater→

For more on review by the International Atomic Energy Agency (IAEA)→

On-site inspection by IAEA

Decommissioning Q&A

5. How will water stored in tanks be handled?

Subcommittee of the national government is carefully discussing this issue, including social perspectives such as reputational damage.

Approx. 900 tanks have been installed in a planned fashion (Each tank stores approx. 1000-3000 tons)

Subcommittee on handling of water treated with the multi-nuclide removal equipment (ALPS), etc.

- The water currently stored in the tanks is treated water with multiple purification systems, so that radioactive materials are reduced to about 1 part per million. However, this water contains substances such as tritium which cannot be removed with purification equipment.

*To lower the dose at the site boundary, purification treatment of contaminated water stored in tanks was sometimes hurried, and this treated water also contains radioactive materials other than tritium which exceed standard values for emission into the environment. However, when this water is disposed into the environment, secondary treatment will be performed to ensure that standards for emission are met.

- The radiation emitted by tritium has weak energy, and compared to substances such as radioactive cesium, it is thought to have little effect on living organisms. For example, the radiation emitted by tritium, called β rays, can only travel about 5 mm through the air, and can be blocked by a single sheet of paper.
- Tritium is a kind of hydrogen. Therefore, tritiated water has properties very similar to water, and cannot be removed from water with present technology.
- Tritium is also produced in natural, and is present in rainwater, tap water, and the atmosphere. In facilities such as nuclear power stations inside and outside of Japan, tritium is generally discharged in a controlled fashion into the environment (seawater and air), but there is also a possibility of additional reputational damage, particularly during the stage of recovery from an accident.
- Therefore, a subcommittee of the national government is discussing this issue, based not only on scientific perspectives, but also on social perspectives such as reputational damage.

For the TEPCO treated water portal site→

Decommissioning Q&A

6. What connections will there be between decommissioning and life in the area?

Safe and steady implementation of decommissioning is a major precondition of Fukushima reconstruction. We will move forward with the cooperation of local communities.


Many of the on-site personnel are local people


Collaborative Laboratories for Advanced Decommissioning Science (Tomioka Town)


Okuma Analysis and Research Center (Okuma Town)


Naraha Center for Remote Technology Development (Naraha Town)

- The decommissioning work which is a major precondition of Fukushima reconstruction will continue over a long period of 30-40 years, and therefore it is essential that nearby industries supporting decommissioning (lodging facilities, restaurants, etc.), on-site personnel, engineers, and others engage with local people in various ways.
- Decommissioning is also a priority sector in terms of the Fukushima Innovation Coast Scheme, which aims to develop new industrial infrastructure in the coastal area, and local firms are already taking up the challenges of difficult work at the front lines of the decommissioning site. There are also close connections between decommissioning and the local community in various ways, such as the commencement of operations by various research and development centers.
- Against this backdrop, it is expected that decommissioning will move forward with the cooperation of the local community, and that this will further stimulate activities in the local area based on technical skills and other new capabilities cultivated in that process.

7. What will eventually be done with the retrieved fuel debris and radioactive waste?

The government of Japan will consider this, taking responsibility to the end.

- Decommissioning is expected to take thirty to forty years to complete its procedures. Efforts of fuel debris retrieval have been put to reduce its risks continuously and as quickly as possible, with safety as a top priority.
- At present, radioactive wastes are stored appropriately considering the amount generated. There are many uncertain factors such as ascertaining the detailed situations within the reactors and possible advancement in radioactive waste treatment technologies in the future. Thus, further investigations and studies are required to deepen the consideration.
- The national government is responsible for proceeding the examination while taking opinions of local people into consideration.

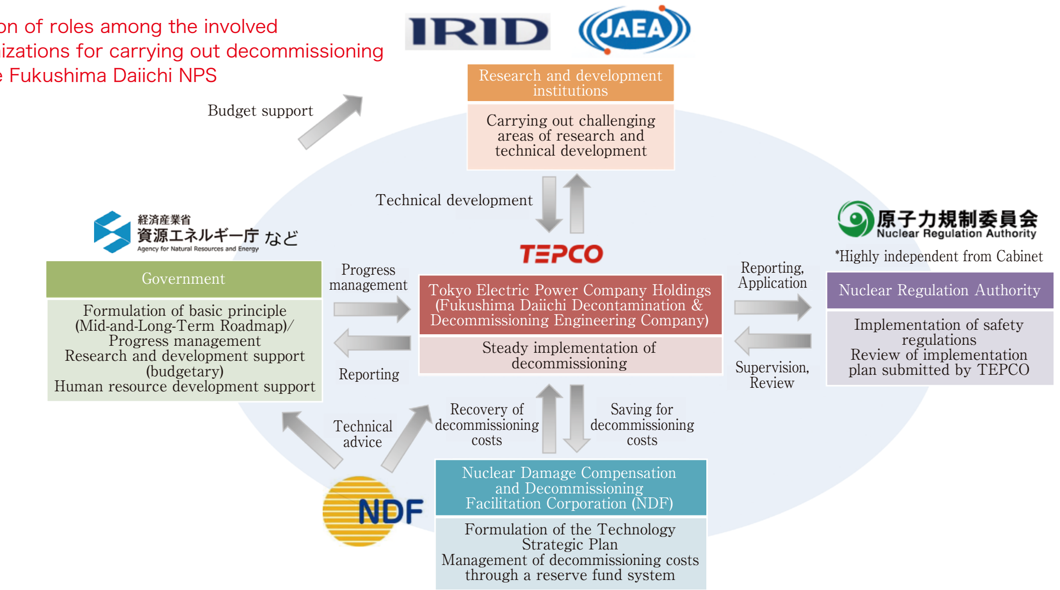
Decommissioning Q&A

8. Who is responsible for decommissioning? Who is in charge of dealing with the task?

TEPCO will be responsible for carrying out decommissioning. The national government will also take a leading role in these efforts.

- To achieve the reconstruction of Fukushima as early as possible, the national government also formulates the overall schedule to ensure decommissioning proceeds safely and steadily, and checks the decommissioning situation based on that schedule. The government also provides support for research and development on challenging technologies.
- This is an unprecedented challenge in the world, and thus will require not only the national government and TEPCO, but also all sorts of capabilities from inside and outside Japan. Therefore, the national government has created the Nuclear Damage Compensation and Decommissioning Facilitation Corporation to bring technical experts together. Furthermore, actions in areas such as technology development and collaboration, have been cooperating with research and development institutions, foreign companies, and other parties. We will continuously cooperate together to further this project.

Division of roles among the involved organizations for carrying out decommissioning of the Fukushima Daiichi NPS



9. Will the process of decommissioning end in 30-40 years for certain?

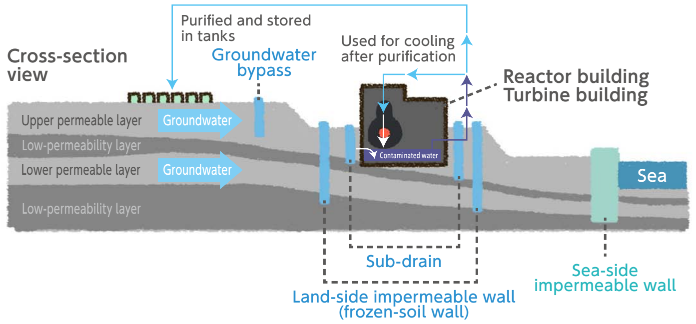
Decommissioning of Fukushima Daiichi is an unprecedented challenge, where difficult and unpredictable work may arise. Therefore, it will be crucial for the many involved parties to work as a team, while always sharing common goals. To ensure the completion of the decommissioning within 30-40 years, the national government will take a leading role in carrying out decommissioning and management of contaminated water.

Management of contaminated water

Due to various efforts we have made so far, significant progress has been made in management of contaminated water as well as in improvement of sea water quality around the plant.
In line with three basic principles, various measures will continue to be taken, in order to further reduce risk.

Mechanism of generation of contaminated water

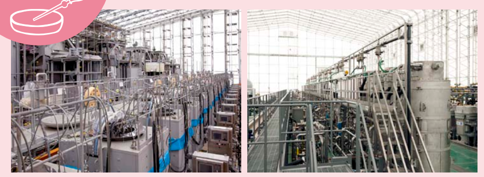
Water for cooling fuel debris touches that debris, and thereby becomes highly contaminated water containing highly concentrated radioactive materials.
New contaminated water is generated due to mixing of this highly contaminated water with groundwater and rainwater that flow into buildings.



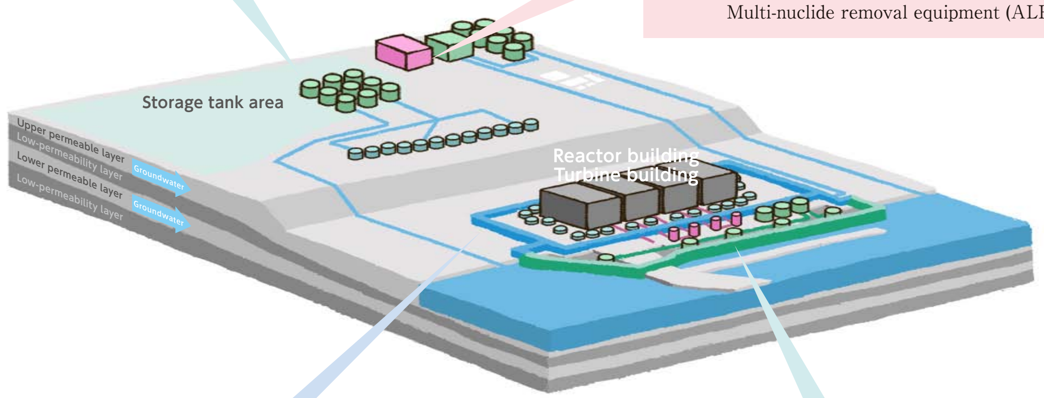
2 Preventing leakage of contaminated water
Changing tanks

Changing from flanged tanks to welded-joint tanks

3 Removing contamination sources
Removing most of the radionuclides except tritium (hydrogen-3)



Multi-nuclide removal equipment (ALPS)



1 Redirecting groundwater from contamination sources
Conceptual drawing of the frozen-soil wall in the ground

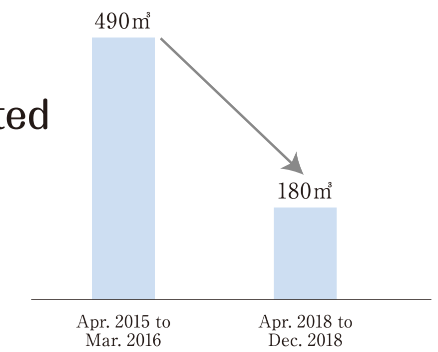
2 Preventing leakage of contaminated water
Sea-side steel impermeable wall

Effectiveness of measures to date

1 Redirecting groundwater from contamination sources

Amount of contaminated water generated is greatly reduced

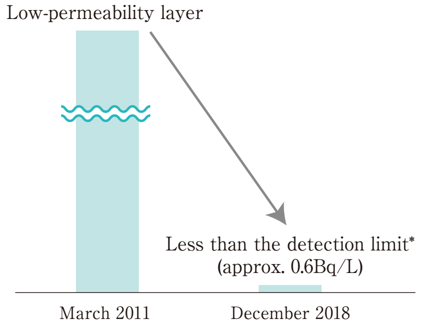
Amount of contaminated water generated (daily average)



2 Preventing leakage of contaminated water

Meets drinking water standard

Concentration of radioactive materials in the sea around the plant

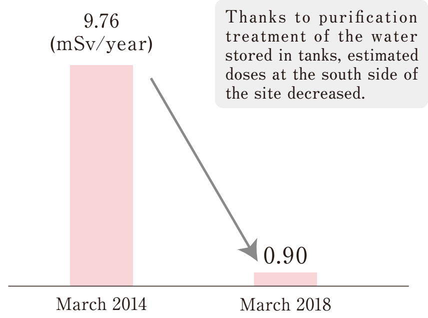


*The concentration of radioactive materials in the sea around the site refers to the Cs-137 level near the south discharge channel
*The international standard for drinking water quality is 10Bq/L

3 Removing contamination sources

A level of 1 mSv/year is attained at the site boundary

Estimated doses from facilities at the south side of the site



Plans for the future

We will work to reduce risk of contaminated water

- We will further reduce the amount of contaminated water generated, which is a source of risk, through continuous implementation of countermeasures for rainwater..
- By 2020, we will remove contaminated water from buildings except reactor buildings, which cooling requires. The removed water will be stored in tanks after purification treatment. This way, we will reduce risk of the contaminated water leakage.

*For information on disposal of water stored in tanks, see Q&A P. 12.

Fuel debris retrieval

The radiation dose rate inside the primary containment vessel is high* and people cannot go inside to work.
Fuel debris retrieval under these conditions is unprecedented challenge in the world. Internal investigations are conducted by using remote control robots to obtain details of the inside situation.

*For example, in internal investigation of the primary containment vessel at Unit 2, a dose rate of a few tens of sieverts per hour has been observed.
The investigation itself is performed via remote control. Some works at outside the primary containment vessel are done by workers with thorough exposure control..
It is also confirmed that there are no effects outside of the site by the investigations.

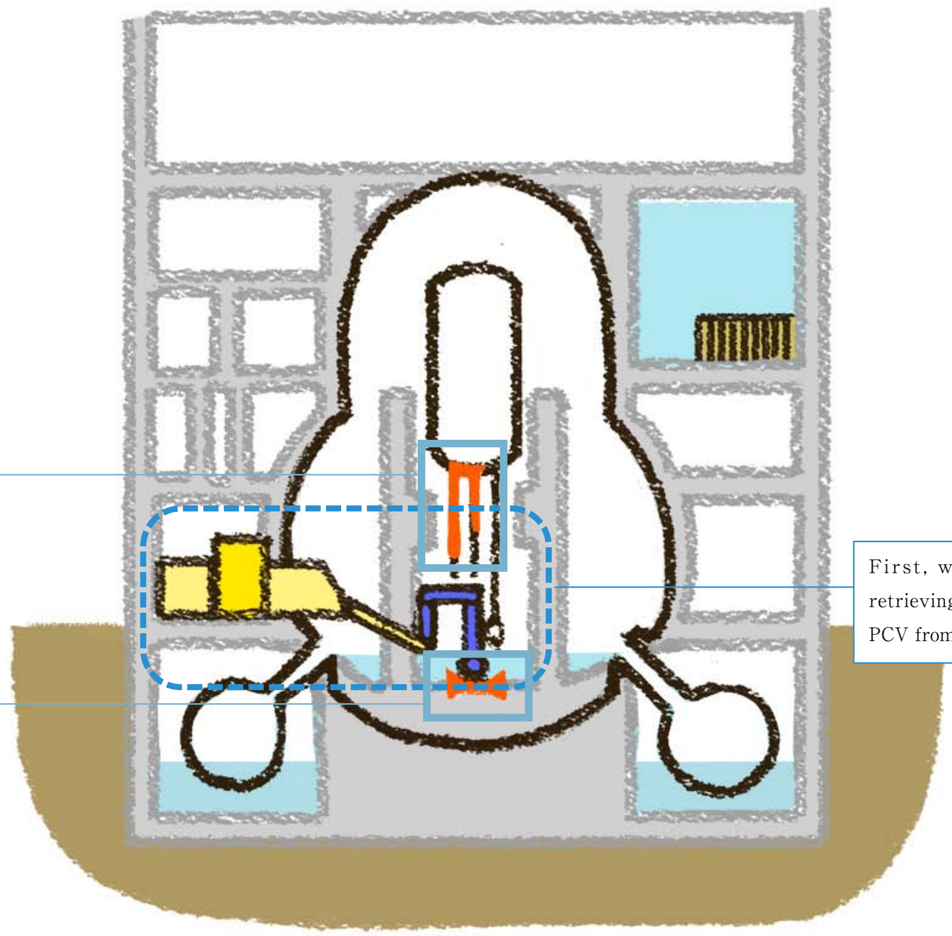
Reports on progress and results of investigation

Investigations that have been made so far have clarified the fuel debris distribution* and the structural damage situation inside the primary containment vessel, and conditions such as the presence of deposits believed to be fuel debris have been confirmed.
In an investigation of Unit 2 carried out on February 2019, we were able to grip deposits believed to be fuel debris and lift it up.

*The distribution situation differs depending on each unit.

In the Three Mile Island Nuclear Generating Station accident, which occurred in the United States in 1979, fuel debris remained in the reactor pressure vessel, and thus retrieval was completed in a little over four years.

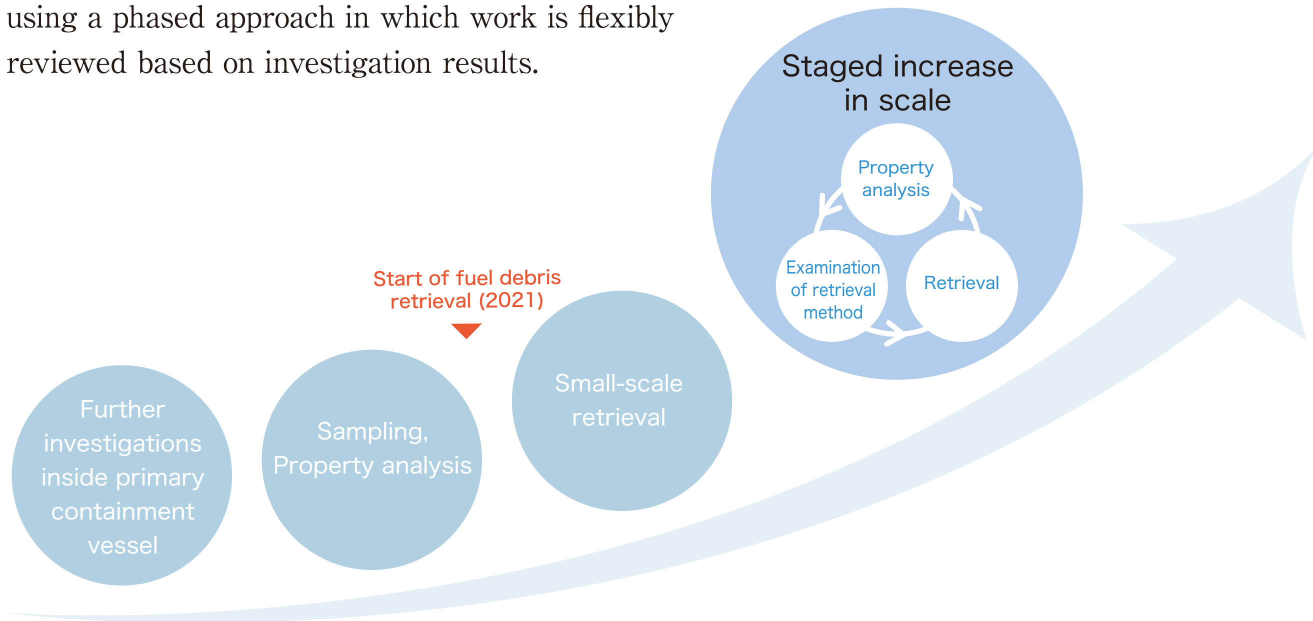

Fuel debris retrieved from the Three Mile Island Nuclear Generating Station

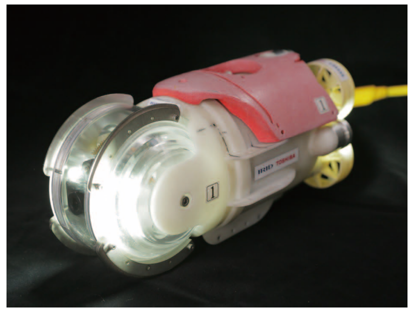


First, we will begin by retrieving fuel debris of the PCV from the side.

Plans for the future

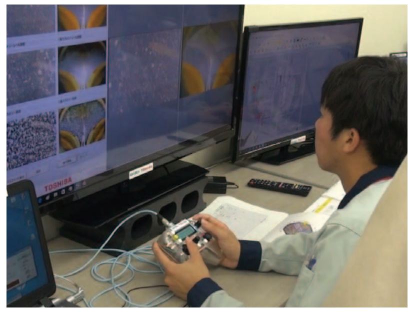
Fuel debris retrieval is an unprecedented task,
and thus it will be carried out with safety as the top priority,
using a phased approach in which work is flexibly
reviewed based on investigation results.

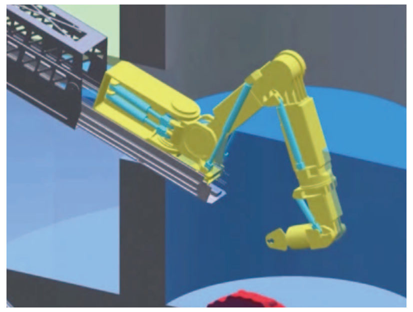



Unit 3 investigation robot


Inside primary containment vessel


Property analysis
*carried out at research facility

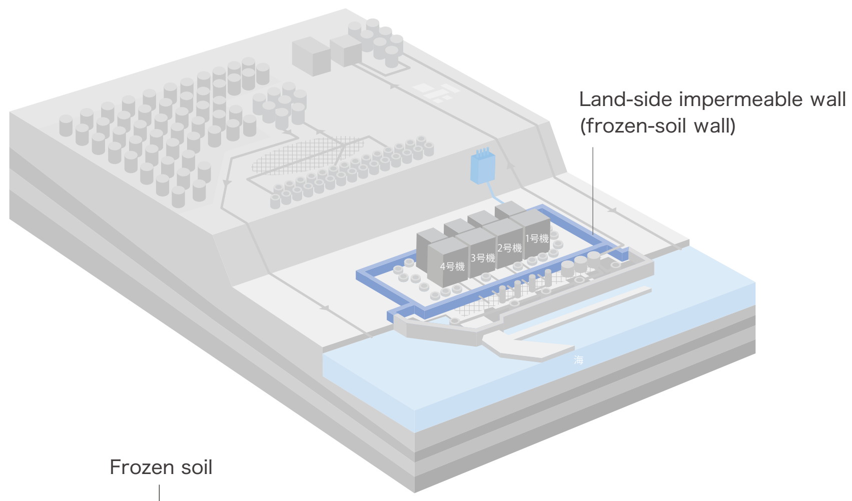

Investigation by remote control

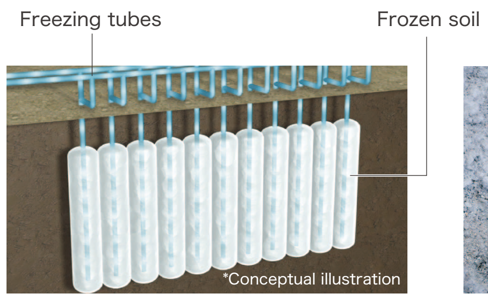

Conceptual image of robotic arm


Robot development

On-site voices — For achieving success in key projects —

Reducing the amount of contaminated water generated through completion of a wall of ice surrounding the buildings



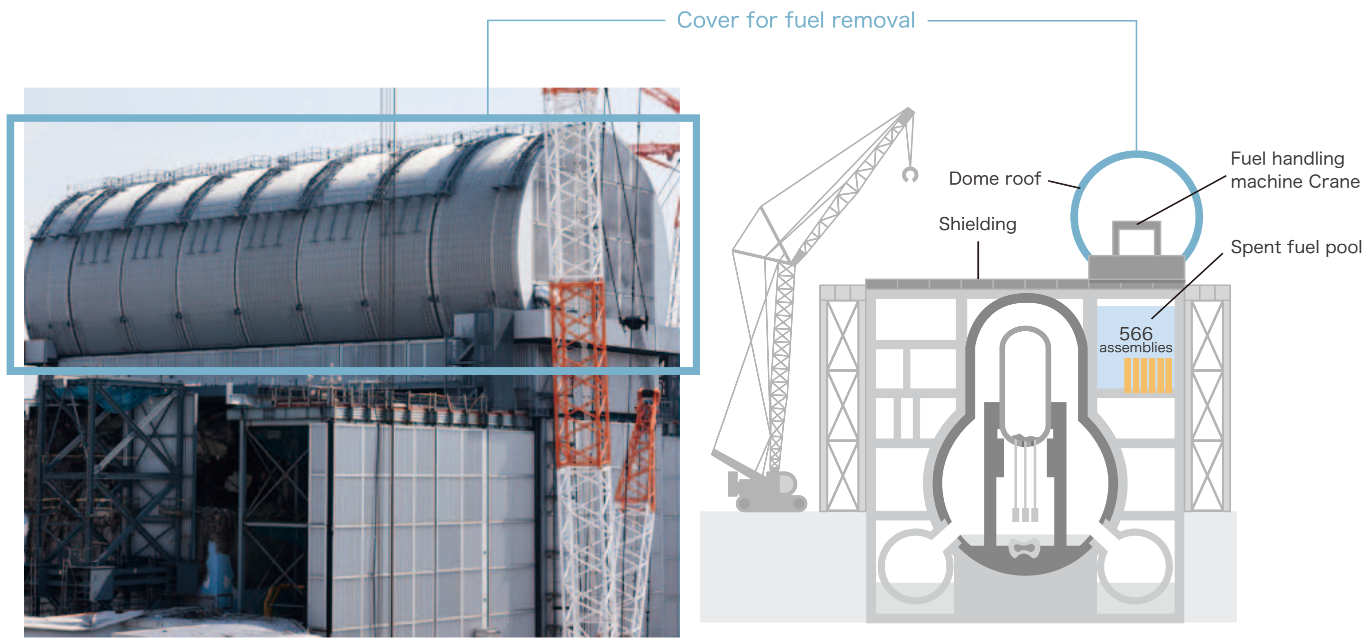


Frozen-soil wall in the ground


Actual situation of freezing
(thermometer reading is -10.6° C)


Freezing tubes

Installation of the cover at Unit 3 has been completed for preventing scattering of radioactive materials and dust, in preparation for fuel removal



Voice from the work site (1)

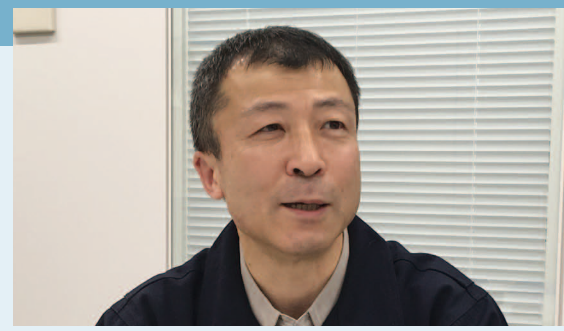
Completion of the land-side impermeable wall (frozen-soil wall) means steadily progress in preparation for decommissioning

Fukushima Daiichi Frozen-soil Impermeable Wall Construction Office,
Tokyo Civil Engineering Branch, Kajima Corporation

Isao Abe

This is a large-scale project with a total length of 1500m and depth of 30m, and the construction period was short due to the need to reduce contaminated water as quickly as possible. The task also required expertise, and thus we made an all-out effort to gather specialized workers from all over Japan. Daily working hours were strictly managed and limited for radiation exposure control. As many as 985 workers engaged in work each day at the peak period. All freezing surrounding the buildings has been completed. The frozen-soil wall is what prevents an increase of contaminated water due to an influx of groundwater to the buildings, and therefore the wall' s performance must be properly maintained. The frozen-soil wall may have an adverse impact on facility structures if the ice expands and becomes too thick. If, conversely, the wall is too thin, it may break. Therefore, the wall must be properly managed to avoid the wall to become too thin or thick. From now on, we will maintain and manage the wall by constantly and carefully checking the condition of the wall, to ensure that there are no problems.

Voice from the work site (2)



The motto at the work site was "for the children who bear the future"

TEPCO Fukushima Architectural Management Office,
Tokyo Architectural Construction Branch, Kajima Corporation

Shinya Okada

It was a challenging period of six years, out of seven and a half years of cover installment, to secure working environment where people could go on top of the building. During that work, we had to repeatedly remove rubble and decontaminate the building. It took a few days to receive the results of the air dose measured after decontamination, and it was a battle with invisible radioactivity: "It seems it' s still intense here. The dose is still high. We need to decontaminate further." Originally, the plan was to complete the work in 6 months, but it ended up taking two and a half years to remove rubble and decontaminate. Installation of the cover took place in the final year. Installation test was repeated a number of times at another site, and verification was done to a point that almost seemed excessive. This is because failure is not acceptable at the site. Thanks to everyone' s support, the installations went smoothly at the work site. A total of a few thousand people have been involved in this work, and I feel it was through the accumulation of small steps that we all took to complete the installation of the cover safely.

Views from the work site

Decommissioning is a huge project that will take 30-40 years.

A large group of people with diverse missions and thoughts are working together in order to accomplish the goal.

Engineer for construction on-site gas station

There are limitations on what a single person can do, but by bringing the strengths of each person together, we can advance little by little toward decommissioning.

Hidemitsu Matsui, Nakazato Contractoro's

On-site shuttle bus driver

The people that work here are all like family. We share our strength by exchanging greetings in the morning and the evening. Let's work in a spirit of harmony so that we can do our best at work.

Yasuhiro Kaibe, Hotoku Bus Co., Ltd.

Remote-controlled robots operator for investigation work

When I'm both physically and mentally exhausted from work, I look at the folded paper crane message cards sent in from all over Japan. That really encourages me.

Katsuji Sasaki, Hitachi Plant Construction, Ltd.

Engineer for building a vehicle gate

As a local company, we will work hard to achieve rebuilding.
Bringing everyone together, we will do our best to achieve decommissioning.

Yoshihiro Umeda, Soshin Co., Ltd.

Engineer for facing (paving work)

I think 1F workers hope to work hard for Fukushima and all of Japan.
We are working hard as a team to finish the task as early as possible.

Daisuke Miura, Maeeda Kensetsu, Ltd.

Engineer for introducing a self-driving EV bus

I want to contribute, even in a small way, to decommissioning by safely transporting the workers who are putting their energy and soul into this project.

Atsuto Suyama, SB Drive Corp.

Manager for scaffolding work

I definitely want people to know more about that many people here doing their best to achieve decommissioning.

Toshiaki Aigasa, Ookigumi Co., Ltd.

Truck driver transporting materials and supplies

I consistently practice "safety confirmation calling." When passing through a traffic signal, even if it is green, I make sure and confirm in mind that "the signal is green, and it is safe to start the car!

Masao Shimazaki, TEPCO Logistics Co., Ltd.

Store manager of Lawson

We provide products in a spirit of supporting the work site, to provide a little comfort for the workers, and help making decommissioning proceed a little quicker.

Masao Kurosawa, Total Food Service, Ltd.

*Excerpts from "1 FOR ALL JAPAN" and other sources. Some of these interviews were conducted a little while ago.

Radiation manager for incineration equipment

Our work is not directly connected with decommissioning, but we do have the same spirit of helping out as much as we could, even in a small way, for reconstruction of local communities and decommissioning of 1F.

Wataru Hasegawa, The Japan Atomic Power Company

Operator for visiters

Our work involves guiding guests through the 1F site, and thus we hope that as many people as possible can visit 1F and see today's situation.

Yui Okada, Tousou Hudosankanri Co., Ltd.

Engineer for freezing-prevention of cooling water

We are moving steadily toward decommissioning.
Sometimes things do not proceed the way we want. We know we are moving forward, without doubt. We will do our best as a team.

Hiroyuki Kaizu, Hanwa Co., Ltd.

Engineer for cover dismantling work at Unit 1

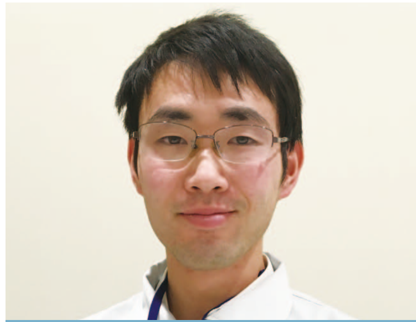
We belong to different companies, and so are the work tasks, but our goal is the same.
We are working hard to achieve decommissioning by cooperating together.

Shoichiro Maruyama, TTK Co., Ltd.

Process manager for draining water from the turbine condenser

In decommissioning work, safety is the most important factor of all.
In our work, we will always put safety first, so our workers can go home with a cheerful smile every day.

Takashi Itatani, Taihei Dengyo Kaisha, Ltd.



Civil servant of Fukushima Prefecture

We hope that as many people as possible will return home to Fukushima through the dissemination of accurate information on the site. I hope I can contribute to solve the problems confronting Fukushima Daiichi NPS, even in a small way.

Takuto Kamishiro, Residing in Naraha Town, Fukushima Prefecture

Manager for sulfuric acid tank removal work

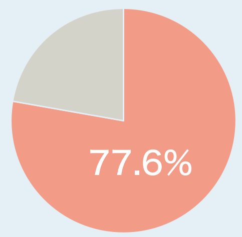
Thanks to the support of everyone from the relevant companies, and many other people.
We will continue to do our best, we can steadily and effectively proceed our work.

Junya Araki, Organo Corporation

Motivation for working at the Fukushima Daiichi NPS

Main reasons

- For the reconstruction of Fukushima (sense of mission)
- To decommission Fukushima Daiichi
- I've been working at Fukushima Daiichi for a long time (feeling of attachment)



Do you feel it is worthwhile working at Fukushima Daiichi NPS?
Civil servant of Fukushima Prefecture

Source: Courtesy of Tokyo Electric Power Company Holdings, Incorporated (TEPCO)

Radiation in daily life

It originally exists in nature, and does radiation exist not only in specific places such as nuclear power stations and hospitals.
Health effects of radiation depend not on the existence of radiation itself but on the amount of radiation we are exposed to.

From the air (Radon, etc.)
0.48mSv

From the soil
0.33mSv

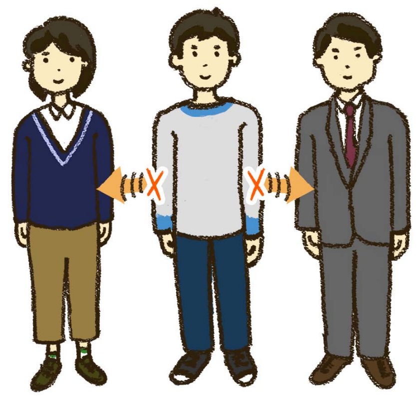
From space
0.3mSv

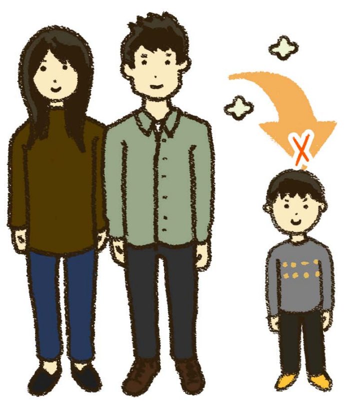
From foods
0.99mSv

Per a year
2.1mSv

Radiation is not infectious

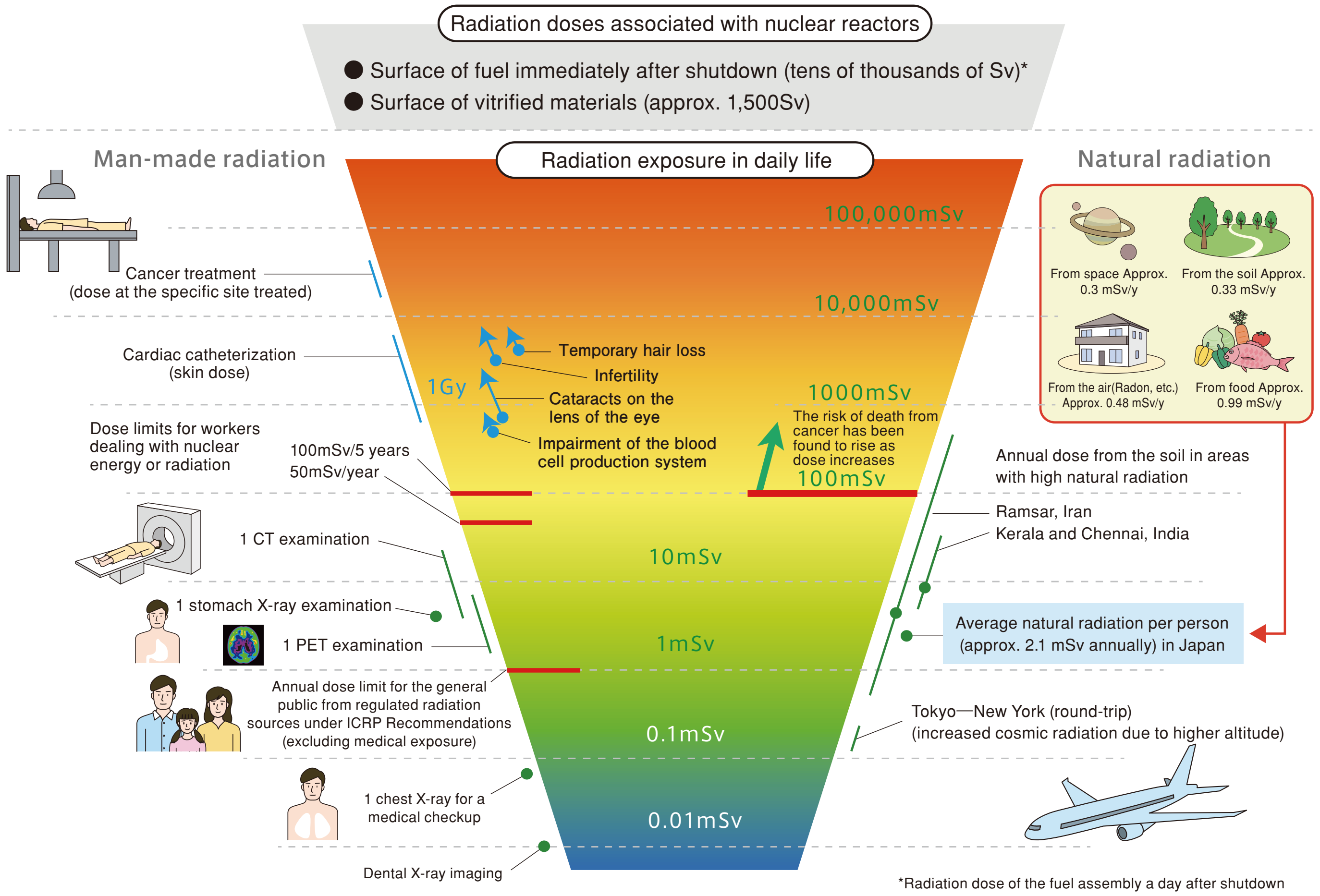
No genetic effects on future offspring due to radiation exposure have been confirmed.





Quick reference chart for radiation exposure

Source: Amended by the Agency for Natural Resources and Energy, based on data from the National Institute of Radiological Sciences, National Institutes for Quantum and Radiological Science and Technology

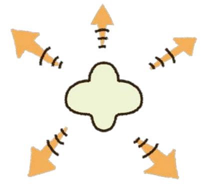


*Radiation dose of the fuel assembly a day after shutdown

What's the difference between radioactive materials, radioactivity, and radiation? What are becquerels and sieverts?

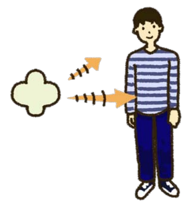
The becquerel (Bq)

is an unit that shows the amount of radioactivity, which is the ability to emit radiation.



The sievert (Sv)

is an unit that shows the degree of impact of radiation on the human body. The imparted effect varies depending on the nuclide, even with the same becquerel value, and therefore it is important to make determinations using sieverts (effective dose) when comparing health effects.



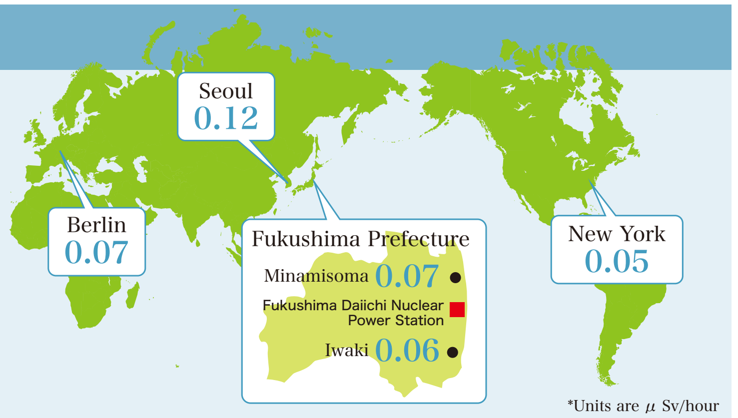
Current Situation of Fukushima

Safety of food from Fukushima Prefecture

Based on the world' s strictest standard of radioactive materials inspection on food and drinking water from Fukushima Prefecture,the safety is ensured and all products that are shipped to the market are within standard values.

Air dose rates in Fukushima

Air dose rates in Fukushima are almost at the same level as those in major cities and at major sightseeing spots in and outside Japan. There is no risk of health problems due to radiation caused by staying in Fukushima.



*Units are μ Sv/hour
Source: Steps for Revitalization in Fukushima (24th edition)

Terminology

① Operating floor ········ P.5
At the uppermost floor of the reactor building, where tasks such as fuel exchange, are carried out using the fuel handling machine during the periodic inspections.

② Noble gas ········ P.9
The group of inert gas elements including helium, neon, xenon, etc. Krypton and xenon are produced during fission of uranium.

③ Air dose rate ········ P.11/P.24
The radiation dose present in a certain space, converted to a value per unit time. This includes more than radiation derived from the accident. It is also affected by radioactive materials derived from nature. Therefore, due to geological difference, there are rate gaps among regions, and weather condition also fluctuates the air dose rate.

④ Reactor pressure vessel ········ P.5
A metal vessel housing fuel, control rods, and other components. This vessel is installed in the primary containment vessel.

⑤ Primary containment vessel ········ P.5/P.6
A steel vessel housing the reactor and an associated cooling system equipment, etc. Its function is to prevent diffusion of radioactive material to the surrounding are in case of fuel damage.

⑥ Sub-drain ········ P.4/P.15
A well installed near a building to lower the level of groundwater around the building, and thereby suppress the influx of groundwater into the building, and efflux of groundwater to the area on the sea-side of the building. Groundwater pumped up from the sub-drain is purified, and discharged after checking that the concentration of radioactive material met the operational targets level.

⑦ Spent fuel ········ P.5/P.9
At the Fukushima Daiichi NPS, removal of spent fuel from reactor buildings of Units 1-3 has been proceeding in order to reduce future risk. (*retrieval from Unit 4 was finished)

⑧ Temperature Limit ········ P.9
In the operating power station, heat is produced in this vessel due to the nuclear fission reaction. Based on the situation at each unit, temperatures are set individually for systems such as the spent fuel pool and bottom of the RPV.

⑨ Radioactive cesium (Cs-134, Cs-137) P.8/P.12/P.16
This is produced during fission of uranium fuel. One of the primary radioactive materials emitted into the environment due to the accident at the Fukushima Daiichi NPS. The half-life of Cs-134 is 2.1 years, and Cs-137 is 30 years. Food safety is measured using radioactive cesium as a standard. (The standard for general foods in Japan is 100Bq/kg.)

⑩ Turbine building ········ P.15
Building housing the turbine generator. At the Fukushima Daiichi NPS, the building is located on the sea-side of the reactor building.

⑪ Dust monitor ········ P.11
This is the temperature which must be maintained for management purposes in the process of decommissioning. The response to be taken in case it exceeds the limit, is established beforehand.

⑫ WHO Guidelines for Drinking-water Quality P.11
Guidelines prescribing numerical targets and measures to be taken to ensure safety of drinking water, set forth by WHO (World Health Organization). A value of 10 becquerel/liter is used as an indicator for cesium-137, and water not exceeding that value is assessed to be suitable for drinking.

⑬ Tritium (T) ········ P.12/P.15
A radioisotope of hydrogen. This is produced not only by nuclear reactors, but also in nature by contact between cosmic rays and the earth's atmosphere. It is present in rivers and the ocean in the form of "tritiated water" combined with oxygen. Tritium is also contained in rainwater, tap water, and water vapor in the atmosphere, but the radiation emitted by tritium has extremely low energy, and thus has little effect on the human body.

⑭ Fuel debris ········ P.5/P.6/P.13/P.15/P.17/P.18
A measuring system for the amount of radioactive materials contained in dust in the air. Work conditions are checked and workers are protected from internal exposure by measuring dust concentration in nuclear facilities, etc.

⑮ Flanged tanks ········ P.15
Tanks in which steel materials are connected together with bolts. To reduce the risk of stored water leaking out, tanks are being switched to welded-joint tanks with higher reliability.

⑯ Blowout panel ········ P.6
Equipment that prevents building damage by automatically failing and releasing pressure when pressure in the reactor building has increased.

⑰ Boric acid water ········ P.9
An aqueous solution of boric acid. Boron has the characteristic of readily absorbing neutrons, and has a function for safety measures to prevent a recriticality condition by boric acid water injection and exploiting its ability to stop a nuclear fission reaction.

⑱ Monitoring post ········ P.11
A system for continuously measuring the radiation dose in the atmosphere. Material formed when fuel melted inside the nuclear reactor due to the accident, and solidified together with concrete and in-core structures such as control rods. This is a source of long-term risk, so various investigations are being conducted in preparation for retrieval.

⑲ Criticality ········ P.9
The condition where fission is ongoing in a sustained chain reaction. In a nuclear power station, electricity is generated by keeping this chain reaction in the nuclear reactor at a certain level (output).

For more information on the Fukushima Prefecture Radiation Monitoring Office→

⑳ Cold shutdown state ········ P.6
A state where temperature at the bottom of the RPV is roughly 100°C or less, emission of radioactive materials is controlled, and medium-term safety of the cooling system can be ensured.

Film on the present decommissioning is available

The current status of the decommissioning work at the Fukushima Daiichi NPS is compiled in an easy-to-understand manner into a several-minute film ("Fukushima Today"), together with evaluations from foreign intellectuals regarding efforts made so far, interviews with workers, and CG illustrations.

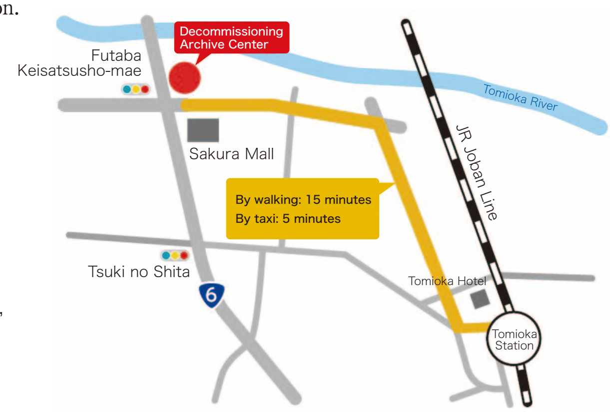
- Management of contaminated water
- Improvement of the Working Environment
- Removal of fuel from the spent fuel pool
- Fuel debris retrieval

Fukushima Today | Search

Please use the QR code to access it

TEPCO Decommissioning Archive Center

Here, people from areas around the power station in Fukushima Prefecture, and general public people can check facts about the accident at the Fukushima Daiichi NPS, the current state of decommissioning work, and other information.



Address: 378 Aza-Chuo, Oaza-Kobama, Tomioka-machi, Futaba-gun, Fukushima
Hours: 9:30 - 16:30 (closed on the third Sunday of every month, and during the year-end and New Year's holidays)
Admission fee: Free (free parking)
Telephone:+81-(0)120-50-2957

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