Important Stories on Decommissioning

Fukushima Daiichi Nuclear Power Station, now and in the future

2017
Introduction

The process of decommissioning TEPCO’s Fukushima Daiichi Nuclear Power Station is currently underway. This involves removing fuel from the buildings and dismantling them.

Expected to take 30 to 40 years to complete, the decommissioning work is proceeding gradually, with cooperation not only from within Japan but also from various other countries. We will continuously reduce the adverse effects of the radioactive materials on the human body and the environment by removing fuel debris (debris that melted and re-solidified during the nuclear accident) and stably storing it.

This booklet provides answers to your questions and worries in the most understandable manner possible, as well as providing information about the situation today and tomorrow at Fukushima Daiichi Nuclear Power Station.
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When the nuclear accident occurred on March 11, 2011, Units 1, 2 and 3 failed to cool their nuclear reactors and the fuel melted, generating a large amount of hydrogen. The hydrogen exploded, damaging the buildings of Units 1, 3, and 4. Decommissioning work is underway at the site of this globally unprecedented accident, with safety the top priority. A continuous injection of water into each unit cools the reactors, keeping the whole unit stable.
When the nuclear accident occurred on March 11, 2011, Units 1, 2 and 3 failed to cool their nuclear reactors and the fuel melted, generating a large amount of hydrogen.

The hydrogen exploded, damaging the buildings of Units 1, 3, and 4.

Decommissioning work is underway at the site of this globally unprecedented accident, with safety the top priority.

A continuous injection of water into each unit cools the reactors, keeping the whole unit stable.
The dismantling of the building’s cover was completed in November 2016, to enable the fuel to be removed from the spent fuel pool (SFP). The next step will be to remove the rubble, while making every effort to prevent the scattering of radioactive material.

The reactor cores at Units 5 and 6 were not damaged because their emergency power supplies didn’t shut down when the accident occurred. Currently, the fuel is being transferred to the SFPs and is being safely stored and managed.

Although a panel on the side of the upper portion of the Unit 2 reactor building was blown off by the hydrogen explosions that occurred at Unit 1, the panel has been replaced to prevent radioactive materials from dispersing. For the future removal of materials such as fuel, the upper portions of the buildings are to be entirely dismantled, while thorough anti-scattering measures are to be taken.

The amount of heat generated by fuel debris at the Fukushima Daiichi Nuclear Power Station has drastically decreased compared to that at the time when the nuclear accident occurred, and this fuel is cooled by having water continuously injected, which keeps all of the units stable.

Currently, gradual but steady progress toward decommissioning is being made.
The amount of heat generated by fuel debris at the Fukushima Daiichi Nuclear Power Station has drastically decreased compared to that at the time when the nuclear accident occurred, and this fuel is cooled by having water continuously injected, which keeps all of the units stable. Currently, gradual but steady progress toward decommissioning is being made.

### Unit 3

The removal of rubble and decontamination/shielding work to facilitate the removal of fuel from the SFP has been completed. Work is now underway to install the equipment required for removal of the fuel.

### Unit 4

All of the fuel from the SFP at Unit 4 was successfully removed by the end of December 2014, which drastically reduced risk. An important milestone towards decommissioning was safely and steadily completed, which marked great progress.
The reactors in Units 1 to 4 are being kept stable. The situation inside each unit is being surveyed in order to locate the fuel debris.

Dismantling of the building cover completed (November 2016)
Installation of fuel removal equipment started (November 2016)
Removal of all fuel completed (December 2014)
Installation of a platform to access the top floor of the building started (September 2016)

To enable workers to safely and steadily carry out their work, the working environment is being improved, while listening to opinions and requests from workers at the decommissioning site.

The current concentration of radioactive materials in the seawater around the site is sufficiently low. Various measures are being taken in order to further reduce risk.

Important Stories on Decommissioning
Efforts toward decommissioning are being made, with the highest priority on safety, so that residents around the site can live with peace of mind.

Urgent Measures to be taken at the Fukushima Daiichi Nuclear Power Station

- Spent fuel removal
- Management of contaminated water
- Improvement of the working environment

Progress at each unit

**Unit 1**
- Number of fuel assemblies: 392

**Unit 2**
- Performance test following assembly of fuel removal equipment

**Unit 3**
- Number of fuel assemblies: 566

**Unit 4**
- Removing fuel from the SFP
- Installation of an access point for survey robots in the Unit 2 primary containment vessel (PCV).

January 30, 2017
Installation of an access point for survey robots in the Unit 2 primary containment vessel (PCV).
Efforts toward decommissioning are being made, with the highest priority on safety, so that residents around the site can live with peace of mind.

**Important Stories on Decommissioning**

Spent fuel removal

Preparations are underway for the removal of fuel from the SFP, as the first step in the removal and storage of fuel debris.

### Progress at each unit

**Unit 1**
- **Number of fuel assemblies:** 392
- Dismantling of the building cover completed (November 2016)

**Unit 2**
- **Number of fuel assemblies:** 615
- Installation of a platform to access the top floor of the building started (September 2016)

**Unit 3**
- **Number of fuel assemblies:** 566
- Installation of fuel removal equipment started (November 2016)

**Unit 4**
- **Number of fuel assemblies:** 615
- Removal of all fuel completed (December 2014)

### Urgent Measures to be taken at the Fukushima Daiichi Nuclear Power Station

**Initiative 1**
- Removal of fuel debris

**Initiative 2**
- Management of contaminated water

**Initiative 3**
- Improvement of the Working Environment

The reactors in Units 1 to 4 are being kept stable. The situation inside each unit is being surveyed in order to locate the fuel debris.

The current concentration of radioactive materials in the seawater around the site is sufficiently low. Various measures are being taken in order to further reduce risk.

To enable workers to safely and steadily carry out their work, the working environment is being improved, while listening to opinions and requests from workers at the decommissioning site.

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The current concentration of radioactive materials in the seawater around the site is sufficiently low. Various measures are being taken in order to further reduce risk.
Progress towards the removal of fuel debris

Current state of the reactor

Fuel debris remains inside the reactors in Units 1 to 3. It is kept stable by means of a continuous stream of water injected into these units. It will be kept safe in the long term by safely removing the debris in due course and reducing the risk posed by radioactive material.

The current situation inside the reactors needs to be properly understood before the fuel debris can be removed. The radiation dose inside the PCV is high, making it impossible for people to enter and carry out surveys, so remote-controlled robots and other instruments are being used instead. Meticulous preparations will continue to be carried out, with safety as the top priority, to facilitate the removal of fuel debris.

The reactors are equipped with various measuring instruments. These are used to monitor temperature, pressure, and the volume of water injected, to ensure that the reactors are being kept stable. Dust monitors are used to check that radioactive material is not being scattered. The data from these instruments is published on TEPCO’s website.

The effects of the radioactive material discharged from the reactor buildings have been assessed as being low at the boundary of the power station site. The air dose is monitored constantly by monitoring posts installed around the site boundary.

*There is no fuel debris in Unit 4, as it was shut down for periodic inspection at the time of the accident.

**Initiative 1**

**Removal of fuel debris**

Various robots are being developed to survey the situation inside the PCV.
Progress towards the removal of fuel debris

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Endoscope Remote-controlled robot

Endoscope

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Endoscope
State of the fuel debris

Currently (as of February 2017), the floor temperatures of the pressure vessels are about 14-18°C, while the water accumulated within the containment vessels is around 17-21°C, so we can say that the fuel debris has been cooled and solidified by the continuous injection of water. A “scorpion-like robot” and other devices were used to survey their interiors in February 2017. This series of investigations enabled the situation near the pressure vessels to be checked directly for the first time and a great deal of information was gathered, including data on temperature and radiation dose.

**Q** Hasn’t the fuel melted through the floor into the ground?

Should nuclear fuel melt through to the area outside the containment vessel and react with concrete, specific gases are released. These gases have not been detected to date, so the fuel debris is presumed to have accumulated within the containment vessels.

**Development of technology for removing fuel debris**

Remote control technologies and cutting technologies to facilitate the safe removal of fuel debris are being developed in parallel with efforts to survey the situation inside the reactors.

**Next generation initiatives**

The younger generation will also have a vital role to play in de-commissioning in the medium to long term.

In December 2016, the First Creative Robot Contest for Decommissioning was held at the Naraha Remote Technology Development Center. 15 teams from 13 technical colleges across Japan competed against each other in demonstrating how their robots performed under the kind of demanding conditions faced in decommissioning work.

It is hoped that manufacturing the robots will not only give students the chance to enhance their creativity and problem-solving abilities, but also foster interest in decommissioning among those who will be the engineers of the future.
In the nuclear reactors, the fuel debris continues to be cooled by having water poured over it (だけ). This water is mixed with the groundwater flowing into the buildings, which is the reason that contaminated water is being generated inside the reactor buildings (だけ).

Currently, water levels in and out of the buildings are controlled so as to prevent contaminated water outflow from the reactor buildings to areas outside the buildings. Therefore, contaminated water is not leaking from the buildings.

Various measures are being taken in order to reduce the exposure for workers and to prevent any further spread.

Isolating groundwater from contamination sources

Preventing leakage of contaminated water

Removing contamination sources

The groundwater inflow into the reactor buildings has been reduced in order to reduce further generation of contaminated water.

Groundwater around the site is being pumped away before contact, and impermeable walls is being installed around the buildings.

To prevent the leakage of contaminated water, an impermeable steel wall has been constructed on the sea side of the buildings (completed in October 2015). The concentration of radioactive material in the sea has fallen considerably.

Multi-nuclide removal equipment (ALPS) and a number of other systems are used to treat the contaminated water that has accumulated inside the reactor buildings.

The concentration of radioactive materials in the seawater near the site is now sufficiently low. Nonetheless, to further reduce risk, various measures are being implemented based on the following three uncompromising basic principles.

Contaminated water

Three principles concerning management of contaminated water

Treated and stored in tanks

Treated and used for cooling

Fuel debris

Groundwater

Contaminated water

Reactor building

Turbine building

Impermeable steel wall

Initiative 2

Management of contaminated water

November 21, 2016

[Checking the land-side impermeable walls] State Minister of Economy, Trade and Industry, Takagi checks how the freezing of the walls is progressing
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- Isolating groundwater from contamination sources
- Preventing leakage of contaminated water
- Removing contamination sources

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**Three principles concerning management of contaminated water**

1. **Isolating groundwater from contamination sources**
   - The groundwater inflow into the reactor buildings has been reduced in order to reduce further generation of contaminated water. Groundwater around the site is being pumped away before contact, and impermeable walls are being installed around the buildings.

2. **Preventing leakage of contaminated water**
   - To prevent the leakage of contaminated water, an impermeable steel wall has been constructed on the sea side of the buildings (completed in October 2015). The concentration of radioactive material in the sea has fallen considerably.

3. **Removing contamination sources**
   - Multi-nuclide removal equipment (ALPS) and a number of other systems are used to treat the contaminated water that has accumulated inside the reactor buildings.
Initiative 2
Management of contaminated water

Efforts made regarding contaminated water

**Principle 1**
Isolating groundwater from contamination sources

**Principle 2**
Preventing leakage of contaminated water

**Isolating groundwater from contamination sources**

**Impermeable walls of frozen soil (land side)**

Groundwater flows into the buildings are prevented by using walls created by freezing soil in the ground around the buildings.

**Pumping up groundwater (groundwater bypass and sub-drains)**

Wells (sub-drains) near the buildings and wells installed in the hills (groundwater bypass) pump up groundwater, minimizing inflows of groundwater into the buildings and the quantity of contaminated water generated.

**Preventing leakage of contaminated water**

**Impermeable steel wall (sea side)**

A 750-meter-long wall of 30-meter-tall steel pipes was constructed on the sea side of Units 1 through 4, which has been gradually improving the water quality in the surrounding sea area.

**Installation of additional water tanks**

Water tanks for storing contaminated water are being systematically installed to ensure adequate storage capacity.

**Changes in the concentration of radioactive material in seawater within the harbor (before and after completion of the impermeable steel wall)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Volume of groundwater flowing into the buildings</th>
<th>Concentration of radioactive material in the sea around the plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before completion (Sept. 15 to 19)</td>
<td>Approx. 200 m³</td>
<td>Str-90: 140 Bq/L, Cs-137: 16 Bq/L</td>
</tr>
<tr>
<td>After completion (Oct. 26 to 30)</td>
<td>Approx. 200 m³</td>
<td>Str-90: 0.3 Bq/L, Cs-137: 2.6 Bq/L</td>
</tr>
</tbody>
</table>

*The concentration of radioactive material in the sea around the plant refers to cesium-137 level near the south discharge channel. (Oct. 25 to 31, 2016)*

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**What is tritium?**

The tritium (hydrogen-3) in the water stored in the tanks is also found in the natural world, including in the tap water we drink and even in our own bodies.

The question of how to handle this water is currently being considered very carefully in comprehensive terms, taking into account not only technical, but also social viewpoints.

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October 26, 2015

Impermeable steel wall completed (installation completed on Oct. 26, 2017)

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**Secondary cesium absorption apparatus (SARRY)**

**Mobile strontium-removal equipment**

**Multi-nuclide removal equipment (ALPS)**

**High-performance multi-nuclide removal equipment**

**Additional multi-nuclide removal equipment**

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**Conceptual drawing of the frozen soil wall**

Freezing ducts

Sub-drain near the buildings

Groundwater drain

Reactor building

Turbine building

Land-side impermeable wall

Seawater pipe trench

Impermeable steel wall

Mountain side: freezing underway

Sea side: freezing completed

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**October 25, 2016**

Impermeable steel wall completed (installation completed on Oct. 26, 2017)

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**Installation completed on Oct. 26, 2017**

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**Approx. 400 m³**

**Approx. 10,000 Bq/L**

**Less than the detection limit**

(0.7 Bq/L)
The management of contaminated water has progressed significantly through the efforts to date and the water quality in the surrounding sea area has been further improved. Contaminated water management continues in order to completely solve the contaminated water issue.

### Principle 3

**Removing contamination sources**

- **Contaminated water**
- **Removal of cesium and strontium**
- **Removal of radioactive materials other than tritium**

Radioactive material removal equipment

### Effects of measures to date

**Volume of groundwater flowing into the buildings**

<table>
<thead>
<tr>
<th>Month</th>
<th>Volume (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2011 to May 2014</td>
<td>Approx. 400 m³</td>
</tr>
<tr>
<td>Sept. 2015 to Jan. 2017</td>
<td>Approx. 200 m³</td>
</tr>
</tbody>
</table>

**Concentration of radioactive material in the sea around the plant**

<table>
<thead>
<tr>
<th>Month</th>
<th>Concentration (Bq/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 2011</td>
<td>Approx. 10,000 Bq/L</td>
</tr>
<tr>
<td>October 2016</td>
<td>Less than the detection limit* (0.7 Bq/L)</td>
</tr>
</tbody>
</table>

*The concentration of radioactive material in the sea around the plant refers to cesium-137 level near the south discharge channel. (Oct. 25 to 31, 2016)*

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**What is tritium?**

The tritium (hydrogen-3) in the water stored in the tanks is also found in the natural world, including in the tap water we drink and even in our own bodies.

- **Tap water**
- **Natural levels within the human body**
  - Several tens (Bq/L)

The question of how to handle this water is currently being considered very carefully in comprehensive terms, taking into account not only technical, but also social viewpoints.
At the Fukushima Daiichi Nuclear Power Station, radiation dose have decreased thanks to measures including decontamination and paving of the site. By March 2016, workers were able to wear general working clothes to carry out their duties on around 90% of the site. Lighter equipment reduces the workload, improving the quality of their work and reducing injuries on site. The number of cases of heat stroke fell to just four in FY2016, due to more thorough precautions against heat stroke.

Emergency physicians are on duty at the emergency medical clinic around the clock, so that workers can receive immediate medical attention in the event of any medical problems or accidents. The clinic is also equipped with ultrasound scanners and AEDs. In addition, a follow-up system has been put in place to ensure that workers have taken the necessary steps, such as being examined by a medical institution, if their medical checkup revealed a need for more in-depth investigation or treatment.

A large nine-story rest house, which can serve 1,200 people, has been in operation since May 31, 2015. It allows workers to eat, rest, and have meetings near the working site, leading to the improvement of both worker health and quality of work.

The working environment has been improved to the extent that workers can now go about their tasks wearing ordinary clothing.
On-site decommissioning work was supported by around 6,000 workers, about half of whom are locals. Improvements in work safety are being implemented thanks to information from workers’ views.

**Various efforts made to improve the working environment**

Efforts are being made to provide a more comfortable working environment, for example, through decontamination and other efforts to expand the area in which a full-face mask is not required, as well as by increasing the number of facilities where workers can eat and rest on the site.

**Lighter equipment for workers**

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Lighter equipment reduces the workload, improving the quality of their work and reducing injuries on site.

**Large rest house is in operation**

A large nine-story rest house, which can serve 1,200 people, has been in operation since May 31, 2015. It allows workers to eat, rest, and have meetings near the working site, leading to the improvement of both worker health and quality of work.

**Big reduction in cases of heat stroke**

The number of cases of heat stroke fell to just four in FY2016, due to more thorough precautions against heat stroke.

**Improvement of the medical system**

Emergency physicians are on duty at the emergency medical clinic around the clock, so that workers can receive immediate medical attention in the event of any medical problems or accidents. The clinic is also equipped with ultrasound scanners and AEDs. In addition, a follow-up system has been put in place to ensure that workers have taken the necessary steps, such as being examined by a medical institution, if their medical checkup revealed a need for more in-depth investigation or treatment.
At the time of the accident, the accident cut off the supply of water to the reactors. As a result, the fuel generated heat, hydrogen was produced, and explosions occurred. TEPCO’s website publishes information about the situation inside the reactors, such as temperature, pressure, and the concentration of noble gases being produced inside the containment vessels. Water is injected continuously.

Is there a risk of recriticality or another explosion? There’s high-dose fuel debris inside the containment vessels. Doesn’t it affect the surrounding areas or the workers? Should a reactor go critical, the production of xenon-135 and other noble gases increases. Accordingly, the production of noble gases inside the containment vessels is monitored around the clock. The volume of noble gases being produced is stable, which means that the reactors have not reached recriticality. The possibility of recriticality is believed to be exceedingly low, but boric acid solution equipment has been installed to suppress nuclear fission in the unlikely event of criticality.

The fuel debris generates much less heat than it did at the time of the accident. A continuous injection of water cools each unit, keeping all of them stable. Steel walls and concrete inside the containment vessels act as a shield. There have been no significant changes in the figures recorded at the monitoring posts around the site, which means that radioactive material is not affecting outside areas. Workers’ exposure dose is monitored even when carrying out tasks in adequately shielded environments around the buildings.

November 7, 2014
“Hoping for a swift resolution to the nuclear accident” This wish, shared by so many people, provides daily inspiration for those working at the site.
Q Is there a risk of recriticality or another explosion?

A Should a reactor go critical, the production of xenon-135 and other noble gases increases. Accordingly, the production of noble gases inside the containment vessels is monitored around the clock. The volume of noble gases being produced is stable, which means that the reactors have not reached recriticality. The possibility of recriticality is believed to be exceedingly low, but boric acid solution equipment has been installed to suppress nuclear fission in the unlikely event of criticality.

The fuel debris generates much less heat than it did at the time of the accident. A continuous injection of water cools each unit, keeping all of them stable.

Q There’s high-dose fuel debris inside the containment vessels. Doesn’t it affect the surrounding areas or the workers?

A Steel walls and concrete inside the containment vessels act as a shield. There have been no significant changes in the figures recorded at the monitoring posts around the site, which means that radioactive material is not affecting outside areas. Workers’ exposure dose is monitored even when carrying out tasks in adequately shielded environments around the buildings.
Have any preparations been made in case of an earthquake or tsunami?

Computer analysis and other research has confirmed that reactor buildings and other important buildings are sound and would not collapse in the event of an earthquake or tsunami similar to or bigger than the Great East Japan Earthquake. To guard against a tsunami, a temporary seawall has been installed and work is underway to close off all openings into the buildings, to ensure that a tsunami could not penetrate them. In addition, a back-up power supply has been put in place, in the form of vehicle-mounted generators located in an area 35m above sea level, out of reach of a tsunami, while the site’s fire trucks would be able to inject water into the buildings if needed. Drills are repeatedly carried out to ensure that cooling of the reactors could continue, even in the unlikely event of an emergency.

To be prepared in case of an emergency, Fukushima Prefecture has formulated a Region-wide Evacuation Plan covering 13 municipalities* around Fukushima Daiichi Nuclear Power Station, which details the methods of communicating evacuation information and the evacuation sites and routes to be used by each municipality.

Each municipality is using the prefecture’s plan as the basis for their own evacuation plans, which describe the municipalities to which each district is to evacuate, as well as providing information about evacuation facilities, methods, and routes, thereby putting in place a multilayered system.

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 plant.

* Iitate Village, Iwaki City, Okuma Town, Katsurao Village, Kawauchi Village, Kawamata Town, Tamura City, Tomioka Town, Namie Town, Naraha Town, Hirono Town, Futaba Town, Minamisoma City (alphabetical order)
Securing power resources in case of emergency

We have secured multiple power resources including power supply vehicles and gas turbine vehicles in preparation for the loss of electric power. These vehicles supply water injection equipment with electricity in cases of emergency.

A drill for injecting water
A power supply vehicle
Fire engines

*An assessment of the situation concluded that, in the unlikely event that cooling was suspended and the temperature rose, it would take two days or more for radioactive substances (cesium) to be released into the environment in significant quantities.

Iitate Village, Iwaki City, Okuma Town, Katsurao Village, Kawauchi Village, Kawamata Town, Tamura City, Tomioka Town, Namie Town, Naraha Town, Hirono Town, Futaba Town, Minamisoma City (alphabetical order)

*Data from the monitoring posts from December 21, 2016 through January 24, 2017 (based on hourly values calculated from measurements taken at 10-minute intervals)

Testing the dust retention effect of an anti-scattering agent

The anti-scattering agent is capable of preventing scattering up to a mean wind speed of 25.0m/s and an instantaneous wind speed of 50.0m/s.

Testing the dust retention effect of an anti-scattering agent

Positions of monitoring posts and dust monitors around the power plant site boundary

Q: Isn’t the power plant scattering radioactive material into the air?

A: Every effort is being made to prevent the scattering of radioactive material during the removal of the building covers and the removal of rubble from the upper portions of the buildings in preparation for the removal of fuel from Units 1-3. Paving (facing) of the site has also been carried out, minimizing the scattering of radioactive material attached to gravel, vegetation, and soil.

Monitoring posts and dust monitors have been installed around the boundaries of the power plant site, which monitor levels around the clock. The air dose rate as measured by these is around 0.503-2.114μSv/hour*. 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 material in dust.

*Data from the monitoring posts from December 21, 2016 through January 24, 2017 (based on hourly values calculated from measurements taken at 10-minute intervals)
Are radioactive materials still draining from the power plant into the sea?

The concentration of radioactive materials in the surrounding seawater close to the power plant (outside the port) is sufficiently low, even when compared to the World Health Organization (WHO) Guidelines for Drinking-water Quality, which set out international standards for drinking water. In addition, an International Atomic Energy Agency (IAEA) assessment concluded that the marine environment is stable. The concentration of radioactive material within the harbor has decreased, due to the construction of an impermeable steel wall on the sea side of the plant, which was completed in October 2015.

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

Since 2012, all rice produced in Fukushima Prefecture has been inspected. Around 52 million bags of rice have been inspected to date and not a single bag produced since 2015 has detected higher than the standard. Foods such as beef, fruit and vegetables are also inspected and, other than some wild mushrooms, not a single item produced since 2015 has detected higher than the standard. Items that exceed the standard are not shipped, so only items that test lower than the standard are distributed to market.

As of February 1, 2017, trial fishing and sale* of 97 species of Fukushima marine produce was underway, including Japanese sandlance, olive flounder, and conger eel. The marine produce caught is tested and not a single item has tested higher than Japan’s strict standards (1/10 of the level of international standards) since April 2015. Fukushima Prefectural Federation of Fisheries Co-operative Associations also conducts voluntary testing and does not ship or sell any item that exceeds its own standards, which are even more rigorous than the Japanese national standards.
Is it safe to eat food produced in Fukushima Prefecture?

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<table>
<thead>
<tr>
<th>Food category</th>
<th>Standard (Bq/kg)</th>
<th>Japan</th>
<th>International Food Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>General foods</td>
<td>100</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Infant foods</td>
<td>50</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>50</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Drinking water</td>
<td>10</td>
<td>1000</td>
<td></td>
</tr>
</tbody>
</table>

As of February 1, 2017, trial fishing and sale* of 97 species of Fukushima marine produce was underway, including Japanese sand lance, olive flounder, and conger eel. The marine produce caught is tested and **not a single item has tested higher than Japan’s strict standards (1/10 of the level of international standards) since April 2015.** Fukushima Prefectural Federation of Fisheries Co-operative Associations also conducts voluntary testing and does not ship or sell any item that exceeds its own standards, which are even more rigorous than the Japanese national standards.

* Trial fishing and sale: Starting in March 2011, the local fishing industry in Fukushima Prefecture voluntarily refrained from fishing. Fish species from waters where radioactive material tests on marine produce have confirmed that levels are consistently below the standard are now subject to fishing and sale on a trial basis.

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**Results of seawater analysis around Fukushima Daiichi Nuclear Power Station**

**Percentage of samples exceeding the standard value of 100 Bq/kg**

![Graph showing percentage of samples exceeding the standard value of 100 Bq/kg](graph.png)
Basic information about radiation

Radiation around us

In our daily lives, we receive various types of radiation. Not only does radiation exist in specific places such as nuclear power plants and hospitals but it also exists in nature.

Quick reference chart for radiation exposure

Radiation dose associated with nuclear reactors
- Surface of fuel immediately after shutdown (tens of thousands of Sv)*
- Surface of vitrified packages (approx. 1,500Sv)

Man-made radiation
- Cancer treatment (dose at the specific site treated)
- Cardiac catheterization (skin dose)
- Dose limits for workers dealing with nuclear energy or radiation
  - 100mSv/5 years
  - 50mSv/year

Natural radiation
- From space: Approx. 0.3mSv
- From the earth: Approx. 0.33mSv
- From food: Approx. 0.99mSv

Radiation exposure in daily life

- Radiation dose of the fuel assembly a day after shutdown
- Average natural radiation per person (approx. 2.1mSv annually) in Japan
- Tokyo—New York (round-trip) (increased cosmic radiation due to higher altitude)

Dental imaging
- 1 CT examination
- 1 stomach X-ray examination
- 1 PET examination
- Annual dose limit for the general public from regulated radiation sources under ICRP Recommendations (excluding medical exposure)
- 1 chest X-ray for a medical checkup

*Radiation dose of the fuel assembly a day after shutdown
Radiation's impact on the human body

Radiation can damage DNA in cells as it travels through the cell. Such damage is repaired by the built-in systems in one's body. Such systems can repair minor damage, and the cells then recover to their original state. If the repair is inadequate, the possibility of genetic mutation exists, and cancer cells may be generated. However, cancer isn't necessarily always generated.

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

What's a becquerel (Bq)?
It is a unit that shows the amount of radioactivity, which is the ability to emit radiation.

What's a sievert (Sv)?
It is a unit that shows the degree of impact of radiation on the human body.

Characteristics of radioactivity
The power to emit radiation, or radioactivity, gets weaker as time passes.

Radioactivity gets weaker as time passes, and the time that it takes for radioactivity to decrease to half of its original level is called the half-life of a substance. There are two types of half-lives: physical half-life and biological half-life.

Physical half-life
This is the period of time that it takes for the amount of the original material to decrease by half by emitting radiation, as radioactive materials change into different atomic nuclei.

- All atomic nuclei initially have the power to emit radiation.
- Half of the atomic nuclei lose their power in the first two years.
- Half of the remaining atomic nuclei lose their power in the following two years.

Half-life differs depending on the radioactive materials. Cesium-134: 2 years; Cesium-137: 30 years.

Biological half-life
This is the period of time that it takes for radioactive materials that have been taken into one's body to decrease by half through excretion from the body via mechanisms such as metabolism.

Cesium-134, Cesium-137
- 1 day after intake
  - 9 days: 38 days
  - 30 days: 70 days
  - 50 days: 90 days
Fukushima Today video clip

The *Fukushima Today* video clip provides a simple introduction to the current situation at Fukushima Daiichi Nuclear Power Station from a variety of angles, including the progress of decommissioning work, improvements to the working environment for decommissioning workers, support for the citizens of evacuation order areas, and efforts to ensure food safety.

*The video is available with Japanese and English subtitles.*

http://www.meti.go.jp/earthquake/nuclear/hairo_osensui/