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# Japan's Fukushima nuclear plant begins fuel rod removal



Tepco has been preparing for months to remove fuel rods at Fukushima

Workers at Japan's stricken Fukushima nuclear plant have begun removing fuel rods from a storage pond at the Unit 4 reactor building.

The delicate operation is seen as a necessary step in stabilising the site.

It will take more over two days to remove the first 22 fuel rod assemblies, plant operator Tepco says.

Overall, more than 1,500 assemblies must be removed in what correspondents describe as a risky and dangerous operation set to take a year.

Experts say hydrogen explosions after the earthquake and tsunami in March 2011 have made the current storage facility vulnerable to further tremors.

The fuel rod assemblies are four-metre long tubes containing pellets of uranium fuel, and the fear is that some may have been damaged during the disaster.

## Removing fuel rods

- The fuel rods - 4m-long tubes containing pellets of uranium fuel - are in a precarious state in the Unit Four storage pool
- The rod assemblies will be lifted out in batches of 22 in casks filled with water, using a crane - each batch will take 7-10 days
- Two critical issues are whether the rods were damaged during the disaster and so are likely to leak, and whether the casks remain watertight so the rods have no contact with air
- The fuel rods will be deposited into a new "common" pool with a cooling system

- [Japan to remove Fukushima fuel rods](#)

When the tsunami struck, water knocked out cooling systems to three of Fukushima's reactors, which went into a state of partial meltdown.

Unit 4 was undergoing maintenance, so all of its fuel rods were being stored. But a build-up of hydrogen triggered an explosion in Unit 4, damaging its structure.

'Important process'

The removal process, which has been preceded by months of repair work and planning, began on Monday afternoon.

"At 15:18 [06:18 GMT], we started to pull up the first fuel assembly with a crane," a spokesman for Tepco (Tokyo Electric Power Company) said.

A recently-installed crane is being lowered into the pool and hooked onto the assemblies to place them inside a cask.



AFP Removal of fuel

rods from the storage pond is a key step in the decommissioning



AFP Tepco has conducted

trial runs of the process, which involves large casks

The fuel rods will then be deposited into a more secure storage pool with a cooling system.

Experts say it is vital that the casks are watertight so the rods have no contact with air - which

risks overheating and possible contamination.

Yoshihide Suga, Japan's top government spokesman, said he hoped the operation would be done properly.

"We hope that this [process] will be conducted in a manner that will not disturb local residents, and that the removal will be done on schedule, properly and safely," he said.

Tepco spokesman Masayuki Ono called the operation "a very important process in moving ahead with the plant's decommissioning".

Nuclear Regulation Authority Chairman Shunichi Tanaka has warned that rubble from the blast in the pool could pose a problem, Kyodo news agency reported.

"The fuel has to be handled very carefully. There is a need to make sure that a fuel assembly is not pulled out (from the fuel rack) by force when it gets stuck because of the rubble," Kyodo news agency quoted him as saying.

The Fukushima nuclear power plant has suffered a series of setbacks in recent months, including a series of toxic water leaks and worker errors.

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Article written by [David Shukman](#) Science editor

## Fukushima nuclear plant set for risky operation



More than 1,000 fuel rod assemblies need to be removed from a building that was badly damaged following the tsunami

A task of extraordinary delicacy and danger is about to begin at Japan's Fukushima nuclear power station.

Engineers are preparing to extract the first of more than 1,000 nuclear fuel rods from one of the wrecked reactor buildings.

This is seen as an essential but risky step on the long road towards stabilising the site.

The fuel rods are currently in a precarious state in a storage pool in Unit 4.

This building was badly damaged by an explosion in March 2011 following the Great Tohoku earthquake and tsunami.

Moving the rods to safety is a high priority but has only become possible after months of repair work and planning.

One senior official told me: "It's going to be very difficult but it has to happen."

The fuel rods are four-metre long tubes containing pellets of uranium fuel and the fear is that some may have been damaged during the disaster.

When the tsunami struck the Japanese coast, the flood swamped the diesel generators providing back up power to the reactors. Three of the reactors went into a state of partial meltdown.

By coincidence, Unit 4 was undergoing maintenance, so all of its fuel rods were being stored. But the meltdown of a neighbouring reactor led to a build-up of hydrogen which is believed to have led to the explosion in Unit 4.

In the days after the tsunami, there were fears that the blast had damaged Unit 4's storage pool and, in desperation, the authorities used helicopters and fire hoses to keep it filled with water.

A guiding principle of nuclear safety is that the fuel is kept underwater at all times - contact with the air risks overheating and triggering a release that could spread contamination.

So the operation to remove the rods will be painstaking.

A senior official in the Ministry of Economy, Trade and Industry (METI) told me that the rods will be lifted out in batches of 22 and in casks filled with water.

This will be done with a new crane, recently installed in the wrecked building, after the original one was destroyed.



Moving the rods has only become possible after months of repair work and planning  
The task of removing each batch will take 7-10 days, I understand.

Two critically important issues are whether the rods themselves are damaged and therefore likely to leak and whether the casks remain watertight to ensure the rods have no contact with the air.

The METI official acknowledged the risks including a possible "release of radiation" from the fuel or if the casks holding the fuel are dropped.

He said that "countermeasures" have been prepared - including back-up wires to hold the loads and mechanisms to hold the fuel in the event of a power failure.

## Previous Fukushima problems

- **21 Oct:** Radioactive water overflows a containment barrier after heavy rain
- **7 Oct** A plant worker accidentally switches off power to pumps used for cooling damaged reactors
- **3 Oct** Tepco says there is a radioactive water leak after workers overfill a storage tank
- **21 Aug** Japan's nuclear agency upgrades Fukushima alert level
- **20 Aug** Tepco says 300 tonnes of radioactive water has leaked from a storage tank into the ground
- **July** Tepco for the first time admits radioactive water is going into the sea
- **June** Tepco says radioactive water leaking from a storage tank to the ground
- **April** Tepco suspects a fresh radioactive water leak at Fukushima
- **March** Tepco suspects a rodent may have been behind a power cut that shut down cooling systems
- **Dec 2011** Contaminated water leaks from a treatment system, caused by a crack in the foundation

A briefing document released by the site's owners, Tepco, spells out a series of safety systems designed to minimize the dangers.

For example, the fuel pond itself has been strengthened while the new crane can handle loads of one tonne while the fuel cask only weighs 450kg.

Collision tests, it is said, have shown that even if the fuel cask is dropped, it may be deformed but its seals will not be broken.

The fuel rods will then be deposited into a new "common" pool with a cooling system.

According to the METI official, "the common pool is planned to be used over a long period, supposedly for 10 to 20 years, and will be reinforced against possible future earthquakes and tsunamis".

The Tepco document says the rods will be checked for signs of damage - large amounts of debris fell into the pool during the disaster so the risks are real.

It says that checks for corrosion have found only minor signs so far - with "no corrosion affecting fuel integrity".

But only when the operation begins will engineers get a detailed look at the rods and a chance to assess their state.

One senior figure in Japan's nuclear watchdog told me: "Inspections by camera show that the rods look OK but we're not sure if they're damaged - you never know."

He said Unit 4 presented particular dangers because its entire stock of fuel rods was in the pool at the time of the accident.

If the operation goes as planned, attention will then focus on the massive challenges posed by Units 1, 2 and 3.

According to the METI official, the latest investigations have shown that despite the meltdowns experienced by each reactor, their temperatures have now stabilised.

In Units 1 and 2, readings show the presence of water in what's called the primary containment vessel - suggesting that the melted fuel rods have not penetrated that safety barrier.

The radiation level is too high in Unit 3 for that kind of examination to be carried out but using data from the reactor pressure vessel the official assumes that water is also present in the primary containment.

Meanwhile, the site continues to be plagued by leaks of radioactive water flowing into the Pacific Ocean.

Tepco will not confirm the precise timing of the fuel rod operation but after so much public outrage at the company's handling of the crisis so far, scrutiny of this latest episode will be intense.