

# Fukushima Nuclear Fuel Removal Procedures

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*The Tokyo Electric Power Company (TEPCO) will begin removing the first of more than 1,500 fuel assemblies from the Fukushima Unit 4 fuel pool that sits about 100 feet above the ground. Each assembly contains 50-70 radioactive fuel rods. If this removal procedure goes seriously awry or the plant is hit by another major earthquake, [some scientists say](#), "It's bye-bye Japan and everyone on the west coast of North America should evacuate."*

Fukushima is a continuing disaster, and the Japanese haven't done that great a job keeping it from getting worse, but that's not the bad news. The bad news is that nobody else in the world has a much better idea about what to do, and even less of an idea of how to do it, and that's why the stampede of global rescue workers rushing to Japan isn't happening now and isn't likely to happen soon.

When all the fulminating and fear-mongering and freak-out fomenting is done, the deteriorating disaster that is Fukushima continues to deteriorate. The only likely effect of the fussing is further deterioration of the ability to think clearly about a situation in which the future is even more unknowable and uncontrollable than the future usually is.

And now it's turning out that nuclear power will also contribute to climate change, indirectly, at least in the short run, because [Japan has announced](#) that it can't afford to reduce greenhouse gas emissions as much as promised, because taking care of Fukushima is too expensive and has led to a shutdown of all the rest of Japan's nuclear power plants. In the short term at least, Japan will rely more on electricity produced by coal, oil, and gas-burning power plants.

As a metaphor, Fukushima now has familiar apocalyptic and terrifying implications, but the reality of the place itself is more complicated. After all, if the sky really is falling, what are you going to do about it anyway?

Fukushima will definitely get worse before it gets better, or worse still

When it was hit by an earthquake followed by a tsunami on March 11, 2011, Fukushima was a six-reactor nuclear power station. Units 1, 2, and 3 all melted down; at least 1 and 3 exploded, and an explosion tore off the roof of Unit 4, leaving its fuel pool precariously exposed. Units 5 and 6, although undamaged, have been shut down and pose no immediate threat.

Continuously since 2011, [Fukushima has been releasing radioactivity](#) into the air, although that seems now to be minimized. The release of radioactive water into the Pacific Ocean continues at varying intensities that appear to be still increasing, with little possible control in the near future. Groundwater flows into the plant and leaves contaminated. Water used as coolant is contaminated and flows out. And contaminated water that TEPCO collects in

huge holding tanks leaks out.

There is broad agreement that the [Unit 4 fuel pool](#) is the highest priority for making Fukushima safer, not that it will be actually safe for a long, long time. Even if the fuel removal goes smoothly, it is expected to take [more than a year to complete](#).

In 1982, TEPCO damaged one of the fuel assemblies now in the Unit 4 fuel pool, and a reference to that damage – the assembly is bent almost at a right angle – was included in an August 2013 report. On November 12, Japan Times and Reuters [reported this news](#), along with news from an April 2010 TEPCO report that: “it found two other spent fuel racks in the reactor’s cooling pool had what appeared to be wire trapped in them. Rods in those assemblies have pin-hole cracks and are leaking low-level radioactive gases.... “

TEPCO has the only plan in town

TEPCO knows what it wants to do with the 1500 assemblies in unit 4. The procedure, as described by Reuters, is straight-forward in concept:

“The assemblies must first be lifted from their storage frames in the pool and individually placed in a [steel](#) cask – kept all the while under water to prevent overheating. The cask, weighing around 90 tonnes when filled, will then be hoisted by crane from the pool, lowered to ground level and transported by trailer to a common storage pool about 100 metres away.”

No one’s criticizing the TEPCO plan, and no one has come forward claiming to have a better plan. What TEPCO doesn’t know, and no one else knows, is whether they will be able to execute the plan according to plan. And what else TEPCO and everyone else doesn’t know is what will happen if and when the plan hits a glitch. And that’s where the [panic-laden extreme scenarios](#) come in: “If something goes wrong this could be a global catastrophe that dwarfs what has happened in Fukushima Daiichi thus far,” says nuclear waste specialist Kevin Kamps with Beyond Nuclear, without suggesting a different approach

Nuclear engineer Arnie Gunderson of Fairewinds told radio station KZYX in September:

“Tokyo Electric has admitted that the boron between these fuel cells — there’s a boron wafer in between the fuel to prevent something called an inadvertent criticality, you can have a nuclear chain reaction in the fuel pool, and that’s not a good thing — but they’ve admitted that all the boron has disintegrated. So the only thing preventing a chain reaction from occurring... in the fuel racks themselves, is the fact they put all sorts of boron in the water. But if the rods get too close to each other, they can still fire up again and create a chain reaction in the nuclear fuel pool.”

TEPCO has confidence, is that reassuring?

TEPCO has produced a reassuring short video describing how the fuel removal process is supposed to go, mixing animation and documentary footage to soothe away any viewer’s worries. Arnie Gunderson calls it a “fantasy cartoon” and provides a [17-minute podcast](#) showing excerpts from the TEPCO production followed by his own explanations of how TEPCO is misleading.

Not surprisingly, TEPCO is counter-alarmist, as [Japan Times](#) reported: “Asked if it’s possible for the spent fuel to achieve recriticality, Zengo Aizawa, vice president of Tepco overseeing the Fukushima crisis, said this is highly improbable since the removal process basically deals with one assembly at a time, and the utility has confirmed that one assembly alone cannot cause a nuclear chain reaction.”

The company’s confidence was shared by one of their consultants, [Lake Barrett](#), an American whose four decades of experience in nuclear energy included overseeing much of the clean-up after the accident at Three Mile Island. Barrett visited the Fukushima site on November 13, and told Japan Times he was impressed with TEPCO’s preparations, including the reinforcement and cover at Unit 4 protecting the fuel pool: “Now I feel confident that they can complete this job properly,”

Meanwhile, at nearby Units 1, 2, and 3 – all of which melted down – the status of the molten cores has remained uncertain since 2011. Talking about this on Art Bell’s [Dark Matter program](#) in October, Beyond Nuclear’s Paul Gunter said:

“We’ve got 3 reactors, the cores have left the vessel. They’ve burned through the bottom of the vessel. We don’t really know where they are, because the radioactive environment even fries robots that TEPCO’s been trying to send in there. They have been sending very innovative robotic machinery and sensors in there to get a picture, to get a reading, and these things don’t return. We have opened a door to hell that cannot be easily closed — if ever. We’ve got those 3 cores that are melting, they could be somewhere in the concrete base mat burning their way through, they could have already burned through and entered into the ground. They hopefully have formed a huge solid ‘elephant’s foot’ of highly radioactive material.”

Think it’s bad on the outside? Inside it’s instant death.

On November 14, Japanese media reported that, for the first time, a remote-controlled robot had found the locations in Unit 1 where radioactive water was leaking out of the reactor. TEPCO acknowledged that it was unable to do anything about these leaks any time soon, and they suspected there were similar leaks in Units 2 and 3. As long as TEPCO can keep the molten cores cooled, they will remain stable – and the flow of contaminated water into the environment will continue.

[According to RT.com:](#)

“The radiation levels in the inspected area were reported at 0.9 to 1.8 sieverts an hour, while a typical release of radiation is generally accepted to be 1 millisievert a year.” In less technical language, a sievert is a unit of measurement for a radiation dose to humans – a dose of more than one sievert in a brief period will likely cause radiation sickness and possibly death. A millisievert is one one-thousandth of a sievert. In other words, roughly calculated, the radiation level the robot found is about 9 million times greater than the so-called “safe” annual human exposure.

Beyond the confines of the Fukushima plant, in the partly evacuated Fukushima Prefecture, local officials are confirming an [increase in thyroid cancer](#) in children. The rate is more than 7 times higher than for the general population and reflects a similar pattern experienced around Chernobyl after the accident there.

The Indian government is meanwhile pressing ahead to complete a [nuclear cooperation agreement](#) with Japan that would clear the way for Japanese nuclear energy companies to do business building nuclear power plants in India.

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