

Nuclear waste's toll, challenge in Japan, 6 years after disaster

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In Photo: Tanks for storing contaminated water, with Reactors 1 and 2 in the background, at the Fukushima Daiichi Nuclear Power Station in Fukushima, Japan, on February 21. Japanese officials wrestle with what to do with the ever-growing pile of radioactive waste at the nuclear-power station, six years after the accident there.

FUKUSHIMA Daiichi Nuclear Power Station—Six years after the largest nuclear disaster in a quarter-century, Japanese officials have still not solved a basic problem: what to do with an ever-growing pile of radioactive waste. Each form of waste at the Fukushima Daiichi Nuclear Power Station, where three reactors melted down after an earthquake and a tsunami on March 11, 2011, presents its own challenges.

400 tons of contaminated water per day

The Tokyo Electric Power Co. (Tepco) is pumping water nonstop through the three reactors to cool melted fuel that remains too hot and radioactive to remove.

About 400 tons of water pass through the reactors every day, including groundwater that seeps in. The water picks up radiation in the reactors and then is diverted into a decontamination facility.

But the decontamination filters cannot remove all the radioactive material. So for now, all this water is being stored in 1,000 gray, blue and white tanks on the grounds.

The tanks already hold 962,000 tons of contaminated water, and Tepco is installing more tanks. It is also trying to slow the flow of groundwater through the reactors by building an underground ice wall.

Within a few years, though, and no one is sure exactly when, the plant may run out of room to store the contaminated water.

“We cannot continue to build tanks forever,” said Shigenori Hata, an official at the Ministry of Economy, Trade and Industry.

Authorities are debating whether it might be acceptable, given the relatively low radioactive levels in the water, to dilute the contaminated water and then dump it into the ocean. But local fishermen are vehemently opposed. Many people still do not trust Tepco because of its bungled response to the disaster, the worst nuclear accident since Chernobyl.

3,519 containers of radioactive sludge

The process of decontaminating the water leaves radioactive sludge trapped in filters, which are being held in thousands of containers of different sizes.

Tepco says it cannot quantify the amount of radioactive sludge being generated. But it says it is experimenting with what to do with it, including mixing it with cement or iron. Then it will have to decide how to store it.

64,700 cubic meters of discarded protective clothing

The estimated 6,000 cleanup workers at the site put on new protective gear every day. These hazmat suits, face masks, rubber gloves and shoe coverings are thrown out at the end of each shift. The clothing is compressed and stored in 1,000 steel boxes stacked around the site.

To date, more than 64,700 cubic meters of gear has been discarded, the equivalent of 17 million 1-gallon containers. Tepco says it will eventually incinerate all this contaminated clothing to reduce the space needed to store it.

Branches and logs from 220 acres of deforested land

The plant's grounds were once dotted with trees, and a portion was even designated as a bird sanctuary. But workers have cleared about 220 acres of trees since the meltdown spewed radiation over them.

Now, piles of branches and tree trunks are stacked all over the site. Officials say there are about 80,000 cubic meters of this waste, and all of it will have to be incinerated and stored someday.

200,400 cubic meters of radioactive rubble

Explosions during the meltdown filled the reactors with rubble. Workers and robots are slowly and carefully trying to remove this tangled mass of crushed concrete, pipes, hoses and metal.

Tepco estimates that more than 200,400 cubic meters of rubble—all of it radioactive—have been removed so far and stored in custom-made steel boxes. That is the equivalent of about 3,000 standard 40-foot shipping containers.

3.5B gallons of soil

Thousands of plastic garbage bags sit in neat rows in the fields and abandoned towns surrounding the Fukushima plant. They contain soil that was scraped from land that was exposed to radiation in the days after the accident.

Japan's Ministry of the Environment estimates that it has bagged 3.5-billion gallons of soil, and plans to collect much more. It will eventually incinerate some of the soil, but that will only reduce the volume of the radioactive waste, not eliminate it.

The ministry has begun building a massive, interim storage facility in Fukushima prefecture and negotiating with 2,360 landowners for the thousands of acres needed to complete it. And that is not even a long-term solution: The government says that after 30 years it will need another site—or sites—to store radioactive waste.

1,573 nuclear fuel rods

The ultimate goal of the cleanup is to cool and, if possible, remove the uranium and plutonium fuel that was inside the three reactors at the time of the disaster.

Hundreds of spent fuel rods are in cooling pools inside the reactors, and the company hopes to have cleared away enough rubble to begin removing them next year. The much bigger challenge will be removing the fuel that was in use in the reactor core at the time of the meltdown.

The condition and location of this molten fuel debris are still largely unknown. In one reactor where a robot was sent in January, much of the melted fuel is believed to have burned through the bottom of the inner reactor vessel and burrowed into the thick concrete foundation of the containment structure.

The plan is to completely seal the containment vessels, fill them with water and use robots to find and remove the molten fuel debris. But the rubble, the lethal levels of radiation and the risk of letting radiation escape make this an exceedingly difficult task.

In January the robot sent into one of the reactors discovered radiation levels high enough to kill a person in less than a minute. Another had to be abandoned last month after debris blocked its path and radiation disabled it.

Tepco hopes to begin removing fuel debris from the reactor cores in 2021. The entire effort could take decades. Some say the radioactive material may prove impossible to remove safely and have suggested leaving it and entombing Fukushima under a concrete and steel sarcophagus, like the one used at Chernobyl.

But the Japanese government and Tepco say they are committed to removing all the waste and cleaning the site, estimated at a cost of \$188.6 billion.

“We want to return it to a safe state,” said Yuichi Okamura, general manager of the company’s nuclear power and plant-siting division. “We promised the local people that we would recover the site and make it a safe ground again.”

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<http://www.businessmirror.com.ph/nuclear-wastes-toll-challenge-in-japan-6-years-after-disaster/>