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# Comparing Nuclear Events at Fukushima, Chernobyl, Three Mile Island: Q&A

By Adi Narayan - Mar 17, 2011

Radiation leaks from Tokyo Electric Power Co.'s earthquake-stricken reactors in northeastern Japan represent the worst nuclear power accident since the meltdown at Chernobyl, Ukraine, almost 25 years ago, scientists say.

Helicopters poured 30 metric tons of water today on pools used to cool spent fuel rods. No change in radiation was reported after four runs by the aircraft, Kyodo News said, citing plant operator Tokyo Electric Power Co. Once exposed, the spent fuel rods may catch fire and melt, spewing radiation into the atmosphere.

"Radiation levels are extremely high, which could possibly impact the ability to take corrective measures," U.S. Nuclear Regulatory Commission Chairman Gregory Jaczko told a congressional panel in Washington yesterday.

Here are answers to some frequently asked questions about the accidents at Fukushima, Chernobyl in 1986 and Three Mile Island, Pennsylvania, in 1979. The information is drawn from the U.S. Nuclear Regulatory Commission in Washington, the World Health Organization in Geneva and interviews with radiation safety experts in the U.S., Australia and India.

Q: How do the three accidents compare?

A: Events unfolding in Japan "appear to be more serious than Three Mile Island," U.S. Energy Secretary Steven Chu told a congressional panel yesterday.

The disaster ranks 6 on a 7-step international scale for nuclear accidents, according to Andre-Claude Lacoste, head of France's nuclear safety authority.

The International Atomic Energy Agency hasn't updated the original rating of 4 on its website. Three Mile Island was rated 5 and Chernobyl was rated 7. Each additional point on this scale represents a factor of 10, so the accident at Three Mile Island was 1/100th as serious as Chernobyl, according to the agency.

Q: How did the reactors differ?

A: Fukushima's 40-year-old reactor No. 2 used nuclear fission to heat water into steam, which powered a turbine. Such units are called boiling water reactors.

In the plant at Three Mile Island, pressurized water is pumped into the reactor core, where it gets heated. The hot water is then sent to a steam generator which is located outside the uranium-containing chamber. Both the Fukushima and Three Mile reactors had steel casings to protect nuclear fuel.

Fuel inside Chernobyl's unit 4 wasn't protected by steel. The reactor's graphite buffer, used to slow high-speed subatomic particles, caught fire. The Fukushima and Three Mile reactors used water for the same purpose.

Q: What happened at Three Mile Island?

A: On March 28, 1979, unit 2 suffered a partial meltdown after water meant for cooling the uranium fuel was released from the containment chamber due to an equipment malfunction. There was no explosion and radioactive materials weren't released into the environment because the chamber didn't rupture.

Q: What happened at Chernobyl?

A: The accident was caused by a power surge that led to overheating at reactor No. 4. A resultant fire and explosions caused the containment roof to cave in and sent radioactive debris, including pieces of fuel rod, spewing into the air, destroying a nearby forest.

Radiation outside the blast area was about 50 times greater than the peak inside Fukushima, and at least 31 workers and firefighters died within a few months. An estimated 4,000 children and adolescents developed thyroid cancer after consuming milk contaminated with radioactive iodine, I-131.

Q: What are the sources of radiation at Fukushima?

A: Fuel rods at the plant's No. 1 and No. 2 reactors, both of which were operating at the time of the temblor, may have been damaged, Tokyo Electric said. Pressure in the containment chamber of unit No. 2 fell yesterday, indicating that radiation may have been released after an explosion on March 15.

Radiation is also leaking from used fuel rods, a form of nuclear waste, stored in a pool near reactors No. 3 and No. 4. Water in the pool has evaporated due to radioactive heat, exposing the uranium-containing rods to the atmosphere. The exposed rods can emit radiation and lead to the production of

radioactive iodine and cesium, both of which are cancer-causing agents. Helicopters and water cannons are being used to deliver water into these pools as it is too dangerous for onsite personnel.

An exposed worker at the edge of the pool would receive a fatal radiation dose in 16 seconds, said David Lochbaum, a nuclear physicist for the Union of Concerned Scientists and a former Nuclear Regulatory Commission safety instructor.

There are six reactors in the Fukushima complex, of which three were operating at the time of the earthquake.

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Three things I learned....

Two questions I had....

One opinion I formed....