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Japan's Nuclear Crisis: Lessons for the U.S.

An 8.9 magnitude quake and tsunami are rare events. But should the U.S. rethink its own nuclear safety plans?

How to Retrofit Reactors

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Frank N. von Hippel, a nuclear physicist, is a professor of public and international affairs at Princeton. His article, with Jan Beyea, "Containment of a Nuclear Meltdown," was published in the Bulletin of the Atomic Scientists, August/September 1982.

No one understands yet all the things that went wrong in the three Fukushima Daiichi nuclear reactors that were shut down by the March 11 earthquake (the other three were already shut down). Thus far, unit #1, which is the oldest, has come the closest to disaster. It reportedly had a partial core meltdown that generated the hydrogen that exploded on March 12. Both events also occurred in the 1979 accident in Three Mile Island unit #2.

Thus far, at Fukushima, as at Three Mile Island, the releases of radioactivity to the environment have been relatively limited, but for different reasons. At T.M.I., the reactor containment worked and did not release any radioactive gases. At Fukushima it has been necessary to release gases because the containment pressure became too high.

But most of the radioactivity released by the fuel may have been trapped in a pool designed to protect the reactor containment from overpressure by condensing steam. Since the pool temperature has risen to the boiling point, it is uncertain how long it will continue this service and the area around the reactor is being evacuated out to a radius of 12 miles.

In 1982, a colleague and I pointed out that not all U.S. reactor containments would have survived the T.M.I. accident, and we suggested that all U.S. reactors be retrofitted with a robust filter system made of sand and charcoal that could filter the gases that would have to be released if a containment was approaching its failure pressure. The nuclear utilities resisted, however, and the Nuclear Regulatory Commission, as usual, did not press for change.

The Fukushima accident suggests once more that the "defense in depth" design of current nuclear reactors may not be deep enough and that previously rejected suggestions like the filtered vent system should be considered again.

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