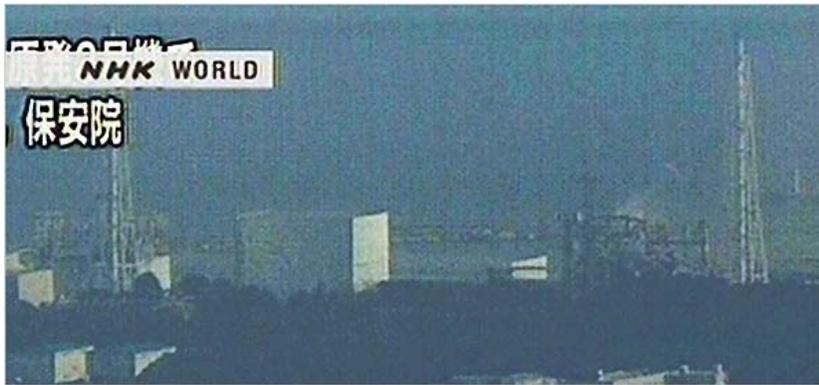


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Radioactive Releases in Japan Could Last Months, Experts Say



NHK, via Agence France-Presse — Getty Images

An explosion Monday at the Fukushima Daiichi Nuclear Power Station blew the roof off the containment building of reactor No. 3, right. Reactor No. 1's containment building, left, was damaged in an explosion on Saturday.

By DAVID E. SANGER and MATTHEW L. WALD
Published: March 13, 2011

WASHINGTON — As the scale of Japan's nuclear crisis begins to come to light, experts in Japan and the United States say the country is now facing a cascade of accumulating problems that suggest that radioactive releases of steam from the crippled plants could go on for weeks or even months.

The emergency flooding of two stricken reactors with seawater and the resulting steam releases are a desperate step intended to avoid a much bigger problem: a full meltdown of the nuclear cores in two reactors at the Fukushima Daiichi Nuclear Power Station. On Monday, an explosion blew the roof off the second reactor, not damaging the core, officials said, but presumably leaking more radiation.

So far, Japanese officials have said the melting of the nuclear cores in the two plants is assumed to be "partial," and the amount of radioactivity measured outside the plants, though twice the level Japan considers safe, has been relatively modest.

But Pentagon officials reported Sunday that helicopters flying 60 miles from the plant picked up small amounts of radioactive particulates — still being analyzed, but presumed to include cesium-137 and iodine-121 — suggesting widening environmental contamination.

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In a country where memories of a nuclear horror of a different sort in the last days of World War II weigh heavily on the national psyche and national politics, the impact of continued venting of long-lasting radioactivity from the plants is hard to overstate.

Japanese reactor operators now have little choice but to periodically release radioactive steam as part of an emergency cooling process for the fuel of the stricken reactors that may continue for a year or more even after fission has stopped. The plant's operator must constantly try to flood the reactors with seawater, then release the resulting radioactive steam into the atmosphere, several experts familiar with the design of the Daiichi facility said.

That suggests that the tens of thousands of people who have been evacuated may not be able to return to their homes for a considerable period, and that shifts in the wind could blow radioactive materials toward Japanese cities rather than out to sea.

Re-establishing normal cooling of the reactors would require restoring electric power — which was cut in the earthquake and tsunami — and now may require plant technicians working in areas that have become highly contaminated with radioactivity.

More steam releases also mean that the plume headed across the Pacific could continue to grow. On Sunday evening, the White House sought to tamp down concerns, saying that modeling done by the [Nuclear Regulatory Commission](#) had concluded that “Hawaii, Alaska, the U.S. Territories and the U.S. West Coast are not expected to experience any harmful levels of radioactivity.”

But all weekend, after a series of intense interchanges between Tokyo and Washington and the arrival of the first American nuclear experts in Japan, officials said they were beginning to get a clearer picture of what went wrong over the past three days. And as one senior official put it, “under the best scenarios, this isn't going to end anytime soon.”

The essential problem is the definition of “off” in a nuclear reactor. When the nuclear chain reaction is stopped and the reactor shuts down, the fuel is still producing about 6 percent as much heat as it did when it was running, caused by continuing radioactivity, the release of subatomic particles and of gamma rays.

Usually when a reactor is first shut down, an electric pump pulls heated water from the vessel to a heat exchanger, and cool water from a river or ocean is brought in to draw off that heat.

But at the Japanese reactors, after losing electric power, that system could not be used. Instead the operators are dumping seawater into the vessel and letting it cool the fuel

by boiling. But as it boils, pressure rises too high to pump in more water, so they have to vent the vessel to the atmosphere, and feed in more water, a procedure known as “feed and bleed.”

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When the fuel was intact, the steam they were releasing had only modest amounts of radioactive material, in a nontroublesome form. With damaged fuel, that steam is getting dirtier.

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Keith Bradsher contributed reporting from Hong Kong, Hiroko Tabuchi from Tokyo and Henry Fountain from New York.

A version of this article appeared in print on March 14, 2011, on page A1 of the New York edition.

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