



At U.S. Nuclear Sites, Preparing for the Unlikely



Mark Ralston/Agence France-Presse — Getty Images

The Diablo Canyon Nuclear Power Plant at Avila Beach in San Luis Obispo County, Calif.

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WASHINGTON — American nuclear safety regulators, using a complex mathematical technique, determined that the simultaneous failure of both emergency shutdown systems that are designed to prevent a core meltdown was so unlikely that it would happen once every 17,000 years.

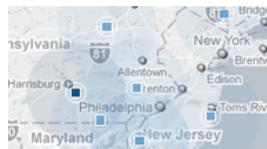
But 20 years ago, it happened twice in four days at a pair of nuclear reactors in southern New Jersey.

The American people, and the regulators whose job it is to protect them from a catastrophic nuclear accident, are watching the unfolding events at a complex of crippled reactors in Japan with foreboding and an overriding question: Can it happen here?

The answer — probably not — from the [Nuclear Regulatory Commission](#) is meant to reassure. But as the New Jersey accidents in 1983, which did not result in any core damage or release of radiation, show, no one can predict what might upend all the computer models, emergency planning and backup systems designed to eliminate those narrow theoretical probabilities or mitigate their effects.

“We can never say that that could never happen here,” said Anthony R. Pietrangolo, senior vice president and chief nuclear officer at the Nuclear Energy Institute, the industry’s main trade association. “It doesn’t matter how

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The Turkey Point Nuclear Power Plant near Florida City, Fla.

you get there, whether it's a hurricane, whether it's a tsunami, whether it's a seismic event, whether it's a terrorist attack, whether it's a cyberattack, whether it's operator error, or some other failure in the plant — it doesn't matter. We have to be prepared to deal with those events.”

The threats considered most serious by nuclear engineers are problems that lead to a loss of power. Lack of power to run cooling systems for the reactor core and for spent-fuel

ponds led to the explosions and release of radiation at the Fukushima Daiichi nuclear complex in Japan.

American nuclear facilities have backup power systems, and backups to those. All plants are required to have batteries to provide power in the event of a loss of power and failure of backup generators. In the United States, 93 of the 104 operating reactors have batteries capable of providing power for four hours; the other 11 have eight-hour batteries. Fukushima had eight-hour batteries. It wasn't enough.

No single analysis can discern which nuclear power plants in the United States are most at risk for a disaster, But the probabilities of an accident leading to damage to a reactor core have been roughly penciled out.

A [2003 Nuclear Regulatory Commission report](#), based on data submitted by plant owners, looked at the risk of equipment breakdowns, power failures and other factors that could lead to core damage.

It found that reactor No. 1 at Three Mile Island, near Harrisburg, Pa., would appear to be at greatest risk. (Three Mile Island is, of course, the plant that suffered a partial core meltdown in reactor No. 2 in 1979, the worst accident so far in the commercial nuclear power industry in the United States) By the commission's calculations, such an episode would occur there roughly once every 2,227 years. By contrast, the expected frequency of a core damage accident at the Quad Cities facility in Illinois is once every 833,000 years.

“These sorts of big numbers can tell you which plants need to take steps first to fix general problems, or which plants might have wider margins if a problem were to occur,” said David Lochbaum, a nuclear engineer and the director of the Nuclear Safety Project of the [Union of Concerned Scientists](#), an environmental and nuclear watchdog group. “They're not going to tell you when that bad day is going to arrive.”

Regulators and federal courts have discounted the likelihood of multiple crises hitting a nuclear facility at the same time. One federal judge, ruling against opponents of the Diablo Canyon nuclear plant near San Luis Obispo, Calif., said that the odds of an earthquake setting off a nuclear accident at the plant were negligible.

“The commission has determined that the chance of such a bizarre concatenation of events occurring is extremely small,” the court said.

But the crisis at Fukushima shows that such natural catastrophes can occur. The fact that the odds of a nuclear accident are unknowable and the risks hard to measure make it in some ways more frightening than the known — and greater — risks of driving without a seat belt or breathing the fumes from a coal-burning power plant.

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