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A catastrophic terrorist attack on the nuclear power plants at Indian Point could leave more than 20 million people in a 50-mile radius trying to flee lethal radioactive clouds without clear guidance from federal and state emergency officials.

A meltdown of the nuclear fuel and a fire at the two plants, 24 miles north of New York City on the Hudson River's eastern bank, would affect all of New York City as well as Westchester, Rockland, Putnam, Orange, Sullivan, Ulster, Dutchess, Nassau and Suffolk counties. In New Jersey, Bergen, Passaic, Sussex, Hudson and Essex counties would be threatened. So would Fairfield County and parts of New Haven County in Connecticut, and eastern Pennsylvania around the Delaware Water Gap.

Though Nassau and Suffolk counties are outside the 50-mile zone, their 2.7 million residents would be cut off on the eastern end of the 120-mile Long Island unless they fled through New York City to New Jersey, or through Westchester to New England.

All would have to travel a limited number of bridges and roadways to leave in a matter of hours.

"An evacuation could not work around New York for that kind of radioactive release," said Paul Leventhal, head of the Nuclear Control Institute in Washington, D.C. "The kind of panic that would result from people deciding whether to flee or seek shelter should be avoided. It would make the response to the World Trade Center look like a picnic."

"There is no way we can evacuate this region if there is a nuclear emergency here," Westchester County Legislator Thomas Abinanti, D-Greenburgh, said last week, following a security briefing with other state and county officials at Indian Point by Entergy Corp., the plants' owner. "We try to evacuate White Plains every day, and the infrastructure is so limited that we are choked with traffic during a normal rush hour."

Gov. George Pataki yesterday ordered National Guard troops to begin protecting Indian Point and the state's other nuclear power plants.

For decades, federal officials, nuclear power operators and emergency planners believed that the prospect of destroyed containment buildings, a runaway nuclear meltdown and fire was too remote for which to realistically plan.

They planned, instead, for the possible need to evacuate people within one mile around the plants' site in Buchanan, and up to 10 miles within the direction that wind would carry radioactive particles. This "Ingestion Emergency Pathway Zone" or IPZ, is all planners believed they needed to prepare.

The plan depends on an orderly withdrawal, with school and public buses making repeated trips to Westchester to remove children and others from the affected area over several hours.

Only since the terrorist attacks on the World Trade Center and the Pentagon has the U.S. Nuclear Regulatory Commission acknowledged that the huge, reinforced concrete containment domes around American nuclear reactors are not designed to withstand the impact of a hit by modern, wide-bodied jets. The attacks also showed the plants' vulnerability, as both jets that slammed into the Twin Towers flew south along the Hudson River, directly above or not far from IP2.

Current emergency evacuation plans are not designed to handle the result of such a terrorist action, and only envision the release of a radioactive cloud over a short time period.

The plans do not envision a destroyed containment building, a nuclear reactor meltdown or a prolonged fire that would spew radioactive particles into the atmosphere for weeks, like the one that engulfed the Ukrainian nuclear plant at Chernobyl in April 1986. That left a permanent lethal zone of contamination around the city for 50 miles. Winds and waterways also deposited long-lasting radioactive material hundreds of miles away.

American emergency plans for nuclear accidents do not contemplate the need to move the public from such a wide region, as would be necessary in New York. The plans assume residents will wait patiently in their homes for instructions and follow directions to move out of the path of wind-borne radiation.

"Our evacuation plans are for a 10-mile zone," said Don Mauer of the New York State Emergency Management Office. "There are no detailed evacuation plans for the miles 10 through 50. The public is notified within the areas that require evacuation. We have the police to establish traffic control points for an orderly flow of people out of the area."

If radiation should spread, he said, "Those folks would be notified by public announcement that they have to leave the area."

The state's plans envision orderly, controlled evacuations from individual segments within the 10-mile zone around the plants. Those regions would depend on the prevailing winds at the time of the accident.

Nowhere do the plans contemplate the widespread movement of millions of people fleeing the uncontrolled release of radiation over several days, traveling in several directions.

"There has long been discussion in the emergency management community as to whether or not you could evacuate New York," said William Waugh, professor of public administration and urban studies at Georgia State University in Atlanta.

"That's particularly true of places like Manhattan, where you have limited access to bridges and tunnels. How do you move so many people in New York who don't have automobiles and rely on mass transportation? It could injure more people than you save."

It would be difficult to maintain order, Waugh said, even though the existing plans depend on it.

"There has been talk about fear management," he said, "and how do you contain a population at risk when you want to keep them quarantined and want to avoid panic? In a panic response, a lot of people would be injured trying to get out of the area. I imagine it is not possible to evacuate that many people."

Critics of the NRC, which regulates the nuclear industry's actions during an accident, and other emergency management agencies have long disputed the planned cutoff at 10 miles.

"I don't think the basis for the 10-mile zone was quantitatively linked to anything," said Ed Lyman, a physicist and scientific director of the Nuclear Control Institute in Washington. "It would have been smaller if the industry had had its way. They were afraid it would alarm the public."

NRC spokesman Neil Sheehan pointed out that evacuations are the responsibility of federal and state emergency agencies. "We look at the on-site response," he said, "because people at the plant are making decisions that greatly impact decisions on evacuations, like determining the level of emergency."

Lyman said there was validity to the industry's argument that the most lethal radioactive particles would fall closest to the site of the accident. But that does not mean people farther away would be safe.

"You can get pretty high assurances that you won't have acute radiation exposures far away," he said. "But broader contamination, causing death from cancer, can happen hundreds of miles from the plant. If you look at Chernobyl, there are areas of contamination a hundred miles away that are almost as high as right near the plant because of the prevailing wind patterns."

The prevailing winds in this region are from the northwest, blowing across Indian Point down to New York City and Long Island. During the course of several days, however, the winds shift in all directions.

"If you have a fire like they had at Chernobyl," said Tom Bevan of the Georgia Tech Research Institute, "the contamination went hundreds of nautical miles away."

A 10-mile evacuation, Bevan said, would be potentially effective only if radioactive steam was released. Radioactive material caught in a petroleum or other fire goes high into the atmosphere and spreads, said Bevan, who headed the U.S.-Ukraine Land Management Resource Center in Kiev, Ukraine, to oversee the assessment and

cleanup of Chernobyl.

The situation in Chernobyl was complicated by the fact that Ukraine was then part of the Soviet Union, and the Communist government wasn't willing to admit to the unfolding catastrophe.

"The Soviets weren't willing to tell anyone that the stuff was blowing north," Bevan said. "They evacuated people away from the reactor and right into the path of where the fallout was going."

It took more than 600,000 emergency workers to cover the fire with sand and cement; up to 80,000 of them died, according to Sergei Korsunsky, science attache at the Ukrainian Embassy in Washington.

"In the civilian population," Korsunsky said, "we estimate about 3.5 million people were exposed to harmful doses of radiation. What is most terrible is that at least 1.5 million children were exposed."

The biggest long-term problem that resulted from the contamination was thyroid gland cancer, triggered by radioactive iodine isotopes.

"With my own eyes," Korsunsky said, "I saw villages where there were several hundred children and all of them - each and every single child - had thyroid problems. They had some kind of cancer or were on the way to getting cancer."

David Lochbaum, a former consultant to Indian Point 3 and a nuclear safety expert with the Union of Concerned Scientists in Washington, said the NRC is still reluctant to consider a catastrophe in its planning.

Lochbaum attended a two-day meeting on nuclear plant security at NRC headquarters in Maryland last week. "The issue of a plane crashing into a dome wasn't discussed," he said. "They didn't do anything to address trucks, boats, airplanes or whatever. They are only dealing with ground threats, which was their concern all along."

Lochbaum said the refusal of emergency planners to consider the destruction of a nuclear plant's containment building "was a fault even before Sept. 11."

"The containment can fail from the inside," he said.

A full meltdown would cause steam explosions with enough force to break open the containment buildings, he said, and "our containment structures aren't designed to handle that scenario."

An external attack, Lochbaum cautioned, would also threaten the storage pools of spent fuel at Indian Point 2 and 3. The pools are not housed in the containment buildings.

Radiation from a meltdown of the reactor's nuclear fuel in a destroyed containment building would have the same effect on the population as radiation from ignited fuel in the storage pools.

"The difference is, a reactor accident causes more fatalities in the first year,"

Lochbaum said. "With the radiation from spent fuel, more fatalities occur after one year from cancer than acute radiation exposure."