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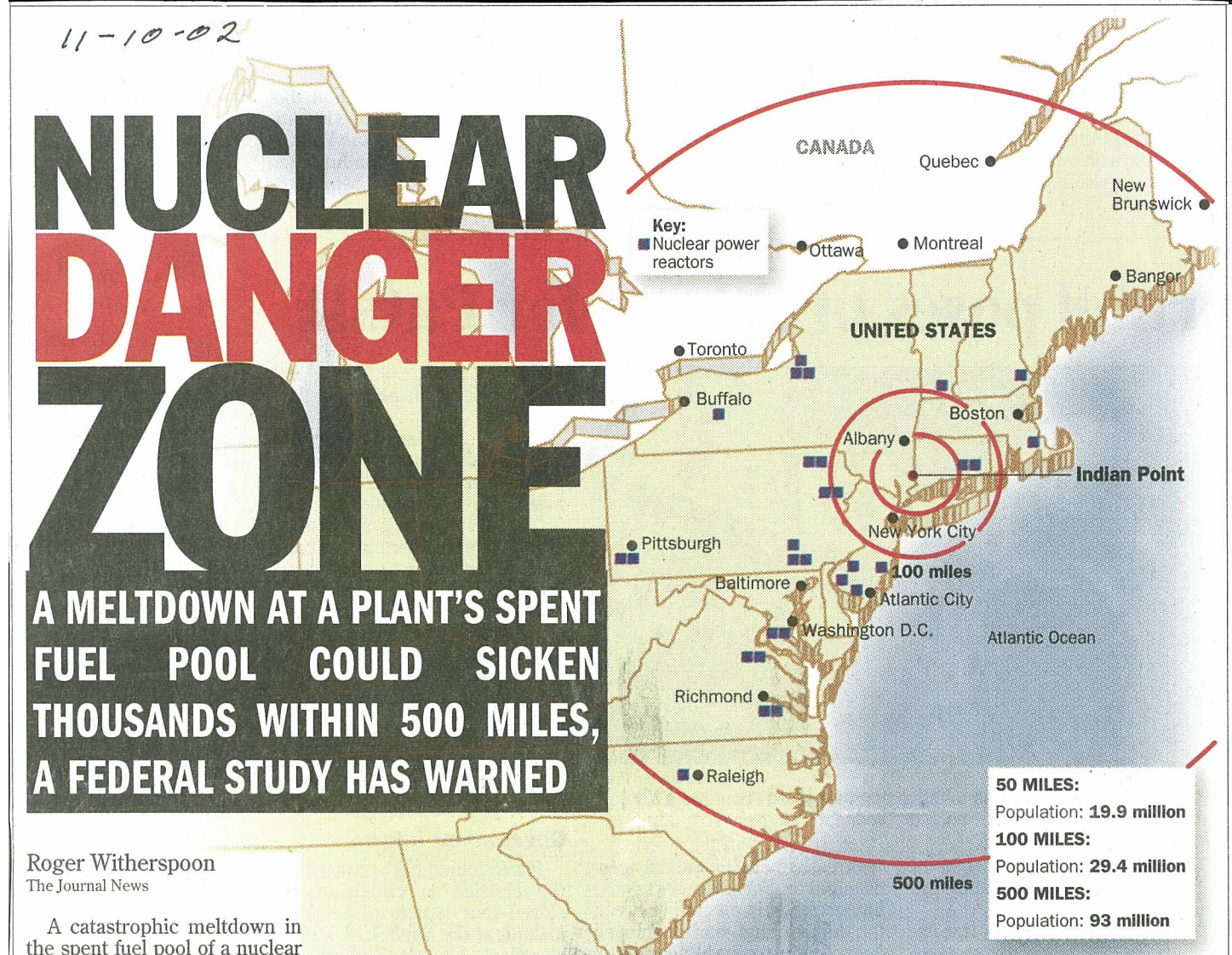
NUCLEAR DANGER ZONE

A MELTDOWN AT A PLANT'S SPENT FUEL POOL COULD SICKEN THOUSANDS WITHIN 500 MILES, A FEDERAL STUDY HAS WARNED



Roger Witherspoon
The Journal News

A catastrophic meltdown in the spent fuel pool of a nuclear power plant could cause fatal, radiation-induced cancer in thousands of people as far as 500 miles from the site, according to a U.S. Nuclear Regulatory Commission study.

The analysis of spent fuel pool meltdowns also states that millions of people within such a 500-mile zone might have to be evacuated for periods ranging from 30 days to one year and that people living within 10 miles of a nuclear plant, such as Indian Point in Buchanan, might never be able to return to their homes.

It also cites the potential for "prompt fatalities" from radiation poisoning that would occur in areas close to a plant site, where many radioactive particles would be expected to fall.

The extent of possible radiation damage described in the NRC documents is far more severe than anything that federal, Westchester County or Indian Point officials have disclosed in public forums or written statements mailed to thousands of residents in Westchester, Rockland, Putnam and Orange counties.

The agency's assessments are contained in a special report prepared by experts within the NRC and the Sandia National Laboratories in Albuquerque, N.M., in October 2000 that was

Fuel rods

The reactor process converts the fuel into a mix of radioactive products, including plutonium and cesium-137.

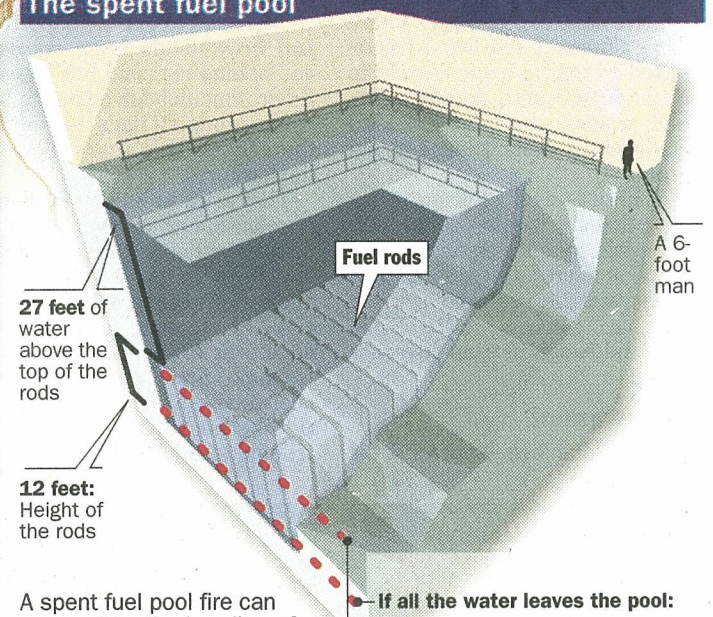
When the uranium inside the fuel rods can no longer be used by the plant, it is still radioactive. The used rods are transferred to the storage pool through an underwater tunnel.

Fuel assembly

There are 200 12-foot uranium fuel rods coated with zirconium inside each assembly.

The rods are kept underwater to protect them from overheating.

The spent fuel pool



A spent fuel pool fire can occur when the bundles of fuel rods are uncovered, causing the rods to overheat and the zirconium cladding covering the nuclear fuel to catch fire and burn, releasing radioactive particles into the air.

FUEL POOL CONTENTS:

Indian Point 1 *out of service:* 160 fuel assemblies, 35.2 tons.

Indian Point 2: 990 assemblies, 500.9 tons.

Indian Point 3: 883 assemblies,

If all the water leaves the pool:

- Circulating air will cool the older bundles (5 years or older).
- Rods in the newer bundles can still overheat in about four hours.
- The zirconium cladding will use the passing air to oxidize and burn.

If most of the water leaves the pool:

- The remaining water will prevent air from circulating, leaving nothing to slow the buildup of heat.
- The water will turn to steam, which will oxidize the zirconium, causing it

Study: Meltdown's fallout could stretch 500 miles

NUCLEAR, from 1A

planning regulation in February 2001. A copy of the report was obtained by The Journal News.

The study has been criticized by nuclear industry representatives who say it reflects a worst-case scenario based on unrealistic assumptions and ignores the effectiveness of plant safety systems.

Michael Slobodien, director of emergency programs at the site for Entergy Nuclear Northeast, which owns Indian Point 2 and 3, said even if an accident did occur at Indian Point's spent fuel pool, the facility had the ability to control the situation and prevent the release of radiation into the atmosphere.

"This is a generic report and is not applicable to Indian Point," Slobodien said. "It neglects the Indian Point design features, and I cannot accept the premise of a meltdown and fire in the spent fuel pool when it comes to Indian Point. You cannot set up a case where it can happen at Indian Point."

Sandia laboratories maintain a computer simulation system that enables the NRC to predict the possible spread of radiation from any of the nation's 103 nuclear plants based on their location, geography and area population densities and the prevailing or seasonal weather patterns within hundreds of miles of the sites. Damage assessments — including the number of prompt fatalities, long-term cancers, affected population centers and durations of evacuations for specific areas — can then be estimated for any region of the country. Within 500 miles of Indian Point, there are nearly 82 million people living in the United States and 11 million in Canada.

The report provides the basis for any future NRC regulations on evacuation needs, safety requirements and insurance and compares the possible damage caused by a spent fuel pool meltdown with that of a meltdown in a fully operational nuclear reactor. It was developed to show the NRC what types of problems could occur in spent fuel pools when nuclear plants are shut down, at which point no new fuel rods would be placed in the pools, and how long they might pose a danger from a meltdown and fire.

The potential spread of contamination cited in the report far exceeds the 10-mile zone the nation's nuclear plants currently utilize in developing emergency evacuation plans. NRC and Indian Point officials said the evacuation plans are intended to deal only with short-term radiation poisoning, which is not likely to occur outside the 10-mile zone.

The report was pulled from the NRC's public database following the Sept. 11, 2001, terrorist attacks because, agency spokesman Neil Sheehan said, "if a terrorist decided to attack any plant in the U.S., not just Indian Point, that is information about what fatalities it could cause, and the exact knowledge of that could be very advantageous to them."

The information was returned to the database in April, however, because it is an official regulation governing spent fuel pool operations and must be accessible to plant operators.

The report states that analysts did not base their findings on "events due to sabotage. No established method exists for estimating the likelihood of a sabotage event. Nor is there a method for analyzing the effect of security provisions on that likelihood." Instead, analysts examined various accident scenarios, ranging from worker mishaps to plane crashes into a spent fuel pool building. The report concluded that while the probability of such accidents is extremely low, the impact of a meltdown would be enormous.

The protection and disposition of spent fuel is a national problem. Every two years, plants such as Indian Point replace a third of the nearly 100 tons of fuel used in their reactors with new fuel. The spent fuel at Indian Point 2 and 3 is stored in pools of water 40 feet deep, and both are nearing their storage limit. The federal government is developing a permanent repository for spent fuel under Yucca Mountain in Nevada, which is expected to open around 2010.

The uranium fuel used in reactors has a zirconium coating that permits nuclear reactions to occur but helps prevent the fuel from literally burning up and being dispersed into the atmosphere. The cooling water in the reactor and the spent fuel pools keep the temperature low enough that there is no danger of fire.

The internal heat of the nuclear fuel drops over time, and after about five years spent fuel rods can be removed from the pools and stored in dry casks that are air cooled. It had been thought by plant operators that there was little chance of a zirconium fire in fuel that was out of a reactor for at least five years. As a result, nuclear plant operators were not required to have emergency evacuation plans for events involving spent fuel pools, even though the pools hold hundreds of tons of radioactive material, far more than is used in the reactors. The NRC was considering industry requests to reduce insurance requirements for pools containing only older fuel.

But the report states that a zirconium fire still can occur 30 years after fuel rods are removed from a reactor, as significant an accident as a worst-case reactor-core meltdown, and that the danger of cancer-causing, radioactive contamination would not significantly decrease at least for that long.

The report assesses the effects of a fuel fire that would be triggered if water were completely or partially drained from spent fuel pools. Cesium-137, which is among the radioactive particles that could be released into the atmosphere, is the primary cause of long-term cancers, according to the NRC study. In that regard, cesium-137 is more significant than radioactive iodine. Westchester, Rockland, Putnam and Orange county officials have distributed pills to residents living within 10 miles of Indian Point as a possible protection against thyroid cancer induced by the radioactive iodine.

Current evacuation plans approved by the NRC for Indian Point are based on the premise that it would take several hours or days to reach the stage where a fuel fire would release radiation into the atmosphere. The agency's 2000 report states that a zirconium fire could erupt and begin releasing radiation within two to four hours after water was completely or partially drained from a spent fuel pool.

Charles Tinkler, a senior adviser in the NRC's office of research and co-author of the report's section on meltdown consequences, said the NRC studied the effects of contamination at Chernobyl in Ukraine, which suffered a catastrophic meltdown in 1986. There is a permanent exclusion zone extending about 35 miles around the site of the former reactor. A permanent exclusion zone also would be needed following such an accident at Indian Point, Tinkler said.

"I am not sure it would be comparable to the same radius as Chernobyl," Tinkler said in an interview. "We would predict that persons would be excluded from that property for the duration if they live within the 10-mile, emergency-planning zone."

Tom Hinton, a radiation ecologist at the University of Georgia's Savannah River Ecology Lab, said the extent of contamination from a meltdown depends on how high the contaminants are pushed into the atmosphere, local weather conditions and the type of radioactive isotopes involved.

"At Chernobyl," he said, "there was contamination spread around the world, though the majority of it was within 300 kilometers or so. Contamination depends on local weather conditions, specifically rain. If a (radiation) cloud passes over you and it is not raining, you will not get as much contamination as if it were raining. Rain scavenges contaminants out of the air and deposits them locally. That is the reason for many hotspots that occurred around Europe after the Chernobyl accident."

Some radiological isotopes, such as plutonium, will stay where they land, Hinton said, while others travel through the environment contaminating plants and waterways.

Officials in the four counties around Indian Point conducted a mock evacuation drill of the 10-mile zone on Sept. 24 under the auspices of the NRC and Federal Emergency Management Agency, which certifies emergency evacuation plans.

Officials at the time said radiation leaking from the reactor would dissipate after about five miles and the evacuation plans would protect the public from any harmful radiation.

Though the drill did not entail the scope of accident studied by the NRC and Sandia, Westchester County Executive Andrew Spano last June hosted a briefing for about 80 municipal and school officials, where they were assured there was little danger of contamination if a meltdown occurred in the reactor. Herschel Specter, a consultant for Entergy, said that 90 percent of county residents were "not at radiological risk. They may be terrified, but there is no danger."

Specter said a massive release of radiation would be of short duration and do little damage.

Slobodien acknowledged last week that the emergency planning zone was designed to protect the public from acute health effects, but that "the latent effects of cancer can occur far beyond that."

Concurring in that assessment was James Lee Witt, former director of FEMA under President Clinton. During his tenure, Witt approved the effectiveness of emergency plans for residents living near each of the nation's nuclear power plants. In an interview last week, Witt said none of the plans deals with protecting residents from long-term radiation effects from a reactor or spent fuel pool accident.

"If you are dealing with a meltdown at that level," Witt said, "you potentially have a threat to deal with that could reach beyond the 10 miles. I was aware of it. But our task has been to look at the emergency preparedness in a 10-mile radius, and that is what we were looking at."

Witt, now a private emergency management consultant, was given an $800,000 contract by Gov. George Pataki to examine the effectiveness of the emergency plans for the 10 miles around Indian Point. His report is due in December.

David Lochbaum, a nuclear safety analyst for the Union of Concerned Scientists in Washington, D.C., said that the argument that radiation couldn't go more than five miles or so "was never accurate."

"If they put the correct information out there and involved the American public and got a majority of people to agree that only those 10 miles need to be protected, that would be one thing," he said. "But for a small group of people to make a decision behind closed doors is what the Kremlin used to do, isn't it?"

Tinkler, who worked on the NRC report, said the study's estimates of possible fatal cancers was based on the conservative premise that a spent fuel pool fire would release up to nine times as much cesium-137 as the meltdown at Chernobyl, and that any dose of radiation above the normal background level for a region could induce cancer at some point.

"It means our figures ... represent the upper bounce," Tinkler said. "But it is not beyond the physical limits of the material involved. It provides us an outside limit for planning."

A decision on how many millions of people might have to be evacuated following a real spent fuel pool fire, he said, would depend on the cost of evacuation, and what is perceived to be an acceptable death rate.

"The decision would depend on what level of radiation the government decided people could receive without a significant health effect," Tinkler said. "That means some acceptable increase in the risk of cancer."

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Fatalities

Evacuation and fatality charts provided in a U.S. Nuclear Regulatory Commission study are intended as a guide, based on different population areas in the country. Numbers could fluctuate widely depending on geography and weather patterns. For example, radiation headed toward New York City from Indian Point would have a greater effect than radiation headed toward Orange County.

Rural area: Uniform population density, 100 people per square mile.

Developed area: Population densities: 1,000 per square mile for zero to 30 miles; 2,300 per square mile for 30-50 miles; 200 per square mile for 50-500 miles.

RURAL	DEVELOPED
0-100 miles	**0-50 miles**
2,440 cancer fatalities	**31,900** cancer fatalities
12 prompt fatalities	**74** prompt fatalities
0-500 miles	**0-500 miles**
20,300 cancer fatalities	**138,000** cancer fatalities
12 prompt fatalities	**101** prompt fatalities

Evacuations

100 miles	500 miles
Population: **2.7 million**	Population: **66.3 million**
Evacuated up to a year: 176,000 **6.5 percent**	Evacuated up to a year: 3.09 million **4.6 percent**
66,000 or 37 percent of those people would never return.	*2.1 percent would never return.*

Note: Evacuations based on populations around the Surry nuclear plant in Virginia.

Sources: Sandia National Laboratories, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," February 2001, for the U.S. Nuclear Regulatory Commission

Merrill Sherman/The Journal News