

# NRC acknowledges warnings

*Consultants say Susquehanna, 35 other reactors have a design flaw.*

By Andrew Maykuth  
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Two years after two contract engineers blew the whistle on the Susquehanna nuclear reactor in Berwick, Pa., the Nuclear Regulatory Commission is struggling to come to grips with the safety issues that they raised.

The NRC, which the engineers said initially played down their findings, now acknowledges that the pools containing highly radioactive spent nuclear fuel might pose a risk at the twin Susquehanna reactors and

other reactors.

"There may be weaknesses at several plants," said Joseph W. Shea, an NRC project manager. "We're not talking just about Susquehanna any more."

The engineers, David A. Lochbaum and Donald C. Prevatte, say the NRC now is conducting four separate examinations into the allegations, including an investigation by the NRC's inspector general into how the agency responded to the engineers' report.

The nation's top nuclear regulator,

NRC Chairman Ivan Selin, invited the two consulting engineers to meet with him privately last Friday to hear their arguments.

"I think there was a turning of the tide and it's recognized that they do have some valid points that need to be addressed," Annette Vietti-Cook, Selin's technical assistant, said after the 90-minute meeting at NRC headquarters in Rockville, Md.

The owner of the Susquehanna reactors, Pennsylvania Power & Light Co., of Allentown, last month announced that it would accept the NRC's findings.

See **REACTORS** on page 11.

# NRC acknowledges possible risk at Susquehanna, other sites

**REACTORS** from A1. announced it would modify the two spent-fuel pools to make them less likely to boil — the condition the engineers say could cause deadly radiation to spread for miles around the reactors.

PP&L, reiterating that the reactors have always been safe, said the alterations had nothing to do with the engineers' warnings.

"None of these changes were really required because this thing was brought forth," said Herb Woodeschick, a PP&L spokesman. "There's a clear distinction there."

Lochbaum and Prevatte say they are encouraged by the NRC's heightened interest in their findings and the utility's decision to change the spent-fuel pool design, which they said greatly reduces the likelihood of a disaster they postulated.

Still, the engineers said they remained unsatisfied with the response by the utility and regulators. They are waging a campaign to push the NRC further on the issue — even at what they say is potential risk to their careers consulting for commercial reactor owners.

"There's right and there's wrong," said Prevatte, 50, a mechanical engineer who lives outside Allentown. "We're committed to doing right." The engineers say neither the NRC nor PP&L has fully lived up to its obligations under the NRC's unbending nuclear regulations.

They say the NRC has taken too long to consider whether 35 similar reactors across the country should modify their spent-fuel pools — including Peco Energy Co.'s Limerick and Peach Bottom plants and GPU Nuclear Corp.'s Oyster Creek reactor, all within 60 miles of Philadelphia. They also say that the modified Susquehanna reactors still do not comply with their operating licenses, which specifically require reactors to withstand the intensely hot and humid conditions at a boiling-fuel pool would cause.

PP&L's engineers recently concluded that a boiling-fuel pool could cause disastrous conditions at the reactor, according to the NRC. But the utility says the odds that a series of events would occur to cause a boiling-fuel pool are so remote that they can hardly be calculated.

PP&L and other utilities say that several other cooling systems could be used instead of service to cool the fuel rods in case the primary system failed. As a last resort, they say, "hero" reactor operators could run a fire hose to the pools to keep the uranium rods covered with water.

"This is a very, very low-probability event that has very low safety consequences," said Woodeschick, noted that the Susquehanna reactors, 25 miles south-west of Wilkes-Barre, have had a safe operating record since they began commercial operations in 1983 and 1985.

"They have postulated things that are just way beyond the way we've designed these plants to operate," said Dickinson M. Smith, Peco's vice president for nuclear operations. He said Peco had examined its fuel pools and determined they were safe.

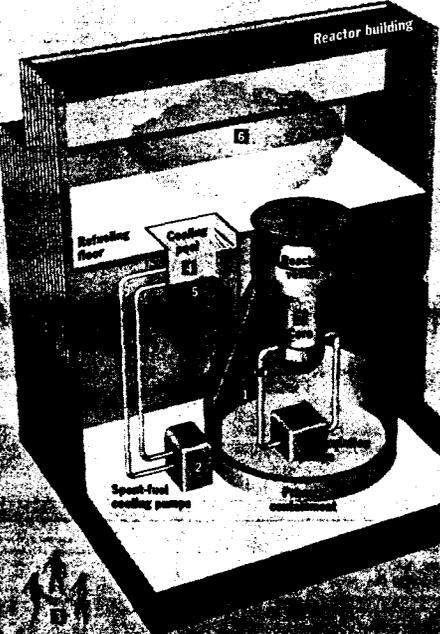
Lochbaum and Prevatte acknowledge that the possibility of disaster is extremely remote. But they said the 1979 accident that destroyed Three Mile Island Unit 2 also was considered so far-fetched that the NRC did not require reactor designs to take it into account.

"Besides, this is not really a probability argument," said Lochbaum, 35, second-generation nuclear engineer who lives in Watchung, N.J. "The law says you have to design for what they haven't."

Lochbaum and Prevatte had not until they were hired by Susquehanna in 1990 to help prepare PP&L's application to increase the reactors' power output. Their consulting contracts expired in 1992.

## What Could Go Wrong

Two nuclear engineers, David Lochbaum and Donald Prevatte, say they have found a fault in the design of the reactors at the Susquehanna Steam Electric Station that could lead to a meltdown and a Chernobyl-like release of radiation. They say the same problem exists at 35 other reactors designed by General Electric Co. Here is what they hypothesize could go wrong:



- 1 A major pipe rupture causes the reactor vessel to lose cooling water. Numerous emergency systems start automatically.
- 2 The emergency system also shuts off electrical power to the system that cools the spent-fuel pool.
- 3 Workers cannot enter the reactor building to restart the spent-fuel pool cooling system because the pipe rupture fills the building with radiation.
- 4 With no cooling system, the water in the spent-fuel pool begins to boil and evaporate.
- 5 No longer covered with water, the spent fuel begins to melt, spewing radiation.
- 6 The air in the reactor building becomes radioactive. Emergency systems not designed to work in these conditions fail.
- 7 Without emergency cooling water going to the reactor, the reactor fuel begins to melt, potentially boiling through the reactor vessel and reactor building containment, resulting in release of radiation to the environment.

The Philadelphia Inquirer / ARCHIVE FILE

Both engineers say PP&L is the best utility they ever worked for and that it had deserved its reputation as a meticulous reactor operator.

That's why they were infuriated by PP&L's adversarial response to their warnings in early 1992, the engineers say.

"Now there's kind of a pride and arrogance in the way they're dealing with it," said Lochbaum.

The engineers said they became concerned that Susquehanna's fuel pools were not designed to withstand the effects of a major accident, such as an earthquake that would break a major pipe and disrupt electrical power.

Spent-fuel pools are deep, unvented concrete vessels where highly radioactive uranium fuel rods are stored after they have been removed from the reactor. The exhausted fuel remains thermally hot for months and radioactive for thousands of years.

At Susquehanna, the fuel pools contain all of the uranium that has been removed from the reactors in their combined 22 years of operation. The water keeps the fuel cool. The water also shields the fuel from emitting radiation.

The spent-fuel pools at Susquehanna are in the containment building beside the reactor vessel, as they are at all nuclear plants that employ a General Electric reactor.

Lochbaum and Prevatte say that in case of a major accident, the containment building would be filled with such intense radiation that a worker would get a lethal dose in 16 seconds.

Workers at Three Mile Island, for instance, had to wait a year after the 1979 accident to enter the Unit 2 reactor building.

At TMI, workers could continue to access Unit 2's spent pool because it is in a building separate from the reactor.

The engineers say that the inaccessibility of the fuel pools at Susquehanna is worrisome because during an accident the fuel-pool cooling system likely would lose power and shut down.



Ivan Selin, chairman of the NRC, met privately with the consulting engineers to discuss concerns.

The engineers said they presented their theory to PP&L, which promised to study the matter.

"We thought the problem was so clear," said Lochbaum, that PP&L would readily agree to correct it. They said that under NRC regulations, the utility was required to report a problem within 60 days that could cause "consequential failure."

In October 1992, after waiting nine months for action by the utility, the two engineers issued an ultimatum: Unless PP&L reported the matter to the NRC, Lochbaum and Prevatte would do so.

On Nov. 17 of that year, the utility

filed a report with the NRC. Lochbaum and Prevatte say PP&L's report played down the significance of the design flaw, and they filed their own report 10 days later.

Lochbaum and Prevatte said the issue languished for nearly a year. They added that the agency began to stir only after several newspapers reported their findings last summer and several members of Congress sent queries to the NRC.

In October 1993, 11 months after the engineers sent their report to the NRC, the Office of Nuclear Reactor Regulation summarized their warnings and issued what the engineers considered a tepid notice to operators of other reactors.

"This information notice requires no specific action or written response," the NRC's notice said. Inside the NRC, the issue began to generate more interest.

The agency assigned Shea, the NRC project manager, to investigate the engineers' findings. The NRC staff invited Lochbaum and Prevatte to explain their report.

"Their presentation definitely helped," said Shea.

Still, the NRC was not won over. In March, the commission's staff announced that it would not cite Susquehanna for failing to satisfy its license because, at the time the NRC licensed the plants, such an accident had not been foreseen.

Shea last week said the NRC staff concluded that the scenario presented by Lochbaum and Prevatte was very unlikely. "We don't think that's very probable and, therefore, [it is] not of great safety significance," he said.

But he said that the engineers had raised some concerns about "vulnerabilities" in the fuel-pool cooling systems "that in other situations could lead to a problem."

The staff is now examining the extent of those weaknesses and whether they pose safety risks at other reactors, he said. "As we've gotten into broader issues, the process has stretched out."

He said the NRC management believed Lochbaum and Prevatte were "credible" — the NRC itself has hired the consulting engineers previously to do inspections, and, he said, their work was considered sound.

"We recognize the benefit of their having brought this forward, even if we don't recognize the significance of their findings," Shea said.

While the NRC believes that a boiling spent-fuel pool is unlikely, Shea acknowledges that such an event would cause "unpredictable" results. PP&L engineers, at the NRC's behest, recently concluded that the containment building's ventilation system would begin to fail apart 17 hours after the pools began to bubble.

A separate PP&L evaluation showed the pools' cooling system was inadequate to prevent boiling following an event such as an earthquake and a loss of electric power, according to the NRC.

While unlikely in northeastern Pennsylvania, an earthquake accompanied by loss of electric power is considered a "design-basis event" — an event that, under law, the plant's design must be prepared to withstand.

PP&L responded last month that it would modify its plant to "cross-tie" the two separate spent-fuel pools. That way, it said, the cooling system for one pool could serve as a backup for both fuel pools — greatly reducing the chance that a fuel pool would boil.

Lochbaum and Prevatte said PP&L's action, while it enhances Susquehanna's safety, would not apply to single-unit plants such as Oyster Creek, which have only one fuel pool and can't rely on the cooling system of a neighboring reactor.

They also say that PP&L's modification still does not address the utility's license requirement to maintain a plant that can withstand a boiling-fuel pool.

"The NRC still hasn't taken an enforcement action," Prevatte complained. "The utility has been outside of the law for several years now."

"The NRC's Shea said that regulators believed the license requirement for Susquehanna to be able to survive a boiling-fuel pool was in error because of a "documentation discrepancy."

"The fuel-pool cooling issue was probably not given the attention it might have deserved during the original licensing process," he said.

He suggested one possible solution — PP&L might apply for a change in its license so that the reactor no longer would be required to withstand a boiling-fuel pool, rather than modifying the plant to withstand an event the NRC considers unlikely.

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