

# Energy Matters

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## [The Conflict of Nuclear Safety: Protect the Public or Protect the Money](#)

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#Fukushima

**By Roger Witherspoon**

For the most part, David Lochbaum's analyses of the escalating problems at the Fukushima Daiichi complex in Japan are in the dry, relatively understated tone of an engineer who has spent nearly 40 years working on nuclear safety issues.

But once in awhile, discussing the interlocking meltdowns in the Mark 1 reactors and their companion spent fuel pools, his Tennessee cadence speeds up and carries a tone with a trace of anger.

"I don't feel bad," he said. "I did all I could to avoid this. The folks at the NRC are the ones who should be feeling bad. The reason I'm at the Union of Concerned Scientists today is because of a spent fuel pool fire."



The year was 1992 and Lochbaum, working for Enercon, the nuclear engineering consulting firm, had established a reputation as the go-to guy to bring systems into compliance with regulatory requirements and industry standards. He was part of a team evaluating the capabilities of the twin reactors at the Susquehanna River Nuclear Power Station in Pennsylvania, which was seeking permission from the Nuclear Regulatory Commission to increase their power and operating temperatures.

“Susquehanna is very similar to the plants in Japan,” recalled Lochbaum. “But it is much bigger. My partner, Don Prevatte, was looking at safety systems and meltdown scenarios in the reactor and I was looking at them in the spent fuel pool system. What we found was that there was a problem with the spent fuel located inside the containment building.

“If there was a reactor accident, the environment produced by the reactor automatically triggers a spent fuel pool accident. And, conversely, if there is a spent fuel pool accident, it automatically triggers a reactor accident. And since they are both in that confined space, the radioactive environment created by one interferes with you being able to get to the other.”

In a sense, it should have been obvious. Having two complex systems next to each other in a single containment building tied their fates together. The design for the pressurized water reactors, on the other hand, utilized separate, adjacent buildings for the reactor and the spent fuel pools.

“In theory,” said Lochbaum, “if you had a reactor accident, the containment would hold and everything would be nice. But when you combine the two systems, everything failed.”

PPL, which owned the plants, declined to invest in a costly fix, so the two engineers put together an inch thick analysis dropped it off at a local copying center and had it mailed to the NRC. It was dismissed within two week.

They didn't know about the copy error until the following year, when the chief engineer from the nuclear plant at Seabrook, NH called. "He said he got a copy of the report from the NRC and wondered if we had a complete version since they only had every other page," recalled Lochbaum, his drawl getting noticeably clipped. "It alarmed him enough that they wanted the whole report and wanted to make changes at their plant.

"That's how we learned that the copy folks had made a mistake and didn't copy both sides of the paper. It didn't matter; the NRC dismissed it without even noticing or caring that every other page was missing."

The two engineers published their findings about the dangers in the GE's Mark 1 reactor design and published it in a book titled "Nuclear Waste Disposal Crisis." PPL reacted to the resulting publicity by linking the spent fuel pools of the two reactor units and so they could be controlled from either unit.

"Susquehanna had an advantage in that there were two plants there," said Lochbaum. "In single unit, Mark 1, BWR plants like Vermont Yankee, you have the spent fuel on top of the reactor and you don't have that luxury – if you have a problem with either the reactor or the spent fuel pool, you'll have a problem with both."

The NRC's response both angered and surprised Lochbaum. But in retrospect, it shouldn't have. There were precedents for finding serious flaws in the GE Mark 1. And precedents for having the NRC ignore them.

On Sept. 20, 1972, S. H. Hanauer, a senior engineer at the Atomic Energy Commission, the forerunner of the NRC, wrote a memo ( <http://bit.ly/e5WjyK> )

to director Joseph H. Hendrie that an analysis of 10 years' experience with the Mark 1 reactors showed there were serious flaws in the design. The smaller containment building, housing both the reactor and spent fuel pool, cost less than two building system employed by pressurized water reactors. But assumptions about the effectiveness of its system to control a buildup of pressure following an accident were flawed and unlikely to work.

"Recently," Hanauer wrote, "we have reevaluated the 10-year-old GE test results, and decided on a more conservative interpretation than has been used all these years by GE (and accepted by us). We now believe that the former interpretation was incorrect, using data

from tests not applicable to accident conditions.”

Five days later, Hendrie sent back a two-paragraph reply which said, in part, “the acceptance of pressure suppression containment concepts by all elements of the nuclear field ... is firmly imbedded in the conventional wisdom. Reversal of this hallowed policy, particularly at this time, could well be the end of nuclear power. It would throw into question the continued operation of licensed plants, would make unlicensable the GE and Westinghouse ice condenser plants now in review, and would generally create more turmoil than I can stand thinking about.” ( <http://bit.ly/gTBYUq> )

That rejection was crucial. In essence, their pressure containment system was designed to work in a single failure situation. Chillers creating ice would force escaping gas to condense back into a liquid, thus relieving pressure and heat in the confined space of the containment building.

The flaw is that there was so little room in the dual function containment building that escaping steam would increase pressure in both areas, *though the system was designed to chill only one at a time*. It was the nuclear equivalent of the French Maginot Line ( <http://www.maginot-line.com/> ), with defenses locked to fight in only one direction, and helpless against attacks from the flanks. What Hanauer foresaw when writing his memo on the last day of the summer of 1972 would play out at the end of winter, 2011 in northern Japan.

And, in Lochbaum’s view, it did not have to end this way.

“I feel bad about the situation,” he said yesterday, “but not guilty. Had the NRC done more to correct the flaws in the design of the BWRs things would be better. This wouldn’t be happening.

“But I did more than my share to try and get that thing corrected. They are the ones who should feel guilty now. Not me.”