Tuesday, December 28, 2010

Environment

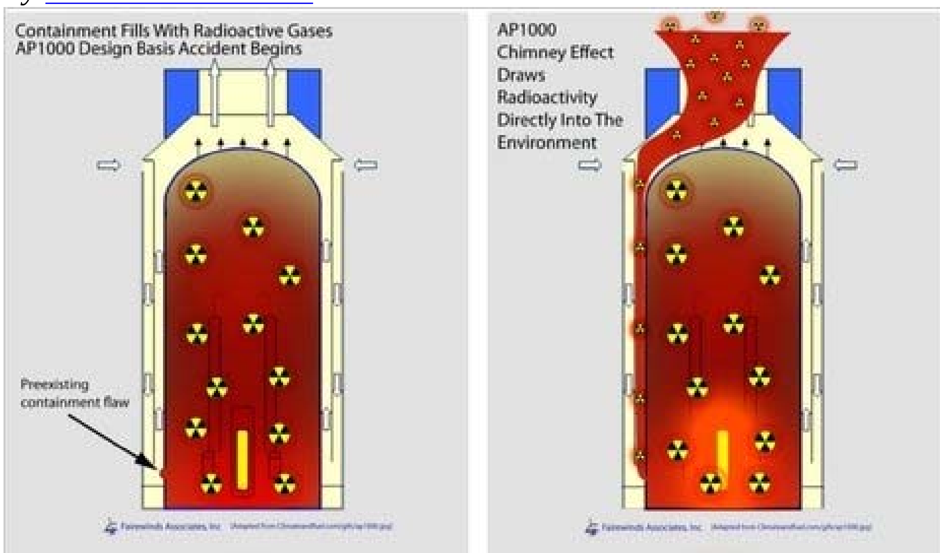
Green

A Blog About Energy and the Environment

June 28, 2010, *1:55 pm*

Is a New Reactor Rust-Prone?

By [MATTHEW L. WALD]



Courtesy of Arnold Gundersen, Fairewinds Associates An expert warns that an air pathway in a new reactor design could open the way for the release of radioactive materials.

Science

Approval of the design for the Westinghouse AP 1000 reactor is slowly moving forward at the Nuclear Regulatory Commission, as are financial arrangements for building the nation's first one, near Augusta, Ga. Yet the argument about whether its design is safer than past models is advancing, too.

On June 18, the Southern Company, the utility holding company that is building it, and the Department of Energy announced that they had come to final terms on a federal loan guarantee that would allow the project to go forward. The guarantee is for 70 percent of the company's costs, not to exceed $3.4 billion. (Georgia Power, the Southern subsidiary building the plant, owns 45.7 percent of it; other partners also got loan guarantees.)

Lots of details have yet to be agreed upon, though. One is that the reactor is surrounded by a shield building meant to protect it from hazards like crashing airplanes, and the Nuclear Regulatory Commission is not convinced that the shield building would survive earthquakes and other natural hazards. Westinghouse, a subsidiary of Toshiba, is doing new analytical work to try to convince the commission staff of its safety.

Also under attack is a thick metal shell inside that shield building that critics say might not withstand an accident.

The theory behind separating the shell from the surrounding wall is to avoid a problem in existing reactors, which use a strong concrete building with a metal liner. In case of a serious accident, some argue, that combination of concrete and steel could become a thermos bottle, allowing heat to build up. In the AP 1000 design, the metal is not a liner but an entire separate shell, with a concrete building surrounding it and an air gap in between.

In the event of an accident, the thinking goes, heat flows through the shell and out into the environment rather than getting bottled up and letting the building's interior get dangerously hot.

But a nuclear engineer, Arnie Gundersen, told a commission committee last week that keeping the metal and the concrete together presents an advantage: essentially, it would be harder for a flaw to appear in both and create a leak. If they are separated, he argued, rust could attack the metal shell in a place that is hard to inspect. What is more, creating a pathway between the metal and concrete that works like a chimney could allow for the release of radioactive materials.

The Nuclear Regulatory Commission's Advisory Committee on Reactor Safeguards, a panel of about a dozen senior experts drawn mostly from academia, gave Mr. Gundersen an hour and fifteen minutes on Friday to make his case, a long period. He outlined rust problems and other containment problems at existing reactors, including Beaver Valley near Shippingport, Pa., Salem in southern New Jersey, and DC Cook in Michigan, on Lake Michigan's eastern shore.

Still, he said, the metal in those reactors is usually only a liner. "Up until now, it's been a containment system,'' he told the committee. "You've got the liner and the concrete and they work together."

"The difference with the AP 1000 is, it's one thing; it's two inches thick, but it's one thing,'' he said. In existing reactor containments, the liners are usually considerably less than two inches thick.

Are there any failures in thicker metal, the committee wanted to know? On Monday morning, Mr. Gundersen dredged one up, at the FitzPatrick reactor in upstate New York. While the geometry of the FitzPatrick plant is very different from the design of the AP 1000, a thick metal part rusted through. The Union of Concerned Scientists explained the problem in 2005.

The committee did not reach a verdict on the AP 1000 design and has not yet been called upon by the Nuclear Regulatory Commission to sign off on it. "Your input to us is helpful in focusing attention,'' said Harold B. Ray, a committee member and a retired chairman of Southern California Edison.

Business, Politics and Policy, Science, nuclear industry, nuclear power, Nuclear Regulatory Commission, nuclear safety, nuclear subsidies, Plant Vogtle, Southern Company, westinghouse

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1.
raschumacher
united states
June 28th, 2010
11:15 am
There are metals and alloys that will not rust under those conditions. Using mild steel or the like that can corrode in this application would be foolish.
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2.
JevanF
Cleveland
June 28th, 2010
11:34 am
This is an excellent combination of journalism, transparent science writing, and public interest. And short, which is sweet. Keep it up NYT; maybe people could actually engage in policy with more of this stuff floating around.
Recommend Recommended by 1 Readers

3.
Bill
Camarillo, CA
June 28th, 2010
2:21 pm
If there is no stainless steel in the vessel, its guaranteed to rust out over time. I saw pix of that rust-out they are

talking about, 4 inches of steel missing, the only thing remaining was 2 inches of stainless. The air-gap design is a large mistake.
Recommend Recommended by 0 Readers
4.
thf1948
Hilton Head SC
June 29th, 2010
4:28 am
I find it difficult to understand how the drawing of the "Chimney Effect" could be so misleading. Go to the Westinghouse website and look up the AP1000 design. They have a very easy to understand discussion of the passive safety features associated with the design. The whole idea is to contain the contamination within the containment building during a design accident, not vent it to the atmosphere as the author would have you believe.
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5.
Mike Keller
Kansas
June 29th, 2010
4:29 am
So how do you inspect rusting on the back of a steel plate abutting concrete? With great difficulty. A free standing shell can be inspected front and back, including using visual, ultrasound and radiography techniques.

There are a number of reactors that employ containments consisting of free standing steel shells with an outer concrete building as well as pre-stressed concrete shells tensioned by cables, with a steel liner. Each design has pluses and minuses, although the cost to build tends to be the major consideration.

Currently, all containments are periodically pressure tested to verify minimal leakage.

The Westinghouse design is the first of a kind, as earlier free standing shell designs employed a concrete building that more or less controlled leakage. Should be noted that conventional containment designs spray water to cool the inside of the containment and reduce pressure. If that did not occur, the accident would become much more serious (increased likelihood of major radiation release). The Westinghouse design does not have that problem and is a major safety improvement. The article would have been better if the advantages of the Westinghouse design were fully explained.

I believe Gundersen's fears are misplaced. However, would probably be not unreasonable for the NRC to require periodic and more rigorous inspections (beyond pressure testing) of the Westinghouse steel shell design.

PS As I recall, the Fitzpatrick problem was related to not being able to inspect steel plate embedded in concrete and subjected to ground water.
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6.
James
Northern Nevada
June 29th, 2010
4:29 am
I have to wonder about simple rust (not high-temperature corrosion) being a problem. In the mountains not far from here, there's an old boiler that powered a sawmill during the Comstock mining days. It's a fairly large thing, maybe 20 ft long and 4 in diameter, but nowhere near the size or thickness of a reactor containment vessel. Despite having been exposed to the elements for over a century, it's still solid.
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