CHAIRMAN Resource

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Sent: Tuesday, November 11, 2014 7:30 PM
To: CHAIRMAN Resource
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Subject: Nov. 11, 2014 Comments on National Academy of Science Fukushima Lessons Learned Report

Good morning,

I have these comments.

Bad Design Decisions

With either a reactor building blown apart, (Units 1, 3, & 4), or with the reactor core melted, (Units 1, 2, & 3), there are 4 destroyed nuclear units at the Tokyo Electric Power Company's Fukushima Daiichi site. It is my opinion that two of these destructions are the result of Bad Design Decisions.

At Unit 4

If the explosion at Unit 4 was the result of the backflow of explosive gas originating in the water/steam supplied to melting (regular & MOX) nuclear reactor fuel in the Unit 3 reactor vessel/primary containment, page 185 of the NAS report suggests to me that a decision to install dampers at Unit 4 may have prevented its loss. (The report provides a TEPCO reference as p. 351 of the "Fukushima Nuclear Accident Analysis Report"). Unfortunately, (according to SIDEBAR 5.3 on pages 184 & 185), although dampers were provided at Unit 1, Unit 2, and Unit 3, the decision to install them at Unit 4 was not made.

It might be a simple return-on-investment calculation to compare the (eventual) complete Unit 4 cost of decommissioning with the cost not spent on purchasing and installing dampers at Unit 4.

(Are such ventilation dampers missing at the Tokyo Electric Power Company's newer Fukushima Daini site as well?)

At Unit 1

After he got back from Japan, I recall asking Jim Trapp: Why didn't the Emergency Condensers save Unit 1?" Based on my understanding of the well-designed Emergency (Isolation) Condenser system at Nine Mile Point, Unit I, (which, by the way, is a passive system), and the information that an Isolation Condenser system was installed at Fukushima Daiichi Unit 1, I could not understand its loss.

It turns out that here are significant differences between the Tokyo Electric Power Company's constructed design and that of the General Electric/Niagara Mohawk Power Corporation.

First off, TEPCO changed a closed loop, passive system into a more-or-less active system. This means that a system which could have performed well without electric power, (including the loss of DC), couldn't. Look at Figure 2.7 on page 50 in the NAS report. Those two valves at the bottom right are condensate return valves. With the double triangles that represent them colored in black, both are shown as closed. They need to open, (at least one does), to initiate cooling. With no DC power, this won't happen.

Here is what needs to be done. Throw away those condensate return valve DC motor valve operators and replace them with valve operating mechanisms that require air pressure to stay closed. Use the plant Instrument Air. If plant Instrument Air pressure is lost, the system will begin cooling since the condensate return valve will open. (This is a design idea approximately from the 1960s – in other words, before TEPCO/Fukushima Daiichi Unit 1 went into operation.)

The Emergency Condenser system was originally designed to isolate on an area high radiation signal because high radiation would be the result if there was a line break In the Emergency Condenser system. However, about in the early 1980s, it was realized that high radiation would also result if there was reactor core damage. (In other words, we would need to use the system, but would be unable to if it were isolated.) I believe we then changed the system isolation on area high radiation to "alarm only."

Niagara Mohawk also spent the money to support a couple of Emergency Condenser Make Up Water Storage Tanks outside the Reactor Building and at a higher elevation than the Emergency Condensers. (This allows gravity feed of water from them to the supplied Emergency Condenser tanks.) They also called for that same type of air-operated valve, (air pressure to stay closed), which opens automatically on loss of air pressure. TEPCO/Fukushima Daiichi Unit 1 did not spend money for Isolation Condenser Make Up Water Storage tanks at any elevation.

Finally, let me address a wide spread misconception, (including US NRC), about Ultimate Heat sinks for BWRs. The adjacent ocean or lake or river is an Ultimate Heat sink for all BWRs, <u>but not necessarily the only one</u>. If that BWR has an Emergency (or Isolation) Condenser, then air outside the Reactor Building is another Ultimate Heat sink. Emergency Condenser systems DON'T DUMP REACTOR CORE/CORIUM HEAT INTO THE PRIMARY CONTAINMENT. (However, the plant's Safety Valves or its Relief Valves do exhaust to the Primary Containment if those valves open.)

I will provide an additional comment on safety system isolations at a later time.

Conclusion

Two of the four damaged plants may have avoided serious damage, in my opinion, if different design decisions had been made.

Thank you,

Tom Gurdziel
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