03/17/00 3:34p

The short response is that the material in NUREG/CR-6365 does not "affirm rather than refute Dr. Hopenfeld's safety concerns..." that multiple tube ruptures are likely during design basis accidents.

The report was done for AEOD, not us. I am trying to figure out why it says some things which obviously can't be true (errors or misprints) by talking to one of the authors (Phil Ellison) at INEL. At this point, I believe the numbers used originate from assumptions used in NUREG-0844, with additional assumptions added by INEL to put it in the context they wanted.

The actual experience used in NUREG-0844 was 4 cases, 2 of which had only one tube susceptible to rupture, plus two cases that were ambiguous as to whether there were more susceptible tubes. So, the authors of NUREG-0844 made a conservative assumption that multiple tubes were susceptible to induced rupture in ½ of the spontaneous rupture events that occurred before the mid-1980s. They therefore used the same conditional rupture probability value for "1 tube" and "2 to 10 tubes" in their report.

It is an error for the petitioners to interpret this as identical probabilities of rupturing 10 tubes and 1 tube. The text says that the *sum* of the probabilities for rupturing 2 tubes, 3 tubes, 4 tubes, etc. through 10 tubes was estimated to *total* to the same value as was estimated for 1 tube. The probability of rupturing a specific number of tubes will decrease as the number increases. So, the probability of rupturing 10 tubes is expected to be much smaller than the probability for rupturing 1 tube.

We have no data on multiple tube ruptures because only single ruptures have ever occurred. I do not know of data that indicates that multiple tubes were susceptible to rupture in the event of a design basis accident, but it is not unrealistic to believe that could happen if steam generator tube inspections are not done adequately or frequently enough. (We do have some data on multiple tubes that do not meet required margins.) However, that does not mean that all tubes that (individually) could not withstand a design basis accident would rupture during such an accident. The reason is that the weak tubes have different strengths, and first tube to rupture changes the course of the accident in a manner that reduces the stress on the other tubes. So, rupture of a few tubes is about all that could be expected for a design basis transient before the conditions that cause the tubes to rupture are reduced back to the levels experienced during normal operation. (We have searched for combinations of accident types with tube flaw types that would not obey this principle, but they are not applicable to the Indian Point unit 2 problem.)

I should warn you that Joe Hopenfeld does not agree with this conclusion that failure of some tubes decreases the potential for additional tubes to fail. However, he is unable to explain his basis for believing otherwise in a manner that I or anyone I know can appreciate. So, the DPO committee will get to hear it both ways and make up its collective mind.

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