Union of Concerned Scientists
Citizens and Scientists for Environmental Solutions

April 26, 2010

Eric Leeds
Director, Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: General Design Criterion 4 (GDC-4) if Applied to Generic Safety Issue 191 (GSI-191)

Dear Mr. Leeds:

This letter is a follow-up to our letter of April 14, 2010, regarding the nuclear industry's request that the leak-before-break provision of Generic Design Criterion 4 be used in the close-out of Generic Safety Issue 191. I was able to view the webcast of the Commission's April 15th briefing on the matter.[1] The information arising during that briefing helped reshape and/or better define our concerns. We remain convinced that a blanket waiver from the Nuclear Regulatory Commission authorizing leak-before-break to substitute for the plant-specific analyzes of debris generation and transport would not yield successful resolution of GSI-191. But the information presented during the briefing did suggest to us that leak-before-break, under proper conditions, might have a role to play.

Our concern about leak-before-break is that leaks will not be detected in time or will not be responded to in time to prevent the ensuing break. Pressurized water reactors have operated in the past with pressure boundary leakage in violation of technical specification requirements to shut down within six hours of such leakage occurring. The NRC's red finding for Davis-Besse was issued because pressure boundary leakage – at a rate below the unidentified leakage rate and even further below the identified leakage rate in technical specifications – caused significant corrosive damage to the reactor coolant pressure boundary. That degradation significantly increased the probability that a loss of coolant accident would be initiated; the basis for NRC issuing a red finding rather than a yellow, white, or green.

If a plant-specific analysis of postulated reactor coolant pressure boundary leakage showed that leakage in all sections where leak-before-leak credit is applied would be detected in a timely manner, then that analysis could constitute solid grounds for applying leak-before-break to GSI-191 closeout. A suitable plant-specific analysis might be patterned after the analyses performed

[1] I will reiterate here the comments I provided via the NRC's website: the webcast option with materials posted to the website in advance is greatly appreciated.

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for fires. The reactor coolant pressure boundary could be subdivided into segments based on equivalent response to postulated leakage. For example, if plant-specific analysis concluded that the postulated leakage from a segment of hot leg piping at the technical specification action limit (say one gallon per minute) would be detected in a timely manner, there would be no need to do the zone-of-influence et al family of analyses currently needed to resolve GSI-191 for a postulated piping break in that segment and therefore no need for insulation replacement(s) driven by those analyses.

In our view, plant-specific analyses are essential in order to obtain NRC authorization to apply leak-before-break. Well-intentioned measures undertaken to impede the transportation of debris to the containment sump screens may have the unintended consequence of also impeding the timely detection of leakage. It is our understanding that some licensees installed berms and barriers to prevent LOCA-generated debris from being carried to the containment sump screens. What if the floor drain used to monitor unidentified leakage in an area is on the wrong side of a new or an existing berm? It is neither implausible nor far-fetched. Both reactors at the DC Cook nuclear plant in Michigan were shut down in September 1997 after the NRC's design inspection team found walls inside the containments. True, the containments had lots of walls, but the particularly troublesome walls divided each containment sump into two regions. The emergency core cooling systems took suction from one region. Water entering the second region only became available when that region was filled to the point of water topping the wall. Without the water in the non-accessible regions, the ECCS pumps lacked adequate net positive suction head under certain design bases conditions. Among other fixes, the licensee bored holes in that concrete walls to allow water on <u>both</u> sides to be available to the ECCS pumps.

DC Cook's original designers calculated ECCS pump performance assuming that all of the water in the containment recirculation sump would be available. Their math was right but their assumption was wrong. To prevent credit for leak-before-break being given on equally wrong assumptions, plant-specific evaluations must be performed to answer two questions:

1. **Will any of the berms and barriers currently in containments to restrict the transport of debris to the containment sumps also impede the flow of leaked water to the leakage detection systems?**

   We have not reviewed any publicly available documentation that answers this question. The documentation we reviewed described in considerable detail the velocities of water inside containment following postulated pipe breaks and rates at which debris will be deposited on sump screens. For credit to be given for leak-before-break, analysis must show that leaks will be detected in a timely manner rather than leaked water pooling on the wrong side of a barrier – until the ensuing break happens

2. **Will allowable out-of-service periods for leakage detection systems in the technical specifications cause a leak not to be detected in a sufficiently timely manner?**

   It seems plausible that current limiting conditions for operation for reactor coolant system leakage monitoring systems could allow an instrument to be out of service for extended periods as long as sufficient remaining instruments provide reliable detection of a leak inside containment. But credit for leak-before-break alters the design and licensing bases of the leakage detection instrumentation. It might be that reliable detection in very specific locations is needed but not provided by the existing technical specifications. In other words, the existing technical specifications might allow a leakage detection instrument to be out of service for a prolonged period. That out of service instrument may prevent timely detection of leakage from a segment of the reactor coolant pressure boundary for which leak-before-break credit is applied.

The NRC must require that plant-specific analyses answer these two key questions before any credit is given for leak-before-break.

There was discussion during the April 15th Commission briefing about the NRC issuing 50.54(f) letters to licensees with PWRs having GSI-191 issues remaining to be resolved. We recommend that any 50.54(f) letters require one of two resolution paths: (a) the deterministic zone-of-influence and transport analyses presently on the table, and (b) the plant-specific evaluation of all portions of the reactor coolant pressure boundary for which leak-before-break credit is sought that shows postulated leaks will be detected, assuming the minimum complement of leakage detection instrumentation permitted by technical specifications, in a timely manner.

Lastly, the nuclear industry must not be allowed to cherry-pick the GDC it wants to apply. GDC 60 and 64 require that no radioactively contaminated water or gas be released from nuclear plants except via controlled and monitored pathways. Yet plants like Vermont Yankee operate with leaks as if GDC 60 and 64 did not exist. That's not fair.

Sincerely,

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