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Mr. Michael L. Marshall, Jr., Project Manager
Division of Engineering Technology
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Comments on NRC Sponsored Risk-Assessment Efforts to Resolve GSI-191, *Assessment of Debris Accumulation on PWR Sump Performance*

PROJECT NUMBER: 689

Dear Mr. Marshall:

In March, the NRC staff conducted a meeting to discuss its ongoing GSI-191 research at which Los Alamos National Laboratory (LANL) presented a summary of risk assessment work being performed. In addition, the NEI Sump Performance Task Force presented an integrated, risk-informed decision-making process to address GSI-191. During the meeting, the NRC staff invited comments on its risk assessment effort.

We appreciate the efforts of the NRC staff and its contractor to prepare the presentations. The task force provides the following observations and comments with the hope that they will promote additional discussion.

1. The task force's presentation outlined a risk-informed, integrated decision-making approach that we believe would help focus appropriate attention and resources on the most important aspects of the containment sump debris issue. Seven main steps were identified and discussed, along with a general description of what would need to be done to accomplish each step. The enclosed LANL presentations included information that addresses these steps, although the approach is different and more complicated than what task force had envisioned.

2. The LANL presentation suggested they could perform a risk-assessment of PWR post-accident sump performance with debris in the containment recirculating fluid. The modeling process uses a complicated set of steps to combine all debris effects into a single event tree node. This is an extremely important aspect of the risk analysis. We recommend that it be subject to a focused peer review.

3. The model node form for debris generation, transport, and accumulation on the sump screen(s) presently combines the separate individual physical events, all of which must occur sufficiently to affect net positive suction head (NPSH) at the sump screen. This simplification masks extensive research (testing and computer modeling) results by subsuming them into a complex calculation for this single event tree node.

   The LANL risk modeling approach makes it difficult to determine how the test results and analyses are reflected in the risk model. Considerable NRC resources are being expended to develop an understanding of the various phenomena associated with debris generation and transport, and sump screen blockage. We anticipate that these physical insights will be important to understanding the risk of post-accident sump in operability. Unfortunately, the contractor's model masks this understanding because the results are provided in terms of risk importance rather than the physical significance. LANL explained that this risk approach is being used to allow construction of a model that can be accommodated by the available PRA software. This logic does not justify masking the physical events.

   We recommend that:

   - The NRC staff reconsider how the event phenomena are modeled and eliminate the masking effect of the current risk model. Collapsing all the event phenomenology into one node will not use the risk insights to the optimum level.
   - If an event tree simplification is required, some plant systems behavior may be approximated by consolidated event tree nodes. This allows for adding more of phenomenological branching nodes. Plant systems behavior is of secondary importance to this assessment.

4. Dr. D. V. Rao's comment on the use of weighting factors, either one or zero, appears inconsistent with the LANL presentation. The presentation combined the conditional probabilities of recirculation failure for particular combinations of debris sets for a given break set, and for particular combinations of break sets for a given accident sequence. See slides 40 through 44. We provide the following observations:

- It is unclear how this process will retain traceability, to the extent needed to verify the results, between the:
  - initiating event frequency;
  - fraction of this frequency that is contributed by any particular break set; and
  - probability that any particular break set generates sufficient debris to be of concern to sump screen blockage sufficient to cause insufficient NPSH for the recirculation pumps.

  This traceability is important to the understanding of events that might challenge post-accident sump operability. We recommend that the weighting factor, (W_i) be assigned the fraction of the total initiating event frequency for a particular break set. Based on the presentation (slide 44), this was apparently not intended.

- Use of the second weighting factor (W_{ik}) is easier to understand. However, it is not clear how a meaningful weighting factor will be defined because the probability obtained from the summation is representative of the probability that insufficient NPSH will occur for a given break set in a given accident sequence. A clarification of this is important to understanding the events that might challenge post-accident sump operability. The recommendation provided in Comment 3 addresses this concern.

- The information provided at the meeting is not sufficiently detailed for us to understand the NRC staff's method to incorporate risk insights into the resolution of GSI-191. We request the NRC staff to provide in the near future additional details, including examples of the calculations involved, for review.

- We understand that the NRC staff plans to "account for licensing versus 'most-likely' plant systems response" as described in slides 4 and 7 of the enclosure. Although this was discussed at the meeting, it remains unclear what the significance of the results of the exercise will be, or how it will be done. We request the NRC staff provide additional explanation of this at a public meeting in the near future.

5. Dr. Darby's presentation (slides 4 and 7) expressed concern with the need for and the ability to model sequences "to the component level." The modeling of plant component performance prior to nodes reflecting recirculation should not require significant new work for this program. There is only one component of concern for this issue, the sump screens, which if "failed" due to excessive blockage, results in failure of the low head

ECCS pumps in recirculation mode. A reasonable and insightful assessment of risk due to sump debris should not require any significant amount of component-level modeling. Thus, the ability to model components should not become an important factor in "squeezing" the important part of the model, which is the modeling of debris generation, transport, and accumulation. The recommendation provided in Comment 3 addresses this concern.

6. We agree that an evaluation of the impact of this issue on large early release frequency (LERF) from containment should be performed. It is less obvious that a detailed event sequence model is required. For some events on the accident sequence list (see slide 9 of the enclosed presentation), LERF is an unlikely event, even with early failure of recirculation cooling. Examples would be transients, including loss of offsite power, and "small-small LOCA."

   As an alternative, we recommend that the NRC staff assess if each specific initiating event is likely to be a contributor to a release that is both large and early, in accordance with the Regulatory Guide 1.174 definition. It is unnecessary to model a detailed LERF event tree when PRAs indicate a large early release is not of concern.

7. At the meeting, D. V. Rao asked if the PWR owners groups had information regarding the likelihood of events involving a high energy line break (e.g., main steam or main feedwater line) with consequential steam generator tube rupture, and the possible debris-related sump blockage as a result. Potential frequencies for these events are not available.

We appreciate the opportunity to offer comments. If you have any questions, please call me at (202) 739-8085.

Sincerely,

Kurt Cozens

Kurt Cozens

KOC/
Enclosure

c: Mr. Robert B. Elliot, U.S. Nuclear Regulatory Commission
Mr. Aleck W. Serkiz, U.S. Nuclear Regulatory Commission