

CLAIM: Conservatism and worst case estimates skewed the risk profile and risk insights.

RESPONSE: The spent fuel pool risk assessment for decommissioning plants (risk assessment) was a two month effort intended to provide early insights into areas that would need more staff attention. NEI requested (so that it could comment on the report and influence the process) early release of the draft risk assessment prior to it receiving a thorough independent technical review. The staff carefully documented its assumptions in the risk assessment to allow for public and industry comment. The risk assessment was based on staff visits to four decommissioning plant sites. The staff attempted to perform the risk assessment in a realistic manner. Because the assessment was performed quickly, had many parts performed in parallel (causing multiple parts to proceed based on various assumptions as to what other parts would conclude), and was prematurely released, the staff did not have an opportunity to institute its usual quality control reviews. Never the less, the risk assessment is the best that has ever been performed for a decommissioned plant and provided useful insights to focus staff, industry, and public attention to the issues that deserved further discussion. As the staff has told NEI many times, the numerical results and insights from the draft risk assessment are not cast in stone, but are meant to generate discussion to lead to the truth about risk at spent fuel pools in decommissioning plants.

The deterministic analysis performed in parallel with the risk assessment was intended to envelope the future decommissioning plants, both for the potential heat loads they might have and the fuel configurations they might choose to use. The staff did not attempt to deterministically model an average plant since the risk from outliers might be unacceptably higher than the average plant.

CLAIM: Consistent bias toward upper bound analyses in the risk assessment.

RESPONSE: As noted above, the staff attempted to use realistic numbers where ever it could. In many cases it lacked a good database from which to make estimates. For example, human reliability analysis does not have good data or models for multiple day events. There is inadequate data on heavy loads to reduce the frequency of challenges to the point that such events are not of concern. NEI points out that we used a diesel-driven pump unreliability of 0.18 when the ALWR database used 0.044. In fact the staff is sufficiently concerned about the unreliability of fire pumps (not required to be operable in the technical specifications; reports of unreliability as high as 0.5 have been discussed) that NRR is in the process of generating a user request to the Office of Research to investigate the actual unreliability of these pumps.

Rather than hold on to the risk assessment until the staff was assured that there were few if any areas for enhancement or problems with the report, the staff chose to issue the risk assessment to give the public and industry a heads up on the preliminary insights. We continue to believe that this is the correct course and are willing to discuss the assumptions and models used in order to get as well founded an understanding of spent fuel pool risk as possible.

CLAIM: Fuel uncoverly was the endpoint of the risk assessment.

RESPONSE: The risk assessment evaluated the time to spent fuel uncoverly and then assumed that the dose rates would be sufficiently high that recovery would be problematic at best. The use of fuel uncoverly was a analytical simplification chosen to allow for completion of the risk

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assessment on time. The use of this simplification was clearly documented in the risk assessment and discussed with NEI multiple times. Subsequent calculations by a National Laboratory indicate that an operator would be subject to dose rates on the order of tens of thousands of Rem per hour at the pool lip in the event the spent fuel was uncovered. The human error rates assumed in the risk assessment would not have changed significantly if the additional time available from the beginning of fuel uncover to the beginning of a zirconium fire were directly considered, since the human error rates are relatively "flat" and insensitive to the difference between an event lasting 5 days or 8 days. Never the less as part of our enhancements to the analysis, the draft final report will reflect that the time to the beginning of a zirconium fire is the time used in the human error rate estimations.

CLAIM: The risk assessment is inconsistent with Commission Policy and the IPEs.

RESPONSE: The risk assessment was performed to provide a technical basis for making risk informed decisions about spent fuel pool risk at decommissioning plants. The risk assessment was performed on an expedited basis and used realistic assumptions and estimates where possible. The nature of this assessment was that multiple parts had to be performed in parallel rather than in series as would normally have been done. In releasing the risk assessment prior to a complete review the staff provided the public and industry with early thinking on the staff's part on what were the most important issues for decommissioning spent fuel pools. The staff has not made a single regulatory decision based on the risk assessment. The staff has looked more closely at some areas of recent exemption requests based on the preliminary insights from the spent fuel pool deterministic and risk assessments.

The modeling process and the staff's evaluation of the spent fuel pool risk assessment was performed in a manner very similar to that chosen by most of the utilities performing IPEs. The biggest differences between the risk assessment and IPEs are that (1) there is more and better data for operating plants than there is for decommissioning plants, (2) while operating plants have multiple redundant, diverse, and automatic systems to prevent and mitigate serious events, decommissioning plants often have no emergency ac power, no residual heat removal system, no component cooling water system, no RWST or condensate storage tank, and no automatic systems to deal with loss of spent fuel pool cooling or inventory, and (3) operating plants are not seeking exemptions from EP, insurance, and security. Most IPEs assume a mission time of 24 hours because the events are over or stable within 24 hours and any additional problems that arise are assumed to be capable of being handled by the alerted staff of the utility. None-the-less, when a plant has need for a longer mission time, for example when considering certain events and equipment for the AP-600 design, the staff investigates the effect of an extended mission time. For spent fuel pools multiple years after the last fuel has been removed from the reactor, after much of the plant has been dismantled and hauled away, when the NRC no longer even retains onsite inspectors, and when the events of interest may not be stable or completed after a number of days (instead of hours for an operating reactor), the staff determined that longer mission times were appropriate.

RECOMMENDATION BY NEI:

1) Credit industry commitments - Response: Industry has yet to make any commitments in writing to the staff. NEI provided a discussion of commitment areas during the July 1999 two-day workshop on decommissioning risk. However, the transcript is sufficiently vague that in some cases it is unclear exactly what NEI is committing to and for whom. NEI indicated it would make commitments in the areas of hardware and procedural aspects. These commitments

were fairly general and need to be better defined to be of practical use in estimating their effect on risk estimates. NEI made specific clear commitments about decommissioning plants following the guidance in NUREG-0612, which allowed the staff to refine its heavy loads analysis. NEI stated in the transcript that it would be willing to provide additional commitments. In addition, NEI submitted a report to the NRC that made a number of commitments and observations about what utilities should do to reduce the risk at their decommissioning spent fuel pools. Subsequently, NEI stated that it did not ascribe to all of these. NEI has indicated that it would provide clarification so the staff can understand which are commitments and which are observations. The staff has provided the public with a discussion of the types of procedures and organization controls necessary to help assure that the human error probabilities are low for decommissioning plants. The staff has not yet received this clarification. The staff's final assessment will reflect the effect of all industry commitments.

2) Revise study to use best estimates and remove conservatisms - Response: The staff has provided all of industry's and the public's comments to its National Lab contractor for consideration for inclusion in the revised draft final report. The draft final report will be issued in early January.

3) Truncate sequences beyond 2 days - Response: The staff cannot rule out the potential for sequences lasting more than two days. While the error rate would be expected to be quite low for such long scenarios, it was not justifiable to simply assume 100% human performance. The staff through use of expert help is attempting to extend the state-of-the-art to be able to better handle human reliability assessments covering multiple days. At this time the staff is working to determine what actions need to be taken or commitments need to be made to assure that the chances of an event lasting so long are very low.

4) Requantify the model - Response: As the staff told NEI at the staff's workshop in July 1999, we will requantify the risk assessment to the extent that we can based on using defensible and appropriate estimates and models. We cannot promise doing more than the state-of-the-art.