

DISPOSITION OF EXPONENT REPORT

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ISSUES

I was asked to evaluate proposed treatment of recent Exponent Failure Analysis Associates assessments of the 2002 Davis Besse reactor vessel head degradation event. The Exponent assessment concluded that, based upon a detailed computational fluid dynamics (CFD) model, reactor vessel head degradation likely developed in a short time before discovery in 2002. At issue are: (1) do Exponent findings significantly change or impact the basis of FENOC and NRC restart decisions, and (2) what, if any, reports should be made to NRC (such as revised root cause or licensee event reports) on the Exponent assessment.

In addition to the Exponent report, I reviewed the extensive body of correspondence, reports and orders related to this issue. I examined the record as it relates to both Davis Besse restart and NRC industry-wide action on Alloy 600 issues. I assessed potential impact on NRC event significance determinations and reviewed NRC reportability requirements.

CONCLUSIONS

Impact on Restart

The Exponent Report does not raise issues that would undercut the basis for NRC's restart approval. The replacement of the reactor vessel head essential eliminated this as an issue.

Reports to NRC/Industry

It is clear that results of the Exponent work must be provided to NRC and the industry. While the RV head has been replaced and much of the data relied upon by Exponent was developed through NRC research, the assessment methodology and conclusions are sufficiently different than those described in previous assessments (e.g. root cause evaluations) that the results must be shared.

Whether a supplemental LER is needed or not is a close call. Strong arguments can be made on either side. My opinion is that a supplemental LER would not be **required**, provided (1) strong steps are taken to disseminate results to NRC and other stakeholders and (2) the basis for this decision is clear. This is a very unique case; I could find no precedent. Supplementing the LER on a voluntary basis might be **prudent** to avoid questions on the matter.

In any case, a rigorous analysis which compares Exponent report conclusions with those previously reported in documents such as the initial root cause analysis is needed. (The evaluation of CR 07-15077 might do this. I was unable to fully review this in the time available. I recommend that technical staff who were not involved in developing the report take a very hard look at this.)

ANALYSIS

NRC assessments prior to restart recognized the uncertainty that exists regarding the rate of vessel head corrosion/erosion. While the FENOC root cause evaluation concluded corrosion of the RV head developed over a period of time (likely over two operating cycles), NRC stated in numerous reports that this may have occurred far more rapidly. This combined with the reactor

vessel head replacement strongly indicate the Exponent Report does not undercut restart decisions.

However, while NRC recognized uncertainties in issuing new requirements for RV head inspections, the level of detail and nature of the Exponent analyses and CFD modeling appear to go beyond what has been reported previously. In taking action on the RV head issue, NRC repeatedly says that research and investigations continue -- that these research activities are important to long-term development of revisions to NRC regulations. The March 13, 2003 NRR assessment of the issue said "a more complete understanding of the Davis-Besse event would aid in determining appropriate inspection requirements to account for the uncertainties in the degradation rates". With this as the backdrop, a study such as the Exponent Report which -- at the very least -- on its face offers a new explanation of the RV head degradation must be shared. This is true even if the Report draws upon previously reported data (e.g., ANL CGR and corrosion data).

Arguments for not filing supplemental LER

- The initial LER addressed the issue at a very broad level. NRC and industry followup was extensive. It was undertaken in the context of a comprehensive confirmatory action letter (CAL) and Manual Chapter 0350 restart process.
- On a number of occasions after the LER was submitted, significant new information was developed in metallurgical studies and investigation of specimens removed from the head. This included, for example, discovery of cladding cracks and circumferential cracks in the number 3 nozzle. This information was passed to NRC informally through inspections and letters sent to the NRC (e.g., letter forwarding the root cause analysis).
- NRC accepted this manner of communication and did not require supplements to the LER each time significant, new information emerged. (50.73 (c) specifically speaks to NRC requiring LER supplements if the Commission considers this necessary.) In the case involving the cracking identified in the RV cladding, NRC issued a Preliminary Notification (PNO-III-02-036 on 9/10/22. No supplement was required.
- FENOC's final technical root cause analysis report was provided to NRC after the LER. The LER was not supplemented. Again, NRC accepted this approach as meeting its needs.
- FENOC has docketed the Exponent Report, briefed senior NRC executives and held detailed discussions with NRC technical staff on Report conclusions. Exponent technical experts have participated in these discussions. Similar steps have been taken with industry groups (e.g., NEI, MEOG). This occurred in a manner similar to what was done during the pre-restart MC-0350 period.
- Guidance in NUREG-1022 says, in effect, that a supplemental LER would not be needed unless an LER was *incomplete at the time of original submittal* or it was technically incorrect. While one can argue the Exponent report presents and addresses new information, reading "*incomplete at the time of submittal*" as meaning failure to provide information in the LER that was possessed at the time the LER was submitted, a supplement would not be required. The Exponent does not appear to suggest anything in the LER was technically incorrect so this is not an issue.

Arguments for supplementing LER

- While it draws on information previously reported, the conclusions are different than what was submitted in the initial LER. In some fashion, NRC and the industry need to be informed and the record needs to be updated. A supplemental LER would help accomplish that.

- NUREG-1022 can be read to require a supplement. Development of significant, new information makes the LER incomplete, after the fact. One can argue that the spirit of this requirement is to maintain a complete record. The supplement accomplishes that.
- NUREG-1022 states that where the original "LER mentions that an engineering study is being conducted"...the results should be reported if they..."*would significantly change the reader's perception of the course, significance, implications, or consequences of the event*"...or if they result..."in substantial changes in the corrective action planned by the licensee". There would be no change to corrective actions, but one can argue that the first clause would call for a supplement. While the LER did *not* mention that an engineering study is occurring, one can argue the intent is clear. An engineering study was done and results would change the "reader's perception" of at least the "course" of the event.
- While not similar to the RV head event, licensees have supplemented LERs well after the fact (e.g., Seabrook LER 50-443/88-09 -- a 1988 report supplemented in 1992) to reflect information providing a significant, new perspective on an event.
- NRC closed the LER in an inspection report dated October 30, 2003. However, this was before the new information was developed. Therefore, this closure cannot be viewed as a basis for not supplementing the LER.
- One can argue that a mechanism such as the CAL and MC-0350 process that provided a path around formal LER reporting does not now exist to assure the record is complete.

NEXT STEPS

Taking all into account, I conclude a supplement is not required. But this depends on very effective communication with NRC and stakeholders.

The approach to reportability should be discussed explicitly with NRC. I recommend the rationale for not supplementing the LER be raised in the context of the broader discussions we are having with NRC on this report. As appropriate, we should share our rationale with industry stakeholders.

Our rationale needs to be laid out in a clear and complete way after CR 07-15077 is fully reviewed by FENOC technical experts who were not involved in developing the Report. We need to make it easy, not hard, for stakeholders to understand how the Exponent Report relates to previous reports. This includes anticipating and addressing the questions that will likely arise given Report conclusions that, as a minimum, appear to be radically different from previous assessments. No doubt FENOC has been doing this in the numerous briefings on the report. Taking the next step of documenting this at some level would assure that it's FENOC, not outsiders, putting Report conclusions into perspective.

It is likely that the docketed report will receive wide attention. Taking these steps will help assure the Company is ready to respond to the many detailed questions that are likely to follow.