NRR-PMDAPEm Resource

From: Wiebe, Joel
Sent: Saturday, October 22, 2016 10:09 AM
To: 'Joseph Bauer'; 'Jessica Krejcie'
Cc: 'David Gullott'
Subject: Supplemental Initial RAIs Related to the Braidwood Unit 2 SX Pump Allowed Outage Time Amendment Request

This e-mail supplements my e-mail dated October 20, 2016, and completes the NRC staff's initial RAIs related to the subject amendment request. The numbering scheme continues the numbering scheme in my October 20, 2016, e-mail.

12. Regulatory Issue Summary 2007-06 states that the NRC staff expects that licensees fully address all scope elements with Regulatory Guide (RG) 1.200, Revision 2 by the end of its implementation period (i.e., April, 2010, one year after the issuance of RG 1.200, Revision 2). In accordance with RG 1.200, Revision 2, it is expected that the differences between ASME/ANS RA-Sa-2009 and earlier versions of the standard used in the internal events PRA peer review be identified and addressed.

    Page 2 of the LAR states that the proposed change to the CT has been evaluated using the risk-informed processes described in RG 1.174, Revision 2 and RG 1.177, Revision 1. The risk associated with the proposed changes was determined to be acceptable. RG 1.177, Revision 1, Section 2.3.1, "Technical Adequacy of the PRA," states that "the technical adequacy of the PRA must be compatible with the safety implications of the TS change being requested and the role that the PRA plays in justifying that change." This section refers to RG 1.200, Revision 2, which endorses, with exceptions and clarifications, ASME/ANS RA-Sa-2009 as one acceptable approach for determining the technical adequacy of the PRA.

    Section 1.1 of Attachment 5 to the LAR states that the analysis follows the guidance provided in RG 1.200, Revision 2. However, Section 4.4 of Attachment 5 to the LAR states that "[t]he ASME/ANS PRA Standard provides the basis for assessing the adequacy of the Braidwood PRA as endorsed by the NRC in RG 1.200, Revision 1. The predecessor to the ASME/ANS PRA Standard was NEI 00-02 which identified the critical internal events PRA elements and their attributes necessary for a quality PRA." Section 4.5 of Attachment 5 to the LAR states that a formal industry peer review was performed in July 2013 against Addendum B of the ASME/ANS PRA Standard, while, Section 4.6.2 of Attachment 5 to the LAR states that this formal peer review was performed against Addendum A of the ASME/ANS PRA Standard.

    It is not clear whether RG 1.200, Revision 2, was used as the basis for assessing the technical adequacy of the Braidwood PRA used for this application. For the formal peer review of the internal events PRA in July 2013, clarify whether this peer review was performed against ASME/ANS RA-Sa-2009, as qualified by RG 1.200, Revision 2. Also, indicate whether this formal review was a full-scope or focused-scope review. If the peer review was performed against an earlier version of this guidance, then provide a gap assessment of the internal events PRA against ASME/ANS RA-Sa-2009, as qualified by RG 1.200, Revision 2. [Section 3.3, "Gap Assessment for PRAs Reviewed Against RG 1.200, Revision 1," of NEI 05-04, Revision 3, provides guidance on performing a gap assessment.]

13. The LAR states that the proposed change to the Technical Specification completion time has been evaluated using the risk-informed processes described in RG 1.174, Revision 2, and RG 1.177, Revision 1. Attachment 5 to the LAR provides the supporting risk-informed evaluation of the requested change including an evaluation of the technical adequacy of the PRA in accordance with RG 1.200, Revision 2.

    a) RG 1.177, Revision 1, states that the proposed change must maintain sufficient safety margins. Section "SX Pump Repair/Replacement History" of Attachment 1 to the LAR (Page 5 of 24) states that the 1B SX pump "has been operating with minimal margin recently. Consequently, the rotating element will be

replaced during Refueling Outage A1R19 (in September/October 2016) to increase the margin." The licensee's risk evaluation for this LAR assumes that the failure probabilities of all the SX pumps, except the 2A pump, remain the same (i.e., they all have sufficient margin and are not degraded).

Confirm that the rotating element of the 1B SX pump has been replaced during Refueling Outage A1R19. Also confirm that the 1A, 1B and 2B SX pumps have not degraded based on the latest surveillance test results.

b) Section 2.3.5, "Sensitivity and Uncertainty Analyses Relating to Assumptions in Technical Specification Change Evaluations," of RG 1.177, Revision 1, states that sensitivity analyses should be performed to address the uncertainties regarding important assumptions made in the submittal.

If the 1A, 1B or 2B SX pump is in degraded condition, adjust the failure probability(ies) of the degraded pump(s) based on the existing margin and perform a sensitivity analysis to confirm that the conclusion of this LAR is not impacted.

14. Section 2.3.3.4, "Truncation Limits," of RG 1.177 states that "truncation levels should be used appropriately to ensure that significant underestimation, caused by truncation of cutsets, does not occur as discussed below. Additional precautions relevant to the cutset manipulation method of analysis are needed to avoid truncation errors in calculating risk measures."

    ASME/ANS RA-Sa-2009, as qualified by RG 1.200, Revision 2, contains "High Level Requirements for Quantification," HLR-QU-B. Truncation limit is one of the HLR-QU-B quantification requirements. In Table 2-2.7-3(b) of ASME/ANS RA-Sa-2009, QU-B2 requires to "TRUNCATE accident sequences and associated system models at a sufficiently low cutoff value that dependencies associated with significant cutsets or accident sequences are not eliminated."; QUB3 requires to "ESTABLISH truncation limits by an iterative process of demonstrating that the overall model results converge and that no significant accident sequences are inadvertently eliminated. For example, convergence can be considered sufficient when successive reductions in truncation value of one decade result in decreasing changes in CDF or LERF, and the final change is less than 5%."
    Explain how the truncations used for calculating the CDFs and LERFs listed in Table 3.2-1 and Table 3.2-9 in Attachment 5 to the LAR meet the above truncation limit requirements. If the truncations used in the LAR do not meet the ASME/ANS RA-Sa-2009 requirements, then update the risk evaluation of the LAR using appropriate truncation limits and explain how these new truncation limits meet the above truncation limit requirements.

15. Section 2.5.3 of RG 1.174, Revision 2, states that "The development of the PRA model is supported by the use of models for specific events or phenomena. In many cases, the industry's state of knowledge is incomplete, and there may be different opinions on how the models should be formulated. Examples include approaches to modeling human performance, common-cause failures, and reactor coolant pump [(RCP)] seal behavior upon loss of seal cooling. This gives rise to model uncertainty." Regarding the model uncertainty, Section 2.5.3 of RG 1.174, Revision 2, states that "the impact of using alternative assumptions or models may be addressed by performing appropriate sensitivity studies or by using qualitative arguments, based on an understanding of the contributors to the results and how they are impacted by the change in assumptions or models." In addition, Section 2.5.5 states that "in general, the results of the sensitivity studies should confirm that the guidelines are still met even under the alternative assumptions (i.e., change generally remains in the appropriate region)."

    Sections 3.2.3, "Peer Review Finding IFSO-A4-01 Sensitivity Analysis," and 3.5, "Uncertainty Assessment," of Attachment 5 to the LAR provide the uncertainty and sensitivity analyses related to the risk evaluation for this application. Section 3.5.2, "Model Uncertainty," of the LAR states that "[b]ecause a loss of SX can impact RCP seal cooling and lead to a challenge to the RCP seals, the modeling of the Shutdown Seals and associated human actions is identified as a potentially key uncertainty for this application." Although the LAR implies that the Generation III (GEN III) Westinghouse Shutdown Seals were used at Braidwood, there is no confirmation about the type(s) of RCP shutdown seals installed at Braidwood. It is unclear how many RCPs have been installed with the GEN III seals. The RCP shutdown seals are modeled in the PRA using the guidance in PWROG-14001-P, "PRA Model for the Generation III Westinghouse Shutdown Seal," Revision 1. Although PWROG-14001-P is the latest available industrial guidance for the Gen III seals, it

has not been endorsed nor approved by the NRC. The likelihood and magnitude of inventory loss resulted from the Gen III seals failures may be greater than that assumed by this Westinghouse guidance. Given the issues identified above, provide additional information to the following:

a) Describe the type(s) of RCP shutdown seals installed at Braidwood and whether the Gen III seals were installed on all the RCPs for Units 1 and 2.
b) Provide the results of a sensitivity analysis (i.e., updated values in LAR Tables 3.2-1 and 3.2-2 for internal events; LAR Tables 3.3-1 and 3.3-2 for fire; and LAR Table 3.4-1 for total risk and comparison to the acceptance guidelines) that considers reduced credit for the RCP shutdown seals (i.e., reduce credit by a factor of 2). Confirm that the results of this sensitivity analysis still meet the risk acceptance guidelines of RG 1.177, Revision 1.
[Note: This sensitivity analysis should take into consideration any changes made to the PRA or risk evaluation as a result of addressing Items 2, 3 and 6 listed in this RAI.]

   If RG 1.177 risk acceptance guidelines are exceeded, then provide qualitative or quantitative arguments, based on an understanding of the contributors to the results and how they are impacted by the change in assumptions or models, to support the conclusion of the LAR. This discussion should include which metrics are exceeded and the conservatisms in the analysis and the risk significance of these conservatisms,

c) In order to verify the adequacy of the human error probabilities (HEPs) associated with the human failure event (HFE) related to tripping the RCPs to preclude damage to the shutdown seals, which is a compensatory measure stated in the LAR, address the following:

   i. Confirm that the HEPs for tripping the RCPs to preclude damage to the shutdown seals used in the internal events and fire PRAs reflect current plant procedures.

   ii. For the fire PRA, explain how the HEPs were calculated for this HFE, and why they are reasonable for this application. Provide sufficient details (e.g., input assumptions and numerical values) to show how these HEPs were developed, including:

      - A discussion of the specific actions and instructions for tripping the RCPs to preclude damage to the shutdown seals for fire scenarios, including the cues or indications operators will use to initiate RCP trip. Provide a timeline for these operator actions, and how the time available and time required to complete operator actions were estimated.

      - Confirm that the modeling and feasibility study of this HFE was performed consistent with guidance in NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines - Final Report," July 2012 (ADAMS Accession No. ML 12216A104). Otherwise, justify the basis for the human reliability analysis of this HFE,

16. Section 2.3.6 of RG 1.177, Revision 1, states that “if compensatory measures are considered as part of the analysis of the change, they should be included in the overall application for the TS change.” Sub-section “Summary of Compensatory Measure Impacts on Important Fire Zones” (Pages 3-24 and 3-25) of Attachment 5 to the LAR listed three compensatory actions. However, Attachment 1, Sub-Section “Tier 2: Avoidance of Risk-Significant Plant Configurations” (Pages 11 and 12 of 24) of the LAR and Section 5.4.1, “Compensatory Measures,” of Attachment 5 to the LAR does not include all of these measures. Also, Sub-section “Summary of Compensatory Measure Impacts on Important Fire Zones” (Pages 3-24 and 3-25) of Attachment 5 to the LAR refers to “BW-CRM-115, Exelon Risk Management Team, Development of Risk Management Actions for the Inclusion of Fire Insights into Braidwood Configuration Risk Management Program, BW-CRM-115, Revision 1, February, 2014” for configuration risk management, while Section 5.4.1 of Attachment 5 to the LAR refers to “OP-AA-201-012-1001, Operations On-Line Fire Risk Management, Revision 1” for fire risk management actions.

a) Describe the differences between the two references for risk management actions and clarify what compensatory measures will be implemented from these risk management actions during and prior to the repair of the 2A SX pump.
b) Ensure that all the compensatory measures are consistent and that they are explicitly listed in the following sections of the LAR:
   - Attachment 1, Sub-Section "Tier 2: Avoidance of Risk-Significant Plant Configurations" of the LAR,
   - Attachment 5, Section 5.4.1, "Compensatory Measures," and
   - Attachment 5, Sub Section "Summary of Compensatory Measure Impacts on Important Fire Zones."

17. Section 2.3.1, "Technical Adequacy of the PRA," of RG 1.177, Revision 1 states that the technical adequacy of the PRA must be compatible with the safety implications of the Technical Specification change being requested and the role that the PRA plays in justifying that change. RG 1.177, Revision 1 endorses the guidance provided in RG 1.200, Revision 2. RG 1.200, Revision 2 endorses, with exceptions and clarifications, ASME/ANS RA-Sa-2009 which provides technical supporting requirements in terms of three Capability Categories. The intent of the delineation of the Capability Categories within the Supporting Requirements is generally that the degree of scope and level of detail, the degree of plant specificity, and the degree of realism increase from Capability Category I to Capability Category III. RG 1.200, Revision 2 describes a peer review process utilizing ASME/ANS RA-Sa-2009 as one acceptable approach for determining the technical adequacy of the PRA once acceptable consensus approaches or models have been established for evaluations that could influence the regulatory decision. The primary results of a peer review are the Findings and Observations (F&Os) recorded by the peer review and the subsequent resolution of these F&Os.
Table 4-3 of Attachment 5 to the LAR lists those "Findings" that are associated with supporting requirements (SRs) that were otherwise assigned to be at least Capability Category II from the peer review consistent with the RG-1.200, Revision 2. Address the following items related to the F&Os listed in Table 4-3:

a) AS-B3-01 (Page 4-14): "Potential failure of containment sump suction screens due to debris clogging is not represented in the fault tree." The licensee states that no significant effect is expected, since dominant sequences often already have failure of recirculation for other reasons.

   According to Table 2-2.2-3(b) in ASME/ANS RA-Sa-2009, SR AS-B3 requires "for each accident sequence, IDENTIFY the phenomenological conditions created by the accident progression. Phenomenological impacts include generation of harsh environments affecting temperature, pressure, debris, water levels, humidity, etc. that could impact the success of the system or function under consideration [e.g., loss of pump net positive suction head (NPSH), clogging of flow paths]. INCLUDE the impact of the accident progression phenomena, either in the accident sequence models or in the system models." This requirement is applicable to Capability Categories I to III.

   Not including failure of containment sump suction screens due to debris clogging in the sequences produces non-conservative results. Explain why there is no significant effect on the modeling results used for this application.

b) DA-D7-01 (Page 4-15): "SR-DA-D7 requires that if common cause events deleted from common cause population of estimate formula due to non-applicability events in the total population also have to be screened and deleted if non-applicable. It was noted that one common cause event excluded from the common cause group was not excluded from the total population." The licensee states that "changes in the one CCF term identified by the review team do not have a large overall effect on model results." According to Table 2-2.6-5(d) in ASME/ANS RA-Sa-2009, DA-D7 requires "If screening of generic event data is performed for plant-specific estimation, ENSURE that screening is performed on both the CCF events and the independent failure events in the database used to generate the CCF parameters." This requirement is applicable to Capability Categories I to III.

   Justify why the impact of not including that one common cause event is not significant for this application.

Table 4-4 of Attachment 5 to the LAR lists the “Findings” that are associated with Braidwood’s fire PRA that did not meet Capability Category I Supporting Requirements. Address the following items related to the F&Os listed in Table 4-4:

c) PRM-B15, F&O No.15-15 (Page 4-21): “BW-PRA-021.05, Fire PRA Plant Response Model notebook Rev 0, Section 3.1.8 and Appendix B. Appendix B documents the review of the containment paths and the basis for screening or including the individual pathways. Additional pathways were identified that should be included in the Fire PRA model. However, these pathways appear to not be included under gate 1(2)-CONTISOLATION.” The licensee states that this is only a documentation upgrade and that there is no impact on PRA quantification.

   According to Table 4-2.5-3(b) in ASME/ANS RA-Sa-2009, PRM-B15, “all the SRs under HLR-LE-A, HLR-LE-B, HLR-LE-C, and HLR-LE-D in Part 2 are to be addressed in the context of fire scenarios including effects on system operability/functionality, operator actions, accident progression, and possible containment failures accounting for fire damage to equipment and associated cabling.”

   F&O No. 15-15 indicates that the issue requires more than a documentation only upgrade. Correct the model by including these missing pathways under gate “1(2)-CONTISOLATION” and update the quantification results, or justify why these pathways have no significant impact on the quantification results used in this application.

Hearing Identifier: NRR_PMDA
Email Number: 3118

Mail Envelope Properties (f3cf286e9da9425e8c0232ffea28c3dd)

Subject: Supplemental Initial RAIs Related to the Braidwood Unit 2 SX Pump Allowed Outage Time Amendment Request
Sent Date: 10/22/2016 10:08:55 AM
Received Date: 10/22/2016 10:08:00 AM
From: Wiebe, Joel

Created By: Joel.Wiebe@nrc.gov

Recipients:
"'David Gullott'" <David.Gullott@ExelonCorp.com>
Tracking Status: None
"'Joseph Bauer'" <Joseph.Bauer@exeloncorp.com>
Tracking Status: None
"'Jessica Krejcie'" <Jessica.Krejcie@exeloncorp.com>
Tracking Status: None

Post Office: HQPWMSMRS07.nrc.gov

Files	**Size**	**Date & Time**
MESSAGE	18548	10/22/2016 10:08:00 AM

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received: