NRR-DMPSPEm Resource

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Sent:	Tuesday, August 7, 2018 6:25 PM
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Subject:	Brunswick - Adoption of 10 CFR 50.69 – Supplement to the HWPRA and XFPRA Audit Plan for BSEP Onsite Audit (EPID: L 2018-LLA-0008)
Attachments:	Brunswick 50.69 External Hazards PRA Audit Plan Supplement.pdf

Mr. Zaremba,

By letter dated January 10, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18010A344), Duke Energy Progress, LLC (Duke Energy, the licensee) submitted a license amendment request (LAR) for the Brunswick Steam Electric Plant Unit Nos. 1 and 2 (BSEP). The proposed amendments would revise the licensing basis by adding a license condition to allow for the implementation of the provisions of Title 10 of the Code of Federal Regulations (10 CFR) Section 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors." The proposed amendment would use, among other probabilistic risk assessment (PRA) models, the BSEP high winds PRA (HWPRA) and external flood PRA (XFPRA) in the proposed 10 CFR 50.69 categorization process.

On May 9, 2018, the U.S. Nuclear Regulatory Commission (NRC) staff issued an audit plan focused on the HWPRA, XFPRA, and the use of an online reference portal (ADAMS Accession No. ML18130A021). On July 2, 2018, the NRC staff issued an audit plan for an onsite audit July 17-19, 2018 focused on categorization approaches excluding the HWPRA and XFPRA. The NRC staff has determined that an onsite audit focused on the HWPRA and XFPRA, including the walkdown of applicable items credited in these PRAs, would assist in the timely completion of the subject LAR review process. The NRC staff is continuing to review other aspects of the licensee's submittal and may identify the need for additional audit subjects by separate correspondence. The attached supplement to the May 9, 2018 audit plan specifically addresses an onsite audit focused on the HWPRA and XFPRA.

If you have any questions, please contact me at (301) 415-6256.

Respectfully,

Dennis Galvin
Project Manager
U.S Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Operating Reactor Licensing
Licensing Project Branch 2-2
301-415-6256

Docket No. 50-325 and 50-324

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SUPPLEMENT TO THE AUDIT PLAN

REGARDING HIGH WINDS AND EXTERNAL FLOODS PROBABILISTIC RISK ASSESSMENTS

LICENSE AMENDMENT REQUEST TO ADOPT 10 CFR 50.69 CATEGORIZATION PROCESS

DUKE ENERGY PROGRESS, LLC

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

DOCKET NOS. 50-325 AND 50-324

I. BACKGROUND

By letter dated January 10, 2018 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML18010A344), Duke Energy Progress, LLC (Duke Energy, the licensee) submitted a license amendment request (LAR) regarding the Brunswick Steam Electric Plant Units 1 and 2 (BSEP). The proposed amendment would modify the licensing basis to allow for the implementation of the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components (SSCs) for Nuclear Power Reactors." The proposed amendment would use, among other probabilistic risk assessment (PRA) models, the BSEP high winds PRA (HWPRA) and external flood PRA (XFPRA) in the proposed 10 CFR 50.69 categorization process.

On May 9, 2018, the U.S. Nuclear Regulatory Commission (NRC) staff issued an audit plan focused on the HWPRA, XFPRA, and the use of an online reference portal (ADAMS Accession No. ML18130A021). On July 2, 2018, the NRC staff issued an audit plan for an onsite audit July 17-19, 2018 focused on the categorization process and various internal PRAs. The NRC staff has determined that an onsite audit focused on HWPRA and XFPRA, including the walkdown of applicable items credited in these PRAs, would assist in the timely completion of the subject LAR review process. The NRC staff is continuing to review other aspects of the licensee's submittal and may identify the need for additional audit subjects by separate correspondence. The background, regulatory audit bases, and regulatory audit scope and methodology from the May 9, 2018 audit plan remain applicable and will not be repeated. This supplement to the May 9, 2018 audit plan specifically addresses an onsite audit.

II. AUDIT TEAM

The members of the audit team are anticipated to be:

- Dennis Galvin, Project Manager, NRC
- Mehdi Reisi-Fard, Acting Team Lead, PRA, NRC
- Stephanie Devlin-Gill, Acting Chief, Hydrology and Meteorology Branch, NRC
- Andy Campbell, Deputy Director, NRC
- Shilp Vasavada, technical reviewer, PRA, NRC
- Jason White, Meteorologist, NRC
- Kevin Quinlan, technical reviewer, hazard analysis, NRC
- Nebiyu Tiruneh, technical reviewer, hazard analysis, NRC

III. LOGISTICS

The regulatory audit will begin the morning of August 21, 2018, and will last approximately 3 days, concluding on the afternoon of August 23rd. The NRC staff will schedule a conference call prior to the audit to discuss the details of the audit plan. An entrance meeting for this audit will be held on the first day and an exit meeting will be held the final day based on a mutually agreed-upon time. The NRC audit team leader will provide daily progress briefings to licensee personnel on the first and second day of the audit.

The audit will take place at BSEP where (1) the necessary reference material and (2) appropriate Duke Energy staff should be available to support the review. Visitor access will be requested for the entire audit team for the duration of the audit. We recommend that security paperwork and processing be handled prior to the first day of the audit, if possible

Audit Milestones and Schedule		
Activity	**Time Frame**	**Comments**
Logistics/Clarification Call	August 16, 2018	Teleconference from NRC Headquarters to discuss logistics and any Duke Energy questions.
Onsite Audit Kick-Off Meeting	August 21, 2018	NRC staff will present a brief team introduction and discuss the scope of the audit. The licensee should introduce team members and give logistics for the week.
End of Day Summary Briefings	August 21-22, 2018	Meet with licensee to provide a summary of any significant findings and requests for additional assistance.
Site Walkdown	August 22, 2018	Perform walkdown of locations in the attachment.
Onsite Audit Exit Meeting	August 23, 2018	NRC staff will hold a brief exit meeting, with licensee staff to conclude audit activities.
Audit Summary (see Section 8.0 below)	90 days after exit	To document the audit.

IV. SPECIAL REQUESTS

The regulatory audit team will require the following to support the regulatory audit:

- Two computers with internet access and printing capability in the NRC room, access to the site portal, and wired or wireless guest internet access for all team members.

- 1 main conference room with 1 additional private area for conference calling capability should be made available. The main NRC conference room should be set up for 6 to 8 NRC staff.

- Access to licensee personnel knowledgeable in the categorization process, plant design, operation and the plant PRA. In addition, Duke Energy staff who participated in preparing the LAR submittal should be available for discussion.

V. DOCUMENTS REQUESTED FOR STAFF REVIEW

The information needed for the regulatory audit is listed in the Attachment 1. The walkdown items are listed in Attachment 2.

VI. DELIVERABLES

An audit summary will be prepared within 90 days of the completion of the audit. If information evaluated during the audit is needed to support a regulatory decision, the NRC staff will identify it in a request for additional information. The NRC staff, if needed, will provide the request for additional information to the licensee in separate docketed correspondence.

VII. REFERENCES

1. Gideon, W. R., Duke Energy Progress, LLC, letter to U.S. Nuclear Regulatory Commission, "Application to Adopt 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components (SSCs) for Nuclear Power Reactors", January 10, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18010A344).

2. U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits," December 29, 2008 (ADAMS Accession No. ML082900195).

3. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," March 2009 (ADAMS Accession No. ML090410014).

4. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.201 , Revision 1, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants according to Their Safety Significance," May 2006 (ADAMS Accession No. ML061090627).

5. Nuclear Energy Institute, NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline," July 2005 (ADAMS Accession No. ML052910035).

6. Nuclear Energy Institute, NEI 12-13, "External Hazards PRA Peer Review Process Guidelines", August 2012 (ADAMS Accession No. ML122400044).

AUDIT INFORMATION NEEDS

Background and Regulatory Bases

By letter dated January 10, 2018 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML18010A344), Duke Energy Progress, LLC (Duke Energy, the licensee) submitted a license amendment request (LAR) regarding the Brunswick Steam Electric Plant Units 1 and 2 (BSEP). The proposed amendment would modify the licensing basis to allow for the implementation of the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components (SSCs) for Nuclear Power Reactors." The proposed amendment would use, among other probabilistic risk assessment (PRA) models, the BSEP high winds PRA (HWPRA) and external flood PRA (XFPRA) in the proposed 10 CFR 50.69 categorization process.

Regulatory Guide (RG) 1.201, Revision 1, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to their Safety Significance," May 2006 (ADAMS Accession No. ML061090627), endorses, with clarifications and qualifications, the Nuclear Energy Institute (NEI) guidance document NEI 00-04, Revision 0, "10 CFR 50.69 SSC Categorization Guideline," July 2005 (ADAMS Accession No. ML052910035), as one acceptable method for use in complying with the requirements in 10 CFR 50.69. The NEI 00-04 quidance describes in detail a process for determining the safety significance of SSCs and for categorizing them into the four risk-informed safety class (RISC) categories defined in 10 CFR 50.69. This categorization process uses an integrated decision-making process, incorporating both risk and traditional engineering insights. The NEI 00-04 guidance allows licensees to implement different approaches, depending on the scope of their probabilistic risk assessment (PRA).

Section 10 CFR 50.69(c) provides the requirements for the SSC categorization process. Section 10 CFR 50.69(c)(1)(i) requires that the PRA must be of sufficient quality and level of detail to support the categorization process, and must be subjected to a peer review process assessed against a standard or set of acceptance criteria that is endorsed by the NRC. Section 10 CFR 50.69(b)(2)(iii) requires the results of the PRA review process conducted to meet 10 CFR 50.69(c)(1)(i) be submitted as part of the application. Section 10 CFR 50.69(e) requires periodic updates to the licensee's PRA and SSC categorization.

RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," February 2004 (ADAMS Accession No. ML040630078), describes an acceptable approach for determining whether the quality of the probabilistic risk assessment (PRA), in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision making for light water-reactors. RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2 March 2009, (ADAMS Accession No. ML090410014), endorses, with staff clarifications and qualifications, the 2009 version of the American Society of Mechanical Engineers (ASME) /American Nuclear Society (ANS) PRA Standard (ASME/ANS RA-Sa-2009).

Peer-Review Process

1. Section 10 CFR 50.69(c)(1)(i) requires that the PRA must be of sufficient quality and level of detail to support the categorization process, and must be subjected to a peer review process assessed against a standard or set of acceptance criteria that is endorsed by the NRC. According to Section 3.3 of the Enclosure to the submittal, the BSEP HWPRA and XFPRA

models were subject to a full-scope peer review in February 2012 against RG 1.200, Revision 2. Appendices B, C and D to RG 1.200, Revision 2, provide the NRC regulatory position on the peer review requirements in the peer review process in NEI 00-02, “Probabilistic Risk Assessment Peer Review Process Guidance” Revision 1, May 2006 (ADAMS Accession No. ML061510619), NEI 05-04, Process for Performing Internal Events PRA Peer Reviews Using the ASME/ANS PRA Standard," Revision 2, November, 2008 (ADAMS Accession No. ML083430462) and NEI 07-12, "Fire Probabilistic Risk Assessment (FPRA) Peer Review Process Guidelines," Revision 1, June 2010 (ADAMS Accession No. ML 102230070). Section 2.2, “Industry Peer Review Program,” in RG 1.200, Revision 2, states that when “the staff’s regulatory positions contained in the appendices are taken into account, use of a peer review can be used to demonstrate that the PRA [with regard to an at-power Level 1 /large early release frequency (LERF) PRA for internal events (excluding external hazards)] is adequate to support a risk-informed application.” Therefore, RG 1.200, Revision 2, does not endorse any peer review guidance for external hazards. Section 2.2 of RG 1.200, Revision 2, further states that “[a]n acceptable peer review approach is one that is performed according to an established process…” and the peer reviewers’ “technical expertise includes experience in performing (not just reviewing) the work in the element assigned for review.”

NEI 12-13, “External Hazards PRA Peer Review Process Guidelines” (ADAMS Accession No. ML12240A027), provides guidance for conducting and documenting peer-reviews of external hazard PRAs. The staff issued a letter accepting the use of NEI 12-13, as modified by the staff’s comments, in March 2018 (ADAMS Accession No. ML18025C025). Section 1.4 of NEI 12-13 states that the “on-site External Hazards PRA Peer Review is a one-week, tiered review” and that “[i]t is necessary to perform on-site walkdowns during an External Hazards PRA Peer Review to confirm the relationships between SSCs and the potential effects of an external hazard.” Section 2.2 of NEI 12-13, referring to the peer review team composition and qualifications, states that “[t]he intent is to ensure that there is more than one peer reviewer with experience in each key External Hazards PRA process” and “experience should have involved explicit development of the PRA technical area being reviewed.” The same section in NEI 12-13 also states that the peer review team “should have at least two utility participants” with specialized experience in the hazards being reviewed. Section 3.2 of NEI 12-13 describes the issues that should be identified by the review team as Unreviewed Analysis Methods (UAMs).

a. Provide details, including the source, for the peer review process and corresponding guidelines followed for the BSEP HW and XF PRA full-scope peer-reviews.

b. If an NRC endorsed external hazard PRA peer-review process was not used by the peer-review team, justify, in detail, why the results of the peer-review process can be used to support risk-informed decision-making. The justification should describe how the peer review, including the corresponding process and guidelines discussed in response to part (a), was consistent with NEI 12-13, as modified and accepted by the NRC. Further, justify deviations from that guidance. The licensee’s discussion of the features of the external hazards PRA peer review should in particular include the process and extent of walkdowns performed by the peer-review team, the duration of the on-site peer-review for each external hazard PRA, composition and qualification of the peer-review team as cited above from NEI 12-13, and identification of UAMs.

Hazard Development

2. High level requirement (HLRs) in Part 8 of the 2009 ASME/ANS PRA Standard, related to the external flooding technical element, specifically HLR-XFHA-A, calls for the use of site-specific probabilistic analysis to develop the hazard frequency and for the propagation of uncertainties in the model and parameter values to develop a family of hazard curves.

   Discuss how the initiating event frequencies used in the XFPRA were developed. The discussion should include a description of (i) method(s) used, (ii) input parameter selection such as precipitation events intensity and duration, storm surge flooding, stillwater levels, wave runup, and other associated effects, (iii) how data were selected for specific analysis including time periods and intensities, and (iv) how parametric and modeling uncertainties were addressed to develop a family of hazard curves.

3. Section 8-2 of the 2009 ASME/ANS PRA Standard indicates that certain flooding phenomena can be screened out using the screening methods in Part 6 of the cited PRA Standard. Part 6 of the 2009 ASME/ANS PRA Standard provides criteria for screening along with associated supporting requirements (SRs) and peer-review.

   The summary of the staff's review of the licensee's reevaluated flood-causing mechanisms, included in the letter dated March 16, 2017 (ADAMS Accession No. ML17072A364), stated that the reevaluated flood hazard results for the local intense precipitation, streams and rivers, failure of dams and onsite water control/storage structures, storm surge, and tsunami flood-causing mechanisms were not bounded by the current design basis. Such flooding mechanisms may lead to flooding in excess of plant grade such that water impinges upon plant structures.

   Further, use of the licensee's design basis to screen out certain flooding phenomena does not address the frequency of exposure to floods (including lower than the design basis flood) that may impinge upon SSCs and challenge plant safety, the impact of associated effects and the temporal characteristics of the event (e.g., the period of site inundation), and the risk associated with those floods.

   a. In light of the above information, identify and describe, with technical rationale and justification, the approach used for screening out any flooding mechanism from inclusion in the licensee's XFPRA. The description should include justification for any credit for flood protection features.

   b. Identify and describe any topographic changes to the site that can invalidate prior analyses (e.g. Individual Plant Examination for External Events) for screening or mitigation of external flooding hazards.

Plant Response Development, PRA Acceptability and Maintenance

4. Several SRs in Parts 7 (e.g. SR WFR-A1 and WPR-A10) and 8 (e.g. SR XFFR-A1, XFPR-A10, and XFPR-B1) of the 2009 ASME/ANS PRA Standard discuss the use of walkdowns in the development of the HW and XF PRAs. High winds and external flooding walkdown process and any relevant guidance.

   a. Provide details on the walkdowns performed to support the HWPRA including (i) composition of the walkdown team, (ii) approach taken to perform the walkdown citing

any relevant guidance that was followed, and (iii) salient results of the walkdown and their incorporation into the HWPRA.

b. Provide details on the walkdowns performed to support the XFPRA including (i) composition of the walkdown team, (ii) approach taken to perform the walkdown citing any relevant guidance that was followed, and (iii) salient results of the walkdown and their incorporation into the XFPRA.

5. SR XFPR-B1 of the 2009 ASME/ANS PRA Standard calls for the assessment of accident sequences that are initiated by external flooding. Accident sequences in the XFPRA models that are initiated by external flooding can vary depending on the flood elevation and the corresponding impact of SSCs and actions.

   Describe how sufficient data points for the external flooding hazard were determined to capture the plant response at different flooding elevations.

6. Section 3.3.2, "Assessment of Assumptions and Approximations," of RG 1.200, Revision 2, states "[f]or each application that calls upon this regulatory guide, the applicant identifies the key assumptions and approximations relevant to that application. This will be used to identify sensitivity studies as input to the decision-making associated with the application." Further, Section 4.2, "Licensee Submittal Documentation," of RG 1.200, Revision 2, states that "[t]hese assessments provide information to the NRC staff in their determination of whether the use of these assumptions and approximations is appropriate for the application, or whether sensitivity studies performed to support the decision are appropriate." RG 1.200, Revision 2, defines the terms "key assumption" and "key source of uncertainty" in Section 3.3.2.

   Section 3.2.7 of the Enclosure to the submittal cites certain references for the process of identifying model uncertainties but does not elaborate on the implementation by the licensee. The same section further states that key BSEP PRA model specific assumptions and sources of uncertainty for this application have been identified and dispositioned in Attachment 6 of the Enclosure. Item 9 in Attachment 6 of the Enclosure to the submittal states that the disposition for the uncertainty associated with the initiating event frequency of external events at extreme ranges "will be addressed as individual systems are categorized in this risk-informed application." The discussion for this item also states that "the Initiating Events for the very rare events is believe[d] to be assigned a frequency higher than actual."

   a. Describe the approach used to identify and characterize the "key" assumptions and "key" sources of uncertainty in the licensee's HF and XF PRA models. The description should contain sufficient detail to identify: (i) whether all assumptions and sources of uncertainty related to aspects of the hazard, fragility, and plant response analysis were evaluated to determine whether they were "key," and (ii) the criteria for determining whether the modeling assumptions and sources of uncertainty were considered "key."

   b. Discuss how each key assumption and key source of uncertainty identified above was dispositioned for this application. If available, provide sensitivity studies that will be used to support the disposition for this application or use a qualitative discussion to justify why different reasonable alternative assumptions would not affect this application.

   c. Describe the approach that the licensee will follow to disposition the uncertainty associated with the initiating event frequency of external events at extreme ranges (Item 9

in Attachment 6 of the Enclosure) “as individual systems are categorized” for licensee's HW and XF PRA models.

d. Discuss why the licensee believes that the assigned frequencies are conservative (i.e., “higher that actual” as described by the submittal).

7. Section 3.3 of the Enclosure to the submittal states that findings were reviewed and closed using the process documented in Appendix X to NEI 05-04, NEI 07-12, and NEI 12-13, “Close-out of Facts and Observations" as accepted by NRC by letter dated May 3, 2017 (ADAMS Accession No. ML17079A427). The licensee cites closure of findings for its internal events, internal flood, high winds, and fire PRA models.

    a. Clarify whether the process cited above was applied to the licensee’s XFPRA and discuss the results therefrom.

    Attachment 3 of the Enclosure to the submittal provides the open peer review findings and their disposition by the licensee for this application. The following information needs apply to the XF PRA Facts and Observations (F&Os) and their corresponding resolutions in above mentioned attachment:

    b. Finding XFPR-A11-1, related to SR XFPR-A11, stated that “there is no evaluation of the potential impact of external floods on system recoveries credited in the Level 1 PRA.” The resolution discusses staging of personnel and re-evaluation of human reliability events and concludes that “changes made are enough to support…the 50.69 application.” The discussion does not include sufficient detail to support staff’s review of the licensee’s conclusion.

        Provide details of the changes made to the XFPRA to resolve XFPR-A11-1 including, but not limited to, discussion on consideration and inclusion of (i) the impacts of environmental conditions on the staged and unstaged operator actions, and (ii) the failures of flood protection or mitigation features that could prevent operators from performing their actions or achieve the desired level of protection.

    c. Finding XFPR-A3-1, related to SRs XFPR-A3, -A5, -A8, and -A10, stated that assurance was needed that external flood-caused failures were modeled and that a systematic review of potential impacts of external flooding was performed. The resolution discusses documentation changes but does not provide information on the systematic review of the potential impacts of external flooding.

        Provide details of the systematic review performed including, but not limited to, discussion on (i) the development of the list of SSCs or features required for external flood hazard mitigation, (ii) the selection of SSCs for inclusion in the PRA model, and (3) the consideration of failures of flood protection features such as manually operated doors, water-tight doors, door seals, penetration seals, conduit seals, internal drainage systems, and sump pumps.

    d. Finding XFPR-A7-1, related to SR XFPR-A7, called for the performance of an analysis of external hazard caused dependencies and correlations. The resolution states that the external flooding analysis does not model dependencies and correlations of equipment failure other than the effects from inundation and that the analysis has equipment failure correlated due to submergence. The resolution also cites inspections performed on the

trash racks for debris accumulation. The note accompanying SR XFPR-A7 in the 2009 ASME/ANS PRA Standard indicates that it is vital to capture spatial and environmental dependencies among external flood caused failures and further states that external floods can affect multiple SSCs or a combination of SSCs at the same time. Further, Section 8-1.3 of the 2009 ASME/ANS PRA Standard mentions the importance of considering "rational probabilistic-based combinations" of external flooding phenomena. The resolution does not provide sufficient information to determine whether dependencies have been appropriately considered and included in the XF PRA model.

i. Provide details on and results from the approach used to identify, capture, or screen spatial and environmental dependencies that can affect multiple SSCs or a combination of SSCs in the XFPRA model.

ii. Discuss the approach used to consider probabilistic-based combinations of external flooding phenomena and their inclusion in the XFPRA model.

e. Finding XFPR-C2-1, related to SR XFPR-C2, stated that the documentation of the specific adaptions to the internal events PRA to produce the XFPRA was not performed. Since the documentation was unavailable at the time of the peer review, it appears that the peer reviewers did not have information necessary to determine whether the adaption of the internal events model was performed appropriately. Provide details of and basis for the specific adaptations that were made to the internal events model to develop the XFPRA.

8. SR WPR-A1 of the 2009 ASME/ANS PRA Standard calls for the inclusion of initiating events caused by high wind hazards that give rise to significant accident or accident progression sequences using a systematic process. The note accompanying the cited SR indicates the importance of thoroughly investigating site-specific wind-caused failure events including multiple-unit impacts and dependencies.

   Describe the systematic process that was followed to determine the initiating events for inclusion in the HWPRA model. Include, as applicable, discussion on consideration of spatial and environmental dependencies, multiple-unit impacts, and feedback from plant walkdowns as well as the outcome of the process.

9. According to Sections 7-1.2 and 8-1.2 of the 2009 ASME/ANS PRA Standard it is assumed that a full-scope internal-events at-power Level 1, and Level 2 LERF, PRAs exist and that those PRAs are used as the basis for the HW and XF PRA. Therefore, the acceptability of the internal events PRA model used as the foundation for the XF and HW PRAs is an important consideration. Section 3.3 of the Enclosure to the submittal states that the internal events findings were reviewed and closed using the process documented in Appendix X to NEI 05-04, NEI 07-12, and NEI 12-13. However, the submittal does not provide information about the propagation of changes made to the internal events model for closing the finding level F&Os to the XF and HW PRAs.

   a. Clarify whether the XF and HW PRAs were developed using the BSEP internal events model as the foundation or ad hoc models were developed for those hazards. Include, as applicable, justification for the development and sufficiency of ad hoc models for this application.

b. Clarify whether changes made to the internal events model to address and close the corresponding finding level F&Os have been implemented in the XF and HW PRAs or justify that not implementing the changes does not affect this application.

10. Section 3.2.6 of the Enclosure to the submittal describes the licensee's PRA maintenance and update process and states that the process includes provisions for monitoring potential areas affecting the PRA models and for assessing the risk impact of unincorporated changes. Further, the licensee states that the assessment of the impact of the changes will be performed no longer than once every two refueling outages. The licensee's HW and XF PRAs use site-specific hazard information that can change during the implementation of the 10 CFR 50.69 program. The discussion of the licensee's PRA maintenance and update process does not include information about the consideration and inclusion of changes to the site-specific hazard information (e.g. occurrence frequencies).

    Discuss how new information about the high winds and external flooding hazard will be identified and incorporated in the licensee's HW and XF PRAs that support this application and will be considered in implementation of the 10 CFR 50.69 program.

Categorization Process

11. 10 CFR 50.69(c) states that "SSCs must be categorized…using a categorization process that determines if an SSC performs one or more safety significant functions and identifies those functions."

    Section 3.2.4 of the Enclosure to the submittal states that the BSEP categorization process for high winds and external flooding will use PRA models. This section further states that "an evaluation is performed to determine if there are components being categorized [that] participate in screened scenarios and whose failure would result in an unscreened scenario" and refers to the flowchart in figure 5-6 of NEI 00-04. Based on the information in the submittal as well as the guidance in NEI 00-04, the approach for the "evaluation" and the use of the cited flowchart is unclear.

    a. Describe the approach and criteria used for the implementation of the flowchart in figure 5-6 of NEI 00-04 as well as the evaluation that will be performed by the licensee to determine participation by components in screened scenarios.

    b. Discuss any relation between BSEP HW and XF PRA models and the evaluation performed to determine participation by components in screened scenarios.

12. The categorization of SSCs using the licensee's HW and XF PRA models is expected to be based on importance measures and corresponding numerical criteria as described in Sections 5.1 and 5.3 of NEI 00-04. Further, Section 5.6 of NEI 00-04 discusses the "integral assessment" wherein the hazard specific importance measures are weighted by the hazards contribution to the plant risk.

    a. Describe how the importance measures are determined from the HW and XF PRA models in the context of the 'binning' approach employed those models. Describe and justify how the same basic events, which were discretized by binning during the development of the PRA, are then combined to develop representative importance measures. Further, discuss how they are compared to the numerical criteria, justify any

impact on the categorization results, and describe how the approach is consistent with the guidance in NEI 00-04.

b. In the context of the "integral assessment" described in Section 5.6 of NEI 00-04, it is understood that importance evaluations performed in accordance with the process in NEI 00-04 are determined on a component basis. However, it is not apparent from the submittal and the NEI 00-04 guidance how the integrated importance measures are calculated for certain components where corresponding basic events, which represent different failure modes for a component, in the HW and XF PRA models may not align with basic events in other PRA models. Examples of such basic events include those that are specific to the HW and XF PRA model or basic events that represent a subcomponent modeled within the boundary of an internal events PRA component. Please describe, with justification, how the integrated importance measures are calculated for HW and XF basic events that may not align with basic events in other PRA models.

13. Section 5.4 of NEI 00-04 indicates that components can be identified as being safety significant following sensitivity studies. Section 5.4 also recommends the completion of several sensitivity studies, including any applicable sensitivity studies identified in the characterization of PRA adequacy.

    a. Table 5-5 of NEI 00-04 identifies sensitivity studies for HW and XF PRAs and includes any applicable sensitivity studies identified in the characterization of PRA adequacy. Please clarify whether the sensitivity analyses in Table 5-5 and those identified as part of PRA adequacy for HW and XF PRAs will be performed every time SSCs are categorized under 10 CFR 50.69.

    b. The key assumptions and sources of uncertainties identified as part of the licensee's submittal may change because HW and XF PRA model updates could affect the significance of those assumptions for this application or create new key assumptions or sources of uncertainties. Please describe how the licensee’s 10 CFR 50.69 program continues to evaluate assumptions and sources of uncertainty when the HW and XF PRA models are updated in the future and subsequently incorporates key assumptions and key sources of uncertainty in sensitivity analysis that is performed consistent with the guidance in NEI 00-04.

14. The regulation 10 CFR 50.69(c)(1)(iv) requires that the categorization process includes evaluations that provide reasonable confidence that for SSCs categorized as RISC-3, any potential increase in core damage frequency (CDF) and LERF resulting from changes in treatment are small. The regulations 10 CFR 50.69(e)(2) and (3) require the licensee to monitor the performance of RISC-1 and RISC-2 SSCs and consider the data collected for RISC-3 SSCs and make adjustments to the categorization or treatment processes so that the categorization process and results are maintained valid.

    Section 8 of NEI 00-04 provides guidance on how to conduct risk sensitivity studies during the categorization process for all the preliminary low-safety-significant (LSS) SSCs to confirm that the categorization process results in acceptably small increases to CDF and LERF. An example is provided in the guidance to increase the unreliability of all preliminary LSS SSCs by a factor of 3 to 5, which appears to address random failures. No explicit discussion of risk sensitivity studies for external hazard PRAs is provided in the guidance.

The categorization of SSCs using the external hazard PRAs is dominated by structural failure modes, which are dependent on the corresponding modeling inputs such as the 'dominant failure modes' and 'fragility curves'. These modeling inputs are derived using several parameters, including the SSC design, testing, and as-built installation, all of which can be impacted by alternative treatments.

Based on the preceding discussion,

a. Describe and justify how the required risk sensitivity study outlined in Section 8 of NEI 00-04 will be performed for categorization using the licensee's HW and XF PRA models to meet the requirements of 10 CFR 50.69(c)(1)(iv) and 10 CFR 50.69(b)(2)(iv).

b. Describe how it will be determined that the modeling inputs in the licensee's HW and XF PRA models and those used for the risk sensitivity study continue to remain valid to ensure compliance with the requirements of 10 CFR 50.69(e).

WALKDOWN ITEM LISTS

High Winds (HW) PRA

Location/Equipment	Purpose
Switchyard relay house	Dominant contributor and source of loss-of-offsite power during high winds event; Considered to capture failure of switchyard towers
Emergency Diesel Generator (EDG) exhaust stacks	Contributors to EDG failure due to high winds and missile impact
Severe Accident Mitigation Alternative (SAMA) diesel generators	Vulnerable to high winds and missile impact
Diesel driven firewater pump	Analyzed for high winds and missile impact
Motor driven firewater pump	Analyzed for high winds and missile impact
Condensate storage tanks (CSTs)	Vulnerable to high winds and missile impact
Plant stack	Interaction hazard with Unit 2 CST; Failure mode for Unit 2 CST
Operator pathways for human actions represented by OPER-HWLVLCV	One of the top 5 dominant HEPs; Credited in HW PRA with “no impact”; Unclear whether action is “outside.”

External Flooding (XF) PRA

Location/Equipment	**Purpose**
Reactor building: - -17 feet elevation - 20 feet elevation - Floor drains in High Pressure Core Injection (HPCI), Reactor Core Isolation Cooling (RCIC), and Core Spray (CS) rooms - Sump and sump pumps	Screened out of analysis; Curbs, pedestals, and floor penetrations at -17 feet elevation are credited for establishing flood paths; Electrical equipment is stated to be designed to be resistant to falling water; Sump pumps at -17 feet elevation and in the HPCI room credited
Turbine building: - Floor drains, - Sump and sump pumps, - Flood propagation pathways to control building and reactor building - Electric tunnel and pipe tunnel wall penetrations	Screened out of analysis; Floor drains and sump considered to provide basis for screening
"Rattle spaces" between turbine, reactor, and radwaste buildings: - Flood pathways into and out of rattle space including sleeves, piping, and building seals	Impact of flooding included in analysis; flood pathways exist from "rattle spaces" to other buildings
Diesel generator building: - Flood pathways, - Basement, - Drains, - Sump	Screened out of analysis except for basement at 2 feet elevation; Treatment of failure of basement equipment in analysis is unclear
Southerly intake canal dike	Provided as justification for screening certain hazards
"Topographic features" near the plant credited for screening extreme river flooding	Provided as justification for screening certain hazards
Diesel driven firewater pump	Flooding impact captured in model; Failure mode and flooding pathway not available
Motor driven firewater pump	Flooding impact captured in model; Failure mode and flooding pathway not available
Circulating Water (CW) pumps	Flooding impact captured in model; Failure mode and flooding pathway not available
SAMA diesels	Assumed to be unaffected by flooding although they are located at plant grade outside a building
Operator pathways and positioning for human actions represented by OPER-4160X, OPER-480X, OPER-ALT-NSW, OPER-CRDFO-INJ, and OPER-DCDG	Credited in XFPRA and considered viable (without any change to internal events HEPs) due to elevations above 23 feet