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50-425**NL-18-0102**U. S. Nuclear Regulatory Commission
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Vogtle Electric Generating – Units 1&2
Incorporate Seismic Probabilistic Risk Assessment into the
10 CFR 50.69 Categorization Process Response to Request for
Additional Information (RAIs 1,2,3, & 12)

Ladies and Gentlemen:

By letter dated June 22, 2017 (Agencywide Documents Access and Management System Accession No. ML17173A875) Southern Nuclear Operating Company, Inc. (SNC) submitted a License Amendment Request (LAR) for Vogtle Electric Generating Plant (VEGP), Units 1 and 2 and requested U.S. Nuclear Regulatory Commission (NRC) approval to use the Seismic Probabilistic Risk Assessment model in the existing 10 CFR 50.69 categorization process. By letter dated January 5, 2018, the NRC staff notified SNC that additional information is needed for the staff to complete their review. The Enclosure provides the SNC response to the NRC requests for additional information (RAIs), specifically, questions 1, 2, 3 and 12.

This letter contains no NRC commitments. If you have any questions, please contact Ken McElroy at 205.992.7369.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 1 day of February 2018.

Respectfully submitted,



J. J. Hutto
Director, Regulatory Affairs
Southern Nuclear Operating Company

JJH/PDB/CBG

Enclosure: SNC Response to NRC Request for Additional Information (RAIs)

cc: Regional Administrator, Region II
NRR Project Manager – Vogtle 1 & 2
Senior Resident Inspector – Vogtle 1 & 2
State of Georgia Environmental Protection Division
RType: CVC700

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Enclosure

SNC Response to NRC Request for Additional Information

NRC RAI 1

Section 3.2 of the Enclosure to the June 22, 2017, submittal cites the licensee's seismic probabilistic risk assessment (SPRA) peer-review report, stating that the peer review was performed using the process defined in Nuclear Energy Institute (NEI) 12-13, "External Hazards PRA Peer Review Process Guidelines" (Agencywide Document Access and Management System (ADAMS) Accession No. ML 122400044). The Enclosure also states that no exceptions to the use of NEI 12-13 were noted in the peer-review report.

While NEI 12-13 follows a process similar to NRC endorsed peer review processes, NEI 12-13 has not been endorsed by the NRC in Regulatory Guide (RG) 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities" (ADAMS Accession No. ML090410014). Please provide the following additional information to justify the use of NEI 12-13:

- a. Please describe how the qualifications of the VEGP SPRA peer review team comply with the peer review requirements in Sections 1-6.2 and 5-3.2 of the American Society of Mechanical Engineers (ASME)/American Nuclear Society (ANS) Probabilistic Risk Assessment (PRA) Standard (RA-Sa-2009), as endorsed in RG 1.200.
- b. Please identify the unreviewed analysis methods (UAMs) used in the VEGP SPRA, as determined by the peer review team, and describe each UAM with a level of detail appropriate for the NRC staff's evaluation of its acceptability.
- c. Please describe if the VEGP SPRA relies on expert judgement to meet any supporting requirement (SR) and, if so, demonstrate conformance to the expert judgment requirements of Section 1-4.3 of the 2009 ASME/ANS PRA Standard (RA-Sa-2009). Also, please cite any information from the peer review report related to the evaluation of the use of expert judgment by the peer review team and whether the peer review team found the use of expert judgment to be appropriate.
- d. Please clarify whether VEGP SPRA was reviewed against Capability Category (CC) I for any SR. Provide a list of all SRs that were reviewed against CC I or found to meet only CC I without an associated finding. For each such SR, please justify why not meeting the SR at CC II does not impact this application.
- e. Please clarify whether an "in-process" peer review was performed for the VEGP SPRA. If an "in-process" approach was utilized, confirm that (i) the approach met the requirements for an independent peer review as stated in the PRA Standard endorsed in RG 1.200, Revision 2, and the process described in NEI 12-13, (ii) a final review by the entire peer review team occurred after the completion of the SPRA, and (iii) peer reviewers remained independent throughout the PRA development activity since the peer reviewers in the early interim peer reviews must still participate in the final peer review, per the NRC staff's comments on NEI 12-13 in the letter dated November 16, 2012 (ADAMS Accession No. ML 12321A280).

SNC Response to RAI 1a

The qualifications of the VEGP SPRA peer review team were reviewed by SNC against the requirements in ASME/ANS PRA Standard RA-Sa-2009 to establish that the peer review team met these requirements. Section 1-6.2 of this standard defines requirements for a PRA peer review team as a whole and for individual reviewers. Section 5-3.2 further establishes seismic PRA-specific reviewer requirements.

Prior to the peer review, SNC was responsible for accepting each of the proposed peer review team members relative to the requirements in the PRA standard. Team requirements in Section 1-6.2 for a seismic PRA peer review include the ability to assess all the applicable PRA Elements of the Technical Requirements section in Part 5 of the Standard, and collectively having knowledge of the plant NSSS design, containment design, and plant operation. Team requirements in Section 5-3.2 include having combined experience in the areas of systems engineering, seismic hazard, seismic capability engineering, and seismic PRAs or seismic margin methodologies.

Individual peer reviewer requirements in Section 1-6.2 include having knowledge of the requirements in the Standard for their area of review, having experience in performing the activities related to the PRA Elements for which the reviewer is assigned, and having neither performed nor directly supervised any work on the portions of the PRA being reviewed. The peer reviewers must also have direct experience with the specific methodology, code, tool, or approach that was used in the PRA Element assigned for review. Section 5-3.2 further requires that reviewers focusing on the seismic-fragility work have successfully completed the SQUG Walkdown Screening and Seismic Evaluation Training Course or equivalent or have demonstrated equivalent experience in seismic walkdowns.

The VEGP SPRA peer review team was determined to have the individual and collective experience to meet these requirements through a combination of review of the resumes of the team members, prior familiarity with team member experience, and consultation with the peer review team lead.

SNC Response to RAI 1b

There were no unreviewed analysis methods used in the VEGP SPRA. The SPRA peer review team did not identify any unreviewed analysis methods in the SPRA.

SNC Response to RAI 1c

The only application of expert judgment as defined in Section 1-4.3 of RA-Sa-2009 is in the probabilistic seismic hazard analysis (PSHA). In this case, the Senior Seismic Hazard Analysis Committee (SSHAC) process, which utilizes a particular method for structured expert elicitation, was applied for determination of the hazard. Initially level 3 was used for both the SSC and ground motion model (GMM). The GMM was later revised with a level 2 analysis. The "SSHAC level" of a seismic hazard study ensures that data, methods and models supporting the PSHA are fully incorporated and that uncertainties are fully considered in the process at sufficient depth and detail necessary to satisfy scientific and regulatory needs.

No other formal expert judgment was used in the SPRA fragility or logic model or identified by the Peer Review. The Peer Review team explicitly noted the following for HRA: "Expert Judgment – No uses of expert judgment were noted, outside the standard judgments used in SPRA methods." Such standard judgments, often referred to as engineering judgments, do not need to follow the Section 1-4.3 process and requirements, as they involve application of engineering, scientific, and mathematical principals by knowledgeable personnel.

SNC Response to RAI 1d

The VEGP SPRA was reviewed against Capability Category (CC) II of the PRA Standard for all applicable SRs. Any SRs that the reviewers found to meet only CC I had associated findings. As noted in the LAR, any such finding-level facts & observations have been addressed such that all SRs are now judged to meet CC II.

SNC Response to RAI 1e

An in-process peer review of the VEGP SPRA was not performed. Independent outside reviews of certain elements of the SPRA, e.g., the methodology used for soil-structure interaction (SSI) and fragility analysis, were performed to ensure that subsequent SPRA development would be appropriate. A final full scope peer review was performed to judge the technical adequacy of the SPRA model. The SPRA peer reviewers had no previous involvement in the VEGP Units 1 & 2 Seismic PRA. This is certified by the reviewers' signatures on the cover of the peer review report.

This satisfies the independence requirements of Section 1-6.2.2 of the ASME/ANS PRA Standard.

NRC RAI 2

Section 5-2.3 of Part 5, "Requirements for Seismic Events At-Power PRA," of the ASME/ANS PRA Standard (RA-Sa-2009) assumes that a full-scope internal-events at-power Level 1, and Level 2 large early release frequency (LERF), PRA exists and that those PRAs are used as the basis for the SPRA systems analysis. High Level Requirement (HLR)-SPR-8 of ASME/ANS Standard (RA-Sa-2009) calls for the incorporation of seismic analysis aspects that are different from the at-power internal events PRA systems model. Therefore, the technical adequacy of the internal events PRA model used as the foundation for the SPRA needs to be established.

Please identify internal events PRA finding-level facts and observations (F&Os) that were not closed per an NRC-accepted process and any internal events PRA upgrades that had not been peer-reviewed prior to the development of the SPRA. For each identified finding-level F&O, describe the resolution and the impact of the F&O on the VEGP SPRA as it pertains to this application.

SNC Response to RAI 2

Prior to conducting the VEGP SPRA peer review, the finding-level F&Os from the VEGP internal events (including internal flooding) PRA peer review were dispositioned and incorporated into the PRA model as appropriate prior to use of the internal events PRA as the basis for the SPRA. There were ten findings for the Internal Events (including Internal Flooding) PRA model. None of these findings were closed per NRC endorsed process outlined in Appendix X of NEI

12-13, but the resolutions of the Internal Events/Internal Flooding PRA findings have been approved by the NRC for the VEGP 50.69 application. Further, there were no PRA upgrades required for the internal events PRA to incorporate the finding resolutions prior to applying the model to the SPRA. Therefore, there was no need for a focused scope peer review.

An assessment of the resolution of each internal events PRA peer review finding was made to determine if the resolution was appropriate for the SPRA. A brief summary of the disposition relative to the SPRA is as follows (the text of each finding is included in the peer review report and in the LAR). The SPRA peer review team was provided with the internal events peer review report and the dispositions of the findings to facilitate their assessment of adequacy of the internal events PRA model as the basis for the SPRA as part of their review of supporting requirement SPR-B1.

Finding Number	Disposition Relative to SPRA
IE-A4-01, IE-D1-01	Initiating events documentation, resolution has no impact on SPRA
AS-A11-01	Finding related to ATWS with SLOCA and SGTR; Seismic induced SGTR was screened as an initiator so no impact on SPRA.
SY-B3-01	Related to CCF documentation, resolution has no impact on SPRA
HR-G6-01	Finding related to HRA reasonableness check; A reasonableness check for both internal events HEPs and SPRA HEPs was performed concluding that the values used are reasonable.
DA-C2-01	Finding related to blocked PORV plant-specific data used; resolution determined that the appropriate data are used, therefore there is no impact on either internal events PRA or SPRA
IF-C2a-01	The Internal Flooding analysis served as background for SPRA flooding scenarios for impacts and timing, but specific evaluations and walkdowns were performed for the SPRA.
QU-D3-01	Finding related to need for comparison with other PRAs; this was documented so no impact on SPRA
QU-F5-01	Finding related to use of a specific plant configuration in the average model could impact EOOS (configuration risk) application; this is not an issue for the SPRA, which is consistent with baseline internal events PRA.
LE-G5-01	Finding related to documentation of limitations in the LERF model; this was resolved through comparison with the standard, so no impact on the SPRA.

Finding Number	Disposition Relative to SPRA
MU-B4-01	Finding related to control of the PRA model update process and for focused peer review; resolution does not affect the SPRA.

NRC RAI 3

Section 4.3 of Enclosure 3 to the October 11, 2017, submittal "License Amendment Request for Approval to Utilize the Tornado Missile Risk Evaluator (TMRE) to Analyze Tornado Missile Protection Non-Conformances," (ADAMS Accession No. ML 17284A348) discusses the 2015 internal events update and states that the major change during the update was the addition of Westinghouse Owners Group (WOG) shutdown seal modeling. The discussion proceeds to state that a peer review was not required for these revisions. Per Section 4.1 of the October 11, 2017, submittal, the most recent peer-review of the licensee's internal events PRA model was performed in 2009. Therefore, it appears that the addition of the WOG shutdown seal model to the licensee's internal events PRA, which forms the basis of the VEGP SPRA, was never peer-reviewed.

Further, Section 3.1 of the Enclosure to the June 22, 2017, submittal states that the only additional sensitivity analysis required beyond those specified in NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline," (ADAMS Accession No. ML052910035) is:

[...]to evaluate the impact of the possibility that, following actuation of the reactor coolant pump shutdown seals (RCP SOS), there may be some scenarios where cold leg temperatures could exceed the rated temperature in a timeframe insufficient to credit operator action following a seismic event, leading to RCP seal LOCA [Loss-of-Coolant Accident] not currently included in the SPRA.

The Enclosure to the June 22, 2017, submittal further states that the issue is under investigation with the vendor of the RCP SOS.

The NRC staff's safety evaluation for Pressurized Water Reactor Owners Group (PWROG)-14001-P, Revision 1, "PRA Model for the Generation III Westinghouse Shut-Down Seal," (ADAMS Accession No. ML 17200C876) imposed limitations and conditions on the use of the models and parameters presented in the report. The limitations and conditions included a requirement for an analysis to be performed to demonstrate that the SDS remains below its maximum qualified temperature limit in the event of the cold leg temperature exceeding a certain threshold value and a requirement to develop plant-specific Human Error Probabilities (HEPs) for certain specific actions relevant to the issue cited in the submittal dated June 22, 2017.

- a. Please clarify whether the Generation III Westinghouse shutdown seal model has been peer-reviewed as part of the internal events PRA or SPRA peer-reviews. If the Generation III Westinghouse shutdown seal model has not been peer-reviewed, justify why the addition of this shutdown seal model is not considered a PRA upgrade requiring a focused-scope peer review. If this change qualifies as

an upgrade, provide the results from the focused-scope peer review including the associated F&Os and their resolutions.

- b. Please demonstrate how the limitations and conditions in the NRC safety evaluation for PWROG-14001-P, Revision 1, are being met for the scenarios identified by the licensee in Section 3.1 of the Enclosure to the June 22, 2017, submittal. Alternately, describe a sensitivity study that evaluates the impact of RCP seal LOCAs not currently modeled in the VEGP SPRA on the current application.

SNC Response to RAI 3a

The peer reviewed VEGP internal events PRA (including internal flooding) PRA that forms the basis for the SPRA did not include the Westinghouse Generation III low leakage (shutdown) seals. However, the peer reviewed PRA model did include an RCP seal leakage model (WOG 2000 model) to assess the plant response to events that result from a total loss of cooling to the RCP seals. Implementation of the new low leakage RCP seal model into the internal events PRA was performed consistent with the PRA methods and modeling that had already been peer reviewed, within the existing PRA model maintenance framework also already peer reviewed. The ASME/ANS PRA Standard defines a PRA upgrade as a new methodology, or a change in scope or change in capability that impacts the significant accident sequences or the significant accident progression sequences. PRA maintenance is defined as changes within the framework of an existing model structure. The change in the seal leakage model is not a new methodology since the new seal leakage model is simply an expansion of the current peer reviewed model, with different failure probabilities and associated human action. It is also not a change of scope of the model, i.e., the equipment, dependencies, and types of accident sequences remain the same. And it is not a change in PRA model capability, i.e., the peer reviewed PRA model can still evaluate the risk associated with station blackout and total loss of cooling events related to RCP seal failures. Thus, implementation of the new seal leakage model is a change implemented within the framework of the existing peer reviewed PRA model structure. The seal leakage model change is only a change in the expected seal leakages associated with the new seals. The framework of the model remains essentially the same, and the High Level and Supporting Requirements in the PRA Standard for the Technical Elements associated with RCP seal modeling (e.g., those within the Accident Sequence Analysis, Data Analysis, Human Reliability Analysis, and Quantification technical elements) will continue to be Met or Not Met regardless of implementation of the change from the WOG2000 RCP seal model to the shutdown seal model. Although the lower seal failure rates will affect the ordering of the associated accident sequences, and reduce CDF and LERF overall, the associated sequences are not significantly changed, and new sequences that have not already been modeled in the PRA and peer reviewed will not be generated. Given the above, this change in the internal events PRA does not constitute a PRA upgrade and does not require a focused scope peer review.

SNC Response to RAI 3b

The VEGP SPRA model was revised after the June 22, 2017, submittal was transmitted to NRC. The revised SPRA model incorporates the effects on RCP seal LOCAs if the rated temperature of shutdown seal is exceeded in a timeframe insufficient to credit operator action following a seismic event. The VEGP SPRA model of record (MOR) considered failure

probabilities for each failure mode, common cause and associated human error probabilities, as well as the seismic effects on those HEPs and on the seals, themselves, consistent with the PWROG-14001-P report. The VEGP SPRA MOR also models plant-specific Human Error Probabilities (HEPs) for specific actions required in response to the temperature limit being exceeded. The MOR would be used to categorize SSC per 10 CFR 50.69.

Since VEGP SPRA MOR has been revised to incorporate the impact of RCP seal LOCAs, a sensitivity study to show an impact of RCP seal LOCAs on the current application is not performed as part of a response to RAI #3b.

The VEGP SPRA MOR addresses Limitations and Conditions #2, 4, and 5 mentioned in the NRC safety evaluation for PWROG-14001-P, Revision 1. The Limitation and Condition #2 is addressed probabilistically in the VEGP SPRA MOR. The Limitation and Condition #4 is not applicable since the limitation is specifically for RCP model 93A while VEGP has RCP model 93A-1. The model 93A-1 RCP seals directly on the shaft, therefore there is no shaft sleeve O-ring to consider. Plant-specific operator actions have been modeled to meet the Limitation and Condition #5.

NRC RAI 12

Section 3.1.3 of the Enclosure to the submittal, dated June 22, 2017, discusses the licensee's current procedure for active component characterization and states that the procedure will be revised to reflect the change in the categorization approach. Please discuss any additional planned or anticipated changes to the licensee's categorization procedures based on the June 22, 2017, submittal, including items related to the:

- a. Use of a 10 percent margin to the importance measure thresholds in NEI 00-04,
- b. Use of absolute importance measures when re-evaluating previously categorized SSCs with an updated SPRA,
- c. Qualifications and training with respect to the SPRA for the integrated decision-making panel members.

SNC Response to RAI 12a

The use of a 10 percent margin to the importance measure thresholds in NEI 00-04 will be applied to the SPRA importance results, consistent with the process currently in use for VEGP 50.69 categorization.

SNC Response to RAI 12b

The absolute importance measures will be used when re-evaluating previously categorized SSCs with an updated SPRA, consistent with the current procedural guidance for internal events and fire PRAs.

SNC Response to RAI 12c

The existing qualifications and training process for the integrated decision-making panel (IDP) members will continue to be used, with the explanation that the VEGP SPRA is being used (as opposed to the previous SMA process). Detailed training of IDP members in SPRA modeling is not planned, but the PRA IDP member (who is a quorum member) will be familiar with the

important SPRA approaches, results, modeling assumptions, and sources of uncertainty and sensitivity.