



September 15, 2015

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52-026

ND-15-1760
10 CFR 50.90
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U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Southern Nuclear Operating Company
Vogtle Electric Generating Plant Units 3 and 4
Response to Request for Additional Information
Request for License Amendment and Exemption:
Containment Hydrogen Igniter Changes (LAR-15-003S1)

Ladies and Gentlemen:

By letter dated February 6, 2015, Southern Nuclear Operating Company (SNC) submitted a request for a license amendment and exemption (LAR-15-003, SNC correspondence ND-15-0280). This LAR requested changes to the Updated Final Safety Analysis Report (UFSAR) in the form of departures from the incorporated plant-specific Design Control Document (PS-DCD) Tier 2 information including the Technical Requirements Manual (TRM) and involved related changes to COL Appendix C information, with corresponding changes to the associated plant-specific Tier 1 information, to add two hydrogen igniters above the In-containment Refueling Water Storage Tank (IRWST) roof vents. The Nuclear Regulatory Commission (NRC) Staff issued Request for Additional Information (RAI) Letter No. 7, also referred to as electronic RAI (eRAI) 7968, via electronic mail dated August 17, 2015 [ADAMS Accession No. ML15229A468]. Enclosure 5 to this letter provides the response to RAI Letter No. 7. Enclosures 1, 2, 3, and 4 were provided with the original submittal of the LAR.

The supplemental information provided in this letter does not impact the scope or conclusions of the technical evaluation, regulatory evaluation (including the significant hazards consideration determination), or environmental considerations of the original LAR or exemption request.

This letter contains no regulatory commitments.

In accordance with 10 CFR 50.91, SNC is notifying the State of Georgia of this LAR supplement by transmitting a copy of this letter and enclosure to the designated State Official.

Should you have any questions, please contact Mr. Jason Redd at (205) 992-6435.

Mr. Wesley A. Sparkman states that: he is the Regulatory Affairs Licensing Manager, Nuclear Development, of Southern Nuclear Operating Company; he is authorized to execute this oath on behalf of Southern Nuclear Operating Company; and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY


Wesley A. Sparkman
WAS/WES/ljs

Sworn to and subscribed before me this 15th day of September 2015.

Notary Public: Lisa Myrick Spears

My commission expires: 6/18/19



Enclosures: 1 - 4 Previously submitted with the original LAR-15-003 in SNC letter ND-15-0280

Enclosure: 5 Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Response to NRC Request for Additional Information Letter No. 7 Related to LAR-15-003 (LAR-15-003S1)

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Southern Nuclear Operating Company

ND-15-1760

Enclosure 5

(Note that the Enclosures 1, 2, 3, and 4 were provided with the original request for license amendment and exemption, Containment Hydrogen Igniter Changes, in SNC letter ND-15-0280)

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

**Response to NRC Request for Additional Information
Letter No. 7 Related to LAR-15-003 (LAR-15-003S1)**

(This enclosure contains three pages, including this cover page.)

Electronic Request for Additional Information (eRAI) Tracking No. 7968

NRC Question:

The hydrogen combustion analysis to investigate the potential for deflagration to detonation transition (DDT) for AP1000 certified design was evaluated using cell width methodology, in particular the method of Sherman and Berman. (NUREG/CR-4803, "The possibility of Local Detonations During Degraded Core Accidents in the Bellefonte Nuclear Power Plant", Jan 1987) To evaluate the potential for DDT in or near the in containment refueling water storage tank (IRWST) including the addition of two new igniters near the IRWST vents, the analysis was revised, using the cell width methodology, but now based on the OECD State of the Art methodology ("Flame Acceleration and Deflagration-to-Detonation Transition in Nuclear Safety," State-of the Art Report by Group of Experts, NEA/CSNI/R(2000)7, August 2000)

For the staff to review and evaluate the results of the new analysis, identify and provide for audit:

- the original combustion analysis (basis for the certified design)
- the revised analysis (basis for the license amendment request)
- the validation/verification of the new analysis results

Compare the original and new analysis results, and identify any differences, with respect to local hydrogen concentration, local potential for DDT, credit for inerting, and assumptions related to reliance on hydrogen igniter performance.

SNC Response:

The two additional igniters that are proposed, in License Amendment Request (LAR)15-003 [ML15037A715], to be added in the upper compartment outside the IRWST vents through the operating deck near the refueling canal and loop compartment 1 are located solely on the basis of the igniter placement criteria that are outlined in UFSAR (plant-specific DCD) Table 6.2.4-6. The need for the igniters was identified during a design review and not by a failure observed in any DDT analyses that were performed previously or since. There are no analyses that support specific igniter placement other than demonstrating that the design criteria are met. The methodology and analysis presented in UFSAR (plant-specific DCD) Section 19.41 remain unchanged by the proposed addition of two igniters above the IRWST vents.

Additional Information Regarding DDT Analyses

The DDT analysis performed using the Organisation for Economic Co-operation and Development (OECD) State-of-the-Art Reports (SOAR) methodology was not utilized to support this license amendment request and is not being requested to be reviewed in conjunction with the licensing basis at this time.

DDT analyses using the SOAR methodology have been performed in support of the ongoing update of the Probabilistic Risk Assessment (PRA) as documented in APP-PRA-GSC-402 "AP1000 Evaluation of DDT Potential," Rev. 0. This updated analysis includes the new igniters (proposed in this LAR). However, the analysis was performed with the MAAP4 code and the

fidelity of the lumped parameter modeling of the upper compartment control volume does not distinguish the new igniters from the existing igniters #35 - #38 that have always been located above the IRWST vents along the containment shell at that elevation. The updated analysis is not utilized to support or justify the proposed igniter placement.

A draft DDT analysis revision of APP-SSAR-GSC-117, "AP1000 Revised MAAP4 Parameter File and Hydrogen Mixing/Combustion Analysis," currently at Rev. 0 (would be updated to Rev. 1) is currently in process using the MAAP4 methodology used in APP-SSAR-GSC-117, Revision 0 with corrected modeling of the IRWST vents. The analysis includes hydrogen releases from severe accident management actions and shutdown conditions. However, these analyses are being performed with the MAAP4 code and do not have fidelity in the lumped parameter model upper compartment control volume to distinguish the new igniters from the existing igniters. The draft analysis revision is not utilized to support or justify the proposed igniter placement.

The design analyses supporting DCD Chapter 19 (and unchanged in the plant-specific DCD) were performed for the AP1000 PRA using the Sherman-Berman methodology and are documented in APP-PRA-GSC-241 "AP1000 Hydrogen Mixing and Combustion Analysis," Rev. 0 and PRA-GSC-241, "AP600 PRA Rev. 7: Hydrogen Mixing and Combustion Analysis," Rev. 0. A direct comparison of the failure probability results of the new analyses with the old is not applicable because of the SOAR vs. Sherman Berman methodology as well as the PRA quantification techniques that were used in the current PRA vs. the more detailed PRA update. The current PRA DDT probabilities were quantified using a decomposition event tree and applied to the containment event tree DDT nodes on the basis of the plant damage state. In the PRA update, DDT failure conditions are defined by sets of conditional successes and failures that are linked by fault trees to the containment event tree. The PRA update also includes ex-vessel combustible gas generation that was not quantified in the current PRA, which conservatively assumed that reactor vessel failure leads directly to containment failure.

Both PRA analyses show igniter failure along with other failures can lead to combustible gas mixtures that potentially reach conditions supporting flame acceleration and DDT. However, in the current PRA, the igniters were modeled as either all on (success) or all off (failure) primarily defined by the availability of power and human reliability to actuate them. In the PRA update, igniter failures are defined using a more detailed modeling of the power availability and the individual igniters' failures as well as the human reliability. In neither PRA was the upper compartment where the new igniters are located identified as a likely location for DDT to occur during in-vessel hydrogen releases.