



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

March 16, 2018

Mr. James J. Hutto  
Regulatory Affairs Director  
Southern Nuclear Operating Co., Inc.  
P.O. Box 1295, Bin 038  
Birmingham, AL 35201-1295

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 – AUDIT PLAN FOR SECOND AUDIT CONCERNING SYSTEMATIC RISK-INFORMED ASSESSMENT OF DEBRIS TECHNICAL REPORT (CAC NOS. MF9685 AND MF9686; EPID L-2017-TOP-0038)

Dear Mr. Hutto:

By letter dated April 21, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17116A096) as supplemented by letters dated July 11, 2017 (ADAMS Accession No. ML17192A245), November 9, 2017 (ADAMS Accession No. ML17314A014), January 2, 2018 (ADAMS Accession No. ML18004A070), January 5, 2018 (ADAMS Accession No. ML17354A782), February 12, 2018 (ADAMS Accession No. ML18045A094), and February 21, 2018 (ADAMS Accession No. ML18052B342). Southern Nuclear Operating Company submitted a plant-specific technical report for Vogtle Electric Generating Plant, Units 1 and 2, and requested U.S. Nuclear Regulatory Commission (NRC) approval of the methods and inputs described in the technical report. The plant-specific technical report describes a risk-informed methodology to evaluate debris effects with the exception of in-vessel fiber limits.

The NRC staff will conduct a regulatory audit to support its review of the technical report. The audit will be remotely via GoToMeeting on March 26, 2018. The audit plan is enclosed. The logistics and scope of the audit was discussed with your staff on March 2, 2018.

If you have any questions, please contact me by telephone at 301-415-2871 or by e-mail at [Michael.Marshall@nrc.gov](mailto:Michael.Marshall@nrc.gov).

Sincerely,

A handwritten signature in black ink that reads "Michael L. Marshall, Jr.".

Michael L. Marshall, Jr., Senior Project Manager  
Plant Licensing Branch I  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-424 and 50-425

Enclosure:

1. Audit Plan
2. Audit Information Needs

## AUDIT PLAN

### GENERIC SAFETY ISSUE 191

#### SOUTHERN NUCLEAR OPERATING COMPANY

#### VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2

#### DOCKET NOS. 50-424 AND 50-425

### **I. BACKGROUND**

By letter dated April 21, 2017 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML17116A096), as supplemented by letters dated July 11, 2017 (ADAMS Accession No. ML17192A245), November 9, 2017 (ADAMS Accession No. ML17314A014), January 5, 2018 (ADAMS Accession No. ML17354A782), February 12, 2018 (ADAMS Accession No. ML18045A094), and February 21, 2018 (ADAMS Accession No. ML18052B342), the Southern Nuclear Operating Company (SNC) submitted a plant-specific technical report for Vogtle Electric Generating Plant, Units 1 and 2 (VEGP) and requested U.S. Nuclear Regulatory Commission (NRC) approval. The plant-specific technical report provides plant-specific conditions and models related to Generic Safety Issue (GSI) - 191, "Assessment of Debris Accumulation on PWR [Pressurized-Water Reactor] Sump Performance" and Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," (ADAMS Accession No. ML042360586). The technical report also provides risk quantification, a description of a plant-specific probabilistic risk assessment model, and defense-in-depth and safety margin evaluations.

### **II. REGULATORY AUDIT BASES**

The purpose of the audit is to gain a more detailed understanding of the analyses performed by SNC to resolve GSI-191 through a risk-informed approach. This will be the second of two audits. The plan for the first audit was provided to SNC in a letter dated October 18, 2017 (ADAMS Accession No. ML17277A489). The main focus of the audit will be the risk-informed approach and related computations that are documented in Enclosures 3 and 5 to SNC's letter dated April 21, 2017. Additional audit discussions will cover the topics discussed during the first audit and topics contained in the supplements provided by SNC. The objectives of the second audit are to (1) gain a better understanding of the technical approaches implemented in support of the risk-informed methodology, and (2) gain a better understanding of the methods used in the computer models.

### **III. REGULATORY AUDIT SCOPE AND METHODOLOGY**

The scope of the audit includes key components of the risk-informed methodology, specifically:

- Approaches to compute the amount of debris generated and transported to the strainer(s) given a break of a specified size, at a specified weld location, a range of orientations, and the operating state of the plant, starting from the computer-aided design model of the nuclear power plant.

- Approaches to compute delta core damage frequency, delta large early release frequency values, and conditional failure probabilities.
- Modelling of plant conditions to provide a realistic or conservative estimation of the effects of debris on recirculation.

#### **IV. INFORMATION AND OTHER MATERIAL NECESSARY FOR THE REGULATORY AUDIT**

The information needed for the regulatory audit is listed in Enclosure 2. The audit team will not remove non-docketed information from the sharing portal (i.e., electronic reading room, ePortal) established by SNC. NRC contractors will maintain control of proprietary materials in accordance with NRC procedures and non-disclosure agreements.

#### **V. AUDIT TEAM ASSIGNMENTS**

The members of the audit team will be:

- Victor Cusumano, team co-lead, NRC
- CJ Fong, team co-lead, NRC
- Michael Marshall, project manager, NRC
- Mehdi Reisi-Fard, technical reviewer, probabilistic risk assessment, NRC
- Steve Smith, technical reviewer, debris generation/transport, NRC
- Paul Klein, technical reviewer, chemical effects, NRC
- Matt Yoder, technical reviewer, coatings and chemical effects, NRC
- Bryce Lehman, technical reviewer, structural, NRC
- Osvaldo Pensado, NRC contractor
- Stuart Stothoff, NRC contractor

#### **VI. LOGISTICS**

The NRC staff and NRC's contractor will conduct the audit on March 26, 2018 via GoToMeeting using the sharing portal established by SNC. The NRC staff will make all arrangements concerning GoToMeeting and will communicate those arrangements to SNC at least one week prior to the start of the second audit. The NRC Project Manager will coordinate any changes to the audit schedule and location with the licensee.

#### **VII. SPECIAL REQUESTS**

The NRC staff would like SNC to maintain NRC staff's access to the sharing portal established by SNC until March 30, 2018. NRC staff access to the sharing portal is expected to be ended on March 30, 2018.

#### **VIII. DELIVERABLES**

An audit summary will be prepared within 90 days of the completion of the second audit – not the first 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 correspondence.

## AUDIT INFORMATION NEEDS

- 1) For cases where sodium aluminum silicate (SAS) precipitation does not occur within 24 hours, please describe how SAS will accumulate on the sump screens for the containment spray (CS) and residual heat removal (RHR) pumps. In the description address time steps used and the time CS pumps are shut off.
- 2) Please explain why some partial breaks from the same weld with the same orientation generate smaller debris amounts when the break size is increased. An increase in partial break size from a break in a given weld at a given orientation should increase total debris amounts.
- 3) Please explain why some small double ended guillotine breaks generate more than twice the amount of debris than the maximum partial break at the same weld.
- 4) The fire barrier debris in NARWHAL appears to be inconsistent with BADGER. The fire barrier particulate in NARWHAL is greater than in BADGER. The fire barrier fiber in NARWHAL is less than BADGER. Please explain what effect, if any, this apparent inconsistency has on debris types and sizes.
- 5) The total calcium in the system increases linearly with the total Nukon fiber (fines + small + large + intact) computed by BADGER, and with a reduced slope (almost leveling off) for larger total Nukon fiber amounts. Please explain why the calcium amounts at the strainer almost level off even when there are increased amounts of Nukon in the pool.
- 6) The response to 3.a.2 in Enclosure 5 to the letter dated April 21, 2017, states that coatings quantities for secondary side breaks are bounded by primary side breaks. Considering the revised treatment of coatings, as described in the responses to RAIs 24 and 35 in the letter dated February 12, 2018, are the secondary breaks bounded by the amounts included in the test? Reference Page E5-13.
- 7) The air void fraction calculation is negative sometimes. Please describe the effect of negative void fraction values. In the description, discuss how the negative values affect the cumulative void fraction. What is the cumulative void fraction used to evaluate? Explain whether the released gasses flow with the coolant to the pump suction. Please explain how the void fraction is calculated in NARWHAL.
- 8) Please describe the documentation of the high level screening criteria. In the description discuss whether the documentation includes:
  - scenarios that may liberate significant debris amounts,
  - scenarios that result in recirculation,
  - scenario includes phenomena that could transport the debris to the sump, and
  - in the absence of Generic Safety Issue 191 related phenomena, the scenario would have been evaluated as successfully terminated.
- 9) Please describe in more detail how high-likelihood scenarios were derived and how the low-likelihood delta core damage frequency and large early release frequency values were calculated.

- 10) The risk assessment does not include a fire probabilistic risk assessment (PRA) or address why fire hazards were screened out. Please describe the rationale for not including fire PRA.
- 11) Please, describe how the systematic screening process (see info need #8) was applied to secondary side breaks. Explain which secondary side breaks were screened into and out-of the analysis and provide a basis for doing so.
- 12) Please clarify how dependencies and common cause failures are treated in the analysis as described in Calculation V-RIE-IEIF-GSI-191-U00-001. Explain how the approach impact the results.
- 13) Please describe how the small break loss-of-coolant accident (LOCA) frequency used in NARWHAL was derived. Confirm that the error factor for medium breaks is correct.
- 14) Please provide the conditional failure probability used for case "sump A strainer fails following large LOCA with 1 NSCW train failed." Explain how this conditional failure probability was derived.
- 15) Please discuss the effects of an interpolation error in Table 1 of calculation V-RIE-IEIF-GSI-191-U00-003, Revision 1, "Vogtle PRA LOCA Frequency Development." The interpolated values appear to be outside the bounds of columns Y1 and Y2 for the 2 inch break size median and 95th percentile.
- 16) Since the treatment of coatings transport was changed, are the sensitivity studies still valid? Provide additional discussion on the sensitivity study that varies the parameter of CS operation.
- 17) The structural evaluation states that the crush pressure of the strainer is 10.1 feet (ft). The head loss section states that the strainer has 24 ft of structural margin. The net positive suction head section states that head loss may reach 14 ft. What is the actual strainer differential pressure limit?

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**ADAMS Accession No. ML18051A317**

\* via email

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