



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

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS

RELATED TO AMENDMENT NOS. 120 AND 119

TO THE COMBINED LICENSE NOS. NPF-91 AND NPF-92

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MEAG POWER SPVM, LLC

MEAG POWER SPVJ, LLC

MEAG POWER SPVP, LLC

CITY OF DALTON, GEORGIA

VOGTLE ELECTRIC GENERATING PLANT UNITS 3 AND 4

DOCKET NOS. 52-025 AND 52-026

1.0 INTRODUCTION

By letter dated October 6, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17279B017), Southern Nuclear Operating Company, Inc., (SNC) requested that the U.S. Nuclear Regulatory Commission (NRC) amend the combined licenses (COL) for Vogtle Electric Generating Plant (VEGP) Units 3 and 4, COL Numbers NPF-91 and NPF-92, respectively. The requested amendment proposes changes to the Updated Final Safety Analysis Report (UFSAR) in the form of departures from the incorporated plant-specific Design Control Document (DCD) Tier 2 information. Further, the amendment would revise a COL License Condition which references the AP1000 DCD Revision 19 section impacted by the proposed changes. Specifically, the requested amendment proposes changes to revise the methodology and acceptance criteria for the in-containment refueling water storage tank (IRWST) heatup preoperational test described in UFSAR Subsection 14.2.9.1.3, item h, and the passive residual heat removal (PRHR) heat exchanger preoperational test described in UFSAR Subsection 14.2.9.1.3, item g. These changes involve material which is specifically referenced in Section 2.D.(2) of the COLs for VEGP Units 3 and 4. The amendment would also revise the reference to the IRWST Heatup Test in the COL license condition, consistent with the changes to the UFSAR.

In letter dated February 28, 2018, (ADAMS Accession No. ML18059A223), SNC provided additional information that supplemented the application. This information did not expand the scope of the application, and did not change the NRC staff's original proposed no significant

hazards consideration determination as published in the *Federal Register* on February 2, 2018 (83 FR 8509).

## 2.0 REGULATORY EVALUATION

The NRC staff considered the following regulatory requirements in reviewing SNC's proposed licensing amendment request (LAR) 17-033.

10 CFR 52, Appendix D, Section VIII.B.5.a allows an applicant or licensee who references this appendix to depart from Tier 2 information, without prior NRC approval, unless the proposed departure involves a change to or departure from Tier 1 information, Tier 2\* information, or the Technical Specifications, or requires a license amendment under paragraphs B.5.b or B.5.c of this section.

10 CFR 52, Appendix D, Section VIII.B.5.b(8) states, in part, that after issuance of a license, "A proposed departure from Tier 2, other than one affecting resolution of a severe accident issue identified in the plant-specific DCD. . . requires a license amendment if it would: (8) Result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses." As discussed above, a change to the method of evaluation is requested and thus requires prior NRC approval.

10 CFR 50, Appendix A, General Design Criterion (GDC) 34 requires, in part, that a system be provided to remove fission product decay heat and other residual heat from the reactor such that design conditions are not exceeded. The PRHR heat exchanger is credited to perform this function for the AP1000 design.

10 CFR 50 Appendix A, GDC 35 requires, in part, that a system be provided to provide abundant emergency core cooling. The PRHR performs a role in performing this function for the AP1000 design for some transient sequences.

10 CFR 50 Appendix A, GDC 37 requires, in part, that the emergency core cooling system shall be designed to permit periodic and functional testing to demonstrate the operability of the system as a whole under conditions as close to design as practical.

## 3.0 TECHNICAL EVALUATION

The proposed changes require a departure from the plant-specific DCD and UFSAR Tier 2 information. The Tier 2 revision involves changes to the conditions specified in the COL for VEGP Units 3 and 4. As part of the LAR, SNC proposed changes to three sections and one table in the UFSAR:

- Table 3.9-17, revising Note 4 of the table to change the test conditions and provide additional clarification related to the plant conditions during the test;
- Subsection 14.2.5, adding the forced flow test to the IRWST heatup discussion;
- Subsection 14.2.9.1.3, revising the acceptance criteria for the IRWST heatup from supporting the safe shutdown temperature criteria specified in UFSAR Section 19E.4.10.2 to be consistent with the PRHR heat transfer modeling in the Chapter 15 analysis.

In addition, SNC proposed conforming changes to a COL license condition in Section 2.D.(2) of the COL for VEGP Units 3 and 4 to reference the amendment resulting from this LAR for a description of the IRWST Heatup Test. These changes are evaluated in detail below in Section 3.1.

### 3.1 Evaluation of Proposed Changes

The proposed changes to UFSAR Tier 2, Table 3.9-17, Note 4, would amend the test conditions for the IRWST heatup test. The LAR proposes to change the allowable calculated heat transfer from the PRHR heat exchanger to the IRWST water from greater than or equal to  $8.11E7$  Btu/hr to greater than or equal to  $8.46E7$  Btu/hr, change the IRWST temperature requirement for this test from  $120^{\circ}\text{F}$  to  $80^{\circ}\text{F}$ , and provide additional clarification for test timing and test conditions. In order to evaluate these changes, the staff audited the documentation supporting the calculation (ADAMS Accession No. ML18059A755). SNC used a LOFTRAN model with inputs corresponding to expected test conditions to calculate a predicted heat transfer rate for various system configurations. The original test conditions and acceptance criterion allowed the possibility that a test could be successful and not meet the minimum calculated safeguards performance requirements. The changes proposed in the LAR would rectify that, as the minimum heat transfer would correspond to the test acceptance criterion at the new initial IRWST temperature value. The test conditions are adequately reflected in the LOFTRAN calculation, which is based on the model of record used for the licensing basis safety analyses. As such, the staff finds the proposed change acceptable, as it ensures that the testing will demonstrate the PRHR will remove heat in accordance with the safety analysis assumptions.

The proposed change to UFSAR Tier 2, Subsection 14.2.5, clarifies that during preoperational testing both the natural circulation and forced flow test will be used to examine the results of IRWST mixing and quantify the conservatism in the Chapter 15 transient analyses. This change acts in conjunction with the proposed change to UFSAR Subsection 14.2.9.1.3, item (h), which revises the acceptance criterion for the IRWST heatup testing from meeting the safe shutdown temperature as specified in Section 19E.4.10.2 to demonstrating that the average IRWST heatup is consistent with the PRHR heat transfer modeling in the Chapter 15 analysis.

The changes proposed by SNC pertain primarily to GDC 37, testing of the emergency core cooling system. The testing requirements associated with GDC 37 provide some of the basis for demonstrating that the passive core cooling system will conform to the requirements of GDCs 34 and 35 as credited in the AP1000 design. GDC 37 requires, in part, that the system be tested to demonstrate the operability of the system as a whole and, under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation. Although the proposed changes result in the test conditions deviating further from those specified in the safety analysis, testing at design conditions is not practical, and the conditions proposed by SNC as part of this LAR can be justified in a similar analytical fashion to those existing in the certified design. As discussed above, the staff audited the calculation for the proposed test conditions and determined that SNC has an appropriately implemented analytical model and that, if the test conditions are implemented in accordance with those input into the model, adequate heat removal from the PRHR heat exchanger will be demonstrated.

While the previous acceptance criteria had a clear numerical basis ( $420^{\circ}\text{F}$  in 36 hours, from the analysis in UFSAR Section 19.E.4.10.2), the revised acceptance criteria instead cites consistency with a modeling approach. It was not clear to the staff how this acceptance criteria would be satisfied based on the information provided in the LAR and therefore the staff

submitted a request for additional information (RAI). In RAI 14.02-1 (ADAMS Accession No. ML18030A734), the staff requested that SNC provide additional detail regarding the new acceptance criteria for a satisfactory test, and how the test data will be used to demonstrate consistency with the analysis documented in Chapter 15.

In the February 28, 2018, response to RAI 14.02-1 (ADAMS Accession No. ML18059A223), SNC clarified that the purpose of the test is to gather pertinent operation data for the passive core cooling system, then use the test data to compare to the predicted heat transfer calculated using LOFTRAN, the analytical tool used to calculate the PRHR performance in Chapter 15 of the UFSAR. An acceptable test, therefore, is one that demonstrates a normalized heat transfer rate greater than or equal to that predicted in LOFTRAN. The heat transfer rate is normalized to account for adjustments in test parameters during the actual test. As the LOFTRAN model has been approved by the staff for use in the Chapter 15 analyses, the staff believes its use for calculating acceptance criteria with input test conditions (different from the limiting safety conditions) constitutes a technically appropriate and defensible test of PRHR heat transfer capability; therefore, the RAI response is acceptable. The response provided by the applicant provides sufficient clarity to the expected acceptance criteria to be used for the test (based on the LOFTRAN model and the test conditions). Based on the additional context provided in the response and the reasoning above, the staff finds the proposed changes to Subsection 14.2.9.1.3 in the UFSAR acceptable. The change to Subsection 14.2.5 in the UFSAR does not materially change the testing program; it merely provides SNC the opportunity to use data from both the natural circulation and forced flow tests to inform their testing experience. The staff believes this is appropriate given the stated purpose of the first plant testing; therefore, the staff finds the change acceptable.

The proposed changes evaluated above represent a departure from the method of evaluation described in the plant-specific DCD, which affects material referenced in Section 2.D.(2) of the COL for VEGP Units 3 and 4. As a result of those changes, SNC proposed to revise sub-bullet (a)1, which currently refers to AP1000 DCD, Rev. 19, Subsection 14.2.9.1.3 for the description of the IRWST Heatup Test, to instead refer to the amendment resulting from this LAR. Based on the conclusions above that the proposed changes to UFSAR Table 3.9-17 and Subsections 14.2.5 and 14.2.9.1.3 are acceptable, the staff finds the proposed revision to Section 2.D.(2) of the COLs for VEGP Units 3 and 4, acceptable for the same reasons.

### 3.2 SUMMARY OF THE TECHNICAL EVALUATION

The staff reviewed SNC's proposed changes in the LAR concerning the methodology and acceptance criteria for the IRWST heatup preoperational test described in UFSAR Subsection 14.2.9.1.3, item h and the PRHR heat exchanger preoperational test described in UFSAR Subsection 14.2.9.1.3, item g. These changes involve material which is specifically referenced in Section 2.D.(2) of the COLs for VEGP Units 3 and 4.

Based on the technical evaluations above, the staff finds that the proposed changes to the plant specific UFSAR Tier 2 information, to revise the licensing basis documents to change the methodology and acceptance criteria for the IRWST heatup preoperational test described in UFSAR Subsection 14.2.9.1.3, item h and the PRHR heat exchanger preoperational test described in UFSAR Subsection 14.2.9.1.3, item g, continue to conform to GDCs 34, 35, and 37. Specifically, the applicant's changes provide additional clarity to, and maintain the intended purpose of the proposed PRHR heatup tests. The changes demonstrate the as-built PRHR heat

transfer rate meets or exceeds the values assumed in the safety analyses. Therefore, the staff finds the proposed changes to be acceptable.

#### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations in 10 CFR 50.91(b) (4), the Georgia State official was consulted on February 28, 2018 regarding the proposed issuance of the amendment. The State official had no comment.

#### 5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20, "*Standards for Protection Against Radiation.*" The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (*Federal Register*, 83 FR 8509, dated February 2, 2018). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Under 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

#### 6.0 CONCLUSION

Based on the technical evaluation presented in Section 3.0 above, the staff has concluded that with regards to the proposed amendment: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public. Therefore, the staff finds the changes proposed in this LAR are acceptable.

#### 7.0 REFERENCES

1. Request for License Amendment (LAR 17-033): Passive Residual Heat Removal Heat Transfer and In-containment Refueling Water Storage Tank Heat Up Test Acceptance Criteria Change, dated October 6, 2017 (ADAMS Accession No. ML17279B017).
2. Request for License Amendment (LAR 17-033S1): Passive Residual Heat Removal Heat Transfer and In-containment Refueling Water Storage Tank Heat Up Test Acceptance Criteria Change, dated March 16, 2018 (ADAMS Accession No. ML18059A223).
3. Request for Additional Information Letter No. 1 Related to Passive Residual Heat Removal Heat Transfer and In-Containment Refueling Water Storage Tank Heat Up Test Acceptance Criteria Change for the Vogtle Electric Generating Plant Units 3 and 4 Combined Licenses (TAC NO. RP9705), dated January 30, 2018, (ADAMS Accession No. ML18030A734)
4. Vogtle Units 3 and 4 Updated Final Safety Analysis Report, Revision 6 and Tier 1, Revision 5 dated March 12, 2017 (ADAMS Accession No. ML17172A218).

5. AP1000 Design Control Document, Revision 19, dated June 13, 2011 (ADAMS Accession No. ML11171A500).
6. Combined License NPF-91 for Vogtle Electric Generating Plant Unit 3, Southern Nuclear Operating Company (ADAMS Accession No. ML14100A106).
7. Combined License NPF-92 for Vogtle Electric Generating Plant Unit 4, Southern Nuclear Operating Company (ADAMS Accession No. ML14100A135).
8. Audit Report for Vogtle Electric Generating Plant, Units 3 and 4, Request for License Amendment and Exemption: PRHR Heat Transfer and IRWST Heat Up Test Acceptance Criteria Change (LAR 17-033), dated March 12, 2018, (ADAMS Accession No. ML18059A755).