



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

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS

RELATED TO AMENDMENT NOS. 111 AND 110

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

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MEGA POWER SPVM, LLC

MEGA POWER SPVJ, LLC

MEGA 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 March 31, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17090A209), 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 proposed amendment provides for departure from approved AP1000 Design Control Document (DCD) Tier 2 information (as incorporated into the Updated Final Safety Analysis Report (UFSAR) as plant-specific DCD information) and proposes changes to plant-specific Tier 1 information (and corresponding changes to COL Appendix C) for each of the VEGP Units 3 and 4 COLs. The amendment proposes changes to UFSAR Tier 2 and COL Appendix C (and plant-specific Tier 1) in regards to the passive core cooling system (PXS) low pressure injection and fourth-stage automatic depressurization system (ADS) flow resistances. This includes proposed changes to inspections, tests and acceptance criteria (ITAAC) and UFSAR information in various locations.

Pursuant to 10 CFR 52.63(b)(1), SNC requested an exemption from the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Appendix D, Section III.B, “Design Certification Rule for the AP1000 Design, Scope and Contents,” to allow a departure from the elements of the certification information in Tier 1 of the generic DCD.<sup>1</sup>

In order to modify the UFSAR Tier 1 (the plant-specific DCD) information, the NRC must find the licensee’s exemption request included in its submittal for the license amendment request (LAR) acceptable. The NRC staff’s review of the exemption request and the LAR is included in this safety evaluation, where NRC staff shall be referred to as the staff.

The staff’s proposed no significant hazards consideration determination was published in the *Federal Register* on June 6, 2017 (82 FR 26128).

## 2.0 REGULATORY EVALUATION

The proposed changes consist of the following:

1. Revising licensing basis text in COL Appendix C (and plant-specific Tier 1) and UFSAR Tier 2 that describes the inspection and analysis of, and specifies the maximum calculated flow resistance acceptance criteria for, the fourth-stage ADS loops;
2. Revising licensing basis text in COL Appendix C (and plant-specific Tier 1) and UFSAR Tier 2 that describes the testing of, and specifies the allowable flow resistance acceptance criteria for, the in-containment refueling water storage tank (IRWST) injection line;
3. Revising licensing basis text in COL Appendix C (and plant-specific Tier 1) and UFSAR Tier 2 that describes the testing of, and specifies the maximum flow resistance acceptance criteria for, the containment recirculation line;
4. Revising licensing basis text in COL Appendix C (and plant-specific Tier 1) and UFSAR Tier 2 that specifies acceptance criteria for the maximum flow resistance between the IRWST drain line and the containment; and
5. Removing licensing basis text from UFSAR Tier 2 that discusses the operation of swing check valves in current operating plants.

The NRC staff considered the following regulatory requirements in reviewing the LAR:

10 CFR Part 52, Appendix D, Section VIII.A.4 states that exemptions from Tier 1 information are governed by the requirements in 10 CFR 52.63(b)(1) and 10 CFR 52.98(f). It also states that the Commission will deny such a request if it finds that the design change will result in a significant decrease in the level of plant safety otherwise provided by the design.

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<sup>1</sup> While the licensee describes the requested exemption as being from Section III.B of 10 CFR Part 52, Appendix D, the entirety of the exemption pertains to proposed departures from Tier 1 information in the generic DCD. In the remainder of this evaluation, the NRC will refer to the exemption as an exemption from Tier 1 information to match the language of Section VIII.A.4 of 10 CFR Part 52, Appendix D, which specifically governs the granting of exemptions from Tier 1 information.

10 CFR Part 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, the Technical Specifications, or requires a license amendment under 10 CFR Part 52, Appendix D, Section VIII, paragraphs B.5.b or B.5.c.

10 CFR 52.63(b)(1) allows the licensee who references a design certification rule to request NRC approval for an exemption from one or more elements of the certification information. The Commission may only grant such a request if it determines that the exemption will comply with the requirements of 10 CFR 52.7, which, in turn, points to the requirements listed in 10 CFR 50.12, "Specific exemptions." In addition, the Commission must consider whether special circumstances, as required by 10 CFR 52.7 and 50.12, outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption. Therefore, any exemption from the Tier 1 information certified by Appendix D to 10 CFR Part 52 must meet the requirements of 10 CFR 50.12, 52.7, and 52.63(b)(1).

10 CFR 52.98(f) requires NRC approval for a proposed amendment to the COL for any modification to, addition to, or deletion from the terms and conditions of a COL. These activities involve a change to COL Appendix C Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) information, with corresponding changes to the associated plant-specific DCD Tier 1 information. Therefore, NRC approval is required prior to making the plant specific changes in this LAR.

The specific NRC technical requirements applicable to LAR-17-009 are the general design criteria (GDC) in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." In particular, these technical requirements include the following GDC:

GDC 2, "Design bases for protection against natural phenomena," requires that structures, systems, and components (SSCs) important to safety be designed to withstand the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches, without loss of capability to perform their safety functions.

GDC 4, "Environmental and dynamic effects design bases," requires that SSCs important to safety be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These SSCs shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.

GDC 35, "Emergency core cooling," requires that a system to provide abundant emergency core cooling be provided. The system safety function shall be to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented, and (2) clad metal-water reaction is limited to negligible amounts.

GDC 36, "Inspection of emergency core cooling system," requires that the emergency core cooling system be designed to permit appropriate periodic inspection of important components,

such as spray rings in the reactor pressure vessel, water injection nozzles, and piping, to assure the integrity and capability of the system.

GDC 37, "Testing of emergency core cooling system," requires that the emergency core cooling system be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leak tight integrity of its components, (2) the operability and performance of the active components of the system, and (3) 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, including operation of applicable portions of the protection system, the transfer between normal and emergency power sources, and the operation of the associated cooling water system.

### 3.0 TECHNICAL EVALUATION

#### 3.1 EVALUATION OF EXEMPTIONS

The regulations in Section III.B of Appendix D to 10 CFR Part 52 require a holder of a COL referencing Appendix D to 10 CFR Part 52 to incorporate by reference and comply with the requirements of Appendix D, including certified information in Tier 1 of the generic AP1000 DCD. Exemptions from Tier 1 information are governed by the change process in Section VIII.A.4 of Appendix D of 10 CFR Part 52. Because SNC has identified changes to plant-specific Tier 1 information, with corresponding changes to the associated COL Appendix C information resulting in the need for a departure, an exemption from the certified design information within plant-specific Tier 1 material is required to implement the LAR. The Tier 1 information for which a plant-specific departure and exemption was requested relates to the PXS low pressure injection and fourth-stage ADS flow resistances. It includes proposed changes to ITAAC and UFSAR information in various locations including changes to ITAAC No. 2.1.02.08d.ii in Table 2.1.2-4, and ITAAC Nos. 2.2.03.08c.i.03, 2.2.03.08c.i.04, and 2.2.03.09a.i in Table 2.2.3-4. The result of this exemption would be that the licensee could implement modifications to Tier 1 information. Pursuant to the provisions of 10 CFR 52.63(b)(1), an exemption from the elements of the design as certified in the 10 CFR Part 52, Appendix D, design certification rule is requested for the involved Tier 1 information described and justified in LAR 17-009. This exemption is a permanent exemption limited in scope to the particular Tier 1 information specified.

As stated in Section VIII.A.4 of Appendix D to 10 CFR Part 52, an exemption from Tier 1 information is governed by the requirements of 10 CFR 52.63(b)(1) and 52.98(f). Additionally, Section VIII.A.4 of Appendix D to 10 CFR Part 52 provides that the Commission will deny a request for an exemption from Tier 1 if it finds that the requested change will result in a significant decrease in the level of safety otherwise provided by the design. Pursuant to 10 CFR 52.63(b)(1), the Commission may grant exemptions from one or more elements of the certification information, so long as the criteria given in 10 CFR 52.7 which, in turn, references 10 CFR 50.12, are met and that the special circumstances, as defined by 10 CFR 50.12(a)(2), outweigh any potential decrease in safety due to reduced standardization.

Pursuant to 10 CFR 52.7, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 52. As 10 CFR 52.7 further states, the Commission's consideration will be governed by 10 CFR 50.12 which states that an exemption may be granted when: (1) the exemptions are authorized by

law, will not present an undue risk to public health and safety, and are consistent with the common defense and security; and (2) special circumstances are present. Specifically, 10 CFR 50.12(a)(2) lists six special circumstances for which an exemption may be considered. It is necessary for one of these special circumstances to be present in order for the NRC to consider granting an exemption request. The licensee stated that the requested exemption meets the special circumstances of 10 CFR 50.12(a)(2)(ii). That subsection defines special circumstances as when “[a]pplication of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.” The staff’s analysis of these findings is presented below.

### 3.1.1 AUTHORIZED BY LAW

This exemption would allow the licensee to implement approved revisions to Tier 1 information and corresponding information in COL Appendix C in the plant-specific DCD. This exemption is a permanent exemption limited in scope to particular Tier 1, Tables 2.1.2-4 and 2.2.3-4 information. Subsequent changes to Tier 1, Tables 2.1.2-4 or 2.2.3-4, or any other Tier 1 information would be subject to the exemption process specified in Section VIII.A.4 of Appendix D to 10 CFR Part 52 and the requirements of 10 CFR 52.63(b)(1). As stated above, 10 CFR Part 52, Appendix D, Section VIII.A.4 allows the NRC to grant exemptions from one or more elements of the Tier 1 information. Based on 10 CFR Part 52, Appendix D, Section VIII.A.4, the staff has determined that granting of the licensee’s proposed exemption will not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission’s regulations. Therefore, as required by 10 CFR 50.12(a)(1), the exemption is authorized by law.

### 3.1.2 NO UNDUE RISK TO PUBLIC HEALTH AND SAFETY

The underlying purpose of Appendix D to 10 CFR Part 52 is to ensure that the licensee will construct and operate the plant based on the approved information found in the DCD incorporated by reference into the plant’s licensing basis. The proposed changes for the flow resistances of the fourth-stage ADS sub-loop valves and associated piping; IRWST injection lines; containment recirculation lines; and IRWST to containment drain lines involve revisions to COL Appendix C (and plant-specific DCD Tier 1) Table 2.1.2-4, ITAAC No. 2.1.02.08d.ii (fourth-stage ADS sub-loop valves and piping flow resistance); Table 2.2.3-4, ITAAC Nos. 2.2.03.08c.i.03 and 04 (IRWST injection and containment recirculation flow resistances); and Table 2.2.3-4, ITAAC No. 2.2.03.09a.i (IRWST to containment drain line flow resistance) information would revise the acceptance criteria for these ITAAC to use revised calculated flow resistance values due to the changes in the methods for calculating the flow resistances and the check valves in the IRWST injection lines and containment recirculation lines not fully opening. Based on the technical evaluation described later in this safety evaluation, these changes will enable SNC to safely construct and operate the facility consistent with the performance of the as-built components for the AP1000 design certified by the NRC by updating the information mentioned above found in Tier 1, Tables 2.1.2-4 and 2.2.3-4, of the DCD. These changes will not impact the ability of the systems or equipment to perform their design function. These changes do not add any new equipment or system interfaces to the current plant design. The flow resistance changes do not introduce any new industrial, chemical, or radiological hazards that would represent a public health or safety risk, nor do they modify or remove any design or operational controls or safeguards intended to mitigate any existing on-site hazards. Furthermore, the proposed changes would not allow for a new fission product release path,

result in a new fission product barrier failure mode, or create a new sequence of events that would result in significant fuel cladding failures. Accordingly, these changes do not present an undue risk from any new equipment or systems. Therefore, as required by 10 CFR 50.12(a)(1), the staff finds that there is no undue risk to public health and safety.

### 3.1.3 CONSISTENT WITH COMMON DEFENSE AND SECURITY

The proposed exemption would allow changes to elements of the plant-specific Tier 1 DCD. This is a permanent exemption limited in scope to particular Tier 1, Table 2.1.2-4 and Table 2.2.3-4 information. Subsequent changes to Tier 1 information would be subject to full compliance by SNC as specified in Section VIII.A.4 of Appendix D to 10 CFR Part 52. The proposed changes for the flow resistances of the fourth-stage ADS sub-loop valves and associated piping; IRWST Injection lines; Containment recirculation lines; and IRWST to Containment drain lines involve revisions Tier 1, Table 2.1.2-4 and Table 2.2.3-4, of the DCD. Based on the Technical Evaluation described later in this safety evaluation, the changes do not alter or impede the design, function, or operation of any plant SSCs associated with the facility's physical or cyber security and, therefore, do not affect any plant equipment that is necessary to maintain a safe and secure plant status. In addition, the changed has no impact on plant security or safeguards. Therefore, as required by 10 CFR 50.12(a)(1), the staff finds that the common defense and security is not impacted by this exemption.

### 3.1.4 SPECIAL CIRCUMSTANCES

Special circumstances, in accordance with 10 CFR 50.12(a)(2), are present whenever application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule. The underlying purpose of the Tier 1 information is to ensure that a licensee will safely construct and operate a plant based on the certified information found in the AP1000 DCD, which was incorporated by reference into the VEGP Units 3 and 4 licensing basis. The proposed changes would allow changes to the ITAAC and UFSAR with regard to the PXS low pressure injection and fourth-stage ADS flow resistances. The changes do not impact the ability of any SSCs to perform their functions or negatively impact safety.

Special circumstances are present in the particular circumstances discussed in LAR-17-009 because the application of specified Tier 1 information is not necessary to achieve the underlying purpose of the rule. The proposed change implements changes to ITAAC Nos. 2.1.02.08d.ii, 2.2.03.08c.i.03 and 04, and 2.2.03.09a.i. This exemption request and associated revisions to Tier 1 Tables 2.1.2-4 and 2.2.3-4 that continue to demonstrate that the applicable regulatory requirements will be met. The changes were made to use revised calculated flow resistance values due to the changes in the methods for calculating the flow resistances and the check valves in the IRWST injection lines and containment recirculation lines not fully opening, and therefore ensure that the design can be implemented in accordance with the purpose of the rule. Therefore, for the above reasons, the staff finds that the special circumstances required by 10 CFR 50.12(a)(2)(ii) for the granting of an exemption from Tier 1 information exist.

### 3.1.5 SPECIAL CIRCUMSTANCES OUTWEIGH REDUCED STANDARDIZATION

The proposed change implements changes to ITAAC Nos. 2.1.02.08d.ii, 2.2.03.08c.i.03 and 04, and 2.2.03.09a.i. This exemption request and associated revisions to Tier 1 Tables 2.1.2-4 and 2.2.3-4, this exemption would allow the implementation of changes to Tier 1 information as proposed in LAR-17-009. The proposed changes for the flow resistances of the fourth-stage ADS sub-loop valves and associated piping; IRWST Injection lines; Containment recirculation lines; and IRWST to Containment drain lines involve revisions to COL Appendix C (and plant-specific DCD Tier 1) Tables 2.1.2-4 and 2.2.3-4). These changes will enable SNC to safely construct and operate the facility consistent with the performance of the as-built components for the AP1000 design certified by the NRC by updating the information mentioned above found in Tier 1, Tables 2.1.2-4 and 2.2.3-4, of the DCD. The functions of the systems associated with this request are consistent with the current design of the plant in supporting the actual system functions. The functions of these systems will continue to be maintained because the associated revisions to the Tier 1 information demonstrate that the applicable regulatory requirement will continue to be met. Consequently, the safety impact that may result from any reduction in standardization is minimized, because the proposed changes do not result in a reduction in the level of safety. Based on the foregoing reasons, as required by 10 CFR Part 52.63(b)(1), the staff finds that the special circumstances outweigh the effects the departure has on the standardization of the AP1000 design.

### 3.1.6 NO SIGNIFICANT REDUCTION IN SAFETY

The proposed exemption would allow the implementation of changes to Tier 1 information as proposed in LAR-17-009. The changes will not significantly impact the functional capabilities of these components. The proposed changes will not adversely affect the ability of the SSCs to perform their design functions and the level of safety provided by the current systems and equipment therein is unchanged. Therefore, based on the foregoing reasons and as required by 10 CFR 52.7, and 10 CFR Part 52 Appendix D, Section VIII.A.4, the staff finds that granting the exemption would not result in a significant decrease in the level of safety otherwise provided by the design.

## 3.2 TECHNICAL EVALUATION OF PROPOSED CHANGES

In LAR-17-009, SNC describes its proposed changes to the COL and UFSAR for VEGP Units 3 and 4 related to PXS and ADS flow resistances. In particular, SNC states that the proposed changes affect the ITAAC for the fourth-stage ADS valves and associated piping; the IRWST injection and drain lines; and containment recirculation lines. In addition, the proposed changes to flow resistances of the fourth-stage ADS sub-loop valves and associated piping; IRWST injection lines; containment recirculation lines; and IRWST to containment drain lines involve revisions to COL Appendix C (and plant-specific DCD Tier 1) Table 2.1.2-4, ITAAC No. 2.1.02.08d.ii (fourth-stage ADS sub-loop valves and piping flow resistance); Table 2.2.3-4, ITAAC No. 2.2.03.08c.i.03 and 04 (IRWST injection and containment recirculation flow resistances); and ITAAC No. 2.2.03.09a.i (IRWST to containment drain line flow resistance) information. SNC proposes to change the acceptance criteria for these ITAAC to use revised calculated flow resistance values due to the changes in the methods for calculating the flow resistances and the check valves in the IRWST injection lines and containment recirculation

lines not fully opening. SNC proposes to change UFSAR Subsection 14.2.9.1.3, "Passive Core Cooling System Testing," by revising the allowable calculated flow resistance for IRWST injection lines and IRWST drain and containment recirculation lines. SNC also proposes to change UFSAR Subsection 14.2.9.1.3 to revise the acceptance criteria for flow resistance from that for two fourth-stage ADS loops, by dividing the two fourth-stage ADS loops into four sub-loops and changing the acceptance criteria for the four fourth-stage ADS sub-loops. SNC proposes additional changes to the UFSAR to reflect the use of revised flow resistance in the analysis of small break loss of coolant accidents (SBLOCA).

The staff conducted a detailed audit of the documentation and calculations supporting the changes proposed in LAR-17-009, including telephone conferences with SNC and Westinghouse Electric Company (WEC) personnel. The staff describes the audit of the LAR-17-009 documentation and calculations in its audit report dated November 27, 2017 (ADAMS Accession No. ML17331A867). In this safety evaluation report, the staff summarizes the results of the audit of the LAR-17-009 documentation and calculations, and reaches a conclusion on the acceptability of the changes proposed in LAR-17-009.

In Section 3.1, "IRWST Injection and Containment Recirculation Check Valves," of the LAR, SNC describes the basis for revision of the acceptance criteria for the flow resistance in the ITAAC for the IRWST injection and containment recirculation lines. In the LAR, SNC indicates that the check valves in the IRWST injection and containment recirculation lines will not receive sufficient flow to be fully open throughout the performance of their safety functions contrary to the assumption in the original ITAAC for the allowable flow resistance in these lines. SNC indicated that the performance of the check valves in the IRWST injection and containment recirculation lines was determined from test data supplied by the vendor. Based on its review of calculations placed in the WEC Electronic Reading Room (ERR), the staff found the use of vendor test data for the applicable check valves in determining the flow resistance for the IRWST injection and containment recirculation lines to be acceptable because of the reliability of test-based valve performance information.

In Section 3.1 of the LAR, SNC stated that the maximum flow resistance for each IRWST injection line was selected using the expected flow from the IRWST at the Technical Specification minimum water level. SNC indicates that the maximum flow resistance for each containment recirculation line was selected based on the minimum containment recirculation flood-up level. Based on its review, the staff found the proposed changes to the acceptance criteria for the range of flow resistance of the IRWST injection and containment recirculation lines to be supported by the documentation provided in the WEC ERR. The staff based its finding on the specification that the ITAAC tests for the flow resistance of the IRWST injection line will be performed at the Technical Specification minimum water level, and the ITAAC tests for the flow resistance of the containment recirculation line will be performed with a flow rate reflecting the minimum containment recirculation flood-up level.

In Section 3.2, "IRWST Drain and Fourth-Stage ADS Lines," of the LAR, SNC states that the changed methodology for calculating the piping tee loss factor resulted in an increase in the calculated maximum line resistance values for the fourth-stage ADS valves and associated piping, and IRWST drain lines. SNC indicates that this methodology accounts for the specific geometry and flow split of each tee. As part of its audit, the NRC reviewed the applicable WEC calculation in the WEC ERR. Based on its review, the staff found the described methodology

for calculating the piping tee loss factor to be acceptable because of its consistency with standard engineering practice.

In Section 3.3, "Impact on LOCA Safety Analyses," of the LAR, SNC states that the changes to the ADS Stages 1 to 4 and IRWST injection line resistances had been considered in the SBLOCA safety analysis. For example, SNC indicated that a sensitivity analysis had been performed on the more limiting SBLOCA safety analysis case to conservatively estimate the effect of the proposed changes. SNC reported significant margin to the 2200 °F peak clad temperature with the increased line resistances for the SBLOCA safety analysis. As part of its audit, the NRC reviewed the supporting documentation in the WEC ERR for the adequacy of the sensitivity analysis for the limiting SBLOCA safety analysis. Based on its review, the staff found the SBLOCA safety analysis to be acceptable because of the minimal impact of the ADS Stages 1 to 4 and IRWST injection line resistance changes on the SBLOCA analysis.

In Section 3.3 of the LAR, SNC states that the impact of the increased IRWST, sump recirculation, and fourth-stage ADS line resistances had been qualitatively evaluated for the large break loss of coolant accident (LBLOCA) analyses with no impact on analysis results, and that the updated WCOBRA/TRAC calculations show that all acceptance criteria continue to be met with respect to long-term core cooling (LTCC). As part of its audit, the staff reviewed the supporting documentation in the WEC ERR for the adequacy of the evaluation of the impact of the increased line resistance on the LBLOCA analysis and LTCC. Based on its review, the staff found the LBLOCA safety analysis and LTCC to be acceptable because of the minimal impact of the flow resistance changes on the LBLOCA analysis and LTCC.

In Section 3.4, "Impact on Containment Safety Analysis," in the LAR, SNC states the fourth-stage ADS line resistance increase does not impact the LBLOCA containment integrity (peak pressure) calculations due to the use of the standard methodology with a conservative boil-off without regard to the more realistic fourth-stage ADS line resistance. SNC states that there is no impact to the LBLOCA containment integrity analysis due to fourth-stage ADS actuation not occurring prior to termination of the limiting case. Therefore, SNC determined that these increases in the line flow resistance for the IRWST injection and drain lines, the containment recirculation lines, and the fourth-stage ADS valves and associated piping do not adversely affect the containment safety analysis results. As part of its audit, the staff reviewed the supporting documentation in the WEC ERR for the evaluation of the impact of the fourth-stage ADS line resistance on the LBLOCA containment integrity (peak pressure) calculations. Based on its review, the staff found the LBLOCA containment integrity analysis to be acceptable because of the minimal impact of the flow resistance changes on the LBLOCA containment integrity analysis.

In Section 3.5, "Impact on Non-LOCA Safety Analyses," in the LAR, SNC states that the safety analyses for non-LOCA transients and events are not adversely affected by the proposed flow resistance changes. For example, SNC indicates that in the safety analysis of the inadvertent operation of the ADS described in UFSAR Subsection 15.6.1, "Inadvertent Opening of a Pressurizer Safety Valve or Inadvertent Operation of the ADS," multiple failures and errors are assumed which actuate both first-stage ADS paths and results in the most severe reactor coolant system (RCS) depressurization due to ADS operation with the reactor at power. SNC states that actuation of the fourth-stage ADS valves does not occur because the core makeup tanks reach a minimum level above the fourth-stage ADS actuation set point. SNC indicates that the results of the transient analysis provide input to the corresponding containment safety

analysis for this event, including first, second and third-stage ADS mass flow rate and enthalpy to the IRWST, which are not adversely impacted by these changes, and passive residual heat removal heat exchanger heat transfer to the IRWST, which is also not adversely affected by these changes. Therefore, SNC determined that the changes in the flow resistance for fourth-stage ADS valves and associated lines, do not adversely affect the non-LOCA safety analyses results. Based on its review, the staff finds the non-LOCA safety analyses to be acceptable because of the minimal impact of the proposed flow resistance changes on the non-LOCA transients and events.

In Section 3.6, "Impact on Loss of Normal Residual Heat Removal System (RNS) During Normal Shutdown Safety Analysis," in the LAR, SNC states that the changes to the ADS Stages 1 through 4 and IRWST injection piping resistances had been considered in the loss of RNS safety analysis. SNC notes that the ADS and IRWST are important parts of the mitigation strategy for loss of RNS events in AP1000 Mode 4 (Safe Shutdown) and Mode 5 (Cold Shutdown). SNC states that the changes in ADS Stage 4 line resistances impact the Mode 4 RCS intact cases, but that updated simulations show the acceptance criteria continue to be met. SNC indicates that the changes to piping resistances have a smaller impact on the Mode 5 RCS open case with the updated simulation showing that the two-phase mixture level is maintained in the upper plenum without core heat-up. As part of its audit, the staff reviewed the supporting documentation in the WEC ERR for the adequacy of the evaluation of the flow resistance changes on the loss of RNS during normal shutdown. Based on its review of the supporting documentation, the staff determined that the impact of the proposed flow resistance changes are not significant to the results of the loss of RNS in Mode 4/5 manual response. As a result, the staff finds the loss of RNS safety analysis to be acceptable because of the minimal impact of the proposed flow resistance changes on the loss of RNS in the normal shutdown safety analysis.

In Section 3.7, "Impact on Severe Accidents," of the LAR, SNC states that the AP1000 reactor design employs an in-vessel retention (IVR) of molten core debris severe accident management strategy where the RCS is depressurized and the reactor cavity is flooded with IRWST water to submerge the reactor vessel. If the PXS fails to fill the reactor vessel cavity automatically and the RNS fails to inject water into the reactor cavity, SNC states that the reactor operators are instructed by emergency operating procedure to manually flood the reactor cavity by opening Valves PXS-PL-V118A and PXS-PL-V118B, and draining the IRWST water through the PXS sump screens into the cavity. SNC indicates that the potential failure of cavity flooding is dominated by the failure of the operator action and common cause software failures in the instrumentation and control system rather than independent hardware failures. Therefore, SNC considers the as-tested line resistances to provide adequate flooding capability for IVR and reducing the line resistance to minimize the flooding time will neither improve nor reduce the success of IVR in the probabilistic risk assessment quantification. As part of its audit, the staff reviewed the supporting documentation in the WEC ERR for the adequacy of the evaluation of the flow resistance changes on severe accident mitigation. Based on its review, the staff found the severe accident mitigation strategy to be acceptable because of the minimal impact of the proposed line resistance changes on the severe accident mitigation strategy.

In Section 3.8, "Fourth-Stage ADS Test Methodology," of the LAR, SNC states that on-site preparation for the performance of the localized fourth-stage ADS line flow resistance test revealed that the test methodology presented several challenges to successful completion. As a result, SNC proposes to change the fourth-stage ADS line flow resistance test from requiring

testing of all flow path combinations with all valves open to testing each valve flow path individually. SNC indicates that the test methodology revision does not impact the safety analysis, but allows proper measurement of the pressure drop as well as providing insight into the resistance of each flow path. As part of its audit, the staff reviewed the supporting documentation in the WEC ERR for the adequacy of the flow resistance tests planned to satisfy the proposed ITAAC revisions. Based on its review, the staff found the proposed fourth-stage ADS line flow resistance test to be acceptable based on the analysis described in the LAR and the supporting documentation.

The staff reviewed the proposed COL and UFSAR changes related to the flow resistances of the fourth-stage ADS sub-loop valves and associated piping; IRWST Injection lines; Containment recirculation lines; and IRWST to Containment drain lines, specified in LAR-17-009 for compliance with the applicable GDC in Appendix A to 10 CFR Part 50. With respect to GDC 2, the proposed changes do not involve physical modifications or addition of SSCs, and do not affect existing design requirements. Therefore, the staff finds that the proposed changes comply with the requirements of GDC 2. With respect to GDC 4, the proposed changes maintain the physical design capability of the fourth-stage ADS sub-loop valves and associated piping; IRWST Injection; containment recirculation; and IRWST to containment drain lines to withstand dynamic effects associated with missiles, pipe whipping, and discharging fluids as required by this criterion. Further, the proposed changes do not change the requirements for anchoring safety-related components and supports to seismic Category I structures. Therefore, the staff finds that the proposed changes comply with the requirements of GDC 4. With respect to GDC 35, the proposed changes maintain the physical design capability of the fourth-stage ADS sub-loop valves and piping, IRWST injection, containment recirculation, and IRWST to containment drain to perform the safety-related design functions of the PXS, including providing adequate core cooling. Further, the change to flow resistance of PXS and ADS lines is used to verify PXS and ADS provide the necessary flow conditions required for the automatic depressurization design function of allowing the RCS to depressurize, allowing IRWST injection and containment recirculation for emergency and LTCC following a design basis accident. Therefore, the staff finds that the proposed changes comply with the requirements of GDC 35. With respect to GDC 36, the proposed changes maintain the capability to inspect the affected fourth-stage ADS valves and associated piping, IRWST and associated injection and drain down valves and piping, and containment recirculation valves and piping. Therefore, the staff finds that the proposed changes comply with the requirements of GDC 36. With respect to GDC 37, the proposed changes maintain the capability to test the affected fourth-stage ADS valves, IRWST injection and drain down, and containment recirculation. Therefore, the staff finds that the proposed changes comply with the requirements of GDC 37.

Based on its review, the staff concludes that the SNC has provided acceptable analyses to support the changes requested in LAR-17-009 for VEGP Units 3 and 4. The staff verified the proper application of calculations to support LAR-17-009. The staff finds the SNC's flow testing, calculations, and sensitivity analysis are reasonable to support the VEGP Units 3 and 4 proposed COL and UFSAR changes related to the flow resistances of the fourth-stage ADS sub-loop valves and associated piping; IRWST Injection lines; Containment recirculation lines; and IRWST to Containment drain lines, specified in LAR-17-009. The staff concludes that the proposed changes for the ITAAC flow resistances are acceptable in satisfying the regulatory criteria in GDC 2, 4, 35, 36, and 37 with respect to cladding oxidation, hydrogen generation, and core temperature at VEGP Units 3 and 4 during design-basis events.

#### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations in 10 CFR 50.91(b), the Georgia State official was consulted about the proposed issuance of the amendment on January 26, 2018. The State official had no comments.

#### 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. Also, 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 (82 FR 26128; (June 6, 2017)). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

Because the exemption is necessary to allow the changes proposed in the license amendment, and because the exemption does not authorize any activities other than those proposed in the license amendment, the environmental consideration for the exemption is identical to that of the license amendment. Accordingly, the exemption meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of the exemption.

#### 6.0 CONCLUSION

The staff finds that pursuant to Section VIII.A.4 of Appendix D to 10 CFR Part 52, the exemption (1) is authorized by law, (2) presents no undue risk to the public health and safety, (3) is consistent with the common defense and security, (4) presents special circumstances, (5) the special circumstances outweigh the potential decrease in safety due to reduced standardization, and (6) does not reduce the level of safety at the VEGP Units 3 and 4 facility. Therefore, the staff grants the exemption from Tier 1 information requested by SNC.

The staff has concluded, for the reasons discussed in Section 3.2 that there is reasonable assurance that: (1) 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 license amendment to be acceptable.

#### 7.0 REFERENCES

1. Southern Nuclear Operating Company, Vogtle Electric Generating Plant Units 3 and 4, Request for License Amendment and Exemption LAR-17-009, "PXS/ADS Line Resistance Changes," March 31, 2017 (ADAMS Accession No. ML17090A209).

2. U.S. Nuclear Regulatory Commission, Audit Report of Flow Test Reports and Calculations in Support of Request for License Amendments and Exemptions related to PXS/ADS Line Resistance Changes, November 27, 2017 (ADAMS Accession No. ML17331A867).
3. U.S. Nuclear Regulatory Commission, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design," NUREG-1793, Supplement 2, August 5, 2011 (ADAMS Accession No. ML112061231).
4. Vogtle Electric Generating Plant Units 3 and 4 Combined Operating License, Appendix C, "Vogtle Electric Generating Plant Unit 3 [or 4] Inspections, Tests, Analyses, and Acceptance Criteria," February 10, 2012 (ADAMS Accession No. ML112991102 and ML113060437, as applicable).
5. AP1000 Design Control Document, Revision 19, June 13, 2012 (ADAMS Accession No. ML11171A500).
6. U.S. Nuclear Regulatory Commission, "Final Safety Evaluation Report Related to the Combined Licenses for Vogtle Electric Generating Plant, Units 3 and 4," NUREG-2124, Volume 1, September 30, 2012 (ADAMS Accession No. ML12271A045).
7. Vogtle Electric Generating Plant Units 3 and 4, Updated Final Safety Analysis Report, Revision 5, June 22, 2016 (ADAMS Accession No. ML16180A413).