



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

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS

RELATED TO AMENDMENT NOS. 165 AND 163

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

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 April 26, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19119A249), the Southern Nuclear Operating Company (SNC) requested that the Nuclear Regulatory Commission (NRC) amend Vogtle Electric Generating Plant (VEGP) Units 3 and 4, Combined License (COL) Numbers NPF-91 and NPF-92, respectively. The License Amendment Request (LAR) 19-006 requested 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* and Tier 2 information and related changes to the VEGP Units 3 and 4 COL, associated with the design-specific pre-operational Automatic Depressurization System (ADS) Blowdown Test.

In license amendment request LAR 19-006, SNC seeks approval to credit the results of the design-specific pre-operational ADS Blowdown test performed in China on new AP1000 power reactor facilities at Sanmen Units 1 and 2 and Haiyang Unit 1 (Sanmen and Haiyang) for use in developing the licensing bases for SNC's VEGP Units 3 and 4. This test is used to further establish unique phenomenological performance parameters of certain AP1000 design features beyond testing performed for the Design Certification of the AP600 that will not change from

plant to plant. This test is required only for the first three plants and thereafter, because of the standardization of the AP1000 design, would not be required to be performed for subsequent plants. “First three plant only” tests are defined and listed in AP1000 DCD Revision 19 Tier 2 Section 14.2.5. The requested amendment involves changes to COL Condition 2.D.(2)(a) to credit the previously completed ADS Blowdown first three plant only tests performed at the new AP1000 power reactor facilities at Sanmen and Haiyang and revise the COL to delete conditions requiring that the design-specific pre-operational ADS Blowdown test be conducted on VEGP Units 3 and 4. Specifically, the proposed change would revise the COL Condition 2.D.(2)(a)2 by removing the requirement to perform the ADS Blowdown first three plant only test during pre-operational testing.

2.0 REGULATORY EVALUATION

The requested amendment involves changes to credit the previously completed ADS Blowdown first three plant only tests performed in China at Sanmen and Haiyang as part of the licensing bases for SNC’s VEGP Units 3 and 4. Specifically, the proposed change would revise the COL Condition 2.D.(2)(a)2 and UFSAR Subsections 14.2.5 and 14.2.9.1.3 by removing the requirement to perform the ADS Blowdown first three plant only test during pre-operational testing.

The staff considered the following regulatory requirements in reviewing the LAR that included the proposed changes.

Title 10 of the *Code of Federal Regulations* (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, or the Technical Specifications, or requires a license amendment under paragraphs B.5.b or B.5.c of the section.

10 CFR 52.98(f) requires NRC approval for any modification to, addition to, or deletion from the terms and conditions of a COL. These changes involve a change to COL License Condition 2.D.(2)(a) and changes to the UFSAR. Therefore, NRC approval is required prior to making the plant specific proposed changes in this license amendment request.

10 CFR Part 50, Appendix B requires that licensees apply a quality assurance (QA) program to the design, fabrication, construction, and testing of structures, systems, and components.

3.0 TECHNICAL EVALUATION

In LAR 19-006, SNC proposes to remove COL Condition 2.D.(2)(a)2, which requires SNC to perform the design-specific pre-operational ADS Blowdown Test described in UFSAR Subsections 14.2.5 and 14.2.9.1.3 as a first three plant only test. The ADS Blowdown pre-operational first three plant only test has been completed in China at the first AP1000 units at Sanmen and Haiyang.

In LAR 19-006, SNC describes its activities to monitor the performance of the ADS valves at the Sanmen and Haiyang nuclear power plants to credit the ADS Blowdown Tests performed at Sanmen and Haiyang as the first three plant only tests for the AP1000 design. The ADS in an AP1000 nuclear power plant consists of two trains of four stages of valves. ADS Stages 1, 2,

and 3 each have two valves in series. The ADS Stage 1, 2 and 3 control valves are normally closed globe valves. The ADS Stage 1, 2, and 3 isolation valves are normally closed gate valves. Each train of ADS Stages 1, 2, and 3 has a common inlet header connected to the top of the pressurizer. The outlet of each train of ADS Stages 1, 2, and 3 combines to a common discharge line to one of the spargers in the in-containment refueling water storage tank (IRWST). The other train of ADS Stages 1, 2, and 3 has its own inlet and outlet lines and sparger. The ADS Stage 4 has two trains of pyrotechnic-actuated (squib) valves from separate hot legs to provide the final blowdown depressurization of the reactor coolant system (RCS).

As described by SNC in LAR 19-006, an ADS Blowdown Test is performed by actuating the ADS at normal operating RCS temperature and pressure conditions. After the reactor coolant pumps (RCPs) are tripped, ADS Stage 1, 2, and 3 valves are manually actuated after the RCPs reach zero speed. The test is terminated when ADS Stage 1, 2, and 3 valves are fully open. The ADS Blowdown Test is performed during hot functional testing of the RCS (1) to verify proper operation of the ADS valves to depressurize the RCS, and (2) to demonstrate the proper operation of the ADS spargers to limit the hydrodynamic loads in containment to less than design limits. The proper operation of ADS Stages 1, 2, and 3 is demonstrated by confirming that the valves open according to the required sequence logic and timeframe. Proper operation of the ADS spargers is demonstrated by confirming that hydrodynamic loading on the IRWST walls is bounded by the +/- 5 pound per square inch (psi) uniform static design pressure limit.

SNC reports in LAR 19-006 that the proper operation of the ADS Stage 1, 2 and 3 valves during the ADS Blowdown Tests at Sanmen and Haiyang nuclear power plants was confirmed using position indication available in the Main Control Room (MCR). SNC indicates that additional temporary valve diagnostics and position indication also supported the test conclusions. During the tests, SNC reports that ADS Stage 1, 2, and 3 valves were confirmed to open according to the required sequence logic and time. The position indication available in the MCR and the additional temporary valve diagnostics and position indication also confirmed the proper operation of ADS Stage 1, 2, and 3 valves. SNC indicates that the post-test analyses demonstrated that the as-tested IRWST average distributed wall pressures were within the limits identified in the UFSAR analyses, and that the +/- 5 psi design limit established in the UFSAR remains bounding.

SNC states in LAR 19-006 that Westinghouse Electric Company (Westinghouse) worked directly with the Sanmen and Haiyang owners to develop the test procedures for the ADS Blowdown Tests. SNC indicates that the test procedures and test reports were authored, verified, and approved by Westinghouse test engineers and co-signed by the owners' engineers. In addition, SNC states that the acceptance criteria for the ADS Blowdown Tests were developed and maintained under the Westinghouse QA process. Westinghouse performed a post-test analysis of the ADS Blowdown Test data in accordance with its QA program and confirmed that the test results met the acceptance criteria.

As part of its overall monitoring of the ADS Blowdown Test activities, SNC states in LAR 19-006 that it worked with the Sanmen and Haiyang owners and Westinghouse to review the applicable QA requirements, administrative procedures, and test procedures, results, and reports. SNC also indicates that it had individuals on site observing the performance of the ADS Blowdown Test at Sanmen Unit 2. SNC states that it documented its reviews of the QA requirements, administrative procedures, and test procedures, results, and reports, as well as its observations while at Sanmen Unit 2. SNC concludes that these reviews demonstrate that the ADS

Blowdown Test results from Sanmen and Haiyang are acceptable for application to VEGP Units 3 and 4.

SNC states in LAR 19-006 that the blowdown of the RCS during the ADS blowdown test was simulated using the NOTRUMP computer code used for small break loss-of-coolant accident (LOCA) analyses as described in UFSAR Subsection 15.6.5.4B.2.1. The small-break LOCA NOTRUMP model, described in UFSAR Chapter 15, was used as the starting model for the ADS Stage 1 - 3 blowdown predictive analysis. The model was updated to reflect the initial RCS conditions, including nominal operating pressure and temperature. UFSAR Subsection 14.2.9.1.3, Item (s), requires an ADS blowdown test to be performed to verify proper operation of the ADS valves and demonstrate the proper operation of the ADS spargers to limit the hydrodynamic loads in containment to less than design limits.

NRC staff performed an audit as part of its review of LAR 19-006. A summary of the audit is provided in an audit report dated October 21, 2019 (ADAMS Accession No. ML19290G926). During this audit, NRC staff observed that Westinghouse verified proper operation of the Stage 1, 2, and 3 ADS valves during blowdown conditions, in part, by comparing the test results against NOTRUMP analyses.

In LAR 19-006, SNC states that the major components, piping, and IRWST at Sanmen and Haiyang, and VEGP Units 3 and 4 are of the same design and are manufactured to the same design specifications. SNC reports that no significant deviations in behavior were reported during the ADS Blowdown Tests at Sanmen and Haiyang. SNC states that the results did not vary significantly from plant to plant, and the reproducibility of the results between these first three units demonstrates that the ADS blowdown and RCS depressurization performance does not vary significantly from plant to plant. SNC considers this reproducibility of plant performance to be the result of the AP1000 standardization. SNC states that it confirmed that there are no site-specific design changes at Sanmen Units 1 and 2, Haiyang Unit 1, or VEGP Units 3 and 4 that alter the standard design features for any of the components involved in the ADS Blowdown Tests such that the test results would be impacted.

In LAR 19-006, SNC states that VEGP Units 3 and 4 have multiple inspection, test, analysis, and acceptance criteria (ITAAC) which are applicable to the components involved in the ADS blowdown test. As indicated in LAR 19-006, SNC considers that the following ITAAC will show design standardization confirming the critical design and construction attributes related to this test:

- ITAAC No. 2.1.02.08d.i, preoperational test for resistance of the ADS Stage 1 - 3 flow paths
- ITAAC No. 2.1.02.08d.iv, type test on ADS 1, 2, 3 valve effective flow area
- ITAAC No. 2.1.02.08d.vii, inspection of sparger flow area
- ITAAC No. 2.1.02.08d.viii, completed as part of ITAAC No. 2.1.02.08d.v, inspection of sparger location
- ITAAC No. 2.2.03.08c.vi, IRWST volume

SNC states that VEGP Units 3 and 4 will perform the passive core cooling system pre-operational tests described in UFSAR Subsection 14.2.9.1.3 which will verify the installed components and associated piping and valves properly perform their design function. Based on the use of standard design components, SNC considers that the ITAAC for critical design features, and pre-operational tests, the boundary conditions for the ADS blowdown test are the

same for Sanmen Units 1 and 2, Haiyang Unit 1, and VEGP Units 3 and 4. SNC states that the successful completion and results of the first three plant ADS Blowdown tests at Sanmen and Haiyang are applicable to VEGP Units 3 and 4, and the ADS Blowdown test is not required to be performed at VEGP Units 3 and 4.

To verify the supporting information referenced in LAR 19-006, the NRC staff conducted an audit of the applicable SNC and Westinghouse documentation made available in the Westinghouse electronic reading room (eRR). The NRC audit team examined the SNC documentation and calculations, QA provisions, and test procedures, results, and reports that provide technical support for the request in LAR 19-006 to credit the results of the ADS Blowdown Tests performed at the Sanmen and Haiyang nuclear power plants as first three plant only tests applicable to VEGP Units 3 and 4. In addition, the audit team discussed the ADS Blowdown Tests at the Sanmen and Haiyang nuclear power plants with SNC and Westinghouse subject matter experts and their applicability to VEGP Units 3 and 4, including (1) applicable differences between VEGP Units 3 and 4 and the Sanmen and Haiyang nuclear power plants, (2) QA of the test data, (3) physical phenomena observed in the test data, and (4) design changes to the ADS valves []

In its audit report, the audit team summarizes its review of the applicable SNC and Westinghouse documentation and calculations, QA provisions, test procedures, results, and analyses (ADAMS Accession No. ML19290G926). The audit team also references its discussions with SNC and Westinghouse subject matter experts related to the applicable material. As summarized in the audit report, the NRC audit team observed that Westinghouse evaluated the ADS Blowdown Tests at the Sanmen and Haiyang nuclear power plants and Westinghouse determined that the tests were successful in demonstrating the performance of the ADS valves.

As described in the audit report, the audit team reviewed a detailed description provided by SNC of the ADS valve performance during the blowdown tests at Sanmen Unit 1 in November 2016 and at Haiyang Unit 1 and Sanmen Unit 1 in June 2017. []

With respect to the ADS Blowdown Test at Sanmen Unit 2 in January 2018, the audit team reviewed a detailed description of the monitoring and observation by SNC personnel of the pre-operational tests at Sanmen Unit 2. No performance issues with the capability of the ADS valves to depressurize the RCS were identified during the ADS Blowdown Test at Sanmen Unit 2 in January 2018. In addition, a Westinghouse report described a predictive analysis indicating acceptable representation of the actual test data from the ADS Blowdown Test at Sanmen Unit 2. Based on its review of the original test procedures, actual test procedure markups, diagnostic test data traces, and test reports described by the staff in the audit report, the NRC staff concludes that the test issues identified during the ADS Blowdown Tests at Sanmen and Haiyang were adequately resolved, and do not impact the applicability of the test results to VEGP Units 3 and 4.

As part of its review, the audit team verified that SNC and Westinghouse monitored the ADS Blowdown Tests at Sanmen and Haiyang to verify that the test procedures were implemented in an acceptable manner. As noted in the audit report, the audit team observed that SNC, with technical support from Westinghouse, tracked the resolution of test issues identified during the ADS Blowdown Tests at Sanmen and Haiyang to verify that the ADS valves would perform their intended functions in accordance with the performance requirements. Based on its review, the NRC staff concludes that the results of the ADS Blowdown Tests at the Sanmen and Haiyang nuclear power plants support completion of the first three plant ADS Blowdown Test requirement for VEGP Units 3 and 4. The staff notes that the ADS valve performance issues will be addressed as part of the American Society of Mechanical Engineers Standard QME-1 qualification of those valves at VEGP Units 3 and 4 to satisfy the ITAAC 2.1.02.12a.i (Index 53).

As discussed in the audit report, the staff reviewed the Westinghouse predictive analysis performed using NOTRUMP computer code and post-test analysis to confirm that hydrodynamic loading on the IRWST walls under ADS discharge through the spargers is bounded by the +/- 5 psi uniform static design pressure limit on the IRWST walls established in UFSAR Subsection 3.8.3.4.2.2. The staff finds that Westinghouse and SNC evaluated the results of the ADS Blowdown Tests at the Sanmen and Haiyang nuclear power plants and provided adequate information for the staff to conclude the tests (1) demonstrate the above hydrodynamic loading limit is bounded and (2) are applicable to VEGP Units 3 and 4.

In addition, by letter dated January 13, 2012 (ADAMS Accession No. ML120040121), the staff communicated six general topics that should be considered in a submittal requesting to credit previously conducted first plant only or first three plant only tests performed in China. SNC provided responses to each of the six topics in a license amendment request dated August 3, 2018 (ADAMS Accession No. ML18215A383, LAR 18-019). In LAR 19-006, SNC stated that those responses remain applicable to this license amendment request. SNC described assessments of the QA regulations applicable to the first three plant tests, the Westinghouse oversight of the design and testing, the SNC observation and review of the testing, and the test results and applicability to Vogtle Units 3 & 4.

The six general topics mentioned above were considered in the staff's review of LAR 18-019 and are documented in the staff's safety evaluation dated January 22, 2019 (ADAMS Accession No. ML18351A342). The staff determined, from the objective evidence review documented in the staff's review of LAR 18-019 safety evaluation Section 3.1.1, that QA program controls for the first three plant only tests used were consistent with 10 CFR Part 50, Appendix B.

Based on the staff's review of the activities performed by SNC in support of this LAR and the justification provided in LAR 18-019, the staff finds that the evaluation and conclusions related to QA addressed as part of the evaluation of LAR 18-019 are applicable to this LAR. Therefore, the staff finds that the testing performed at Sanmen and Haiyang are relevant and adequate to delete conditions requiring SNC to meet the Initial Test Program (ITP) requirements of COL Condition 2.D(2)(a), which include the performance of the ADS blowdown test.

In summary, the NRC staff concludes that the ADS Blowdown Tests were successful in demonstrating the performance of the ADS valves at Sanmen and Haiyang. The staff finds that the test issues identified during the ADS Blowdown Tests at Sanmen and Haiyang have been adequately resolved, and do not impact the applicability of the test results to VEGP Units 3 and 4. The staff determined that SNC and Westinghouse monitored the ADS Blowdown Tests at Sanmen and Haiyang to verify that the test procedures were implemented in an acceptable manner. The staff finds that SNC and Westinghouse properly tracked the resolution of test issues identified during the ADS Blowdown Tests at Sanmen and Haiyang to verify that the ADS valves would perform their intended functions in accordance with the performance requirements. The staff finds that the information provided by SNC as part of this LAR as well as the evaluation performed in connection with LAR 18-019 adequately demonstrate the QA program controls for the first three plant only tests were consistent with the regulations in 10 CFR Part 50, Appendix B. The staff did not identify any concerns with the application of the results of the ADS Blowdown Tests at the Sanmen Units 1 and 2 and Haiyang Unit 1 nuclear power plants to support completion of the ADS Blowdown first three plant test requirement for VEGP Units 3 and 4. The staff notes that the ADS valve performance issues will be addressed as part of ASME Standard QME-1 qualification of those valves at VEGP Units 3 and 4 to satisfy the ITAAC 2.1.02.12a.i (Index 53). With respect to LAR 19-006, the staff concludes that SNC has provided adequate support for its request to apply the results of the ADS Blowdown Tests performed at Sanmen and Haiyang nuclear power plants in satisfying the first three plant test requirement for an ADS Blowdown Test at VEGP Units 3 and 4. Therefore, the staff finds the SNC request in LAR 19-006 to change current licensing basis documents – Combined License Condition 2.D.(2)(a) and UFSAR Subsections 14.2.5 and 14.2.9.1.3 – based on the successful completion of the test at the first three AP1000 units, to be acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Georgia State official was notified of the proposed issuance of the amendment on September 11, 2019. 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. 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*, 84 FR 28346, dated June 18, 2019). 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.

6.0 CONCLUSION

The staff has concluded, based on the considerations discussed in Section 3.0 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 acceptable.

7.0 REFERENCES

1. Southern Nuclear Operating Company, Vogtle Electric Generating Plant Units 3 and 4, Request for License Amendment: Crediting Previously Completed ADS Blowdown First Three Plant Tests (LAR 19-006), April 26, 2019 (ADAMS Accession No. ML19119A249).
2. Vogtle Electric Generating Plant Unit 3, Current Facility Combined License NPF-91, Revised June 25, 2019 (ADAMS Accession No. ML14100A106).
3. Vogtle Electric Generating Plant Unit 4, Current Facility Combined License NPF-92, Revised June 25, 2019 (ADAMS Accession No. ML14100A135).
4. Vogtle Electric Generating Plant, Units 3 and 4, Updated Final Safety Analysis Report, Revision 7, June 15, 2018 (ADAMS Accession No. ML18179A227).
5. Response to Southern Nuclear Operating Company's Letter on first-plant-only-tests and first-three-plant-only-tests for the Vogtle Electric Generating Plant Units 3 and 4, January 13, 2012 (ADAMS Accession No. ML120040121).
6. Safety Evaluation – Vogtle Electric Generating Plant Units 3 and 4 (LAR 18-019), January 22, 2019 (ADAMS Accession No. ML18351A342).
7. Southern Nuclear Operating Company, Vogtle Electric Generating Plant Units 3 and 4, Request for License Amendment and Exemption: Crediting Previously Completed First Plant and First Three Plant Tests (LAR 18-019), August 3, 2018 (ADAMS Accession No. ML18215A383).
8. Vogtle Electric Generating Plant Units 3 and 4, Audit Report: Crediting Previously Completed ADS Blowdown First Three Plant Tests (LAR 19-006), October 21, 2019 (ADAMS Accession No. ML19290G926).