Southern Nuclear Operating Company

ND-19-0677

Enclosure 1

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Request for License Amendment:

Crediting Previously Completed First Plant Only Startup Tests

(LAR-19-011)

(This Enclosure consists of 27 pages, including this cover page)

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Pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, Southern Nuclear Operating Company (SNC, or the "Licensee") hereby requests an amendment to Combined License (COL) Nos. NPF-91 and NPF-92 for Vogtle Electric Generating Plant (VEGP) Units 3 & 4, respectively.

1. SUMMARY DESCRIPTION

The requested amendment involves changes to Combined Operating License (COL) requirements, License Conditions 2.D.(4), *Initial Criticality and Low-Power Testing* and 2.D.(5), *Power Ascension Testing,* regarding performance of four first plant only startup tests described in the Updated Final Safety Analysis Report (UFSAR). In lieu of performing these four first plant only startup tests, SNC proposes changes which would credit the successful completion of the tests conducted at the first AP1000 unit.

The proposed changes would revise the COL to delete licensing conditions requiring the following first plant only startup tests:

2.D.(4)(b) Natural Circulation (Steam Generator),

2.D.(5)(b) Rod Cluster Control Assembly Out of Bank Measurements,

2.D.(5)(b) Load Follow Demonstration, and

2.D.(5)(b) Passive Residual Heat Removal Heat Exchanger.

The purpose of the first plant only tests is to further establish the unique phenomenological performance parameters of the AP1000 design features. These special tests are in addition to other preoperational and startup testing that will be completed at every AP1000 unit. UFSAR Subsection 14.2.5, *Utilization of Reactor Operating and Testing Experience in the Development of Initial Test Program,* provides the basis that "[b]ecause of the standardization of the AP1000 design, these special tests (designated as first plant only tests) are not required on follow plants." UFSAR Subsection 14.2.5 also states for subsequent plants "...justification shall be provided that the results of the first plant only tests or first three plant tests are applicable to the subsequent plant." The four startup first plant only tests listed above have been completed at the first AP1000 unit at Sanmen Unit 1.

A review of the Quality Assurance Regulations governing Sanmen has been performed to demonstrate that the requirements governing these tests are equivalent to 10 CFR 50 Appendix B. To confirm acceptability of the first plant only startup tests and the associated results, and appropriate adherence to these governing regulations, SNC has reviewed applicable administrative procedures and worked with the Sanmen owners and Westinghouse to review test procedures, test reports, and test results. Reviews of these documents have been recorded by SNC. Additionally, individuals from SNC were on site at Sanmen Unit 1 observing the performance of the startup tests; the surveillances were documented by SNC in observation reports. It was concluded, based on document reviews and observations, that the conduct of the startup testing and the associated test results, for the first plant only tests completed at Sanmen Unit 1, are acceptable.

The applicability of the startup tests to Vogtle Units 3 & 4 was validated by determining the systems, structures and components (SSCs) within the scope of the tests are designed and procured using the same standard AP1000 design requirements across Sanmen Unit 1 and

Vogtle Units 3 & 4. Design changes completed at Sanmen Unit 1 were reviewed to confirm the unit did not make any changes that would take the SSCs involved in the testing outside the standard plant design such that the test performance would be impacted. Vogtle Units 3 & 4 have ITAAC and further initial test program (ITP) requirements associated with the SSCs involved in these first plant only tests. Completion of the ITAAC and the additional ITP testing will verify that Vogtle Units 3 & 4 meet the standard AP1000 design requirements as described in the Vogtle Units 3 & 4 UFSAR. Therefore, it was concluded that the first plant only startup tests and the associated test results, for tests completed at Sanmen Unit 1, are applicable to Vogtle Units 3 & 4.

The first plant only startup tests listed above are discussed in UFSAR Subsection 14.2.5 and further described in individual test descriptions in UFSAR Subsections 14.2.10.3.6, 14.2.10.4.6, 14.2.10.4.22, and 14.2.10.4.29. Therefore, in addition to changes to COL License Conditions, the requested amendment proposes changes to the UFSAR in the form of departures from the plant-specific Design Control Document (DCD) Tier 2* and Tier 2 information (as detailed in Section 2). This enclosure requests approval of the license amendment necessary to implement these changes.

2. DETAILED DESCRIPTION and TECHNICAL EVALUATION

As described in the COL License Condition 2.D.(4)(b), the licensee is required to perform initial criticality and low-power testing including the Natural Circulation (first plant test) identified in UFSAR Subsection 14.2.10.3.6. In addition, as described in COL License Condition 2.D.(5)(b), the licensee is required to perform power ascension testing including the Rod Cluster Control Assembly Out of Bank Measurements (first plant test) identified in UFSAR Subsection 14.2.10.4.6, the Load Follow Demonstration (first plant test) identified in UFSAR Subsection 14.2.10.4.22, and the Passive Residual Heat Removal Heat Exchanger (first plant test) identified in UFSAR Subsection 14.2.10.4.29.

The four startup tests listed above are designated as first plant only tests. The first plant only tests are described in UFSAR Subsection 14.2.5 as "[s]pecial tests to further establish a unique phenomenological performance parameter of the AP1000 design features beyond testing performed for Design Certification of the AP600 and that will not change from plant to plant...." The basis for the first plant only designation, provided in UFSAR Subsection 14.2.5 is, "[b]ecause of the standardization of the AP1000 design, these special tests (designated as first plant only tests) are not required on follow plants." Regarding subsequent plants, UFSAR Subsection 14.2.5 states "...justification shall be provided that the results of the first-plant-only tests or first-three-plant tests are applicable to the subsequent plant."

Four AP1000 units were completed ahead of Vogtle Units 3 & 4; the units include Sanmen Units 1 & 2 and Haiyang Units 1 & 2. Sanmen Unit 1 performed the first plant only startup tests listed above. The results of these tests were provided to SNC and Westinghouse for review. The test reports, as well as the performance of the tests, have been evaluated to determine if the test results are both acceptable and applicable to Vogtle Units 3 & 4. Evaluations focused on key areas including the Quality Assurance (QA) regulations and the administrative procedures governing the performance of the testing, evaluation of test procedures and results, and the use of standard AP1000 designed SSCs. SNC determined that the completed tests and test results accomplished their purpose and are applicable to Vogtle Units 3 & 4.

The following sections provide an assessment of the QA regulation applicable to the first plant only startup tests, a description of Westinghouse's oversight and SNC's evaluations, and an overview of the startup tests and their applicability to Vogtle Units 3 & 4.

2.1 Assessment of the Quality Assurance Regulation

Westinghouse has an NRC approved 10 CFR Part 50 Appendix B program; the program requirements apply to all activities affecting the safety-related functions of SSCs. For SSCs involved in first plant only startup tests, the design, testing methods and acceptance criteria, and evaluation methods were developed under a 10 CFR Part 50 Appendix B compliant program.

The first plant only startup tests at Sanmen Unit 1 were performed following the China regulatory quality assurance requirements specified in HAF-003-1991, *Safety Regulations for Quality Assurance of Nuclear Power Plants*. The requirements in 10 CFR Part 50 Appendix B were compared to those within HAF-003-1991; the introduction and 18 criteria of 10 CFR Part 50 Appendix B were compared to the introduction and 13 sections of HAF-003-1991. The evaluation demonstrated that the requirements of HAF-003-1991, as implemented, are comparable to and encompass the requirements of 10 CFR Part 50 Appendix B. For any specific requirements in 10 CFR Part 50 Appendix B that are not directly included in HAF-003-1991, other standards were identified which implement those same requirements.

Based on the review of the QA regulations, the first plant only startup tests performed at Sanmen Unit 1 were conducted following QA standards that encompass the 10 CFR Part 50 Appendix B requirements applied at Vogtle Units 3 & 4.

2.2 Oversight and Evaluations

Westinghouse is the design authority for SSCs involved in first plant only startup testing. Because Westinghouse is the design authority for Sanmen Unit 1 and Vogtle Units 3 & 4 for this scope, they play a key role in maintaining standardization of the design across the units and in oversight of testing.

Westinghouse utilizes an NRC approved 10 CFR Part 50 Appendix B program including governance of design and document control. 10 CFR Part 50 Appendix B, Criterion III, states "Design control measures shall be applied to items such as the following: ...delineation of acceptance criteria for inspections and tests." Westinghouse engineering developed and approved the test specifications for the first plant only startup tests including the acceptance criteria for the tests. After initial issuance of the test specifications, changes were authorized and approved using the Westinghouse design control process. Westinghouse also worked directly with the owners of Sanmen Unit 1 to develop the test procedures for the first plant only startup tests. The test procedures and test reports were authored, verified, and approved by Westinghouse test engineers and cosigned by the owner's engineers. The procedures were approved by a Test Review Board, which included Westinghouse personnel, prior to use. Major changes to the test procedures were also approved by the Test Review Board; minor changes were reviewed and approved by Westinghouse personnel. The progression ensured acceptance criteria for the first plant only startup tests were developed and maintained under the Westinghouse Appendix B process.

10 CFR Part 50, Appendix B, Criterion III states "Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design and be approved by the organization that performed the original design unless the applicant designates another responsible organization."

The SSCs at Sanmen Unit 1 and Vogtle Units 3 & 4, which fall within the scope of the first plant only startup tests listed in Section 1, reflect the standard AP1000 design. Westinghouse created,

approved, and maintained the design documents governing the scope of SSCs involved in first plant only startup tests. Any design change made to an SSC involved in the first plant only startup tests listed above has been reviewed and approved by Westinghouse under the Westinghouse design control process. The design control process involves documenting which units will apply the design change. Changes which were applicable to Sanmen Unit 1 but were not applicable to Vogtle Units 3 & 4 were reviewed for potential impacts to the first plant only startup test design parameters. The review was completed after conclusion of the testing to confirm all design changes were captured. The purpose of the review was to confirm the design of the SSCs involved in the first plant only startup tests at Sanmen Unit 1 were not altered to be outside the standard AP1000 design such that test results could be impacted. After reviewing design changes, it was concluded that there were no site-specific design changes for Sanmen Unit 1 which would have altered any of the critical design attributes for first plant only startup tests. In addition, it was determined that components involved in the testing were procured using the same design specification requirements. Based on the standard AP1000 design, consistency of design changes, and procurement to the same quality requirements imposed by design specifications, the SSCs used during first plant only startup tests at Sanmen Unit 1 were determined to be within the standard AP1000 design. Vogtle Units 3 & 4 follow the same design control process described above to maintain the standard plant design. Additionally, Vogtle Units 3 & 4 have ITAAC for SSCs involved in the first plant only startup tests. The ITAAC related to the startup tests identified above are described in the following subsections for each test. The completion of these ITAAC will confirm the SSCs involved in the first plant only startup tests meet the AP1000 standard design described in the Vogtle Units 3 & 4 UFSAR.

10 CFR Part 50 Appendix B, Criterion XII, requires calibration and testing of test equipment, comparable to the requirements in HAF-003-1991. Calibration requirements for measurement and test equipment (M&TE) are specified in localized procedures at Sanmen Unit 1. Westinghouse had a team of engineers on site at Sanmen Unit 1 during performance of the first plant only startup tests. Westinghouse engineers were embedded in the startup organization and worked alongside the owner as the testing was performed. Prior to the testing, Westinghouse and the owner surveyed instrumentation to confirm proper installation.

SNC reviewed Sanmen administrative manual procedures, test procedures, and test reports. The reviews were performed by knowledgeable individuals in engineering, testing, and operations. The Sanmen administrative manual procedures were compared to NRC IP 72401, *Inspection of Startup Test Program*. The conclusion of the review is that the Sanmen administrative manual procedures satisfy the requirements of NRC IP 72401. For instances where the IP requirement was not explicitly addressed in a single administrative procedure, the requirement was addressed through a combination of procedures. No issues were identified during the review of the administrative manual procedures that would challenge any test results. NRC Inspection Procedure 72304, *Startup Testing for AP 1000: Test Procedure Review, Test Witnessing, and Test Results Evaluation*, was used for guidance in creating criteria to review the test procedures and test reports against. Every line of each test procedure was reviewed using the established criteria. For any inconsistency identified in the procedures, the discrepancy was reviewed and dispositioned for impact to the test results. Evaluations of the discrepancies concluded that the inconsistencies would not impact the test results. Test reports were reviewed to ensure test results met the acceptance criteria in the Vogtle Units 3 & 4 UFSAR for each test. All reviews completed by SNC have been documented following SNC procedures.

In addition to reviewing test documentation and results, SNC performed observations of startup testing at Sanmen Unit 1. Six SNC individuals, with backgrounds in engineering and operations, were on site at Sanmen Unit 1 to perform observations of the startup testing. The objective of the

visit was to observe the following activities for those specific tests:

- performance of pre-test requirements,
- confirmation of M&TE usage,
- adherence to the approved procedure,
- execution of test changes,
- handling of anomalies, problems, and/or interruptions,
- handling of deficiencies,
- recording of data,
- maintenance of the test narrative log, and
- maintenance of operator logs.

The observations were documented in a report. The report chronicles observations and access the individuals had throughout their time on site. The observations concluded the first plant only startup testing at Sanmen Unit 1 was conducted in accordance with the test procedures.

SNC concludes that the test results are sufficient to support crediting the first plant only startup testing completed at Sanmen Unit 1 for Vogtle Units 3 & 4.

2.3 Sanmen Unit 1 Test Results and Applicability to Vogtle Units 3 & 4

2.3.1 Steam Generator, Natural Circulation Test – UFSAR Subsection 14.2.10.3.6

The steam generator (SG) removes heat from the reactor coolant system (RCS) during power operation and anticipated transients, and under natural circulation conditions. The SG channel head, tubesheet, and tubes are a portion of the reactor coolant pressure boundary. The tubes transfer heat to the steam system while retaining radioactive contaminants in the primary system. Under natural circulation conditions, when the normal feedwater supply is not available, water may be supplied to the SGs by the startup feedwater system. The startup feedwater system is a nonsafety-related system that provides a nonsafety-related source of decay heat removal. In addition, the system is used during startup and shutdown, and other times when the normal feedwater system is not available. When the SG is supplied with water from the startup feedwater system, the SG has enough surface area and a small enough primary-side hydraulic resistance to remove decay heat from the reactor coolant by natural circulation without operation of the reactor coolant pumps. The SG heat transfer function and associated secondary water and steam systems are not required to provide a safety-related safe shutdown of the plant.

The ability of the SGs to remove heat from the RCS under natural circulation conditions is verified during startup testing. The natural circulation test using the SGs is performed after criticality is achieved and the plant is operating at approximately three percent power. The plant is placed into a natural circulation mode by tripping of all reactor coolant pumps. The plant response is observed using the SGs to remove core residual heat.

Plant data and vessel temperatures are recorded. The average vessel temperature change is compared to predictions as defined in design specifications.

Test Method

The objective of the SG natural circulation (first plant only) startup test is to demonstrate the heat removal capability of the steam generators under natural circulation conditions. Before beginning the test, the reactivity computer is installed, checked, and verified to be operational. In addition, instrumentation and data collection equipment is installed and verified to be operational and available for logging plant data; special instrumentation is made available for measuring the change in temperature of the vessel. Prior to the test, the reactor is critical, the neutron flux level is within the range for low-power physics testing, and the reactor coolant pumps running. During this time, the neutron flux level, and the RCS boron concentration and temperature are made stable and the controlling rod bank is positioned in such a way that an increase in core power level to approximately three percent can be achieved by rod motion alone.

The SG natural circulation test is initiated by using reactor power to simulate decay heat; this is essential as core fission product density is low at the beginning of life. Control rod motion is used to increase reactor power to approximately three percent of full power based on predictions of vessel temperature difference at full power. With reactor coolant pumps running, data is obtained to correlate nuclear flux level and loop temperatures with power. This step is followed by tripping the four RCPs and confirming that natural circulation commences by observing the response of the hot leg temperature in each loop; the plant is stable under natural conditions when the hot leg temperature as measured by the four protection and safety monitoring system (PMS) divisions is constant. Next, plant data is obtained to characterize the plant under natural circulation conditions. Once the reactor is shut down and isothermal conditions are reached, the reactor coolant pumps are restarted.

Evaluation of the Test Results

The test results are evaluated to ensure the measured average vessel ΔT (temperature difference) under natural circulation conditions is equal to or less than limiting design predictions for the measured reactor power level as specified in the applicable design specifications.

The SG natural circulation test report documented the test performed to the test procedure. SNC engineering reviewed the test report for technical adequacy and evaluated the test data to confirm the test results met the acceptance criterion. During the natural circulation period of the test, a rated thermal power (RTP) fluctuated between values below 3%. Given that a lower power level has a lower average vessel ΔT, a bounding lower RTP value was chosen as the power level realized during the test. The predicted lower average vessel ΔT corresponding to the lower bounding RTP value was derived following requirements in the test procedure. Each hot leg average ΔT measured by the four PMS divisions and the total average ΔT are below the predicted average vessel ΔT. Furthermore, the maximum divisional average vessel ΔT occurring at any of the recording times during the natural circulation period is also below the predicted value. The average vessel ΔT is below the predicted value which corresponds to the conservative bounding lower power level. Therefore, SNC engineering concluded that the acceptance criterion was met.

The SG natural circulation test is a first plant only test. Sanmen Unit 1 successfully demonstrated the heat removal capability of the steam generators under natural circulation conditions. There were no deficiencies observed during this test. Review and evaluation of the test data by SNC engineering determined the acceptance criterion delineated in the VEGP Units 3 & 4 UFSAR was met.

Applicability of Test to Vogtle Units 3 & 4

Vogtle UFSAR Subsection 14.2.5 states that "...justification shall be provided that the results of the first plant only test... are applicable to the subsequent plant." UFSAR Subsection 14.2.5 also provides the basis that "[b]ecause of the standardization of the AP1000 design, these special tests (designated as first plant only tests) are not required on follow plants." Therefore, verifying standardization of the component design between Sanmen Unit 1 and Vogtle Units 3 & 4 provides the basis that the successful test results from Sanmen Unit 1 are applicable to Vogtle Units 3 & 4.

The critical design and construction attributes for this test are:

- Reactor Coolant System
- Steam Generators

For the RCS and steam generators, standard design and procurement documentation is used for Sanmen Unit 1 and Vogtle Units 3 & 4. The primary system and steam generators are manufactured using the same design specification and are procured to the same quality requirements imposed by the design specification. The use of standard design documentation confirms that the RCS and SGs used for this test are within the standard AP1000 design parameters. Any design changes made to any of these standard components are captured in the Westinghouse design change process. A review has confirmed that there are no site-specific design changes for either Sanmen Unit 1 or Vogtle Units 3 & 4 that alter the standard design features for any of the components involved in this test such that the test results would be affected.

In addition to using standard design and procurement requirements, Vogtle Units 3 & 4 have ITAAC which are applicable to the components involved in this test. ITAAC will confirm the location of the SG and components within the RCS as well as other critical design and construction attributes related to this test for Vogtle Units 3 & 4.

Based on the use of standard designed components and ITAAC for critical design features, the boundary conditions for the SG natural circulation test are the same for Sanmen Unit 1 and Vogtle Units 3 & 4.

Therefore, the successful completion of the SG natural circulation test conducted at Sanmen Unit 1 is applicable to Vogtle Units 3 & 4; the first plant only startup test is not required to be performed at Vogtle Units 3 & 4.

Change Description

As stated above, the SG natural circulation test (first plant only) was successfully completed at Sanmen Unit 1, the first AP1000 plant. SNC concluded the results of that test are acceptable and applicable to Vogtle Units 3 & 4. Therefore, the following changes to licensing basis documents are proposed:

- COL Condition 2.D.(4)(b) requires the licensee to perform the Steam Generator Natural Circulation (first plant test) identified in UFSAR 14.2.10.3.6. This COL condition is proposed to be deleted based on the successful completion of the test at the first AP1000 unit.
- UFSAR Subsection 14.2.5 describes the first plant only tests, including the Natural

Circulation Test of the Steam Generator. A clarification is proposed to be added, prior to the test description, that states the test will not be conducted at Vogtle Units 3 & 4 based on the successful completion of the test at the first AP1000 unit.

- UFSAR Subsection 14.2.10.3.6, describes the general test methods and acceptance criteria for the Steam Generator Natural Circulation Test (first plant only). The description of the Steam Generator Natural Circulation Test (first plant only) is proposed to be deleted from this section. In its place a statement is proposed to be added that clarifies the test is not required to be performed at Vogtle Units 3 & 4 based on the successful completion of the test at the first AP1000 unit.

2.3.2 Rod Cluster Control Assembly Out of Bank Measurements – UFSAR Subsection 14.2.10.4.6

The AP1000 reactor contains a matrix of fuel rods assembled into mechanically identical fuel assemblies along with control and structural elements. The fuel assembly consists of 264 fuel rods in a 17x17 square array. The center position in the fuel assembly has a guide thimble that is reserved for in-core instrumentation. The remaining 24 positions in the fuel assembly have guide thimbles. Depending on the position of the fuel assembly in the core, the guide thimbles may be used for rod cluster control assemblies (RCCAs). The RCCAs consist of 24 absorber rodlets fastened at the top end to a spider assembly; each absorber rod consists of an alloy of silver-indium-cadmium, which is clad in stainless steel. During full power plant operation, the RCCAs are held at the fully withdrawn position by their respective control rod drive mechanisms. During certain accident conditions, the RCCAs drop to their fully inserted position to control changes in reactivity and to control the axial power distribution. Performance of the core is monitored by incore and excore instrumentation; data from the instrumentation is used to determine power distribution and power peaking factors.

RCCA out of bank measurements (first plant only) are performed during startup testing. The test is only required for the first plant as it is used to validate calculation tools and the instrumentation's sensitivity to RCCA misalignment. The results are compared to the predictions and TS limits. The incore and excore instrumentation signals are recorded during maneuvers of misaligned RCCAs; the signals are used to determine power distributions and power peaking factors.

Test Method

The objectives of the RCCA out of bank measurements (first plant only) startup test include demonstrating the sensitivity of the incore and excore instrumentation system to RCCA misalignments, demonstrating the design conservatism for predictive power distributions with a fully misaligned RCCA, and monitoring the power distribution following the recovery of a misaligned RCCA. Prior to the test, the reactor is operated between 30 and 50 percent of full licensed power until xenon equilibrium is reached; the test is conducted within that power range so the plant does not exceed peaking factor limits. Reactor power level, RCS boron concentration, and RCS temperature are required to be stable before beginning the test. During this time, the control and shutdown banks are positioned as required for the specific measurement; RCCAs will be near fully withdrawn for the insertion test and at their insertion limits for the withdrawal test.

For the RCCA insertion test, a group of RCCAs is inserted one at a time. The RCCAs are originally inserted to the limit of misalignment specified in the safety analysis. Next the RCCAs are fully inserted. The full insertion step is followed by restoring the group of RCCAs to the bank position.

Boration and dilution are used to compensate for reactivity changes, as required.

For the RCCA withdrawal test, one or more selected RCCAs is withdrawn, one at a time, to the fully withdrawn position. Boration and dilution are used to compensate for reactivity changes, as required.

During the testing, incore and excore instrumentation signals are recorded to determine the response of the instrumentation and to determine the power distribution and power peaking factors prior to RCCA misalignment, at partial misalignment, at full misalignment, and periodically after restoration to normal position.

Evaluation of the Test Results

The data collected during the RCCA out of bank measurements test is evaluated to ensure that the measured power distributions and power peaking factors are within TS limits and are consistent with the predictions. Additionally, the sensitivity of the incore and excore instrumentation, to RCCA misalignment, is demonstrated by examination of the power distribution and power peaking factors measured at each position.

The acceptance criteria for the RCCA out of bank measurements test include verification that the measured power distribution and power peaking factors are within the limits stated in TS 3.2.5. Continuous monitoring during the test, using the On-line Power Distribution Monitoring System (OPDMS) evidenced that power distribution and power peaking factors are within TS limits and that a rod misalignment does not violate any core peaking factors. In addition, as required by acceptance criteria, no OPDMS related alarms were logged during the test. The evaluation of the test results also includes verification that the difference between measured and predicted power distribution values met the established criteria as defined in the test procedure. Measured power distributions from BEACON® data maps were evaluated to be consistent with the predictions. The test data demonstrated the accuracy of the design model in predicting power distribution in cases of misaligned RCCAs.

The sensitivity of the incore and excore instrumentation to RCCA misalignment is demonstrated by assessments of the power distribution and power peaking factors. The proper response of the instrumentation is confirmed for each misalignment throughout the test. Additionally, the sensitivity of the core exit thermocouples (CETs) to the rod misalignment is demonstrated by assessments performed during this test. The test demonstrated that the incore instrumentation, excore instrumentation, and CETs can detect a misaligned rod.

The RCCA out of bank measurements test is a first plant only startup test. Sanmen Unit 1 successfully performed this test with satisfactory results. Acceptance criteria delineated in the VEGP Units 3 & 4 UFSAR were met. SNC's review and evaluation of the test data, to verify acceptability, is documented in an observation report.

Applicability of Test to Vogtle Units 3 & 4

Vogtle UFSAR Subsection 14.2.5 states that "...justification shall be provided that the results of the first plant only test... are applicable to the subsequent plant." UFSAR Subsection 14.2.5 also provides the basis that "[b]ecause of the standardization of the AP1000 design, these special tests (designated as first plant only tests) are not required on follow plants." Therefore, verifying

standardization of the component design between Sanmen Unit 1 and Vogtle Units 3 & 4 provides the basis that the successful test results from Sanmen Unit 1 are applicable to Vogtle Units 3 & 4.

The RCCA out of bank measurements is a test of the capability of the plant to detect an RCCA misalignment and to withstand the event without exceeding any power peaking factors. This test is performed to validate calculation tools and instrument responses. Consequently, the test evaluates indication responses of the Reactor System (RXS), Nuclear Instrumentation System (NIS) (PMS internal function), and Incore Instrumentation System (IIS) to demonstrate that the plant can detect and withstand a misaligned rod.

The critical attributes for the RCCA out of bank measurements include the design and construction of the following systems:

- Reactor System;
- Nuclear Instrumentation System; and
- Incore Instrumentation System.

For the RXS, NIS, and IIS, standard design and procurement documentation is used for Sanmen Unit 1 and Vogtle Units 3 & 4. Components within those systems are all manufactured using the same design specifications and procured to the same quality requirements imposed by the design specifications. The physical layout of the RXS and the RCCAs follows the standard plant design; therefore, a consistent response to a rod misalignment is expected at all units. The components within the NIS and IIS are equivalent; thus, the systems are predicted to respond to any core changes in the same manner at both Sanmen Unit 1 and Vogtle Units 3 & 4.

Any design changes made to standard components of the systems identified above are captured in the Westinghouse design change process. A review of completed design changes has confirmed that there are no site-specific design changes, for either Sanmen Unit 1 or Vogtle Units 3 & 4, that alter the standard design features for any of the components involved in this test such that the test results would be affected.

In addition to using standard design and procurement requirements, Vogtle Units 3 & 4 have multiple startup tests which further validate the affects, that changes in RCCA position have, on power peaking factors. The following startup tests demonstrate changes in control rod position are correctly detected and calibrated:

- Incore Instrumentation System (UFSAR Subsection 14.2.10.4.2);
- Nuclear Instrumentation System (UFSAR Subsection 14.2.10.4.3); and
- Axial Flux Difference Instrumentation Calibration (UFSAR Subsection 14.2.10.4.7).

The IIS test is used to obtain data for incore thermocouple and flux maps at various power levels during ascension to full power. This data is used to determine flux distributions and verify proper core loading and fuel enrichments. The NIS test is used to establish and determine voltage settings, trip settings, operational settings, and alarm settings. It is also used to establish and determine overlap of channels on intermediate range and power range instrumentation as power is increased from zero power to at or near full rated thermal power (RTP). The IIS and NIS tests demonstrate that the systems will perform their design functions of

indicating changes in RCCA positions and determining power peaking factors. The axial flux difference (AFD) instrumentation calibration test is used to calibrate the power range nuclear instrumentation signals used as AFD (i.e., delta flux) input to the reactor protection system and to calibrate instrumentation used to display and monitor AFD. The AFD, which fluctuates in response to rod position and core power distribution, is displayed on the NIS power range detectors.

Furthermore, Vogtle Units 3 & 4 have multiple ITAAC related to SSCs involved in this test. ITAAC confirm the design, construction, and location of the RCCAs as well as other critical design and construction attributes of the RXS. Successful completion of these ITAAC will confirm the critical design and construction attributes related to this test for Vogtle Units 3 & 4.

Based on the use of standard designed components, ITAAC for critical components, and completion of the startup tests identified above, the boundary conditions for the RCCA out of bank measurements are the same for Sanmen Unit 1 and Vogtle Units 3 & 4.

Therefore, the successful completion of the RCCA out of bank measurements conducted at Sanmen Unit 1 is applicable to Vogtle Units 3 & 4; the first plant only startup test is not required to be performed at Vogtle Units 3 & 4.

Change Description

As stated above, the RCCA out of bank measurements (first plant test) was successfully completed at Sanmen Unit 1, the first AP1000 plant. SNC concluded the results of that test are acceptable and applicable to Vogtle Units 3 & 4. Therefore, the following changes to licensing basis documents are proposed:

- COL Condition 2.D.(5)(b) requires the licensee to perform the RCCA out of bank measurements (first plant test) identified in UFSAR 14.2.10.4.6. This COL condition is proposed to be deleted based on the successful completion of the test at the first AP1000 unit.

- UFSAR Subsection 14.2.5 describes the first plant only tests, including the RCCA out of bank measurement test. A clarification is proposed to be added, prior to the test description, that states the test will not be conducted at Vogtle Units 3 & 4 based on the successful completion of the test at the first AP1000 unit.

- UFSAR Subsection 14.2.10.4.6, describes the general test methods and acceptance criteria for RCCA out of bank measurements tests (first plant only). The description of the RCCA out of bank measurements test (first plant only) is proposed to be deleted from this section. In its place a statement is proposed to be added that clarifies the test is not required to be performed at Vogtle Units 3 & 4 based on the successful completion of the test at the first AP1000 unit.

2.3.3 Load Follow Demonstration – UFSAR Subsection 14.2.10.4.22

The AP1000 plant reactor contains a matrix of fuel rods assembled into mechanically identical fuel assemblies along with control and structural elements. The fuel assembly consists of 264 fuel rods in a 17x17 square array. The center position in the fuel assembly has a guide thimble that is reserved for in-core instrumentation. The remaining 24 positions in the fuel assembly have guide thimbles. Depending on the position of the fuel assembly in the core, the guide thimbles may be

used for gray rod cluster assemblies (GRCAs). The GRCAs consist of 24 rodlets fastened at the top end to a spider assembly; each absorber rod consists of tungsten contained within a nickel-chromium-iron Alloy 718 sleeve and covered with stainless steel cladding. During most full power plant operation, the GRCAs are held at either the fully withdrawn or fully inserted static position, as directed by flux shape considerations, by their respective control rod drive mechanisms. The GRCAs are used in base load operation and load follow maneuvers. The assemblies provide a mechanical shim reactivity mechanism to minimize the need for changes to the concentration of soluble boron.

The AP1000 plant is designed to permit a design basis daily load follow cycle for at least 90 percent of the fuel cycle length. During the load follow operations, the plant power is reduced from the 100 percent power to 50 percent power at a prescribed rate and remains there for a specified time, and then the power ramps up to 100 percent power at a prescribed rate. Power remains at 100 percent power for the remainder of the 24-hour cycle. During load follow the plant is designed to routinely make load changes of ≤ 10 percent at ± 2 percent per minute between 50 and 100 percent power without exceeding the core power distribution limits for the purpose of responding to grid frequency changes. The AP1000 plant features a rod control system that provides a load follow capability without requiring a change in the boron concentration in the coolant. Thus, the reactivity gain available from temperature reduction is not required for load follow, and reduced temperature return to power is not applicable to the AP1000 plant.

Test Method

One objective of the load follow demonstration (first plant only) startup test is to demonstrate the ability of the AP1000 plant to follow a design basis daily load follow cycle. The other objective of the test is to demonstrate the ability of the plant to respond to grid frequency changes while in the load follow cycle. Prior to the test, the plant is operated at a stable power level of approximately 100% power; the plant is operated at that power until an equilibrium xenon condition is reached. In addition, startup testing of the reactor and turbine control and protection systems is verified to be complete. Preoperational and startup testing of the incore instrumentation system is also verified to be complete. During this time, instrumentation and data collection equipment is confirmed to be operational and available for logging plant data.

The load follow demonstration is initiated by obtaining thermal power measurements and statepoint data along with incore power distribution maps to serve as the reference plant condition. Using normal plant procedures, the turbine load is reduced at a rate such that a reactor thermal power level of approximately 50% is achieved linearly in 2 hours. After remaining at 50% RTP for more than 2 hours, but less than 10 hours, the turbine load is increased at a rate such that approximately 100% RTP is achieved linearly in 2 hours. During the test, plant performance is monitored by gathering data from both incore and excore instrumentation at selected times during the power decrease, at reduced power, during the power increase, and after reaching approximately full RTP. While within the load follow maneuver, the ability to respond to grid frequency changes is demonstrated by operators increasing and decreasing load by as much as 10%, at a rate of 2% per minute.

Evaluation of the Test Results

The data collected during the load follow demonstration is evaluated to ensure the core distribution limits, as specified in TSs, are not exceeded when the plant power is varied according

to the design basis load-follow cycle, or while in the cycle, responding to load changes simulating grid frequency changes. The test is also used to confirm load follow maneuvers, including response to grid frequency changes, can be accomplished without changes to the reactor coolant boron concentration.

During the load follow demonstration, plant parameters, including pressurizer level, pressurizer pressure, steam generator level, rod control, and chemical volume and control, are automatically controlled. The pressurizer safety valves, the steam generator atmospheric relief values, and the steam generator atmospheric safety valves are monitored to ensure the valves do not lift. The results are determined to be acceptable if the test is completed within normal operating limits and without a reactor trip, a turbine trip, engineered safety features actuation system actuation, or the requirement for any control system to be reverted to manual control. In addition, the plant must remain within the normal operating limits and plant technical specification limits for AFD, RCS average temperature, and pressurizer pressure and level.

Load follow maneuvers, including responses to simulated grid frequency changes, were accomplished without manual intervention and systems were maintained under automatic control for the duration of the test. All maneuvers were completed without changing the RCS boron concentration. The load follow demonstration confirms that the plant can perform as designed and can conduct daily load follow operations and grid frequency changes without challenging the control of the reactor.

The load follow demonstration is a first plant only startup test. Sanmen Unit 1 successfully performed this first plant only test with satisfactory results. All acceptance criteria delineated in the Sanmen test procedure were met. SNC's review and evaluation of the test data, to verify acceptability, is documented in an observation report.

Applicability of Test to Vogtle Units 3 & 4

Vogtle UFSAR Subsection 14.2.5 states that "...justification shall be provided that the results of the first plant only test... are applicable to the subsequent plant." UFSAR Subsection 14.2.5 also provides the basis that "[b]ecause of the standardization of the AP1000 design, these special tests (designated as first plant only tests) are not required on follow plants." Therefore, verifying standardization of the component design between Sanmen Unit 1 and Vogtle Units 3 & 4 provides the basis that the successful test results from Sanmen Unit 1 are applicable to Vogtle Units 3 & 4.

The load follow demonstration is a test to demonstrate the ability of the AP1000 plant to follow a design basis daily load follow cycle and to respond to grid frequency changes. The demonstration is a global test of reactor control and, as such, includes aspects of the standard AP1000 design. The main control systems that are being tested by this demonstration are those of the RCS, RXS, Digital Rod Control System (DRCS), and Steam Generator System (SGS). In addition, plant controls which maintain the turbine output demand signals and the SG water level, controls within the Feed Water System (FWS) and Main Steam System (MSS) respectively, are also tested.

The critical attributes for the load follow demonstration include the design and construction of the following control systems:

- Reactor Coolant System;
- Reactor System;

- Digital Rod Control System (a subsystem of the Plant Control System (PLS));
- Steam Generator System;
- Feed Water System (SG water level control); and
- Main Steam System (turbine output demand signal control).

For the RCS, RXS, DRCS, and SGS, standard design and procurement documentation is used for Sanmen Unit 1 and Vogtle Units 3 & 4. Components within those control systems (e.g., reactor vessel, steam generators, reactor coolant pumps, upper internals, fuel, and RCS pressure boundary piping) are all manufactured using the same design specifications and are procured to the same quality requirements imposed by the design specifications. In addition, for plant controls which maintain SG water level and turbine output demand signals, controls within the FWS and MSS respectively, standard design and procurement documentation is used for Sanmen Unit 1 and Vogtle Units 3 & 4.

Any design changes made to standard components of the control systems identified above are captured in the Westinghouse design change process. A review of completed design changes has confirmed that there are no site-specific design changes for either Sanmen Unit 1 or Vogtle Units 3 & 4 that alter the standard design features for any of the standard components involved in this test such that the test results would be affected.

In addition to using standard design and procurement requirements, Vogtle Units 3 & 4 have multiple startup tests which further demonstrate the ability of the plant to react to grid frequency changes while in the load follow cycle. The load follow demonstration includes maneuvering the plant by reducing power, decreasing and increasing reactor power in 10% increments, and returning to 100% RTP in a smooth and controlled manner. The following startup tests also demonstrate the ability of the reactor to respond to changes in reactor power using automatic reactor controls:

- Power Ascension Tests, Test Sequence (UFSAR Subsection 14.2.10.4.1);
- Load Swing Test (UFSAR Subsection 14.2.10.4.20);
- 100 Percent Load Rejection (UFSAR Subsection 14.2.10.4.21);
- Plant Trip from 100 Percent Power (UFSAR Subsection 14.2.10.4.24);
- Loss of Offsite Power (UFSAR Subsection 14.2.10.4.26); and
- Feedwater Heater Loss and Out of Service Test (UFSAR Subsection 14.2.10.4.27).

The startup tests listed above provide sufficient evidence that the reactor will endure changes in reactor power due to both expected and emergent plant conditions in a controlled manner. The capability of the reactor to increase power to 100% RTP is demonstrated throughout the test sequence performed during power ascension testing; power is increased to various power plateaus per the power ascension test sequence. The capability of the reactor to respond to changing needs in reactor power is tested during the load swing test and the feedwater heater loss test; during these tests, 10-20% step-load changes are introduced at 30%, 75%, and 100% RTP levels, as applicable. The test sequence, load swing test, and the feedwater heater loss test

show the reactor can endure changes in power which occur during expected plant conditions. The 100% load rejection, plant trip from 100% power, and loss of offsite power tests demonstrate the reactor can respond to emergent issues. Moreover, these tests are more restrictive than the load follow demonstration as they inspect the ability to control the reactor during rapid load reductions. The plant is required to recover both with and without xenon in conjunction with these tests.

Furthermore, Vogtle Units 3 & 4 have ITAAC related to SSCs in the RCS, RXS, DRCS (PLS), SGS, FWS, and MSS. Successful completion of these ITAAC will also confirm the critical design and construction attributes related to this test for Vogtle Units 3 & 4.

Based on the use of standard designed components, ITAAC for critical components, and completion of the startup tests identified above, the boundary conditions for the load follow demonstration test are the same for Sanmen Unit 1 and Vogtle Units 3 & 4.

Therefore, the successful completion of the load follow demonstration conducted at Sanmen Unit 1 is applicable to Vogtle Units 3 & 4; the first plant only startup test is not required to be performed at Vogtle Units 3 & 4.

Change Description

As stated above, the load follow demonstration test (first plant only) was successfully completed at Sanmen Unit 1, the first AP1000 plant. SNC concluded the results of that test are acceptable and applicable to Vogtle Units 3 & 4. Therefore, the following changes to licensing basis documents are proposed:

- COL Condition 2.D.(5)(b) requires the licensee to perform the load follow demonstration (first plant test) identified in UFSAR 14.2.10.4.22. This COL condition is proposed to be deleted based on the successful completion of the test at the first AP1000 unit.

- UFSAR Subsection 14.2.5 describes the first plant only tests, including the load follow demonstration test. A clarification is proposed to be added, prior to the test description, that states the test will not be conducted at Vogtle Units 3 & 4 based on the successful completion of the test at the first AP1000 unit.

- UFSAR Subsection 14.2.10.4.22 describes the general test methods and acceptance criteria for the load follow demonstration test (first plant only). The description of the load follow demonstration test (first plant only) is proposed to be deleted from this section. In its place a statement is proposed to be added that clarifies the test is not required to be performed at Vogtle Units 3 & 4 based on the successful completion of the test at the first AP1000 unit.

2.3.4 Passive Residual Heat Removal Heat Exchanger, Natural Circulation Test – UFSAR Subsection 14.2.10.4.29

The primary function of the passive core cooling system (PXS) is to provide emergency core cooling following postulated design basis events. The passive residual heat removal (PRHR) heat exchanger is a component of the PXS. The PRHR heat exchanger, in conjunction with the in-containment refueling water storage tank (IRWST) and the condensate collection features, is designed to remove decay heat and reduce RCS temperature. The heat exchanger is elevated above the RCS loops to induce natural circulation flow through the heat exchanger when the

reactor coolant pumps are not available. The PRHR heat exchanger piping arrangement also allows actuation of the heat exchanger while reactor coolant pumps are operating. When the reactor coolant pumps are operating, they provide forced flow in the same direction as natural circulation flow through the heat exchanger. If the pumps are operating and subsequently trip, the natural circulation continues to provide the driving head for heat exchanger flow.

One method to verify the ability of the PXS to perform its emergency core decay heat removal function is through testing. One of these tests is the natural circulation test of the PRHR heat exchanger which is performed during startup testing. This first plant only startup test is used to verify the heat transfer capabilities of the PRHR heat exchanger. The test is performed using decay heat which is generated following reactor operation. The plant is operated at power until a sufficient amount of decay heat is generated. The reactor is then tripped, followed by the tripping of all reactor coolant pumps. The plant's response is observed as the PRHR heat exchanger is placed into service and the IRWST is used as the primary heat sink.

Measurements of the heat exchanger flow rate and the inlet and outlet temperatures are recorded. Calculations are performed to quantify the heat transfer capability of the heat exchanger; the results are compared to heat transfer rates predicted by the methodology in the safety analyses.

Test Method

The objective of the PRHR heat exchanger (first plant only) startup test is to demonstrate the heat removal capability of the heat exchanger with the RCS at prototypic temperatures and natural circulation conditions that include the influence of nuclear decay heat. The PRHR heat exchanger is equipped with instrumentation to obtain inlet and outlet temperature, and flow data. Instrumentation is also available to measure the change in reactor vessel temperature. Prior to the test, instrumentation and data collection equipment are verified to be available for logging plant data during the test. The reactor is operated for enough time to generate the necessary decay heat to perform the test; the reactor is taken to MODE 3 with the reactor coolant pumps running. During this time, the heat exchanger inlet isolation valve is in its open position and the heat exchanger outlet isolation valves are in their closed position.

The natural circulation test of the PRHR heat exchanger is initiated by verifying the reactor is in MODE 3 at normal operating temperature and pressure. This step is followed by tripping the running RCPs and confirming that natural circulation commences with decay heat being removed by the steam generators. Next, one of the two parallel heat exchanger outlet isolation valves is slowly opened to initiate flow through the PRHR heat exchanger; the valve is slowly opened until it is fully open. The steam generator steam dump automatically reduces heat removal by the steam generators in response to operation of the passive residual heat exchanger. Heat exchanger inlet and outlet temperature, and flow data are obtained. This data is used to characterize the heat removal capability of the PRHR heat exchanger and heat up of the IRWST water when one of two parallel isolation valves is open. The heat exchanger test is terminated by closing the open heat exchanger isolation valve. The steam generator steam dump automatically maintains the RCS fluid average temperature constant. The reactor coolant pumps are restarted after the reactor is shut down and isothermal conditions are reestablished.

Evaluation of the Test Results

The test results are evaluated to ensure the PRHR heat exchanger heat removal rate is equal to or greater than the heat removal rate predicted in the methodology used in the safety analyses at the measured hot leg and in-containment refueling water temperatures.

The post-test analysis performed by Westinghouse compared digitally recorded test data to the predictions generated by the LOFTRAN program. The LOFTRAN model utilized the safety analysis model with adjustments to account for actual test conditions; such as the measured test values for hot leg and IRWST temperatures. The post-test analysis cases provide sufficient justification that the LOFTRAN model used for predicting the minimum safeguards performance of the PRHR system is bounded by the performance of the prototypical PRHR system tested.

SNC engineering completed an independent evaluation to confirm the results of the natural circulation test of the PRHR heat exchanger. Hand recorded data, documented in the test report, was used to calculate the heat transfer obtained during the test by multiplying the mass flow rate by the change in enthalpy between the inlet and outlet flow of the PRHR heat exchanger. The heat transfer derived from the calculations was plotted and compared to the Westinghouse post-test analysis. The calculated heat transfer values compare favorably to the digitally recorded data, and both sets of data show margin to the LOFTRAN predictions. This independent evaluation performed by SNC engineering provides additional confidence that the test was successfully completed.

The natural circulation test of the PRHR heat exchanger is a first plant only startup test. Sanmen Unit 1 successfully performed this first plant only test with satisfactory results. All acceptance criteria delineated in the Sanmen test procedure were met. Westinghouse's review and evaluation of the test results, to verify acceptability, is documented in a test report. SNC engineering reviewed the test report and concurred with the conclusions.

Applicability of Test to Vogtle Units 3 & 4

Vogtle UFSAR Subsection 14.2.5 states that "...justification shall be provided that the results of the first plant only test... are applicable to the subsequent plant." UFSAR Subsection 14.2.5 also provides the basis that "[b]ecause of the standardization of the AP1000 design, these special tests (designated as first plant only tests) are not required on follow plants." Therefore, verifying standardization of the component design between Sanmen Unit 1 and Vogtle Units 3 & 4 provides the basis that the successful test results from Sanmen Unit 1 are applicable to Vogtle Units 3 & 4.

The critical design and construction attributes for this test are:

- PRHR Heat Exchanger design including inlet and outlet channel heads;
- PRHR inlet and outlet piping and fittings, and valves design;
- Location of the PRHR heat exchanger relative to the hot and cold legs, steam generator, and IRWST; and
- Free IRWST volume.

For these components, standard design and procurement documentation is used for Sanmen Unit 1 and Vogtle Units 3 & 4. The reactor vessel, steam generators, reactor coolant pumps,

PRHR heat exchanger and RCS pressure boundary piping including the PRHR inlet and outlet lines are all manufactured using the same design specification and are procured to the same quality requirements imposed by the design specification. The IRWST is formed by six structural modules. All structural modules are designed using the same standard design drawings. The IRWST has a standardized minimum volume requirement that is the same for all AP1000 Units. The use of standard design documentation confirms that the PXS and RCS system components used for this test are within the standard AP1000 design parameters. Any design changes made to any of these standard components are captured in the Westinghouse design change process. A review has confirmed that there are no site-specific design changes for either Sanmen Unit 1 or Vogtle Units 3 & 4 that alter the standard design features for any of the components involved in this test such that the test results would be affected.

In addition to using standard design and procurement requirements, Vogtle Units 3 & 4 have multiple ITAAC which are applicable to the components involved in this test. ITAAC will confirm the critical design and construction attributes of the PRHR heat exchanger and IRWST which are related to this test for Vogtle Units 3 & 4.

Vogtle Units 3 & 4 will test the capability of the PRHR heat exchanger to transfer heat using forced flow. This preoperational test of the PXS, described in UFSAR Subsection 14.2.9.1.3, will verify the installed components and associated piping and valves properly perform their design function.

Based on the use of standard designed components, ITAAC for critical design features, and preoperational test of the PRHR heat exchanger heat transfer capability, the boundary conditions for the PRHR heat exchanger natural circulation test are the same for Sanmen Unit 1 and Vogtle Units 3 & 4.

Therefore, the successful completion of the PRHR heat exchanger natural circulation test conducted at Sanmen Unit 1 is applicable to Vogtle Units 3 & 4; the first plant only startup test is not required to be performed at Vogtle Units 3 & 4.

Change Description

As stated above, the natural circulation test of the PRHR heat exchanger (first plant only) was successfully completed at Sanmen Unit 1, the first AP1000 plant. SNC concluded the results of that test are acceptable and applicable to Vogtle Units 3 & 4. Therefore, the following changes to licensing basis documents are proposed:

- COL Condition 2.D.(5)(b) requires the licensee to perform the PRHR Heat Exchanger (first plant test) identified in UFSAR 14.2.10.4.29. This COL condition is proposed to be deleted based on the successful completion of the test at the first AP1000 unit.

- UFSAR Subsection 14.2.5 describes the first plant only tests, including the Natural Circulation Test of the PRHR Heat Exchanger. A clarification is proposed to be added, prior to the test description, that states the test will not be conducted at Vogtle Units 3 & 4 based on the successful completion of the test at the first AP1000 unit.

- UFSAR Subsection 14.2.10.4.29 describes the general test methods and acceptance criteria for the PRHR Heat Exchanger Test (first plant only). The description of the PRHR Heat Exchanger Test (first plant only) is proposed to be deleted from this section. In its place a statement is proposed to be added that clarifies the test is not required to be performed at Vogtle Units 3 & 4 based on the successful completion of the test at the first AP1000 unit.

2.4 Changes to Current Licensing Basis Documents

COL Condition Changes

Combined License Conditions 2.D.(4)(b), *Initial Criticality and Low-Power Testing*, and 2.D.(5)(b), *Power Ascension Testing*, are revised to remove the requirements to perform design-specific first plant only startup testing including the Natural Circulation (Steam Generator) test, the Rod Cluster Control Assembly Out of Bank Measurements, the Load Follow Demonstration, and the Passive Residual Heat Removal Heat Exchanger test.

UFSAR Changes

UFSAR Subsection 14.2.5 is revised to indicate that the Natural Circulation (Steam Generator) test, the Rod Cluster Control Assembly Out of Bank Measurements, the Load Follow Demonstration, and the Passive Residual Heat Removal Heat Exchanger test will not be conducted at Vogtle Units 3 & 4 based on the successful completion of the testing at the first AP1000 unit.

UFSAR Subsections 14.2.10.3.6, 14.2.10.4.6, 14.2.10.4.22, and 14.2.10.4.29 are revised to remove the test descriptions for the Natural Circulation Test, the Rod Cluster Control Assembly Out of Bank Measurements, the Load Follow Demonstration, and the Passive Residual Heat Removal Heat Exchanger Test, respectively. A statement is added to each subsection which explains the test will not be conducted at Vogtle Units 3 & 4 based on the successful completion of the test at the first AP1000 units.

2.5 Summary

The proposed changes credit previously completed first plant only startup tests which confirmed the design functions of the involved SSCs. There are no changes to any testing requirements from Regulatory Guide 1.68. The proposed changes do not affect any function or feature used for the prevention and mitigation of accidents or their safety analyses. No changes were made to the assumptions used in the Chapter 15 analyses. No safety-related structure, system, or component (SSC) function is changed. The proposed changes do not involve nor interface with any SSC accident initiator or initiating sequence of events related to the accidents evaluated in the plant-specific Design Control Document (DCD) or UFSAR. The proposed changes do not affect the radiological source terms (i.e., amounts and types of radioactive materials released, their release rates and release durations) used in the accident analyses. No system or design function or equipment qualification is adversely affected by the proposed changes. The changes do not result in a new failure mode, malfunction or sequence of events that could adversely affect a radioactive material barrier or safety-related equipment. The proposed changes do 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. The proposed changes do not adversely affect any design code limit allowable value, design analysis, nor do they

adversely affect any safety analysis input or result, or design/safety margin. The proposed changes do not revise any aspects of the plant that could have any adverse effect on safety or security, including the site emergency plan.

3. TECHNICAL EVALUATION (Included in Section 2)

4. REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR Part 52.98(c) requires an amendment to the license for any modification to, addition to, or deletion from the terms and conditions of a combined license, including modification to, addition to, or deletion from the inspections, tests, analyses, or related acceptance criteria contained in the license. The proposed amendment involves changes to UFSAR Subsections 14.2.5 and 14.2.10, which requires a revision to COL License Conditions 2.D.(4)(b) and 2.D.(5)(b). Therefore, a license amendment request (LAR) (as supplied herein) is required.

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. The proposed changes to first plant only startup testing include changes to Tier 2* information in UFSAR Subsection 14.2.10. Therefore, NRC approval is required for the departures.

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 1, requires that structures, systems, and components (SSCs) important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. The proposed changes involve crediting first plant only startup tests which were previously completed at the lead AP1000 unit and do not need to be repeated at Vogtle Units 3 & 4. The test results confirmed the design functions of the involved SSCs. The proposed changes do not alter any design, analysis or test acceptance criteria. Therefore, the proposed changes comply with the requirements of GDC 1.

10 CFR Part 50, Appendix A, GDC 26 requires two independent reactivity control systems of different designs be provided. One of the controls systems shall use control rods, preferably including a positive means for inserting the rods, and shall be capable of reliably controlling reactivity changes to assure that under conditions of normal operation, including anticipated operational occurrences, and with appropriate margin for malfunctions such as stuck rods, specified acceptable fuel design limits are not exceeded. The second reactivity control system shall be capable of reliably controlling the rate of reactivity changes resulting from planned, normal power changes to assure acceptable fuel design limits are not exceeded. The changes credit previously completed tests which confirmed the use of control rods in controlling reactivity. Therefore, the proposed changes comply with the requirements of GDC 26.

10 CFR Part 50, Appendix A, GDC 27 requires the reactivity control systems shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained. The proposed changes to credit previously completed first plant only startup tests do not include changes to any design feature or function described in the UFSAR. The changes credit previously

completed tests which confirmed the design functions of the involved SSCs. Therefore, the proposed changes comply with the requirements of GDC 27.

10 CFR Part 50, Appendix A, GDC 35 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. The proposed changes to credit previously completed first plant only startup tests involving PXS do not include changes to any design feature or function described in the UFSAR. The changes credit previously completed tests which confirmed the design functions of the involved SSCs. Therefore, the proposed changes comply with the requirements of GDC 35.

10 CFR Part 50, Appendix A, GDC 36 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. The proposed changes to credit previously completed first plant tests involving PXS do not include physical changes to any component. The changes credit previously completed tests which confirmed the design functions of the involved SSCs. Therefore, the proposed changes do not adversely affect the capability to perform appropriate inspections and comply with the requirements of GDC 36.

10 CFR Part 50, Appendix A, GDC 37 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. The proposed changes to credit previously completed first plant tests involving PXS do not included changes to any design feature or function described in the UFSAR. The changes credit previously completed tests which confirmed the design functions of the involved SSCs. Therefore, the proposed changes comply with the requirements of GDC 37.

Regulatory Guide 1.68 describes the Initial Test Program (ITP) requirements. The proposed changes to first plant only startup tests do not alter compliance with RG 1.68; the SSCs within the scope of RG 1.68 are still included in the ITP. The proposed changes, to credit previously completed first plant only startup testing, do not adversely impact the UFSAR in terms of conformance to RG 1.68.

The proposed changes have been evaluated to determine whether applicable regulations continue to be met. It was determined that the proposed changes do not affect conformance with the General Design Criteria as described in the plant-specific DCD or UFSAR.

4.2 Precedent

There is precedence to remove COL License Conditions requiring the performance of first plant only testing. The request to utilize and evaluate the results of tests performed on the first AP1000 plant as part of the initial test program for VEGP Units 3 & 4 was approved by the NRC by issuance of Amendment Numbers 151 and 150 to COL Numbers NPF-91 and NPF-92 for the VEGP Units 3 & 4, respectively (see Reference Section).

4.3 Significant Hazards Consideration

The requested amendment involves changes to credit previously completed first plant only startup testing which met the requirements in the VEGP Units 3 & 4 COLs and UFSAR Subsections 14.2.5 and 14.2.10 for the Natural Circulation (Steam Generator) Test, the RCCA Out of Bank Measurements, the Load Follow Demonstration, and the Passive Residual Heat Exchanger Test. The proposed changes are based on the successful completion of these tests at the lead AP1000 unit.

The requested amendment proposes changes to COL License Conditions 2.D.(4)(b) and 2.D.(5)(b) and associated UFSAR information which supports the changes.

An evaluation to determine whether a significant hazards consideration is involved with the proposed amendment was completed by focusing on the three standards set forth in 10 CFR 50.92, *Issuance of Amendment*, as discussed below.

4.3.1 Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The proposed change does not affect the operation of any systems or equipment that initiates an analyzed accident or alter any structures, systems, or components (SSC) accident initiator or initiating sequence of events. The proposed change involves removing the requirement to perform first plant only startup tests including the Natural Circulation (Steam Generator) Test, the RCCA Out of Bank Measurements, the Load Follow Demonstration, and the Passive Residual Heat Exchanger Test. The request is based on the successful completion of these tests at the lead AP1000 unit. The change does not adversely affect any methodology which would increase the probability or consequences of a previously evaluated accident.

The change does not impact the support, design, or operation of mechanical or fluid systems. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to predicted radioactive releases due to normal operation or postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, nor does the proposed change create any new accident precursors.

Therefore, the proposed amendment does not involve a significant increase in the probability or consequences of a previously evaluated accident.

4.3.2 Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed change does not affect the operation of any systems or equipment that may initiate a new or different kind of accident, or alter any SSC such that a new accident initiator or initiating sequence of events is created.

The proposed change credits previously completed first plant only startup tests including the Natural Circulation (Steam Generator) Test, the RCCA Out of Bank Measurements, the Load

Follow Demonstration, and the Passive Residual Heat Exchanger Test. The request is based on the successful completion of the tests at the lead AP1000 unit. The proposed changes do not adversely affect any design function of any SSC design functions or methods of operation in a manner that results in a new failure mode, malfunction, or sequence of events that affect safety-related or non-safety-related equipment. This activity does 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 result in significant fuel cladding failures.

Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

4.3.3 Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No

The proposed change maintains existing safety margin and provides adequate protection through continued application of the existing requirements in the UFSAR. The proposed change satisfies the same design functions in accordance with the same codes and standards as stated in the UFSAR. This change does not adversely affect any design code, function, design analysis, safety analysis input or result, or design/safety margin. No safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the proposed change. Since no safety analysis or design basis acceptance limit/criterion is challenged or exceeded by this change, no significant margin of safety is reduced.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

4.4 Conclusions

This assessment addresses the considerations discussed above. The plant licensing basis, safety analyses, and design bases evaluations demonstrate that the requested change is accommodated without an increase in the probability or consequences of an accident previously evaluated, without creating the possibility of a new or different kind of accident from any accident previously evaluated, and without a significant reduction in the margin of safety. In conclusion, based on the considerations discussed above, (1) there is a reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) 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.

Based on the above, it is concluded that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5. ENVIRONMENTAL CONSIDERATIONS

The requested amendment requires changes to the Combined License (COL) regarding the requirement to perform first plant only startup tests including the Natural Circulation (Steam Generator) Test, the RCCA Out of Bank Measurements, the Load Follow Demonstration, and the

Passive Residual Heat Exchanger Test. The requested amendment proposes changes to COL License Conditions, and UFSAR Tier 2 and Tier 2* information.

Sections 2 and 3 of this license amendment request provide the details of the proposed change.

The Licensee has determined that the anticipated construction and operational effects of the proposed amendment meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9), in that:

(i) There is no significant hazards consideration.

As documented in Section 4.3, *Significant Hazards Consideration*, of this license amendment request, an evaluation was completed to determine whether a significant hazards consideration is involved by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment." The significant hazards consideration determined that (1) the requested amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the requested amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the requested amendment does not involve a significant reduction in a margin of safety. Therefore, it is concluded that the requested amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

(ii) There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

The proposed change is unrelated to any aspect of plant construction or operation that would introduce any change to effluent type (e.g., effluents containing chemicals or biocides, sanitary systems effluents, and other effluents), or affect any plant radiological or non-radiological effluent release quantities. Furthermore, the proposed changes do not affect any effluent release path or diminish the design function or operational features that are credited with controlling the release of effluents during plant operation. Therefore, it is concluded that the requested amendment does not involve a significant change in the types or a significant increase on the amounts of any effluents that may be released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed changes do not adversely affect walls, floors, or other structures that provide shielding. Plant radiation zones are not affected, and there are no changes to the controls required under 10 CFR Part 20 that preclude a significant increase in occupational radiation exposure. Therefore, the requested amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

Based on the above review of the requested amendment, it has been determined that the anticipated construction and operational impacts of the requested amendment do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, and (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the requested amendment 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 need be prepared in connection the requested amendment.

6. REFERENCES

NRC Letter, *Vogtle Electric Generating Plant, Units 3 and 4 – Issuance of Amendments and Granting of Exemptions RE: Crediting Previously Completed First Plant and First Three Plant Tests (LAR-18-019)*, dated January 22, 2019 (ADAMS Accession No. ML18351A342)