Southern Nuclear
Operating Company, Inc.
42 Inverness Center Parkway
Birmingham, AL 35242

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52-026

ND-16-0652
10 CFR 50.90

U.S. Nuclear Regulatory Commission
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Southern Nuclear Operating Company
Vogtle Electric Generating Plant Units 3 and 4
Request for License Amendment:
PMS Logic Changes for Source Range Flux Doubling (LAR-16-006)

Ladies and Gentlemen:

Pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, Southern Nuclear Operating Company (SNC), the licensee for Vogtle Electric Generating Plant (VEGP) Units 3 and 4, requests an amendment to Combined License Numbers NPF-91 and NPF-92, for VEGP Units 3 and 4, respectively. The requested amendment requires changes to the Updated Final Safety Analysis Report (UFSAR) in the form of departures from the incorporated plant-specific Design Control Document Tier 2 information and involves related changes to the VEGP Units 3 and 4 Technical Specifications (TS).

The proposed changes to the TS and information in the UFSAR (which includes the plant-specific DCD Tier 2 information) update the Protection and Safety Monitoring System (PMS) to align with the requirements in IEEE 603-1991, “IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations.” IEEE 603-1991, Clause 6.6, “Operating Bypasses,” imposes requirements on the operating bypasses (i.e., “blocks” and “resets”) used for the AP1000 PMS. The PMS functional logic for blocking and resetting the source range neutron flux doubling signal requires revision to fully comply with this requirement.

Enclosure 1 provides the description, technical evaluation, regulatory evaluation (including the Significant Hazards Consideration determination), and environmental considerations for the proposed changes in the License Amendment Request (LAR).

Enclosure 2 provides the proposed changes to the licensing basis documents.

Enclosure 3 provides the conforming changes to the Technical Specifications Bases for information only.

Enclosure 4 provides the description of proposed changes that differ from the PMS functional logic changes for the source range neutron flux doubling signal included in the Williams States Lee III submittal as information only.

This letter contains no regulatory commitments.

SNC requests staff approval of this license amendment by November 17, 2016, to support installation of the PMS cabinets. Delayed approval of this licensing request could result in delay of the associated construction activity and subsequent dependent construction activities. SNC expects to implement this proposed amendment within the VEGP Units 3 and 4 TS and UFSAR within 30 days of approval of the requested changes; however, in accordance with License Condition 2.D.(9), the technical specifications in Appendix A to these licenses would not become effective until a Commission finding that the acceptance criteria these licenses (ITAAC) are met in accordance with 10 CFR 52.103(g).

In accordance with 10 CFR 50.91, SNC is notifying the State of Georgia of this LAR by transmitting a copy of this letter and enclosures to the designated State Official.

Should you have any questions, please contact Mr. Christopher L. Whitfield at (205) 992-5071.

Mr. Wesley A. Sparkman states that: he is the Regulatory Affairs Licensing Manager, Nuclear Development, of Southern Nuclear Operating Company; he is authorized to execute this oath on behalf of Southern Nuclear Operating Company; and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

Wesley A. Sparkman

WAS/CLW/ljs

Sworn to and subscribed before me this 16th *day of* June, *2016*

Notary Public: Lisa Myrick Spears

My commission expires: June 18, 2019

Enclosures: 1) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Request for License Amendment: PMS Logic Changes for Source Range Flux Doubling (LAR-16-006)
2) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Proposed Changes to the Licensing Basis Documents (LAR-16-006)
3) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Conforming Changes to the Technical Specifications Bases (For Information Only) (LAR-16-006)
4) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Differences between SNC and Lee Proposed Licensing Basis Document Changes (For Information Only) (LAR-16-006)

cc:
Southern Nuclear Operating Company / Georgia Power Company
Mr. S. E. Kuczynski (w/o enclosures)
Mr. M. D. Rauckhorst
Mr. D. G. Bost (w/o enclosures)
Mr. M. D. Meier (w/o enclosures)
Mr. D. H. Jones (w/o enclosures)
Ms. K. D. Fili (w/o enclosures)
Mr. D. L. McKinney (w/o enclosures)
Mr. T.W. Yelverton (w/o enclosures)
Mr. B. H. Whitley
Mr. C. R. Pierce
Mr. D. L. Fulton
Mr. M. J. Yox
Mr. J. C. Haswell
Mr. T. R. Takats
Mr. W. A. Sparkman
Mr. J. P. Redd
Ms. K. A. Roberts
Document Services RTYPE: VND.LI.L00
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Nuclear Regulatory Commission
Ms. C. Haney (w/o enclosures)
Mr. S. Lee (w/o enclosures)
Mr. L. Burkhart (w/o enclosures)
Ms. J. Dixon-Herrity (w/o enclosures)
Mr. P. Kallan
Mr. C. Patel
Mr. W. C. Gleaves
Mr. B. M. Bavol
Ms. R. Reyes
Ms. M. A. Sutton
Mr. M. E. Ernstes
Mr. G. Khouri
Mr. J. D. Fuller
Ms. S. Temple
Ms. J. Uhle
Mr. T.E. Chandler
Ms. P. Braxton
Mr. T. Brimfield

State of Georgia
Mr. R. Dunn

Oglethorpe Power Corporation
Mr. M. W. Price
Mr. K. T. Haynes
Ms. A. Whaley

Municipal Electric Authority of Georgia
Mr. J. E. Fuller
Mr. S. M. Jackson

Dalton Utilities
Mr. T. Bundros

WECTEC
Ms. K. Stoner (w/o enclosures)
Mr. C. A. Castell

Westinghouse Electric Company, LLC
Mr. R. Easterling (w/o enclosures)
Mr. J. W. Crenshaw (w/o enclosures)
Mr. C. D. Churchman (w/o enclosures)
Mr. L. Woodcock
Mr. P. A. Russ
Mr. G. F. Couture
Mr. M. Y. Shaqqo

Other
Mr. J. E. Hesler, Bechtel Power Corporation
Ms. L. A. Matis, Tetra Tech NUS, Inc.
Dr. W. R. Jacobs, Jr., Ph.D., GDS Associates, Inc.
Mr. S. Roetger, Georgia Public Service Commission
Ms. S. W. Kernizan, Georgia Public Service Commission
Mr. K. C. Greene, Troutman Sanders
Mr. S. Blanton, Balch Bingham
Mr. R. Grumbir, APOG
Mr. N. R. Kellenberger, South Carolina Electric & Gas Company
Mr. D. Kersey, South Carolina Electric & Gas Company
Mr. B. Kitchen, Duke Energy
Mr. S. Franzone, Florida Power & Light

Southern Nuclear Operating Company

ND-16-0652

Enclosure 1

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Request for License Amendment:

PMS Logic Changes for Source Range Flux Doubling

(LAR-16-006)

(Enclosure 1 consists of 14 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 and 4, respectively.

1. SUMMARY DESCRIPTION

The proposed changes to the Technical Specification (TS) and information in the UFSAR (which includes the plant-specific DCD Tier 2 information) update the Protection and Safety Monitoring System (PMS) to align with the requirements in IEEE 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations." IEEE 603-1991, Clause 6.6, "Operating Bypasses," imposes requirements on the operating bypasses (i.e., "blocks" and "resets") used for the AP1000 PMS. The PMS functional logic for blocking the source range (SR) neutron flux doubling signal shown in UFSAR Figure 7.2-1 (Sheet 3) requires revision to fully comply with this requirement. This also necessitates an amendment to Technical Specifications to reflect the changes.

Design Change Description

The following changes are proposed to bring the PMS design into compliance with IEEE 603-1991 and to support normal plant operational needs:

- Add a new permissive, P-8. Blocking of the flux doubling signal during reactor startup when the plant is above P-8 is permitted by this new permissive. P-8 is set to the minimum RCS temperature needed for criticality as defined by Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.4.2.
- Add an additional reset of SR neutron flux doubling signal when RCS temperature decreases below P-8. Note that the PMS design will continue to reset the flux doubling signal when neutron flux decreases below P-6.
- Add PMS logic to initiate a closure signal for Chemical and Volume Control System (CVS) valves 136A and 136B (note that PMS Division A closes valve 136A and PMS Division C closes valve 136B) if the flux doubling signal is blocked when reactor coolant temperature is less than P-8. This satisfies IEEE 603, Clause 6.6, by initiating the appropriate safety function if the applicable permissive conditions are not met.

These design changes result in the need for TS and UFSAR changes.

SNC requests NRC staff approval of the license amendment by November 17, 2016, to support the installation of Protection and Safety Monitoring System (PMS) cabinets.

2. DETAILED DESCRIPTION

Overview

The Protection and Safety Monitoring System:

The PMS is a digital Instrumentation and Control (I&C) system which detects off-nominal conditions and actuates the appropriate safety-related functions necessary to achieve and

maintain the plant in a safe shutdown condition. The PMS controls safety-related components in the plant that are operated from the main control room or remote shutdown workstation. In addition, the PMS provides the equipment necessary to monitor the plant safety-related functions during and following an accident.

The Nuclear Instrumentation System (NIS) is a subsystem of the PMS that measures neutron leakage from the reactor core over the full range of reactor power by using source range (SR), intermediate range (IR), and power range (PR) neutron detectors. The NIS consists of four identical independent divisions of equipment, each associated with one PMS division. Each division performs signal processing on inputs from its associated SR, IR, and PR detectors.

Excess Neutron Flux:

The NIS provides protection against unplanned reactor criticality resulting from inadvertent boron dilution of the Reactor Coolant System (RCS). The NIS performs this function by comparing the current SR neutron count rate with the SR neutron count rate at an earlier time. If the ratio of the current average neutron count rate to the earlier average count rate is greater than a preset value, then a partial trip is generated in the division. This is referred to as flux doubling. On a coincidence of excessively increasing SR neutron flux in two of the four divisions, an Engineered Safety Feature Actuation System (ESFAS) protection function is initiated to isolate the boron dilution flow path. This ESFAS protection function is discussed in UFSAR Section 7.3.1.2.14. UFSAR Section 7.3.1.2.14 refers to the ESFAS protection function as “boron dilution block” and the flux doubling input into the ESFAS protection function as “excessive increasing rate of source range flux doubling signal.”

Chemical and Volume Control System:

Terminating inadvertent RCS boron dilution is considered a safety-related function provided by the CVS. The CVS is designed to terminate inadvertent boron dilution events by isolating unborated water sources. It provides this function by automatically closing the two safety-related CVS makeup line isolation valves (CVS V090/V091) when the SR NIS detects excessively increasing neutron flux. In addition, unborated water is prevented from reaching the reactor core, and thus an inadvertent RCS boron dilution is avoided, by closing the two safety-related valves in the Demineralized Water System (DWS) supply line to the CVS makeup pump suction (CVS V136A/B).

Operating Bypasses for Flux Doubling:

Operating bypasses (i.e., “blocks” and “resets”) are required for many of the protection functions initiated by the PMS to allow the plant to perform normal operations when the associated safety actions are not required and would actuate unnecessarily. For example, the boron dilution block ESFAS function upon a SR neutron flux doubling actuation is disabled (i.e., blocked / bypassed) to allow the plant to reach criticality. The protection function is automatically enabled (i.e., reset) when the plant drops below the P-6 setpoint (i.e., IR neutron flux channels below setpoint).

Reason for Change

This license amendment request (LAR) involves updates to the Protection and Safety Monitoring System (PMS) design to align it with the requirements in IEEE 603-1991, “IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations.” IEEE 603-1991, Clause 6.6, “Operating Bypasses,” imposes requirements on the operating

bypasses (i.e., "blocks" and "resets") used for the AP1000 PMS. It includes the following criteria:

1. If applicable permissive conditions are not met, a safety system shall automatically prevent the activation of an operating bypass or initiate the appropriate safety function(s).
2. If plant conditions change so that an activated operating bypass is no longer permissible, the safety system shall automatically accomplish one of the following actions:
    a. Remove the appropriate active operating bypass(es)
    b. Restore plant conditions so that permissive conditions once again exist
    c. Initiate the appropriate safety function(s)

The PMS functional logic for blocking the SR neutron flux doubling signal shown in UFSAR Figure 7.2-1 (Sheet 3) requires revision to fully comply with this requirement.

This LAR requests approval of the Technical Specification and associated UFSAR changes for the PMS logic updates needed to comply with IEEE 603-1991, Clause 6.6.

Description of any Changes to Current Licensing Basis Documents

The following departures from plant-specific DCD Tier 2 information are proposed

Chapter 7:

- Figure 7.2-1 (Sheet 3)

  The PMS logic figure is changed to reflect the design changes described above, as follows:

  - A close signal is sent to the CVS DWS isolation valves if the P-8 permissive is not set (i.e., RCS T_{avg} is below the P-8 setpoint) and the operator blocks the flux doubling portion of the boron dilution block function.
  - A circuit is added to automatically reinstate the flux doubling protection when plant conditions decrease to less than the P-8 setpoint. The circuit remains unchanged in the fact that it reinstates the flux doubling protection when plant conditions decrease to less than the P-6 setpoint.
  - Since the new function block to "Close DWS Isolation Valves" is not required to mitigate any design basis event, a note is added to state that it is not an Engineered Safety Feature (ESF) actuation function. The existing function block to "Close DWS Isolation Valves" remains an ESF actuation function because it is required to mitigate a possible design basis event (i.e., boron dilution). Both functional blocks actuate closure of CVS valves 136A (PMS Division A) and 136B (PMS Division C). The physical components and process to close the CVS DWS isolation valves downstream of PMS are the same for each function block.

- Section 7.3.1.2.14
  - P-8 permissive is added to the text as the permissive which allows the CVS DWS isolation valves to be open when the boron dilution block of SR neutron flux doubling signal is manually blocked when T_{avg} is above the P-8 setpoint. The section also describes that it is used to automatically reinstate the automatic SR

neutron flux actuation of the boron dilution block protection function when plant conditions decrease to less than P-8.

- A paragraph is added explaining the ability to manually block the flux doubling function when below the P-8 setpoint. It states that unborated water sources are isolated by the operator prior to manually blocking the flux doubling signal. An automatic close signal is also sent to the CVS demineralized water system isolation valves as a backup when this function is manually blocked below P-8.

- Section 7.3.1.2.15
  - P-8 permissive is added to the text as the permissive which allows the CVS DWS isolation valves to remain open when the boron dilution block of SR neutron flux doubling signal is manually blocked when T_{avg} is above the P-8 setpoint. The section also describes that it is used to automatically reinstate the automatic SR neutron flux actuation of the boron dilution block protection function when plant conditions decrease to less than P-8.
  - Text is added explaining the ability to manually block the flux doubling function during shutdown conditions below P-8. It states that unborated water sources are isolated by the operator prior to manually blocking the flux doubling signal. An automatic close signal is also sent to the CVS demineralized water system isolation valves as a backup when this function is manually blocked below P-8.
- Table 7.3-1
  - The Permissives and Interlocks column for actuation signal number 13.a (Flux doubling calculation) is revised to reflect the new permissive logic for this function.
  - The Permissives and Interlocks column for actuation signal number 14.f (Flux doubling calculation) is revised to reflect the new permissive logic for this function.
- Table 7.3-2
  - The P-8 permissive is added to the table. P-8 is described as the condition when the reactor coolant average temperature is above setpoint. It permits manual block of flux doubling actuation of the boron dilution block.
  - The “Not” P-8 permissive is added to the table. “Not” P-8 is described as the condition when the reactor coolant average temperature is below the setpoint. It automatically resets the manual block of the flux doubling actuation of the boron dilution block. It permits a manual block of the flux doubling actuation of the boron dilution block and sends a closed signal to the demineralized water system isolation valves if flux doubling actuation of the boron dilution block is blocked below P-8.

Chapter 9:

- Section 9.3.6.3.7
  - The Demineralized Water System Isolation Valves section is updated to state that the CVS DWS isolation valves are sent a signal to close when the SR neutron flux doubling signal is blocked below the P-8 setpoint.
- Section 9.3.6.4.5.1
  - This section is updated to state that the CVS DWS isolation valves are sent a signal to close when the SR neutron flux doubling signal is blocked below the P-8 setpoint.
- Section 9.3.6.7
  - The Demineralized Water System Isolation Valves section is updated to state that the CVS DWS isolation valves are sent a signal to close when the SR neutron flux doubling signal is blocked below the P-8 setpoint.

Chapter 19:

- Section 19E.2.7.2
  - This section is updated to specify that the SR neutron flux doubling signal closes the safety-related CVS makeup line isolation valves for dilution events occurring during shutdown. A clarification is made that the DWS is isolated from the CVS makeup pumps.
  - This section is updated to include information about blocking the SR flux doubling signal below the P-8 setpoint.

The following COL Appendix A Technical Specifications are proposed

- TS Table 3.3.8-1, Function 17 (Source Range Neutron Flux Doubling)
  - Note (j) is revised. The note now requires the function to be operational if unborated water source flow paths are not isolated. It continues to permit the operators to block the SR neutron flux doubling signal when critical or during an intentional approach to criticality. This note continues to be applicable in Modes 2 and 3.
  - Note (l) is added to the table and applied to the SR neutron flux doubling function for Modes 4, and 5. This note permits the operators to block the SR neutron flux doubling signal during shutdown conditions only when unborated water source flow paths are isolated.

The following conforming Technical Specifications Bases revisions are provided below for information only. The revisions are made in accordance with the Bases Control Program. They will be implemented during the implementation of the license amendment:

- TS Bases 3.3.1
  - The description of the Intermediate Range Neutron Flux, P-6 interlock is corrected to match the information provided in UFSAR Figure 7.2-1 (Sheet 3) and Table 7.2-3. Specifically, item (3) is revised to state that on decreasing power, the P-6 interlock automatically resets the flux doubling block control ensuring the source range neutron flux doubling circuit is enabled.
- TS Bases 3.3.8
  - The description of the P-6 permissive is updated to match the information provided in UFSAR Figure 7.2-1 (Sheet 3) and Table 7.2-3.
  - A description of the P-8 permissive is added.
  - The boron dilution block section is updated to be consistent with the changes already described and Figure 7.2-1.
  - The SR neutron flux doubling section (Function 17) is updated to be consistent with the TS changes.

3. TECHNICAL EVALUATION

The proposed changes to the PMS design described above improve the level of protection provided by the PMS flux doubling boron dilution block feature by bringing it into compliance with the IEEE 603-1991 requirements in Clause 6.6.

As described below, various administrative and digital I&C safety system controls are implemented to provide adequate inadvertent boron dilution protection.

Termination or Prevention of Inadvertent Boron Dilution Events

The ability to terminate inadvertent boron dilution events is assured by satisfying Technical Specifications (TS) 3.1.9 and 3.3.8.

- TS 3.1.9 requires the Demineralized Water Isolation Valves and CVS Makeup Line Isolation Valves to be OPERABLE in Modes 1, 2, 3, 4, and 5.

- TS 3.3.8 requires four SR neutron flux doubling circuits to be OPERABLE in Modes 2, 3, 4, and 5, with exceptions for the approach to criticality. Modes 2 and 3 Applicability retains the exception but also includes a new exception for when unborated water source flow paths are isolated. The current Operability requirements in Modes 4 and 5 have no exception, but they are being revised to include a new exception when unborated water source flow paths are isolated. These exceptions are discussed in further detail below.

Inadvertent Boron Dilution in Mode 6

During refueling operations (Mode 6), inadvertent boron dilution events are avoided by satisfying TS 3.9.2.

- TS 3.9.2 provides administrative controls to preclude the possibility of boron dilutions by isolating unborated water sources. Operators verify that the appropriate CVS valves (i.e., V092, V108, V126, and V136A/B) are secured closed to isolate the unborated

makeup water flow paths to the RCS. Makeup required during refueling is provided by the CVS makeup pumps using borated water in the boric acid tank.

TS 3.9.2 will remain unchanged.

Inadvertent Boron Dilution in Mode 2 and 3

During startup (Mode 2), the RCS inventory will be replenished by blending the flow of highly borated water from the boric acid storage tank with unborated water from the demineralized water storage tank. This blended flow of makeup water is closely monitored. These startup operations cause the CVS makeup line to be filled with borated water at the current RCS boron concentration.

In order to return to power operation, a means to lower RCS boron concentration must be available in order to establish the proper core reactivity conditions for a controlled return to criticality. As the RCS T_{avg} increases to greater than the P-8 setpoint, it is necessary to introduce demineralized water to the RCS to increase reactor power. The SR neutron flux doubling input to the boron dilution block ESFAS function is permitted to be blocked at this time.

The operators will closely monitor intentional dilution. The potential for inadvertent dilution exists in these situations. Therefore, the PMS will continue to initiate preemptive valve closures in response to other plant signals to preclude the possibility of a dilution event, as follows:

- If a loss of offsite power occurs during a dilution operation, boron dilution block is activated by a loss of input voltage to the Class 1E dc and uninterruptible power supply system (IDS) battery chargers.
- Boron dilution block is activated when P-4 (reactor trip) is set.
- Inadvertent dilution events at power are mitigated by the over temperature ΔT reactor trip or by operator action.
- SR, IR, and PR flux – high reactor trips.

If operators block the SR neutron flux doubling signal when below the P-8 setpoint in Modes 2 or 3, the modified Technical Specifications Table 3.3.8-1, Function 17 Applicability requires unborated water source flow paths to be isolated. This Technical Specification required action isolates the main source of unborated water. The PMS also sends a confirmatory signal to close the demineralized water system isolation valves when the flux doubling signal is blocked. This new PMS function complies with IEEE 603, Clause 6.6, by initiating the appropriate safety function if the applicable permissive conditions are not met. Closure of the demineralized water system isolation valves eliminates the possibility of boron dilution while the flux doubling signal is blocked.

Inadvertent Boron Dilution in Modes 4 and 5

When in Modes 4 or 5, Technical Specification Table 3.3.8-1, Function 17 Applicability, is modified to require operability of the SR neutron flux doubling function if unborated water source flow paths are not isolated. Therefore, prior to making SR flux doubling inoperable by blocking the function, the Applicability is exited. The Applicability is exited when operators manually isolate unborated water source flow paths. In addition, the demineralized water system isolation valves are sent a signal to close by PMS when the function is blocked below the P-8 setpoint.

The proposed UFSAR changes are made to align with these TS changes to meet PMS requirements in IEEE 603-1991.

The proposed changes to the PMS logic, as described above, do not adversely affect plant design, any physical aspect of the plant, system function, or any equipment qualification previously performed. The changes would not adversely affect any safety-related equipment or function, radioactive material barrier, effluent types, or safety analysis.

4. REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

- 10 CFR 52, Appendix D, Section VIII.B.5.a allows an applicant or licensee who references this appendix to depart from Tier 2 information, without prior NRC approval, unless the proposed departure involves a change to or departure from Tier 1 information, Tier 2* information, or the Technical Specifications, or requires a license amendment under paragraphs B.5.b or B.5.c of the section. The proposed activity makes Tier 2 changes that involve a change to Technical Specifications and, thus, requires prior NRC approval.
- 10 CFR 52, Appendix D, VIII.C.6 states that after issuance of a license, “Changes to the plant-specific TS (Technical Specifications) will be treated as license amendments under 10 CFR 50.90.” 10 CFR 50.90 addresses the applications for amendments of licenses, construction permits and early site permits. As discussed above, changes to Technical Specifications are requested, and thus a license amendment request (LAR) (as supplied herein) is required.
- 10 CFR 50.55a(h)(3), “Safety Systems” requires combined licenses filed under Part 52 of this chapter to meet the requirements for safety systems in IEEE 603–1991 and the correction sheet dated January 30, 1995. The proposed protection and safety monitoring system (PMS) design change brings the AP1000 safety system into alignment with the requirements in this standard.
- 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 13 requires that instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges. The proposed change does not change the conditions under which the flux doubling boron dilution isolation function performs its design function or the manner in which the design function is performed.
- 10 CFR Part 50, Appendix A, GDC 28 requires that reactivity control systems shall be designed with appropriate limits on the potential amount and rate of reactivity increase to assure that the effects of postulated reactivity accidents can neither (1) result in damage to the reactor coolant pressure boundary greater than limited local yielding nor (2) sufficiently disturb the core, its support structures or other reactor pressure vessel internals to impair significantly the capability to cool the core. These postulated reactivity accidents shall include consideration of rod ejection (unless

prevented by positive means), rod dropout, steam line rupture, changes in reactor coolant temperature and pressure, and cold water addition. The proposed change does not change the conditions under which SR neutron flux doubling boron dilution isolation performs its design function nor does it change the manner in which this design function is performed.

4.2 Precedent

None.

4.3 Significant Hazards Consideration Determination

The proposed changes to the Technical Specifications (TS) and information in the Updated Final Safety Analysis Report (UFSAR) (which includes the plant-specific DCD Tier 2 information) update the Protection and Safety Monitoring System (PMS) to align with the requirements in IEEE 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations." IEEE 603-1991, Clause 6.6, "Operating Bypasses," imposes requirements on the operating bypasses (i.e., "blocks" and "resets") used for the AP1000 PMS. The PMS functional logic for blocking and resetting the source range (SR) neutron flux doubling signal requires revision to fully comply with this requirement. This also necessitates changes to Technical Specifications to reflect the changes.

This license amendment requests approval of the Tier 2 and COL Appendix A Technical Specification changes associated with the following PMS design changes:

- Add a new permissive, P-8. Blocking of the flux doubling signal during reactor startup when the plant is above P-8 is permitted by this new permissive. P-8 is set to the minimum Reactor Coolant System (RCS) temperature needed for criticality as defined by Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.4.2.
- Add an additional reset of SR neutron flux doubling signal when RCS temperature decreases below P-8. Note that the PMS design will continue to reset the flux doubling signal when neutron flux decreases below P-6.
- Add PMS logic to initiate a closure signal for Chemical and Volume Control System (CVS) valves 136A and 136B (note that PMS Division A closes valve 136A and PMS Division C closes valve 136B) if the flux doubling signal is blocked when reactor coolant temperature is less than P-8. This satisfies IEEE 603, Clause 6.6, by initiating the appropriate safety function if the applicable permissive conditions are not met.

An evaluation to determine whether or not 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 modifies the PMS logic used to terminate an inadvertent boron dilution accident which results in a source range flux doubling signal. An inadvertent boron dilution is caused by the failure of the demineralized water transfer and storage system or chemical and volume control system, either by controller, operator or mechanical failure. The proposed changes to PMS and Technical Specification requirements do not adversely affect any of these accident initiators or introduce any component failures that could lead to a boron dilution event; thus the probabilities of accidents previously evaluated are not affected. The proposed changes do not adversely interface with or adversely affect any system containing radioactivity or affect any radiological material release source term; thus the radiological releases in an accident are not affected.

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

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 accident analysis evaluates events involving a decrease in reactor coolant system boron concentration due to a malfunction of the chemical and volume control system in Modes 1 through 6. The Technical Specifications currently provide administrative controls to prevent a boron dilution event in Mode 6. The proposed change would provide additional PMS interlocks and administrative controls for prevention of a boron dilution event applicable in Modes 2, 3, 4, and 5. The proposed changes to the PMS design do not adversely affect the design or operation of safety related equipment or equipment whose failure could initiate an accident from what is already described in the licensing basis. These changes do not adversely affect fission product barriers. No safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the requested change.

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 would add additional restrictions on the source range flux doubling signal operational bypass to align it with the requirements in IEEE 603

and provide assurance that the protection logic is enabled whenever the plant is in a condition where protection might be required. These changes to the PMS design do not adversely impact nor affect the design, construction, or operation of any plant SSCs, including any equipment whose failure could initiate an accident or a failure of a fission product barrier. No analysis is adversely affected by the proposed changes. Furthermore, no system function, design function, or equipment qualification will be adversely affected by the changes.

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

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.

4.4 Conclusions

Based on the considerations discussed above, (1) there is 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. The above evaluations demonstrate that the requested changes can be 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 a margin of safety. Having arrived at negative declarations with regard to the criteria of 10 CFR 50.92, this assessment determined that the requested change does not involve a Significant Hazards Consideration.

5. ENVIRONMENTAL CONSIDERATIONS

The proposed amendment revises plant-specific Technical Specifications and associated Tier 2 material that is incorporated into the Updated Final Safety Analysis Report (UFSAR). The requested amendment involves changes to the PMS design to align it with IEEE 603 requirements.

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.

An evaluation was completed to determine whether or not a significant hazards consideration is involved by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment." The changes to the PMS logic for the flux doubling boron dilution function, as described in section 4.3 above, do not adversely affect the plant design or any physical aspect of the plant. The No Significant Hazards Consideration determined that (1) the proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the proposed

amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the proposed amendment does not involve a significant reduction in a margin of safety. Therefore, 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.

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

The requested amendment involves changes to the PMS design to align it with IEEE 603 requirements and changes to Technical Specifications to address operational controls for unborated water sources and requirements for automatic isolation functions.

The proposed PMS logic changes are unrelated to any aspects of plant construction or operation that would introduce any changes to effluent types (e.g., effluents containing chemicals or biocides, sanitary system effluents, and other effluents) or affect any plant radiological or non-radiological effluent release quantities. Furthermore, these proposed changes do not diminish the functionality of any design or operational features that are credited with controlling the release of effluents during plant operation. Therefore, the proposed amendment does not involve a significant change in the types or a significant increase in 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 have no effect on individual or cumulative occupational radiation exposure during plant operation. The changes described in this amendment will only affect the PMS functional logic for blocking and resetting the source range neutron doubling signal. These changes will not pose a negative impact to processes or design controls related to individual or cumulative occupational radiation exposure. Therefore, the proposed amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

Based on the above review of the proposed amendment, it has been determined that there are no anticipated construction and operational effects of the proposed amendment involving (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, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), an environmental impact statement or environmental assessment of the proposed amendment is not required.

6. REFERENCES

None.

Southern Nuclear Operating Company

ND-16-0652

Enclosure 2

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Proposed Changes to the Licensing Basis Documents

(LAR-16-006)

Note:
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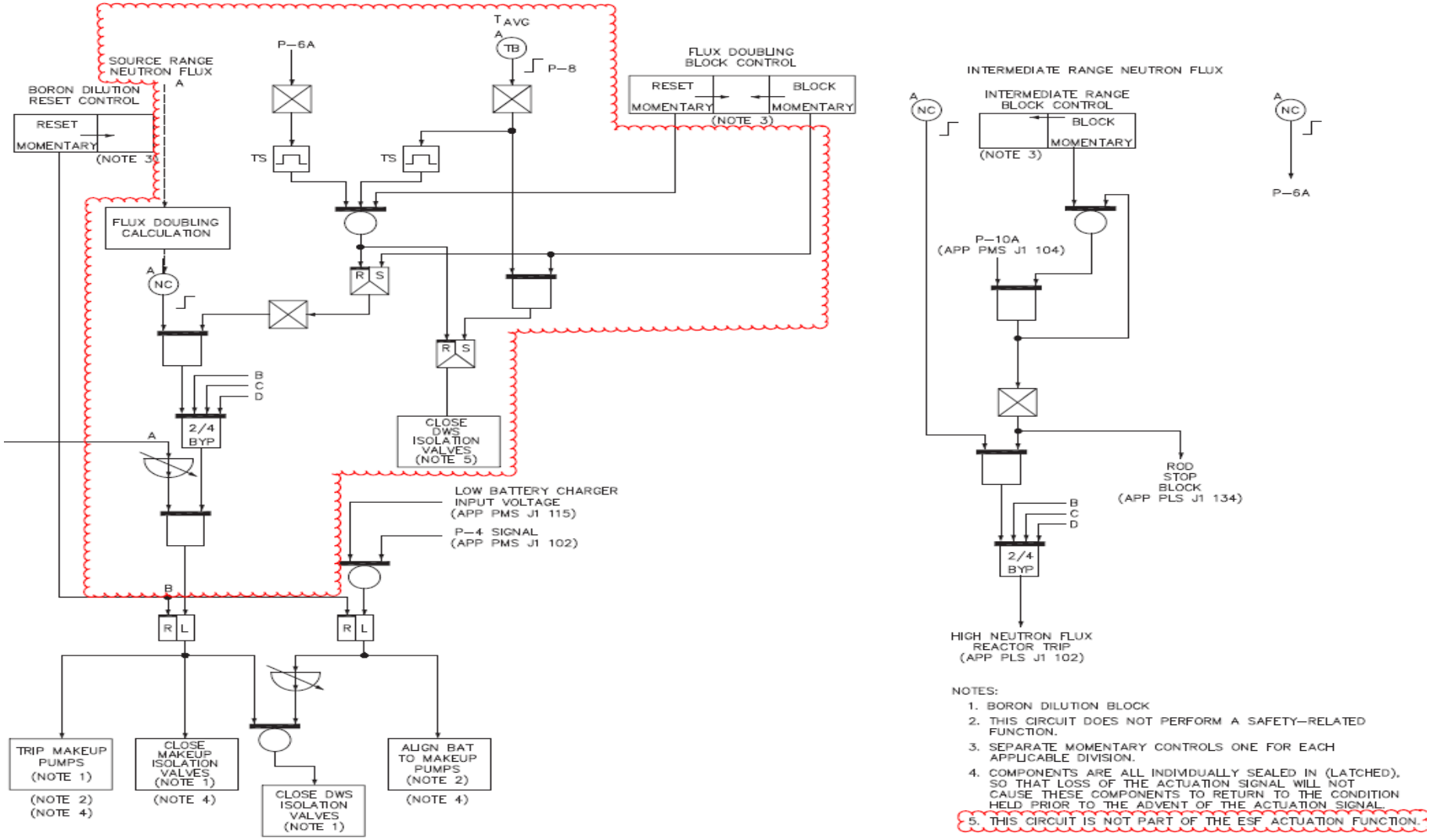
Deleted text is shown as ~~**Red Strikethrough**~~
Omitted text is shown as three asterisks (* * *)

(Enclosure 2 consists of 11 pages, including this cover page)

Tier 2 UFSAR Figure 7.2-1 (Sheet 3 of 21) Functional Diagram Nuclear Startup Protection, Figure update



Tier 2 UFSAR Subsection 7.3.1.2.14 Boron Dilution Block, Revise paragraph four and add paragraph 5.

7.3.1.2.14 Boron Dilution Block

Signals to block boron dilution are generated from any of the following conditions:

1. Excessive increasing rate of source range flux doubling signal
2. Loss of ac power sources (low Class 1E battery charger input voltage)
3. Reactor trip (Table 7.3-2, interlock P-4)

* * *

Condition 1 is an average of the source range count rate, sampled at least N times over the most recent time period T_1, compared to a similar average taken at time period T_2 earlier. If the ratio of the current average count rate to the earlier average count rate is greater than a preset value, a partial trip is generated in the division. On a coincidence of excessively increasing source range neutron flux in two of the four divisions, boron dilution is blocked. The Flux Doubling function is also delayed from actuating each time the source range detector's high voltage power is energized to prevent a spurious dilution block due to the short term instability of the processed source range values. This source range flux doubling signal may be manually blocked to permit plant startup and normal power operation **when reactor coolant average temperature is above the P-8 setpoint**. It is automatically reinstated when reactor power is decreased below the P-6 power level during shutdown **or reactor coolant average temperature decreases below the P-8 setpoint**.

The source range flux doubling function can also be manually blocked during shutdown conditions when below the P-8 setpoint. Prior to manually blocking the source range flux doubling function, the operator isolates unborated water source flow paths. When blocked during shutdown conditions, an automatic close signal is also sent to the CVS demineralized water system isolation valves to prevent boron dilution.

* * *

Tier 2 UFSAR Subsection 7.3.1.2.15 Chemical and Volume Control System Isolation, Revise Paragraph 8.

7.3.1.2.15 Chemical and Volume Control System Isolation

A signal to close the isolation valves of the chemical and volume control system is generated from any of the following conditions:

1. High-2 pressurizer level
2. High-2 steam generator narrow range water level
3. Automatic or manual safeguards actuation signal (Subsection 7.3.1.1) coincident with High-1 pressurizer level
4. High-2 containment radioactivity
5. Manual initiation
6. High steam generator narrow range water level (coincident with P-4 permissive)
7. Excessive increasing rate of source range flux doubling signal

* * *

Condition 7 is an average of the source range count rate, sampled at least N times over the most recent time period T_1, compared to a similar average taken at time period T_2 earlier. If the ratio of the current average count rate to the earlier average count rate is greater than a preset value, a partial trip is generated in the division. On a coincidence of excessively increasing source range neutron flux in two of the four divisions, chemical and volume control system makeup is isolated. The flux doubling function is also delayed from actuating each time the source range detector's high voltage power is energized to prevent a spurious chemical and volume control system makeup isolation due to the short-term instability of the processed source range values. This source range flux doubling signal may be manually blocked to permit plant startup and normal power operation **when reactor coolant average temperature is above the P-8 setpoint**. It is automatically reinstated when reactor power is decreased below the P-6 power level during shutdown **or reactor coolant average temperature decreases below the P-8 setpoint. The source range flux doubling function can also be manually blocked during shutdown conditions when below the P-8 setpoint. Prior to manually blocking the source range flux doubling function, the operator isolates unborated water source flow paths. When blocked during shutdown conditions, an automatic close signal is also sent to the CVS demineralized water system isolation valves to prevent inadvertent boron dilution.**

***

Tier 2 UFSAR Section 7.3 Engineered Safety Features, UFSAR Table 7.3-1, Revise Rows 13.a and 14.f Permissives and Interlocks.

Table 7.3-1 (Sheets 6 and 7 of 9)
Engineered Safety Features Actuation Signals

Actuation Signal	No. of Divisions/ Controls	Actuation Logic	Permissives and Interlocks
* * *			
13. Block of Boron Dilution (Figure 7.2-1, Sheets 3 and 15)			
a. Flux doubling calculation	4	2/4-BYP[1]	Manual block permitted **above P-8** ~~when critical or intentionally approaching criticality~~ Automatically unblocked below P-6 **or below P-8 Manual block permitted below P-8; demineralized water system isolation valves signaled closed when blocked below P-8**
* * *			
14. Chemical Volume Control System Isolation (See Figure 7.2-1, Sheets 6 and 11)			
a. High-2 pressurizer water level	4	2/4-BYP[1]	Automatically unblocked above P-19 Manual block permitted below P-19
* * *			
f. Flux doubling calculation	4	2/4-BYP[1]	Manual block permitted **above P-8** ~~when critical or intentionally approaching criticality~~ Automatically unblocked below P-6 **or below P-8 Manual block permitted below P-8; demineralized water system isolation valves signaled closed when blocked below P-8**
* * *			

Tier 2 UFSAR Section 7.3 Engineered Safety Features, UFSAR Table 7.3-2, add rows for Interlock P-8 and Not P-8.

Table 7.3-2 (Sheet 1 of 4)
Interlocks for Engineered Safety Features Actuation System

Designation	Derivation	Function
* * *		
P-6	Intermediate range neutron flux channels above setpoint	None
$\overline{\text{P-6}}$	Intermediate range neutron flux channels below setpoint	Automatically resets the manual block of flux doubling actuation of the boron dilution block
P-8	Reactor coolant average temperature above setpoint	Permits manual block of flux doubling actuation of the boron dilution block
$\overline{\text{P-8}}$	Reactor coolant average temperature below setpoint	(a) Automatically resets the manual block of flux doubling actuation of the boron dilution block (b) Permits manual block of flux doubling actuation of the boron dilution block; signals the demineralized water system isolation valves closed if flux doubling actuation of the boron dilution block is blocked below P-8
* * *		

Tier 2 UFSAR Subsection 9.3.6.3.7 Chemical and Volume Control System Valves, Revise paragraph 10.

9.3.6.3.7 Chemical and Volume Control System Valves

The chemical and volume control system valves are stainless steel for compatibility with the borated reactor coolant. Isolation valves are provided at connections to the reactor coolant system. Lines penetrating the reactor containment meet the containment isolation criteria described in subsection 6.2.3.

* * *

Demineralized Water System Isolation Valves

These normally open, air-operated butterfly valves are located outside containment in the line from the demineralized water storage and transfer system. These valves close on a signal from the protection and safety monitoring system derived by either a reactor trip signal, a source range flux doubling signal, low input voltage (loss of ac power) to the 1E dc and uninterruptable power supply system battery chargers, or a safety injection signal, isolating the demineralized water source to prevent inadvertent boron dilution events. **The protection and safety monitoring system also issues a close signal to these valves when below the P-8 setpoint when the source range flux doubling signal is blocked to prevent inadvertent boron dilution.** Manual control for these valves is provided from the main control room and at the remote shutdown workstation.

* * *

Tier 2 UFSAR Subsection 9.3.6.4.5.1 Boron Dilution Events, Revise paragraph 3

9.3.6.4.5.1 Boron Dilution Events

The chemical and volume control system is designed to address a boron dilution accident by closing redundant safety-related valves, tripping the makeup pumps and/or aligning the suction of the makeup pumps to the boric acid tank.

For dilution events occurring at power (assuming the operator takes no action), a reactor trip is initiated on either an overpower trip or an overtemperature ΔT trip. Following a reactor trip signal, the line from the demineralized water system is isolated by closing two safety-related, air-operated valves. The three-way pump suction control valve aligns so the makeup pumps take suction from the boric acid tank. If the event occurs while the makeup pumps are operating, the realignment of these valves causes the makeup pumps, if they continue to operate, to borate the plant.

For dilution events during shutdown, the source range flux doubling signal is used to isolate the makeup line to the reactor coolant system by closing the two safety-related, motor-operated valves, isolate the line from the demineralized water system by closing the two safety-related, air-operated valves, and trip the makeup pumps. **The source range flux doubling function can be manually blocked during shutdown conditions when below the P-8 setpoint after the operator isolates unborated water source flow paths. When blocked during shutdown conditions, an automatic close signal is also sent to the CVS demineralized water system isolation valves to prevent inadvertent boron dilution.** For refueling operations, administrative controls are used to prevent boron dilutions by verifying the valves in the line from the demineralized water system are closed and secured.

Tier 2 UFSAR Subsection 9.3.6.7 Instrumentation Requirements, Revise Paragraph 7

9.3.6.7 Instrumentation Requirements

Process control instrumentation is provided to acquire data concerning key parameters about the chemical and volume control system. The location of the instrumentation is shown on the chemical and volume control system piping and instrumentation diagram.

* * *

● **Demineralized water system isolation valves** – To prevent inadvertent boron dilution, the demineralized water system isolation valves close on a signal from the protection and safety monitoring system derived from either a reactor trip signal, a source range flux doubling signal, low input voltage (loss of ac power) to the 1E dc and uninterruptible power supply system battery chargers, or a safety injection signal providing a safety-related method of stopping an inadvertent dilution. **The valves are closed to prevent inadvertent boron dilution when the source range flux doubling logic is blocked below P-8.** The main control room and remote shutdown workstation provide manual control for these valves.

* * *

Tier 2 UFSAR Subsection 19E.2.7.2 Design Features to Address Shutdown Safety, Revise paragraph 3 and add new paragraph 6

19E.2.7.2 Design Features to Address Shutdown Safety

The AP1000 CVS is a nonsafety-related system. However, portions of the system are safety related and perform safety-related functions, such as containment isolation, termination of inadvertent RCS boron dilution, RCS pressure boundary preservation, and isolation of excessive makeup.

* * *

The safety analysis of boron dilution accidents is provided in Chapter 15 and is discussed in Subsection 19E.4.5 of this appendix. For dilution events that occur during shutdown, the source-range flux-doubling signal **closes the safety-related remotely operated CVS makeup line isolation valves to terminate the event. In addition, the signal** is used to isolate the line from the demineralized water system **to the makeup pump suction** by closing the two safety-related remotely operated valves. The three-way pump suction control valve aligns the makeup pumps to take suction from the boric acid tank and, therefore, stops the dilution.

For refueling operations, administrative controls are used to prevent boron dilutions by verifying that the valves in the line from the demineralized water system are closed and locked. These valves block the flow paths that can allow unborated makeup water to reach the RCS. Makeup required during refueling uses borated water supplied from the boric acid tank by the CVS makeup pumps.

During refueling operations (Mode 6), two source-range neutron flux monitors are operable to monitor core reactivity. This is required by the plant Technical Specifications. The two operable source-range neutron flux monitors provide a signal to alert the operator to unexpected changes in core reactivity. The potential for an uncontrolled boron dilution accident is precluded by isolating the unborated water sources. This is also required by the plant Technical Specifications.

The source range flux doubling function can be manually blocked during shutdown conditions when below the P-8 setpoint after the operator isolates unborated water source flow paths. When blocked during shutdown conditions, an automatic close signal is also sent to the CVS demineralized water system isolation valves to prevent inadvertent boron dilution.

Table 3.3.8-1 (page 2 of 2)
Engineered Safeguards Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS
15. Core Makeup Tank (CMT) Level – Low 1	1,2,3,4	4 per tank	H
	5(i)	4 per OPERABLE tank	J
16. CMT Level – Low 2	1,2,3,4	4 per tank	H
	5	4 per OPERABLE tank	J
17. Source Range Neutron Flux Doubling	2(j),3(i),~~4~~ 4(i)	4	I
	~~5~~ 5(i)	4	I
18. IRWST Level – Low 3	1,2,3,4(b)	4	F
	4(d),5	4	M
	6(h)	4	N
19. Reactor Coolant Pump Bearing Water Temperature – High	1,2,3,4	4 per RCP	O
20. SG Narrow Range Water Level – Low	1,2,3,4(b)	4 per SG	F
21. SG Wide Range Water Level – Low	1,2,3,4(b)	4 per SG	F
22. SG Narrow Range Water Level High	1,2,3,4	4 per SG	I
23. SG Narrow Range Water Level – High 2	1,2	4 per SG	D
	3,4	4 per SG	I
24. Steam Line Pressure – Low	1,2,3,4(b)	4 per steam line	G
25. Steam Line Pressure – Negative Rate – High	3(k)	4 per steam line	I

(b) With the RCS not being cooled by the Normal Residual Heat Removal System (RNS).

(d) With the RCS being cooled by the RNS.

(g) Above the P-19 (RCS Pressure) interlock with the RCS not being cooled by RNS.

(h) With upper internals in place.

(i) With RCS pressure boundary intact and with pressurizer level ≥ 20%.

(j) ~~Not applicable when critical or~~ during intentional approach to criticality.

(k) Below the P-11 (Pressurizer Pressure) interlock.

With unborated water source flow paths not isolated except when critical or except

(i) With unborated water source flow paths not isolated.

Southern Nuclear Operating Company

ND-16-0652

Enclosure 3

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Conforming Changes to the Technical Specifications Bases

(For Information Only)

(LAR-16-006)

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(Enclosure 3 consists of 6 pages, including this cover page)

BASES

APPLICABLE SAFETY ANALYSES, LCOs, and APPLICABILITY (continued)

to leaving the source range. When the source range trip is blocked, the high voltage to the detectors is also removed.

(2) On decreasing power, the P-6 interlock automatically energizes the source range detectors and enables the Source Range Neutron Flux reactor trip.

(3) On decreasing power, the P-6 interlock automatically resets the flux doubling block control ensuring the source range neutron flux doubling circuit is enabled. Normally, the source range neutron flux doubling circuit is manually blocked by the main control room operator during the reactor startup. ~~On increasing power, the P-6 interlock provides a backup block signal to the source range neutron flux doubling circuit. Normally, this Function is manually blocked by the main control room operator during the reactor startup.~~

Power Range Neutron Flux, P-10

The Power Range Neutron Flux, P-10 interlock is actuated at approximately 10% power as determined by the respective power-range detector. The P-10 interlock ensures that the following are performed:

(1) On increasing power, the P-10 interlock automatically enables reactor trips on the following Functions:

- Pressurizer Pressure – Low Setpoint,
- Pressurizer Water Level – High 3,
- Reactor Coolant Flow – Low, and
- RCP Speed – Low.

These reactor trips are only required when operating above the P-10 setpoint (approximately 10% power). These reactor trips provide protection against violating the DNBR limit. Below the P-10 setpoint, the RCS is capable of providing sufficient natural circulation without any RCP running.

(2) On increasing power, the P-10 interlock allows the operator to manually block the Intermediate Range Neutron Flux reactor trip.

(3) On increasing power, the P-10 interlock allows the operator to manually block the Power Range Neutron Flux – Low Setpoint reactor trip.

BASES

APPLICABLE SAFETY ANALYSES, LCOs, and APPLICABILITY (continued)

The reactor trip breaker position switches that provide input to the P-4 interlock only function to energize or de-energize or open or close contacts. Therefore, this interlock has no adjustable trip setpoint.

Intermediate Range Neutron Flux, P-6

The Intermediate Range Neutron Flux, P-6 interlock is actuated when the respective NIS intermediate range channel increases to approximately one decade above the channel lower range limit. ~~Below the setpoint, the P-6 interlock automatically unblocks the flux doubling function, permitting the block of boron dilution. Normally, this Function is blocked by the main control room operator during reactor startup~~. Above the setpoint, the P-6 interlock allows manual block of the source range neutron flux reactor trip. Below the setpoint, the P-6 interlock automatically energizes the source range detectors and unblocks the source range neutron flux reactor trip. As intermediate range flux decreases from above the setpoint to below the setpoint, the P-6 interlock automatically resets the flux doubling block function ensuring source range neutron flux doubling function is enabled. Normally, the source range neutron flux doubling function is blocked by the main control room operator during reactor startup.

Reactor Coolant Average Temperature, P-8

The P-8 interlock is used to permit manual blocking, and for the resetting of a manual block, of the automatic Source Range Neutron Flux Doubling actuation of the Boron Dilution Block.

The automatic Source Range Neutron Flux Doubling actuation of the Boron Dilution Block Function may be manually blocked (disabled) to permit plant startup and normal power operation when above the P-8 reactor coolant average temperature setpoint.

The manual block to disable the automatic Source Range Neutron Flux Doubling actuation of the Boron Dilution Block Function is automatically reset upon decreasing reactor coolant average temperature to below the P-8 setpoint.

Once reactor coolant average temperature is below the P-8 setpoint and after the operator isolates unborated water source flow paths, the Source Range Neutron Flux Doubling actuation of the Boron Dilution Block Function may also be manually blocked to prevent inadvertent actuation during refueling operations and post-refueling control rod testing.

BASES

APPLICABLE SAFETY ANALYSES, LCOs, and APPLICABILITY (continued)

When the Source Range Neutron Flux Doubling actuation of the Boron Dilution Block Function is manually blocked below the P-8 setpoint, an automatic close signal is also sent to the CVS demineralized water system isolation valves to prevent inadvertent boron dilution

Pressurizer Pressure, P-11

The P-11 interlock permits a normal unit cooldown and depressurization without Safeguards Actuation or main steam line and feedwater isolation. With pressurizer pressure channels less than the P-11 setpoint, the operator can manually block the Pressurizer pressure – Low, Steam Line Pressure – Low, and T_{cold} – Low Safeguards Actuation signals and the Steam Line Pressure – Low and T_{cold} – Low steam line isolation signals. When the Steam Line Pressure – Low is manually blocked, a main steam isolation signal on Steam Line Pressure-Negative Rate – High is enabled. This provides protection for an SLB by closure of the main steam isolation valves. Manual block of feedwater isolation on T_{avg} – Low 1, Low 2, and T_{cold} – Low is also permitted below P-11. With pressurizer pressure channels ≥ P-11 setpoint, the Pressurizer Pressure – Low, Steam Line Pressure – Low, and T_{cold} – Low Safeguards Actuation signals and the Steam Line Pressure Low and T_{cold} – Low steam line isolation signals are automatically enabled. The feedwater isolation signals on T_{cold} – Low, T_{avg} – Low 1 and Low 2 are also automatically enabled above P-11. The operator can also enable these signals by use of the respective manual reset buttons. When the Steam Line Pressure – Low and T_{cold} – Low steam line isolation signals are enabled, the main steam isolation on Steam Line Pressure-Negative Rate – High is disabled. The Containment Pressure – High 2 and Containment Radioactivity – High 2 channels are automatically unblocked above the P-11 interlock, with manual block permitted below P-11. The Setpoint reflects only steady state instrument uncertainties.

Pressurizer Level, P-12

The P-12 interlock is provided to permit midloop operation without core makeup tank actuation, reactor coolant pump trip, CVS letdown isolation, or purification line isolation. With pressurizer level channels less than the

P-12 setpoint, the operator can manually block Pressurizer Water Level – Low 1 and Pressurizer Water Level – Low 2 signals used for these actuations. Concurrent with blocking CMT actuation on Pressurizer Water Level – Low 2, ADS 4^{th} Stage actuation on Low 2 RCS hot leg level is enabled. Also CVS letdown isolation on Low 1 RCS hot leg level is enabled. When the pressurizer level is above the P-12 setpoint, the

BASES

APPLICABLE SAFETY ANALYSES, LCOs, and APPLICABILITY (continued)

Passive Residual Heat Removal (PRHR) Heat Exchanger Actuation

The PRHR Heat Exchanger (HX) provides emergency core decay heat removal when the Startup Feedwater System is not available to provide a heat sink.

PRHR is actuated on the following signals:

- SG Narrow Range Water Level – Low coincident with Startup Feedwater Flow – Low;
- SG Wide Range Water Level – Low;
- ADS Stages 1, 2, & 3 Actuation;
- CMT Actuation;
- Pressurizer Water Level – High 3; and
- PRHR Heat Exchanger Actuation – Manual Initiation.

Boron Dilution Block

The block of boron dilution is accomplished by closing the CVS makeup line isolation~~suction~~ valves or closing the~~to~~ demineralized water system isolation valves to the CVS~~storage tanks, and aligning the boric acid tank to the CVS makeup pumps~~.

Boron Dilution Block is actuated on the following signals:

- Source Range Neutron Flux Doubling; and
- Reactor Trip Signal (P-4).

Chemical Volume and Control System Makeup Isolation

The CVS makeup line is isolated following certain events to prevent overfilling of the RCS. In addition, this line is isolated on High 2 containment radioactivity to provide containment isolation following an accident. This line is not isolated on a containment isolation signal, to allow the CVS makeup pumps to perform their defense-in-depth functions. However, if very high containment radioactivity exists (above the High 2 setpoint) this line is isolated.

BASES

APPLICABLE SAFETY ANALYSES, LCOs, and APPLICABILITY (continued)

17. Source Range Neutron Flux Doubling

The source range neutron detectors are used for this Function. A signal to block boron dilution is derived from source range neutron flux increasing at an excessive rate (source range flux doubling). The LCO requires four divisions to be OPERABLE. There are four divisions and two-out-of-four logic is used. On a coincidence of excessively increasing source range neutron flux in two of the four divisions, demineralized water is isolated (CVS demineralized water system isolation valves closed) from the makeup pumps and reactor coolant makeup is isolated (CVS makeup line isolation valves closed) from the reactor coolant system to preclude a boron dilution event.

The Boron Dilution Block ESFAS protective function is actuated by Source Range Neutron Flux Doubling.

The signal to block boron dilution on source range neutron flux increasing at an excessive rate (source range flux doubling) must be OPERABLE in MODE 2 and MODE 3 if unborated water source flow paths are not isolated. However, the signal to block boron dilution on source range flux doubling is not required in MODE 2 or MODE 3 when the reactor is critical or when an intentional approach to criticality is in progress. It must also be OPERABLE in MODES 4 and 5 if unborated water flow paths are not isolated. ~~The signal to block boron dilution on source range neutron flux increasing at an excessive rate (source range flux doubling) must be OPERABLE in MODES 2 or 3, when not critical or during an intentional approach to criticality, and MODES 4 or 5. This Function is not applicable in MODES 4 and 5 if the demineralized water makeup flow path is isolated.~~ In MODE 6, a dilution event is precluded by the requirement in LCO 3.9.2 to close, lock and secure at least one valve in each unborated water source flow path.

When the Source Range Flux Doubling feature is blocked below P-8, an automatic close signal is sent to both valves in the CVS demineralized water flow path to ensure a single failure does not reestablish this potential dilution flow path.

18. IRWST Level – Low 3

A low IRWST level coincident with a ADS Stage 4 Actuation signal will open the containment recirculation valves. Four channels of IRWST Level – Low 3 instrumentation are provided to permit one channel to be in trip or bypass indefinitely and still ensure that no single random failure will disable this trip Function.

Southern Nuclear Operating Company

ND-16-0652

Enclosure 4

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Differences between SNC and Lee Proposed Licensing Basis Document Changes

(For Information Only)

(LAR-16-006)

Note:
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SNC text difference shown in **{…}** or **{…}**

(Enclosure 2 consists of 8 pages, including this cover page)

The proposed changes in this License Amendment Request (LAR), to modify the Protection and Safety Monitoring System (PMS) functional logic for blocking and resetting the source range (SR) neutron flux doubling signal, were previously submitted by Duke Energy Carolinas, LLC, for William States Lee III Nuclear Station Units 1 and 2 (Docket Nos. 52-018 and 52-019) (Ltr#s WLG2015.09-01 and WLG2016.02-05). While those changes are not yet formally issued as part of a COL, the NRC Staff review as documented in the Advanced Safety Evaluation provided for ACRS review (cover letter Agencywide Documents Access and Management System (ADAMS) Accession No. ML16019A296) is acknowledged as a basis for a precedent. Below is an evaluation of the differences in the changes to Tier 2 and Technical Specifications between this LAR and the proposed Duke Energy Carolinas submittal.

UFSAR 7.3.1.2.14:

LEE: The Flux Doubling function can also be manually blocked during shutdown conditions when below the P-8 reactor coolant average temperature. When blocked during shutdown conditions, the CVS demineralized water system isolation valves are automatically closed to prevent inadvertent boron dilution.

VEGP: **The {source range} flux doubling function can also be manually blocked during shutdown conditions when below the P-8 {setpoint}. {Prior to manually blocking the source range flux doubling function, the operator isolates unborated water source flow paths}. When blocked during shutdown conditions, {an automatic close signal is also sent to} the CVS demineralized water system isolation valves to prevent boron dilution**

Basis for difference:

The proposed changes to UFSAR 7.3.1.2.14 are for improved clarity of the submittal. Based on Request for Additional Information (RAI) submitted against the Duke Energy Carolinas submittal, revisions were made to wording in the Southern Nuclear Operating Company (SNC) submittal to align it with the staff's requests for clarity. Additional clarifications are made in this section to distinguish automatic actions from operator initiated actions, which recognize the normal conduct of operations would be to exit the Applicability (by isolating unborated water source flow paths) prior to bypassing a required Engineering Safety Feature Actuation System (ESFAS) protective function.

The proposed changes are only intended to improve the overall clarity of the submittal, and do not present a change of intent from information contained in the Duke Energy Carolinas submittal.

FSAR 7.3.1.2.15:
VEGP had changes similar to those in FSAR 7.3.1.2.14 above; however, this section was not revised in LEE submittal.

Basis for difference:
For SNC, this section was previously updated in a separate UFSAR departure. This departure added a new paragraph for Source Range (SR) flux doubling. This previously added paragraph is what is being edited in this LAR. The Lee COLA does not have this departure incorporated.

FSAR Table 7.3-1:
LEE:
Manual block permitted above P-8.
Automatically unblocked (momentary) below P-6 or below P-8.
Demineralized water system isolation valves closed if blocked below P-8

VEGP:
Manual block permitted **above P-8.**
Automatically unblocked below P-6 **or below P-8**
{Manual block permitted below P-8;} demineralized water system isolation valves {signaled} closed {when} blocked below P-8

Basis for difference:
The proposed change is made to align wording in UFSAR Table 7.3-1. The term "(Momentary)" is identified in logic diagrams, but it is not used to describe information contained in Table 7.3-1. In order to maintain consistency with wording in Table 7.3-1, the term "(Momentary)" was removed. Additional clarifications were made to this section to maintain consistency in regards to recognizing the normal conduct of operations would be to exit the Applicability (by isolating unborated water source flow paths) prior to bypassing a required ESFAS protective function. As well as identifying that the manual block occurred below the P-8. One grammatical change was made to correct "if" to "when."

The proposed changes are only intended to improve the overall clarity of the submittal, and do not present a change of intent from information contained in the Duke Energy Carolinas submittal.

FSAR Table 7.3-1
LEE: Below P-8
(b) Closes demineralized water system isolation valves if flux doubling actuation of the boron dilution block is blocked below P-8

VEGP: Below P-8
(b) {Permits manual block of flux doubling actuation of the boron dilution block; signals the} demineralized water system isolation valves {closed} if flux doubling actuation of the boron dilution block is blocked below P-8

Basis for difference:
The proposed changes to UFSAR Table 7.3-1 are made to maintain consistency with regards to recognizing the normal conduct of operations would be to exit the Applicability (by isolating unborated water source flow paths) prior to bypassing a required ESFAS protective function

The proposed changes are only intended to improve the overall clarity of the submittal, and do not present a change of intent from information contained in the Duke Energy Carolinas submittal.

FSAR 9.3.6.3.7:

LEE: These valves close on a signal from the protection and safety monitoring system derived by either a reactor trip signal, a source range flux doubling signal, low input voltage (loss of ac power) to the 1E dc and uninterruptable power supply system battery chargers, or a safety injection signal, isolating the demineralized water source to prevent inadvertent boron dilution events and, during shutdown conditions, whenever the flux doubling signal is blocked to prevent inadvertent boron dilution.

VEGP: These valves close on a signal from the protection and safety monitoring system derived by either a reactor trip signal, a source range flux doubling signal, low input voltage (loss of ac power) to the 1E dc and uninterruptable power supply system battery chargers, or a safety injection signal, isolating the demineralized water source to prevent inadvertent boron dilution events. **The protection and safety monitoring system also issues a close signal to these valves when below the P-8 setpoint when the source range flux doubling signal is blocked to prevent inadvertent boron dilution.**

Basis for difference:
The proposed changes to UFSAR 9.3.6.3.7 are made to identify that these valves get a close signal when the function is blocked “below P-8.” This distinction was made to maintain consistency and detail with descriptions of the “close signal” as presented in other sections of this submittal.

The proposed changes are only intended to improve the overall clarity of the submittal, and do not present a change of intent from information contained in the Duke Energy Carolinas submittal.

FSAR 9.3.6.4.5.1:
LEE: ... and trip the makeup pumps. For refueling operations, administrative controls are used to prevent boron dilutions by verifying the valves in the line from the demineralized water system are closed and secured. In addition, when the flux doubling signal is blocked during shutdown, the demineralized water system isolation valves are closed to prevent inadvertent boron dilution.

VEGP: … and trip the makeup pumps. **{The source range flux doubling function can be**

manually blocked during shutdown conditions when below the P-8 setpoint after the operator isolates unborated water source flow paths. When blocked during shutdown conditions, an automatic close signal is also sent to the CVS demineralized water system isolation valves to prevent inadvertent boron dilution.} For refueling operations, administrative controls are used to prevent boron dilutions by verifying the valves in the line from the demineralized water system are closed and secured.

Basis for difference:
The proposed changes to UFSAR 9.3.6.4.5.1 are made to maintain consistency and detail with descriptions of manual and automatic actions as presented in other sections of this submittal. The proposed changes are only intended to improve the overall clarity of the submittal, and do not present a change of intent from information contained in the Duke Energy Carolinas submittal.

FSAR 9.3.6.7:
LEE: ... providing a safety-related method of stopping an inadvertent dilution. In addition, when the flux doubling logic is blocked during shutdown, the valves are closed to prevent inadvertent boron dilution.

VEGP: ... providing a safety-related method of stopping an inadvertent dilution. **The valves are closed to prevent inadvertent boron dilution {when the source range flux doubling logic is blocked below P-8.}**

Basis for difference:

The proposed change to UFSAR 9.3.6.7 is to provide additional detail and maintain consistency with information gained from RAIs against the Duke Energy Carolinas submittal and information for regarding the P-8 signal.

The proposed changes is only intended to improve the overall clarity of the submittal, and do not present a change of intent from information contained in the Duke Energy Carolinas submittal.

FSAR Table 14.3-2
LEE included change:

Section 7.3.1.2.14	The demineralized water system isolation valves close on a signal from the protection and safety monitoring system derived from either a reactor trip signal, a source range flux doubling signal, or low input voltage to the 1E dc uninterruptible power supply battery chargers or if the source range flux doubling logic is blocked during shutdown.
Section 9.3.6.7	The demineralized water system isolation valves close on a signal from the protection and safety monitoring system derived from either a reactor trip signal, a source range flux

doubling signal, low input voltage to the 1E dc and uninterruptible power supply battery chargers, or a safety injection signal or if the source range flux doubling logic is blocked during shutdown conditions.

VEGP: Change removed in Rev B

Basis for difference:
Per UFSAR 14.3.7, "Tables 14.3-2 through 14.3-8 summarize the design material that has been incorporated into the [AP1000 Certified Design Material (CDM)]." As such these changes do not reflect revises to the certified design for SNC

FSAR 19E.2.7.2
LEE: {{paragraph not added}}

VEGP: **{The source range flux doubling function can be manually blocked during shutdown conditions when below the P-8 setpoint after the operator isolates unborated water source flow paths. When blocked during shutdown conditions, an automatic close signal is also sent to the CVS demineralized water system isolation valves to prevent inadvertent boron dilution.}**

Basis for difference:
The proposed changes to UFSAR 19E.2.7.2 are made to maintain consistency and detail with descriptions of manual and automatic actions as presented in other sections of this submittal.

The proposed changes are only intended to improve the overall clarity of the submittal, and do not present a change of intent from information contained in the Duke Energy Carolinas submittal.

Technical Specifications (TS):
LEE:
TS Table 3.3.2-1, Function 18.d added
Function 16 Flux Doubling had (from DCD – unchanged in exemption)

- MODE 2 & 3 Applicability modified with: Not applicable when critical or during intentional approach to criticality.
- MODE 4& 5 Applicability modified with: Not applicable for valve isolation Functions whose associated flow path is isolated

VEGP: No interlocks included – removed in TSU; therefore Lee would be expected to follow
Function 17, Flux Doubling

- MODE 2 & 3 Applicability modified with: {With unborated water source flow paths not

- isolated except} when critical or except during intentional approach to criticality.
- MODE 4 & 5 Applicability modified with: {With unborated water source} flow paths {not} isolated.

Basis for difference:
The VEGP TS originally issued as COL Appendix A, aligned with the AP1000 Design Control Document Generic TS; just as are the proposed William States Lee III TS. Subsequently for VEGP, the Technical Specifications Upgrade (TSU) License Amendment Request was approved by the NRC as amendment 13 (ML13238A337). Of the various changes included, "Less Restrictive Change" labeled as "L10" approved relocating from TS the PMS interlocks, which were in TS Table 3.3.2-1, Function 18. The relocation of the explicit treatment of interlocks as separate Functions was supported based on their continued role as required support features for operability of the associated actuation functions still required by TS. The P-8 interlock (i.e., the subject of the currently proposed LAR), was included in the William States Lee III TS; however, the VEGP licensing basis provided by the TSU Amendment supports maintaining this new interlock as a support feature for the SR Neutron Flux Doubling actuation function without P-8 being explicitly added as a stand-alone TS actuation function.

The VEGP proposed MODE 2 Applicability for TS Table 3.3.8-1, Function 17, SR Neutron Flux Doubling, is proposed with the additional exception "With unborated water source flow paths not isolated except ... ." This allows exiting the Applicability either when critical or during intentional approach to criticality (matching William States Lee III), or when all unborated water source flow paths are isolated. While William States Lee III TS do not provide for this allowance, it is a justified operational flexibility since any potential boron dilution event is precluded. On bypassing SR Neutron Flux Doubling in this condition there would be an additional closure signal on the demineralized water isolation valves – consistent with MODE 3 allowances.

The VEGP proposed MODE 3 Applicability for a VEGP TS Table 3.3.8-1, Function 17, SR Neutron Flux Doubling, is proposed with the additional exception "With unborated water source flow paths not isolated except ... ." This allows exiting the Applicability either when critical or during intentional approach to criticality (matching William States Lee III). Additionally, the Applicability can be exited when all unborated water source flow paths are isolated, which is similar to William States Lee III proposed "Not applicable for valve isolation Functions whose associated flow path is isolated." In both cases potential boron dilution events are precluded. On bypassing SR Neutron Flux Doubling in this condition there would be an additional closure signal on the demineralized water isolation valves. The Footnote exception proposed for VEGP is editorially different from William States Lee III Footnote in order to present the more standard wording defining the condition when the Function is Applicable, verses stating a "not applicable when..." format.

The VEGP proposed MODES 4 and 5 Applicability for a VEGP TS Table 3.3.8-1, Function 17, SR Neutron Flux Doubling, was modified in the TSU Amendment to remove the Footnoted modification "Not applicable for valve isolation Functions whose associated flow path is isolated." With the addition of the P-8 interlock to provide a close signal to the valves when SR Neutron Flux Doubling is blocked, inclusion of a similar Applicability exception is appropriate to be added back. In both cases potential boron dilution events are precluded. On bypassing SR Neutron Flux Doubling in this condition there would be an additional closure signal on the

demineralized water isolation valves. The Footnote exception proposed for VEGP is editorially different from William States Lee III Footnote in order to present the more standard wording defining the condition when the Function is Applicable, verses stating a “not applicable when...” format.

TS Bases differences are either TSU-related, or conforming to TS differences noted above.