March 28, 2005

Mr. D. E. Grissette
Vice President
Southern Nuclear Operating
Company, Inc.
P.O. Box 1295
Birmingham, AL 35201-1295

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 - ISSUANCE OF EXEMPTION AND AMENDMENTS RE: REQUEST TO REVISE TECHNICAL SPECIFICATIONS AND PRESSURE TEMPERATURE LIMITS REPORT AND RELOCATE THE COLD OVERPRESSURE PROTECTION SYSTEM (COPS) ARMING TEMPERATURE (TAC NOS. MC2225, MC2226, MC2227, MC2228, MC3090, AND MC3091)

Dear Mr. Grissette:

The Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 136 to Facility Operating License NPF-68 and Amendment No. 115 to Facility Operating License NPF-81 for the Vogtle Electric Generating Plant, Units 1 and 2 (Vogtle, Units 1 and 2). The amendments consist of changes to the Technical Specifications (TS) in response to your applications dated February 26 and April 28, 2004, as supplemented July 8 and October 22, 2004. Although the licensee submitted these applications separately, due to the nature of the requested actions, the NRC staff is issuing an amendment that combines the requested revisions.

The amendments revise TS Section 5.6.6, “Reactor Coolant System (RCS) Pressure Temperature Limits Report (PTLR),” to facilitate future licensee-controlled changes to the PTLR. The changes include a revised PTLR that provides new heatup and cooldown limits and COPS setpoints, and a revised minimum size for the pressurizer power operated relief valve orifice that acts to vent the RCS. In addition, the changes relocate the COPS arming temperature to the PTLR and lower the COPS arming temperature from 350 °F to 220 °F. The licensee also included TS bases changes to support the changes to the TSs.

Your February 26, 2004, letter as supplemented by letters dated July 8 and October 22, 2004, requested an exemption from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix G as they pertain to the establishment of minimum temperature requirements (footnote (2) to Table 1), for all modes of operation addressed by 10 CFR Part 50, Appendix G, based on the material properties of the reactor pressure vessel closure flange region that is highly stressed by the bolt preload. The Commission has approved the enclosed exemption from specific requirements of 10 CFR Part 50, Appendix G, footnote (2) to Table 1, for Vogtle, Units 1 and 2. A copy of the exemption and the supporting safety evaluation are enclosed. The exemption has been forwarded to the Office of the Federal Register for publication.

A copy of the related Safety Evaluation for the license amendment is also enclosed. A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Christopher Gratton, Sr. Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-424 and 50-425

Enclosures:
1. Amendment No. 136 to NPF-68
2. Amendment No. 115 to NPF-81
3. Safety Evaluation
4. Exemption

cc w/encls: See next page

A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/
Christopher Gratton, Senior Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-424 and 50-425

Enclosures:
1. Amendment No. 136 to NPF-68
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Package Number: ML05690228 Exemption: ML050840305 NRR-058
License Amendment Number: ML050690216 Tech Spec Number: ML050910029

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SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 RE: ISSUANCE OF AMENDMENTS (TAC NOS. MC2225, MC2226, MC2228, MC2229, MC3090 AND MC3091)

Date: March 28, 2005

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SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA

CITY OF DALTON, GEORGIA

VOGTLE ELECTRIC GENERATING PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 136
License No. NPF-68

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The applications for amendment to the Vogtle Electric Generating Plant, Unit 1 (the facility) Facility Operating License No. NPF-68 filed by the Southern Nuclear Operating Company, Inc. (the licensee), acting for itself, Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and City of Dalton, Georgia (the owners), dated February 26 and April 28, 2004, as supplemented July 8 and October 22, 2004, comply with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-68 is hereby amended to read as follows:

   Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 136, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 90 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/
John A. Nakoski, Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Technical Specification
Changes

Date of Issuance: March 28, 2005

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA

CITY OF DALTON, GEORGIA

VOGTLE ELECTRIC GENERATING PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 115
License No. NPF-81

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The applications for amendment to the Vogtle Electric Generating Plant, Unit 2 (the facility) Facility Operating License No. NPF-68 filed by the Southern Nuclear Operating Company, Inc. (the licensee), acting for itself, Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and City of Dalton, Georgia (the owners), dated February 26 and April 28, 2004, as supplemented July 8 and October 22, 2004, comply with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-81 is hereby amended to read as follows:

   Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 115, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 90 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/
John A. Nakoski, Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Technical Specification
Changes

Date of Issuance: March 28, 2005

ATTACHMENT TO LICENSE AMENDMENT NO. 136

FACILITY OPERATING LICENSE NO. NPF-68

DOCKET NO. 50-424

AND

TO LICENSE AMENDMENT NO. 115

FACILITY OPERATING LICENSE NO. NPF-81

DOCKET NO. 50-425

Replace the following pages of the Appendix A Technical Specifications and associated Bases with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
1.1-5	1.1-5
3.4.6-1	3.4.6-1
3.4.10-1	3.4.10-1
3.4.12-1 and -2	3.4.12-1 and -2
3.4.12-4 and -5	3.4.12-4 and -5
3.5.2-1	3.5.2-1
5.6-4 and -5	5.6-4 and -5
B 3.4.3-1	B 3.4.3-1
B 3.4.3-7 and -8	B 3.4.3-7 and -8
B 3.4.6-2	B 3.4.6-2
B 3.4.10-1 thru -4	B 3.4.10-1 thru -4
B 3.4.12-1	B 3.4.12-1
B 3.4.12-3 thru -13	B 3.4.12-3 thru -13
B 3.5.2-6	B 3.5.2-6

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 136 TO FACILITY OPERATING LICENSE NPF-68

AND AMENDMENT NO. 115 TO FACILITY OPERATING LICENSE NPF-81

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2

DOCKET NOS. 50-424 AND 50-425

1.0 INTRODUCTION

By letter dated February 26, 2004 (Ref. 1), as supplemented July 8 (Ref. 2) and October 22, 2004, Southern Nuclear Operating Company, Inc. (SNC, the licensee), proposed license amendments to change the Technical Specifications (TS) for the Vogtle Electric Generating Plant, Units 1 and 2 (Vogtle, Units 1 and 2). The proposed changes revise TS Section 5.6.6, "Reactor Coolant System (RCS) Pressure and Temperature Limits Report (PTLR)," to facilitate future licensee-controlled changes to the PTLR in accordance with a Nuclear Regulatory Commission (NRC or Commission)-approved methodology. The licensee also submitted revised PTLRs for review and approval and a proposed revision to TS Section 3.4.12 to change the RCS vent size in Limiting Condition for Operation (LCO) 3.4.12b. The revisions to the PTLR include new heatup and cooldown limits and Cold Overpressure Protection System (COPS) setpoints. The licensee's request was made in accordance with the provisions in NRC Generic Letter (GL) 96-03 (Ref. 5). The licensee also submitted Bases changes associated with the proposed changes to the TSs.

By letter dated April 28, 2004, SNC proposed a separate change to the TSs for Vogtle, Units 1 and 2. The licensee requested to relocate the COPS arming temperature to the PTLR to facilitate future licensee-controlled changes to the COPS arming temperature and to revise the affected TS LCOs and Bases sections to reflect the change. The request also proposed a change to the COPS arming temperature from 350 °F to 220 °F, which changes other plant-specific TSs. The proposed changes include the addition of the COPS arming temperature to the PTLR definitions section of the TS and a new section to the reporting requirements in the Administrative Controls section of the TSs delineating the necessary reports. Guidance on the proposed changes was developed by the NRC on the basis of a proposal by the owners groups during the development of the improved standard technical specifications. This guidance was provided to all power reactor licensees and applicants by GL 96-03.

Due to the nature of the changes proposed in the February 26 and April 28, 2004, applications the NRC staff decided to issue a combined amendment incorporating the revisions associated with both applications into a single amendment.

The supplemental letters dated July 8 and October 22, 2004, provided clarifying information that did not change the scope of the February 26, 2004, application nor the initial proposed no significant hazards consideration determination for the February 26, 2004, application. In addition, the supplemental letters dated July 8 and October 22, 2004, did not change the scope of the April 28, 2004, application nor its associated initial proposed no significant hazards consideration determination.

2.0 REGULATORY EVALUATION

Section 182a of the Atomic Energy Act (the Act) requires applicants for nuclear power plant operating licenses to include TS as part of the license. The Commission's regulatory requirements related to the content of TS are set forth in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36. That regulation requires that the TS include items in five specific categories: (1) safety limits, limiting safety system settings and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; and (5) administrative controls, and states also that the Commission may include such additional TS as it finds to be appropriate. However, the regulation does not specify the particular requirements to be included in a plant's TS.

The Commission has provided guidance for the contents of TS in its "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors" (Final Policy Statement), 58 FR 39132 (July 22, 1993), in which the Commission indicated that compliance with the Final Policy Statement satisfies Section 182a of the Act. In particular, the Commission indicated that certain items could be relocated from the TS to licensee-controlled documents, consistent with the standard enunciated in Portland General Electric Co. (Trojan Nuclear Plant), ALAB-531, 9 NRC 263, 273 (1979). In that case, the Atomic Safety and Licensing Appeal Board indicated that "technical specifications are to be reserved for those matters as to which the imposition of rigid conditions or limitations upon reactor operation is deemed necessary to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety."

Consistent with this approach, the Final Policy Statement identified four criteria to be used in determining whether a particular matter is required to be included in the TS, as follows: (1) installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary; (2) a process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of, or presents a challenge to, the integrity of a fission product barrier; (3) a structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of, or presents a challenge to, the integrity of a fission product barrier; or, (4) a structure, system, or component which operating experience or probabilistic safety assessment has shown to be significant to public health and safety.[1] As a result, existing TS requirements that fall within or satisfy any of the criteria in the Final Policy Statement must be

[1] The Commission promulgated a change to 10 CFR 50.36, which amends the rule to codify and incorporate these criteria. See Final Rule, "Technical Specifications," 60 FR 36953 (July 19, 1995).

retained in the TS, while those TS requirements that do not fall within or satisfy these criteria may be relocated to other licensee-controlled documents.

The NRC staff evaluates the acceptability of a facility's proposed pressure-temperature (P-T) limits and PTLRs based on the following regulations and guidance:

10 CFR 50.60(a) states:

> Except as provided in paragraph (b) of this section, all light-water nuclear power reactors, other than reactor facilities for which the certifications under §50.82(a)(1) have been submitted, must meet the fracture toughness and material surveillance program requirements for the reactor coolant program pressure boundary set forth in appendices G and H to this part.

Appendix H to 10 CFR Part 50, "Reactor Vessel Material Surveillance Requirements," establishes requirements related to facility reactor pressure vessel (RPV) material surveillance programs. Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence [Ref. 4]," describes methods and assumptions acceptable to the NRC staff for determining the pressure vessel neutron fluence. RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," contains methodologies for determining the increase in transition temperature resulting from neutron radiation.

Appendix G to 10 CFR Part 50, "Fracture Toughness Requirements," requires that facility P-T limit curves for the RPV be at least as conservative as those obtained by applying the methodology of Appendix G to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code). The 2001 Edition through the 2003 Addenda of the ASME Code is the most recent version of Appendix G to Section XI of the ASME Code to be endorsed in 10 CFR 50.55a, and therefore, by reference in 10 CFR Part 50, Appendix G. This edition of Appendix G to Section XI incorporates the provisions of ASME Code Cases N-588 and N-640. Additionally, Appendix G to 10 CFR Part 50 imposes minimum RPV flange temperatures when system pressure is at or above 20 percent of the preservice hydrostatic test pressure.

GL 92-01, Revision 1, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)," requested that licensees submit the RPV data for their plants to the NRC staff for review, and GL 92-01, Revision 1, Supplement 1, requested that licensees provide and assess data from other licensees that could affect their RPV integrity evaluations.

NUREG-0800, "Standard Review Plan [SRP]," Section 5.3.2, "Pressure-Temperature Limits," provides guidance on using these regulations and documents in the NRC staff's review. Additionally, Section 5.3.2 provides guidance to the NRC staff in performing check calculations of the licensee's submittal.

GL 96-03 addresses the technical information necessary for a licensee's implementation of a PTLR. GL 96-03 establishes the information that must be included in: (1) an acceptable PTLR methodology (which will be used to develop the PTLR) and, (2) the information that must be included within the PTLR itself. These information requirements are principally addressed in a table contained in GL 96-03, Attachment 1, "Requirements for Methodology and PTLR," and are subdivided into seven technical elements that are numbered by rows in the table. GL 96-03

also addresses the appropriate modifications to the administrative controls section of a facility's TS that are necessary to implement a PTLR. Technical Specification Task Force Change Traveler 419 provides guidance on an alternative set of facility TS administrative control section changes that may be made to implement a PTLR.

The regulatory requirements for RPV fluence calculations are specified in General Design Criteria (GDCs) 30 and 31 (Ref. 3). In March 2001, the NRC staff issued RG 1.190, which described an acceptable method for conducting the RPV fluence calculations and satisfy the requirements of GDCs 30 and 31. Fluence calculations are acceptable if they are done with NRC-approved methodologies that satisfy GDC 30s and 31 or with methods that are shown to conform to the guidance in RG 1.190.

Review requirements for the heat injection and mass injection transients for the determination of the COPS setpoint enable temperature limits are in the SRP Section 5.2.2, subject to GDCs 15 and 31.

3.0 TECHNICAL EVALUATION

3.1 Licensee Evaluation

Implementation of PTLRs

By letters dated February 26 and October 22, 2004, SNC provided the following information:

(1) a license amendment request including proposed TS Section 5.6.6 for Vogtle, Units 1 and 2 that identifies the documents which fully describe the PTLR methodology for the units, and

(2) the proposed Vogtle, Units 1 and 2 PTLRs that indicate the results obtained from the licensee's proposed PTLR methodology.

The proposed Vogtle, Units 1 and 2 PTLRs were submitted as attachments to the licensee's February 26, 2004, letter.

The proposed TS 5.6.6 included in the February 26, 2004, license amendment request (item (1) above) included a list of documents comprising the licensee's complete PTLR methodology for Vogtle, Units 1 and 2. The documents referenced in the February 26, 2004, letter were: (a) Westinghouse Topical Report WCAP-14040-NP-A, Revision 4, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves," and (b) Westinghouse Topical Report WCAP-16142-P, Revision 1, "Reactor Vessel Closure Head/Vessel Flange Requirements Evaluation for Vogtle, Units 1 and 2." These documents will be referred to as "Reference (a)" and "Reference (b)" in the remainder of this Safety Evaluation (SE).

Regarding item (2), SNC submitted the proposed Vogtle, Unit 1 PTLR, "Southern Nuclear Company Vogtle, Unit 1 Pressure Temperature Limits Report Revision 2, February 2004," and the proposed Vogtle, Unit 2 PTLR, "Southern Nuclear Company Vogtle, Unit 2 Pressure Temperature Limits Report Revision 2, February 2004," as attachments to the licensee's February 26, 2004, letter. SNC's application dated April 28, 2004, modified the proposed PTLR

to reflect the relocation of the COPS arming temperature to the PTLR.

Detailed Information Regarding P-T Limits and Their Underlying Methodology

The licensee's adjusted reference temperature (ART) values and P-T limit curves valid for up to 36 effective full power years (EFPY) of facility operation, documented in the PTLRs, were based on information from Westinghouse Commerical Atomic Power (WCAP)-15068, Revision 3, "Vogtle Electric Generating Plant Unit 1 Heatup and Cooldown Limit Curves for Normal Operation," and WCAP-15161, Revision 3, "Vogtle Electric Generating Plant Unit 2 Heatup and Cooldown Limit Curves for Normal Operation." These two WCAPs are plant-specific reports based on References (a) and (b) and are attached to the February 26, 2004, letter. The licensee identified the limiting material for the Vogtle, Unit 1 RPV as intermediate shell plate B8805-2, fabricated from plate heat C-0613-2; and for the Vogtle, Unit 2 RPV as lower shell plate R8-1, fabricated from plate heat C-4304-1. The licensee calculated the ART values for the limiting material for both the one-quarter of the RPV wall thickness (1/4t) and three-quarter of the RPV wall thickness (3/4t) locations. The key parameters for the licensee's ART determination for each of these locations are shown in the table below for both units.

Unit	Limiting Material	Location	Initial RT_{NDT} (EF)	Fluence (n/cm^2)	Chemistry Factor [1] (EF)	ΔRT_{NDT} (EF)	Margin [2] (EF)	ART (EF)
1	Intermediate Shell Plate B8805-2	1/4 t	20	1.25×10^{19}	53.1	56.3	34 ($\sigma_I = 0$, $\sigma_\Delta = 17$)	110
1	Intermediate Shell Plate B8805-2	3/4 t	20	0.442×10^{19}	53.1	41.0	34 ($\sigma_I = 0$, $\sigma_\Delta = 17$)	95
2	Lower Shell Plate R8-1	1/4 t	40	1.20×10^{19}	44.0	46.2	34 ($\sigma_I = 0$, $\sigma_\Delta = 17$)	120
2	Lower Shell Plate R8-1	3/4 t	40	0.426×10^{19}	44.0	33.6	33.6 ($\sigma_I = 0$, $\sigma_\Delta = 16.8$)	107

[1] The chemistry factor for each plate was determined from the chemistry factor table using RG 1.99, Revision 2 Position 1.1.

[2] The margin term for each ART calculation was based on the establishment of initial material property uncertainty (σ_I) and shift in material property uncertainty (σ_Δ) consistent with the guidance in RG 1.99, Revision 2.

The two WCAPs documented the detailed thermal and fracture mechanics evaluations to establish the proposed Vogtle, Units 1 and 2 P-T limits. The RPV coolant temperature, metal temperature, and the applied thermal stress intensity factors (K_{It}) at the tip of the postulated flaw at the 1/4t location for the 100 EF cooldown transient and at the 3/4t location for the 100 EF heatup transient are presented in Appendix A of each WCAP. Based on the applied K_{It} values and the plane-strain fracture toughness (K_{Ic}) values at the crack tip, the WCAPs calculated the corresponding applied pressure stress intensity factors (K_{Ip}) at the tip of the postulated flaw at the 1/4t and 3/4t locations and subsequently the allowable pressure.

The proposed P-T limit methodology, as applied to RPV beltline materials, is in accordance with Appendix G of Section XI of the ASME Code. The proposed methodology, as applied to RPV closure flange materials, is based on Reference (b).

3.2 NRC Staff Evaluation

3.2.1 Review of Proposed PTLR

The proposed PTLRs for Vogtle, Units 1 and 2 were reviewed by the NRC staff against the criteria in GL 96-03. As noted in Section 2.0, the technical elements from the table in Attachment 1 to GL 96-03, "Requirements for Methodology and PTLR," were used to review the licensee's submittal to determine whether adequate information had been included within: (1) the PTLR methodology (which will be used to develop the proposed PTLRs) and (2) the proposed PTLRs themselves. The review topics are addressed in Sections 3.2.1.1 through Section 3.2.1.7 of this SE. The detailed information regarding P-T limits and the underlying methodology were reviewed by the NRC staff against the remaining rules and regulations mentioned in Section 2.0. This topic is addressed in Section 3.2.2 of this SE.

3.2.1.1 Vessel Fluence Methodology

The fluence methodology and analysis for Vogtle, Units 1 and 2 is documented in WCAP-15067 and WCAP-15259, respectively (Refs. 6 and 7). The neutron fluence calculations were carried out using the DORT code in forward and adjoined formulations in (r, θ) and (r, z) geometries. The anisotropic scattering was treated with a P_3 approximation and the angular discretization with an S_8 quadrature. Cross sections were derived from the ENDF/B-VI data file, which is the recommended data file in RG 1.190. The neutron source distribution accounted for spectral changes. References 6 and 7 adhere to the guidance in RG 1.190 regarding the calculated fluence value and are, therefore, acceptable.

In Attachment 11 of its February 26, 2004, letter, the licensee presented the P-T curves for 26 and 36 EFPYs for Vogtle, Units 1 and 2, respectively. The curves were contained in WCAP-15068 (Ref. 8) and WCAP-15161 (Ref. 9). The material properties for 26 EFPYs were calculated assuming peak inside surface vessel neutron fluence values of 1.52×10^{19} and 1.46×10^{19} n/cm^2 (E$1.0 MeV) for Vogtle, Units 1 and 2, respectively. Neither reference 6 nor 7 lists 26 EFPY neutron fluence values. However, interpolation between 16 and 32 EFPYs for Vogtle, Unit 1 and 16 and 36 for Vogtle, Unit 2 shows that the 26 EFPY values are bounding for both units. For 36 EFPYs, the 2.09×10^{19} and 2.01×10^{19} n/cm^2 (E$1.0 MeV) values were calculated directly for both units. Therefore, the NRC staff finds the neutron fluence values to be acceptable.

3.2.1.2 Reactor Vessel Material Surveillance Program

Concerning the licensee's reactor vessel material surveillance program, GL 96-03 states that, at a minimum, a licensee's PTLR methodology shall:

> Briefly describe the surveillance program. Licensee transmittal letter should identify by title and number report containing the Reactor Vessel Surveillance

> Program and surveillance capsule reports.

The NRC staff concluded in its SE on WCAP-14040, Revision 3, dated February 27, 2004, that:

> The provisions of the methodology described in WCAP-14040, Revision 3, do not specify how the plant-specific RPV surveillance programs should be maintained in order to be in compliance with Appendix H to 10 CFR Part 50. Licensees who wish to use WCAP-14040, Revision 3, as their PTLR methodology must submit additional information to address the methodology requirements discussed in provision 2 in the table of Attachment 1 to GL 96-03 related to the RPV material surveillance program.

WCAP-14040, Revision 4 did not address this NRC staff comment either. SNC, however, included required plant-specific information regarding the Vogtle, Units 1 and 2 RPV material surveillance programs in its PTLRs. This information addresses the RPV material surveillance program technical element specified in GL 96-03. Hence, the NRC staff concludes that this criterion is satisfied.

GL 96-03 also states that, at a minimum, a licensee's PTLR shall:

> Provide the surveillance capsule withdrawal schedule, or reference by title and number the documents in which the schedule is located. Reference the surveillance capsule reports by title and number if ARTs are calculated using surveillance data.

The NRC reviewed the proposed Vogtle, Units 1 and 2 PTLRs and found that SNC had referenced all of the surveillance capsule reports that provided information relevant to the calculation of Vogtle, Units 1 and 2 RPV material ARTs in Section 6.0 of the proposed PTLRs. Hence, the NRC staff concludes that this criteria is satisfied.

3.2.1.3 COPS Setpoints

The setpoints have been revised as required by the recalculation of the P-T curves. The NRC staff reviewed the revised setpoints against the revised P-T curves and finds that they are acceptable.

The licensee proposed to change Limiting Condition for Operations (LCO) 3.4.12b in TS 3.4.12, "Cold Overpressure Protection System," to resize the RCS vent area to 1.5 square inches (in^2). No particular reason for the vent resizing request was given in the submittal nor any calculations justifying that the 1.5 in^2 vent would provide adequate depressurization capability. However, the licensee in response to a request for additional information presented a calculation that shows that the 1.5 in^2 orifice is able to depressurize under conditions of cold overpressurization (Reference 2, Attachment 4). Therefore, the NRC staff finds the request acceptable.

3.2.1.4 Calculation of RPV Material ARTs

Concerning the licensee's calculation of RPV material ARTs, GL 96-03 states that, at a minimum, a licensee's PTLR methodology shall:

> Describe the method for calculating the ART using Regulatory Guide 1.99, Revision 2.

The NRC staff concluded in its February 27, 2004, SE concerning WCAP-14040, Revision 3 that Reference (a) was adequate to meet the minimum requirements for a licensee's PTLR methodology for this technical element. Since SNC includes Reference (a) in its PTLR methodology, the NRC staff concludes that this criterion is satisfied.

GL 96-03 also states that, at a minimum, a licensee's PTLR shall:

> Identify both the limiting ART values and limiting materials at the 1/4t and 3/4t locations...PWRs - identify RT_{PTS} value in accordance with 10 CFR 50.61.

The required information was provided in Section 5.0 of the proposed PTLRs. Hence, the NRC staff concludes that this criterion is satisfied.

3.2.1.5 Calculation of P-T Limit Curves Based on Limiting Material ART values

Concerning the licensee's calculation of P-T limit curves based on limiting material ART values, GL 96-03 states that, at a minimum, a licensee's PTLR methodology shall:

> Describe the application of fracture mechanics in constructing P-T curves based on ASME Code, Appendix G, Section XI, and SRP Section 5.3.2.

In the February 27, 2004, SE on WCAP-14040, Revision 3, the NRC staff concluded that the basic methodology specified in WCAP-14040, Revision 3 for establishing P-T limit curves meets the regulatory requirements of Appendix G to 10 CFR Part 50 and the guidance provided in SRP Section 5.3.2. However, the NRC staff has concluded that the discussion provided in WCAP-14040, Revision 3 regarding the use of optional guidelines for the development of P-T limit curves, including the use of ASME Code Cases N-588, N-640, and N-641, is not correct. The NRC staff has concluded that licensees do not need to obtain exemptions to use the provisions of ASME Code Case N-588, N-640, or N-641, because the provisions of N-588, N-640, and N-641 have been incorporated into the ASME Code in the 2003 Addenda version of ASME Section XI, Appendix G, endorsed in 10 CFR 50.55a.

WCAP-14040, Revision 4 addressed this NRC staff comment by deleting the sentences stating the need for exemption when ASME Code Case N-640 or N-588 is used in the P-T limit methodology. In addition, SNC's amendment request did not provide an exemption request for the use of ASME Code Case N-640 in its PTLR methodology. Hence, the NRC staff concludes that this criterion is satisfied.

GL 96-03 also states that, at a minimum, a licensee's PTLR shall:

> Provide the P-T limit curves for heatup, cooldown, criticality, and hydrostatic and leak tests.

In Section 2.0 of the licensee's proposed PTLRs, Figures 2-1 and 2-2 provide P-T limit curves applicable to heatup and cooldown of the RPV, criticality, and hydrostatic and leak tests, that were developed using the licensee's proposed PTLR methodology. These P-T limit curves were reviewed and found to be acceptable by the NRC staff in that they comply with the requirements specified in 10 CFR Part 50, Appendix G. Hence, the NRC staff concludes that this criterion is satisfied.

3.2.1.6 P-T Limit Curve Minimum Temperature Requirements

Concerning the licensee's incorporation of P-T limit curve minimum temperature requirements as specified by Appendix G to 10 CFR Part 50, GL 96-03 states that, at a minimum, a licensee's PTLR methodology shall:

> Describe how the minimum temperature requirements in Appendix G to 10 CFR Part 50 are applied to P-T curves.

The NRC staff concluded in its February 27, 2004, SE concerning Reference (a) that WCAP-14040, Revision 3 was adequate to meet the minimum requirements for licensee's PTLR methodology for this technical element. However, by letter dated February 26, 2004, SNC requested that Vogtle, Units 1 and 2 be exempted from the minimum temperature requirements related to RPV closure flange region material properties (see footnote 2 to Table 1 in 10 CFR Part 50, Appendix G) based on the technical information provided in Reference (b). Enclosure 4 to the letter forwarding the NRC staff's finding on the requested amendment contains the NRC staff evaluation and approval of the SNC exemption request for Vogtle, Units 1 and 2 and the use of an alternative minimum temperature requirements based on the information provided in Reference (b). Therefore, the NRC staff concludes that the minimum temperature requirements specified in Reference (a), as modified by Reference (b), meet the minimum requirements for a licensee's PTLR methodology for this technical element. Hence, the NRC staff concludes that this criterion is satisfied.

GL 96-03 also states that, at a minimum, a licensee's PTLR shall:

> Identify minimum temperatures on the P-T curves such as minimum boltup temperature and hydrotest temperature.

In Section 2.0 of the licensee's proposed PTLRs, Figures 2-1 and 2-2 provide P-T limit curves that include the minimum temperature requirements specified in 10 CFR Part 50, Appendix G, as modified by the SNC exemption request discussed above. The NRC staff reviewed the minimum temperature requirements incorporated into the Vogtle, Units 1 and 2 PTLR Figures 2-1 and 2-2 and found them to be acceptable in that they comply with the requirements specified in 10 CFR Part 50, Appendix G, as exempted. Hence, the NRC staff concludes that this criterion is satisfied.

3.2.1.7 Evaluation and Use of RPV Surveillance Data

Concerning the licensee's evaluation and use of RPV surveillance data, GL 96-03 states that, at

a minimum, a licensee's PTLR methodology shall:

> Describe how the data from multiple surveillance capsules are used in the ART calculation. Describe procedure if measured value exceeds predicted value.

In the NRC staff's February 27, 2004, SE on WCAP-14040, Revision 3, it was stated that:

> Requirement 2 of Section 2.4 of WCAP-14040, Revision 3, addresses the determination of changes in material properties due to irradiation. This information includes a description of how surveillance capsule test results may be used to calculate RPV material properties in a manner which is consistent with Section C.2.1 of RG 1.99, Revision 2, and other NRC staff guidance.
>
> The NRC staff has reviewed the information in Section 2.4 of the TR [topical report] and determined that it is consistent with NRC staff guidance, including RG 1.99, Revision 2, and is, therefore, acceptable.

Hence, based on SNC's incorporation of Reference (a) into the proposed Vogtle, Units 1 and 2 PTLR methodology, the NRC staff concludes that this criterion is satisfied.

GL 96-03 also states that, at a minimum, a licensee's PTLR shall:

> Provide supplemental data and calculations of the chemistry factor in the PTLR if the surveillance data are used in the ART calculation. Evaluate the surveillance data to determine if they meet the credibility criteria in Regulatory Guide 1.99, Revision 2. Provide the results.

In Section 5.0 of the licensee's proposed PTLRs, Table 5-2 provides an evaluation of the RPV surveillance data relevant to Vogtle, Units 1 and 2 to determine if the data meets the credibility criteria in RG 1.99, Revision 2 and the results of this evaluation. The NRC staff reviewed the information provided in Table 5-2 of the Vogtle, Units 1 and 2 PTLRs and found that it accurately reflected an assessment of the Vogtle, Units 1 and 2 RPV surveillance data that was consistent with RG 1.99, Revision 2. Hence, the NRC staff concludes that this criterion is satisfied.

3.2.1.8 PTLR Evaluation Summary

Based on the NRC staff's review of the information provided in SNC's February 26, 2004, application, as supplemented by letters dated July 8 and October 22, 2004, responses to requests for additional information, the NRC staff concludes the following:

(a) SNC has defined an acceptable PTLR methodology that is consistent with the regulatory requirements given in Section 2.0 of this SE. This acceptable methodology is documented in References (a) and (b) as stated in Section 3.1 of this SE.

(b) SNC provided as an attachment to its February 26, 2004, letter, proposed PTLRs for Vogtle, Units 1 and 2. On April 28, 2004, the licensee revised the PTLR to reflect the incorporation of the COPS arming temperature changes also approved as part of this amendment. The PTLRs contain information consistent with NRC regulatory

requirements and are acceptable for incorporation into the Vogtle, Units 1 and 2 licensing bases.

(c) SNC provided as an attachment to its February 26, 2004, letter WCAP-15068, Revision 3 and WCAP-15161, Revision 3, that contain the proposed P-T limits for Vogtle, Units 1 and 2 and detailed information regarding its underlying P-T limits methodology based on WCAP-14040-A, Revision 4. The NRC staff concludes that the proposed P-T limits and the underlying methodology satisfy the requirements in Appendix G to 10 CFR Part 50 and Appendix G to Section XI of the ASME Code. Therefore, the proposed P-T limits are approved for incorporation into the Vogtle, Units 1 and 2 TS and PTLRs for 36 EFPY of facility operation.

3.2.2 Evaluation of the detailed information regarding P-T limits and the underlying methodology

The detailed information regarding P-T limits and the underlying methodology are documented in WCAP-15068, Revision 3 for Vogtle, Unit 1 and WCAP-15161, Revision 3 for Vogtle, Unit 2. These WCAP reports are considered plant-specific application reports of WCAP-14040-NP-A, Revision 4, as modified by the licensee's February 26, 2004, exemption request.

The evaluation of the embrittlement of the RPV beltline materials relies on a neutron fluence prediction acceptable to the NRC staff. Issues related to RPV neutron fluence calculation and determination of acceptable COPS settings were reviewed by the NRC staff and documented in Sections 3.2.1.1 and 3.2.1.3 of this SE.

To evaluate the proposed P-T limits for Vogtle, Units 1 and 2, the NRC staff performed an independent calculation of the ART values to determine the limiting material of each Vogtle RPV using the methodology in RG 1.99, Revision 2. Based on these calculations, the NRC staff verified that the limiting materials for the RPVs are the intermediate shell plate B8805-2 for Vogtle, Unit 1 and the lower shell plate R8-1 for Vogtle, Unit 2. The NRC staff's ART values for the limiting materials at the 1/4t and 3/4t locations are calculated using materials information for Vogtle, Units 1 and 2 in the NRC Reactor Vessel Integrity Database. The ART values calculated by the NRC staff agree with the licensee's calculated values.

The NRC staff then evaluated the licensee's P-T limit curves for acceptability by performing independent calculations using the methodology referenced in Appendix G to the ASME Code (as indicated by SRP 5.3.2) based on information submitted by the licensee. The licensee stated that the proposed P-T limits were based on ASME Code Case N-640 that permits the use of the K_{IC} curve instead of the crack arrest fracture toughness (K_{Ia}) curve for RPV materials in the P-T limit calculations. As discussed in Section 2.0 of this SE, the 2001 Edition through the 2003 Addenda of the ASME Code, endorsed in 10 CFR 50.55a, has incorporated the provisions of ASME Code Cases N-588 and N-640. Therefore, the use of the K_{Ic} curve is now in accordance with the ASME Code. Appendix G permits two approaches to calculate K_{It}: use of the bounding K_{It} formulas based on heatup and cooldown rates, or use of the K_{It} formulas based on the thermal stress distribution from a thermal model (e.g., a finite element model) for heatup and cooldown. The Vogtle site-specific WCAPs used the latter approach and provided RPV coolant temperature, metal temperature, and the applied K_{It} values at the tip of the postulated flaw at the 1/4t location during cooldown and at the 3/4t location during heatup.

The revised PTLRs for each Vogtle unit were provided as an enclosure to the February 26, 2004, submittal and were updated to reflect the licensee's application dated April 28, 2004. The PTLRs were prepared as required by TS 5.6.6 and include the statement that a copy of the final versions will be submitted to the NRC staff. The final version will include modifications in response to the NRC staff's request for additional information including listing WCAP-15067 and WCAP-15159 along with WCAP-14040A in the PTLR to completely describe the vessel fluence methodology (see Ref. 2, item 2). The NRC staff finds the proposed revision of the PTLRs are acceptable because they were prepared in accordance with TS 5.6.6 and satisfy the requirements of GL 96-03.

Based on this information, the NRC staff verified that the licensee's proposed P-T limits satisfy the requirements of Appendix G to 10 CFR Part 50, except for the minimum temperature requirements related to RPV closure flange considerations, as specified in footnote 2 to Table 1 in 10 CFR Part 50, Appendix G. The Appendix G closure flange requirements and the requested exemption are discussed in Section 3.2.1.6 of this SE. The NRC staff's exemption for the requirements of footnote 2 to Table 1 in 10 CFR Part 50, Appendix G is contained in an attachment to this amendment. In conclusion, the NRC staff concludes that the licensee's proposed P-T limit curves are acceptable for operation of the Vogtle, Units 1 and 2 RPVs for 36 EFPY. The NRC staff also considers the 26 EFPY P-T limit curves acceptable because the licensee used the same methodology to construct the curves, along with acceptable neutron fluence values.

3.2.3 COPS Arming Temperature Relocation to the PTLR

All components of the RCS are designed to withstand the effects of cyclic loads resulting from system pressure and temperature changes. These loads are introduced by heatup and cooldown operations, power transients, and reactor trips. In accordance with Appendix G to 10 CFR Part 50, TS limit the pressure and temperature changes during RCS heatup and cooldown within the design assumptions and the stress limits for cyclic operation. These limits are defined by P-T limit curves for heatup, cooldown, COPS, and inservice leak and hydrostatic testing. Each curve defines an acceptable region for normal operation. The curves are used for operational guidance during heatup and cooldown maneuvering, when pressure and temperature indications are monitored and compared to the applicable curve to determine that operation is within the allowable region.

The COPS controls RCS pressure at low temperatures so that the integrity of the reactor coolant pressure boundary is not compromised by violating 10 CFR Part 50, Appendix G limits. The COPS setpoints are reevaluated each time the P-T limit curves are revised to ensure that the COPS meets its intended function.

The licensee proposed changes to the TS are in accordance with the guidance in GL 96-03, as follows:

(1) The definitions section of the TS was modified to include a definition of the PTLR to which the figures, values, and parameters for P-T and COPS setpoints will be relocated on a unit-specific basis in accordance with the methodology approved by the NRC that maintains the acceptance limits and the limits of the safety analysis. The approved methodology, discussed in NL-03-2177 is consistent with WCAP-14040-A, Revision 4,

"Methodology Used to Develop Cold Overpressure Protection Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves," as modified by the licensee's February 26, 2004, exemption request. The COPS arming temperature, lowered to 220 ^{o}F from 350 ^{o}F, was determined utilizing WCAP-14040-A, Revision 4, and the Applicability of the LCOs have been modified accordingly. As noted in the definition, plant operation within these limits is addressed by individual specifications.

(2) The following specifications were revised to replace the P-T limits and COPS setpoints with a reference to the PTLR that provides these limits:

3.4.6 RCS Loops - MODE4
3.4.10 Pressurizer Safety Valves
3.4.12 Cold Overpressure Protection System
3.5.2 ECCS - Operating

(3) Specification 5.6.6, "Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)," was added to the reporting requirements of the administrative controls section of the TS. This specification requires that the PTLR be submitted, upon issuance, to the NRC Document Control Desk with copies to the regional administrator and resident inspector. The report provides the explanations, figures, values, and parameters of the P-T limits and COPS setpoints for the applicable effective period. Furthermore, this specification requires that the figures, values, and parameters be established using the methodology approved by the NRC for this purpose in WCAP-14040-A, Revision 4, as modified by the licensee's February 26, 2004, exemption request, and be consistent with all the applicable acceptance limits and the limits of the safety analysis.

Finally, the specification requires that all changes in values of these limits be documented in the PTLR each effective period and submitted upon issuance to the NRC.

Relocation of the P-T limit curves and COPS setpoints does not eliminate the requirement to operate in accordance with the limits specified in Appendix G to 10 CFR Part 50. The requirement to operate within the limits in the PTLR is specified in, and controlled by, the TS. Only the figures, values, and parameters associated with the P-T limits and COPS setpoints are to be relocated to the PTLR. In order for the curves and setpoints to be relocated to a PTLR, a methodology for their development must be reviewed and approved in advance by the NRC. The methodology to be approved by the NRC is to be developed in accordance with GL 96-03. This generic letter delineates the requirements for both the methodology and the PTLR including, but not limited to, the requirements of Appendix G to 10 CFR Part 50. The PTLR review process requires that changes to the methodology be approved by the NRC. Further, when changes are made to the figures, values, and parameters contained in the PTLR, the PTLR is to be updated and submitted to the NRC upon issuance. The NRC staff reviewed and approved the licensee's PTLR and PTLR methodology in Sections 3.2.1 and 3.2.2 of this SE.

Modifications to TS Section 5.6.6c allows the licensee to make changes to the PTLR using NRC-approved methodologies under the provisions of 10 CFR 50.59. The proposed TS

revision lists WCAP-14040A (Ref.10) and has an additional general reference stating that the PTLR will contain a complete identification for each of the TS-referenced topical reports used to prepare the PTLR. The NRC staff concludes that this satisfies the requirement in GL 96-03, Condition 1, to describe the neutron fluence calculational methodology in the PTLR.

On this basis, the NRC staff concludes that the licensee provided an acceptable means of establishing and maintaining the detailed values of the P-T limit curves and COPS setpoints. Further, because plant operation continues to be limited in accordance with the requirements of Appendix G to 10 CFR Part 50, the requirements for P-T limits and COPS setpoints will be retained in the TS, and the actual setpoints will be established using a methodology approved by the NRC and located in the PTLR, the changes will not impact safety.

The NRC staff also concludes that the relocated numeric requirements discussed above relating to the P-T limits and COPS setpoints are not required to be in the TS under 10 CFR 50.36 or Section 182a of the Atomic Energy Act and are not required to obviate the possibility of an abnormal condition or event giving rise to an immediate threat to public health and safety. Accordingly, the NRC staff concludes that the proposed changes are acceptable and that these requirements may be relocated from the TS to the PTLR.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Georgia State official was notified of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change requirements with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and change surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued proposed findings that the amendments involve no significant hazards consideration, and there has been no public comment on such findings (69 FR 19575 and 69 FR 34707). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

7.0 REFERENCES

1. Letter from J. Gasser, Southern Nuclear Operating Company Incorporated to US NRC "Request to Revise Technical Specifications and Pressure and Temperature Limits Report," dated February 26, 2004.

2. Letter from J. Gasser, Southern Nuclear Operating Company Incorporated to US NRC "Response to Request for Additional Information Regarding Request to Revise Technical Specifications and Pressure and Temperature limits Report," dated July 8, 2004.

3. Appendix A to 10 CFR 50, General Design Criterion 30, "Quality of Reactor Coolant Pressure Boundary," and General Design Criterion 31, "Fracture Prevention of Reactor Coolant Pressure Boundary."

4. Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," US Nuclear Regulatory Commission, March, 2001.

5. Generic Letter 96-03, "Relocation of the Pressure and Temperature Limit Curves and Low Temperature Overpressure Protection System Limits," US Nuclear Regulatory Commission, January 31, 1996.

6. WCAP-15067, "Analysis of Capsule V from Souther Nuclear Vogtle Electric Generating Plant Unit 1 Reactor Vessel Radiation Surveillance Program," Westinghouse Electric Company, September 1998.

7. WCAP-15159, "Analysis of Capsule X from Vogtle Electric Generating Plant Unit 2 Reactor Vessel Radiation Surveillance Program," Westinghouse Electric Company, March 1999.

8. WCAP-15068, Revision 3, "Vogle Electric Generating Plant Unit 1, Heatup and Cooldown Limit Curves for Normal Operation," Westinghouse Electric Company LLC, February 2004.

9. WCAP-15161, Revision 3, "Vogle Electric Generating Plant Unit 2, Heatup and Cooldown Limit Curves for Normal Operation," Westinghouse Electric Company LLC, February 2004.

10. WCAP-14040A, Revision 4, “Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves,” J.D. Andrachek, et al, Westinghouse Electric Company LLC, May 2004.

Principal Contributor: S. Sheng
L. Lois
T. Tjader

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