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

August 4, 2016

Mr. C. R. Pierce
Regulatory Affairs Director
Southern Nuclear Operating Company, Inc.
P.O. Box 1295 / Bin 038
Birmingham, AL 35201-1295

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2, AND VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 – ISSUANCE OF AMENDMENTS REGARDING USE OF OPTIMIZED ZIRLO™ (CAC NOS. MF7480, MF7481, MF7482, AND MF7483)

Dear Mr. Pierce:

The U.S. Nuclear Regulatory Commission (NRC or the Commission) has issued the enclosed Amendment No. 204 to the Joseph M. Farley Nuclear Plant (FNP) Unit 1, Renewed Facility Operating License No. NPF-2; Amendment No. 200 to FNP, Unit 2, Renewed Facility Operating License No. NPF-8; Amendment No. 182 to the Vogtle Electric Generating Plant (VEGP), Unit 1, Renewed Facility Operating License No. NPF-68; and Amendment No. 163 to VEGP, Unit 2, Renewed Facility Operating License No. NPF-81. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated March 16, 2016.

The amendments revise TS 4.2.1, "Fuel Assemblies," and TS 5.6.5.b, "Core Operating Limits Report (COLR)," which will allow the use of Optimized ZIRLO™ fuel cladding material in both FNP, Units 1 and 2, and VEGP, Units 1 and 2. Additionally, the amendments modify TS 5.6.5.b to add associated methodologies for determining the limits in the COLR. These amendments are also supported by an exemption from certain requirements of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," and 10 CFR 50, Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," for FNP and VEGP. The NRC has addressed the requested exemption in separate correspondence (Agencywide Documents Access and Management System Accession No. ML16179A410).

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

Sincerely,

Robert Martin

Robert Martin, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-348, 50-364, 50-424,
and 50-425

Enclosures:
1. Amendment No. 204 to NPF-2
2. Amendment No. 200 to NPF-8
3. Amendment No. 182 to NPF-68
4. Amendment No. 163 to NPF-81
5. Safety Evaluation

cc w/enclosures: Distribution via Listserv

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

SOUTHERN NUCLEAR OPERATING COMPANY

ALABAMA POWER COMPANY

DOCKET NO. 50-348

JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 204
Renewed License No. NPF-2

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

   A. The application for amendment to the Joseph M. Farley Nuclear Plant, Unit 1, Renewed Facility Operating License No. NPF-2, filed by Southern Nuclear Operating Company, Inc. (the licensee), dated March 16, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations 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;

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

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 204, are hereby incorporated in the renewed facility operating license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

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

Robert Martin
for Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to License No. NPF-2
and Technical Specifications

Date of Issuance: August 4, 2016

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

SOUTHERN NUCLEAR OPERATING COMPANY

ALABAMA POWER COMPANY

DOCKET NO. 50-364

JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 200
Renewed License No. NPF-8

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

   A. The application for amendment to the Joseph M. Farley Nuclear Plant, Unit 2, Renewed Facility Operating License No. NPF-8, filed by Southern Nuclear Operating Company, Inc. (the licensee), dated March 16, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations 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;

   D. The issuance of this license 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 amended by changes to the Technical Specifications, as indicated in the attachment to this license amendment; and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-8 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 200, are hereby incorporated in the renewed facility operating license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

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

Robert Martin for
Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to License No. NPF-8
and Technical Specifications

Date of Issuance: August 4, 2016

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

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA

CITY OF DALTON, GEORGIA

DOCKET NO. 50-424

VOGTLE ELECTRIC GENERATING PLANT, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 182
Renewed License No. NPF-68

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

   A. The application for amendment to the Vogtle Electric Generating Plant, Unit 1 (the facility) Renewed 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 March 16, 2016, complies 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 Renewed Facility Operating License No. NPF-68 is hereby amended to read as follows:

   C. Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 182, 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 from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Shawn Williams for

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to License No. NPF-68
and Technical Specifications

Date of Issuance: August 4, 2016

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

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA

CITY OF DALTON, GEORGIA

DOCKET NO. 50-425

VOGTLE ELECTRIC GENERATING PLANT, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 163
Renewed License No. NPF-81

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

   A. The application for amendment to the Vogtle Electric Generating Plant, Unit 2 (the facility) Renewed Facility Operating License No. NPF-81 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 March 16, 2016, complies 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 Renewed Facility Operating License No. NPF-81 is hereby amended to read as follows:

   C. Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 163, 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 from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Shawn Williams for

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to License No. NPF-81
and Technical Specifications

Date of Issuance: August 4, 2016

ATTACHMENT TO

JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2

LICENSE AMENDMENT NO. 204

RENEWED FACILITY OPERATING LICENSE NO. NPF-2

DOCKET NO. 50-348

AND LICENSE AMENDMENT NO. 200

RENEWED FACILITY OPERATING LICENSE NO. NPF-8

DOCKET NO. 50-364

Replace the following pages of the Renewed Facility Operating Licenses and Appendix "A" Technical Specifications (TSs) with the enclosed pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
License	License
NPF-2, page 4	NPF-2, page 4
NPF-8, page 3	NPF-8, page 3
TSs	TSs
4.0-1	4.0-1
5.6-4	5.6-4

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 204, are hereby incorporated in the renewed license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

(3) Additional Conditions

The matters specified in the following conditions shall be completed to the satisfaction of the Commission within the stated time periods following the Issuance of the renewed license or within the operational restrictions indicated. The removal of these conditions shall be made by an amendment to the renewed license supported by a favorable evaluation by the Commission.

a. Southern Nuclear shall not operate the reactor in Operational Modes 1 and 2 with less than three reactor coolant pumps in operation.

b. Deleted per Amendment 13

c. Deleted per Amendment 2

d. Deleted per Amendment 2

e. Deleted per Amendment 152

Deleted per Amendment 2

f. Deleted per Amendment 158

g. Southern Nuclear shall maintain a secondary water chemistry monitoring program to inhibit steam generator tube degradation. This program shall include:

1) Identification of a sampling schedule for the critical parameters and control points for these parameters;

2) Identification of the procedures used to quantify parameters that are critical to control points;

3) Identification of process sampling points;

4) A procedure for the recording and management of data;

5) Procedures defining corrective actions for off control point chemistry conditions; and

(2) Alabama Power Company, pursuant to Section 103 of the Act and 10 CFR Part 50, "Licensing of Production and Utilization Facilities," to possess but not operate the facility at the designated location in Houston County, Alabama in accordance with the procedures and limitations set forth in this renewed license.

(3) Southern Nuclear, pursuant to the Act and 10 CFR Part 70, to receive, possess and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as supplemented and amended;

(4) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(5) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required any byproducts, source or special nuclear material without restriction to chemical or physical form for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(6) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporate below:

(1) Maximum Power Level

Southern Nuclear is authorized to operate the facility at reactor core power levels not in excess of 2775 megawatts thermal.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 200, are hereby incorporated in the renewed license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

(3) Delete per Amendment 144

(4) Delete Per Amendment 149

(5) Delete per Amend 144

4.0 DESIGN FEATURES

4.1 Site Location

The site is located in southeast Alabama on the west side of the Chattahoochee River about 6 miles north of the intersection of U.S. Highway No. 84 and State Highway No. 95. It is in the northeastern section of Houston County, Alabama, and about 180 miles south-southwest of Atlanta, Georgia.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 157 fuel assemblies. Each assembly shall consist of a matrix of zirconium alloy, zircaloy-4, ZIRLO®, or Optimized ZIRLO™ fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium alloy, zircaloy-4, ZIRLO, or stainless steel filler rods for fuel rods, in accordance with NRC-approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.

4.2.2 Control Rod Assemblies

The reactor core shall contain 48 control rod assemblies. The control material shall be silver, indium, and cadmium as approved by the NRC.

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum nominal U-235 enrichment of 5.0 weight percent;

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

3a. WCAP-12945-P-A, Volume 1, Revision 2, and Volumes 2 through 5, Revision 1, "Code Qualification Document for Best Estimate LOCA Analysis," March 1998 (W Proprietary).

3b. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995 (W Proprietary).

3c. WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (Westinghouse Proprietary).

3d. WCAP-16009-P-A, "Realistic Large Break LOCA Evaluation Methodology Using Automated Statistical Treatment of Uncertainty Method (ASTRUM)" M.E. Nissley, et al., January 2005 (Proprietary).

(Methodology for LCO 3.2.1 - Heat Flux Hot Channel Factor and LCO 3.4.1-RCS Pressure, Temperature and Flow Departure from Nucleate Boiling Limits.)

4. WCAP-8745-P-A, "Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions," September 1986 (Westinghouse Proprietary)

(Methodology for Overpower ΔT and Thermal Overtemperature ΔT Trip Functions)

5. WCAP-14750-P-A Revision 1, "RCS Flow Verification Using Elbow Taps at Westinghouse 3-Loop PWRs. (Westinghouse Proprietary)

(Methodology for minimum RCS flow determination using the elbow tap measurement.)

6a. WCAP-11596-P-A, "Qualification of the Phoenix-P/ANC Nuclear Design System for Pressurized Water Reactor Cores," June 1988

----------NOTE----------
Commencing Unit 1 Cycle 27 and Unit 2 Cycle 24, methods 6b and 6c shall be used in lieu of method 6a.

6b. WCAP-16045-P-A, "Qualification of the Two-Dimensional Transport Code PARAGON," August 2004

6c. WCAP-16045-P-A, Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology," August 2007

(Methodology for LCO 3.9.1 - Boron Concentration and LCO 3.1.3 - Moderator Temperature Coefficient.)

(continued)

ATTACHMENT TO

VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2

LICENSE AMENDMENT NO. 182

RENEWED FACILITY OPERATING LICENSE NO. NPF-68

DOCKET NO. 50-424

AND LICENSE AMENDMENT NO. 163

RENEWED FACILITY OPERATING LICENSE NO. NPF-81

DOCKET NO. 50-425

Replace the following pages of the Renewed Facility Operating Licenses and Appendix "A" Technical Specifications (TSs) with the enclosed pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
License	License
NPF-68, page 4	NPF-68, page 4
NPF-81, page 3	NPF-81, page 3
TSs	TSs
4.0-1	4.0-1
5.6-3	5.6-3
5.6-4	5.6-4
5.6-5	5.6-5

(1) Maximum Power Level

Southern Nuclear is authorized to operate the facility at reactor core power levels not in excess of 3625.6 megawatts thermal (100 percent power) in accordance with the conditions specified herein.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 182, 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) Southern Nuclear Operating Company shall be capable of establishing containment hydrogen monitoring within 90 minutes of initiating safety injection following a loss of coolant accident.

(4) Deleted

(5) Deleted

(6) Deleted

(7) Deleted

(8) Deleted

(9) Deleted

(10) Mitigation Strategy License Condition

The licensee shall develop and maintain strategies for addressing large fires and explosions and that include the following key areas:

(a) Fire fighting response strategy with the following elements:
1. Pre-defined coordinated fire response strategy and guidance
2. Assessment of mutual aid fire fighting assets
3. Designated staging areas for equipment and materials
4. Command and control
5. Training and response personnel

(b) Operations to mitigate fuel damage considering the following:
1. Protection and use of personnel assets
2. Communications
3. Minimizing fire spread
4. Procedures for Implementing integrated fire response strategy
5. Identification of readily-available pre-staged equipment
6. Training on integrated fire response strategy

(2) Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and City of Dalton, Georgia, pursuant to the Act and 10 CFR Part 50, to possess but not operate the facility at the designated location in Burke County, Georgia, in accordance with the procedures and limitations set forth in this license;

(3) Southern Nuclear, pursuant to the Act and 10 CFR Part 70, to receive, possess, and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as supplemented and amended;

(4) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30, 40, and 70 to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(5) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components;

(6) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as my be produced by the operation of the facility authorized herein.

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter 1 and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified or incorporated below.

(1) Maximum Power Level

Southern Nuclear is authorized to operate the facility at reactor core power levels not in excess of 3625.6 megawatts thermal (100 percent power) in accordance with the conditions specified herein.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 163 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.

The Surveillance requirements (SRs) contained in the Appendix A Technical Specifications and listed below are not required to be performed immediately upon implementation of Amendment No. 74. The SRs listed below shall be

4.0 DESIGN FEATURES

4.1 Site

4.1.1 Site and Exclusion Area Boundaries (EAB)

The VEGP site and EAB consist of approximately 3,169 acres in eastern Georgia on the west side of the Savannah River about 26 miles southeast of Augusta, Georgia, and 15 miles east-northeast of Waynesboro, Georgia, in Burke County, Georgia. The nearest point to the EAB from the VEGP Reactors is the near bank of the Savannah River. Reactor 1 is approximately 3600 feet from the EAB and Reactor 2 is approximately 3900 feet from the EAB.

4.1.2 Low Population Zone (LPZ)

The LPZ is that area falling within a 2-mile radius from the midpoint between the containment buildings.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy, ZIRLO®, or Optimized ZIRLO™ clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.

4.2.2 Control Rod Assemblies

The reactor core shall contain 53 control rod assemblies. The control material shall be silver-indium-cadmium, or hafnium metal as approved by the NRC.

(continued)

5.6 Reporting Requirements (continued)

5.6.5 Core Operating Limits Report (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

LCO 3.1.1 "SHUTDOWN MARGIN"
LCO 3.1.3 "Moderator Temperature Coefficient"
LCO 3.1.5 "Shutdown Bank Insertion Limits"
LCO 3.1.6 "Control Bank Insertion Limits"
LCO 3.2.1 "Heat Flux Hot Channel Factor"
LCO 3.2.2 "Nuclear Enthalpy Rise Hot Channel Factor"
LCO 3.2.3 "Axial Flux Difference"
LCO 3.9.1 "Boron Concentration"

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

WCAP-9272-P-A, "WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY," July 1985 (W Proprietary). (Methodology for Moderator Temperature Coefficient, Shutdown Bank Insertion Limit, Control Bank Insertion Limits, and Nuclear Enthalpy Rise Hot Channel Factor.)

WCAP-10216-P-A, Revision 1A, "RELAXATION OF CONSTANT AXIAL OFFSET CONTROL FQ SURVEILLANCE TECHNICAL SPECIFICATION," February, 1994 (W Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-10266-P-A, Revision 2, "The 1981 Version of the Westinghouse ECCS Evaluation Model Using the BASH Code," March 1987. (W Proprietary) (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-13749-P-A, "Safety Evaluation Supporting the Conditional Exemption of the Most Negative EOL Moderator Temperature Coefficient Measurement," March 1997.

WCAP-16045-P-A, "Qualification of the Two-Dimensional Transport Code PARAGON," August 2004 (Methodology for Moderator Temperature Coefficient.)

WCAP-16045-P-A, Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology," August 2007 (Methodology for Moderator Temperature Coefficient.)

(continued)

5.6 Reporting Requirements (continued)

5.6.5 Core Operating Limits Report (COLR) (continued)

WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995 (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

a. RCS pressure and temperature limits for heatup, cooldown, operation, criticality, and hydrostatic testing as well as heatup and cooldown rates shall be established and documented in the PTLR for the following:

LCO 3.4.3 "RCS Pressure and Temperature (P/T) Limits"

b. The power operated relief valve lift settings required to support the Cold Overpressure Protection Systems (COPS) and the COPS arming temperature shall be established and documented in the PTLR for the following:

LCO 3.4.12 "Cold Overpressure Protection Systems"

c. The analytical methods used to determine the RCS pressure and temperature limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. WCAP-14040-A, Rev. 4, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves."

(continued)

5.6 Reporting Requirements

5.6.6 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR) (continued)

2. WCAP-16142-P, Rev. 1, "Reactor Vessel Closure Head/Vessel Flange Requirements Evaluation for Vogtle Units 1 and 2."

3. The PTLR will contain the complete identification for each of the TS reference Topical Reports used to prepare the PTLR (i.e., report number, title, revision, date, and any supplements).

d. The PTLR shall be provided to the NRC upon issuance for each reactor vessel fluence period and for any revision or supplement thereto.

5.6.7 EDG Failure Report

If an individual emergency diesel generator (EDG) experiences four or more valid failures in the last 25 demands, these failures and any nonvalid failures experienced by that EDG in that time period shall be reported within 30 days. Reports on EDG failures shall include the information recommended in Regulatory Guide 1.9, Revision 3, Regulatory Position C.4, or existing Regulatory Guide 1.108 reporting requirement.

5.6.8 PAM Report

When a Report is required by Condition G or J of LCO 3.3.3, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

(continued)

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2

AMENDMENT NO. 204 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-2

AMENDMENT NO. 200 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-8

AND

VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2

AMENDMENT NO. 182 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-68

AMENDMENT NO. 163 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-81

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

DOCKET NOS. 50-348, 50-364, 50-424, AND 50-425

1.0 INTRODUCTION

By letter dated March 16, 2016 (Reference 1), Southern Nuclear Operating Company, Inc. (SNC or the licensee) requested changes to the Technical Specifications (TSs) for the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2, and the Vogtle Electric Generating Plant (VEGP), Units 1 and 2. The proposed changes would revise TS 4.2.1, "Fuel Assemblies," and TS 5.6.5.b, "Core Operating Limits Report (COLR)," to allow the use of Optimized ZIRLO™ fuel cladding material in both FNP, Units 1 and 2, and VEGP, Units 1 and 2.

The proposed changes would revise TS 4.2.1 to allow the use of Optimized ZIRLO™ fuel rod cladding at both FNP and VEGP. The proposed changes would also revise TS 5.6.5 for both FNP and VEGP to add Addendum 1-A to Topical Reports WCAP-12610-P-A & CENPD-404-P-A, entitled, "Optimized ZIRLO™" (Reference 2), to the list of documents previously reviewed and approved by the U.S. Nuclear Regulatory Commission (NRC or the Commission). Additionally, the changes would revise TS 5.6.5 for VEGP to add WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report" (Reference 3).

These amendments are also supported by an exemption from certain requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," and 10 CFR 50, Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," for both FNP and VEGP.

2.0 REGULATORY EVALUATION

Section 50.36 of 10 CFR requires that TSs be included by applicants for a license authorizing operation of a production or utilization facility. Section 50.36(c) of 10 CFR also requires that TSs include: (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. The proposed change to TS 4.2.1 would revise the design features for fuel assemblies listed within the reactor core TSs, and the proposed change to TS 5.6.5 would revise administrative controls TSs.

Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition (NUREG-0800) (SRP), Section 4.2, "Fuel System Design," provides regulatory guidance for the review of fuel rod cladding materials and fuel system. In addition, the SRP provides guidance for compliance with the applicable General Design Criteria (GDC) in 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants." According to SRP Section 4.2, the fuel system safety review provides assurance that:

- The fuel system is not damaged as a result of normal operation and anticipated operational occurrences,
- Fuel system damage is never so severe as to prevent control rod insertion when it is required,
- The number of fuel rod failures is not underestimated for postulated accidents, and
- Coolability is always maintained.

Appendix A to 10 CFR Part 50 sets forth GDC that must be considered when developing the principal design criteria for a water-cooled nuclear power plant. Section 3.1 of the FNP and VEGP updated final safety analysis reports (UFSARs) discuss conformance with the GDC. The proposed amendment was evaluated against the following GDCs, as incorporated into the FNP and VEGP licensing basis through their respective UFSARs.

GDC 10, "Reactor design," states that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

GDC 27, "Combined reactivity control system capability," states that the reactivity control systems shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained.

3.0 TECHNICAL EVALUATION

3.1 Proposed Change to TS 4.2.1 and TS 5.6.5

3.1.1 Introduction

The FNP reactor core is made up of 157 fuel assemblies with 48 control rod assemblies. The VEGP reactor core is made up of 193 fuel assemblies with 53 control rod assemblies. Each fuel assembly is a 17x17 square lattice fuel rod array containing 264 fuel rods, 24 guide thimbles, and one instrument tube. Each fuel assembly is a canless type with the basic assembly consisting of the rod cluster control guide thimbles fastened to grids and top and bottom nozzles. The fuel rods are made up of slightly enriched uranium dioxide pellets that are clad in a tube made from zircaloy or ZIRLO®. Zircaloy-4 is an alloy of zircaloy used at FNP and VEGP.

The proposed change to TS 4.2.1 will add "Optimized ZIRLO™" to the list of cladding materials listed in the sentence describing the fuel rods. The NRC staff has approved Optimized ZIRLO™ fuel cladding based upon (1) similarities with standard ZIRLO®, (2) demonstrated material performance, and (3) provision of irradiated data and validate fuel performance models ahead of burnups achieved in batch applications.

3.1.2 Limitations and Conditions in Addendum 1-A of WCAP-12610

The NRC staff's safety evaluation (SE) for the topical report (Reference 2) contains ten conditions and limitations. The staff indicated in the SE that licensees referencing Addendum 1-A of WCAP-12610-P-A and CENPD 404-P-A to implement Optimized ZIRLO™ must ensure compliance with the ten conditions and limitations. The licensee provided documentation of its compliance with these ten conditions and limitations and, by including reference to the topical report in the TSs, will continue to ensure compliance for future reloads. Each condition and limitation is restated below, along with the NRC staff's evaluation of SNC's response.

3.1.2.1 Condition and Limitation 1 – Need for Exemption

Condition and Limitation 1 states that until rulemaking to 10 CFR Part 50 addressing Optimized ZIRLO™ has been completed, implementation of Optimized ZIRLO™ fuel clad requires an exemption from 10 CFR 50.46 and 10 CFR Part 50, Appendix K. SNC submitted an exemption request to 10 CFR 50.46 and Appendix K to 10 CFR Part 50 for both FNP and VEGP concurrent with this amendment request on March 16, 2016. The exemption request is being evaluated separately from this license amendment request. Therefore, the NRC staff concludes that this condition and limitation has been satisfied.

3.1.2.2 Condition and Limitation 2 – Burnup Limit

Condition and Limitation 2 states that the fuel rod burnup limit for this approval must remain at currently established limits of 62 gigawatt-days per metric ton uranium (GWd/MTU) for Westinghouse Electric Company LLC (Westinghouse) fuel designs and 60 GWd/MTU for Combustion Engineering (CE) fuel designs. FNP and VEGP use a Westinghouse fuel design, and SNC has stated that FNP and VEGP will continue to use a 62 GWd/MTU rod burnup. The

addition of Addendum 1-A of WCAP-12610-P-A and CENPD 404-P-A to TS 5.6.5.b for both FNP and VEGP will require both FNP and VEGP to maintain a maximum rod burnup limit of 62 GWd/MTU. Therefore, the NRC staff concludes that this condition and limitation has been satisfied.

3.1.2.3 Condition and Limitation 3 – Corrosion Limit

Condition and Limitation 3 states that the maximum fuel rod waterside corrosion, as predicted by the best-estimate model, will satisfy proprietary limits in the topical report for all locations of the fuel rod. SNC confirmed that the methodologies used for normal reload process will ensure that the maximum fuel rod waterside corrosion limit will be verified to be less than the specified proprietary limits for all fuel rod locations as a normal part of the reload design process. Therefore, the NRC staff has concluded that this condition and limitation has been satisfied.

3.1.2.4 Condition and Limitation 4 – Conditions on Approved Methodologies

Condition and Limitation 4 states that all the conditions listed in previous NRC SE approvals for methodologies used for standard ZIRLO® and zircaloy-4 fuel analysis will continue to be met, except that the use of Optimized ZIRLO™ cladding, in addition to standard ZIRLO® and zircaloy-4 cladding, is now approved. SNC confirmed that future analysis using Optimized ZIRLO™, as required by the reload methodologies listed in TS 5.6.5.b, will continue to meet all conditions contained within the approved methods. Therefore, the NRC staff has concluded that this condition and limitation has been satisfied.

3.1.2.5 Condition and Limitation 5 – Application Domain

Condition and Limitation 5 states that all methodologies will be used only within the range for which ZIRLO® and Optimized ZIRLO™ data were acceptable and for which the verifications discussed in Addendum 1 and responses to requests for additional information (RAIs) for Addendum 1 were performed. SNC confirmed that the application of Optimized ZIRLO™ will be consistent with the approach accepted in WCAP-12610-P-A and CENPD-404-P-A Addendum 1-A, and that confirmation of these conditions is part of the normal reload design process required by the methodologies in TS 5.6.5.b. Therefore, the NRC staff has concluded that this condition and limitation has been satisfied.

3.1.2.6 Condition and Limitation 6 – Lead Test Assembly (LTA) Data

Condition and Limitation 6 states that the licensee is required to ensure that Westinghouse has fulfilled the following commitment: Westinghouse shall provide the NRC staff with a letter(s) containing the following information:

a. Optimized ZIRLO™ LTA data from Byron, Calvert Cliffs, Catawba [Nuclear Station], and Millstone [Power Station].

   i. Visual
   ii. Oxidation of fuel rods
   iii. Profilometry
   iv. Fuel rod length
   v. Fuel assembly length

b. Using the standard and Optimized ZIRLO™ database including the most recent LTA data, confirm applicability with currently approved fuel performance models (e.g., measured vs. predicted).

Confirmation of the approved models' applicability up through the projected end of cycle burnup for the Optimized ZIRLO™ fuel rods must be completed prior to their initial batch loading and prior to the startup of subsequent cycles. For example, prior to the first batch application of Optimized ZIRLO™, sufficient LTA data may only be available to confirm the models' applicability up through 45 GWd/MTU. In this example, the licensee would need to confirm the models up through the end of the initial cycle. Subsequently, the licensee would need to confirm the models, based upon the latest LTA data, prior to re-inserting the Optimized ZIRLO™ fuel rods in future cycles. Based upon the LTA schedule, it is expected that this issue may only be applicable to the first few batch implementations, since sufficient LTA data up through the burnup limit should be available within a few years.

Westinghouse submitted numerous documents to the NRC to supply the requested information in various stages:

- LTR-NRC-07-1 (Reference 4) – This submittal includes information from the complete Byron Station (Byron) LTA (three cycles). It also includes information from the ongoing Calvert Cliffs Nuclear Power Plant (Calvert Cliffs) LTA (one cycle), CNS LTA (two cycles), and Millstone LTA (two cycles).

- LTR-NRC-07-58 (Reference 5) – This submittal includes information from the complete Byron LTA (three cycles). It also includes information from the ongoing Calvert Cliffs LTA (one cycle), CNS LTA (two cycles), and Millstone LTA (two cycles).

- LTR-NRC-07-58, Rev. 1. (Reference 6) – This submittal includes information from the complete Byron LTA (three cycles). It also includes updated information from the ongoing Calvert Cliffs LTA (one cycle), CNS LTA (two cycles), and Millstone LTA (one cycle).

- LTR-NRC-08-60 (Reference 7) – This submittal includes information from the complete Byron LTA (three cycles). It also includes information from the ongoing Calvert Cliffs LTA (two cycles), CNS LTA (two cycles), and Millstone LTA (two cycles).

- LTR-NRC-10-43 (Reference 8) – This submittal includes information from the complete Byron LTA (three cycles), CNS LTA (three cycles), and Millstone LTA (three cycles). It also includes information from the ongoing Calvert Cliffs LTA (three cycles).

- LTR-NRC-13-6 (Reference 9) – This submittal includes information from the complete Byron LTA (three cycles), CNS LTA (three cycles), Millstone LTA (three cycles), and Calvert Cliffs LTA (three cycles).

- LTR-NRC-15-7 (Reference 10) – This submittal includes the VEGP growth and creep data summary reports and provides the responses to RAIs received in response to letter LTR-NRC-13-6 (Reference 9), which was issued to fulfill Conditions 6 and 7 of WCAP-12610-P-A and CENPD-404-P-A Addendum 1-A (Reference 2).

The LTA measurements submitted showed the corrosion rate of the stress-relief annealed (SRA) Optimized ZIRLO™ and partially-re-crystallized annealed (PRXA) Optimized ZIRLO™ to be significantly lower than that of the standard ZIRLO®. Similarly, the measured SRA/PRXA Optimized ZIRLO™ fuel rod growth is also within the predictive capability of the standard ZIRLO® fuel rod growth model, as the measured values are well within the scatter band of the standard ZIRLO® fuel rod growth database. Based on the measurements and evaluations of LTA data, the NRC staff finds that the licensee has demonstrated acceptable in-reactor performance, the fuel rod and assembly design calculations remain valid, and the Optimized ZIRLO™ fuel will operate within design criteria.

By submitting this information, the models' applicability has been confirmed for burnups up to 62 GWd/MTU for Westinghouse fuels. None of the visual inspections showed anomalies. The oxidation measurements demonstrated that the oxide thickness of Optimized ZIRLO™ was bounded by that of ZIRLO®. The profilometry data demonstrated that the growth of Optimized ZIRLO™ was bounded by that of ZIRLO® and was appropriately bounded by performance and design (PAD). The measurements of axial growth demonstrated that the Optimized ZIRLO™ assemblies were within the upper and lower growth bounds. Based on this information, the NRC staff concludes that this condition and limitation is satisfied.

3.1.2.7 Condition and Limitation 7 – Cycle Data

Condition and Limitation 7 states that the licensee is required to ensure that Westinghouse has fulfilled the following commitment: Westinghouse shall provide the NRC staff with a letter containing the following information:

a. Vogtle growth and creep data summary reports.

b. Using the standard ZIRLO® and Optimized ZIRLO® database including the most recent Vogtle data, confirm applicability with currently approved fuel performance models (e.g., level of conservatism in W rod pressure analysis, measured vs. predicted, predicted minus measured vs. tensile and compressive stress).

Confirmation of the approved models' applicability up through the projected end of cycle burnup for the Optimized ZIRLO™ fuel rods must be completed prior to their initial batch loading and prior to the startup of subsequent cycles. For example, prior to the first batch application of Optimized ZIRLO™, sufficient LTA data may only be available to confirm the models' applicability up through 45 GWd/MTU. In this example, the licensee would need to confirm the models up through the end of the initial cycle. Subsequently, the licensee would need to confirm the models, based upon the latest LTA data, prior to re-inserting the Optimized ZIRLO™ fuel rods in future cycles. Based upon the LTA schedule, it is expected that this issue may only be applicable to the first few batch implementations since sufficient LTA data, up through the burnup limit should be available within a few years.

Westinghouse submitted numerous documents to the NRC to supply the requested information in various stages:

- LTR-NRC-07-1 (Reference 4) – This submittal includes information from the complete Byron LTA (three cycles). It also includes information from the ongoing Calvert Cliffs LTA (one cycle), CNS LTA (one cycle), and Millstone LTA (one cycle).

- LTR-NRC-07-58 (Reference 5) – This submittal includes information from the complete Byron LTA (three cycles). It also includes information from the ongoing Calvert Cliffs LTA (one cycle), CNS LTA (two cycles), and Millstone LTA (two cycles).

- LTR-NRC-07-58, Rev. 1 (Reference 6) – This submittal includes information from the complete Byron LTA (three cycles). It also includes updated information from the ongoing Calvert Cliffs LTA (one cycle), CNS LTA (two cycles), and Millstone LTA (two cycles).

- LTR-NRC-08-60 (Reference 7) – This submittal includes information from the complete Byron LTA (3 cycles). It also includes information from the ongoing Calvert Cliffs LTA (two cycles), CNS LTA (two cycles), and Millstone LTA (two cycles).

- LTR-NRC-10-43 (Reference 8) - This submittal includes information from the complete Byron LTA (three cycles), CNS LTA (three cycles), and Millstone LTA (three cycles). It also includes information from the ongoing Calvert Cliffs LTA (three cycles).

- LTR-NRC-13-6 (Reference 9) – This submittal includes information from the complete Byron LTA (three cycles), CNS LTA (three cycles), Millstone LTA (three cycles), and Calvert Cliffs LTA (three cycles).

- LTR-NRC-15-7 (Reference 10) – This submittal includes the VEGP growth and creep data summary reports provides the responses to RAIs received in response to letter LTR-NRC-13-6 (Reference 9), which was issued to fulfill Conditions 6 and 7 of WCAP-12610-P-A and CENPD-404-P-A Addendum 1-A (Reference 2).

One of the main objectives of the ongoing Westinghouse creep program is to demonstrate Optimized ZIRLO™ creep is the same as standard ZIRLO®, and that the creep in tension is similar to creep in compression. Westinghouse concludes (Reference 9) that the PAD 4.0 creep model does not extrapolate well to the low temperatures at which the VEGP capsule operates. However, the PAD 4.0 model provides acceptable results in the high temperature region that are typically limiting for fuel performance analyses. Section 3.3 of Reference 9 summarizes creep/growth results based on currently available data for (1) the irradiation growth and creep of standard ZIRLO® and PRXA Optimized ZIRLO™, and (2) the irradiation creep of standard ZIRLO® under tensile and compressive deviatoric (differential) hoop stresses. The irradiation creep was measured using samples filled with helium gas. The internal gas pressure was either below or above system pressure so that the samples were in either compressive or tensile hoop stress, respectively.

Figures 14-17 of Reference 9 (as amended by Attachment 2 of Reference 9) presents the diameter irradiation creep data for standard ZIRLO®, PRXA Optimized ZIRLO™, and SRA Optimized ZIRLO™ under compressive stress. In response to an NRC staff request (RAI #3a of Reference 10), Westinghouse provided similar irradiation creep data under tensile stress. The measured data show that the diameter irradiation creep of PRXA Optimized ZIRLO™ cladding and SRA ZIRLO™ cladding are similar under both compression and tension stresses.

Figures 18, 19, 20, and 21 of Reference 9 (as amended by Attachment 2 of Reference 10) present an evaluation of the irradiation creep data for standard ZIRLO® for tensile and compressive deviatoric hoop stresses. In response to an NRC staff request (RAI #4 of Reference 10), Westinghouse provided similar irradiation creep data for PRXA Optimized ZIRLO™. All of these figures show that the data are consistent between stress levels, the strain behavior is linear as a function of the deviatoric (differential) hoop stress, and the regression fits to the data approximately exhibit zero strain when the deviatoric hoop stress is zero, demonstrating that compressive and tensile creep are equivalent.

Section 4.0 of Reference 9 describes the analytical evaluations relating the measured VEGP and other ZIRLO® creep and growth profilometry data to the Westinghouse licensed fuel performance models (PAD 4.0 and FATES3B) to assess the ability of the existing creep models to predict the data. In response to NRC staff concerns regarding the comparison of data trends based on deviatoric stress, and model predictions based on total hoop stress (RAI #5 of Reference 10), Westinghouse stated that limitations with the existing creep model would be addressed in PAD 5 (currently under review). In RAI #7 of Reference 10, Westinghouse states that while the existing creep models may under-predict the data under low temperature conditions, these same models provide acceptable results in the high temperature regions, which are typically limiting for fuel performance analyses. Based on this information, the NRC staff concludes that this condition and limitation is satisfied.

3.1.2.8 Condition and Limitation 8 – Yield Strength

Condition and Limitation 8 states that the licensee shall account for the relative differences in unirradiated strength (yield strength and ultimate tensile strength) between Optimized ZIRLO™ and standard ZIRLO® in cladding and structural analyses until irradiated data for Optimized ZIRLO™ have been collected and provided to the NRC staff.

a. For the Westinghouse fuel design analyses:

   i. The measured, unirradiated Optimized ZIRLO™ strengths shall be used for BOL [beginning of life] analyses.

   ii. Between BOL up to a radiation fluence of 3.0 x 10^{21} n/cm^2 (E>1MeV), pseudo-irradiated Optimized ZIRLO™ strength set equal to linear interpolation between the following two strength level points: At zero fluence, strength of Optimized ZIRLO™ equal to measured strength of Optimized ZIRLO™ and at a fluence of 3.0 x 10^{21} n/cm2 (E>1MeV), irradiated strength of standard ZIRLO® at the fluence of 3.0 x 10^{21} n/cm^2 (E>1MeV) minus 3 ksi [kilopounds per square inch].

   iii. During subsequent irradiation from 3.0 x 10^{21} n/cm^2 up to 12 x 10^{21} n/cm^2, the differences in strength (the difference at a fluence of 3 x 10^{21} n/cm^2 due to tin content) shall be decreased linearly such that the pseudo-irradiated Optimized ZIRLO™ strengths will saturate at the same properties as standard ZIRLO® at 12 x 10^{21} n/cm^2.

b. For the CE fuel design analyses, the measured, unirradiated Optimized ZIRLO™ strengths shall be used for all fluence levels (consistent with previously approved methods).

SNC stated that future analysis of Optimized ZIRLO™ will use the yield strength and ultimate tensile strength as modified per Conditions 8.a.i, 8.a.ii, and 8.a.iii until such time as the irradiated data for Optimized ZIRLO™ cladding strengths have been collected and accepted by the NRC and that this is confirmed as part of the normal reload design process as required by the methodologies listed in TS 5.6.5.b. Therefore, the NRC staff concludes that this condition and limitation is satisfied.

FNP and VEGP use a Westinghouse fuel design and, therefore, Condition and Limitation 8.b does not apply.

3.1.2.9 Condition and Limitation 9 – LOCBART or STRIKIN-II Early Peak Cladding Temperature (PCT)

Condition and Limitation 9 states that as discussed in response to RAI #21 (Reference 3), for plants introducing Optimized ZIRLO™ that are licensed with LOCBART or STRIKIN-II and have a limiting PCT that occurs during blowdown or early reflood, the limiting LOCBART or STRIKIN-II calculation will be rerun using the specified Optimized ZIRLO™ material properties. Although not a condition of approval, the NRC staff strongly recommends that, for future evaluations, Westinghouse update all computer models with Optimized ZIRLO™ specific material properties.

FNP is not licensed with LOCABART of STRIKIN-II. Therefore, the NRC staff concludes that this condition and limitation does not apply to FNP.

VEGP is not licensed with STRIKIN-II. While VEGP is licensed with LOCBART, the limiting PCT

does not occur during blowdown or early reflood. Therefore, the NRC staff has concluded that this condition and limitation does not apply to VEGP

3.1.2.10 Condition and Limitation 10 – Locked Rotor PCT

Condition and Limitation 10 states that due to the absence of high temperature oxidation data for Optimized ZIRLO™, the Westinghouse coolability limit on PCT during the locked rotor event shall be maintained within the proprietary limits included in the topical report and proprietary version of the SE.

SNC has confirmed that the PCT limit during the locked rotor event will be assessed relative to the Westinghouse Optimized ZIRLO™ PCT and that this is confirmed as part of the normal reload design process. The NRC staff has concluded that this condition and limitation has been satisfied.

3.1.3 Thermal-Hydraulic Design and Transients and Accidents Methodology

SNC stated that it will transition to Optimized ZIRLO™ using the same thermal-hydraulic analysis and transients and accident (non-loss-of-coolant accident (LOCA)) analyses described in WCAP-9272-P-A (Reference 11), which is currently approved for use at FNP and VEGP, as listed TS 5.6.5. The current methods remain valid for Optimized ZIRLO™ transition cores as described in WCAP-12610-P-A. This process is valid for all resident fuel designs licensed for FNP and VEGP, and the transition has no impact on both non-LOCA and LOCA analyses methodologies at FNP and VEGP. Therefore, the NRC staff concludes that this is acceptable.

3.1.4 Technical Conclusion

Based upon the NRC staff's prior approval of Optimized ZIRLO™, the licensee's compliance with the SE conditions and limitations through inclusion of the topical reports into the TSs, and the licensee's use of NRC-approved methodologies in TS 5.6.5.b for thermal-hydraulic transients and accidents analyses to ensure that cycle-specific parameters and the operating limits will be appropriate, the NRC staff finds the proposed changes to TS 4.2.1 and TS 5.6.5 to allow the use of Optimized ZIRLO™ to be acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Alabama and Georgia State officials were notified on June 30, 2016, of the proposed issuance of the amendments. The State officials had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. 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 a proposed finding that the amendments involve no

significant hazards consideration, and there has been no public comment on such finding (May 24, 2016; 81 FR 32808 and 81 FR 32809). 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) there is reasonable assurance that 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. SNC, C. R. Pierce letter to U.S. NRC, "Joseph M. Farley Nuclear Plant - Units 1 and 2, Vogtle Electric Generating Plant - Units 1 and 2 - License Amendment Request and 10 CFR 50.12 Exemption Request Optimized ZIRLO™ Fuel Rod Cladding," March 16, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16076A217).

2. Westinghouse, "Optimized ZIRLO™," WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A, July 2006 (ADAMS Accession No. ML062080576 (non-public) (proprietary)).

3. Westinghouse, "VANTAGE+ Fuel Assembly Reference Core Report," WCAP-12610-P-A, April 1995 (ADAMS Accession No. ML090720988 (non-public) (proprietary)).

4. Westinghouse, J. A. Gresham letter to U.S. NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A, 'Optimized ZIRLO™'," LTR-NRC-07-1, January 4, 2007 (ADAMS Accession No. ML070100385 (submittal letter), ADAMS Accession No. ML070100388 (non-proprietary attachment), and ADAMS Accession No. ML070100389 (non-public) (proprietary attachment)).

5. Westinghouse, J. A. Gresham letter to U.S. NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A, 'Optimized ZIRLO™'," LTR-NRC-07-58, November 6, 2007 (ADAMS Accession No. ML073130556 (submittal letter), ADAMS Accession No. ML073130560 (non-proprietary attachment), and ADAMS Accession No. ML073130562 (non-public) (proprietary attachment)).

6. Westinghouse, J. A. Gresham letter to U.S. NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A, 'Optimized ZIRLO™'," LTR-NRC-07-58, Rev. 1, February 5, 2008 (ADAMS Accession No. ML080390451 (submittal letter), ADAMS Accession No. ML080390452) (non-proprietary attachment), and ADAMS Accession No. ML080390453 (non-public) (proprietary attachment)).

7. Westinghouse, J. A. Gresham letter to U.S. NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A, 'Optimized ZIRLO™'," LTR-NRC-08-60, December 30, 2008 (ADAMS Accession No. ML090080380) (submittal letter), ADAMS Accession No. ML090080381 (non-proprietary attachment), and ADAMS Accession No. ML090080382 (non-public) (proprietary attachment)).

8. Westinghouse, J. A. Gresham letter to U.S. NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A, 'Optimized ZIRLO™'," LTR-NRC-10-43, July 26, 2010 (ADAMS Accession No. ML102140213) (submittal letter), ADAMS Accession No. ML102140214) (non-proprietary attachment), and ADAMS Accession No. ML102140215 (non-public) (proprietary attachment)).

9. Westinghouse, J. A. Gresham letter to U.S. NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A, 'Optimized ZIRLO™'," LTR-NRC-13-6, February 25, 2013 (ADAMS Accession No. ML13070A188) (submittal letter), ADAMS Accession No. ML13070A189 (non-proprietary attachment), and (ADAMS Accession No. ML13070A190 (proprietary attachment)).

10. Westinghouse, J. A. Gresham letter to U.S. NRC, "Submittal of Responses to Draft RAIs and Revisions to Select Figures in LTR-NRC-13-6 to Fulfill Conditions 6 and 7 of the Safety Evaluation for WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A," LTR-NRC-15-7, February 9, 2015 (ADAMS Accession No. ML15051A427) (submittal letter), ADAMS Accession No. ML15051A428 (non-proprietary attachment 1), ADAMS Accession No. ML15051A429 (non-proprietary Attachment 2), ADAMS Accession No. ML15051A430 (proprietary Attachment 1), and ADAMS Accession No. ML15051A431 (proprietary Attachment 2)).

11. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," Westinghouse Nuclear Energy Systems, March 1978.

Principal Contributor: J. S. Kaizer

Date: August 4, 2016

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

Sincerely,

/RA/

Robert Martin, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-348, 50-364, 50-424,
and 50-425

Enclosures:
Enclosures:
1. Amendment No. 204 to NPF-2
2. Amendment No. 200 to NPF-8
3. Amendment No. 182 to NPF-68
4. Amendment No. 163 to NPF-81
5. Safety Evaluation

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