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

September 20, 2019

Ms. Cheryl A. Gayheart
Regulatory Affairs Director
Southern Nuclear Operating Co., Inc.
3535 Colonnade Parkway
Birmingham, AL 35243

SUBJECT: EDWIN I. HATCH NUCLEAR PLANT, UNIT NOS. 1 AND 2, ISSUANCE OF AMENDMENT NOS. 299 AND 244, REGARDING REVISION TO TECHNICAL SPECIFICATIONS TO ADOPT TSTF-564, "SAFETY LIMIT [MINIMUM CRITICAL POWER RATIO] MCPR" (EPID L-2019-LLA-0085)

Dear Ms. Gayheart:

The U.S Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 299 to Renewed Facility Operating License No. DPR-57 and Amendment No. 244 to Renewed Facility Operating License No. NPF-5 for the Edwin I. Hatch Nuclear Plant (Hatch), Unit Nos. 1 and 2, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated April 23, 2019.

The amendments adopt TSTF-564, "Safety Limit [Minimum Critical Power Ratio] MCPR," Revision 2, which is an approved change to the Improved Standard Technical Specifications, into the Hatch, Unit 1 and Unit 2 TS. The proposed amendment for each unit revises the TS safety limit on minimum critical power ratio to reduce the need for cycle-specific changes to the value while still meeting the regulatory requirement for a safety limit.

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,

John G. Lamb, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-321 and 50-366

Enclosures:
1. Amendment No. 299 to DPR-57
2. Amendment No. 244 to NPF-5
3. Safety Evaluation

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA

CITY OF DALTON, GEORGIA

DOCKET NO. 50-321

EDWIN I. HATCH NUCLEAR PLANT, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 299
Renewed License No. DPR-57

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

   A. The application for amendment to the Edwin I. Hatch Nuclear Plant, Unit No. 1 (the facility) Renewed Facility Operating License No. DPR-57 filed by 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 April 23, 2019, 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. DPR-57 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications (Appendix A) and the Environmental Protection Plan (Appendix B), as revised through Amendment No. 299, are hereby incorporated in the renewed 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 prior to reaching Mode 4 following Refueling Outage 1 R29 (Spring 2020) or within 270 days from the date of issuance, whichever is later.

FOR THE NUCLEAR REGULATORY COMMISSION

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

Attachment:
Changes to Renewed Facility
Operating License No. DPR-57
and Technical Specifications

Date of Issuance: September 20, 2019

ATTACHMENT TO LICENSE AMENDMENT NO. 299

EDWIN I. HATCH NUCLEAR PLANT, UNIT NO. 1

RENEWED FACILITY OPERATING LICENSE NO. DPR-57

DOCKET NO. 50-321

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

Remove Pages	Insert Pages
License	License
4	4
TSs	TSs
2.0-1	2.0-1
5.0-21	5.0-21

for sample analysis or instrumentation calibration, or associated with radioactive apparatus or components;

(6) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30 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 following Commission regulations in 10 CFR Chapter I; Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Section 50.54 of Part 50, and Section 70.32 of Part 70; all applicable provisions of the Act and the rules, regulations, and orders of the Commission now or hereafter in effect; and the additional conditions specified or incorporated below:

(1) Maximum Power Level

Southern Nuclear is authorized to operate the facility at steady sate reactor core power levels not in excess of 2804 megawatts thermal.

(2) Technical Specifications

The Technical Specifications (Appendix A) and the Environmental Plan (Appendix B), as revised through Amendment No. 299 are hereby incorporated in the renewed license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

The Surveillance Requirement (SR) contained in the Technical Specifications and listed below, is not required to be performed immediately upon implementation of Amendment No. 195. The SR listed below shall be successfully demonstrated before the time and condition specified:

SR 3.8.1.18 shall be successfully demonstrated at its next regularly scheduled performance.

(3) Fire Protection

Southern Nuclear shall implement and maintain in effect all provisions of the fire protection program, which is referenced in the Updated Final Safety Analysis Report for the facility, as contained in the updated Fire Hazards Analysis and Fire Protection Program for the Edwin I. Hatch Nuclear Plant, Units 1 and 2, which was originally submitted by letter dated July 22, 1986. Southern Nuclear may make changes to the fire protection program without prior Commission approval only if the changes

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 685 psig or core flow < 10% rated core flow:

THERMAL POWER shall be ≤ 24% RTP.

2.1.1.2 With the reactor steam dome pressure ≥ 685 psig and core flow ≥ 10% rated core flow:

MCPR shall be ≥ 1.07.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System (RCS) Pressure SL

Reactor steam dome pressure shall be ≤ 1325 psig.

2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

5.6 Reporting Requirements

5.6.2 Annual Radiological Environmental Operating Report (continued)

format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted in a supplementary report as soon as possible.

5.6.3 Radioactive Effluent Release Report

----------NOTE----------
A single submittal may be made for a multiple unit station. The submittal should combine sections common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

The Radioactive Effluent Release Report covering the operation of the unit shall be submitted in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and the Process Control Program and in conformance with 10 CFR 50.36a and 10 CFR 50, Appendix I, Section IV.B.1.

5.6.4 Deleted.

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:

1) The Average Planar Linear Heat Generation Rate for Specification 3.2.1.

2) The Minimum Critical Power Ratio (MCPR) for Specification 3.2.2 and the $MCPR_{99.9\%}$ value used to calculate the Specification 3.2.2 MCPR.

3) The Linear Heat Generation Rate for Specification 3.2.3.

(continued)

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SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA

CITY OF DALTON, GEORGIA

DOCKET NO. 50-366

EDWIN I. HATCH NUCLEAR PLANT, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 244
Renewed License No. NPF-5

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

   A. The application for amendment to the Edwin I. Hatch Nuclear Plant, Unit No. 2 (the facility) Renewed Facility Operating License No. NPF-5 filed by 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 April 23, 2019, 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-5 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications (Appendix A) and the Environmental Protection Plan (Appendix B), as revised through Amendment No. 244 are hereby incorporated in the renewed 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 prior to reaching Mode 4 following Refueling Outage 2R26 (Spring 2021) or within 635 days from the date of issuance, whichever is later.

FOR THE NUCLEAR REGULATORY COMMISSION

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

Attachment:
Changes to Renewed Facility
Operating License No. NPF-5
and Technical Specifications

Date of Issuance: September 20, 2019

ATTACHMENT TO LICENSE AMENDMENT NO. 244

EDWIN I. HATCH NUCLEAR PLANT, UNIT NO. 2

RENEWED FACILITY OPERATING LICENSE NO. NPF-5

DOCKET NO. 50-366

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

Remove Pages	Insert Pages
License	License
4	4
TSs	TSs
2.0-1	2.0-1
5.0-21	5.0-21

(6) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30 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 following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Section 50.54 of Part 50, and Section 70.32 of Part 70; all applicable provisions of the Act and the rules, regulations, and orders of the Commission now or hereafter in effect; and the additional conditions[2] specified or incorporated below:

(1) Maximum Power Level

Southern Nuclear is authorized to operate the facility at steady sate reactor core power levels not in excess of 2,804 megawatts thermal, in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications (Appendix A) and the Environmental Protection Plan (Appendix B); as revised through Amendment No. 244 are hereby incorporated in the renewed license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(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 license supported by a favorable evaluation by the Commission.

(a) Fire Protection

Southern Nuclear shall implement and maintain in effect all provisions of the fire protection program, which is referenced in the Updated Final Safety Analysis Report for the facility, as contained

[2] The original licensee authorized to possess, use, and operate the facility with Georgia Power Company (GPC). Consequently, certain historical references to GPC remain in certain license conditions.

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 685 psig or core flow < 10% rated core flow:

THERMAL POWER shall be ≤ 24% RTP.

2.1.1.2 With the reactor steam dome pressure ≥ 685 psig and core flow ≥ 10% rated core flow:

MCPR shall be ≥ 1.07.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System (RCS) Pressure SL

Reactor steam dome pressure shall be ≤ 1325 psig.

2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

5.6 Reporting Requirements

5.6.2 Annual Radiological Environmental Operating Report (continued)

table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted in a supplementary report as soon as possible.

5.6.3 Radioactive Effluent Release Report

----------NOTE----------
A single submittal may be made for a multiple unit station. The submittal should combine sections common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

The Radioactive Effluent Release Report covering the operation of the unit shall be submitted in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and the Process Control Program and in conformance with 10 CFR 50.36a and 10 CFR 50, Appendix I, Section IV.B.1.

5.6.4 Deleted.

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:

1) The Average Planar Linear Heat Generation Rate for Specification 3.2.1.

2) The Minimum Critical Power Ratio (MCPR) for Specification 3.2.2 and the $MCPR_{99.9\%}$ value used to calculate the Specification 3.2.2 MCPR.

3) The Linear Heat Generation Rate for Specification 3.2.3.

(continued)

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 299 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-57

AND

AMENDMENT NO. 244 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-5

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

EDWIN I. HATCH NUCLEAR PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-321 AND 50-366

1.0 INTRODUCTION

By application dated April 23, 2019, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19113A282), Southern Nuclear Operating Company, Inc. (SNC, the licensee) submitted a license amendment request (LAR) for Edwin I. Hatch Nuclear Plant (Hatch), Unit Nos. 1 and 2, which are boiling-water reactors (BWRs).

The proposed LAR amendment to the technical specifications (TSs) would revise the reactor core safety limit for the minimum critical power ratio (MCPR), which protects against boiling transition on the fuel rods in the core. The current MCPR safety limit for Hatch ensures that 99.9 percent of the fuel rods in the core are not susceptible to boiling transition. The revised MCPR safety limit would ensure that there is a 95-percent probability at a 95-percent confidence level (95/95) that no fuel rods will be susceptible to boiling transition based on a statistical analysis of critical power ratio (CPR) data. The TS requirements for the core operating limits report (COLR) would also be modified.

The proposed changes are based on Technical Specifications Task Force (TSTF) Traveler TSTF-564, Revision 2, "Safety Limit MCPR [Minimum Critical Power Ratio]," dated October 24, 2018 (ADAMS Accession No. ML18297A361). The U.S. Nuclear Regulatory Commission (NRC or the Commission) issued a final safety evaluation (SE) approving traveler TSTF-564, Revision 2, on November 16, 2018 (ADAMS Accession No. ML18299A069).

The licensee has proposed a few variations from the TS changes described in traveler TSTF-564, Revision 2. The variations are described in Section 2.2 of this SE and evaluated in Section 3.9.

2.0 REGULATORY EVALUATION

2.1 Description of TS Sections

2.1.1 TS 2.1.1, "Reactor Core SLs"

Safety limits ensure that specified acceptable fuel design limits are not exceeded during steady state operation, normal operational transients, and anticipated operational occurrences (AOOs).

Hatch, Unit 1, TS 2.1.1.2 currently requires that with the reactor steam dome pressure greater than or equal to (≥) 685 pounds per square inch gauge (psig) and core flow ≥ 10 percent rated core flow, MCPR shall be ≥ 1.09 for two recirculation loop operation or ≥ 1.12 for single recirculation loop operation.

Hatch, Unit 2, TS 2.1.1.2 currently requires that with the reactor steam dome pressure ≥ 685 psig and core flow ≥ 10 percent rated core flow, MCPR shall be ≥ 1.10 for two recirculation loop operation or ≥ 1.13 for single recirculation loop operation.

The MCPR SL ensures that 99.9 percent of the fuel in the core is not susceptible to boiling transition.

2.1.2 TS 5.6.5, "Core Operating Limits Report (COLR)"

Hatch, Units 1 and 2, TS 5.6.5 requires core operating limits to be established prior to each reload cycle, or prior to any remaining portion of a reload cycle. These limits are required to be documented in the COLR.

2.2 Proposed Changes to the TS

The licensee proposed to revise the MCPR SL to make it cycle-independent, consistent with the method described in traveler TSTF-564, Revision 2.

The proposed changes to the Hatch, Units 1 and 2, TSs to revise the value of the MCPR SL in TS 2.1.1.2 to 1.07, with corresponding changes to the associated bases. The change to TS 2.1.1.2 replaces the existing separate SLs for single- and two-recirculation loop operation with a single limit since the revised SL is no longer dependent on the number of recirculation loops in operation.

The $MCPR_{99.9\%}$ (i.e., the current MCPR SL) is an input to the MCPR OL in limiting LCO 3.2.2, "Minimum Critical Power Ratio (MCPR)." While the definition and method of calculation of both the $MCPR_{99.9\%}$ and the LCO 3.2.2 MCPR OL remains unchanged, the proposed TS changes include revisions to TS 5.6.5, to require the $MCPR_{99.9\%}$ value used in calculating the LCO 3.2.2 MCPR OL to be included in the cycle-specific COLR.

In addition, the licensee proposed the following variations from the TS changes described in TSTF-564 or the applicable parts of the NRC staff's SE:

- Hatch TS utilize different numbering than the STS on which TSTF-564 was based. Specifically, TS 5.6.3, "Core Operating Limits Report," is TS 5.6.5, "Core Operating Limits Report (COLR)" in the Hatch TS.

- Hatch TS 3.2.2 has requirements for reactor steam dome pressure and applicability (thermal power as percent rated thermal power) that differ from the STS on which TSTF-564 was based.

- TSTF-564 and the staff's safety evaluation discuss the applicable regulatory requirements and guidance, including the Title 10 of the *Code of Federal Regulations* (10 CFR) section 50, Appendix A, General Design Criteria (GDC) 10. The limits placed on the MCPR are specified acceptable fuel design limits to prevent boiling transition used to meet GDC 10 or its equivalent. For Hatch Unit 1, a plant-specific design criterion similar to GDC 10 is applicable, because Hatch, Unit 1 was not licensed to the 10 CFR 50, Appendix A, GDC. Hatch, Unit 1 was licensed to the applicable Atomic Energy Commission (AEC) preliminary general design criteria identified in *Federal Register* on July 11, 1967 (32 FR 10213) (ADAMS Accession No. ML043310029). Hatch, Unit 2, however, was licensed to the 10 CFR 50, Appendix A, GDC; therefore, GDC 10 is applicable for Hatch, Unit 2.

2.3 Applicable Regulatory Requirements and Guidance

The regulation at 10 CFR, Section 50.36(a)(1), requires an applicant for an operating license to include in the application proposed TSs in accordance with the requirements of 10 CFR 50.36. The applicant must include in the application, a "summary statement of the bases or reasons for such specifications, other than those covering administrative controls." However, per 10 CFR 50.36(a)(1), these TS bases "shall not become part of the technical specifications."

As required by 10 CFR 50.36(c),

> Technical Specifications will include items in the following categories:

As required by 10 CFR 50.36(c)(1)(i)(A),

> (1) *Safety limits, limiting safety system settings, and limiting control settings.*
> (i)(A) safety limits for nuclear reactors are limits upon important process variables that are found to be necessary to reasonably protect the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity. If any safety limit is exceeded, the reactor must be shut down. The licensee shall notify the Commission, review the matter, and record the results of the review, including the cause of the condition and the basis for corrective action taken to preclude recurrence. Operation must not be resumed until authorized by the Commission....

As required by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met. Paragraph 50.36(c)(5) of 10 CFR states that:

> Administrative controls are the provisions relating to organization and management, procedures, recordkeeping, review and audit, and reporting necessary to assure operation of the facility in a safe manner.

The limits placed on the MCPR are specified acceptable fuel design limits to prevent boiling transition, used to meet GDC 10 or its equivalent. In Table 15.1-3 of the Updated Final Safety Analysis Report (UFSAR), GDC 10 is linked to the specified acceptable fuel design limit (SAFDL), and the SAFDL is linked to the Safety Limit MCPR.

A design evaluation of GDC Criterion 10 is included for Hatch, Unit 1 in Section F.3 of the Hatch UFSAR, "Evaluation with Respect to 1971 General Design Criteria."

> Following implementation of the proposed change, HNP [Hatch] Unit 1 will remain in compliance with applicable [Atomic Energy Commission] AEC design criteria as described in the HNP [Hatch] UFSAR.

Hatch, Unit 1 was licensed to equivalent GDC states:

> *Criterion 6* - Reactor *Core Design (Category A).* The reactor core shall be designed to function throughout its design lifetime, without exceeding acceptable fuel damage limits which have been stipulated and justified. The core design, together with reliable process and decay heat removal systems, shall provide for this capability under all expected conditions of normal operation with appropriate margins for uncertainties and for transient situations which can be anticipated, including the effects of the loss of power to recirculation pumps, tripping out of a turbine generator set, isolation of the reactor from Its primary heat sink, and loss of all offsite power.

Hatch, Unit 2 was licensed to GDC 10, "Reactor design," of 10 CFR Part 50 Appendix A, "General Design Criteria of Nuclear Power Plants," states:

> 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.

The limit placed on the MCPR acts as a specified acceptable fuel design limit to prevent boiling transition, which has the potential to result in fuel rod cladding failure.

The NRC staff's guidance contained in Revision 2 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition" (SRP), Section 4.4, "Thermal and Hydraulic Design," (ADAMS Accession No. ML070550060) provides the following two examples of acceptable approaches to meeting the SRP acceptance criteria for establishing fuel design limits (as stated in SRP Acceptance Criterion 1):

A. For departure from nucleate boiling ratio (DNBR), CHFR [critical heat flux ratio] or CPR [critical power ratio] correlations, there should be a 95-percent probability at the 95-percent confidence level that the hot rod in the core does not experience a DNB [departure from nucleate boiling] or boiling transition condition during normal operation or AOOs.

B. The limiting (minimum) value of DNBR, CHFR, or CPR correlations is to be established such that at least 99.9 percent of the fuel rods in the core will not experience a DNB or boiling transition during normal operation or AOOs.

3.0 TECHNICAL EVALUATION

3.1 Background on Boiling Transition

During steady-state operation in BWRs, most of the coolant in the core is in a flow regime known as annular flow. In this flow regime, a thin liquid film is pushed up the surface of the fuel rod cladding by the bulk coolant flow, which is mostly water vapor with some liquid water droplets. This provides effective heat removal from the cladding surface; however, under certain conditions, the annular film may dissipate, which reduces the heat transfer and results in an increase in fuel cladding surface temperature. This phenomenon is known as boiling transition or dryout. The elevated surface temperatures resulting from dryout may cause fuel cladding damage or failure.

3.2 Background on Critical Power Correlations

For a given set of reactor operating conditions (pressure, flow, etc.), dryout will occur on a fuel assembly at a certain power, known as the critical power. Because the phenomena associated with boiling transition are complex and difficult to model purely mechanistically, thermal-hydraulic test campaigns are undertaken using electrically heated prototypical fuel bundles to establish a comprehensive database of critical power measurements for each BWR fuel product. These data are then used to develop a critical power correlation that can be used to predict the critical power for assemblies in operating reactors. This prediction is usually expressed as the ratio of the actual assembly power to the critical power predicted using the correlation, known as the CPR.

One measure of the correlation's predictive capability is based on its validation relative to the test data. For each point j in a correlation's test database, the experimental critical power ratio (ECPR) is defined as the ratio of the measured critical power to the calculated critical power, or:

$$ECPR_j = \frac{Measured\ Critical\ Power_i}{Calculated\ Critical\ Power_j}$$

For ECPR values less than or equal to 1, the calculated critical power is greater than or equal to the measured critical power and the prediction is considered to be non-conservative. Because the measured critical power includes random variations due to various uncertainties, evaluating the ECPR for all of the points in the dataset (or, ideally, a subset of points that were not used in the correlation's development) results in a probability distribution. This ECPR distribution allows the predictive uncertainty of the correlation to be determined. This uncertainty can then be used to establish a limit above which there can be assumed that boiling transition will not occur (with a certain probability and confidence level).

3.3 Background on Thermal-Hydraulic Safety Limits

To protect against boiling transition, BWRs have implemented an SL on the CPR, known as the MCPR SL. Consistent with the current BWR standard technical specifications (STS),[1] the current basis of the MCPR SL for the licensee's facility is to prevent 99.9 percent of the fuel in the core from being susceptible to boiling transition from a letter dated August 30, 2018, on TS Bases page B2.0-1. This limit is typically developed by considering various cycle-specific power distributions and uncertainties and is highly dependent on the cycle-specific radial power distribution in the core. As such, the limit may need to be updated as frequently as every cycle.

The fuel cladding SL for pressurized-water reactor (PWR) designs, described in the STS for Babcock & Wilcox, Westinghouse, and Combustion Engineering plants in NUREG-1430, Volumes 1 and 2, (ADAMS Accession Nos. ML12100A177 and ML12100A178), NUREG-1431, Volumes 1 and 2 (ADAMS Accession Nos. ML12100A222 and ML12100A228), and NUREG-1432, Volumes 1 and 2 (ADAMS Accession Nos. ML12102A165 and ML12102A169) respectively, correspond to a 95 percent probability at a 95 percent confidence level that departure from nucleate boiling will not occur. As a result of the overall approach taken in developing the PWR limits, they are only dependent on the fuel type(s) in the reactor and the corresponding departure from nucleate boiling ratio (DNBR) correlations. The limits are not cycle-dependent and are typically only updated when new fuel types are inserted in the reactor.

The TSs for the licensee's facility also include a limiting condition for operation (LCO) that governs MCPR, known as the MCPR operating limit (OL). The OL on MCPR is an LCO which must be met to ensure that anticipated operational occurrences do not result in fuel damage. The current MCPR OL is calculated by combining the largest change in CPR from all analyzed transients, also known as the ΔCPR, with the MCPR SL.

3.4 Basis for Proposed Change

As discussed above, the current MCPR SL (i.e., the $MCPR_{99.9\%}$), is affected by the plant's cycle-specific core design, especially including the core power distribution, fuel types in the reactor, and the power-to-flow operating domain for the plant. As such, it is frequently necessary to change the MCPR SL to accommodate new core designs. Changes to the MCPR SL are usually determined late in the design process and necessitate an accelerated NRC review (i.e., license amendment request) to support the subsequent fuel cycle.

The proposed LAR amendment to the TSs would revise the reactor core safety limit for the MCPR, which protects against boiling transition on the fuel rods in the core. The current MCPR safety limit for Hatch ensures that 99.9 percent of the fuel rods in the core are not susceptible to boiling transition. The revised MCPR safety limit would ensure that there is a 95-percent probability at a 95-percent confidence level (95/95) that no fuel rods will be susceptible to boiling transition based on a statistical analysis of CPR data.

The intent of the proposed reason for the revised MCPR SL is acceptable to the NRC staff based on the discussion in SRP Section 4.4, SRP Acceptance Criterion 1. The remainder of this SE is devoted to ensuring that the methodology for determining the revised MCPR SL provides the intended result, that the revised MCPR SL can be determined adequately in the

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1 U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric Plants BWR/4," NUREG-1433 Volume 1, "Specifications," and Volume 2, "Bases," Revision 4.0, April 2012 (ADAMS Accession Nos. ML12104A192 and ML12104A193).

core using various types of fuel, that the proposed SL continues to fulfil the necessary functions of an SL without unintended consequences, and that the proposed changes have been adequately implemented in the Hatch, Units 1 and 2, TSs.

3.5 Revised MCPR SL Calculational Method

As discussed above, a critical power correlation's ECPR distribution quantifies the uncertainty associated with the correlation. Traveler TSTF-564, Revision 2, provides a formula for a limit that bounds 95 percent of a correlation's ECPR distribution at a 95 percent confidence level, according to the following formula:

$$MCPR_{95/95}(i) = \mu_i + \kappa_i \sigma_i$$

where μ_i is the mean ECPR and σ_i is the standard deviation of the ECPR distribution. The statistical parameter (κ_i) is selected, based on the number of samples in the critical power database, to provide the one-sided upper tolerance limit with a 95-probability at a 95-percent confidence level. This is a commonly used statistical formula to determine a one-sided upper tolerance limit for a normal distribution, which is appropriate for the situation under consideration. For reactor cores loaded with a single fuel type, the $MCPR_{95/95}$ safety limit is the $MCPR_{95/95}(i)$ value for the fuel type.

In the SE approving TSTF-564, the NRC staff determined that the formula for determining $MCPR_{95/95}$ will appropriately establish a 95/95 upper tolerance limit on the critical power correlation and that any issues in the underlying correlation will be addressed through adjustments to the correlation mean and standard deviation, as necessary to ensure appropriate conservatism. Therefore, the NRC staff concluded that the proposed method of determining $MCPR_{95/95}$ can be used to establish acceptable fuel design limits.

3.6 Determination of Revised MCPR SL for Mixed Cores

Traveler TSTF-564, Revision 2, proposed that a core containing a variety of fuel types would evaluate the $MCPR_{95/95}$ for all of the fresh and once-burnt fuel in the core and apply the most limiting (i.e., the largest) value of $MCPR_{95/95}$ for each of the applicable fuel types as the MCPR SL. As stated in Section 3.1 of Traveler TSTF-564, Revision 2, this is because bundles that are twice-burnt or more at the beginning of the cycle have significant MCPR margin relative to the fresh and once-burnt fuel. The justification is that the MCPR for twice-burnt and greater fuel is far enough from the MCPR for the limiting bundle that its probability of boiling transition is very small compared to the limiting bundle and it can be neglected in determining the SL. In its letter dated May 29, 2018, the TSTF provided results of a study that confirmed that this is the case even for fuel operated on short (12-month) reload cycles. As discussed in the Traveler, twice-burnt or greater fuel bundles are included in the cycle-specific evaluation of the $MCPR_{99.9\%}$ and the MCPR OL. If a twice-burnt or greater fuel bundle is found to be limiting, it would be governed by the MCPR OL, which will always be more restrictive than both the $MCPR_{95/95}$ and the $MCPR_{99.9\%}$. The NRC staff found this justification to be appropriate and determined that it is acceptable to determine the $MCPR_{95/95}$ SL for the core based on the most limiting value of the $MCPR_{95/95}$ for the fresh and once-burnt fuel in the core.

The NRC staff reviewed the information furnished by the TSTF and determined that the process for establishing the revised MCPR SL for mixed cores ensures that the limiting fuel types in the core will be evaluated and the limiting $MCPR_{95/95}$ will be appropriately applied as the SL. The NRC staff, therefore, found this process to be acceptable.

3.7 Relationship between MCPR Safety and Operating Limits

As discussed in the TSTF letter dated May 29, 2018, the current $MCPR_{99.9\%}$ safety limits are greater than the proposed $MCPR_{95/95}$ safety limits for two reasons. First, because the $MCPR_{99.9\%}$ includes uncertainties not factored into the $MCPR_{95/95}$, and second, because the 99.9 percent probability basis for determining the $MCPR_{99.9\%}$ is more conservative than the 95 percent probability at a 95 percent confidence level used in determining the $MCPR_{95/95}$. The level of conservatism in the $MCPR_{95/95}$ SL is appropriate because the lead fuel rod in the core (i.e., the limiting fuel rod with respect to MCPR) is used to evaluate whether any fuel rods in the core are susceptible to boiling transition). This is consistent with evaluations performed for PWRs using a 95/95 upper tolerance limit on the correlation uncertainty as an SL.

Consistent with Traveler TSTF-564, Revision 2, the MCPR OL for LCO 3.2.2 would continue to be evaluated using the $MCPR_{99.9\%}$ as an input. The $MCPR_{99.9\%}$ will continue to be evaluated in the same way as it is currently, using the whole core.

Consistent with Traveler TSTF-564, Revision 2, the licensee proposed to revise TS 5.6.5 to require the cycle-specific value of the $MCPR_{99.9\%}$ to be included in the COLR. The methods for determining $MCPR_{99.9\%}$ are included in the list of COLR references contained in TS 5.6.3.b. The changes to TS 5.6.3.b will ensure that the uncertainties being removed from the MCPR SL are still included as part of the MCPR OL and will continue to appropriately inform plant operation.

The NRC staff, therefore, determined that the changes proposed by the licensee will retain an adequate level of conservatism in the MCPR SL in TS 2.1.1.2 while appropriately ensuring that plant- and cycle-specific uncertainties will be retained in the MCPR OL. The NRC staff notes that the $MCPR_{95/95}$ represents a hard floor on the value of the $MCPR_{99.9\%}$, which should always be higher since it accounts for numerous uncertainties that are not included in the $MCPR_{95/95}$.

3.8 Implementation of the Revised MCPR SL in the TSs

The licensee has proposed to change the value of the SL in TS 2.1.1.2 to 1.07, consistent with the value from Table 1 of the TSTF-564, Revision 2, for the fuel type(s) in use at Hatch, Units 1 and 2 (i.e., GE14, GNF2, and GNF3 fuel bundles). The licensee has evaluated the fresh and once-burnt fuels in use at Hatch, Units 1 and 2, and the NRC staff finds that the limiting $MCPR_{95/95}$ for these fuels was provided for inclusion in TS 2.1.1.2, consistent with the process described in Traveler TSTF-564, Revision 2. As discussed in TSTF-564, Revision 2, the derivation of these values using the methodology described in the Traveler was provided to the NRC staff in a proprietary letter from the fuel vendor, Global Nuclear Fuel (ADAMS Package Accession No. ML18212A017) or a submittal from Westinghouse (ADAMS Accession No. ML17142A319).

The value reported in Hatch, Units 1 and 2, TS 2.1.1.2 was calculated using Equation 1 from Traveler TSTF-564, Revision 2, and reported at a precision of two digits past the decimal point with the hundreds digit rounded up.

SNC also modified Hatch, Units 1 and 2's TS 5.6.5 to include the value of the $MCPR_{99.9\%}$ in order to continue to be reported in the COLR. The COLR continues to report the cycle-specific value of the MCPR OL contained in LCO 3.2.2 and Hatch, Units 1 and TS 5.6.5.b will continue to reference appropriate NRC-approved methodologies for determination of the $MCPR_{99.9\%}$ and the MCPR OL.

The NRC staff reviewed the licensee's proposed TS changes and found that the licensee appropriately implemented the revised MCPR SL, as discussed in this SE.

3.9 Variations

SNC noted the following variations in its submittal:

- Hatch TS utilize different numbering than the STS on which TSTF-564 was based. Specifically, TS 5.6.3, "Core Operating Limits Report," is TS 5.6.5, "Core Operating Limits Report (COLR)" in the Hatch TS.

- Hatch TS 3.2.2 has requirements for reactor steam dome pressure and applicability (thermal power as percent rated thermal power) that differ from the STS on which TSTF-564 was based.

- TSTF-564 and the staff's safety evaluation discuss the applicable regulatory requirements and guidance, including the Title 10 of the *Code of Federal Regulations* (10 CFR) section 50, Appendix A, General Design Criteria (GDC) 10. The limits placed on the MCPR are specified acceptable fuel design limits to prevent boiling transition used to meet GDC 10 or its equivalent. For Hatch Unit 1, a plant-specific design criterion similar to GDC 10 is applicable, because Hatch, Unit 1 was not licensed to the 10 CFR 50, Appendix A, GDC. Hatch, Unit 1 was licensed to the applicable Atomic Energy Commission (AEC) preliminary general design criteria identified in *Federal Register* on July 11, 1967 (32 FR 10213) (ADAMS Accession No. ML043310029). Hatch, Unit 2, however, was licensed to the 10 CFR 50, Appendix A, GDC; therefore, GDC 10 is applicable for Hatch, Unit 2.

The NRC staff determined that these differences do not affect the applicability of TSTF-564 for Hatch.

3.10 NRC Staff Conclusion

The NRC staff reviewed the licensee's proposed TS changes and determined that the proposed SL associated with TS 2.1.1.2 was calculated in a manner consistent with the process described in traveler TSTF-564, Revision 2, and was therefore acceptably modified to suit the revised definition of the MCPR SL. Under the new definition, the MCPR SL will continue to protect the fuel cladding against the uncontrolled release of radioactivity by preventing the onset of boiling transition, thereby fulfilling the requirements of 10 CFR 50.36(c)(1) for SLs. The MCPR OL in LCO 3.2.2 remains unchanged and will continue to meet the requirements of 10 CFR 50.36(c)(2) and GDC 10 for Hatch, Unit 2 or the equivalent plant-specific design criterion for Hatch, Unit 1 by ensuring that no fuel damage results during normal operation and anticipated operational occurrences. The NRC staff determined that the changes to TS 5.6.5 proposed in the traveler are acceptable; upon adoption of the revised MCPR SL, the COLR will be required to contain the $MCPR_{99.9\%}$, supporting the determination of the MCPR OL using current methodologies.

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 a requirement with respect to the installation or use of facility components 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 a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding on July 2, 2019 (84 FR 31637). 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.

Principal Contributors: Muhammad Razzaque, NRR/DSS
Caroline Tilton, NRR/DSS
John G. Lamb, NRR/DORL

Date: September 20, 2019

SUBJECT: EDWIN I. HATCH NUCLEAR PLANT, UNIT NOS. 1 AND 2, ISSUANCE OF AMENDMENT NOS. 299 AND 244, REGARDING REVISION TO TECHNICAL SPECIFICATIONS TO ADOPT TSTF-564, "SAFETY LIMIT [MINIMUM CRITICAL POWER RATIO] MCPR" (EPID L-2019-LLA-0085) DATED SEPTEMBER 20, 2019

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Amendment No. ML19212A054 ***via memo** ****via email**

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NAME	JLamb	KEntz	KGoldstein	JBorromeo
DATE	7/31/19	8/7/2019	08/14/19	7/1/19
OFFICE	NRR/DSS/STSB/BC**	OGC – NLO**	NRR/DORL/LPL2-1/BC	NRR/DORL/LPL2-1/PM
NAME	VCusumano (MHamm for)	DRoth	MMarkley	JLamb
DATE	9/13/19	9/12/19	9/20/19	9/20/19

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