



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

September 24, 2015

Mr. Scott Batson
Site Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3, ISSUANCE OF
AMENDMENTS REGARDING ALLOWED MAXIMUM RATED THERMAL
POWER (TAC NOS. MF4668, MF4669, AND MF4670)

Dear Mr. Batson:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment Nos. 395, 397, and 396 to Renewed Facility Operating Licenses DPR-38, DPR-47, and DPR-55, for the Oconee Nuclear Station, Units 1, 2, and 3, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated June 30, 2014, as supplemented by letter dated June 8, 2015.

These amendments revise Technical Specification 3.5.2 by reducing the allowed maximum Rated Thermal Power at which each unit can operate when select High Pressure Injection system equipment is inoperable.

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. If you have any questions, please call me at 301-415-4032 or Karen Cotton at 301-415-1438.

Sincerely,

A handwritten signature in black ink that reads "James R. Hall". The signature is written in a cursive style with a large, stylized "J" and "H".

James R. Hall, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosures:

1. Amendment No. 395 to DPR-38
2. Amendment No. 397 to DPR-47
3. Amendment No. 396 to DPR-55
4. Safety Evaluation

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

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-269

OCONEE NUCLEAR STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 395
Renewed License No. DPR-38

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the Oconee Nuclear Station, Unit 1 (the facility), Renewed Facility Operating License No. DPR-38, filed by Duke Energy Carolinas, LLC (the licensee), dated June 30, 2014, and supplemented by letter dated June 8, 2015, 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.

Enclosure 1

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 3.B of Renewed Facility Operating License No. DPR-38 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 395, are hereby incorporated in the license. The licensee 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 120 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Robert J. Pascarelli, 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-38
and the Technical Specifications

Date of Issuance: September 24, 2015



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

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-270

OCONEE NUCLEAR STATION, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 397
Renewed License No. DPR-47

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the Oconee Nuclear Station, Unit 2 (the facility), Renewed Facility Operating License No. DPR-47, filed by Duke Energy Carolinas, LLC (the licensee), dated June 30, 2014, and supplemented by letter dated June 8, 2015, 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.

Enclosure 2

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 3.B of Renewed Facility Operating License No. DPR-47 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 397, are hereby incorporated in the license. The licensee 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 120 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Robert J. Pascarelli, 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-47
and the Technical Specifications

Date of Issuance: September 24, 2015



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

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-287

OCONEE NUCLEAR STATION, UNIT 3

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 396
Renewed License No. DPR-55

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the Oconee Nuclear Station, Unit 3 (the facility), Renewed Facility Operating License No. DPR-55, filed by Duke Energy Carolinas, LLC (the licensee), dated June 30, 2014, and supplemented by letter dated June 8, 2015, 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.

Enclosure 3

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 3.B of Renewed Facility Operating License No. DPR-55 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 396, are hereby incorporated in the license. The licensee 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 120 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Robert J. Pascarelli, 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-55
and the Technical Specifications

Date of Issuance: September 24, 2015

ATTACHMENT TO LICENSE AMENDMENT NO. 395
RENEWED FACILITY OPERATING LICENSE NO. DPR-38
DOCKET NO. 50-269
AND
TO LICENSE AMENDMENT NO. 397
RENEWED FACILITY OPERATING LICENSE NO. DPR-47
DOCKET NO. 50-270
AND
TO LICENSE AMENDMENT NO. 396
RENEWED FACILITY OPERATING LICENSE NO. DPR-55
DOCKET NO. 50-287

Replace the following pages of the Licenses 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

Licenses

License No. DPR-38, page 3
License No. DPR-47, page 3
License No. DPR-55, page 3

TSs

3.5.2-2
3.5.2-3

Insert Pages

Licenses

License No. DPR-38, page 3
License No. DPR-47, page 3
License No. DPR-55, page 3

TSs

3.5.2-2
3.5.2-3

A. Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 2568 megawatts thermal.

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 395 are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

C. This license is subject to the following antitrust conditions:

Applicant makes the commitments contained herein, recognizing that bulk power supply arrangements between neighboring entities normally tend to serve the public interest. In addition, where there are net benefits to all participants, such arrangements also serve the best interests of each of the participants. Among the benefits of such transactions are increased electric system reliability, a reduction in the cost of electric power, and minimization of the environmental effects of the production and sale of electricity.

Any particular bulk power supply transaction may afford greater benefits to one participant than to another. The benefits realized by a small system may be proportionately greater than those realized by a larger system. The relative benefits to be derived by the parties from a proposed transaction, however, should not be controlling upon a decision with respect to the desirability of participating in the transaction. Accordingly, applicant will enter into proposed bulk power transactions of the types hereinafter described which, on balance, provide net benefits to applicant. There are net benefits in a transaction if applicant recovers the cost of the transaction (as defined in ¶1 (d) hereof) and there is no demonstrable net detriment to applicant arising from that transaction.

1. As used herein:

- (a) "Bulk Power" means electric power and any attendant energy, supplied or made available at transmission or sub-transmission voltage by one electric system to another.
- (b) "Neighboring Entity" means a private or public corporation, a governmental agency or authority, a municipality, a cooperative, or a lawful association of any of the foregoing owning or operating, or proposing to own or operate, facilities for the generation and transmission of electricity which meets each of

A. Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 2568 megawatts thermal.

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 397 are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

C. This license is subject to the following antitrust conditions:

Applicant makes the commitments contained herein, recognizing that bulk power supply arrangements between neighboring entities normally tend to serve the public interest. In addition, where there are net benefits to all participants, such arrangements also serve the best interests of each of the participants. Among the benefits of such transactions are increased electric system reliability, a reduction in the cost of electric power, and minimization of the environmental effects of the production and sale of electricity.

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A. Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 2568 megawatts thermal.

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 396 are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

C. This license is subject to the following antitrust conditions:

Applicant makes the commitments contained herein, recognizing that bulk power supply arrangements between neighboring entities normally tend to serve the public interest. In addition, where there are net benefits to all participants, such arrangements also serve the best interests of each of the participants. Among the benefits of such transactions are increased electric system reliability, a reduction in the cost of electric power, and minimization of the environmental effects of the production and sale of electricity.

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ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met.	B.1 Reduce THERMAL POWER to $\leq 50\%$ RTP.	12 hours
	<u>AND</u>	
	B.2 Verify by administrative means that the ADV flow path for each steam generator is OPERABLE.	12 hours
	<u>AND</u>	
	B.3 Restore HPI pump to OPERABLE status.	30 days from initial entry into Condition A
	<u>AND</u>	
	B.4 Restore HPI discharge crossover valve(s) to OPERABLE status.	30 days from initial entry into Condition A

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One HPI train inoperable.	C.1 <u>NOTE</u> Only required when inoperable HPI train is incapable of automatic actuation and incapable of actuation through remote manual alignment. Reduce THERMAL POWER to $\leq 50\%$ RTP.	3 hours
	<u>AND</u> C.2 <u>NOTE</u> Only required when THERMAL POWER $\leq 50\%$ RTP. Verify by administrative means that the ADV flow path for each steam generator is OPERABLE.	3 hours
	<u>AND</u> C.3 Restore HPI train to OPERABLE status.	72 hours
D. HPI suction headers not cross-connected.	D.1 Cross-connect HPI suction headers.	72 hours
E. HPI discharge headers cross-connected.	E.1 Hydraulically separate HPI discharge headers.	72 hours

(continued)



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 395 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-38

AMENDMENT NO. 397 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-47

AND

AMENDMENT NO. 396 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-55

DUKE ENERGY CAROLINAS, LLC

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

DOCKET NOS. 50-269, 50-270, AND 50-287

1.0 INTRODUCTION

By application dated June 30, 2014 (Reference 1), as supplemented by letter dated June 8, 2015 (Reference 2), Duke Energy Carolinas, LLC (the licensee), requested changes to the Technical Specifications (TSs) for the Oconee Nuclear Station, Units 1, 2, and 3 (ONS). The supplement dated June 8, 2015, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on September 16, 2014 (79 FR 55510).

The proposed changes would revise TS 3.5.2 by reducing the allowed maximum Rated Thermal Power (RTP) at which each unit can operate when select High Pressure Injection system (HPI) equipment is inoperable.

2.0 REGULATORY EVALUATION

NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition" (SRP), Section 16.0, "Technical Specifications," provides guidance which states that proposed plant-specific TSs shall satisfy 10 CFR 50.34, 10 CFR 50.36, and 10 CFR 50.36a, and are therefore acceptable if consistent with the regulatory guidance of the applicable standard technical specification (STS) documents and present plant-specific values for parameters at the indicated level of detail. In the case of this amendment request, the applicable guidance is in NUREG-1430, "Standard Technical Specifications — Babcock and Wilcox Plants" Revision 4 (B&W STS).

Enclosure 4

The SRP Section 4.2 guidance regarding fuel design cites acceptance criteria, some of which are applicable to this review:

- 10 CFR 50.46, as it relates to the cooling performance analysis of the Emergency Core Cooling System (ECCS) using an acceptable evaluation model and establishing acceptance criteria for light-water nuclear power reactor ECCS.
- GDC 35, as it relates to providing an ECCS to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented; and (2) clad metal-water reaction is limited to negligible amounts.

3.0 TECHNICAL EVALUATION

3.1 Background

ONS Technical Specification 3.5.2, "High Pressure Injection (HPI)," Conditions B and C provide required actions when an HPI pump or HPI discharge crossover valve is inoperable, or when an HPI train is inoperable. These required actions include a reduction in power level to less than or equal to 75% of RTP. The proposed changes would reduce the maximum power level for unit operation under the specified conditions to less than or equal to 50% of RTP, to account for non-conservatisms identified in the relevant accident analyses.

In 2010, the licensee initiated two ONS Problem Investigation Program (PIP) reports identifying issues with the ONS small break loss-of-coolant accident (SBLOCA) analysis, and ultimately, TS 3.5.2. In the first case, a licensee review of ONS Emergency Operating Procedure (EOP) changes identified an issue where the potential exists for core flood tank (CFT) nitrogen gas to enter the RCS during reactor coolant system (RCS) depressurization and affect primary-to-secondary heat transfer in the steam generator (SG) tubes during specific SBLOCAs with inadequate HPI. Further review of the issue identified that a new partial-power SBLOCA analysis was required to allow ONS EOPs to include operator actions to isolate the CFTs. Isolating the CFT has the potential to negatively impact the SBLOCA analysis due to the reduction in injection volume of borated water.

The second PIP was initiated after the fuel vendor, AREVA, Inc. (AREVA), discovered that the standard axial power shape utilized in the SBLOCA evaluation model (Reference 3) may not be bounding for the entire fuel cycle, particularly near the end-of-cycle (EOC). The standard axial power shape used in the SBLOCA evaluation model for ONS peaked at the 9.5 foot core elevation; however, AREVA subsequently determined that a bounding EOC axial power shape that peaked at a core elevation of 11 feet should be used in the SBLOCA analyses.

As a result of these issues, Duke Energy concluded that the existing 75% partial-power SBLOCA analysis supporting event mitigation with one HPI pump was non-conservative, and currently considers the HPI system for each ONS unit operable, but degraded/nonconforming (OBDN). This condition was described in a Duke Energy letter to the NRC dated August 19, 2010 (Reference 4). The licensee has imposed administrative controls to limit maximum power to less than or equal to 50% of RTP vs. 75%, when entering TS 3.5.2, Conditions B and C, in accordance with the guidance of NRC Administrative Letter 98-10 (Reference 5). This condition has been

captured in the ONS Corrective Action Program, and the administrative controls remain in place pending approval of the proposed changes to TS 3.5.2.

On November 25, 2014, AREVA submitted a 10 CFR Part 21 report (Reference 6) notifying the NRC of an error regarding a potential defect in the LOCA analysis for Babcock and Wilcox (B&W) plants, including ONS. AREVA determined that the defect was related to the thermal conductivity model used in the computer codes TACO3 and GDTACO. AREVA stated that the models did not accurately account for the thermal conductivity degradation (TCD) due to fuel burnup; consequently the fuel peak cladding temperatures previously calculated for ONS were non-conservative. The NRC staff also considered the potential impact of this issue in its review of this license amendment request (LAR).

The NRC staff identified a number of technical issues that required additional information in the course of its review of the LAR. To facilitate an expedited review of the LAR and to develop a clear understanding of the information provided by the licensee, a regulatory audit was conducted on May 4-5, 2015. Following this audit, by letter dated May 21, 2015 (Reference 7), the NRC staff transmitted a request for additional information (RAI) to the licensee to provide additional justification regarding certain analysis methods. The licensee provided its responses to the four RAI questions in Reference 2.

3.2 Potential for Nitrogen Intrusion into RCS from Core Flood Tanks

In 2010, the licensee identified the possibility of nitrogen intrusion into the RCS from the CFTs. During the investigation of this nitrogen intrusion issue, the licensee determined that the Oconee CFTs are not isolated during a loss of coolant accident (LOCA). As a result, the current EOPs direct an operator action to maintain a minimum RCS pressure of 300 psig. This operator action is to prevent the intrusion of nitrogen in the CFT and subsequently into the RCS.

10 CFR 50, Appendix B, Criterion V, requires that procedures affecting quality shall be appropriate to the circumstances and should include acceptance criteria for determining that important activities have been satisfactorily accomplished. In Reference 7 (RAI 4), the NRC staff asked the licensee to describe how the EOPs will be modified to inhibit the intrusion of nitrogen into the RCS by the core flood tanks during a SBLOCA event without compromising any of the many other safety analysis requirements.

The NRC staff review of the RAI response confirmed that per the Applicable Safety Analysis section of the Oconee Technical Specification Bases (ONS TSB 3.5.1), the CFTs are credited in the small break LOCA analyses. In addition to SBLOCA analyses, the CFTs have been assumed to operate to provide borated water for reactivity control for severe overcooling events in case of a main steam line break (MSLB).

In its RAI response (Reference 2), the licensee described several LOCA scenarios. In the case of SBLOCA events initiated at full-power conditions, the limiting peak cladding temperature occurs at approximately 640 seconds, per Oconee Updated Final Safety Analysis Report (UFSAR) Figure 15-231, when adequate HPI flow is being provided to the RCS. For this case, the main steam pressure remains well above the 250 - 275 psig range to be used in the EOPs. For the limiting SBLOCA event from full-power conditions, the analysis is terminated at approximately 1300 seconds. The atmospheric dump valve (ADV) flow path is not used to depressurize the

steam generators (SGs) for the full-power SBLOCA analyses; therefore, the proposed EOP changes do not affect full-power SBLOCA analyses as described in Oconee UFSAR Section 15.14.

For the limiting partial-power SBLOCA scenarios analyzed for this LAR, operator action to modulate main steam pressure would occur at a time greater than 1500 seconds from the event initiation. For partial-power SBLOCA scenarios where depressurization via the ADVs is credited, main steam pressure will be maintained in 250 - 275 psig range in accordance with the revised EOPs. Operation in this range will prevent the CFTs from emptying their water inventory, thus precluding nitrogen introduction into the RCS. For small steam line breaks, the main steam pressures remain above 450 psig for the duration of the event.

For the Oconee Large Main Steam Line Break (MSLB) without loss of offsite power (LOOP) as described in Oconee UFSAR Section 15.13.2, the NRC staff review confirmed that the overcooling event is terminated at 10 minutes, since operator action is credited at that point to terminate feeding of the faulted SG, which stops the uncontrolled RCS cooldown. Per Oconee UFSAR Figure 15-43, the core does not experience a return to power during the event. The CFTs do inject into the RCS for this Large Main Steam Line Break event; however, the CFT injection ceases at approximately 500 seconds into the event as the CFT and RCS pressures equilibrate. After this point, the boron concentration in the RCS continues to increase due to continued HPI flow with suction from the Borated Water Storage Tank. Therefore, the proposed EOP changes will have no impact on the Large MSLB without LOOP safety analyses described in Oconee UFSAR Section 15.13.2, since the timing of these operator actions would occur well after the point in time when the safety analysis acceptance criteria have been demonstrated.

For the Oconee Large MSLB with LOOP, the event is only modeled for the first five seconds after the break, since the point of minimum Departure from Nucleate Boiling Ratio (DNBR) occurs at approximately 1.5 seconds, per Oconee UFSAR Figure 15-167. The RCS pressure remains above 1800 psig during the event, which is well above the CFT pressure. Therefore, the proposed EOP changes have no impact on the Large MSLB with LOOP safety analyses described in Oconee UFSAR Section 15.13.3.

Based on the above information, the NRC staff finds that the proposed EOP changes will minimize the potential for nitrogen intrusion into the RCS, and that the EOP changes will not impact the approved safety analyses as described in Chapter 15 of the Oconee UFSAR.

3.3 Axial Power Distribution

The NRC staff reviewed the Engineering Information Record (EIR) prepared by AREVA for ONS, which documented many parameters used in the LOCA analysis, including the linear heat rate (LHR) limiting values. The EIR did not document the actual axial shapes employed in the analysis. The axial shapes described in the licensee's analysis are identified only by the elevation of peak axial location. The previous axial shapes were the 2.605', 4.264', 6.021', 7.779', and 9.536'. On the basis of these axial shapes, AREVA analyzed and documented the SBLOCA analysis, which is the limiting accident for consideration of this LAR. In that previous analysis, AREVA concluded that operation at 75% of rated thermal power with one HPI train out of service would result in an acceptable peak clad temperature even if the limiting break were to occur.

In 2010, AREVA notified the licensee that the 9.536' axial shape may not be the most limiting axial shape. Some end-of-cycle top-peaked power distributions would result in a more limiting accident analysis. Therefore, the licensee developed a bounding EOC axial power shape that peaked at a core elevation of 11 feet. This 11-foot axial shape results in the limiting partial-power SBLOCA analysis for ONS.

Based on the 11-foot axial shape, the licensee reanalyzed the SBLOCA to determine PCT and determined that using the previous 75% of rated thermal power would result in exceeding the 10 CFR 50.46 PCT limit of 2200°F. The NRC staff reviewed the revised ONS SBLOCA analysis (Reference 8) that implemented the 11-foot axial shape (which assumes an initial core power level of 50% of 2568 MWt), with only one HPI pump available for mitigation. The NRC staff specifically reviewed the full sequence of events and analytical results for each SBLOCA case analyzed, as described in Section 7.0 of the ONS SBLOCA analysis. The ONS-specific SBLOCA applications used the NRC-approved methods contained in Volume II of BAW-10192P-A, Revision 0 (Reference 3). The NRC-approved topical reports identified in BAW-10192P-A are summarized in Section 3.7 of this Safety Evaluation. In this analysis, the initial power level was reduced from the previous nominal value of 75% of 2568 MWt in order to accommodate the more limiting axial power shape. The previous 75% partial-power SBLOCA analysis reported a peak cladding temperature (PCT) of 1788 °F, without application of a penalty to address the 11-foot peak axial power shape. The reduction in maximum allowed initial core power level to 50% of 2568 MWt results in a PCT value of 1480.2°F. This PCT is less than the full-power SBLOCA analysis for full-core Mk-B-HTP fuel, where a PCT of 1597.5°F is described in ONS UFSAR Section 15.14.4.2.3 and Table 15-64. Therefore, the new partial-power SBLOCA analysis is no longer the limiting accident in terms of PCT for SBLOCAs.

Based on its review, the NRC staff finds that the revised ONS partial-power SBLOCA analysis, assuming a maximum initial core power level of 50%, restores substantial margin to the PCT limit for this event and is acceptable.

3.4 Similarity of ONS Units

The licensee stated that this LAR is applicable to all three Oconee units. However, a review of the documents supplied in the audit indicated that differences in the reactor coolant pumps (RCPs) between units might affect the SBLOCA analysis. The licensee stated that the differences in RCPs do not impact the analysis results for SBLOCA. RAI Question 3 requested that the licensee explain why the differences between Oconee, Units 1, 2, and 3 do not impact the SBLOCA analysis.

In the RAI response, the licensee explained that: (1) the replacement once-through steam generators (OTSGs) are identical in design for all three units; and (2) the CFTs for all units have identical operating control bands. Although the RCPs are not identical, the licensee stated that its analysis was based on a bounding analysis using the most limiting pump design (Westinghouse-type pumps in Unit 1). The bounding analysis also used an M3-modified two-phase degradation multiplier previously reviewed by the NRC to be applicable to RCPs in operation at all B&W plants.

Based upon its evaluation of the Oconee equipment and the bounding analysis for the RCPs, the NRC staff concludes that this LAR and the associated analysis apply to all 3 Oconee units.

3.5 Break Locations

During the audit, the licensee explained why hot leg breaks and pump suction breaks were excluded from the reanalysis of the SBLOCA used to support the LAR. The licensee stated that it varied its analysis in order to identify the most limiting location. As a result of that analysis, the licensee identified the cold leg pump discharge (bottom of the pipe) as the most limiting break location due to the loss of HPI liquid directly out of the break before reaching the reactor vessel. RAI Question 2 requested that the licensee provide the justification for its selection of the cold leg pump discharge as the most limiting break location.

In its response, the licensee confirmed that the revised Oconee partial-power SBLOCA analyses were performed in accordance with the analysis of record for SBLOCA, Topical Report BAW-10192-P-A, Revision 0 (Reference 3). In the approved Topical Report, locations in the RCP suction were excluded from further analysis. The Topical Report identifies the bottom of cold leg pump discharge piping as the limiting break location. The NRC safety evaluation report (SER) approving the topical report indicated that PCT and break flow rate would be lower for a double-ended guillotine break in the pump suction piping than for one in the pump discharge piping, and thus, concluded that a break located in the discharge piping was more limiting. Therefore, the NRC staff concludes that the licensee has selected the most limiting break location for consideration of the partial-power SBLOCA for this LAR.

3.6 Thermal Conductivity Degradation

On November 25, 2014 (Reference 6), in accordance with 10 CFR Part 21, AREVA notified the NRC of an error regarding a potential defect in the LOCA analysis for B&W type plants, including ONS. In that notification, AREVA indicated that the finite element heat transfer codes TACO and GDTACO incorrectly model TCD as a function of burnup.

On December 17, 2014 (Reference 9), as required by 10 CFR 50.46, Duke Energy provided its 30-day report to the NRC describing the impacts of TCD on the large-break loss-of-coolant accident analyses. That report also included a statement that the SBLOCA analyses are not affected by the TCD issue and provided an estimate of 0°F change to the limiting SBLOCA PCT. This is consistent with the AREVA response to SBLOCA RAI-4 provided in Volume 3 of BAW-10192P-A, which stated that the SBLOCA PCT is insensitive to variations in initial fuel stored energy.

RAI-1 in Reference 7 specifically asked for an explanation of TCD for the ONS SBLOCA analyses of record, which include the full power condition with all ECCS equipment initially available, as well as the partial-power, with one HPI pump out-of-service condition that is the subject of this LAR. While the LAR specifically is for the partial-power scenario, the similarities of the full power and partial-power SBLOCA analyses allow them to be addressed in one response. The similarity is that in the analyses, the hot bundle and hot pins have the same initial power in the entire fuel rod, independent of core power levels between 50 percent and 100 percent of full power. The licensee indicated that the full power SBLOCA analysis represents the bounding PCT condition for ONS.

The Oconee 100% full power 0.5-ft² cold leg pump discharge (CLPD) break with a LOOP was used by the licensee to assess the TCD impacts for SBLOCA. While the LAR is specifically focused on

the partial-power SBLOCA results, the hot bundle power is identical for both the 50% and 100% full power cases. Therefore, the 100% full power case was used as a generic response that is slightly conservative as it has additional decay heat and stored energy in the average core that must be removed as well.

After reviewing the licensee's analysis and response to RAI-1, the NRC staff finds the assumptions and calculations made by the licensee to be acceptable. In addition, the licensee's analysis showed an approximately 0 °F impact on the limiting peak clad temperature (PCT) of about 1600 °F. Based on the NRC staff's review of AREVA's preliminary SBLOCA analysis for the TCD issue, the TCD impact on the SBLOCA PCT would not exceed 50°F. Therefore, the NRC staff determined that the effect of TCD on this LAR is negligible.

3.7 Methodology

The SBLOCA analysis performed by the licensee in support of this LAR uses NRC-approved methodologies and uncertainties. They include:

- BAW-10164-P-A "RELAP5/MOD2-B&W, an Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analyses," Revision 6, approved in September 23, 2010 (Reference 10),
- BAW-10162P-A, "TACO3, Fuel Rod Thermal Analysis Computer Code," Revision 0, approved August 1989 (Reference 11),
- GDTACO documented in BAW-10184(P)(A)-00 approved in June 1993 (Reference 12), and
- COPERNIC2 documented in BAW-10231(P)(A)-01, approved January 2004 (Reference 13).

The NRC staff's SER for Topical Report BAW-10164-P-A, Revision 6, dated September 23, 2010 (Reference 12), imposed several restrictions on the use of the RELAP5/MOD2-B&W computer code. Based on the review of the licensee's proposed use of the approved methodology and the application of the limiting restriction as explained in the staff's SER, the NRC staff has determined that the licensee's proposed use of the codes above meets the applicable requirements and is acceptable for this LAR.

3.8 Technical Conclusion

Duke Energy proposed changes to the Required Actions for ONS TS 3.5.2, Conditions B and C. These changes would require an affected unit to reduce thermal power to less than or equal to 50% of RTP when one HPI pump or one or more HPI discharge crossover valves are inoperable, or when one train of HPI is inoperable, versus the current requirement to reduce thermal power to less than or equal to 75% RTP. The changes provide additional restrictions on unit operation to ensure that adequate margin to the PCT limit is preserved for a partial-power SBLOCA. The NRC staff has reviewed the licensee's revised SBLOCA analysis and the methodology used, and has determined that they adequately address non-conservatism in previous analyses and are consistent with the previously-approved methods. Therefore, the NRC staff finds the proposed changes acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the South Carolina 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. 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, which was published in the *Federal Register* on September 16, 2014 (79 FR 55510). 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. "License Amendment Request (LAR) to Reduce Allowed Maximum Rated Thermal Power When High Pressure Injection (HPI) Equipment Is Inoperable License Amendment Request No. 2013-03, License No. DPR-46," June 30, 2014 (ADAMS Accession No. ML14184B384).
2. S. Batson (Duke Energy) to Document Control Desk, "Response to Request for Additional Information Regarding the License A amendment Request (LAR) to Reduce Allowed Maximum Rated Thermal Power When High Pressure Injection (HPI) Equipment is Inoperable License Amendment Request No. 2013-03," ONS-2015-066, June 8, 2015 (ADAMS Accession No. ML15166A019).
3. AREVA Topical Report BAW-10192-P-A, Revision 0, "BWNT LOCA - BWNT Loss of Coolant Accident Evaluation Model for Once-Through Steam Generator Plants," June 1998 (ADAMS Accession No. ML093080467; proprietary, non-public).
4. Geer, T. C (Duke Energy) to USNRC, "30-Day Report Pursuant to 10 CFR 50.46, Changes to or Errors in an Evaluation Model", August 19, 2010 (ADAMS Accession No. ML102360485).

5. U. S. Nuclear Regulatory Commission (NRC) Administrative Letter 98-10 (AL-98-010, dated December 29, 1998 (ADAMS Accession No. ML031110108).
6. Elliot, G. (AREVA) to the NRC Operations Center, "Part 21 - Defect in LOCA Analysis for B&W Plants," November 25, 2014 (ADAMS Accession No. ML14337A095).
7. Hall, J. R. (NRC) to S. Batson (Duke Energy), "Oconee Nuclear Station, Units 1, 2, and 3 - Request for Additional Information Regarding License Amendment Request to Reduce Allowed Maximum Rated Thermal Power When High Pressure Injection Equipment is Inoperable (TAC Nos. MF4668, MF4669, and MF4670)," May 21, 2015 (ADAMS Accession No. ML15141A147).
8. ONS Full-Core Mark-B-HTP, Gadolinia Fuel, & 24 Month Cycle LOCA Summary Report.
9. Duke Energy Carolinas, LLC (Duke Energy): 10 CFR 50.46 – 30-Day Report for Oconee Nuclear Station, Units 1, 2, and 3; Estimated Impacts to Peak Cladding Temperature due to Fuel Pellet Thermal Conductivity Degradation, December 17, 2014 (ADAMS Accession No. ML14353A214).
10. BAW-10164-P-A "RELAP5/MOD2-B&W, and Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analyses," Revision 6, approved September 23, 2010 (ADAMS Accession No. ML091410456) (non-public).
11. BAW-10162P-A, "TACO3, Fuel Rod Thermal Analysis computer code," Revision 0, approved August 1989 (ADAMS Accession No. ML15040A369) (non-public).
12. GDTACO documented in BAW-10184(P)(A)-00 approved in June 1993 (ADAMS Accession No. ML15028A446) (non-public).
13. COPENIC2 documented in BAW-10231(P)(A)-01, approved January 2004 (ADAMS Accession No. ML040150701).

Principal Contributor: Fred M. Forsaty, NRR/DSS/SRXB

Date: September 24, 2015

September 24, 2015

Mr. Scott Batson
Site Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3, ISSUANCE OF
AMENDMENTS REGARDING ALLOWED MAXIMUM RATED THERMAL
POWER (TAC NOS. MF4668, MF4669, AND MF4670)

Dear Mr. Batson:

The Nuclear Regulatory Commission has issued the enclosed Amendment Nos. 395, 397, and 396 to Renewed Facility Operating Licenses DPR-38, DPR-47, and DPR-55, for the Oconee Nuclear Station, Units 1, 2, and 3, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated June 30, 2014, as supplemented by letter dated June 8, 2015.

These amendments revise Technical Specification 3.5.2 by reducing the allowed maximum Rated Thermal Power at which each unit can operate when select High Pressure Injection system equipment is inoperable.

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. If you have any questions, please call me at 301-415-4032 or Karen Cotton at 301-415-1438.

Sincerely,

/RA/

James R. Hall, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosures:

1. Amendment No. 395 to DPR-38
2. Amendment No. 397 to DPR-47
3. Amendment No. 396 to DPR-55
4. Safety Evaluation

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ADAMS Accession No. ML15166A387

*via email

OFFICE	NRR/LPL2-1/PM	NRR/LPL2-1/LA	DSS/STSB/BC*	DSS/SRXB/BC*
NAME	KCotton	SFiguroa	RElliott	CJackson
DATE	06/15/15	06/16/15	06/17/15	06/15/15
OFFICE	DSS/SNPB/BC*	OGC*	NRR/LPL2-1/BC	NRR/LPL2-1/PM
NAME	JDean	BHarris	RPascarelli	RHall
DATE	06/16/15	06/24/15	09/24/15	09/24/15

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