



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

April 23, 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 KEOWEE HYDRO UNIT (KHU) STEADY STATE  
FREQUENCY REQUIREMENTS (TAC NOS. MF1741, MF1742, AND MF1743)**

Dear Mr. Batson:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment Nos. 390, 392, and 391 to Renewed Facility Operating Licenses DPR-38, DPR-47, and DPR-55, for the Oconee Nuclear Station (ONS), Units 1, 2, and 3, respectively. The amendments consist of changes to the ONS operating licenses and Updated Final Safety Analysis Report (UFSAR) in response to the application from Duke Energy Carolinas, LLC (Duke Energy), dated April 26, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13121A460), as supplemented by letter dated February 12, 2015 (ADAMS Accession No. ML15055A168). These amendments incorporate steady state frequency limits for the onsite emergency power sources, the Keowee Hydro Units (KHUs), into the ONS technical specification (TS) surveillance requirements. The addition of these surveillance requirements will impose a more restrictive frequency band for the testing of the KHUs when not connected in parallel with the offsite sources.

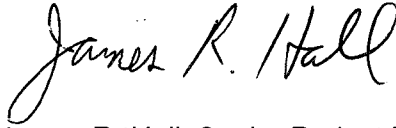
A copy of the NRC staff's related Safety Evaluation providing the technical bases for the staff's approval of the amendments is also enclosed.

S. Batson

- 2 -

A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice. If you have any questions, please contact me at 301-415-4032.

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. 390 to DPR-38
2. Amendment No. 392 to DPR-47
3. Amendment No. 391 to DPR-55
4. Safety Evaluation

cc w/encls: Distribution via Listserv



**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. 390  
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 April 26, 2013, as supplemented by letter dated February 12, 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. 390, 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 30 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: April 23, 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. 392  
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 April 26, 2013, as supplemented by letter dated February 12, 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. 392, 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 30 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: April 23, 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. 391  
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 April 26, 2013, as supplemented by letter dated February 12, 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. 391, 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 30 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: April 23, 2015

ATTACHMENT TO  
LICENSE AMENDMENT NO. 390  
RENEWED FACILITY OPERATING LICENSE NO. DPR-38  
DOCKET NO. 50-269  
LICENSE AMENDMENT NO. 392  
RENEWED FACILITY OPERATING LICENSE NO. DPR-47  
DOCKET NO. 50-270  
AND  
LICENSE AMENDMENT NO. 391  
RENEWED FACILITY OPERATING LICENSE NO. DPR-55  
DOCKET NO. 50-287

Replace the following pages of the Renewed Facility Operating 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

Page 3.8.1-15

Insert Pages

Licenses

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

TSs

Page 3.8.1-15

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. 390 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. 392 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. 391, 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

**SURVEILLANCE REQUIREMENTS (continued)**

SURVEILLANCE		FREQUENCY
SR 3.8.1.7	Verify both KHU's underground tie breakers cannot be closed simultaneously.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.8	Verify each KHU's overhead emergency power path tie breaker cannot be closed when tie breaker to underground emergency power path is closed.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.9	<p>Verify on an actual or simulated emergency actuation signal each KHU auto starts and:</p> <ul style="list-style-type: none"> <li>a. Achieves frequency <math>\geq 57</math> Hz and <math>\leq 63</math> Hz and voltage <math>\geq 13.5</math> kV and <math>\leq 14.49</math> kV in <math>\leq 23</math> seconds;</li> <li>b. Achieves steady state frequency <math>\geq 59.4</math> Hz and <math>\leq 61.8</math> Hz; and</li> <li>c. Supplies the equivalent of one Unit's Loss of Coolant Accident (LOCA) loads plus two Unit's Loss of Offsite Power (LOOP) loads when synchronized to system grid and loaded at maximum practical rate.</li> </ul>	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.10	Verify each KHU's battery capacity is adequate to supply, and maintain in OPERABLE status, required emergency loads for design duty cycle when subjected to a battery service test.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.11	Verify each KHU's battery cells, cell end plates, and racks show no visual indication of physical damage or abnormal deterioration that could degrade battery performance.	In accordance with the Surveillance Frequency Control Program

(continued)



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 390 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-38

AMENDMENT NO. 392 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-47

AND

AMENDMENT NO. 391 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 letter dated April 26, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13121A460), as supplemented by letter dated February 12, 2015 (ADAMS ML15055A168), Duke Energy Carolinas, LLC (the licensee) submitted a license amendment request (LAR) for the Oconee Nuclear Station (ONS), Units 1, 2, and 3, to the U.S. Nuclear Regulatory Commission (NRC). The LAR proposed to incorporate steady state frequency operating limits for the ONS onsite emergency power sources, the Keowee Hydro Units (KHUs), into the Technical Specification (TS) Surveillance Requirements (SRs). The addition of these surveillance requirements will impose a more restrictive frequency band for the testing of the KHUs when not connected in parallel with the offsite sources.

The supplemental letter dated February 12, 2015, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's proposed no significant hazards consideration determination as published in the *Federal Register* on July 9, 2013 (78 FR 41121).

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.36(b) requires that each license authorizing operation of a production or utilization facility include TSs. Section 50.36(c) of 10 CFR requires that TSs include items in five specific categories related to station operation. These categories are: (1) safety limits, limiting safety system settings, and limiting control settings; (2)

limiting conditions for operation; (3) surveillance requirements (SRs); (4) design features; and (5) administrative controls. The proposed change to ONS TS 3.8.1.9 concerns the SRs.

Section 3.1, "Conformance with NRC General Design Criteria," of the ONS Updated Final Safety Analysis Report (UFSAR), states that ONS was designed and constructed to comply with the licensee's understanding of the 70 Atomic Energy Commission (AEC) General Design Criteria (GDC) for Nuclear Power Plant Construction Permits, as proposed on July 11, 1967 (ADAMS Accession No. ML043310029).

AEC GDC 24, "Emergency Power for Protection Systems," states that in the event of loss of all offsite power, sufficient alternate sources of power shall be provided to permit the required functioning of the protection systems. ONS has normal (preferred offsite power) and emergency power (KHUs) to provide for the required functioning of protection systems. In the event of a reactor and turbine trip, emergency power is supplied by two KHUs shared by the three ONS units, as described in Section 8 of the ONS UFSAR. Either KHU is capable of supplying the emergency power requirements for all three ONS units.

AEC GDC 39, "Emergency Power for Engineered Safety Features (ESF)," states that alternate power systems shall be provided and designed with adequate independency, redundancy, capacity, and testability to permit the functioning required of the ESF. As a minimum, the onsite power system and the offsite power system shall each, independently, provide this capacity assuming a failure of a single active component in each power system. At ONS, reliability of electric power supply is insured through two independent connections to the system grid, and a redundant source of emergency power from two hydro units installed near the facility. Power to the ESF is assured even with the failure of a single active component in each system.

NRC Regulatory Guide (RG) 1.108 "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power System at Nuclear Power Plants" describes a method acceptable to the NRC staff for complying with the Commission's regulations with regard to periodic testing of diesel electric power units to ensure that the diesel electric power systems will meet their availability requirements.

AEC Safety Guide 9, "Selection of Diesel Generator Set Capacity for Standby Power Supplies," dated March 1971, (subsequently superseded by NRC RG 1.9) was applicable when ONS received its operating license. This Guide describes an acceptable basis for the selection of diesel generator sets of sufficient capacity and margin to implement GDC 17.

The NRC staff notes that ONS is unique in that emergency power is supplied by the two KHUs and not by diesel powered generators. Neither the NRC nor the industry has developed performance requirements for hydro units. However, the intent of Safety Guide 9 and RG 1.108 (1977) was to provide sizing criteria, performance, surveillance and testing requirements to demonstrate the capability of the onsite power systems to perform their intended safety functions. As these guides were applicable to nuclear plants of similar vintage, the NRC staff used the guidance from these documents to evaluate the LAR.

### 3.0 TECHNICAL EVALUATION

#### 3.1 BACKGROUND

The descriptions of the ONS power distribution system and configuration of the KHU system for use as the onsite emergency power source are provided in Section 8.3 of the UFSAR, and are briefly summarized below.

The ONS alternating current (AC) Power System consists of the offsite power sources (preferred power) and the KHUs, which provide the onsite emergency power. The emergency power system is designed to supply the required Engineered Safeguards (ES) loads of one unit and simultaneously supply the safe shutdown loads of the other two units in the event of an accident at one unit, coupled with loss of offsite power at all three units. The Keowee Hydro Station contains two units rated 87,500 kilovolt amperes (kVA) each, which generate power at 13.8 kilovolts (kV). The KHUs can start up and accelerate to full speed in 23 seconds or less. In the event of loss of power from the ONS generating units and the 230 kV switchyard preferred power source, both KHUs start automatically and provide power to the ONS shutdown buses through two separate and independent routes, an underground path from one KHU through transformer CT-4, and an overhead path from the other KHU through the startup transformer and the startup incoming breakers.

#### 3.2 DESCRIPTION OF PROPOSED CHANGES

In letter dated April 26, 2013, the licensee proposed to modify SR 3.8.1.9. Specifically, the LAR proposes to add steady state frequency requirements for the KHUs into the TS. The licensee has determined that the steady state frequency limits for the KHUs have to be within -1% to +3% of nominal frequency (59.4 Hz to 61.8 Hz) to assure the performance capabilities of loads required to mitigate the consequences of an accident. The proposed changes are listed below:

Add SR 3.8.1.9.b to SR 3.8.1.9 to require steady state frequency be verified at the same 12-month frequency as SR 3.8.1.9.a and locate that frequency in the Surveillance Frequency Control Program (SFCP) consistent with SR 3.8.1.9.a. The existing SR 3.8.1.9.b is renumbered to SR 3.8.1.9.c.

The modified SR requirement is re-stated below:

Verify on an actual or simulated emergency actuation signal each KHU auto starts and:

- a. Achieves frequency  $\geq 57$  Hz and  $\leq 63$  Hz and voltage  $\geq 13.5$  kV and  $\leq 14.49$  kV in  $\leq 23$  seconds;
- b. Achieves steady state frequency  $\geq 59.4$  Hz and  $\leq 61.8$  Hz; and
- c. Supplies the equivalent of one Unit's Loss of Coolant Accident (LOCA) loads plus two Units' Loss of Offsite Power (LOOP) loads when synchronized to system grid and loaded at maximum practical rate.

The NRC staff has previously approved license amendment Nos. 372, 374 and 373 that allowed ONS to relocate certain SR frequencies to a SFCP in accordance with Technical Specification Task Force (TSTF) 425. The licensee stated that TSTF-425 is applicable to the 12-month frequency of proposed SR 3.8.1.9.b since it is a fixed frequency not subject to the exclusion criteria identified in TSTF-425, and the licensee proposes to place it in the SFCP.

### 3.3 EVALUATION

Plant safety analyses make specific assumptions regarding the emergency core cooling system (ECCS) flow needed to provide the core cooling function following any event that requires safety injection (SI) to mitigate the event. At ONS, for the events that assume offsite power is lost, the KHUs provide power to the ECCS pumps. Following a LOOP, the KHUs start and when the respective KHU reaches 90% of rated voltage and frequency increasing, the output breaker closes tying the unit to the ESF electrical bus. After the start transient is complete, the KHUs operate at steady state at a frequency band of -1% to +3% of rated frequency. The essential loads, including the ECCS pumps, are block loaded. The maximum possible rate of loading occurs, by design, in two large blocks: a single unit's LOCA loads, followed approximately 10 seconds later by the other two units' LOOP loads concurrently.

The NRC staff noted that changes in KHU frequency will affect the performance of ECCS components such as pumps and motor-operated valves (MOVs). For induction motors, motor speed is directly proportional to power supply frequency. As power supply frequency varies, pump speed varies, causing variations in pump flow and discharge pressure. MOV stroke time may be negatively affected by lower source frequency, causing the MOV to operate more slowly.

At ONS, the KHU frequency and voltage tolerances associated with the governor and voltage regulator capabilities were not considered in the development of the TS. The licensee has determined that acceptable steady state limits are -1% to +3% of nominal frequency (59.4 Hz to 61.8 Hz). The LAR initially did not provide details on the impact of allowable frequency band on operating equipment. By letter dated January 16, 2015, the NRC staff requested the licensee to explain the impact of frequency variations after the breakers close on the ESF buses with allowable voltage and frequency of 90% increasing and subsequent operation within the allowable operating band.

The NRC staff requested a summary of the bounding analysis that was performed to evaluate the ESF loads, such as pumps and MOVs, when required to respond to an accident signal coupled with a LOOP event. By letter dated February 12, 2015 (ADAMS Accession No. ML15055A168), the licensee provided the following information.

The ESF pumps at ONS are the ECCS pumps (high pressure injection (HPI) and low pressure injection (LPI)), and the containment heat removal spray pumps (RBS). The licensee performed hydraulic analyses based on the weakest pump (of the nine pumps for both the HPI and LPI systems, accounting for additional allowed in-service testing degradation) at low KHU frequency. The licensee has concluded that the results, as used in the UFSAR Chapter 15 accident analysis for each ECCS pump, demonstrate the adequacy of the system design.

The licensee also provided a summary of the minimum margin of motor torque allowed over the pump load torque during the motor accelerating period. The analytical method used for ONS analyses calculates the motor current and torque at each time step, based on calculated motor

terminal voltage and frequency, using frequency-dependent motor and system models. Based on the electrical analysis, the licensee has concluded that none of the ESF pump motors will stall.

The licensee provided HPI, LPI and RBS motor starting coordination curves to demonstrate that there is available margin to overcurrent protection settings for each of these safety motors, in accordance with the recommendation provided in IEEE Standard 242, "Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems."

Based on the information provided by the licensee in the February 12, 2015 letter, the NRC staff concludes that the ECCS motor and pump performance has been evaluated at the low frequency expected during the block loading of ECCS loads (starting and running) immediately after the ESF busses have been energized by the KHU unit, and that the results have been adequately considered in the accident analysis. The NRC staff finds the motor starting coordination curves provided for HPI, LPI and RBS motors acceptable, as these show adequate margin for overcurrent protection.

In response to the NRC staff's question related to impact of low frequency on MOV stroke times, the licensee stated, "Analyses to demonstrate that sufficient margin exists between actual stroke times and maximum allowed stroke times to account for the minimum expected KHU frequency have not specifically been performed." The licensee has credited the analysis performed in response to NRC Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," to indicate that MOV stroke times will not be significantly impacted due to frequency variations expected when the ESF bus is powered from one of the KHUs with frequency at 57 Hz. The licensee has stated that GL 89-10 analysis considers degraded electrical conditions which bound the minimum expected KHU frequency. Based on the ratio of maximum limit to actual stroke time being greater than 115%, the licensee has concluded that sufficient margin is available such that a reduction in allowed frequency is not significant. The NRC staff concludes that there is reasonable assurance that the MOV stroke time is not adversely impacted such that it would affect the timing assumed in accident analysis.

In response to the NRC staff's concern that operation at the high end of the frequency range may cause a higher differential pressure across MOVs, the licensee has indicated that the MOV thrust values calculated in response to GL-89-10 provide assurance that MOVs will function satisfactorily under anticipated hydraulic conditions.

The NRC staff requested the licensee to provide a summary of the changes in KHU loading as a consequence of operation at the extremes of the proposed frequency and voltage ranges.

The licensee's letter dated February 12, 2015, stated that there is no change in loading ONS equipment for this LAR. The emergency power system will operate as described in the electrical power system design discussion above. After the start transient is complete, the KHUs operate at steady state. This is a frequency band of -1% to +3% of rated frequency. Transients outside the steady state band would only occur when adding loads during the recovery phase of an event. Load variations due to power frequency variation within the specified steady-state band are insignificant compared to the available capacity of each of the KHUs. Based on the above, the NRC staff determined that the licensee's explanation is acceptable.

The NRC staff previously approved amendments (Amendment Nos. 372, 374, and 373, for ONS Units 1, 2, and 3, respectively; March 21, 2011; ADAMS Accession No. ML110470446) that allow ONS to relocate certain SR frequencies into a licensee-controlled SFCP. These amendments allow ONS to change SR frequencies without NRC approval based on an approved method in accordance with TSTF-425. The TSTF allows SR frequencies that are of a fixed frequency to be relocated to a SFCP, with certain identified exceptions. The licensee considers the amendments incorporating TSTF-425 to be applicable to the 12-month frequency of proposed SR 3.8.1.9.b, since it is a fixed frequency and none of the exclusion criteria apply.

The NRC staff made the following observations with regard to applicability of TSTF-425 in evaluating surveillance frequency changes under the SFCP:

1. The licensee is required to include documentation regarding the probabilistic risk assessment (PRA) technical adequacy consistent with the guidance in Section 4.2 of RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment (PRA) Results for Risk-Informed Activities."
2. The TSTF guidelines used for making the assessment should ensure that the proposed surveillance test frequency change is not in conflict with approved industry codes and standards or adversely affects any assumptions or inputs to the safety analysis, or, if such inputs are affected, justification is provided to ensure sufficient safety margin will continue to exist. The NRC staff acknowledges that the design of the ONS emergency AC electrical power system is unique among U.S. nuclear power plants in the use of hydroelectric generators as emergency power sources. However, the staff considers the guidance for diesel generators provided in RG 1.108 (now part of RG 1.9 Rev. 3 onwards) and Safety Guide 9, which endorse industry standards, as part of "approved industry codes and standards" applicable to onsite power sources for ONS and should therefore be considered when changes to testing intervals are evaluated under TSTF-425 guidance.

### 3.4 SUMMARY

The licensee proposed to modify the TS by adding TS Surveillance Requirement SR 3.8.1.9.b, to verify that steady state frequency requirements are within limits when a KHU is operating as an emergency power source for ONS. The licensee has determined that acceptable steady state limits are -1% to +3% of nominal frequency (59.4 Hz to 61.8 Hz). The NRC staff reviewed the LAR and the supplemental information and finds that the TS change is acceptable, for the following reasons:

- SR 3.8.1.9.b verifies the KHU's steady state frequency, and the limits of  $\geq 59.4$  Hz and  $\leq 61.8$  Hz were established to ensure key mechanical systems and equipment have adequate frequency for accident mitigation.
- The performance capabilities of the ECCS are not adversely impacted when the KHUs are operating at the extremes of the allowable frequency range.
- There is minimal or no change in the KHU loading as a consequence of operation at the extremes of the proposed frequency and voltage ranges. The SR change maintains requirements within the safety analyses and licensing basis. Addition of the SR for steady state frequency requirement makes ONS consistent with the testing requirements in NUREG-1430, "Standard Technical Specifications - Babcock and Wilcox Plants."

The NRC staff concludes that the proposed change in allowable frequency range for testing of the KHUs provides reasonable assurance that the ONS will maintain compliance with AEC GDC 24 and 39. The NRC staff agrees that the previous license amendments incorporating TSTF-425 allow the licensee to control the frequency of these SRs through TS 5.5.19, "Surveillance Frequency Control Program," in accordance with the requirements of that program.

#### 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 July 9, 2013 (78 FR 41121). 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: S. Som, G. Matharu

Date: April 23, 2015

S. Batson

- 2 -

A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice. If you have any questions, please contact me at 301-415-4032.

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. 390 to DPR-38
2. Amendment No. 392 to DPR-47
3. Amendment No. 391 to DPR-55
4. Safety Evaluation

cc w/encls: Distribution via Listserv

DISTRIBUTION:

PUBLIC

RidsAcrsAcnw\_MailCtr Resource

RidsRgn2MailCenter Resource

SSom, NRR/DE

LPLII-1 R/F

RidsNrrDeEeeb Resource

RidsNrrLASFiguroa Resource

RecordsAmend Resource

RidsNrrPMOconee Resource

RidsNrrDorlDpr Resource

RidsNrrDorlLp2-1 Resource

**ADAMS Accession No. ML15093A349**

**\* See memo**

OFFICE	NRR/LPL2-1/PM	NRR/LPL2-1/LA	DE/EEEB/BC	OGC /NLO	NRR/LPL2-1/BC	NRR/LPL2-1/PM
NAME	RHall	SFiguroa	JZimmerman*	DRoth	RPascarelli	RHall
DATE	04/07/15	04/06/15	03/27/15	04/20/15	04/22/15	04/23/15

**OFFICIAL RECORD COPY**