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

July 21, 2011

Mr. Preston Gillespie
Site Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 - ISSUANCE OF AMENDMENTS REGARDING APPROVAL FOR THE USE OF GADOLINIA AS AN INTEGRAL BURNABLE ABSORBER (TAC NOS. ME2504, ME2505, AND ME2506)

Dear Mr. Gillespie:

The Nuclear Regulatory Commission has issued the enclosed Amendment Nos. 374, 376, and 375 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 October 19, 2009, as supplemented November 15, 2010.

These amendments revise the Technical Specifications approving the use of gadolinia as an integral burnable absorber in the uranium oxide fuel matrix. The proposed amendment would revise TS 2.1.1; Reactor Core Safety Limits, TS 5.6.5.b, the Core Operating Limit Report, and the licensee's approved methodology reports for reload design and non-loss-of-coolant accident safety analyses to allow use of gadolinia.

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 301-415-1345.

Sincerely,

Jon H. Thompson
for

John Stang, 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. 374 to DPR-38
2. Amendment No. 376 to DPR-47
3. Amendment No. 375 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. 374
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 the Duke Energy Carolinas, LLC (the licensee), dated October 19, 2009, as supplemented November 15, 2010, 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.

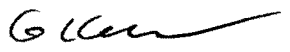
2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 3.B of Renewed Facility Operating License No. DPR-38 is hereby amended to read as follows:

   B. Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 374 , 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



Gloria Kulesa, 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: July 21, 2011

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. 376
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 the Duke Energy Carolinas, LLC (the licensee), dated October 19, 2009, as supplemented November 15, 2010, 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 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. 376 , 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

Gloria Kulesa, 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: July 21, 2011

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. 375
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 the Duke Energy Carolinas, LLC (the licensee), dated October 19, 2009, as supplemented November 15, 2010, 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 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. 375 , 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

Gloria Kulesa, 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: July 21, 2011

ATTACHMENT TO LICENSE AMENDMENT NO. 374

RENEWED FACILITY OPERATING LICENSE NO. DPR-38

DOCKET NO. 50-269

AND

TO LICENSE AMENDMENT NO. 376

RENEWED FACILITY OPERATING LICENSE NO. DPR-47

DOCKET NO. 50-270

AND

TO LICENSE AMENDMENT NO. 375

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	Insert Pages
Licenses	Licenses
License No. DPR-38, page 3	License No. DPR-38, page 3
License No. DPR-47, page 3	License No. DPR-47, page 3
License No. DPR-55, page 3	License No. DPR-55, page 3
TSs	TSs
2.0-1	2.0-1
5.0-25	5.0-25

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. 374 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. 376 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 375 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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2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 In MODES 1 and 2, for UO_2 fuel, the maximum local fuel pin centerline temperature shall be $\leq$ 4656 - (5.8×10^{-3} x (Burnup, MWD/MTU)) – 709.04|chi| - 786.62$(chi)^2$ + 1087.07$(chi)^3$ °F where chi is the quantity oxygen-to-uranium ratio minus 2.0. For gadolinia fuel, the local fuel pin centerline temperature shall be $\leq$ 4656 – (6.5×10^{-3} x (Burnup, MWD/MTU)) °F. Operation within these limits is ensured by compliance with the Axial Power Imbalance Protective Limits as specified in the Core Operating Limits Report.

2.1.1.2 In MODES 1 and 2, the departure from nucleate boiling ratio shall be maintained greater than the limit of 1.18 for the BWC correlation, 1.19 for the BWU correlation, and 1.132 for the BHTP correlation. Operation within these limits is ensured by compliance with the Axial Power Imbalance Protective Limits and RCS Variable Low Pressure Protective Limits as specified in the Core Operating Limits Report.

2.1.2 RCS Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained $\leq$ 2750 psig.

2.2 SL Violations

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

2.2.1 In MODE 1 or 2, if SL 2.1.1.1 or SL 2.1.1.2 is violated, be in MODE 3 within 1 hour.

2.2.2 In MODE 1 or 2, if SL 2.1.2 is violated, restore compliance within limits and be in MODE 3 within 1 hour.

2.2.3 In MODES 3, 4, and 5, if SL 2.1.2 is violated, restore RCS pressure to $\leq$ 2750 psig within 5 minutes.

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

6. Nuclear Overpower Flux/Flow/Imbalance and RCS Variable Low Pressure allowable value limits for Specification 3.3.1;

7. RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits for Specification 3.4.1

8. Core Flood Tanks Boron concentration limits for Specification 3.5.1;

9. Borated Water Storage Tank Boron concentration limits for Specification 3.5.4;

10. Spent Fuel Pool Boron concentration limits for Specification 3.7.12;

11. RCS and Transfer Canal boron concentration limits for Specification 3.9.1; and

12. AXIAL POWER IMBALANCE protective limits and RCS Variable Low Pressure protective limits for Specification 2.1.1.

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

(1) DPC-NE-1002-A, Reload Design Methodology II;

(2) NFS-1001-A, Reload Design Methodology;

(3) DPC-NE-2003-P-A, Oconee Nuclear Station Core Thermal Hydraulic Methodology Using VIPRE-01;

(4) DPC-NE-1004-A, Nuclear Design Methodology Using CASMO-3/SIMULATE-3P;

(5) DPC-NE-2008-P-A, Fuel Mechanical Reload Analysis Methodology Using TACO3 and GDTACO;

(6) BAW-10192-P-A, BWNT LOCA - BWNT Loss of Coolant Accident Evaluation Model for Once-Through Steam Generator Plants;

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 374 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-38

AMENDMENT NO. 376 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-47

AND

AMENDMENT NO. 375 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 October 19, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML092960626), as supplemented by letter dated November 15, 2010 (ADAMS Accession No. ML103210226), Duke Energy Carolinas, LLC (Duke, the licensee), requested changes to the Technical Specifications (TSs) for the Oconee Nuclear Station, Units 1, 2, and 3 (Oconee 1/2/3). The supplement dated November 15, 2010, 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 March 16, 2010 (75 FR 12576).

The proposed changes would revise the TSs to allow the use of gadolinia as an integral burnable absorber in the uranium oxide fuel matrix. The proposed amendment would revise TS 2.1.1; Reactor Core Safety Limits, TS 5.6.5.b, the Core Operating Limit Report, and the licensee's approved methodology reports for reload design and non-loss-of-coolant accident (LOCA) safety analyses to allow use of gadolinia.

2.0 REGULATORY EVALUATION

The U.S. Nuclear Regulatory Commission (NRC) staff's review focused on the nuclear and fuel design, thermal-hydraulic design, LOCA and non-LOCA transient and accident analyses, and mechanical analysis. Each of these subjects is evaluated separately in the respective sections which follow.

In the proposed license amendment, the licensee referenced a number of NRC approved topical reports (TRs) as part of the justification for the change to the TSs. A TR is a document that addresses a technical topic related to nuclear power plant (NPP) safety, which the industry submits for review and approval by the NRC before publishing for use in the licensing process by other NPP licensees.

A TR allows for a single NRC review and (if appropriate) approval of a safety-related topic that may apply to multiple NPPs. In that way, it increases the efficiency of the licensing process and reduces the burden on licensees by minimizing the time and resources that both industry, and the NRC staff could expend on redundant reviews of the same topic.

TRs are reviewed by the NRC staff with the intent of maximizing their scope of applicability consistent with current standards for licensing actions, compliance with the applicable regulations, and reasonable assurance that the health and safety of the public will not be adversely affected.

A TR improves the efficiency of the licensing process by allowing the NRC staff to review a proposed methodology, design, operational requirements, or other safety-related subjects that will be used by multiple licensees following approval by referencing the approved TR. The TR provides the technical basis for a licensing action. Under the NRC TR program, industry organizations, such as a vendor or an owners' group (OG), or licensee, may submit reports to the NRC on specific safety-related subjects and have them reviewed independently of any operating license review.

Once the NRC staff has approved a TR, licensees may use a TR to justify changes to their facilities. If the changes are within the bounds and constraints of the TR, the NRC normally finds the changes acceptable.

The licensee's proposed amendment to allow the use of gadolinia as an integral burnable absorber in the uranium oxide fuel matrix was justified by the licensee using approved TRs. The NRC staff reviewed the licensee's justification for the changes to the TSs to assure the licensee had properly used each TR referenced by the licensee in the proposed amendment.

3.0 TECHNICAL EVALUATION

3.1 Fuel System Design

The licensee plans to use gadolinia as an integral burnable absorber for reactivity control during beginning of cycle. The gadolinium is mixed with low enriched uranium to form the gadolinia-urania (Gd_2O_3-UO_2) fuel pellets. Gadolinia is added to fuel pellets for beginning-of-cycle reactivity hold down and for peaking control. Gadolinia also affects the physical characteristics of the fuel pellets such as reducing the pellet thermal conductivity and altering the neutron flux profile across the pellet. The gadolinia concentration varies between 2 to 8 weight percent (w/o). The licensee will use approved AREVA designed Mark-B-HTP fuel assemblies for the first batch of gadolinia fuel. A full core of gadolinia bearing fuel will contain no more than 10 percent gadolinia fuel rods at no more than 8 w/o gadolinia.

The Mark-B-HTP fuel assembly to be used at Oconee 1/2/3 is an AREVA's 15x15 fuel design with M5 cladding, instrument, and guide tubes. The intermediate and top spacer grids are also made of M5. The bottom spacer grid and upper and lower end fittings are made of Inconel 718. The M5 material was approved in the TR BAW-10227P-A, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel." The Mark-B-HTP fuel is an evolution of the standard Mark-B fuel product. The M5 material and Mark-B-HTP fuel designs are approved to a peak rod average burnup limit of 62 GWd/MTU. The licensee indicated that fuel rod mechanical analyses were performed with the TACO3 fuel performance code. The TACO3 code was approved for the licensee's licensing applications in the TR DPC-NE-2008P-A, "Duke Power Company Fuel Mechanical Reload Analysis Methodology Using TACO3," to a peak rod average burnup limit of 62 GWd/MTU.

The NRC staff reviewed the licensee's application of the TRs to assure they were used correctly. Based on the review, the NRC staff found the licensee had correctly applied the TRs concerning the fuel system design. Based on the use of approved TRs, the NRC staff concludes that the Mark-B-HTP fuel design including the use of gadolinia integral burnable absorber is approved to the peak rod average burnup limit of 62 GWd/MTU for Oconee 1/2/3.

3.2 Fuel Centerline Temperature

The fuel centerline melting temperature equation for UO_2 fuel currently in the TS is based on the approved TACO3 code, BAW-10162P-A, and assumes an oxygen-to-uranium ratio of 2.02. The oxygen-to-uranium ratio for the Mark-B-HTP fuel design is 2.01, which would change the resultant equation. The licensee modified the fuel centerline melting temperature equation for the Mark-B-HTP fuel design based on the oxygen-to-uranium ratio of 2.01. In addition, the licensee will include the fuel centerline melting temperature equation for gadolinia-urania fuel in the TS according to the approved GDTACO code, BAW-10184P-A. The NRC staff reviewed the licensee's application of GDTACO code to assure its application was in accordance with the NRC staff's previous approval. Based on the review, the NRC staff found the licensee correctly used the approve code. Based on the use by the licensee of approved codes, the NRC staff concludes that the fuel centerline melting temperature equations for UO_2 and gadolinia-urania fuel pellets are acceptable for Oconee 1/2/3.

3.3 Methodology Report Changes

3.3.1 UFSAR Chapter 15 LOCA Evaluation

The methodology report BAW-10192P-A, Revision 0, "BWNT LOCA – BWNT Loss-of-Coolant Accident Analysis for Once Through Steam Generator Plant," describes the NRC approved LOCA evaluation model (EM) for Oconee. The licensee revised the methodology report to incorporate the gadolinia fuel models which were documented in the approved BAW-10179P-A. The methodology report BAW-10179P-A, "Safety Criteria and Methodology for Acceptable Cycle Reload Analyses," describes methodologies for steady-state fuel initial condition input to the LOCA EM using the approved TACO3 and GDTACO codes for UO_2 and gadolinia-urania fuel, respectively.

The NRC staff reviewed the licensee's application of the TRs to assure they were used correctly. Bases on the review, the NRC staff found the licensee had correctly applied the TRs concerning the fuel system design. Based on the approved methodology in the TRs and fuel performance codes, the NRC staff concludes that the revised Chapter 15 LOCA evaluation of the updated final safety analysis report is acceptable for Oconee 1/2/3.

3.3.2 NFS-1001

The methodology report NFS-1001, "Oconee Nuclear Station Reload Design Methodology," describes the fuel cycle designs of optimization of placement of fresh and burned assemblies, control rod groupings, and burnable poison assemblies. The licensee will continue using the approved CASMO-3/SIMULATE-3P for UO_2 fuel nuclear design and the approved CASMO-4/SIMULATE-3 in DPC-NE-1006, "Oconee Nuclear Design Methodology Using CASMO-4/SIMULATE-3," for gadolinia-urania fuel nuclear design.

The licensee added a new section for modeling gadolinia in the LOCA analysis. The method in the new section is the method used by AREVA for other plant reloads and is documented in the approved BAW-10179P-A, "Safety Criteria and Methodology for Acceptable Cycle Reload Analyses." The licensee will use the approved TACO3 and GDTACO for UO_2 and gadolinia-urania, respectively, for steady-state fuel initial condition input to the LOCA EM.

The NRC staff reviewed the licensee's application of the TRs to assure they were used correctly. Based on the review, the NRC staff found the licensee had correctly applied the TRs concerning the fuel system design. Based on the approved methodology in TRs and fuel performance codes, the NRC staff concludes that the revised NFS-1001 is acceptable for Oconee 1/2/3.

3.3.3 DPC-NE-1002

The methodology report DPC-NE-1002, "Oconee Nuclear Station Reload Design Methodology II," describes Duke Energy's statistically combined uncertainty factors for the reload design. The licensee revised the manufacturing tolerance factor of lumped burnable poison (LBP) to burnable poison (BP) to reflect the combined uncertainty of gadolinia and other poisons as one single factor.

The NRC staff reviewed the licensee's application of the TRs to assure they were used correctly. Based on the review, the NRC staff found the licensee had correctly applied the TRs concerning the fuel system design. Based on the correct use of approved methodology in approved TRs, the NRC staff considers the revision in DPC-NE-1002 acceptable.

3.3.4 DPC-NE-2003

The methodology report DPC-NE-2003, "Oconee Nuclear Station Core Thermal-Hydraulic Methodology Using VIPRE-01," describes the Duke Energy's power distribution in the reload design analysis. The licensee added the gadolinia hot channel factor in addition to the UO_2 hot channel factor, and a reference of DPC-NE-1006, "Oconee Nuclear Design Methodology Using CASMO-4/SIMULATE-3," for gadolinia-urania fuel nuclear design.

The NRC staff reviewed the licensee's application of the TRs to assure they were used correctly. Based on the review, the NRC staff found the licensee had correctly applied the TRs concerning the fuel system design. Based on the correct use of approved methodology in TRs, the NRC staff considers the revision in DPC-NE-2003 acceptable.

3.3.5 DPC-NE-2008

The methodology report DPC-NE-2008, "Fuel Mechanical Reload Analysis Methodology Using TACO3 and GDTACO," describes the Duke Energy's fuel rod mechanical reload analysis methodology using TACO3 and GDTACO fuel performance codes. The approved TACO3 and GDTACO codes analyze the UO_2 and gadolinia-urania fuel, respectively. The title of the methodology report was updated to include GDTACO. Appendix A, "Application of GDTACO for Gadolinia Fuel," to DPC-NE-2008 was added to specifically address the use of GDTACO. Thus, this methodology report included both TACO3 and GDTACO applications.

The NRC staff reviewed the licensee's application of GDTACO code to assure its application was in accordance with the NRC staff's previous approval. Based on the review, the NRC staff found the licensee correctly used the approved code. Based on the approved fuel performance codes, the NRC staff concludes that the revised DPC-NE-2008 is acceptable for Oconee 1/2/3.

3.3.6 DPC-NE-3000

The methodology report DPC-NE-3000, "Thermal-Hydraulic Transient Analysis Methodology," describes Duke Energy's thermal-hydraulic model for transient analysis. The licensee included the hot channel factor for gadolinia-urania fuel in Appendix D, "Methodology Revisions for Mark-B-HTP Fuel," to DPC-NE-3000 for the Mark-B-HTP fuel design. Based on the correct use of approved methodology, the NRC staff finds the revision in DPC-NE-3000 to be acceptable.

3.3.7 DPC-NE-3005

The methodology report DPC-NE-3005, "UFSAR Chapter 15 Transient Analysis Methodology," describes the Duke Energy's neutronic and thermal-hydraulic models for the non-LOCA transients and accidents. The licensee made necessary changes to the methodology to model the gadolinia cores. The revision includes the CASMO-4/SIMULATE-3 code as described in DPC-NE-1006 and the gadolinia hot channel factor for the Mark-B-HTP fuel design. Based on the correct use of approved methodology, the NRC staff considers the revision in DPC-NE-3005 acceptable.

3.4 TS Revisions

3.4.1 Section 2.1.1.1, Reactor Core Safety Limits

Current TS 2.1.1.1 establishes the maximum local fuel centerline temperature for UO_2. The licensee revised the existing UO_2 fuel melt limit to include the dependence on the oxygen-to-uranium ratio based on the approved TACO3 code. The licensee also added the fuel melt limit for fuel containing gadolinia based on the approved GDTACO code.

For UO_2 fuel, TS 2.1.1.1 is revised as follows:

"In MODES 1 and 2, for UO_2 fuel, the maximum local fuel pin centerline temperature shall be $\leq$ $4656 - (5.8 \times 10^{-3} \times (\text{burnup, MWD/MTU})) - 709.04(\text{chi}) - 786.62(\text{chi})^2 + 1087.07(\text{chi})^3$ °F where chi is the quantity oxygen-to-uranium ratio minus 2.0."

For gadolinia fuel, TS 2.1.1.1 is added with a new line as follows:

"For gadolinia fuel, the local fuel pin centerline temperature shall be $\leq 4656 - (6.5 \times 10^{-3} \times (\text{burnup, MWD/MTU}))$ °F."

Based on the use of approved TACO3 and GDTACO fuel performance codes and the licensee's correct application of the codes, the NRC staff finds that the revised TS 2.1.1.1 is acceptable.

3.4.2 Section 5.6.5.b, Core Operating Limits Report (COLR)

As evaluated in Section 3.3.5, the licensee revised the methodology report DPC-NE-2008, "Fuel Mechanical Reload Analysis Methodology Using TACO3 and GDTACO." The title of the methodology report was updated to include GDTACO. Thus, this methodology report includes both TACO3 and GDTACO for licensing applications.

Based on the use of approved TACO3 and GDTACO codes and the licensee's correct application of the codes, the NRC staff considers that the revised TS 5.6.5.b is acceptable.

4.0 SUMMARY

The NRC staff has reviewed the licensee's proposed amendment requesting TS revisions to allow the use of gadolinia as an integral burnable absorber in the uranium oxide fuel matrix. Based on the NRC staff's technical evaluation, as set forth above, the NRC staff concludes that the proposed TS revisions are acceptable for Oconee 1/2/3.

5.0 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.

6.0 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 published in the *Federal Register* on March 16, 2010 (75 FR 12576). The amendment also relates to changes in recordkeeping, reporting, or administrative procedures or requirements. Accordingly, the amendments meet the eligibility criteria for categorical exclusions set forth in 10 CFR 51.22(c)(9)

and (c)(10). 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.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Shih-Liang Wu, NRR

Date: July 21, 2011

If you have any questions, please call me at 301-415-1345.

Sincerely,

/RA/ by JThompson for

John Stang, 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. 374 to DPR-38
2. Amendment No. 376 to DPR-47
3. Amendment No. 375 to DPR-55
4. Safety Evaluation

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