



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

April 14, 2015

Mr. Steven D. Capps
Site Vice President
McGuire Nuclear Station
Duke Energy Carolinas, LLC
12700 Hagers Ferry Road
Huntersville, NC 28078

Mr. K. Henderson
Site Vice President
Catawba Nuclear Station
Duke Energy Carolinas, LLC
4800 Concord Road
York, SC 29745

**SUBJECT: CATAWBA NUCLEAR STATION, UNITS 1 AND 2 (CATAWBA 1 AND 2) AND
MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 (MCGUIRE 1 AND 2) -
ISSUANCE OF AMENDMENTS RE: TECHNICAL SPECIFICATION (TS) 3.1.3,
"MODERATOR TEMPERATURE COEFFICIENT (MTC)" AND TS 5.6.5, "CORE
OPERATING LIMITS REPORT" (TAC NOS. ME8829, ME8830, ME8831,
AND ME8832)**

Dear Mr. Kapopoulos and Mr. Henderson:

By letter dated May 31, 2012, as supplemented by letters dated March 13, 2013, and November 25, 2014, Duke Energy Carolinas, LLC (Duke, the licensee), submitted a license amendment request for NRC review and approval of a revision to the TSs for Catawba and McGuire. Specifically, the proposed changes would revise TS 3.1.3 to allow the end-of-cycle moderator temperature coefficient surveillance to not be performed if certain conditions are met. Additionally, the proposed change would the supporting methodology to the Core Operating Limits Report referenced in TS 5.6.5.

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 275 to Renewed Facility Operating License NPF-35 and Amendment No. 271 to Renewed Facility Operating License NPF-52 for Catawba 1 and 2 and Amendment No. 278 to Renewed Facility Operating License NPF-9 and Amendment No. 258 to Renewed Facility Operating License NPF-17 for McGuire 1 and 2, respectively.

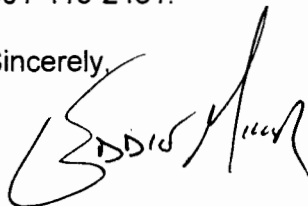
A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

S. Capps and K. Henderson

- 2 -

If you have any questions, please call me at 301-415-2481.

Sincerely,

A handwritten signature in black ink, appearing to read "G. Edward Miller". The signature is stylized with a large, sweeping "G" and a long, horizontal stroke extending to the right.

G. Edward Miller, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-413, 50-414, 50-369, and 50-370

Enclosures:

1. Amendment No. 275 to NPF-35
2. Amendment No. 271 to NPF-52
3. Amendment No. 278 to NPF-9
4. Amendment No. 258 to NPF-17
5. Safety Evaluation

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

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-413

CATAWBA NUCLEAR STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 275
Renewed License No. NPF-35

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the Catawba Nuclear Station, Unit 1 (the facility), Renewed Facility Operating License No. NPF-35, filed by Duke Energy Carolinas, LLC (the licensee), dated May 31, 2012, as supplemented by letters dated March 13, 2013, and November 25, 2014, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-35 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 275, are hereby incorporated into this renewed operating 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 License No. NPF-35
and the Technical Specifications

Date of Issuance: April 14, 2015



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

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-414

CATAWBA NUCLEAR STATION, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 271
Renewed License No. NPF-52

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the Catawba Nuclear Station, Unit 2 (the facility), Renewed Facility Operating License No. NPF-52, filed by Duke Energy Carolinas, LLC (the licensee), dated May 31, 2012, as supplemented by letters dated March 13, 2013 and November 25, 2014, 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 2.C.(2) of Renewed Facility Operating License No. NPF-52 is hereby amended to read as follows:

- (2) Technical Specifications

- The Technical Specifications contained in Appendix A, as revised through Amendment No. 271, are hereby incorporated into this renewed operating 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 License No. NPF-52
and the Technical Specifications

Date of Issuance: April 14, 2015



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

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-369

MCGUIRE NUCLEAR STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 278
Renewed License No. NPF-9

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the McGuire Nuclear Station, Unit 1 (the facility), Renewed Facility Operating License No. NPF-9, filed by Duke Energy Carolinas, LLC (the licensee), dated May 31, 2012, as supplemented by letters dated March 13, 2012 and November 25, 2014, 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 2.C.(2) of Renewed Facility Operating License No. NPF-9 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 278, are hereby incorporated into this renewed operating 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 License No. NPF-9
and the Technical Specifications

Date of Issuance: April 14, 2015



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

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-370

MCGUIRE NUCLEAR STATION, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 258
Renewed License No. NPF-17

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the McGuire Nuclear Station, Unit 2 (the facility), Renewed Facility Operating License No. NPF-17, filed by Duke Energy Carolinas, LLC (the licensee), dated May 31, 2012, as supplemented by letters dated March 13, 2013 and November 25, 2014, 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 4

2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-17 is hereby amended to read as follows:

- (2) Technical Specifications

- The Technical Specifications contained in Appendix A, as revised through Amendment No. 258, are hereby incorporated into this renewed operating 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 License No. NPF-17
and the Technical Specifications

Date of Issuance: April 14, 2015

ATTACHMENT TO LICENSE AMENDMENT NO. 275
RENEWED FACILITY OPERATING LICENSE NO NPF-35
DOCKET NO. 50-413
AND
LICENSE AMENDMENT NO. 271
FACILITY OPERATING LICENSE NO. NPF-52
DOCKET NO. 414

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.

<u>Remove</u>	<u>Insert</u>
Licenses	Licenses
NPF-35, page 4	NPF-35, page 4
NPF-52, page 4	NPF-52, page 4
TSs	TSs
3.1.3-2	3.1.3-2
5.6-4	5.6-4
5.6-5	5.6-5
5.6-6	5.6-6

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 275, which are attached hereto, are hereby incorporated into this renewed operating license. Duke Energy Carolinas, LLC shall operate the facility in accordance with the Technical Specifications.

(3) Updated Final Safety Analysis Report

The Updated Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on December 16, 2002, describes certain future activities to be completed before the period of extended operation. Duke shall complete these activities no later than December 6, 2024, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

The Updated Final Safety Analysis Report supplement as revised on December 16, 2002, described above, shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following issuance of this renewed operating license. Until that update is complete, Duke may make changes to the programs described in such supplement without prior Commission approval, provided that Duke evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements in that section.

(4) Antitrust Conditions

Duke Energy Carolinas, LLC shall comply with the antitrust conditions delineated in Appendix C to this renewed operating license.

(5) Fire Protection Program (Section 9.5.1, SER, SSER #2, SSER #3, SSER #4, SSER #5)*

Duke Energy Carolinas, LLC shall implement and maintain in effect all provisions of the approved fire protection program as described in the Updated Final Safety Analysis Report, as amended, for the facility and as approved in the SER through Supplement 5, subject to the following provision:

The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

*The parenthetical notation following the title of this renewed operating license condition denotes the section of the Safety Evaluation Report and/or its supplement wherein this renewed license condition is discussed.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 271, which are attached hereto, are hereby incorporated into this renewed operating license. Duke Energy Carolinas, LLC shall operate the facility in accordance with the Technical Specifications.

(3) Updated Final Safety Analysis Report

The Updated Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on December 16, 2002, describes certain future activities to be completed before the period of extended operation. Duke shall complete these activities no later than December 6, 2024, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

The Updated Final Safety Analysis Report supplement as revised on December 16, 2002, described above, shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following issuance of this renewed operating license. Until that update is complete, Duke may make changes to the programs described in such supplement without prior Commission approval, provided that Duke evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements in that section.

(4) Antitrust Conditions

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The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

*The parenthetical notation following the title of this renewed operating license condition denotes the section of the Safety Evaluation Report and/or its supplement wherein this renewed license condition is discussed.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.3.1 Verify MTC is within upper limit.	Once prior to entering MODE 1 after each refueling
<div data-bbox="249 573 1158 1234"> <p>SR 3.1.3.2 -----NOTES-----</p> <ol style="list-style-type: none"> 1. Not required to be performed until 7 effective full power days (EFPD) after reaching the equivalent of an equilibrium RTP all rods out (ARO) boron concentration of 300 ppm. Measurement of the MTC may be suspended provided the benchmark criteria specified in DPC-NE-1007-PA, and the Revised MTC Prediction specified in the COLR are satisfied. 2. If the MTC is more negative than the 300 ppm Surveillance limit (not LCO limit) specified in the COLR, SR 3.1.3.2 shall be repeated once per 14 EFPD during the remainder of the fuel cycle. 3. SR 3.1.3.2 need not be repeated if the MTC measured at the equivalent of equilibrium RTP-ARO boron concentration of ≤ 60 ppm is less negative than the 60 ppm Surveillance limit specified in the COLR. <p>-----</p> <p>Verify MTC is within lower limit.</p> </div>	Once each cycle

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

12. DPC-NE-2008-P-A, "Fuel Mechanical Reload Analysis Methodology Using TACO3" (DPC Proprietary).
13. WCAP-10054-P-A, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code" (W Proprietary).
14. DPC-NE-2009-P-A, "Westinghouse Fuel Transition Report" (DPC Proprietary).
15. WCAP-12945-P-A, Volume 1 and Volumes 2-5, "Code Qualification Document for Best-Estimate Loss of Coolant Analysis" (W Proprietary).
16. DPC-NE-1005P-A, "Duke Power Nuclear Design Methodology Using CASMO-4/SIMULATE-3 MOX," (DPC Proprietary).
17. BAW-10231P-A, "COPERNIC Fuel Rod Design Computer Code," (Framatome ANP Proprietary).
18. DPC-NE-1007-PA, "Conditional Exemption of the EOC MTC Measurement Methodology" (Duke and Westinghouse Proprietary).

The COLR will contain the complete identification for each of the Technical Specifications referenced topical reports used to prepare the COLR (i.e., report number, title, revision number, report date or NRC SER date, and any supplements).

- c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.
- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

(continued)

5.6 Reporting Requirements (continued)

5.6.6 Ventilation Systems Heater Report

When a report is required by LCO 3.6.10, "Annulus Ventilation System (AVS)," LCO 3.7.10, "Control Room Area Ventilation System (CRAVS)," LCO 3.7.12, "Auxiliary Building Filtered Ventilation Exhaust System (ABFVES)," LCO 3.7.13, "Fuel Handling Ventilation Exhaust System (FHVES)," or LCO 3.9.3, "Containment Penetrations," a report shall be submitted within the following 30 days. The report shall outline the reason for the inoperability and the planned actions to return the systems to OPERABLE status.

5.6.7 PAM Report

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

(continued)

5.6 Reporting Requirements (continued)

5.6.8 Steam Generator (SG) Tube Inspection Report

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of the inspection. The report shall include:

- a. The scope of inspections performed on each SG,
 - b. Active degradation mechanisms found,
 - c. Non-destructive examination techniques utilized for each degradation mechanism,
 - d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,
 - e. Number of tubes plugged during the inspection outage for each active degradation mechanism,
 - f. Total number and percentage of tubes plugged to date,
 - g. The results of condition monitoring, including the results of tube pulls and in-situ testing,
 - h. For Unit 2, the primary to secondary LEAKAGE rate observed in each SG (if it is not practical to assign leakage to an individual SG, the entire primary to secondary LEAKAGE should be conservatively assumed to be from one SG) during the cycle preceding the inspection which is the subject of the report,
 - i. For Unit 2, the calculated accident leakage rate from the portion of the tubes below 14.01 inches from the top of the tubesheet for the most limiting accident in the most limiting SG. In addition, if the calculated accident leakage rate from the most limiting accident is less than 3.27 times the maximum primary to secondary LEAKAGE rate, the report shall describe how it was determined, and
 - j. For Unit 2, the results of monitoring for tube axial displacement (slippage). If slippage is discovered, the implications of the discovery and corrective action shall be provided.
-

ATTACHMENT TO LICENSE AMENDMENT NO. 278
RENEWED FACILITY OPERATING LICENSE NO NPF-9
DOCKET NO. 50-369
AND
LICENSE AMENDMENT NO. 258
FACILITY OPERATING LICENSE NO. NPF-17
DOCKET NO. 370

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.

<u>Remove</u>	<u>Insert</u>
Licenses	Licenses
NPF-9, page 3	NPF-9, page 3
NPF-17, page 3	NPF-17, page 3
TSs	TSs
3.1.3-2	3.1.3-2
5.6-4	5.6-4

- (4) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components;
- (5) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproducts and special nuclear materials as may be produced by the operation of McGuire Nuclear Station, Units 1 and 2, and;
- (6) Pursuant to the Act and 10 CFR Parts 30 and 40, to receive, possess and process for release or transfer such byproduct material as may be produced by the Duke Training and Technology Center.

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

(1) Maximum Power Level

The licensee is authorized to operate the facility at a reactor core full steady state power level of 3469 megawatts thermal (100%).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 278 are hereby incorporated into this renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

(3) Updated Final Safety Analysis Report

The Updated Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on December 16, 2002, describes certain future activities to be completed before the period of extended operation. Duke shall complete these activities no later than June 12, 2021, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

The Updated Final Safety Analysis Report supplement as revised on December 16, 2002, described above, shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following issuance of this renewed operating license. Until that update is complete, Duke may make changes to the programs described in such supplement without prior Commission approval, provided that Duke evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements in that section.

Renewed License No. NPF-9
Amendment No. 278

- (4) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components;
- (5) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproducts and special nuclear materials as may be produced by the operation of McGuire Nuclear Station, Units 1 and 2; and,
- (6) Pursuant to the Act and 10 CFR Parts 30 and 40, to receive, possess and process for release or transfer such byproduct material as may be produced by the Duke Training and Technology Center.

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

(1) Maximum Power Level

The licensee is authorized to operate the facility at a reactor core full steady state power level of 3469 megawatts thermal (100%).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 258 are hereby incorporated into this renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

(3) Updated Final Safety Analysis Report

The Updated Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on December 16, 2002, describes certain future activities to be completed before the period of extended operation. Duke shall complete these activities no later than March 3, 2023, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

The Updated Final Safety Analysis Report supplement as revised on December 16, 2002, described above, shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following issuance of this renewed operating license. Until that update is complete, Duke may make changes to the programs described in such supplement without prior Commission approval, provided that Duke evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59, and otherwise complies with the requirements in that section.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.1.3.1 Verify MTC is within upper limit.	Once prior to entering MODE 1 after each refueling
<div data-bbox="232 569 1164 1281"> <p>SR 3.1.3.2 -----NOTES-----</p> <ol style="list-style-type: none"> Not required to be performed until 7 effective full power days (EFPD) after reaching the equivalent of an equilibrium RTP all rods out (ARO) boron concentration of 300 ppm. Measurement of the MTC may be suspended provided the benchmark criteria specified in DPC-NE-1007-PA, and the Revised MTC Prediction specified in the COLR are satisfied. If the MTC is more negative than the 300 ppm Surveillance limit (not LCO limit) specified in the COLR, SR 3.1.3.2 shall be repeated once per 14 EFPD during the remainder of the fuel cycle. SR 3.1.3.2 need not be repeated if the MTC measured at the equivalent of equilibrium RTP-ARO boron concentration of ≤ 60 ppm is less negative than the 60 ppm Surveillance limit specified in the COLR. <p>-----</p> </div> <div data-bbox="426 1344 835 1375"> <p>Verify MTC is within lower limit.</p> </div>	Once each cycle

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

14. DPC-NE-2009-P-A, "Westinghouse Fuel Transition Report," (DPC Proprietary).
15. WCAP-12945-P-A, Volume 1 and Volumes 2-5, " Code Qualification Document for Best-Estimate Loss of Coolant Analysis," (W Proprietary).
16. DPC-NE-1005P-A, "Duke Power Nuclear Design Methodology Using CASMO-4/SIMULATE-3 MOX," (DPC Proprietary).
17. DPC-NE-1007-PA, "Conditional Exemption of the EOC MTC Measurement Methodology" (Duke and Westinghouse Proprietary).

The COLR will contain the complete identification for each of the Technical Specifications referenced topical reports used to prepare the COLR (i.e., report number, title, revision number, report date or NRC SER date, and any supplements).

- c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.
- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Ventilation Systems Heater Failure Report

When a report is required by LCOs 3.6.10, "Annulus Ventilation System (AVS)," or LCO 3.7.9, "Control Room Area Ventilation System (CRAVS)," a report shall be submitted within the following 30 days. The report shall outline the reason for the inoperability and the planned actions to return the systems to OPERABLE status.

5.6.7 PAM Report

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

(continued)



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 275 TO RENEWED FACILITY OPERATING LICENSE NPF-35

AMENDMENT NO. 271 TO RENEWED FACILITY OPERATING LICENSE NPF-52

AMENDMENT NO. 278 TO RENEWED FACILITY OPERATING LICENSE NPF-9

AMENDMENT NO. 258 TO RENEWED FACILITY OPERATING LICENSE NPF-17

DUKE ENERGY CAROLINAS, LLC

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-413 AND 50-414

MCGUIRE NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-369 AND 50-370

1.0 INTRODUCTION

By letter dated May 31, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12153A328), as supplemented by letters dated March 13, 2013 (ADAMS Accession No. ML13074A304), and November 25, 2014 (ADAMS Accession No. ML14332A301), Duke Energy Carolinas, LLC (Duke), the licensee for the Catawba and McGuire Nuclear Stations, requested changes to the Catawba Units 1 and 2 and McGuire Units 1 and 2 Technical Specifications (TS). The proposed changes would revise the Catawba and McGuire TS 3.1.3, "Moderator Temperature Coefficient (MTC)" to allow the normally required near end-of-cycle (EOC) MTC measurement to not be performed under certain conditions. If these conditions are met, the MTC measurement would be replaced by a calculated value.

This license amendment request included a request to review the Duke Energy Methodology Report DPC-NE-1007-P, Revision 0, "Conditional Exemption of the EOC MTC Measurement Methodology," in support of the EOC MTC measurement exemption request. DPC-NE-1007-P is a description of the methodology Duke will use to determine (a) the applicability of the core calculations, which are subject to certain acceptance criteria, and (b) the computed value of MTC that would be compared, in lieu of the MTC measurement, to the surveillance limit provided in the

Core Operating Limits Report (COLR). Duke also proposed to add this methodology report to the list of COLR references in TS 5.6.5, "Core Operating Limits Report (COLR)." The NRC staff therefore reviewed DPC-NE-1007-P as part of the current effort.

The U. S. Nuclear Regulatory Commission (NRC) staff accepted the license amendment request for review by letter dated July 3, 2012 (ADAMS Accession No. ML12188A010). Subsequently, the NRC staff issued a request for additional information (RAI) with nine questions regarding Duke's application by letter dated January 22, 2013 (ADAMS Accession No. ML13018A071). Duke responded to these initial nine RAIs in a letter dated March 13, 2013 (ADAMS Accession No. ML13074A304). By letter dated October 24, 2014 (ADAMS Accession No. ML14295A454), the NRC staff sent a second request for additional information to clarify the licensee's responses to the previous RAIs. Duke responded to this second set of RAIs in a letter dated November 25, 2014 (ADAMS Accession No. ML14332A301).

2.0 REGULATORY EVALUATION

The reviewed methodology describes the process to be used to evaluate and apply a conditional exemption to the near end-of-cycle MTC measurement required by Surveillance Requirement (SR) 3.1.3.2 as part of TS 3.1.3, "Moderator Temperature Coefficient (MTC)." This SR is specified, as stipulated by Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36(c)(3), "Surveillance Requirements," to demonstrate that the MTC is within the limits assumed in the licensee's transient analyses, which are documented in the Catawba and McGuire Updated Final Safety Analysis Reports (UFSARs), as required by 10 CFR 50.34(b). Under SR 3.1.3.2, the licensee must perform a measurement of the MTC within 7 effective full power days of reaching the equivalent of an equilibrium core boron concentration of 300 parts per million (ppm). The measured value of MTC is then compared to the surveillance limit as specified in the COLR. The limitations on MTC contained in the COLR and TS 3.1.3, which are verified by SR 3.1.3.2, provide assurance that the value of the coefficient remains bounded by the limiting condition that is assumed in the UFSAR accident and transient analyses. This, in turn, provides reasonable assurance that the reactor will be operated in a safe manner.

The content of the COLR derived from the guidance in NRC Generic Letter (GL) 88-16, "Removal of Cycle-Specific Parameter Limits from Technical Specifications," which indicates that it is acceptable for licensees to control reactor physics parameter limits by specifying an NRC-approved calculation methodology. These parameter limits may be removed from the TS and placed in an administratively-controlled cycle-specific COLR, which is defined in the TS and required to be submitted to the NRC every operating cycle or each time it is revised. As recommended by GL 88-16, the Catawba and McGuire TSs include lists of references for the NRC-approved calculation methodologies used to generate the cycle-specific operating limits. The changes requested to TS 5.6.5 are changes to this list that would add DPC-NE-1007-P as a reference.

The NRC staff has established the requirements and methodologies for evaluating the radiological consequences of the postulated design basis accidents (DBAs) using the dose criteria specified in Title 10 of the *Code of Federal Regulations* Part 50.67 (10 CFR 50.67), "Accident source term", and the guidance described in Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors." The requirements of 10 CFR 50.67 state that the applicable dose acceptance criteria are 5 rem

Total Effective Dose Equivalent (TEDE) in the control room (CR), 25 rem TEDE at the exclusion area boundary (EAB), and 25 rem TEDE at the outer boundary of the low population zone (LPZ). RG 1.183 provides guidance to licensees on acceptable application of alternative source term (AST) submittals, including acceptable radiological analysis assumptions for use in conjunction with the accepted AST. The NRC staff also considered relevant information in the Catawba and McGuire Final Safety Analysis Report (FSAR) and TSs as part of this review.

The Catawba DBA dose analyses were found to be acceptable to the NRC staff by License Amendment No. 227 and 222 to Facility Operating License Nos. NPF-35 and NPF-52 for Units 1 and 2, respectively (ADAMS Accession No. ML052730317). The McGuire DBA dose analyses were found to be acceptable to the NRC staff by License Amendment Nos. 251 and 231 to Facility Operating License Nos. NPF-9 and NPF-17 for Units 1 and 2, respectively (ADAMS Accession No. ML090890627).

3.0 TECHNICAL EVALUATION

3.1 Review of DPC-NE-1007-P

3.1.1 Description of Methodology

TS 3.1.3 places limits on the MTC. These limits are derived from the accident analyses, which bound operation of the plant up to the TS limits. The most negative MTC limiting condition for operation (LCO) limit requires that the MTC be less negative than the specified limit for the all rods withdrawn, EOC, rated thermal power (RTP) condition. To demonstrate compliance with the most negative MTC LCO, SR 3.1.3.2 requires verification that the MTC is less negative than the surveillance limit within 7 effective full power days of reaching a 300 ppm equilibrium boron concentration. From the time that 300 ppm boron concentration is reached until EOC, the hot full power (HFP) MTC will gradually become more negative due to additional fuel burnup and reductions in boron concentration. To account for this effect, the 300 ppm MTC surveillance limit is sufficiently less negative than the most negative MTC LCO limit to ensure that the LCO limit will be met as long as the 300 ppm MTC surveillance criterion is met.

Currently, TS 3.1.3 requires measurements of MTC at the beginning of core life (BOC) to verify the most positive MTC limit and at near-EOC to verify the most negative MTC limit. At BOC, the measurement of the hot zero power (HZIP) isothermal temperature coefficient (ITC) is relatively simple to perform because it is not complicated by changes in the reactor coolant enthalpy rise or xenon transient effects. The measurement made near EOC is performed at or near HFP conditions, and is therefore more difficult to perform due to small variations in certain parameters, including xenon concentration and distribution and enthalpy rise (due to perturbations to the core average power level). These variations must be accounted for when interpreting the measurement data to accurately determine the change in reactivity over the course of the measurement. Duke discussed this sensitivity of the EOC MTC measurement to small changes in the plant parameters as support for the measurement exemption, noting that even minor perturbations could yield inaccurate results if improperly accounted for.

The MTC measurement also results in a loss in electrical generation as a result of the measurement procedures, which require additional manpower to perform the test. This measurement disrupts normal reactor operation and increases the potential for a reactivity event due to a human performance error or unanticipated equipment issues. Therefore, in order to

improve plant availability and minimize disruptions to normal reactor operations, Duke has proposed an alternative to the EOC MTC measurement.

The proposed alternative would modify the EOC MTC SR by placing a set of conditions on core operations and the core design calculations. If the core has been shown to operate as predicted throughout the cycle by conforming to the acceptance criteria, performance of the EOC MTC measurement would not be required. Instead, the EOC MTC measurement required by SR 3.1.3.2 would be replaced by a calculation of MTC that accounts for cycle operating history, current operating conditions, and uncertainty in the calculation itself.

In the Duke methodology report, there are three main components that contribute to differences between predicted and measured MTC. Two of these components account for differences between predicted and actual operating conditions and history; one accounts for modeling uncertainties that impact the ability of the core design model to accurately predict the MTC. DPC-NE-1007-P addresses these three components and specifies an algorithm that allows for a revised predicted MTC to be computed.

3.1.2 Nuclear Design Methods Used in the DPC-NE-1007-P Methodology

Duke's methodology uses an NRC-accepted CASMO-4/SIMULATE-3 core design model as the basis of the analyses for the conditional EOC MTC measurement exemption described in the LAR. The qualification of Duke's CASMO-4/SIMULATE-3 core design model is documented in DPC-NE-1005-PA, Rev. 1, "Nuclear Design Methodology Using CASMO-4/SIMULATE-3 MOX," which has been reviewed and approved by the NRC. Benchmark analyses provided in both DPC-NE-1005 and DPC-NE-1007 demonstrate that this core model accurately predicts the depletion characteristics of the operating core and is capable of demonstrating whether sufficient margin exists to the EOC MTC LCO limit for the core given the current operating conditions.

RAI 1 requested additional information regarding the benchmark datasets provided in Tables 3-1 and 3-4 of DPC-NE-1007-P, to confirm their relevance, sufficiency, and lack of bias. Specifically, Duke was asked to provide bases and justifications for any data truncations, the time period covered by the data, the number of data points, and whether or not the data consideration of both low-enriched uranium (LEU) and LEU-Gadolinia core types. In its response, Duke discussed how three data points were removed from the BOC MTC measurement dataset, as they were considered to be outliers, and two data points were removed from the EOC MTC measurement dataset, due to anomalous conditions experienced during the tests. Duke also clarified that the database for the CASMO-4/SIMULATE-3 code qualification contained both LEU and LEU-Gadolinia cores and provided a table with the number of points evaluated for each parameter in Table 3-1. The NRC staff reviewed this response and determined that the bases supplied for the limited data truncations, the time period and number of data points, and the statement clarifying that the data treated both LEU and LEU-Gadolinia cores were appropriate. The NRC staff, therefore finds that the code set is appropriately benchmarked for the purposes of the conditional EOC MTC measurement exemption methodology.

Duke stated in the methodology report that "the conditional exemption methodology is intended to be independent of the core model used provided the core model has been appropriately benchmarked, and has been reviewed and approved by the NRC for use in safety related calculations." Because much of the methodology report is devoted to developing uncertainty factors that are only appropriate for the CASMO-4/SIMULATE-3 code system, the NRC staff

asked Duke to clarify the intent and significance of this statement in RAI 8. Duke responded that the statement was made to indicate that the methodology for conditional exemption to the MTC does not impact the methods used to establish the TS limits or the transient analyses. Duke also clarified that qualification of the CASMO-4/SIMULATE-3 code set is described in DPC-NE-1005-PA, and that transition to an alternate code set would require additional benchmarks to determine the measured minus predicted biases and uncertainties and would therefore require NRC review and approval. Because using a different code system and/or new biases and uncertainties would prompt NRC review, the NRC staff determined this response to be acceptable.

In their response to RAI 5, Duke clarified the benchmarking that would be needed to use a different code set. In the same RAI response, Duke also discussed the administrative controls on core performance monitoring that would confirm the acceptability of the methodology for minor fuel design and operational changes. Duke specifically noted that major fuel design changes would likely require further validation of the CASMO-4/SIMULATE-3 physics methodologies and would therefore require NRC review and approval. The NRC staff reviewed Duke's response and determined that the administrative controls in place are acceptable.

3.1.3 Proposed Core Operation Acceptance Criteria

The methodology includes, as mentioned above, seven acceptance criteria, which are used to verify that the core has been operating as originally predicted and that the calculated prediction of core performance is still valid. These acceptance criteria are applied to the following parameters:

- Assembly power (measured normal reaction rate)
- Measured incore quadrant tilt (intermediate power)
- Measured incore quadrant tilt (full power)
- Core reactivity difference
- BOC Hot Zero Power (HZP) Isothermal Temperature Coefficient (ITC)
- Individual control bank worth
- Total control bank worth

If any of the acceptance criteria on any of these seven parameters are not satisfied during either startup physics testing or tests performed throughout the cycle, or if the revised predicted MTC does not meet the TS EOC 300 ppm MTC surveillance limit, then the EOC SR 3.1.3.2 MTC measurement is not exempted and must be completed. The NRC staff found that most of the acceptance criteria conformed to the suggested acceptance criteria for HZP physics tests from ANSI/ANS-19.6.1-2011, "Reload Startup Physics Tests for Pressurized Water Reactors." The NRC staff reviewed the licensee's proposal and determined that the variables used in the acceptance criteria were adequately representative of core performance. For five of these variables, the proposed acceptance criteria were determined by the NRC staff to be acceptable, in that they were well represented and justified by the data provided by the licensee. However, for the acceptance criterion for the difference between measured and predicted BOC HZP ITC and the acceptance criterion for core reactivity balance, the NRC staff asked RAIs to solicit additional justification from the licensee. These RAIs, the licensee's responses, and the NRC staff's evaluation are discussed in the following paragraphs.

Duke originally proposed an acceptance criterion for the difference between measured and predicted BOC HZP ITC of ± 2 pcm/°F. In RAI 2, the NRC staff requested justification for the use

of this value. Duke provided the requested justification, and additionally proposed to reduce the existing ± 2 pcm/ $^{\circ}$ F to a lower value. RAI 11 requested further clarification and justification regarding how the bias between the measured and predicted HZP ITC was accounted for in the development of the ± 2 pcm/ $^{\circ}$ F acceptance criterion. Duke provided the requested discussion and justification in their RAI response, which the NRC staff reviewed and determined to be acceptable when paired with the reduction to the acceptance criterion.

Duke also proposed an acceptance criterion for core reactivity balance deviation of ± 1000 pcm. In RAI 3, the NRC staff requested justification for the use of this value, as there was a concern based on the data presented in the LAR that it would not be sufficiently constrained to indicate that there was a significant deviation between the code and the operating core. In its response to the RAI, Duke noted that the original acceptance criterion was selected to be consistent with the TS 3.1.2 core reactivity balance limit. However, Duke also acknowledged that there had been both code and measurement technique improvements since the original TS limit was developed and accordingly lowered the acceptance criterion. To support the new, tighter acceptance criterion, Duke provided additional data from previous cycles. The NRC staff found that the data was consistent with the justification and, thus determined that the core reactivity balance criterion is acceptable with the lower limit.

In RAI 9, the NRC staff asked about the definition of intermediate and full power when performing the measurement in support of the measured incore quadrant tilt acceptance criterion, and how these parameters related to the TS 3.2.4 definition of quadrant power tilt ratio (QPTR). In response, Duke defined the applicable power levels and clarified that the incore tilt used to confirm acceptable core operation is not directly related to the QPTR and has no impact on existing plant TS. Because there is not a direct relation of the incore tilt to the QPTR, the NRC staff finds this to be acceptable.

3.1.4 Calculation of the Revised Predicted MTC

The methodology proposed in DPC-NE-1007-P allows the EOC MTC measurement to be exempted if the core operation acceptance criteria are met, as discussed above in Section 3.1.3. However, the exemption of the measurement does not exempt the surveillance from being performed. Instead of a measurement, a calculated value called the "revised predicted MTC" by the licensee is compared to the most negative MTC limit.

The revised predicted MTC is the sum of several pieces: the EOC MTC as output from the original CASMO-4/SIMULATE-3 calculations, corrections that account for differences between the conditions assumed in those calculations and how the plant has actually operated, and an additional term that accounts for uncertainty between measurements and code predictions. This last term, developed based on observed differences between EOC MTC measurements and predictions, is referred to periodically as the predictive correction term. The methodology presented in DPC-NE-1007-P describes these various correction terms and how they are applied.

The corrective terms chosen for use in the DPC-NE-1007-P methodology were slightly different from those used in the previous EOC HFP MTC measurement exemption methodology submitted by Westinghouse in WCAP-13749-P-A, "Safety Evaluation Supporting the Conditional Exemption of the Most Negative [End-of-Life] EOL Moderator Temperature Coefficient Measurement." In RAI 6, the NRC staff requested an explanation of why certain correction terms were not required in the DPC-NE-1007-P methodology. Duke provided a summary of how the methodologies

differed and how the predictive corrections proposed in DPC-NE-1007-P are appropriate to the methodology. The NRC staff finds Duke's response to be acceptable.

In RAI 7, the NRC staff questioned the ability of one of the two operational corrective terms to adequately account for the effects it is intended to represent. Duke provided calculations of an example case using extreme initial conditions as a sensitivity study to demonstrate that the corrective term would, in a worst-case scenario, be able to adequately represent the phenomenon in question. The NRC staff finds that the sensitivity study provided by Duke confirms that the corrective terms do account for the subject phenomenon and, therefore that both of the proposed operational corrective terms are acceptable.

Based on the data used to develop the predictive corrective term, however, the NRC staff identified a bias in the difference between the measured and predicted values of MTC provided by the licensee. In order to clarify how this bias was treated in the development of the predictive correction term, the NRC staff requested additional information. RAI 4 asked the licensee to either propose a new predictive correction term that accounted for the bias or justify the adequacy of the currently proposed term. Duke responded that measured-to-predicted bias is already included in the equation used to compute the revised predicted MTC and that a footnote would be added to the table containing the equation to clarify this fact. In RAI 10, the NRC staff asked for further clarification about where the bias was included. In their response to RAI 10, Duke stated that their reload methodology requires application of the measured-to-predicted bias to the computed MTC value prior to comparison against TS limits. The NRC staff finds this to be an acceptable clarification of how the bias is included in the number used to compute the revised predicted MTC. In RAI 12, because there were points in the figures provided in DPC-NE-1007-P that were not bounded by the predictive correction, the NRC staff asked the licensee for additional quantitative justification for the proposed value of the predictive correction, including a discussion of the measurement uncertainty and the unbounded points. In their response to RAI 12, the licensee provided a discussion of the sources of measurement error that are encountered when performing a HFP MTC measurement, along with estimates of the magnitudes of these errors. Duke also provided a discussion of the outlier points from the methodology report, which the NRC staff found to appropriately justify their exclusion from the bounds of the predictive correction due to measurement error. Based on the considerations above, the NRC staff finds that the proposed predictive correction will appropriately account for errors due to uncertainties in the computation of the EOC HFP MTC and is therefore acceptable.

3.1.5 Conclusion Regarding DPC-NE-1007-P

Based on the licensee's description of the methodology for computing a revised predicted EOC HFP MTC to compare to the surveillance limit, as well as the clarifications and additional justifications provided in the RAI responses, the NRC staff concludes that the licensee's approach to meeting the requirements of 10 CFR 50.36 is reasonable. The NRC staff finds the use of DPC-NE-1007 appropriate. The NRC staff notes the following factors that were integral to its finding of acceptability:

1. In the review of DPC-NE-1007-P, the NRC staff considered that the plant-specific analyses used to determine the revised predicted EOC HFP MTC will be performed with the CASMO-4/SIMULATE-3 calculational methods. In order to use the DPC-NE-1007-P methodology with an alternative calculational method that has received NRC approval for use at Catawba and/or McGuire, the licensee must

verify that the EOC MTC uncertainty developed in DPC-NE-1007-P remains bounding. If the EOC MTC uncertainty is not bounding with respect to the alternative calculational method, further review by the NRC will be necessary.

2. Duke stated that they will reexamine the predictive correction if changes in core design, changes in fuel design, or continued MTC calculations and measurement data show or are anticipated to show a significant effect on the predictive correction.
3. The NRC staff review did not consider application of DPC-NE-1007 for compatibility with mixed oxide (MOX) fuel or burnable poison materials not contained in the databases used to develop the revised predicted MTC correction terms. Use of MOX fuel or other burnable poison materials would require further review by the NRC staff.

The first two conditions were discussed by Duke in their response to RAI 8, where they stated that the CASMO-4/SIMULATE-3 code system is the current NRC approved methodology used for core design and analysis, as described in DPC-NE-1005-PA. In RAI 5, Duke discussed the administrative controls that monitor core performance and the parameters that would be expected to change with alterations to the fuel and/or core design. Duke explained that significant fuel design changes would require further validation of DPC-NE-1005-PA, the core design methodology, with the new fuel. New fuel designs would also require a lead test assembly (LTA) program. The NRC staff determined that this response is acceptable with regard to the second condition. If it would be reasonably anticipated that a reload quantity of new fuel, a significant change in core design, or another major change to the nuclear design of the plant would impact the ability of the approved code set to predict the EOC HFP MTC, the measurement required by SR 3.1.3.2 will be performed in order to determine that the predictive correction remains adequate.

The NRC staff reviewed the Catawba and McGuire UFSARs and determined that while Catawba Unit 1 had previously loaded MOX fuel in an LTA program for the Department of Energy, MOX fuel no longer resides in the reactor. The other units at Catawba and McGuire do not contain MOX fuel. If MOX were to be used again at Catawba or McGuire, the DPC-NE-1007 methodology would not be valid and the EOC HFP MTC measurement required by SR 3.1.3.2 will be performed as normal.

The use of new burnable poison materials was not discussed in the licensee's response, although the burnable poisons in use at Catawba and McGuire are discussed in the sites' respective UFSARs. Because the DPC-NE-1007 methodology was developed using recent cores with no major changes to the burnable poisons in use at the two sites in the intervening period, the NRC staff determined that the use of burnable poisons included in the database used to the revised predicted MTC correction terms is acceptable. However, if new burnable poisons are introduced without updating DPC-NE-1007, the methodology cannot be used and the EOC HFP MTC measurement required by SR 3.1.3.2 will be performed as normal.

3.2 Radiological Consequences

The MTC is a measure of the core reactivity as the primary system water temperature changes. As described in Attachment 1, Section 3 of the licensee's application, TS 3.1.3 places limits on the

MTC and requires that the MTC be less negative than the specified limit for the All Rods Out (ARO) EOC RTP condition. To demonstrate compliance with the TS 3.1.3 LCO for the most negative MTC, SR 3.1.3.2 requires verification of the MTC after reaching the equivalent of an equilibrium boron concentration of 300 ppm. In Attachment 1, Section 3 of its application, the licensee states that in order to account for this effect, the 300 ppm MTC surveillance value is sufficiently less negative than the EOC LCO limit value to provide assurance that the LCO will be met as long as the 300 ppm MTC surveillance criterion is met. The NRC staff notes that, currently, TS 3.1.3 requires measurement of MTC at BOC to verify the most positive MTC limit and near EOC to verify the most negative MTC limit. Both the most positive value and the most negative value of the MTC are important to safety, and both values must be bounded. The values used in analysis of accidents that result in overheating and overcooling of the reactor core consider worst-case conditions to ensure the accident results are bounding.

The licensee proposed an alternate method in order to improve availability and to minimize perturbations on normal reactor operation. The EOC MTC measurement SR is proposed to be replaced by a calculation of the core MTC to confirm that the MTC is behaving as anticipated by placing a set of conditions on core operations. The amendment proposes that if these conditions are met, performing the surveillance measurement is not required.

As described in Catawba and McGuire Bases for TS 3.1.3, the consequences of accidents that cause core overheating must be evaluated when the MTC is positive. Such accidents include the rod withdrawal transient from any power level, turbine trip, and loss of forced reactor coolant flow. The consequences of accidents that cause core overcooling must be evaluated when the MTC is negative. Such accidents include sudden feedwater flow increase and steam line break.

Since the proposed changes involve the EOC MTC SR, the NRC staff reviewed Catawba and McGuire DBA dose analyses for accidents that cause overcooling. The NRC staff finds that the proposed conditional alternative methodology only changes the method for determining worst-case conditions applied at EOC. The proposed change does not impact the availability, operability, or performance of any safety-related systems or components. In addition, the proposed changes do not change the design, configuration, operation, or function of any plant structure, system, or component. The acceptability of the alternative approach is based upon a SE from Nuclear Performance and Code Review Branch. The NRC staff finds that the DBA radiological consequence analyses that were approved in License Amendment Nos. 227 and 222 for Catawba and License Amendment Nos. 251 and 231 for McGuire remain bounding for accidents that cause core overcooling.

As described above, the NRC staff reviewed the justification used by the licensee to assess the radiological impacts of the proposed changes. The NRC staff finds that the licensee used methods consistent with regulatory requirements and guidance. The NRC staff finds, that the licensee's estimates of the EAB, LPZ, and CR doses will continue to comply with the 10 CFR Part 50.67 criteria. Therefore, the proposed change is acceptable with regard to the radiological consequences of postulated DBAs.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the North Carolina and South Carolina State officials were notified of the proposed issuance of the amendments. The State officials had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding, which was published in the *Federal Register* on February 5, 2013 (78 FR 8198). 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.

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Date: April 14, 2015

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If you have any questions, please call me at 301-415-2481.

Sincerely,

/RA/

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Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-413, 50-414, 50-369, and 50-370

Enclosures:

1. Amendment No. 275 to NPF-35
2. Amendment No. 271 to NPF-52
3. Amendment No. 278 to NPF-9
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5. Safety Evaluation

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