

July 19, 1999

Mr. William R. McCollum, Jr.
Vice President, Oconee Site
Duke Energy Corporation
P. O. Box 1439
Seneca, SC 29679

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RScholl (e-mail SE only) KKavanagh

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2 AND 3 RE: ISSUANCE OF AMENDMENTS (TAC NOS. MA3765, MA3766, AND MA3767)

Dear Mr. McCollum:

The Nuclear Regulatory Commission has issued the enclosed Amendment Nos. 305, 305, and 305 to Facility Operating Licenses DPR-38, DPR-47, and DPR-55, respectively, for the Oconee Nuclear Station, Units 1, 2, and 3. The amendments consist of changes to the Updated Final Safety Analysis Report in response to your application dated October 2, 1998, and supplements dated November 20, 1998, December 21, 1998, and May 13, 1999. In these submittals you supplied information related to an unreviewed safety question regarding the use of a small amount of containment overpressure to ensure sufficient net positive suction head for the reactor building spray and low pressure injection pumps during the post loss of coolant accident recirculation phase.

The amendments approve the necessary changes to the UFSAR. A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,
Original signed by:
David E. LaBarge, Senior Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

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

Enclosures:

1. Amendment No. 305 to DPR-38
2. Amendment No. 305 to DPR-47
3. Amendment No. 305 to DPR-55
4. Safety Evaluation

cc w/encls: See next page

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DATE	7/16/99	7/16/99		6/24/99	7/16/99	7/19/99

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

July 19, 1999

Mr. William R. McCollum, Jr.
Vice President, Oconee Site
Duke Energy Corporation
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2 AND 3 RE: ISSUANCE OF
AMENDMENTS (TAC NOS. MA3765, MA3766, AND MA3767)

Dear Mr. McCollum:

The Nuclear Regulatory Commission has issued the enclosed Amendment Nos. 305 , 305 , and 305 to Facility Operating Licenses DPR-38, DPR-47, and DPR-55, respectively, for the Oconee Nuclear Station, Units 1, 2, and 3. The amendments consist of changes to the Updated Final Safety Analysis Report in response to your application dated October 2, 1998, and supplements dated November 20, 1998, December 21, 1998, and May 13, 1999. In these submittals you supplied information related to an unreviewed safety question regarding the use of a small amount of containment overpressure to ensure sufficient net positive suction head for the reactor building spray and low pressure injection pumps during the post loss of coolant accident recirculation phase.

The amendments approve the necessary changes to the UFSAR. A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

A handwritten signature in cursive script, appearing to read "D. LaBarge".

David E. LaBarge, Senior Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

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

Enclosures:

1. Amendment No. 305 to DPR-38
2. Amendment No. 305 to DPR-47
3. Amendment No. 305 to DPR-55
4. Safety Evaluation

cc w/encs: See next page

Oconee Nuclear Station

cc:

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

DUKE ENERGY CORPORATION

DOCKET NO. 50-269

OCONEE NUCLEAR STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 305
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) Facility Operating License No. DPR-38 filed by the Duke Energy Corporation (the licensee) dated October 2, 1998, as supplemented November 20, 1998, December 21, 1998, and May 13, 1999, 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 to authorize changes to the Oconee Updated Final Safety Analysis Report to allow a total of 2.2 pounds per square inch of containment overpressure for the time period of 3000 to 30000 seconds after a hot leg break LOCA to be credited in the calculation of NPSH available for the building spray and the low pressure injection pumps during the recirculation phase of a loss of coolant accident (LOCA).

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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



Richard L. Emch, Jr., Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Technical Specification
Changes

Date of Issuance: July 19, 1999



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

DUKE ENERGY CORPORATION

DOCKET NO. 50-270

OCONEE NUCLEAR STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 305
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) Facility Operating License No. DPR-47 filed by the Duke Energy Corporation (the licensee) dated October 2, 1998, as supplemented November 20, 1998, December 21, 1998, and May 13, 1999, 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 to authorize changes to the Oconee Updated Final Safety Analysis Report to allow a total of 2.2 pounds per square inch of containment overpressure for the time period of 3000 to 30000 seconds after a hot leg break LOCA to be credited in the calculation of NPSH available for the building spray and the low pressure injection pumps during the recirculation phase of a loss of coolant accident (LOCA).

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

Richard L. Emch, Jr.

Richard L. Emch, Jr., Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Technical Specification
Changes

Date of Issuance: July 19, 1999



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

DUKE ENERGY CORPORATION

DOCKET NO. 50-287

OCONEE NUCLEAR STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 305
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) Facility Operating License No. DPR-55 filed by the Duke Energy Corporation (the licensee) dated October 2, 1998, as supplemented November 20, 1998, December 21, 1998, and May 13, 1999, 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 to authorize changes to the Oconee Updated Final Safety Analysis Report to allow a total of 2.2 pounds per square inch of containment overpressure for the time period of 3000 to 30000 seconds after a hot leg break LOCA to be credited in the calculation of NPSH available for the building spray and the low pressure injection pumps during the recirculation phase of a loss of coolant accident (LOCA).

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



Richard L. Emch, Jr., Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Technical Specification
Changes

Date of Issuance: July 19, 1999



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 305 TO FACILITY OPERATING LICENSE DPR-38

AMENDMENT NO. 305 TO FACILITY OPERATING LICENSE DPR-47

AND AMENDMENT NO. 305 TO FACILITY OPERATING LICENSE DPR-55

DUKE ENERGY CORPORATION

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

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

1.0 INTRODUCTION

By letter dated October 2, 1998 (Reference 1), as supplemented by letters dated November 20 and December 21, 1998 (References 2 and 3 respectively), and May 13, 1999 (Reference 4), Duke Energy Corporation (Duke, the licensee) requested a change to the Oconee Nuclear Station, Units 1, 2, and 3 licensing basis. The request involves the review of an unreviewed safety question (USQ) pertaining to the net positive suction head (NPSH) requirements for the reactor building spray (RBS) and the low pressure injection (LPI) pumps during the post-accident recirculation phase of a loss of coolant accident (LOCA). The proposed changes allow reactor building pressure to be credited in the calculation of NPSH available (NPSHA) for the RBS and LPI pumps during the recirculation phase. For Oconee, containment overpressure is considered to be the difference between the reactor building pressure and the saturated vapor pressure of the containment sump. A total of 2.2 pounds per square inch (psi) of containment overpressure is requested for the time period of 3000 to 30000 seconds (approximately 7.5 hours) after a hot leg break LOCA.

2.0 BACKGROUND

Oconee Nuclear Station, Units 1, 2, and 3 are each Babcock and Wilcox 177 lowered-loop pressurized water reactors with large, dry containments (known as the Reactor Buildings), two reactor coolant loops with one steam generator per loop, and two reactor coolant pumps per loop. The emergency core cooling system (ECCS) for each unit consists of three high pressure injection (HPI) pumps, three LPI pumps, and two core flood tanks. During the recirculation phase following a hot leg break LOCA, long term core cooling is provided by recirculation of water from the reactor building sump by the LPI pumps. The LPI system is also designed to provide adequate NPSH for certain modes of operation of the HPI and RBS pumps. The containment heat removal system for each unit consists of two reactor building spray pumps that share a suction header with the LPI and HPI pumps. The RBS system is designed to reduce the containment pressure and temperature and remove radionuclides from the containment atmosphere following a LOCA.

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3.0 EVALUATION

3.1 Minimum Containment Pressure Analysis

In order to demonstrate that adequate containment pressure is available, the licensee performed a calculation of containment pressure that included assumptions to minimize the calculated pressure. The assumptions were also intended to maximize the post-LOCA sump temperature. The methods used have been previously approved by the staff and documented in Duke Power Company Topical Report DPC-NE-3003-PA. The staff safety evaluation on these methods was issued on March 15, 1995, and approved the methods for reactor building pressure calculations.

The licensee's October 2, 1998, letter to the staff discussed the assumptions made to minimize reactor building pressure. The staff has reviewed these assumptions and finds them acceptable since they tend to minimize reactor building pressure. In general, these assumptions minimize the amount of air initially in the containment, minimize the effect of passive heat sinks, and maximize the reactor power (e.g., the decay heat is maximized by adding what is called a 2σ uncertainty). Since the licensee intended to also maximize the sump water temperature, the licensee performed sensitivity studies to determine what values to use for certain parameters, such as Reactor Building Cooling Unit (RBCU) fouling when the effect was not clear.

The staff finds the licensee's containment calculations, in support of the NPSH calculations, to be acceptable since they were performed with approved methods using conservative input.

3.2 NPSH Analysis

At Oconee, containment overpressure is defined as the difference between the reactor building pressure and the vapor pressure of the sump fluid. The staff has previously approved credit for containment overpressure for some facilities when the objective of Safety Guide 1 (Reference 5) cannot be met. However, approval was not considered until all other options, such as throttling or orificing, had been demonstrated to be impractical.

According to Licensee Event Report (LER) 269/1998-12, Revision 1 (Reference 6), throttling of the RBS and LPI pumps has been considered. To ensure adequate pump NPSH, the Emergency Operating Procedure (EOP) contains steps to throttle the flow rate of both the LPI and RBS systems to limit total flow in the common suction piping. This requirement is documented in both the LPI and the RBS system design basis documents. Operator action is required to initially throttle RBS flow from the BWST to 1500 gallons per minute (gpm) as indicated by flow instrumentation and to throttle flow to 1000 gpm just prior to realigning RBS suction to the emergency reactor building sump.

Revision 0 of calculation OSC-4467, "RB Pressure Needed for RBS Operation (Recirculation Phase)," (Reference 7) did not account for the effects of instrument uncertainty on the assumed flows in either the RBS or LPI systems. This was corrected in Revision 1 of OSC-4467. Currently, Revision 8 of OSC-4467 states that, for long term cooling during the recirculation phase, instrument uncertainty results in a RBS flow of 1150 gpm (versus 1000 gpm without instrument uncertainty) and a LPI flow of 3310 gpm (versus 3000 gpm). It is the increased flow

due to the instrument uncertainty that results in the need for containment overpressure to prevent cavitation of the RBS and/or the LPI pumps.

At Oconee, the hot leg break is bounding for NPSH analyses since it results in a higher sump temperature and lower reactor building pressure when compared to small breaks or a large break of the cold leg. Additionally, the licensee assumed a single failure of one LPI train, one RBS train, and one reactor building cooling unit (RBCU) in their NPSH analyses.

Duke provided the following relationship that was used to calculate the available NPSH for the LPI and RBS pumps in Calculation OSC-4467, Revision 8:

$$NPSHA = P_b(C) + P_a(C) + H_s - h_f - P_{sat}(C)$$

where:

- P_b = reactor building pressure (containment overpressure) (psig)
- P_a = atmospheric pressure (psia)
- H_s = static head of submergence (ft)
- h_f = friction losses in piping system (ft)
- P_{sat} = saturation pressure at sump temperature (psia)
- C = conversion factor to convert psig to ft. of water

The Oconee NPSH analyses also assume that the sump screen and grating are 50 percent blocked. This results in a negligible friction head loss of 0.01 foot. Therefore, this friction loss was not considered in the NPSH analyses. Table 1 lists the sump temperatures and containment overpressure assumed in the NPSH analyses.

Table 1: Containment Overpressure Assumed in NPSH Analyses

Sump Temperature (°F)	P_{sat} (psig)	P_b (psig) (2.2 psi > P_{sat})
195	-4.31	-2.11
200	-3.17	-0.97
205	-1.93	0.27
210	-0.58	1.62
215	0.89	3.09
220	2.49	4.69
225	4.21	6.41
229.6	5.94	8.14

Using the worst case conditions, and assuming credit for 2.2 psi of reactor building overpressure, the licensee calculated that the NPSH available was 19.76 feet for the RBS pumps and 18.48 feet for the LPI pumps (Reference 4).

Using the information provided by the licensee, the staff performed its own calculations to verify the Oconee NPSH analyses. The NPSH required (NPSHR) for the LPI pumps at 3310 gpm is 13 feet and the NPSHR for the RBS pumps at 1150 gpm is 17 feet. Table 2 presents the results of the staff's NPSHA calculations assuming credit for 2.2 psi of containment overpressure for the LPI and RBS pumps.

Table 2: Staff NPSH Analyses with Credit for 2.2 psi

Sump Temperature (°F)	RBS NPSHA (feet)	LPI NPSHA (feet)
195	19.688	18.408
200	19.688	18.418
205	19.72	18.44
210	19.742	18.462
215	19.742	18.462
220	19.764	18.484
225	19.764	18.484
229.6	19.786	18.506

As noted in Table 2, the NPSH available exceeds the NPSH required for both the RBS and the LPI pumps in all cases. Based on both the staff's and the licensee's calculations, therefore, adequate NPSH to the RBS and LPI pumps is ensured when credit of 2.2 psi for the containment overpressure is assumed.

The staff evaluated the consequences of a loss of containment overpressure following a LOCA on RBS and LPI pump operation. In this case without containment overpressure credit, it is expected that the pump would experience the onset of cavitation, which would reduce flow to some extent but would also reduce cavitation. The analysis shows that full cavitation, and the resultant pump damage, is not expected. The staff notes that credit for containment overpressure is only needed for sump temperatures above 208 °F for the RBS pumps. Additionally, the LPI pumps require less containment overpressure credit to ensure adequate NPSH than the RBS pumps. Therefore, a loss of containment overpressure following a LOCA should not result in unacceptable consequences.

Based on the above analysis, the staff concludes that crediting a containment overpressure of 2.2 psi above the vapor saturation pressure ensures adequate NPSH for the RBS and LPI pumps and is, therefore, acceptable. This credit for containment overpressure is applicable to the RBS and LPI pumps for the time period of approximately 3000 to 30000 seconds after a hot leg LOCA .

4.0 SUMMARY

The staff has reviewed the licensee's minimum containment pressure and NPSH analyses for the RBS and LPI pumps. The staff finds that with credit for 2.2 psi of containment overpressure from 3000 to 30000 seconds (approximately 7.5 hours) following a LOCA, sufficient NPSH for the RBS and LPI pumps will be available to meet the RBS and LPI flow requirements with instrument uncertainty included. The staff concludes that there is reasonable assurance that plant operation in this manner poses no undue risk to the health and safety of the public. As a result, the staff finds the proposed UFSAR changes acceptable and the USQ resolved.

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 requirements with respect to installation or use of a facility component 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 (64 FR 32288). 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.

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.

8.0 REFERENCES

1. McCollum, W.R., Jr., Duke Energy, to USNRC, "Oconee Nuclear Station Units 1, 2, and 3, Proposed Amendment to the Facility Operating License Regarding Reactor Building Overpressure to Assure Net Positive Suction Head for the Reactor Building Spray Pumps," October 2, 1998.
2. McCollum, W.R., Jr., Duke Energy, to USNRC, "Oconee Nuclear Station Units 1, 2, and 3 - Response to Request for Additional Information Related to Reactor Building Overpressure for Reactor Building Spray Pumps Net Positive Suction Head," November 20, 1998.

3. McCollum, W.R., Jr., Duke Energy, to USNRC, "Oconee Nuclear Station Units 1, 2, and 3 - Additional Information Related to Reactor Building Overpressure to Assure Net Positive Suction Head for the Reactor Building Spray Pumps," December 21, 1998.
4. McCollum, W.R., Jr., Duke Energy, to USNRC, "Oconee Nuclear Station Units 1, 2, and 3 - Supplement to Proposed Amendment to the Facility Operating License Regarding Reactor Building Overpressure to Assure Net Positive Suction Head for the Reactor Building Spray Pumps," May 13, 1999.
5. US Atomic Energy Commission, Safety Guide 1, "Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal System Pumps," November 2, 1970.
6. McCollum, W.R., Jr., Duke Energy, to USNRC, "Oconee Nuclear Station - Licensee Event Report 269/1998-12, Revision 1, Problem Investigation Process No.: 0-098-4512," December 3, 1998.
7. Duke Engineering Corporation, Oconee Nuclear Station, "RB Pressure Needed for RBS Operation (Recirculation Phase)," Calculation OSC-4467 Rev. 0, March 9, 1992.

Principal Contributors: Kerri Kavanagh
Richard Lobel

Date: July 19, 1999