

October 9, 1997

Mr. G. R. Peterson
Site Vice President
Catawba Nuclear Station
Duke Power Company
4800 Concord Road
York, South Carolina 29745-9635

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SUBJECT: ISSUANCE OF AMENDMENT - CATAWBA NUCLEAR STATION, UNIT 1
(TAC NO. M98728)

Dear Mr. Peterson:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 162 to Facility Operating License NPF-35 for the Catawba Nuclear Station, Unit 1. The amendment is in response to your application dated May 8, 1997, and supplemented by letter dated September 10, 1997.

The amendment revises Section 3/4.1.2 of the Technical Specifications to permit a one-time natural circulation test during Mode 3.

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:

Peter S. Tam, Senior Project Manager
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation.

Docket No. 50-413

Enclosures:

- 1. Amendment No. 162 to NPF-35
- 2. Safety Evaluation

cc w/encls: See next page

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DATE	9/19/97	9/11/97	9/22/97	10/19/97	
COPY	YES NO		YES NO	YES NO	YES NO

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**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

WASHINGTON, D.C. 20555-0001

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Sincerely,

A handwritten signature in black ink that reads "Peter S. Tam".

Peter S. Tam, Senior Project Manager
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-413

Enclosures:

1. Amendment No.162 to NPF-35
2. Safety Evaluation

cc w/encls: See next page

Catawba Nuclear Station

cc:

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Catawba Nuclear Station

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

DUKE ENERGY CORPORATION

NORTH CAROLINA ELECTRIC MEMBERSHIP CORPORATION

SALUDA RIVER ELECTRIC COOPERATIVE, INC.

DOCKET NO. 50-413

CATAWBA NUCLEAR STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 162
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) Facility Operating License No. NPF-35 filed by the Duke Energy Corporation, acting for itself, North Carolina Electric Membership Corporation and Saluda River Electric Cooperative, Inc. (licensees), dated May 8, 1997, and supplemented by letter dated September 10, 1997, 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.

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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 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. 162, which are attached hereto, are hereby incorporated into this license. Duke Energy Corporation shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Herbert N. Berkow, Director
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment: Technical Specification Changes

Date of Issuance: October 9, 1997

ATTACHMENT TO LICENSE AMENDMENT NO. 162

FACILITY OPERATING LICENSE NO. NPF-35

DOCKET NO. 50-413

Replace the following page of the Appendix "A" Technical Specifications with the enclosed page. The revised page is identified by Amendment number and contains vertical lines indicating the areas of change.

Remove

Insert

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3/4 4-2

REACTOR COOLANT SYSTEM

HOT STANDBY

LIMITING CONDITION FOR OPERATION

3.4.1.2 At least three of the reactor coolant loops listed below shall be OPERABLE and in operation:*

- a. Reactor Coolant Loop A and its associated steam generator and reactor coolant pump,
- b. Reactor Coolant Loop B and its associated steam generator and reactor coolant pump,
- c. Reactor Coolant Loop C and its associated steam generator and reactor coolant pump, and
- d. Reactor Coolant Loop D and its associated steam generator and reactor coolant pump.

APPLICABILITY: MODE 3.

ACTION:

- a. With less than the above required reactor coolant loops OPERABLE, restore the required loops to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 12 hours.
- b. With less than the above required coolant loop in operation, restore the required loops to operation within 72 hours or open the Reactor Trip System breakers.
- c. With no reactor coolant loops in operation, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required reactor coolant loops to operation.

SURVEILLANCE REQUIREMENTS

4.4.1.2.1 The required steam generators shall be determined OPERABLE by verifying secondary side water level to be greater than or equal to 12% at least once per 12 hours.

4.4.1.2.2 At least 3 reactor coolant loops shall be verified in operation and circulating reactor coolant at least once per 12 hours.

*All reactor coolant pumps may be deenergized for up to 1 hour (4 hours on a one time basis for natural circulation testing following steam generator replacement) provided: (1) no operations are permitted that would cause dilution of the Reactor Coolant System boron concentration, and (2) core outlet temperature is maintained at least 10°F below saturation temperature.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 162 TO FACILITY OPERATING LICENSE NPF-35

DUKE ENERGY CORPORATION, ET AL.

CATAWBA NUCLEAR STATION, UNIT 1

DOCKET NO. 50-413

1.0 INTRODUCTION

By letter dated May 8, 1997, as supplemented by letter dated September 10, 1997, Duke Energy Corporation, et al. (formerly Duke Power Company), the licensee, proposed a one-time Technical Specification (TS) change to Section 3/4.1.2 for Catawba Nuclear Station, Unit 1. The proposed change would allow all reactor coolant pumps (RCPs) to be deenergized for up to 4 hours in Mode 3 provided: (1) no operations are permitted that would cause dilution of the Reactor Coolant System (RCS) boron concentration; and (2) core outlet temperature is maintained at least 10°F below saturation temperature. The licensee proposed the change to allow a one-time test to collect data on the natural circulation performance of the RCS with the recently replaced steam generators (SGs). The September 10, 1997, letter provided clarifying information that did not change the scope of the May 8, 1997, application and the initial proposed no significant hazards consideration determination.

2.0 EVALUATION

The natural circulation capability of the system was previously evaluated and found acceptable by the staff (see Safety Evaluation supporting Amendment No. 151). Hence the proposed test is voluntary (i.e., not prescribed by NRC requirements or guidance). The licensee estimated that the proposed natural circulation test would take approximately 2 hours, including time to stabilize plant conditions and gather the test data. Therefore, the licensee considered 4 hours reasonable for contingencies and for restarting a reactor coolant pump.

Natural circulation (thermosiphon) is the flow created by fluid density differences (i.e., as the lower density fluid rises within a system). In a Westinghouse pressurized water reactor (PWR) like Catawba Unit 1, the reactor vessel (core region), vessel upper plenum, hot legs, and riser section of the SG U-tubes contain hotter (lower density) fluid; the downcomer section of the SG U-tubes, crossover legs, cold legs, RCP volumes, and reactor vessel downcomer region contain colder (higher density) fluid. The difference in coolant density as well as elevation differences between the U-tubes in the SGs and the bottom of the core region in the reactor vessel create a hydrostatic head, which provides a driving force for natural circulation flow. Flow resistance encountered by the fluid as it flows through the RCS results in pressure losses, which effectively work against natural circulation flow; however, some flow is maintained at system equilibrium.

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This phenomenon is understood to occur at PWRs in scenarios such as the loss of offsite power—where the RCPs lose electrical power and stop. Branch Technical Position (BTP) RSB 5-1, "Design Requirements of the Residual Heat Removal (RHR) System," requires that plants be capable of being cooled from normal operating conditions to cold shutdown conditions with and without offsite power available. Therefore, plants must be capable of being brought down to the RHR entry conditions (temperature and pressure) under natural circulation. The RHR system can then be used to take the plant down to cold shutdown.

A natural circulation verification test was performed at Catawba Unit 1 during the initial startup testing program (Updated Final Safety Analysis Report (UFSAR) Section 14.5.30). That test was performed in Mode 2 at 3 percent power. For performance of that test, the licensee reduced the intermediate and power range low setpoint high level reactor trips to approximately 7 percent rated thermal power, gagged the upper head injection isolation valves, and blocked the overtemperature and overpower delta-T reactor trip signals. In addition, that test was performed at low core burnup (i.e. new core), ensuring that core decay heat levels present were not significant. The test that was performed confirmed the natural circulation capability of the plant.

The Catawba Unit 1 steam generators were replaced during the 1996 refueling outage. The natural circulation capability of the replacement steam generators was evaluated as part of the SG replacement effort. As part of this effort, the licensee analyzed the Loss of Non-Emergency AC Power to the Station Auxiliaries transient for long-term cooling and natural circulation (UFSAR 15.2.6). The licensee's analysis included the following conservative assumptions: (a) initial power of 102 percent ; (b) turbine-driven auxiliary feedwater (TDAFW) pump unavailable; (c) 18 percent of the SG tubes in each SG are plugged; and (d) secondary system steam relief is achieved through the SG safety valves. This analysis showed that the natural circulation flow available is sufficient to provide adequate core decay heat removal following reactor trip and RCP coastdown. Based on this analysis, the licensee concluded that the replacement SGs with their enhanced heat transfer characteristics will not impede natural circulation. The staff reviewed the licensee's analysis in its Safety Evaluation supporting Amendment No. 151 to Facility Operating License NPF-35 for the Catawba Nuclear Station, Unit 1. The staff concluded that the results of this analysis are acceptable as they show that, within 10 minutes of the loss of offsite power, a stable natural circulation flow rate of approximately 5 percent of the full-power flow value is established with a core delta-T of less than 30 °F.

The licensee voluntarily proposed to perform a natural circulation test to collect actual plant performance data. The licensee will use the data from the proposed test at Catawba Unit 1 to validate analysis and simulator models for that unit as well as for McGuire, Units 1 and 2, which have replaced their SGs with ones identical to those at Catawba Unit 1. The licensee estimated that it will take approximately 2 hours, following initiation of the test, to stabilize plant conditions and gather the test data. Therefore, the licensee considered 4 hours reasonable for contingencies and for restarting an RCP.

Currently, Section 3.10.4 of the TS allows all RCPs to be deenergized for a total of 1 hour provided that no operations are permitted that would cause dilution of the RCS boron concentration, and that core outlet temperature is maintained at least 10°F below saturation temperature. Therefore, the licensee's proposed change would effectively extend the current TS-specified period from 1 to 4 hours on a one-time basis.

Additionally, Section 3.10.4 allows operation in Mode 2 (reactor critical) with all RCPs tripped for conducting startup and physics tests. Section 3.10.4 does not have a time limit for restarting an RCP; however, it does require that: (a) the thermal power not exceed the P-7 Interlock Setpoint; and (b) the reactor trip setpoints on the operable intermediate and power range channels are set less than or equal to 25 percent of rated thermal power. In the May 8, 1997, letter, the licensee stated that "performance of the test in Mode 3 would have the nuclear safety advantage that the reactor would be subcritical throughout the test." The licensee further stated that "...no trip setpoint changes are needed or bypassed to perform the test [as proposed by this request]."

By contrast to the Loss of Non-Emergency AC Power to the Station Auxiliaries transient analysis previously discussed, the proposed natural circulation test will be performed with less than 0.1 percent of the SG tubes plugged in each SG and all support systems operable. This should provide a better natural circulation capability than that calculated by the analysis. The proposed test will be initiated with the unit in a stable Mode 3 condition. With the unit at approximately 557°F and 2235 psig, operators will simultaneously trip all RCPs. Operators will verify natural circulation by observation of wide-range loop temperatures as well as core exit thermocouples. In addition, operators will monitor pressurizer and SG pressure and level response throughout this test. Operators will maintain stable natural circulation conditions for approximately 30 minutes to collect the desired data. To ensure that the test is conducted in a controlled and safe manner, the licensee has established the following test termination criteria:

- Lowest RCS subcooling margin of $\leq 15^{\circ}\text{F}$,
- Core outlet temperature $< 10^{\circ}\text{F}$ below saturation temperature (Section 3.4.1.2 of the TS),
- SG level (narrow-range) on any two loops $< 12\%$,
- Pressurizer level $< 17\%$ or $> 5\%$ unexplained decrease,
- RCS T-hot (wide-range) or any valid incore thermocouple $> 590^{\circ}\text{F}$,
- RCS delta-T in any loop $> 45^{\circ}\text{F}$,

- Steam line pressure \leq 900 psig,
- Controlled or uncontrolled dilution of the RCS (Section 3.4.1.2 of the TS), and
- RCPs de-energized for greater than 4 hours.

Recovery from the test, after either normal or early termination, will be achieved by realigning normal charging and restarting the RCPs. These steps will be accomplished using existing procedures. Emergency operating procedures also exist for dealing with design-basis accidents that would make all RCPs unavailable. The licensee stated that the operators that will be on shift to perform the test will receive "Just in Time" training in the form of a pre-job briefing, simulator exercise, and a second pre-job briefing on the control room immediately prior to the test.

The staff has reviewed the licensee's submittal related to the proposed natural circulation test and the one-time change to Section 3/4.1.2 of the TS for Catawba Unit 1. The staff concurs with the licensee's conclusion that the proposed natural circulation test is bounded by the analysis of the Loss of Non-Emergency AC Power to the Station Auxiliaries transient (UFSAR Section 15.2.6). The staff concluded that the required plant configuration for the test (i.e., with less than 0.1 percent of the SG tubes plugged in each SG and all support systems operable) should provide greater natural circulation flow capability than that predicted by the analysis. The staff reviewed the Loss of Non-Emergency AC Power to the Station Auxiliaries transient analysis in the evaluation for Amendment No. 151 to Facility Operating License NPF-35 for the Catawba Nuclear Station, Unit 1. In that review, the staff found the analysis acceptable with respect to natural circulation. The analysis showed, with conservative assumptions, that the natural circulation flow available is sufficient to provide adequate core decay heat removal following reactor trip and RCP coastdown. The staff further concludes that the proposed test termination criteria adequately ensure that the test is terminated, prior to any adverse effects, should the system behave in an unexpected manner. Based on the above discussion, the staff finds the licensee's proposal to modify Section 3/4.1.2 of the TS to allow for a one-time performance of a natural circulation test acceptable.

3.0 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.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement 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 amendment involves 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 amendment involves no

significant hazards consideration, and there has been no public comment on such finding (62 FR 30631 dated June 4, 1997). Accordingly, the amendment meets 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 amendment.

5.0 CONCLUSION

The staff 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Mohammed A. Shuaibi

Date: October 9, 1997