July 30, 1996

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Mr. William R. McCollum
Site Vice President
Duke Power Company
4800 Concord Road
York, South Carolina 29745-9635

SUBJECT: ISSUANCE OF AMENDMENT - CATAWBA NUCLEAR STATION, UNIT 1 (TAC NO. M94561)

Dear Mr. McCollum:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 150 to Facility Operating License No. NPF-35 for the Catawba Nuclear Station, Unit 1. The amendment consists of changes to the Technical Specifications (TS) in response to your application dated January 26, 1996, as supplemented by letters dated May 6, May 20, and June 5, 1996. The amendment revises portions of the TS to permit a one-time operation of the Containment Purge Ventilation System during Modes 3 and 4 after the current steam generator replacement outage.

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. 150 to NPF-35
2. Safety Evaluation

cc w/encl: See next page

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*see previous concurrence

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| DATE | 7/30 /96 | 7/30 /96 | 7/16 /96 | 7/30 /96 |
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 30, 1996

Mr. William R. McCollum
Site Vice President
Catawba Nuclear Station
Duke Power Company
4800 Concord Road
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cc w/encl: See next page

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Catawba Nuclear Station

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

DUKE POWER COMPANY

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. 150
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 Power Company, acting for itself, North Carolina Electric Membership Corporation and Saluda River Electric Cooperative, Inc. (licensees), dated January 26, 1996, as supplemented by letters dated May 6, May 20, and June 5, 1996, 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:

   Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 150 , which are attached hereto, are hereby incorporated into this license. Duke Power Company 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 from the 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: July 30, 1996

ATTACHMENT TO LICENSE AMENDMENT NO. 150

FACILITY OPERATING LICENSE NO. NPF-35

DOCKET NO. 50-413

Replace the following pages of Appendix "A", Technical Specifications, with the enclosed pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change.

| Remove Pages | Insert Pages |
|---|---|
| 3/4 6-1 | 3/4 6-1 |
| 3/4 6-2 | 3/4 6-2 |
| 3/4 6-14 | 3/4 6-14 |
| 3/4 6-15 | 3/4 6-15 |
| 3/4 6-16 | 3/4 6-16 |

## 3/4.6 CONTAINMENT SYSTEMS

### 3/4.6.1 PRIMARY CONTAINMENT

### CONTAINMENT INTEGRITY

### LIMITING CONDITION FOR OPERATION

3.6.1.1 Primary CONTAINMENT INTEGRITY shall be maintained.

APPLICABILITY: MODES 1, 2, 3, and 4.**

ACTION:

Without primary CONTAINMENT INTEGRITY, restore CONTAINMENT INTEGRITY within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

### SURVEILLANCE REQUIREMENTS

4.6.1.1 Primary CONTAINMENT INTEGRITY shall be demonstrated:

a. At least once per 31 days by verifying that all penetrations* not capable of being closed by OPERABLE containment automatic isolation valves and required to be closed during accident conditions are closed by valves, blind flanges, or deactivated automatic valves secured in their positions, except as provided in Table 3.6-2 of Specification 3.6.3;

b. By verifying that each containment air lock is in compliance with the requirements of Specification 3.6.1.3; and

c. After each closing of each penetration subject to Type B testing, except the containment air locks, if opened following a Type A or B test, by leak rate testing the seal with gas at a pressure not less than $P_a$, 14.68 psig, and verifying that when the measured leakage rate for these seals is added to the leakage rates determined pursuant to Specification 4.6.1.2d. for all other Type B and C penetrations, the combined leakage rate is less than 0.60 $L_a$.

---

*Except valves, blind flanges, and deactivated automatic valves which are located inside the annulus or the containment and are locked, sealed or otherwise secured in the closed position. These penetrations shall be verified closed during each COLD SHUTDOWN except that such verification need not be performed more often than once per 92 days.

**A one-time change is granted to have the containment purge supply and/or exhaust isolation valves for the upper and lower compartment open in Modes 3 and 4 following the steam generator replacement outage. The cumulative time for having the valves open in Modes 3 and 4 is limited to seven (7) days. All other provisions of this specification apply with the exception of those containment purge valves open in Modes 3 and 4. Each valve will be sealed closed prior to initial entry into Mode 2.

CONTAINMENT LEAKAGE

LIMITING CONDITION FOR OPERATION

3.6.1.2 Containment leakage rates shall be limited to:

a. An overall integrated leakage rate of less than or equal to $L_a$, 0.30% by weight of the containment air per 24 hours at $P_a$, 14.68 psig.

b. A combined leakage rate of less than 0.60 $L_a$ for all penetrations and valves subject to Type B and C tests, when pressurized to $P_a$, and

c. A combined bypass leakage rate of less than 0.07 $L_a$ for all penetrations identified in Table 3.6-1 as secondary containment bypass leakage paths when pressurized to $P_a$.

APPLICABILITY: MODES 1, 2, 3, and 4. *

ACTION:

With: (a) the measured overall integrated containment leakage rate exceeding 0.75 $L_a$, or (b) the measured combined leakage rate for all penetrations and valves subject to Types B and C tests exceeding 0.60 $L_a$, or (c) the combined bypass leakage rate exceeding 0.07 $L_a$, restore the overall integrated leakage rate to less than 0.75 $L_a$ and the combined leakage rate for all penetrations and valves subject to Type B and C tests to less than 0.60 $L_a$, and the combined bypass leakage rate to less than 0.07 $L_a$ prior to increasing the Reactor Coolant System temperature above 200°F.

SURVEILLANCE REQUIREMENTS

4.6.1.2 Type A containment leakage rates shall be demonstrated as required by 10 CFR 50.54(o) and Appendix J of 10 CFR Part 50, Option B, as modified by approved exemptions, and in accordance with the guidelines of Regulatory Guide 1.163, September, 1995.

*A one-time change is granted to have the containment purge supply and/or exhaust isolation valves for the upper and lower compartment open in Modes 3 and 4 following the steam generator replacement outage. The cumulative time for having the valves open in Modes 3 and 4 is limited to seven (7) days. All other provisions of this specification apply with the exception of those containment purge valves open in Modes 3 and 4. Each valve will be sealed closed prior to initial entry into Mode 2.

## ANNULUS VENTILATION SYSTEM

### LIMITING CONDITION FOR OPERATION

3.6.1.8 Two independent Annulus Ventilation Systems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.**

ACTION:

a. With one Annulus Ventilation System inoperable for reasons other than the pre-heaters tested in 4.6.1.8.a and 4.6.1.8.d.5, restore the inoperable system to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With the pre-heaters tested in 4.6.1.8.a and 4.6.1.8.d.5 inoperable, restore the inoperable pre-heaters to operable status within 7 days, or file a Special Report in accordance with Specification 6.9.2 within 30 days specifying the reason for inoperability and the planned actions to return the pre-heaters to operable status.

### SURVEILLANCE REQUIREMENTS

4.6.1.8 Each Annulus Ventilation System shall be demonstrated OPERABLE:

a. At least once per 31 days on a STAGGERED TEST BASIS by initiating, from the control room, flow through the HEPA filters and activated carbon adsorbers and verifying that the system operates for at least 10 continuous hours with the pre-heaters operating;

b. At least once per 18 months or (1) after any structural maintenance on the HEPA filter or activated carbon adsorber housings, or (2) following painting, fire, or chemical release in any ventilation zone communicating with the system by:

   1) Verifying that the cleanup system satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 1% and uses the test procedure guidance in Regulatory Positions C.5.a, C.5.c, and C.5.d* of Regulatory Guide 1.52, Revision 2, March 1978, and the system flow rate is 9000 cfm ±10%;

---

*The requirement for reducing refrigerant concentration to 0.01 ppm may be satisfied by operating the system for 10 hours with heaters on and operating.

**A one-time change is granted in Modes 3 and 4 to allow repair activities for the containment purge supply and/or exhaust isolation valves for the upper and lower compartment that were open in Modes 3 and 4 following the steam generator replacement outage.

SURVEILLANCE REQUIREMENTS (Continued)

2) Verifying, within 31 days after removal, that a laboratory analysis** of a representative activated carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, and tested per ASTM D3803-89 has a methyl iodide penetration of less than 4%; and

3) Verifying a system flow rate of 9000 cfm ± 10% during system operation when tested in accordance with ANSI N510-1980.

c. After every 720 hours of activated carbon adsorber operation, by verifying, within 31 days after removal, that a laboratory analysis** of a representative activated carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, and tested per ASTM-D3803-89 has a methyl iodide penetration of less than 4%;

d. At least once per 18 months by:

1) Verifying that the pressure drop across the combined HEPA filters, activated carbon adsorber banks, and moisture separators is less than 8 inches Water Gauge while operating the system at a flow rate of 9000 cfm ± 10%;

2) Verifying that the system starts automatically on any safety injection test signal,

3) Verifying that the filter cooling electric motor-operated bypass valves can be manually opened,

4) Verifying that each system produces a negative pressure of greater than or equal to 0.5 inch Water Gauge in the annulus within 1 minute after a start signal, and

5) Verifying that the pre-heaters dissipate 45 ± 6.7 kW at a nominal voltage of 600 vac.

e. After each complete or partial replacement of a HEPA filter bank, by verifying that the cleanup system satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 1% in accordance with ANSI N510-1980 for a DOP test aerosol while operating the system at a flow rate of 9000 cfm ± 10%; and

f. After each complete or partial replacement of an activated carbon adsorber bank, by verifying that the cleanup system satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 1% in accordance with ANSI N510-1980 for a halogenated hydrocarbon refrigerant test gas while operating the system at a flow rate of 9000 cfm ± 10%.

---

**Activated carbon adsorber samples are tested at 30 degrees C and 95% RH.

CONTAINMENT PURGE SYSTEMS

LIMITING CONDITION FOR OPERATION

3.6.1.9 Each containment purge supply and exhaust isolation valve shall be OPERABLE and:

a. Each containment purge supply and/or exhaust isolation valve for the lower compartment and the upper compartment (24-inch), instrument room (12-inch), and the Hydrogen Purge System (4-inch) shall be sealed closed, and

b. The Containment Air Release and Addition System (4-inch) isolation valve(s) may be open for up to 3000 hours during a calendar year for pressure control, for ALARA and respirable air quality considerations for personnel entry and for surveillance tests that require the valve(s) to be open.

APPLICABILITY: MODES 1, 2, 3, and 4.*

ACTION:

a. With any containment purge supply and/or exhaust isolation valve for the lower compartment and the upper compartment, or instrument room, or Hydrogen Purge System open or not sealed closed, close and/or seal closed that valve or isolate the penetrations(s) within 4 hours, otherwise be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With the Containment Air Release and Addition System isolation valve(s) open for more than 3000 hours during a calendar year or for reasons other than given in 3.6.1.9b. above, close the open valve(s) or isolate the penetration(s) within 4 hours, otherwise be in at least HOT STANDBY within the next 6 hours, and in COLD SHUTDOWN within the following 30 hours.

c. With a containment purge supply and/or exhaust isolation valve(s) having a measured leakage rate in excess of the limits of Specifications 4.6.1.9.3 and/or 4.6.1.9.4, restore the inoperable valve(s) to OPERABLE status within 24 hours, otherwise be in at least HOT STANDBY within the next 6 hours, and in COLD SHUTDOWN within the following 30 hours.

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*A one-time change is granted to have the containment purge supply and/or exhaust isolation valves for the upper and lower compartment open in Modes 3 and 4 following the steam generator replacement outage. The cumulative time for having the valves open in Modes 3 and 4 is limited to seven (7) days. All other provisions of this specification apply with the exception of those containment purge valves open in Modes 3 and 4. Each valve will be sealed closed prior to initial entry into Mode 2.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 150 TO FACILITY OPERATING LICENSE NPF-35

DUKE POWER COMPANY, ET AL.

CATAWBA NUCLEAR STATION UNIT 1

DOCKET NOS. 50-413

## 1.0 INTRODUCTION

The Catawba Nuclear Station Unit 1 steam generators (SGs) are being replaced during the current outage. The SG replacement will involve modifications to interfacing piping and supports. These modifications will, in turn, involve the installation of new insulation material and extensive use of cutting fluids, lubricants, cleaning fluids, hydraulic fluids, and chemicals associated with non-destructive examinations. During the initial plant heatup following the modifications, there will be an anticipated large amount of thermal decomposition products (TDPs) produced in the containment atmosphere. This would render a closed containment atmosphere unfit for breathing by personnel who must enter the containment to perform adjustments, tests, and inspections during this period. The licensee has also determined that use of respiratory protection would be hazardous, and that a high vent/purge flow would be the most suitable means of permitting personnel access.

Accordingly, by letter dated January 26, 1996, Duke Power Company (the licensee) requested NRC approval for a one-time change to Catawba Unit 1's Technical Specifications (TS) to allow operation of the Containment Purge Ventilation System in modes 3 and 4 during the startup following the current steam generator replacement outage. The licensee has stated that the TS change is needed to protect personnel from airborne hazardous materials during containment entries during the initial startup with the new steam generators. Operation of the ventilation system is planned to reduce the concentration of these gasses.

On April 26, 1996, the staff requested additional information. By letters dated May 6, May 20, and June 5, 1996, the licensee responded. The responses provided clarifying information that did not change the scope of the January 26, 1996, application for amendment and the initial proposed no significant hazards consideration determination.

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## 2.0 EVALUATION

### 2.1 Containment Ventilation Systems and Associated Technical Specifications

The licensee considered numerous options for dealing with the TDP problem during the initial post-SG-replacement heatup. The licensee concluded that high flow rate purging would be the most feasible means of permitting personnel to work in the containment. The facility is provided with several containment ventilation systems that are capable of supplying fresh outside air to the containment to replace contaminated containment air. These systems are the Containment Purge Ventilation System (described in Section 9.4.5 of the Final Safety Analysis Report) and the Hydrogen Purge System (described in Section 6.2.5.2.2).

#### 2.1.1 Hydrogen Purge System

The Containment Hydrogen Purge System has a single supply blower which is designed to supply purge air at 100 cubic feet per minute (cfm) to the containment under accident conditions to reduce hydrogen concentration. This provides a backup safety function in the event the hydrogen recombiners cannot be used. During post-accident hydrogen purging, containment air can be exhausted to the containment annulus as necessary to prevent increase of containment pressure due to purge air addition. This system, referred to in the application and the TS as the "Containment Air Release and Addition System," is used during normal operation to make containment pressure adjustments. The Hydrogen Purge System isolation valves may be opened up to 3000 hours/calendar year for pressure control purposes (see Technical Specifications Section 3.6.1.9). Because of its low flow capacity, this system would not provide a significant reduction in TDP concentration during the startup.

#### 2.1.1 Containment Purge Ventilation System

The Containment Purge Ventilation System (CPVS), referred to as the "Containment Purge System" in the application, has supply and exhaust fans designed to purge the containment at 25,000 cfm (8750 cfm to lower containment via two supply penetrations and one exhaust penetration, and 16,250 cfm to upper containment via two supply and two exhaust penetrations). It has no accident mitigation function, but is intended for use during refueling and for containment atmosphere cleanup before personnel entry into the containment during power operation. Exhaust air is filtered by carbon filters and discharged to the plant vent which provides radiation monitoring. Containment isolation valves in the supply and exhaust lines are 24-inch diameter butterfly valves with pneumatic diaphragm type "air-to-open" operators. The operators are provided with instrumentation and controls such that they isolate automatically in the event of a Phase A Containment Isolation Signal, high radiation in the plant exhaust or high humidity at the carbon filters. Technical Specifications Section 3.6.1.9 requires that the Containment Purge Ventilation System containment isolation valves be sealed closed during Modes 1, 2, 3 & 4 (i.e., reactor coolant system temperature > 200 °F). This requirement is based on the fact that these valves have not been previously shown to be capable of closing against loss-of-coolant-accident (LOCA) dynamic

forces. Additional considerations are that the resiliently-seated, butterfly valves typically used in this application have a history of significant leakage test failures, and that these valves are relied on to seal containment "bypass" pathways (i.e., the leakage would not be collected, treated, and released to an elevated release point).

2.2 Proposed TS Change and Associated Safety Concerns

Specifically, the following changes were proposed by the licensee:

> Sections 3.6.1.1, 3.6.1.2 and 3.6.1.9 - A footnote is added, specifying that a one-time change is granted to have the containment purge supply and/or exhaust isolation valves for the upper that lower compartment open in Modes 3 and 4 following the steam generator replacement outage. The footnote also limits the cumulative time for having the valves open in Modes 3 and 4 to seven days.
>
> Section 4.6.1.1.c - The last phrase is corrected from "...leakage rate is less than to 0.60 $L_a$" to "...leakage rate is less than 0.60 $L_a$".
>
> Section 3.6.1.8 - A footnote is added, specifying that a one-time change is granted in Modes 3 and 4 to allow repair activities for the containment purge supply and/or exhaust isolation valves for the upper and lower compartment that were open in Modes 3 and 4 following the steam generator replacement outage.

The proposed TS changes would apply to the first startup following the SG replacement outage and only for the period that the facility is in Mode 3 (Hot Standby) or Mode 4 (Hot Shutdown). During these periods the Reactor Coolant System will be brought up to normal operating temperature and pressure using coolant pump heat input. However, the core will be subcritical and producing very little decay heat. Since the Reactor Coolant System will be hot and pressurized, and irradiated fuel will be in the reactor pressure vessel, a LOCA is a postulated event and containment integrity is required. Unlike the initial startup of a new facility, the proposed initial post-SG-replacement startup does not encompass a separate pre-fuel-loading hot functional testing phase to verify piping support loadings and pipe displacement measurements.

In view of the associated safety concerns, the staff review encompassed the following areas: (1) what tests and analyses, and debris protection measures confirm the capability of the containment vent/purge valves to close against LOCA dynamic forces, and (2) what would be the radiological consequences of a LOCA assuming a failure to isolate the containment.

2.2.1 Containment Purge/Vent System (CPVS) Valve Isolation Reliability

For valves that are not sealed closed, Branch Technical Position CSB 6-4 and Standard Review Plan Section 3.10 (NUREG-0800) state that the operability of the containment purge and vent valves, particularly their ability to close during a design-basis accident, must be demonstrated to ensure containment isolation. Catawba Nuclear Station Safety Evaluation Report (SER), Supplement 3 concludes that the licensee "failed to demonstrate the ability of

the 24-inch valves to close against the buildup of containment pressure in the event of a design basis loss of coolant accident (DBLOCA) since certain site-specific installation characteristics were not accounted for." The SER and its supplements provide no other technical details relative to the "site specific installation characteristics." The TS currently requires that the 24-inch vent and purge valves be sealed closed in Modes 1, 2, 3, and 4 based on this negative finding.

The licensee has subsequently performed additional analyses in order to demonstrate adequate containment isolation following a postulated design-basis LOCA during startup from the steam generator replacement outage. The evaluation below discusses whether these valves would close during such conditions, considering the additional information provided by the licensee for this one-time revision to the TS.

The 24-inch butterfly valves in question are air-spring operated with an offset disc (Fisher Type 9200, Serial Numbers BF203260 to BF203287). These purge valves use air to open and spring force to close. The associated actuator vent solenoid valves and the controls used for closure on a containment isolation signal are Class 1E (nuclear safety-related).

The closure adequacy review performed by the valve vendor, Fisher Controls, in a report dated May 30, 1995, determined the following:

1. The critical valve components can withstand the specified pressure differential conditions without approaching yield.

2. The weakest valve component is the shaft in shear at the disc pin connection, followed by the key in compression at the shaft radius, the key in shear at the key connection, and the pin in shear at the shaft radius. Yield torque of the weakest component (shaft) is 29,614 in-lbf.

3. A flow closed negative torque characteristic is expected for both the inboard and outboard valves at opening angles up to 80 degrees open. This characteristic may be weak at opening angles of 50 degrees or less, requiring some actuator action to overcome friction (which is within the capabilities of the Bettis 732C-SR60 actuators).

4. At full 90 degrees open, the torque characteristics (depending on orientation) are expected to be nil or positive, possibly requiring maximum output from the actuator to initiate closure.

5. Sufficient spring-return torque output is expected from the Bettis actuator to initiate closure from 90 degrees open for the inboard valves.

6. The spring-return torque output from the outboard valve actuator may be insufficient to initiate closure from 90 degrees open; therefore, the maximum opening should be limited to 80 degrees or less.

In evaluating the expected performance of the Catawba purge valves, Fisher determined that both the inboard (hub downstream) and outboard (hub upstream) butterfly valves would be self-closing from open angles of 10 degrees up to 80 degrees under the postulated accident conditions. To ensure that the outboard butterfly valves remain self-closing when open to large angles, the licensee will be installing new actuators on the outboard butterfly valves with travel limiters to prevent the valves from opening more than 80 degrees. Fisher predicts that the inboard valves will require 7,103 in-lbf of torque to initiate closure at the 90 degree open position. Fisher predicts the seating torque requirement as 5,348 in-lbf for both the inboard and outboard valves.

Fisher uses information from its laboratory testing of a 6-inch butterfly valve in predicting the performance of the 24-inch Catawba purge valves. The licensee reviewed the valve performance predicted by Fisher and has found the predictions to parallel valve behavior observed during testing in response to Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance." Recent testing by the Electric Power Research Institute suggest that flow and torque coefficients for low aspect-ratio (defined here as disc thickness divided by disc diameter) butterfly valves (such as the Catawba purge valves) are linear. However, because of the extensive extrapolation of the Fisher test information, the staff considers it important for the licensee to demonstrate significant margin in the capability of the actuators to close the Catawba purge valves.

Fisher reports that the spring in each Catawba purge valve actuator can supply 12,930 in-lbf of torque at the 90-degree open position and 6,876 in-lbf at the 0-degree closed position. The outboard valve is self-closing for most of the closure stroke and is predicted to have nearly 30 percent margin above required seating torque. The inboard valve is predicted to have more than 80 percent margin at the full open position, to be self-closing from 80 degrees to almost closed, and then to have nearly 30 percent margin above required seating torque. Therefore, the staff considers the actuators to have sufficient capability for the primarily self-closing inboard and outboard Catawba purge valves although a leak-tight seal might not be achieved.

The licensee states that leak-tight closure is not necessary for the Catawba purge valves during the proposed purge of lower containment because of the small radiological source term during startup from the steam generator replacement outage. To bound historical leakrate test data for these valves, the licensee assumed 100% of the containment volume would leak past the valves in the first 24 hours, and 50% of the volume per day thereafter, in the radiological analysis of a postulated DBLOCA during startup from the steam generator replacement outage. This should account for past problems identified by the licensee regarding the discs not sealing following closure and the potential that the actuators might not fully seat the valves. The licensee's radiological analyses predict doses much lower than the applicable 10 CFR 100 dose limits using these bounding leakage rates (see evaluation in Section 2.2.2 below).

The licensee has committed to conduct specific testing to confirm certain assumptions in the capability and radiological analyses of the purge valves. Specifically, the testing to be conducted by the licensee on each of the

valves prior to entry into Mode 4 includes: (1) a leak test, a remote position indication verification test, fail safe test, and stroke test that are performed as part of ASME Section XI inservice testing program required by 10 CFR 50.55a; and (2) a spring torque output test.

For a one-time basis only during startup from the steam generator replacement outage in Modes 3 and 4, the staff finds that the licensee's proposal to rely on the containment purge valves provides a reasonable assurance that the valves in question would perform their function to close following a design-basis LOCA. This finding is contingent upon the licensee performing the tests listed in the above paragraph on each valve in question prior to entering Mode 4 to validate the assumptions used in its analyses.

The staff has considered the lack of debris strainers for the CPVS. Debris strainers are intended to protect the isolation valves from loss of ability to fully close due to LOCA-generated debris entering the purge/vent lines during blowdown. However, the licensee has conservatively assumed a very high containment leakage rate function to provide a conservative upper bound on purge isolation valve leakage. The dose analysis (see Section 2.2.2 below) assumes that the containment leaks at 100%/day for the first 24 hours and 50%/day for the remainder of the accident. This assumed leakage rate is considerably in excess of the 0.3%/day leakage rate that would apply if the purge/vent penetrations were sealed. Based on use of these assumptions and the associated dose consequences, and the limited time involved, the staff has determined that installation of temporary strainers is unwarranted.

2.2.2 Radiological Consequences Analyses

The licensee provided calculations of the expected radiation doses that would be received by individuals off-site and in the control room if a LOCA were to occur coincident with purge/vent operation. The results of these calculations indicate the requirements of 10 CFR Part 100 and General Design Criterion (GDC) 19 in Appendix A to 10 CFR Part 50 would be met during this postulated accident. For these calculations, it was assumed that two thirds of the reactor core had been operated at power then decayed for a minimum of 80 days due to the current extended outage. The other one third would be new unirradiated fuel, therefore contributing no fission products to the source term. Due to the uncertainty of how well the purge/vent isolation valves will seal following a containment isolation signal, the licensee conservatively assumed that they would leak at a rate equal to 100% of the containment volume per day for the first 24 hours then 50% per day for the remainder of the accident. Since leakage through the purge/vent system bypasses the containment annulus, no credit for fission product holdup in the annulus nor removal by the annulus ventilation system filtration was assumed. In addition, no fission product removal by the containment ice beds nor by the filtration system was assumed.

The staff reviewed the licensee's calculations and performed an independent analysis of the expected offsite and control room doses resulting from the postulated LOCA. Using the assumption stated above and input parameters taken from the current licensing basis, whole body and thyroid doses for an individual at the exclusion area boundary (EAB) and the low population zone

(LPZ) as well as whole body, thyroid and skin doses for operators in the control room were calculated using the HABIT computer code. Since no credit was taken for iodine removal by the ice beds, the ice condenser containment was modelled as a single compartment (node).

Table 1 lists the staff's estimates of the offsite and control room doses resulting from the postulated LOCA along with the applicable acceptance criteria from the Standard Review Plan (SRP). The input parameters used in the staff's calculations are listed in Table 2. The acceptance criteria in SRP Section 6.4.11.6 for skin dose to the control room operators is 30 rem unless eye protection is provided. If eye protection is provided, the acceptable skin dose is 75 rem. In response to the staff's calculated skin dose to the control room operators, the licensee committed in its May 6, 1996, letter to provide eye protection and associated procedures during this unique plant startup.

As indicated in Table 1, the radiological consequences of a postulated LOCA with the containment purge system operating during the startup (in Modes 3 or 4) following the steam generator replacement outage are within the acceptance criteria in the SRP, and meet the design criteria in 10 CFR Part 100 for off-site doses and GDC 19 in Appendix A of 10 CFR 50 for control room operators. The radiological consequences are thus acceptable.

## 3.0 STATE CONSULTATION

In accordance with the Commissions'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 CONSIDERATIONS

The amendment changes requirements with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The 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 staff has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (61 FR 18165 dated April 24, 1996). 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 proposed amendment will permit a degraded containment condition during a period of time when there is an increased probability of a LOCA due to extensive reactor coolant system repairs having been performed and the piping vibration measurement, thermal displacements and pipe support forces will have not yet been verified to be in conformance with piping flexibility/support

calculations. The staff has determined that the amendment is acceptable based on (1) the greatly reduced core fission product inventory that will exist under the precritical conditions and (2) the limited duration (one-time) for which the amendment would apply.

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.

Attachment: Tables 1 and 2

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TABLE 1: RADIOLOGICAL CONSEQUENCES OF A LOCA
WHILE PURGING FOLLOWING A
STEAM GENERATOR REPLACEMENT OUTAGE

| | Dose (Rem) | Acceptance Criteria |
|---|---|---|
| Exclusion Area Boundary (2 Hour): | | |
| Whole Body | .05 | 25 |
| Thyroid | 178 | 300 |
| Low Population Zone (30 Days): | | |
| Whole Body | .02 | 25 |
| Thyroid | 71 | 300 |
| Control Room (30 Days): | | |
| Whole Body | .02 | 5 |
| Thyroid | 22 | 30 |
| Skin | 55 | 75* |

* Applicable with eye protection provided.

TABLE 2: INPUT PARAMETERS FOR LOCA ANALYSIS

| | |
|---|---|
| **Off-site Dose Calculation:** | |
| Reactor power prior to shutdown (Adjusted to account for 1/3 core of new fuel) | 3565 MWt |
| Fission product decay time | 80 days |
| Containment volume | $1.2 \times 10^6$ $ft^3$ |
| Fraction of core inventory available for leakage | |
| Iodines | 25% |
| Noble Gases | 100% |
| Initial iodine composition | |
| Elemental | 91% |
| Organic | 4% |
| Particulate | 5% |
| Atmospheric dispersion | |
| 0 to 2 hours | $3.8 \times 10^{-4}$ $s/m^3$ |
| 0 to 8 hours | $2.7 \times 10^{-5}$ $s/m^3$ |
| 8 to 24 hours | $1.8 \times 10^{-5}$ $s/m^3$ |
| 24 to 96 hours | $7.5 \times 10^{-6}$ $s/m^3$ |
| 96 to 720 hours | $2.1 \times 10^{-6}$ $s/m^3$ |
| **Control Room Dose Calculation:** | |
| Control room volume | 2526 $m^3$ |
| Air volume flow rates | |
| Filtered recirculation | 2000 CFM |
| Filtered make-up | 2800 CFM |
| Unfiltered make-up | 30 CFM |
| Filter efficiencies | |
| Elemental iodine | 99% |
| Organic iodine | 99% |
| Atmospheric dispersion | |
| 0 to 8 hours | $2.0 \times 10^{-3}$ $s/m^3$ |
| 8 to 24 hours | $1.4 \times 10^{-3}$ $s/m^3$ |
| 24 to 96 hours | $5.1 \times 10^{-4}$ $s/m^3$ |
| 96 to 720 hours | $2.8 \times 10^{-4}$ $s/m^3$ |