October 30, 1995

Mr. William R. McCollum
Site Vice President
Catawba Nuclear Station
Duke Power Company
4800 Concord Road
York, SC 29745-9635

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SUBJECT: ISSUANCE OF AMENDMENTS - CATAWBA NUCLEAR STATION, UNITS 1 AND 2 HYDROGEN IGNITERS (TAC NOS. M92087 AND M92088)

Dear Mr. McCollum:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 136 to Facility Operating License NPF-35 and Amendment No. 130 to Facility Operating License NPF-52 for the Catawba Nuclear Station, Units 1 and 2. The amendments consist of changes to the Technical Specifications (TS) in response to your application dated April 10, 1995.

The amendments revise the required number of operable hydrogen igniters to allow removal of two hydrogen igniters serving the lower reactor cavity and incore instrument cable tunnel.

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:

Robert E. Martin, Senior Project Manager
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-413 and 50-414

Enclosures:
1. Amendment No. 136 to NPF-35
2. Amendment No. 130 to NPF-52
3. Safety Evaluation

cc w/encl: See next page

DOCUMENT NAME: G:\CATAWBA\CAT92087.ADM

subject to change

| OFFICE | DRPE/PD22/LA | DRPE/PD22/PM | OGC | DRPE/PD22/D |
|---|---|---|---|---|
| NAME | L.BERRY | R.MARTIN | C Marco | H.BERKOW |
| DATE | 10/26/95 | 10/19/95 | 10 24/95 | 10/27/95 |
| 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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Duke Power Company

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. 136
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 April 10, 1995, 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. 136 , and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. Duke Power Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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: October 30, 1995

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

DUKE POWER COMPANY

NORTH CAROLINA MUNICIPAL POWER AGENCY NO. 1

PIEDMONT MUNICIPAL POWER AGENCY

DOCKET NO. 50-414

CATAWBA NUCLEAR STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 130
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) Facility Operating License No. NPF-52 filed by the Duke Power Company, acting for itself, North Carolina Municipal Power Agency No. 1 and Piedmont Municipal Power Agency (licensees), dated April 10, 1995, 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 Facility Operating License No. NPF-52 is hereby amended to read as follows:

   Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 130 , and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. Duke Power Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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: October 30, 1995

ATTACHMENT TO LICENSE AMENDMENT NO. 136

FACILITY OPERATING LICENSE NO. NPF-35

DOCKET NO. 50-413

AND

TO LICENSE AMENDMENT NO. 130

FACILITY OPERATING LICENSE NO. NPF-52

DOCKET NO. 50-414

Replace the following pages of the 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 6-40 | 3/4 6-40 |
| B 3/4 6-4 | B 3/4 6-4 |

## HYDROGEN MITIGATION SYSTEM

### LIMITING CONDITION FOR OPERATION

3.6.4.3 Both trains of the Hydrogen Mitigation System shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTION:

With one train of the Hydrogen Mitigation System inoperable, restore the inoperable train to OPERABLE status within 7 days or decrease the surveillance interval of Specification 4.6.4.3a. from 92 days to 7 days on the OPERABLE train until the inoperable train is returned to OPERABLE status.

### SURVEILLANCE REQUIREMENTS

4.6.4.3 Each train of the Hydrogen Mitigation System shall be demonstrated OPERABLE:

a. At least once per 92 days by energizing the supply breakers and verifying that at least 34 of 35 igniters are energized,* and

b. At least once per 18 months by verifying the temperature of each igniter is a minimum of 1700°F.

---

*Inoperable igniters must not be on corresponding redundant circuits which provide coverage for the same region.

## 3/4.6.2 DEPRESSURIZATION AND COOLING SYSTEMS

The OPERABILITY of the Containment Spray System ensures that containment depressurization and cooling capability will be available in the event of a LOCA. The pressure reduction and resultant lower containment leakage rate are consistent with the assumptions used in the safety analyses. However, the Containment Spray System also provides a mechanism for removing iodine from the containment atmosphere, and therefore the time requirements for restoring an inoperable Spray System to OPERABLE status have been maintained consistent with those assigned other inoperable ESF equipment.

## 3/4.6.3 CONTAINMENT ISOLATION VALVES

The OPERABILITY of the containment isolation valves ensures that the containment atmosphere will be isolated from the outside environment in the event of a release of radioactive material to the containment atmosphere or pressurization of the containment and is consistent with the requirements of GDC 54 through 57 of Appendix A to 10 CFR Part 50. Containment isolation within the time limits specified for those isolation valves designed to close automatically ensures that the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for a LOCA.

## 3/4.6.4 COMBUSTIBLE GAS CONTROL

The OPERABILITY of the equipment and systems required for the detection and control of hydrogen gas ensures that this equipment will be available to maintain the hydrogen concentration within containment below its flammable limit during post-LOCA conditions. Either recombiner unit is capable of controlling the expected hydrogen generation associated with: (1) zirconium-water reactions, (2) radiolytic decomposition of water, and (3) corrosion of metals within containment. These Hydrogen Control Systems are consistent with the recommendations of Regulatory Guide 1.7, "Control of Combustible Gas Concentrations Following a LOCA," March 1971.

The OPERABILITY of at least 34 of 35 igniters per train (68 of 70 for both trains) ensures that the Distributed Ignition System will maintain an effective coverage throughout the containment provided the two inoperable ignitors are not on corresponding redundant circuits which provide coverage for the same region. This system of igniters will initiate combustion of any significant amount of hydrogen released after a degraded core accident. This system is to ensure burning in a controlled manner as the hydrogen is released instead of allowing it to be ignited at high concentrations by a random ignition source.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 136 TO FACILITY OPERATING LICENSE NPF-35

AND AMENDMENT NO. 130 TO FACILITY OPERATING LICENSE NPF-52

DUKE POWER COMPANY, ET AL.

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-413 AND 50-414

## 1.0 INTRODUCTION

By letter dated April 10, 1995, Duke Power Company, et al. (DPC or the licensee), submitted a request for changes to the Catawba Nuclear Station, Units 1 and 2, Technical Specifications (TS). The requested changes would revise the required number of operable hydrogen igniters to allow removal of two hydrogen igniters serving the lower reactor cavity and incore instrument cable tunnel. These igniters are located in a high radiation area which poses an occupational exposure problem. The licensee has provided an analysis indicating that these two igniters are unnecessary. The attached figure depicts the location of the pair of igniters which are the subject of this evaluation.

## 2.0 EVALUATION

### 2.1 COMBUSTIBLE GAS CONTROL SYSTEMS - BACKGROUND

Combustible gases can form in a containment under post-accident conditions due to fuel cladding reaction (with steam or water), corrosion (particularly of zinc-based paint and cable insulation), and radiolysis of coolant. Containment pressure vessels and equipment in the containment are not designed to withstand the additional loads that would result from a large-scale combustion of hydrogen. Combustible gas control systems are therefore provided to prevent the occurrence of a potentially damaging hydrogen combustion event.

The combustible gas control systems and equipment provided at Catawba include recombiners, vent/purge systems, containment atmosphere mixing and monitoring systems, and distributed ignition (hydrogen igniter) systems. The recombiners serve as the primary means of combustible gas control for design basis accidents (DBA) that involve quantities of hydrogen associated with approximately 5% fuel clad metal-water reaction. The vent/purge systems provide a backup hydrogen control capability for design basis accidents. The Distributed Ignition (igniter) System (a.k.a., Hydrogen Mitigation System or "HMS") is provided for mitigation of recoverable degraded core events (TMI-type events that are "beyond design basis") involving up to 75% metal-water reaction. The design of those combustible gas control systems provided for the purpose of mitigating DBAs is based on Regulatory Guide 1.7. The design

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of HMSs is based on the requirements of 10 CFR 50.44 (the "Hydrogen Rule"). The protection provided by igniters is based on the knowledge that immediate local burning of lean mixtures of combustible gas will prevent the subsequent formation of a larger, richer combustible mixture capable of supporting a major deflagration or detonation. Igniters are used in mid-size containments (i.e., ice condenser containment and Mark III containments). The Catawba facility has ice condenser-type containments. Smaller containments, such as BWR Mark I and Mark II containments are typically nitrogen-inerted. Large dry containments are not considered to be highly vulnerable due to their large internal free volume and HMSs were found not to be cost effective (Ref: Beckjord, Resolution of Generic Issue 121, March 24, 1992).

Regulatory guidance documents such as the Standard Review Plan and associated Regulatory Guides do not provide specific criteria regarding the locations of hydrogen igniters in those containments using igniter systems to comply with 10 CFR 50.44 requirements. The igniter locations at ice condenser facilities have been selected with a view toward providing coverage near hydrogen sources and in compartments where hydrogen could accumulate in both high locations and low locations. High locations have been included to account for the possibility of hydrogen pocketing at high points due to buoyancy. Low locations have been included to take advantage of the fact that burning will propagate upward in leaner mixtures. Igniter coverage is also provided in areas where low-concentration hydrogen mixtures could be rapidly concentrated into combustible mixtures due to ice or spray cooling effects (e.g., upper plenum of ice condenser). Both expert judgement and analysis were used in the igniter location selection process. As a result, differences exist among the facilities. The staff's safety evaluation of the lead plant HMS was published in NUREG-0011, Supplement No. 6 (Sequoyah SER) and provides a discussion of igniter locations. NUREG-1370 "Resolution of Unresolved Safety Issue A-48, Hydrogen Control Measures and Effects of Hydrogen Burns on Safety Equipment," provides an additional related background discussion.

The staff gave careful consideration to the igniter selection as part of its review. The original computer models used by the staff and applicants did not model the cavity/instrument tunnel space as a separate compartment. A detailed description of the McGuire and Catawba igniter systems, including discussions of background experiments, analyses, and research, is provided in "An Analysis of Hydrogen Control Measures at McGuire Nuclear Station", Revision 16, transmitted by letter dated August 5, 1993, from M. S. Tuckman, DPC, to the NRC, a three-volume document known as the "Redbook." The igniter system at Catawba consists of 72 glow plug igniters arranged in two trains. Each protected area is served by two independently powered igniters (Ref: DPC response to the July 21, 1981, NRC Request for Additional Information). All compartments are provided with direct igniter coverage. According to the Redbook, the McGuire and Catawba igniter systems are identical except for minor differences in terminal box designation and igniter location (but not total number). Additional igniters are provided that are not included in the Sequoyah/Watts Bar/D.C. Cook facilities, each of which have 68 igniters. The pair of igniters that the licensee has requested to eliminate at Catawba are among those. (See attached figure)

## 2.2 NEED FOR IGNITERS IN THE LOWER CAVITY/INSTRUMENT TUNNEL

### 2.2.1 SEQUOYAH LEAD REVIEW

The Catawba Hydrogen Mitigation System (HMS) was designed to provide direct hydrogen igniter coverage for all compartments in the containment (Ref: Redbook 3.4). This was a licensee initiative that resulted in the installation of additional igniters at Catawba and McGuire located in an area not included in the Sequoyah lead HMS design. (The HMS at Sequoyah was reviewed as the "lead HMS design".) As noted above, the locations of concern for this review were not identified as being separate compartments or locations and were treated and analyzed as being contiguous portions of the lower containment area. The containment arrangements of the Tennessee Valley Authority and DPC ice condenser facilities are sufficiently similar that the approved Sequoyah locations, as described in the aforementioned Sequoyah SER, are considered sufficient with respect to mitigation of hydrogen combustion scenarios encompassed by the hydrogen rule. Based on the results of the original lead HMS review, the existing pair of igniters located in the lower reactor cavity can be removed from the required operability list.

### 2.2.2 LICENSEE'S SUPPORTING INFORMATION

In the April 10, 1995, application, the licensee provided a discussion of supporting analyses. The analyses performed by the licensee utilized the HECTR code and MAAP code. The reactor cavity subcompartment area was modeled as a separate compartment joined by one and two junctions (separate cases) to the lower compartment. Accident sequences selected to reflect the 10 CFR 50.44 recoverable (in vessel) degraded core scenarios were analyzed; four loss-of-coolant accident (LOCA) scenarios with HECTR and one with MAAP. For MAAP, only a small break was analyzed since HECTR results indicated that all four cases produced similar behavior. The HECTR and MAAP results indicated that hydrogen concentration in the cavity is maintained below 4% (non-combustible) when one flow junction is modeled. With both junctions modeled, mixing with the lower compartment occurs. This precludes the potential for a higher hydrogen concentration in the cavity than exists in the igniter-covered lower compartment.

A LOCA in the reactor cavity was also considered. There is greatly reduced probability of a break in the cavity, due to the very small percentage of reactor coolant system piping in that area. However, should a break occur in the cavity, combustion would be unlikely due to steam and/or water inerting effects. The licensee further considered the possibility of a hydrogen detonation in the lower cavity and concluded that it would present little threat due to the obstructions and energy-absorbing mechanisms.

The staff does not consider it necessary to perform independent or confirmatory analyses.

## 3.0 SUMMARY

Based on the information provided above, the results of the lead HMS review, and the licensee's supporting information, the staff concludes that the pair of igniters installed in the lower reactor cavity need not be required to be operable.

## 4.0 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.

## 5.0 ENVIRONMENTAL CONSIDERATION

The amendments change surveillance requirements. 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 (60 FR 49932 dated September 27, 1995). 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

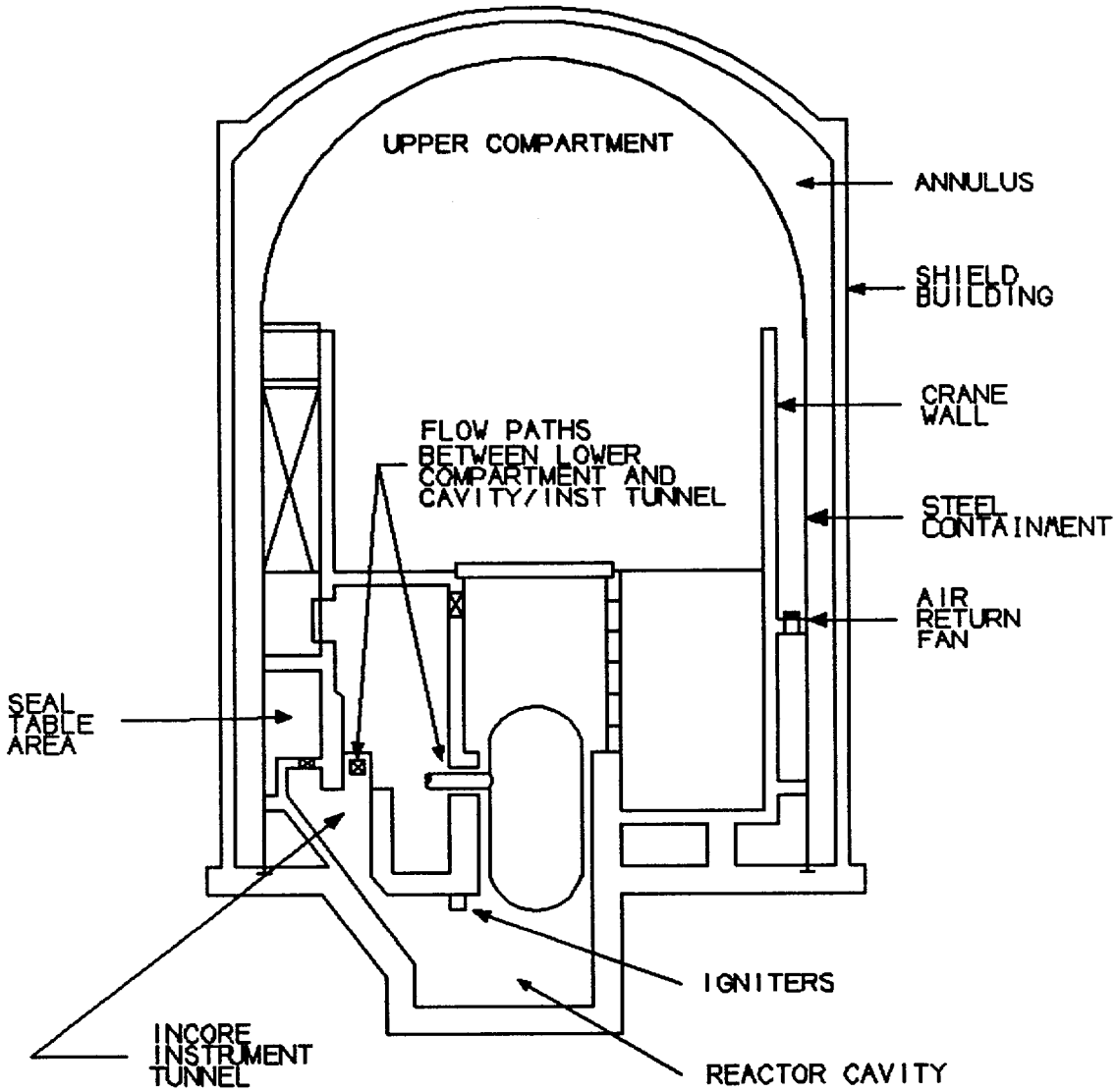
The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations,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

Attachment: Figure

Principal Contributor: William O. Long

Date: October 30, 1995

# ICE CONDENSER CONTAINMENT




FIGURE