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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST FROM ASME CODE, SECTION XI REQUIREMENT

DUKE ENERGY CORPORATION

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

MCGUIRE NUCLEAR STATION, UNITS 1 AND 2

1.0 INTRODUCTION

The Technical Specifications for the Catawba Nuclear Station, Units 1 and 2, the Oconee Nuclear Station, Units 1, 2, and 3, and the McGuire Nuclear Station, Units 1 and 2, state that the inservice inspection of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (ASME Code) and applicable Addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC if (i) the proposed alternative provides an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

As published In the Federal Register (No. 154, Volume 61, dated August 8, 1996) the U.S. Nuclear Regulatory Commission announced an amendment to its regulation of Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Section.55a (rule). The rule incorporated, by reference, the 1992 Edition with 1992 Addenda of Subsections IWE and IWL of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code). Subsections IWE and IWL provide the requirements for inservice inspection (ISI) of Class CC (concrete containments), and Class MC (metallic containments) of light water cooled power plants. The effective date for the amended rule was September 9, 1996, which requires the licensees to incorporate the new requirements into their ISI plans and to complete the first containment inspection by September 9, 2001. However, a licensee can submit a request for relief from one or more requirements of the regulation (or the endorsed Code requirements) with proper justification. The provision for granting relief is incorporated in the regulation.

By letter dated April 6, 1998, Duke Energy Corporation (Duke or the licensee), submitted to the NRC Relief Request No. 98-GO-001 for the Catawba Nuclear Station, Units 1 and 2, Oconee Nuclear Station, Units 1, 2, and 3, and McGuire Nuclear Station, Units 1 and 2. This letter requested relief under provisions of 10 CFR 50.55a(a)(3)(ii). The licensee is seeking relief from the visual, VT-3 examination requirements for seals and gaskets of Class MC pressure retaining components and metallic liners of Class CC components, as specified in the ASME

Enclosure

Boiler and Pressure Vessel Code, Section XI, 1992 Edition with the 1992 Addenda, IWE-2500, Table IWE-2500-1, for Examination Category E-D, Item Numbers E5.10 and E5.20. The licensee believes that the visual examinations are impractical and that compliance with the specified requirements of Subsection IWE would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. In addition, the licensee believes that existing surveillance requirements are sufficient to assure the leak-tight integrity of containment pressure retaining seals and gaskets.

2.0 DISCUSSION

2.1 Code Requirement and Relief Request

Subsection IWE-2500, Table IWE-2500-1, Examination Category E-D requires seals and gaskets on airlocks, hatches, and other devices required to assure containment leak-tight integrity to be visually examined by the VT-3 visual examination method, once each inspection interval. Relief is requested from performing the Code-required visual examination, VT-3, on the above identified metal containment seals and gaskets.

2.2 Basis for Requesting Relief

The licensee has determined that the following types of containment penetrations have seals and gaskets that may be subject to the requirements of IWE-2500, Table IWE-2500-1, Examination Category E-D. A description of these penetrations and their seals and gaskets follows.

2.2.1 Electrical Penetrations (as stated by licensee)

D. G. O'Brien electrical penetration assemblies use a header plate (blind flange) bolted to a containment penetration nozzle flange and are sealed with redundant metal 0-rings between the flange faces. Modules through which electrical conductors pass are welded to both sides of the header plate, and non-resilient hermetic glass seals are used within each module to seal individual electrical conductors which pass through. All of the header plate openings are interconnected by a series of channels within the header plate to facilitate local leak rate [testing (Type B) in accordance with 10 CFR, Part 50, Appendix J]. The dual 0-ring configuration also allows for local leak rate testing to be performed.

Conax electrical penetration assemblies consist of one of the two following types:

- One type uses a header plate which is welded to a containment penetration sleeve. Electrical conductors are routed through modules which penetrate the header plate. The module connection to the header plate is sealed by compression fittings (ferrules) which compress seal material against the header plate. Midlock plugs are used to compress ferrules onto the header plate to seal spare openings. Individual conductors are routed through the modules, and the ends of each module contain a resilient seal surrounding

the conductors to maintain leak-tightness. A port in each module is aligned between the ferrules within the header plate opening, and all of the header plate openings are interconnected by a series of channels to facilitate local leak rate [testing] (Type B) [in accordance with 10 CFR, Part 50, Appendix J].

- The second type uses a header plate (blind flange) which is bolted to a containment penetration nozzle flange and is sealed with redundant metal 0-rings between the flange faces. The remaining details are similar to the first Conax type, and interconnected channels and the dual 0-rings are provided to facilitate local leak rate [testing] (Type B) [in accordance with 10 CFR, Part 50, Appendix J].

Viking electrical penetration assemblies use a header plate (blind flange) bolted to a containment penetration nozzle flange and are sealed with redundant metal 0-rings between the flange faces. Modules through which electrical conductors pass are sealed to the header plate, and the modules are also sealed against a second header plate within the penetration assembly. The space between the header plates is configured to facilitate local leak rate [testing] (Type B) [in accordance with 10 CFR, Part 50, Appendix J] to verify the integrity of the module and conductor seals. The dual 0-ring configuration also facilitates local leak rate...testing.

2.2.2 Mechanical Penetrations with Bolted Joints (as stated by licensee)

Containment penetrations such as fuel transfer tube penetrations and some spare penetrations consist of bolted, flanged joints with gaskets or 0-rings. These penetrations are designed to permit local leak rate testing in accordance with [10 CFR, Part 50], Appendix J to verify the integrity of the sealed or gasketed connection.

2.2.3 Equipment Hatches and Personnel Air Locks (including Emergency Personnel Air Locks at Oconee) (as stated by licensee)

- [Oconee] Equipment Hatches utilize dual 0-rings to seal the hatch cover to the Equipment Hatch penetration. The sealed joint is designed to permit local leak rate testing in accordance with [10 CFR, Part 50], Appendix J after each closure, before returning to service.

- Personnel and Emergency Personnel Airlocks utilize an inner and outer door with dual gaskets or seals on each door to seal the airlock doors to the bulkheads on the containment penetrations. The airlocks also contain other gaskets and seals, such as those for sealing handwheel shafts, electrical penetrations, blank flanges, and equalizing pressure connections. The sealed joints on airlocks are designed to permit local leak-rate testing in accordance with [10 CFR, Part 50], Appendix J and Technical Specifications.

Leak-tightness of containment pressure retaining seals and gaskets is verified by Type B tests in accordance with Option A of 10 CFR [Part] 50, Appendix J, as required by current Technical Specifications. On some electrical penetrations, internal compartments within the electrical penetration assembly are pressurized by N_2 or SF_6 gas, and the integrity of seals on these penetration compartments is verified by monitoring the gas pressure and determining the local leak rate to satisfy the Type B test requirements. Overall containment leakage is verified by Type A tests in accordance with Option B of 10 CFR [Part] 50, Appendix J. Although the Type A test does not verify individual penetration leakage, it does provide additional assurance that there is no significant leakage through the containment pressure boundary, which includes all sealed penetrations.

Examination of seals and gaskets would require the joints, which are proven adequate by pressure testing, to be disassembled. For electrical penetrations, this would involve determination of cables at electrical penetrations if enough cable slack is not available, disassembly of the joint, removal and examination of the seals and gaskets, re-assembly of the joint, retermination of the cables if necessary, post maintenance testing of the cables, and a post maintenance Appendix J test of the penetration. This imposes the risk that equipment could be damaged, thus increasing the risk of potential leakage. The 1992 Edition, 1993 Addenda, of Section XI recognizes that disassembly of joints to perform these examinations is not warranted and Examination Category E-D was modified to state that sealed and gasketed connections need not be disassembled solely for performance of examinations. However, without disassembly, most of the surface of the seals and gaskets would be inaccessible for visual examination. A visual examination of the seal or gasket will not ensure that the material is acceptable and that it will effectively seal the joint. This can only be determined by pressure testing, which is already required by 10 CFR [Part] 50, Appendix J. In addition, visual examinations on existing seals and gaskets after joint disassembly provides no benefit since most of these are replaced prior to joint reassembly.

For those penetrations that are routinely disassembled, a Type B test is required upon final assembly and prior to service. Since the Type B test will assure the leak tight integrity of the primary containment, the performance of the visual examination would not increase the level of safety or quality. If an unacceptable leakage rate is determined by Type B testing after the connection is reassembled, corrective measures would be taken and the component would be retested to ensure leak tightness.

The visual, VT-3 examinations required by Subsection IWE for some seals on penetrations, such as the fuel transfer tube, will increase personnel radiological exposure, with no compensating increase in quality or safety.

Recently approved revisions to ASME Section XI, Subsection IWE have eliminated the visual examination VT-3 of seals and gaskets for many of the

reasons described above. Although not yet published, these changes are expected in the next scheduled publication of the Code (1998 Edition).

Examination of containment accessible surfaces performed in accordance with the ASME Code, Section XI, IWE-2500, Table IWE-2500-1, Examination Category E-A may reveal indications of damage or degradation if it occurs on or adjacent to containment sealed or gasketed connections. If such degradation is detected, the provisions of 10 CFR 50.55a (b) (2) (x) (A) will require that an evaluation be performed to determine the acceptability of adjacent inaccessible areas, including the sealed or gasketed joint. In such cases, this evaluation may require that the connection be disassembled and examined, or may require that the connection be leak tested to provide continued assurance of the integrity of these seals or gaskets.

Relief is requested in accordance with 10 CFR 50.55a (a)(3)(ii). Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Testing the seals and gaskets in accordance with 10 CFR [Part] 50, Appendix J will provide adequate assurance of the leak-tight integrity of containment pressure retaining seals and gaskets.

2.3 Alternative Examination(s): (as stated by licensee)

The leak-tightness of containment pressure retaining seals and gaskets will be verified by leak rate testing in accordance with 10 CFR [Part] 50, Appendix J, as required by Technical Specifications. No additional alternatives to the visual, VT-3 examinations required in Table IWE-2500-1, Examination Category E-D, for Items E5.10 and E5.20 will be performed.

3.0 EVALUATION

The staff has reviewed the information provided in Duke's letter dated April 6, 1998, in support of its Request for Relief No. 98-GO-001, for the Catawba Nuclear Station, Units 1 and 2, the Oconee Nuclear Station, Units 1, 2, and 3, and the McGuire Nuclear Station, Units 1 and 2. Duke has provided information that shows that compliance with VT-3 examination requirements for seals and gaskets of Class MC pressure retaining components and metallic liners of Class CC components will result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

The leak-tightness of containment pressure retaining seals and gaskets is verified by performing Type B local leak rate tests and overall containment pressure boundary leak tightness is verified by performing a Type A test in accordance with the existing Technical Specification and 10 CFR Part 50 Appendix J requirements, thereby providing adequate assurance of structural integrity. In addition, for sealed or gasketed joints that are disassembled, a VT-3 visual examination does not ensure that these items, when reassembled, will not leak.

Hardship considerations include the disassembly, reassembly, and post-reassembly testing that would be necessary to perform the examinations, the increased potential for equipment damage during disassembly and reassembly, the additional personnel radiological exposure experienced when performing the examinations, and the need to establish special plant conditions in order to perform the Code-required tests.

However, the licensee is reminded that the Code requirement, IWE-2500, Table IWE-2500-1, Examination Category E-D, Item E5.30, requires the VT-3 visual examination of moisture barriers. This evaluation does not include relief from performing the VT-3 visual examination of moisture barriers.

4.0 CONCLUSION

Based on the information provided by the licensee in the relief request, the staff concludes that the licensee has existing alternative requirements for assuring the leak tight integrity of the containment penetrations including the associated seals and gaskets, and that the additional VT-3 visual examination in accordance with the Code requirement, IWE-2500, Table IWE-2500-1, Examination Category E-D, would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, the alternative proposed in the licensee's submittal dated April 6, 1998, is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

Principal Contributor: Hans Ashar

Date: September 3, 1998