January 8, 2001

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

SUBJECT: OCONEE NUCLEAR STATION, UNIT 1 RE: USE OF ALTERNATIVE EXAMINATIONS FOLLOWING REPAIR OF REACTOR VESSEL HEAD THERMOCOUPLE NOZZLE PENETRATIONS NOS. 2 AND 5, REQUEST FOR RELIEF NO. 00-04 (TAC NO. MB0846)

Dear Mr. McCollum:

By letter dated December 28, 2000, as supplemented by letters dated January 2 and January 4, 2001, Duke Energy Corporation requested relief for Oconee Nuclear Station, Unit 1, from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code requirements associated with the repair of the No. 2 and No. 5 reactor vessel head thermocouple nozzle penetrations.

Based on the enclosed safety evaluation, the staff has concluded that compliance with the Code requirements to perform liquid penetrant testing and radiographic examination of the weld volume of the capped No. 2 and No. 5 thermocouple penetrations would result in hardship or unusual difficulty for the licensee without a compensating increase in the level of quality and safety. Therefore, the staff authorizes use of ultrasonic examinations as an alternative to the Code-required radiographic examination for the subject thermocouple nozzle penetration weld repair pursuant to 10 CFR 50.55a(a)(3)(ii).

The staff is concerned with the lack of timeliness and thoroughness shown in the preparation of the submittal for this relief request that resulted in the need for conference calls, additional information, and rescheduling of staff resources to resolve the issues.

Sincerely,

/RA by Gary S. Janosko Acting for/

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

Docket No. 50-269

Enclosure: As stated

cc w/encl: See next page

January 8, 2001

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

January 8, 2001

SUBJECT: OCONEE NUCLEAR STATION, UNIT 1 RE: USE OF ALTERNATIVE EXAMINATIONS FOLLOWING REPAIR OF REACTOR VESSEL HEAD THERMOCOUPLE NOZZLE PENETRATIONS NOS. 2 AND 5, REQUEST FOR RELIEF NO. 00-04 (TAC NO. MB0846)

Dear Mr. McCollum:

By letter dated December 28, 2000, as supplemented by letter dated January 2 and January 4, 2001, Duke Energy Corporation requested relief for Oconee Nuclear Station, Unit 1, from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code requirements associated with the repair of the No. 2 and No. 5 reactor vessel head thermocouple nozzle penetrations.

Based on the enclosed safety evaluation, the staff has concluded that compliance with the Code requirements to perform liquid penetrant testing and radiographic examination of the weld volume of the capped No. 2 and No. 5 thermocouple penetrations would result in hardship or unusual difficulty for the licensee without a compensating increase in the level of quality and safety. Also, the staff authorizes use of ultrasonic examinations as an alternative to the Code-required radiographic examination for the subject thermocouple nozzle penetration weld repair pursuant to 10 CFR 50.55a(a)(3)(ii).

The staff is concerned with the lack of timeliness and thoroughness shown in the preparation of the submittal for this relief request that resulted in the need for conference calls, additional information, and rescheduling of staff resources to resolve the issues.

Sincerely,
/RA by Gary S. Janosko Acting for/

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

Docket No. 50-269

Enclosure: As stated

cc w/encl: See next page

Distribution:
PUBLIC
PD II-1 Rdg.
RidsNrrDlpmLpdii1 (paper copy)
RidsNrrLACHawes (paper copy)
DNaujock
RidsNrrPMDLaBarge (paper copy)
RidsOgcRp
RidsAcrsAcnwMailCenter
RidsRgn2MailCenter
GHill(2)
SRosenberg,EDO
COgle,RII

Accession Number ML010090166 *See Previous Concurrence

OFFICE	PM:PDII/S1		LA:PDII/S1		EMCB*		SC:\PDII/S1		OGC*	
NAME	DLaBarge:cn		CHawes		ESullivan		GJanosko for REmch		RHoefling	
DATE	01/08/2001		01/08/2001		01/05/2001		01/08/2001		01/08/2001	

OFFICIAL RECORD COPY

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD TEN-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN

REQUEST FOR RELIEF NO. 00-04

DUKE ENERGY CORPORATION

OCONEE NUCLEAR STATION, UNIT 1

DOCKET NO. 50-269

1.0 INTRODUCTION

The inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 1, Class 2, and Class 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states in part that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that: (i) the proposed alternatives would provide 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.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ISI Code of record for Oconee Nuclear Station, Unit 1, third 10-year interval is the 1989 Edition of the ASME Code. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein and subject to Commission approval.

By letter dated December 28, 2000, as supplemented by letters dated January 2 and 4, 2001, Duke Energy Corporation (the licensee) submitted Relief Request No. 00-04, requesting relief from certain Code-required radiographic testing (RT) criteria for the third 10-year inservice inspection interval at the Oconee Nuclear Station, Unit 1 for repair of the No. 2 and No. 5 reactor vessel head thermocouple nozzle penetrations.

2.0 RELIEF REQUEST 00-04, REPAIR OF REACTOR VESSEL THERMOCOUPLE HEAD PENETRATIONS

2.1 Code Requirement for which Relief is Requested

The licensee decided to use a more current edition of the Code referenced in the 10 CFR 50.55a(b) for this repair. The Code for this repair is the 1992 Edition with no addenda.

Paragraph IWA-4533 of the ASME Code requires that the weld repair as well as the preheated band shall be examined by the liquid penetrant testing (PT) method after the completed weld has been at ambient temperature for at least 48 hours. The repaired region shall be examined by the RT method and, if practical, by the ultrasonic testing (UT) method following repair of dissimilar materials using the temper bead process in accordance with IWA-4530. IWA-4500(e)(2) defines the band around the weld repair area as 1-1/2 times the component thickness or 5 inches, whichever is less.

2.2 Licensee's Proposed Alternative to Code

In lieu of the requirements of IWA-4533, the licensee proposed the following:

1. Within the band around the weld repair, as defined by IWA-4500(e)(2), an interference exists that would prevent using PT over 100 percent of the band area associated with the No. 2 and No. 5 thermocouple nozzle penetration weld repairs. The licensee proposed that the band area exclusive of the interferences be examined by PT.

2. Due to the thickness of the reactor vessel head and the complex geometry of the Oconee, Unit 1 reactor vessel head in the area of the No. 2 and No. 5 thermocouple nozzles, the licensee proposed that examination by UT be substituted for RT.

3.0 EVALUATION

The licensee identified leakage at the No. 2 and No. 5 thermocouple tube-to-reactor vessel head welds. Because these thermocouple tubes were not in use, the licensee repaired the leakage by removing the thermocouple tubes and affected weld material and capping the reactor vessel head penetration. The capping consisted of inserting an Inconel cylinder into the penetration and attaching the cylinder to the carbon steel reactor vessel head with an Inconel weld overlay. The weld overlay is on the outer (exposed) surface of the reactor vessel head. The licensee determined this configuration was structurally acceptable based on design by analysis according to Article NB-4200 to Section III of the Code. The licensee also determined that the resulting weld repair could not be nondestructively examined according to Section III Code-requirements. The Code requires that the weld be examined using surface and RT techniques.

The repaired configuration is not amenable to examination by RT. RT is used to identify flaws by detecting changes in material density. These changes can be due to differences in thickness or physical density as compared to the surrounding material. RT is not appropriate for this repair configuration because the gap between the insert and head would mask flaws in that location, and the contour of the insert with the outer surface of the head results in changing densities across the insert which would mask flaws above the insert. In order to use RT, the reactor head penetration (nominally 1-3/8 inch diameter by 7 inches through-wall) would have to

be enlarged to permit a full penetration weld. Such an extensive through-wall repair would subject the vessel to internal stresses that would have to be relieved and subject personnel to large radiation doses. Moreover, the results of an RT would be questionable because of density changes between the base and weld metal and residual radiation from the base metal would render the film image inconclusive. Therefore, compliance with the Code RT requirement would create unusual difficulties and hardship for the licensee.

Instead of performing the RT examination, the licensee proposed to examine the weld using UT and, to the extent practical, PT. UT is used to identify features that reflect sound waves. The degree of reflection depends largely on the physical state of matter on the opposite side of the reflective surface and to a lesser extent on specific physical properties of the matter (density). For instance, sound waves are almost completely reflected at metal-gas interfaces and partially reflected at metal-to-solid interfaces. Discontinuities that act as metal-gas interfaces, like cracks, laminations, shrinkage cavities, and bonding faults are easily detected. Inclusions and other metal inhomogeneities can also be detected by partial reflection of the sound wave.

Because the selected weld material and deposited weld thickness is similar to weld overlays used to reinforce degraded piping, the licensee chose to use a UT technique that is predominately a subset of the weld overlay technique demonstrated under the Electric Power Research Institute - Performance Demonstration Initiative program. The licensee designed the procedure to detect flaws in the weld overlay as well as under the weld overlay. To demonstrate the effectiveness of the procedure, the licensee used a cladded calibration block with side-drilled holes representing reflectors.

The proposed UT examinations will satisfy the requirements in Article 5 to Section V of the 1992 Code. The examinations will be performed using 0 degree and 60 degree longitudinal wave transducers and an outside diameter creeping wave transducer. The 60 degree longitudinal wave transducer will scan the repaired area in four orthogonal directions except where there is an interference. The licensee will evaluate indications according to NB-5330, “Ultrasonic Acceptance Standards.” Any indication with a crack-like signature will be evaluated and sized using tip diffraction techniques.

Based on the above evaluation, the staff concludes that compliance with the Code requirements for performance of PT and RT of the weld volume for the capped No. 2 and No. 5 thermocouple penetrations would result in hardship or unusual difficulty for the licensee without a compensating increase in the level of quality and safety. The proposal to use UT, and PT to the extent practical, will provide a reasonable alternative to RT for identifying detrimental flaws for this configuration.

4.0 CONCLUSION

The staff concludes that compliance with the PT and RT requirements of the Code for the thermocouple penetration weld volumes would result in hardship or unusual difficulty for the licensee without a compensating increase in the level of quality and safety. Therefore, pursuant

10 CFR 50.55a(a)(3)(ii), the proposed alternative is authorized for repair of the Oconee Nuclear Station, Unit 1, reactor vessel thermocouples No. 2 and No. 5. The relief granted is authorized by law and will not endanger the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Principal Contributor: Donald Naujock

Date: January 8, 2001

cc:
Ms. Lisa F. Vaughn
Legal Department (PBO5E)
Duke Energy Corporation
422 South Church Street
Charlotte, North Carolina 28201-1006

Anne W. Cottingham, Esquire
Winston and Strawn
1400 L Street, NW
Washington, DC 20005

Mr. Rick N. Edwards
Framatome Technologies
Suite 525
1700 Rockville Pike
Rockville, Maryland 20852-1631

Manager, LIS
NUS Corporation
2650 McCormick Drive, 3rd Floor
Clearwater, Florida 34619-1035

Senior Resident Inspector
U. S. Nuclear Regulatory Commission
7812B Rochester Highway
Seneca, South Carolina 29672

Virgil R. Autry, Director
Division of Radioactive Waste Management
Bureau of Land and Waste Management
Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201-1708

Mr. L. E. Nicholson
Compliance Manager
Duke Energy Corporation
Oconee Nuclear Site
7800 Rochester Highway
Seneca, South Carolina 29672

Ms. Karen E. Long
Assistant Attorney General
North Carolina Department of Justice
P. O. Box 629
Raleigh, North Carolina 27602

Mr. C. Jeffrey Thomas
Manager - Nuclear Regulatory Licensing
Duke Energy Corporation
526 South Church Street
Charlotte, North Carolina 28201-1006

Mr. Richard M. Fry, Director
Division of Radiation Protection
North Carolina Department of Environment, Health, and Natural Resources
3825 Barrett Drive
Raleigh, North Carolina 27609-7721

Mr. Steven P. Shaver
Senior Sales Engineer
Westinghouse Electric Company
5929 Carnegie Blvd.
Suite 500
Charlotte, North Carolina 28209