March 21, 2001

Mr. S. K. Gambhir
Division Manager - Nuclear Operations
Omaha Public Power District
Fort Calhoun Station FC-2-4 Adm.
Post Office Box 399
Hwy. 75 - North of Fort Calhoun
Fort Calhoun, NE 68023-0399

SUBJECT: FORT CALHOUN STATION, UNIT NO. 1 - RELIEF REQUEST RE: EVALUATION OF THE USE OF A MECHANICAL NOZZLE SEAL ASSEMBLY AS A PREEMPTIVE REPAIR FOR PRESSURIZER TEMPERATURE SENSING NOZZLE TE-107 (TAC NO. MB0802)

Dear Mr. Gambhir:

By letter dated December 20, 2000, Omaha Public Power District (OPPD) submitted a relief request to use an alternative method of repair for the pressurizer steam space temperature sensing nozzle, TE-107. OPPD has installed a Mechanical Nozzle Seal Assembly (MNSA) on the TE-107 nozzle should it develop leakage during operation. OPPD has requested authorization for use of this alternative from the design conditions of Article 4, "Design" of the American Society of Mechanical Engineers (ASME) Section III Code, 1965 with Addenda through Winter 1966. OPPD has cited 10 CFR 50.55a(a)(3)(i) as the basis for requesting the temporary use of the MNSA as a preemptive repair.

The staff's evaluation and conclusions are contained in the enclosed safety evaluation. The staff finds that the proposed alternative provides an acceptable level of quality and safety and therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized up to the inspection scheduled during Fort Calhoun's Fall 2002 refueling and maintenance outage. A thorough visual inspection of the TE-107 MNSA for leakage, corrosion and/or other degradation will take place during the Spring 2001 refueling and maintenance outage, however, the MNSA will remain installed during and after the inspection if satisfactory results are found.

Sincerely,

/RA/

Stephen Dembek, Chief, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-285

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE MECHANICAL NOZZLE SEAL ASSEMBLY

INSTALLATION ON THE PRESSURIZER STEAM SPACE

TEMPERATURE SENSING NOZZLE (TE-107)

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION

DOCKET NO. 50-285

1.0 INTRODUCTION

By letter dated December 20, 2000, and as supplemented by letter dated February 14, 2001, Omaha Public Power District (OPPD) requested relief from the 10 CFR 50.55a repair requirements as implemented through the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. OPPD has requested authorization to install a mechanical nozzle seal assembly (MNSA) as a preemptive repair of the currently installed Inconel alloy (A600) pressurizer steam space temperature sensing nozzle. This nozzle is welded to the pressurizer shell wall with a "J"-groove weld which has been found to be susceptible to cracking as a result of stress corrosion. The MNSA has already been installed as a preemptive measure in the event that the nozzle begins leaking. To date, there is no indication that the TE-107 nozzle is leaking.

The February 14, 2001, supplement was in response to staff questions posed during telephone discussions conducted on January 4 and January 31, 2001. The supplement changed the duration of relief requested from the 2005 refueling and maintenance outage to the 2002 refueling and maintenance outage. It also provided clarification on MNSA design details and showed how lessons learned were factored into installation specifications and procedures used to install the TE-107 MNSA.

The "J"-groove welds on instrument nozzles have the dual purpose of restraining the nozzle in place and preventing leakage through the annulus between the nozzle and the wall. MNSAs are intended to be installed on leaking, or potentially leaking, instrument nozzle penetrations on reactor coolant system (RCS) components. This type of repair is done in lieu of performing required ASME Section XI weld repairs on leaking ASME Code Class 1, Alloy 600 nozzles. The MNSA is intended to provide sealing and structural integrity by acting as a complete replacement of the "J"-groove weld.

2.0 BACKGROUND

Among the nozzles penetrating the vessel wall of the pressurizer, RC-4 is a 1" diameter resistance temperature detector (RTD) nozzle connection, located near the top of the pressurizer, tagged TE-107 (vapor space temperature indication). A walkdown inspection of the containment building on October 22, 2000, conducted during a plant heatup, after a forced outage for replacing reactor coolant pump seals revealed leakage from the lower pressurizer liquid space temperature nozzle, TE-108. A weld repair to correct this leakage was performed.

Even though no leakage has been observed from the TE-107 nozzle, industry experience and recommendations from Westinghouse Electric Company-CE Nuclear Power, LLC, indicated that it was prudent to install a MNSA as a leak preventive measure on the TE-107 nozzle. This installation was performed under 10 CFR 50.59 as an ASME Section XI replacement in accordance with Article IWA-7000 for replacement.

In a preemptive measure against the TE-107 nozzle developing a leak, OPPD is requesting NRC authorization to use the MNSA as an alternate method of repair. By crediting the MNSA as a pressure boundary, the need for a weld repair in the event that the TE-107 "J"-groove weld develops a leak may be postponed. The savings in radiation exposure due to the use of the MNSA instead of the weld repair method is expected to be approximately 1.5 to 2.0 person-Rem. Approval of the request would eliminate the need to remove the MNSA to verify integrity of the credited pressure boundary, the "J"-groove weld. This inspection is an avoidable work burden at hot system conditions during plant startup and has an associated personnel exposure to radiation of 200-400 mRem.

3.0 EVALUATION

3.1 NRC Requirements

Section 50.55a(g)(4) to 10 CFR requires in part that "throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, set forth in Section XI of editions of the ASME Boiler and Pressure Vessel Code, to the extent practical within the limitations of design, geometry and materials of construction of components." However, Section 50.55a(a)(3)(i) of 10 CFR allows the Director of the Office of Nuclear Reactor Regulation to authorize alternatives to the requirements of Section XI of the ASME Code when an applicant can demonstrate that the alternative program will provide an acceptable level of quality and safety in lieu of complying with the requirement in Section XI.

3.2 Current Edition of the ASME Code Used for ISI of ASME Code Class Components

The applicable edition of Section XI of the ASME Code for the FCS inservice inspection program is the 1989 Edition, no Addendum.

3.3 Code Requirements

Article IWA-4000, Paragraph 4110(a) states: "This Article provides rules and requirements for repair of pressure retaining components and their supports, including appurtenances, subassemblies, parts of a component, and core support structures, by welding, brazing, or metal removing."

Article IWB-4000 provides rules and requirements in addition to those of Article IWA-4000 that essentially covers tube or tubesheet bore hole plugging by various methods of welding.

Neither article addresses the mechanical repair of pressure retaining components.

3.4 Proposed Alternative Program

OPPD has preemptively installed a MNSA on the TE-107 nozzle in the event that "J"-groove weld degradation or other pressure boundary degradation may be in progress. At this time, a repair alternative authorization is requested until the beginning of the 2002 refueling and maintenance outage. OPPD intends to then remove the TE-107 MNSA for inspection and also to inspect the TE-107 nozzle. OPPD's inspection program for the MNSA includes the following phases:

1. Examinations will be performed in accordance with and at a frequency prescribed by the Fort Calhoun Station's ASME Section XI Program. Presently this frequency is once per refueling outage. Any evidence of degradation, including leakage or corrosion, of the installed MNSA device or surrounding area will be recorded. Evidence of leakage from the interface of the vessel wall and the MNSA device lower flange, or along the axis of the nozzle, could be a cause for disassembly of the MNSA device for further investigation.

2. Documentation and reports of the examinations will be in accordance with the Fort Calhoun Station's ASME Section XI program.

3. As part of the inspection program described under Item 1. above, the conditions of the retaining washers and associated fasteners will be evaluated. A satisfactory condition is an indication that there has been no loss of pre-load or load relaxation on the seal.

OPPD will submit a relief request in the spring of 2002 in the event that this inspection cannot take place. In addition, OPPD will inspect the installed MNSA for leakage and/or deterioration during the next refueling and maintenance outage in the spring 2001. Specifically, any evidence of degradation, including leakage or corrosion of the installed MNSA device or surrounding area, will be recorded. Evidence of leakage from the interface of the vessel wall and the MNSA lower flange or along the axis of the nozzle, could be a cause for a disassembly of the MNSA for further investigation. Documentation and reports of the examinations will be in accordance with the Fort Calhoun Station's ASME Section XI programs. As part of the inspections described, the condition of the retaining washers and associated fasteners will also be evaluated.

3.5 Technical and Regulatory Attributes of the Alternative Program

The MNSA is installed concentric to the TE-107 nozzle with four bolts bolted into blind holes drilled and tapped 90 degrees apart in the pressurizer wall. The internal members of the MNSA apply compressive loads through the MNSA tie rods (i.e., bolting materials) to a graphite-based packing ring. The loads of the tie rods, which serve to replace the "J"-groove weld as the pressure boundary for the nozzle, press down on the graphoil seal to provide a leak tight seal around the nozzle. A groove is machined into the outside diameter of the nozzle's socket weld end to which a collar and top plate are attached. Tie rods extending from the upper flange to the top plate, loaded by Belleville springs, enable portions of the MNSA to act as an anti-ejection device in the event that the "J"-groove weld (internal to the pressurizer) fails completely.

The MNSA has been endorsed by the Combustion Engineering Owners Group as a leak prevention device on a nozzle with either weld or nozzle material considered susceptible to stress corrosion cracking. The MNSA is designed in accordance with ASME Section III and is designed to accommodate a 360-degree failure of the nozzle in the weld region.

The MNSA has also been qualified through prototype testing. The testing has included limited pressure testing both at operating and ambient temperature, thermal cycling, and seismic testing. The seismic testing was conducted with the MNSA pressurized at seismic levels that envelop all domestic power plant sites. No leakage or loss of pressure was observed during the prototype testing.

MNSAs have been installed at a number of other reactor sites. In most cases, their installation has stopped leaks previously detected and allowed the affected plants to return to power until permanent repairs can be determined and implemented. Recently, a Licensee Event Report (LER) was received from a licensee citing evidence of small amounts of MNSA leakage at two primary system component connections where they were installed. The MNSA designer/fabricator has determined the cause of the leakage and has factored lessons-learned into installation specifications and procedures that were used at Fort Calhoun for installation of the TE-107 MNSA.

The staff is currently reviewing the detailed MNSA design submitted as a part of a request to install MNSAs preemptively for another facility. The long term effects of MNSA installation on RCS components have not yet been totally assessed.

The TE-107 MNSA was installed as an engineering change. OPPD has stated that the MNSA is designed to withstand the effects of pressure, weight, thermal expansion, seismic loads, and faulted conditions such as the loss-of-coolant accident. In addition, it has been determined that the MNSA installation and use will have no significant effect on the short-term operation (one refueling cycle) or performance characteristics of the pressurizer or the installed pressurizer sensing instrument performance.

4.0 CONCLUSION

The staff concludes that the MNSA design is in accordance with the joint requirements specified in ASME Section III, 1989 ASME Edition. The design and installation of MNSAs that meet the applicable ASME Code requirements for joints provides assurance that the safety functions of the original "J"-groove weld, namely prevention of RCS leakage, and nozzle structural integrity, are maintained when the MNSAs are installed around the nozzles. Therefore, the use of the MNSA provides an acceptable level of quality and safety compared to the applicable ASME Code requirements for repair of instrument nozzles, for short term operation only. Accordingly, pursuant to 10 CFR 50.55a(a)(3)(i), the use of the MNSA as an alternative to a Section XI Code repair of the instrument nozzles is authorized until the Fall 2002 refueling and maintenance outage.

Principal Contributor: D. Holland

Date: March 21, 2001