Omaha Public Power District

444 South 16th Street Mall
Omaha NE 68102-2247

December 11, 2001
LIC-01-0123

U.S. Nuclear Regulatory Commission
ATTN.: Document Control Desk
Washington, DC 20555

References:
1. Docket No. 50-285
2. Letter from OPPD (S. K. Gambhir) to NRC (Document Control Desk), "Request for Use of a Mechanical Nozzle Seal Assembly as an Alternate Method of Repair," dated December 20, 2000 (LIC-00-0107)
3. Letter from OPPD (S. K. Gambhir) to NRC (Document Control Desk), "Additional Information Supporting the Fort Calhoun Station's Request for Use of a Mechanical Nozzle Seal Assembly as an Alternate Method of Repair," dated February 14, 2001 (LIC-01-0011)
4. Letter from NRC (L. R. Walker) to OPPD (S. K. Gambhir), "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)," dated March 14, 2001 (NRC-01-028)

SUBJECT: Request for Continuing Use of a Mechanical Nozzle Seal Assembly as an Alternate Method of Repair

Under the provisions of 10 CFR 50.55a(a)(3)(i), Omaha Public Power District (OPPD) requests NRC Staff authorization for continuing the use of a Mechanical Nozzle Seal Assembly (MNSA) as an alternate method of repair for the restoration of the structural integrity and leak tightness of Fort Calhoun Station's (FCS's) pressurizer instrument nozzle penetration (TE-107), should TE-107 nozzle leaks occur.

This request is for a continuance of the relief requested by References 2 and 3 and approved by the NRC for one operating cycle of use in Reference 4. In accordance with Reference 3, the current relief request applies through the cooldown to Mode 5 at the beginning of the 2002 refueling and maintenance outage. Should FCS be unable to permanently remove the MNSA during the 2002 refueling and maintenance outage, as detailed below, approval for an additional operating cycle would be needed.

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The MNSA was installed as a contingency on the non-leaking TE-107 thermowell nozzle during the October 2000 forced outage under the replacement provisions of ASME Section XI 1989 edition. To avoid radiation exposure associated with an inservice visual inspection during startup from the spring 2001 refueling and maintenance outage, a relief request to credit the MNSA as the pressure boundary was submitted by OPPD and approved by the NRC (Reference 4).

As committed in Reference 3, OPPD plans to remove and inspect the MNSA for materiel condition and the TE-107 pressurizer nozzle for leakage during the 2002 refueling outage. Further, OPPD is pursuing options whose purpose is to justify permanent removal of the MNSA. If the 2002 outage inspections determine that the TE-107 nozzle is leaking or J-weld inspection data indicates Inconel-600 cracking is in progress: 1) the nozzle will be weld repaired if allowed by outage logistical constraints, i.e., dose, craft availability, outage scheduling conditions, etc.; 2) the significance of the inspection indications will be evaluated for allowing continued service without a MNSA; or 3) the MNSA will be re-installed in accordance with a contingency MNSA repair request, i.e., this request. Should the MNSA be re-installed under repair relief, the MNSA will be removed during the next refueling and maintenance outage, scheduled for the fall of 2003. If TE-107 nozzle cracks are found by the nozzle inspections, installation of the MNSA, option 3, is the most efficient course of action.

All aspects of the MNSA design and installation are identical to the previous request and application.

The MNSA was designed and constructed by ASEA Brown Boveri/Combustion Engineering (now Westinghouse Electric Company, LLC) as a Class 1 component in accordance with the ASME Boiler & Pressure Vessel Code, Section III. Authorization was requested because use of a MNSA is not addressed directly in the ASME Code.

The MNSA on TE-107 nozzle was inspected in its installed configuration on October 24, 2000, November 4, 2000, and March 20, 2001. No leakage or other abnormal conditions were observed.

OPPD research has indicated residual stresses induced by a fabrication weld repair to the TE-108 thermowell after the vessel heat treatment was a contributing cause to the through-wall crack on TE-108. No such repair was made to the TE-107 nozzle. Residual stresses in the TE-107 nozzle would have been relieved by post weld heat treatment of the vessel. It is therefore concluded that a crack in the area of the TE-107 nozzle is very unlikely. TE-107 inspections will be conducted during the 2002 refueling and maintenance outage to confirm the nozzle J-weld integrity.

If this relief request is not approved, in order to support the plant restart date, contingency nozzle repair plans and outage preparations must be implemented now. Implementing the nozzle repair plan is a significant emergent workload during the outage, which could be effectively avoided through approval of this MNSA relief request. Nozzle repair plan preparation significantly

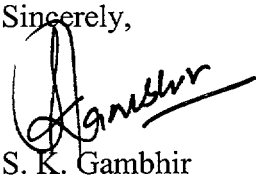
affects outage planning due to the constraints associated with the reactor coolant system (RCS) pressure boundary for removal/repair of the nozzle.

With the exception of date-related and historical inspection information, the attached Authorization Request is a duplication of the relief request submitted in Reference 2 with updates to include the additional information presented in Reference 3.

It is requested this authorization be granted by March 15, 2002, to facilitate outage preparations.

If you have any questions, please call Dr. Richard Jaworski at 402-533-6833.

Sincerely,



S. K. Gambhir
Division Manager
Nuclear Operations

SKG/RLJ/rlj

Attachment

c: E. W. Merschoff, NRC Regional Administrator, Region IV
A. B. Wang, NRC Project Manager
W. C. Walker, NRC Senior Resident Inspector
Winston & Strawn

AUTHORIZATION REQUEST
Omaha Public Power District
Fort Calhoun Station

1. BRIEF DESCRIPTION OF AUTHORIZATION REQUESTED:

Authorization for continued use of a Mechanical Nozzle Seal Assembly (MNSA) as an approved alternate method of repair for a pressurizer temperature nozzle (TE-107) for an additional operating cycle.

2. SYSTEM:

Reactor Coolant System (RCS)

3. COMPONENTS:

Pressurizer: Tag No. RC-4

Pressurizer Temperature Nozzle for Vapor Phase Temperature Element: Tag No. TE-107

4. SYSTEM CODE CLASS:

Pressurizer Construction Code: ASME Section III; Subsection A for Class A Vessels, 1965 edition, Summer 1966 addendum

5. CODE REPAIR APPLICABILITY:

A. ASME Section XI; Subsection IWA; Article IWA-4000 for Repair Procedures, 1989 edition, No addendum

B. ASME Section XI; Subsection IWB; Article IWB-4000 for Repair Procedures, 1989 edition, No addendum

6. CODE REPAIR 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.

7. REQUESTED AUTHORIZATION:

In accordance with 10 CFR 50.55a(a)(3)(i), the NRC is being requested to provide advance authorization for the use of a MNSA as an alternate method of repair for the pressurizer temperature nozzle for the vapor phase temperature element (Tag Number TE-107), should a leak occur. In order to credit the MNSA as the nozzle pressure boundary, an exemption to the design conditions of Article 4 "Design" of the ASME III Code "Nuclear Vessels" 1965 Edition with Addenda through Winter 1966 is being requested. This authorization was previously requested by References 2 and 3 and approved by the NRC in Reference 4.

8. BASIS FOR RELIEF:

8.1 BACKGROUND

Among the nozzles penetrating the vessel wall of the pressurizer, RC-4, is a 1" pipe-size resistance temperature detector (RTD) nozzle connection, located near the top, tagged TE-107 (vapor space temperature indication). A walk-down inspection of the containment building on October 22, 2000, conducted during a plant heat-up after a forced outage for replacing reactor coolant pump seals, observed leakage from the lower pressurizer liquid space temperature nozzle TE-108.

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

OPPD research has indicated residual stresses induced by a fabrication weld repair to the TE-108 thermowell after the vessel heat treatment was a contributing cause to the through-wall crack on TE-108. No such repair was made to the TE-107 nozzle. (The nozzles for TE-107 and TE-108 are similar in configuration and different than all other pressurizer penetrations.) Residual stresses in the TE-107 nozzle would have been relieved by post weld heat treatment of the vessel. It is therefore concluded that a crack in the area of the TE-107 nozzle is very unlikely. TE-107 inspections will be conducted during the 2002 refueling and maintenance outage to confirm the nozzle J-weld integrity.

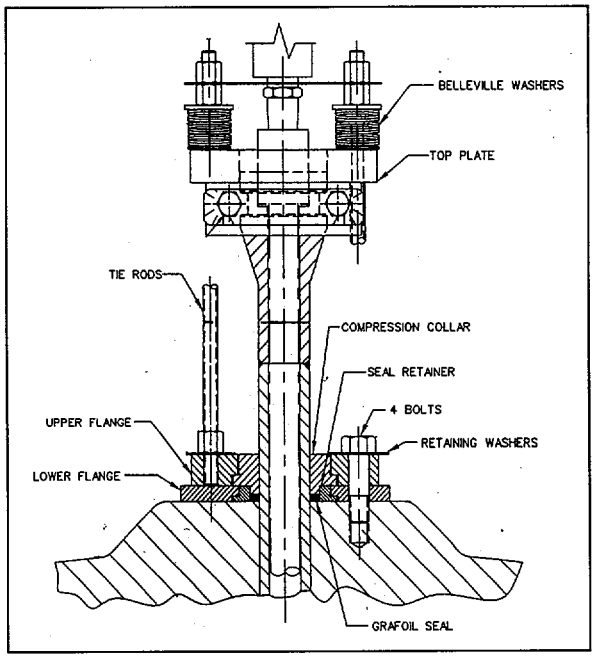
As a contingency measure in the event that the TE-107 nozzle is found to be leaking and not repairable during the planned 2002 outage, OPPD is requesting NRC authorization to continue to use the MNSA as an alternate method of repair. Crediting the MNSA as a pressure boundary prevents the need for implementing extraordinary weld repair plans during the 2002 refueling and maintenance outage in the event that planned inspections determine the TE-107 J-groove weld is leaking or an evaluation of the weld concludes the weld is unacceptable for continued service.

This request is for continuance of the relief requested by References 2 and 3 and approved by the NRC for one operating cycle of use at FCS in Reference 4.

8.2 DESCRIPTION OF THE MNSA

All aspects of the design and installation are identical to the previous request and application.

The MNSA is installed concentric to the TE-107 nozzle. Four blind holes are drilled 90 degrees apart using a fixture. The holes are tapped for bolts that attach the baseplate of the device to the pressurizer shell. The baseplate (made-up of a lower flange and compression collar) and an upper flange apply compressive forces to a graphite based packing ring that acts as the seal if the device were acting as a pressure boundary device (such as a leaking joint). A groove is machined into the outside diameter of the nozzle's socket weld end to which a collar and top plate are attached Four tie rods extending from the upper flange to the top plate, loaded by Belleville springs, act as an anti-ejection device should the J-groove weld, internal to the pressurizer, fail completely. Reference the MNSA diagram below.



8.3 DISCUSSION

Inconel-600 instrumentation nozzles are generally installed in the primary system using a partial penetration (J-groove) weld (as is the TE-107 nozzle on the Fort Calhoun Station pressurizer). These nozzles have experienced failures in the area of the weld due to Primary Water Stress Corrosion Cracking (PWSCC), requiring replacement or repair. The MNSA is a

qualified design that offers an alternative to the weld repair techniques normally used to repair cracked welds on these nozzles.

The seal between the nozzle and vessel is a graphite-based ring that has been used extensively by Westinghouse Electric Company, LLC. The MNSA is recommended by the Combustion Engineering Owners Group to be installed as a leak preventive measure on a nozzle with either a weld or nozzle material considered susceptible to stress corrosion cracking. The MNSA design is in accordance with Section III of the ASME Code and accommodates a worst case 360-degree circumferential failure of the nozzle in the weld region.

The MNSA has been subjected to prototype testing. This testing included pressure testing both at operating and at ambient temperature, thermal cycling and seismic testing. The seismic testing was conducted with the MNSA pressurized at seismic levels that envelope all domestic power plant sites. No leakage or loss of pressure was observed

MNSAs have been installed at the San Onofre Nuclear Generation Station and Waterford Steam Electric Station, Unit 3 on leaking temperature element and heater nozzles. They successfully stopped the leaks and allowed the plants to return to power. The MNSA design specifications methodology, analysis and installation procedures utilized at Fort Calhoun are comparable to those applied to the MNSAs at other stations.

Westinghouse Electric Company, LLC, sent a technical inquiry to the ASME Boiler and Pressure Vessel Committee regarding the MNSA. The Committee's opinion was that the concepts used in the design of MNSA are in accordance with the ASME Boiler and Pressure Vessel Code.

The MNSA was designed and constructed by ABB-CE (now Westinghouse Electric Company, LLC) as a Class 1 component in accordance with ASME Boiler and Pressure Vessel Code, Section III 1989 edition. Design documentation includes a calculation in accordance with ASME code to demonstrate acceptability of the reinforcement requirements, stress intensities, fatigue evaluation, and maximum permissible shear loads in the area of the MNSA installation as well as stress analysis of the MNSA components.

The MNSA was proactively installed as an engineering change on the non-leaking TE-107 thermowell nozzle during the October 2000 forced outage under the replacement provisions of ASME Section XI 1989 edition. The impact of installing the MNSA on Fort Calhoun's pressurizer has been extensively analyzed. Analysis shows that the addition of the MNSA has no impact on the seismic qualification/integrity of the pressurizer, RCS or associated equipment. Analysis also shows that the addition of the MNSA has no impact on the structural integrity of the pressurizer. 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.

Based on the small mass of the MNSA in comparison to the mass of the pressurizer, and the non-intrusive installation of the MNSA, a specific determination of the MNSA impact on the

RTD itself was determined to be unnecessary. Post-installation testing was conducted that verified proper operation of the temperature indication following the MNSA installation.

The MNSA, as installed, has no effect on the operation or performance characteristics of the pressurizer.

The MNSA joint design uses both ASME III 1965 with Addenda through Winter 1966 Article 4 "Design" and ASME III 1989 (No Addenda) Article NB-3000 "Design" as a basis.

If it is necessary to reinstall the MNSA on TE-107 following the 2002 refueling and maintenance outage, the installation procedures and post installation inspection procedures as used in the October 2000 installation will be utilized

8.4 INSPECTIONS

The MNSA was installed as a preventive measure on the TE-107 nozzle. When installed, there was no evidence of nozzle leakage. OPPD has performed periodic visual inspections and associated actions as follows:

a. The MNSA on TE-107 nozzle was inspected in its installed configuration on October 24, 2000, November 4, 2000, and March 20, 2001.
b. Examinations to date have been 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.
c. There has been no evidence of degradation, leakage or corrosion, of the installed MNSA device.
d. There has been no evidence of leakage from the interface of the vessel wall and the MNSA device lower flange, or along the axis of the nozzle.
e. As part of the inspection described in item "a" above, the condition of the retaining washers and associated fasteners has been inspected and no loss of pre-load or load relaxation on the seal has been observed.
f. Documentation and reports of the examinations have been maintained in accordance with the Fort Calhoun Station's ASME Section XI programs.
g. During the 2002 refueling outage, the MNSA will be removed and inspected for materiel condition.
h. The TE-107 pressurizer nozzle weld, with the MNSA removed, will be inspected using eddy-current testing (ECT).
i. In the unlikely event the 2002 outage inspections determine that the TE-107 nozzle is leaking or J-weld inspection data indicates Inconel-600 cracking is in progress: 1) the nozzle will be weld repaired if allowed by outage logistical constraints, i.e., dose, craft availability, outage scheduling conditions, etc.; 2) the significance of the inspection indications will be evaluated for allowing continued service without a MNSA; or 3) the MNSA will be re-installed in accordance with this contingency MNSA repair request, and plans will be made for a code compliant repair during the 2003 refueling and maintenance outage.

This inspection program has not identified any problems with the installed MNSA device. The design analysis, in conjunction with the completed two years of inspection, supports use of a MNSA as a leak preventive device and continued cognizant use of the MNSA as an alternate method of repair.

9. CONCLUSION:

The MNSA has a sound technical design and a proven performance as installed at FCS as an alternate method of repair of the pressurizer's vapor phase temperature element (TE-107) nozzle. The MNSA does not affect the operation or performance of the pressurizer or plant. In addition, there is no significant structural impact on the pressurizer wall. It is concluded that the safety margin of the plant is not reduced by the use of the MNSA as an alternate repair method. If it is necessary to re-install the MNSA following the 2002 refueling and maintenance outage, the MNSA will continue to provide an acceptable level of quality and safety that will ensure pressure boundary integrity.