July 3, 2002

Mr. Michael Krupa
Director, Nuclear and Safety Engineering
Entergy Operations, Inc.
1340 Echelon Parkway
Jackson, MS 39213-8293

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 - RE: REQUEST FOR RELIEF FROM THE REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) BOILER AND PRESSURE VESSEL CODE (CODE) CONCERNING AUTHORIZATION TO USE NEW DESIGN OF MECHANICAL NOZZLE SEAL ASSEMBLY (MNSA) (TAC NO. MB4517)

Dear Mr. Krupa:

By letter dated March 15, 2002, as supplemented by letters dated April 4, and April 26, 2002, Entergy Operations, Inc. (Entergy, the licensee), requested relief from ASME Code, Section XI, requirements for IWA-4170 required repairs. Entergy requested Nuclear Regulatory Commission (NRC) staff approval to use the new design of the MNSA in temporary applications on locations in the reactor coolant system (RCS) that exhibit leakage due to primary water stress corrosion cracking (PWSCC) at Arkansas Nuclear One, Unit 2 (ANO-2).

Specifically, pursuant to 10 CFR 50.55a(a)(3)(i), you requested NRC's authorization to use the improved design of the MNSA, designated as MNSA-2, in applications at the affected pressurizer instrument nozzles and heater sleeves. The request was made in order to repair leaks attributed to PWSCC that may be detected while performing inspections during refueling outages. The typical repair of these nozzles or heater sleeves of this type uses a half-nozzle replacement with external weld repair. These repairs would extend RCS drain-down activities or require a de-fueled condition, and significantly increase worker radiation exposure to perform extensive field machining and temper bead welding activities. As an alternative, you proposed the use of MNSA-2 as a repair to restore nozzle or heater sleeve integrity and prevent leakage for two operating cycles.

The staff evaluated the information provided in the submittal and determined that the proposed alternative would provide an acceptable level of quality and safety for the requested two cycles. Therefore, Entergy's proposed alternative is authorized, pursuant to 10 CFR 50.55a(a)(3)(i). In view of the immediate and possible need during the past refueling outage (RFO 15), the staff gave you a verbal authorization on April 12, 2002, for the use of MNSA-2 at ANO-2.

With respect to the two modified instrument nozzles, the socket weld between the inserted new nozzle and the old nozzle is the new pressure boundary. Cracks in the "J"-groove welds have the potential to show leakage at the surface of the pressurizer in the annulus region between the old nozzle and the base material, and if the socket weld were to crack, the leakage is observed at the socket weld. Since "...*the MNSA-2 is a mechanical device designed to replace the function of partial penetration J-groove welds that attach Alloy 600 nozzles or heater sleeves to the pressurizer*..." (as stated in your application dated March 15, 2002), for evidence of leakage at the surface of the pressurizer, the proposed MNSA-2 repair would be appropriate.

If the evidence of leakage is at the socket weld, the proposed MNSA-2 repair would not be appropriate and normal weld repair techniques would be required.

Subsequent to the verbal authorization, your staff informed NRC that five pressurizer heater sleeve nozzles were found leaking during walkdown following shutdown and MNSAs were installed on these nozzles during the outage. One additional pressurizer heater sleeve nozzle was found leaking during the heatup walkdown in preparation for power ascension. ANO-2 was shut down to install a MNSA on this nozzle. No other leaking nozzles were found.

Entergy indicated in its application that it may seek relief in the future to use the MNSA-2 for permanent application. Supplemental letters dated April 4, and April 26, 2002, contained the design stress report for qualification of the MNSA-2 for use at ANO-2. The staff notes that the analysis contains several aspects that would trigger questions and requests for additional clarifying information from ANO-2, if the relief request was intended for a period exceeding two operating cycles. These aspects, however, are less significant when the use of the MNSA-2s is limited to two operating cycles. The staff did not review the design stress reports with respect to use of the MNSAs beyond a time period of two operating cycles. Therefore, if an application for extended operation, i.e., beyond the approved two operating cycles, is submitted, the staff will need to evaluate all current and any new data, including stress and fatigue calculations, that may pertain to long-term usage before approval is granted for extended operation.

This authorization is valid for the next two operating cycles of the current inspection interval, which ends on March 25, 2010.

The staff's safety evaluation is enclosed.

Sincerely,

/RA/

Robert A. Gramm, Chief, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosure: Safety Evaluation

cc: w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

AUTHORIZATION FOR TEMPORARY INSTALLATION OF

THE NEW DESIGN OF MECHANICAL NOZZLE SEAL ASSEMBLIES

REQUEST FOR RELIEF

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT 2

DOCKET NO. 50-368

1.0 INTRODUCTION

By letter dated March 15, 2002, as supplemented by letters dated April 4, and April 26, 2002, Entergy Operations, Inc. (Entergy, licensee) submitted a request to install a new design of mechanical nozzle seal assembly (MNSA), designated as MNSA-2, on leaking pressurizer nozzles and heater sleeves at Arkansas Nuclear One, Unit 2 (ANO-2). This new design is an improvement of an older model MNSA that had been previously installed on a temporary basis at certain other plants. Specifically, Entergy requested authorization to install MNSA-2 at ANO-2, for a period of two operating cycles, in the event that small bore pressurizer nozzles and heater sleeves on the pressurizer were found to be leaking during refueling outage (RFO) 15. These leaks are typically attributed to primary water stress corrosion cracking (PWSCC) of the "J"-groove weld on the interior of the pressurizer shell.

2.0 DISCUSSION

Background

Pursuant to 10 CFR 50.55a(a)(3), licensees may use alternatives to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) when authorized by the Director of the Office of Nuclear Reactor Regulation. The licensee must demonstrate that, pursuant to the requirements of 10 CFR 50.55a(a)(3)(i), the alternatives will provide an acceptable level of quality and safety in lieu of meeting the requirements in Section XI of the Code, or that, pursuant to the requirements of 10 CFR 50.55a(a)(3)(ii), complying with the requirements of 10 CFR 50.55a would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

RFO 15 at ANO-2 was scheduled for April 2002. During this outage, Entergy planned to inspect two lower level instrument nozzles, one shell side instrument nozzle, one vent nozzle, four upper steam space nozzles, and 96 heater sleeves on the pressurizer, for a total of 104 nozzles. The potential existed for leaks to occur in Alloy 600 pressurizer nozzles and heater sleeves due to PWSCC. On evidence of a leak in any of these nozzles or heater sleeves, Entergy proposed to install, under the provisions of 10 CFR 50.55a(a)(3)(i), a MNSA-2 on each nozzle and/or heater sleeve found to be leaking, as a repair method to restore the integrity of the pressure boundary and prevent leakage of the identified cracked nozzle or heater sleeve. The use of a MNSA has been proposed as a temporary alternative repair method to the Code requirements to restore the integrity and prevent leakage of pressurizer nozzles and heater sleeves for up to two cycles of operation.

The nozzles and heater sleeves are welded to the pressurizer bottom head with internal “J”-groove welds. These welds have been found to be susceptible to PWSCC. In addition, the two pressurizer instrument nozzles were modified with new SA-182, F-316 stainless steel nozzle additions. The original nozzles were cut off approximately 2 inches from the pressurizer shell’s external surface and flush with the internal pressurizer surface. The stainless steel nozzles were inserted inside the existing pieces. The stainless steel additions extend 5 inches into the pressurizer and are socket welded to the 2 inch tails of the original pieces. The typical permanent repair of these nozzles and heater sleeves consists of either installing a heater sleeve plug welded to a temper-bead pad or a half sleeve replacement, in accordance with ASME Section XI requirements.

The licensee has stated that a Section XI repair method would extend reactor coolant system (RCS) drain-down activities or require de-fueled conditions. It may also cause a significant increase in worker radiation exposure while performing extensive field-machining and temper bead welding activities. MNSAs can be effectively installed under various plant conditions and thus provide outage schedule flexibility, as well as reduced worker radiation exposure, while restoring structural integrity and leak tightness to the RCS.

The staff has approved similar requests for temporary repair of pressurizer nozzles and heater sleeves by MNSA (the original design) at Southern California Edison’s San Onofre Nuclear Generating Station; Waterford Steam Electric Station, Unit 3 (Waterford 3); Arizona Public Service Company’s Palo Verde Nuclear Generating Station; and most recently at Dominion Nuclear Connecticut’s Millstone Nuclear Power Station.

The MNSA-2 utilizes the same materials of construction and the same seal material as the original MNSA. They are attached in a similar fashion. The primary seal is loaded by tensioning bolts or studs. The MNSA-2 design differs from the original MNSA design in three ways: (1) a counterbore provision contains the primary seal, (2) the method of live-loading the primary seal, and (3) a means to divert leakage, should it occur.

Licensing Basis

Paragraph (g) to 10 CFR 50.55a requires, in part, that all inservice examinations and system pressure tests conducted during the first 10-year interval and subsequent intervals on ASME Code Class 1, 2, and 3 components comply with the requirements in the latest edition and addenda of Section XI incorporated by reference in 10 CFR 50.55a(b), on the date 12 months prior to the start of the 10-year interval.

By reference to, and implementation of, ASME Code Section XI, paragraphs IWB-3132 or IWB-3142, 10 CFR 50.55a also requires that existing flaws in ASME Code Class components be removed by mechanical means, or the components be repaired or replaced to the extent necessary to meet the acceptance standards in ASME Code Section XI, Article IWB-3000. Detection of leaks in the structural portion of an ASME Code Class 1, 2, or 3 component is direct evidence of a flaw in the component.

Paragraph IWA-4170 of Section XI of the ASME Code requires that repairs and the installation of RCS pressure boundary be performed and reconciled in accordance with the Owner's Design Specifications and Original Code of Construction for the component or system. The ANO-2 RCS pressurizer was designed and constructed to the rules of ASME Section III, Subsection NB, 1968 Edition, through and including Summer 1970 Addenda.

Paragraph NB-3671.7 to Section III of the ASME Code, "Sleeve Coupled and Other Patented Joints," applies to MNSA-2, and requires that ASME Code Class 1 joints be designed to meet the following criteria:

1. provisions must be made to prevent separation of the joint under all service loading conditions,

2. the joint must be designed to be accessible for maintenance, removal, and replacement activities, and

3. the joint must either be designed in accordance with the rules of ASME Code, Section III, Subarticle NB-3200, or be evaluated using a prototype of the joint that will be subjected to additional performance tests in order to determine the safety of the joint under simulated service conditions.

These conditions also apply to the design, installation, inspection and maintenance of MNSAs.

3.0 EVALUATION OF RELIEF REQUEST

Use of Mechanical Nozzle Seal Assemblies

The Items for which Relief is Requested:

Pressurizer lower level instrument nozzles/(2)
Pressurizer upper level instrument nozzles/(2)
Pressurizer upper pressure instrument nozzles/(2)
Pressurizer upper vent nozzle/(1)
Pressurizer side shell temperature nozzle/(1)
Pressurizer Heater Sleeves/(96)

(The figures within the parentheses indicate the number of components in each item).

Code Requirement:

ASME Code Section XI, IWA-4170 requires repairs and installation of replacements to be performed in accordance with the Owner's Design Specification and the original Construction Code of the component or system. The affected pressurizer instrument nozzles and heater sleeves were designed and constructed to the rules of ASME Code Section III, Subsection NB, 1968 Edition, through and including the Summer 1970 Addenda. Rules for replacing ASME

Code Section III, Class 1 welded nozzle or heater sleeve integrity with mechanical clamping devices are not clearly defined by ASME Code, Section III.

Licensee's Proposed Alternative (as stated):

"Pursuant to 10[ ]CFR[ ]50.55a(a)(3)(i), Entergy Operations, Inc. (Entergy) requests NRC [U.S. Nuclear Regulatory Commission] authorization to use the improved design of the Mechanical Nozzle Seal Assembly, designated MNSA-2, in applications at those nozzle locations listed in Section I, Components, above. Entergy makes this request in order to repair leaks attributed to Primary Water Stress Corrosion Cracking (PWSCC) that may be detected while performing inspections during refueling outages.

The typical repair of nozzles or heater sleeves of this type uses a half-nozzle replacement with external weld repair. These repairs would extend reactor coolant system (RCS) drain-down activities or require de-fueled conditions and significantly increase worker radiation exposure to perform extensive field machining and temper bead welding activities.

As an alternative, Entergy proposes to use the MNSA-2 as a repair to restore nozzle or heater sleeve integrity and prevent leakage for 2 operating cycles."

Licensee's Basis for Relief (as stated):

"... The Ni-Cr-Fe heat-affected zone of the J-weld has proven to be susceptible to PWSCC. Numerous instances of nozzle cracking have been identified in the industry in recent years. Studies performed by the CE [Combustion Engineering] Owner's Group (Report CE-NPSD-690-P) have found that the cracking growth is predominantly axial. The dominant conditions that promote axial growth rather than circumferential growth is high circumferential stress (hoop stress) compared to the axial stress. The hoop stress is a residual stress caused by weld shrinkage that diminishes quickly as the distance from the J-weld increases. The susceptibility to cracking is based on several factors that deal with material, stress, and environment.

Inspections required by ASME [Code] Section XI, IWB-2500 for Examination Category B-P are performed during each refueling outage. Additionally, the inspections recommended by the CE Owner's Group have been performed."

"... The MNSA-2 is a mechanical device designed to replace the function of partial penetration J-groove welds that attach Alloy 600 nozzles or heater sleeves to the pressurizer. MNSA-2 provides a seal against leakage and positively captures the nozzle preventing ejection in the unlikely event of complete 360-degree weld failure..."

Evaluation:

The licensee requests the use of MNSA-2 pursuant to 10 CFR 50.55a(a)(3)(i), stating that this alternative provides an acceptable level of quality and safety. To determine if MNSA-2 provides an acceptable level of quality and safety, the staff compared the MNSA-2 design and operational characteristics with the applicable ASME requirements, reviewed the MNSA-2 resistance to corrosion for the intended service period, and evaluated the licensee's commitments associated with the use of MNSA-2. The staff's review is described below.

The MNSA-2 is a mechanical device designed to replace the function of partial penetration "J"-groove welds that attach Alloy 600 nozzles or heater sleeves to the pressurizer, moving the pressure boundary to the sub-surface of the pressurizer exterior wall. The MNSA-2 stainless steel components performing a RCS pressure boundary function are designed, fabricated, and constructed using approved ASME Code materials (except the Grafoil gasket, which is a non-Code material), in accordance with the applicable rules of ASME Code Section III, Subsection NB and Appendix I.

A MNSA-2 consists of two split-seal/flange assemblies placed around a leaking nozzle or heater sleeve. The seals are made of Grafoil, a graphite compound that is compressively loaded within the assembly to prevent RCS leakage past the nozzle. The seal assembly is placed in a counterbore below the pressurizer surface and bolted with threaded rods into holes drilled and threaded on the outer surface of the RCS component wall. The primary seal is held under compression by a compression collar made of stainless steel. The compression collar with a collection area is utilized if there is leakage, to funnel the leakage along the annulus region between the nozzle and the compression collar. A second seal at the top of the compression collar blocks leakage from passing beyond the compression collar. A leakoff nozzle that penetrates through the collar allows for leakage to pass out to where it can be detected. This assembly acts as a complete replacement of the "J"-groove weld between the Alloy 600 sleeve and the pressurizer.

The MNSA-2 is designed to prevent separation of the joint under all service loadings. An anti-ejection clamp, which is installed and secured in place via the tie rods, Belleville spring washers, and hexagon nuts, serves as a structural restraint of the nozzle or heater sleeve in case of total "J"-groove weld failure and potential ejection of the nozzle or heater sleeve. This design is supported by technical analysis and tests that meet the design criteria specified in ASME Code Section III, Subsection NB, 1989 Edition, no Addenda. Enclosure 2 to the licensee’s letter of March 6, 2002, for Waterford 3, "Westinghouse Electric Corporation Design Report No. DAR-CI-02-1, “Addendum to CENC-1244 Analytical Report for Waterford Unit 3 Pressurizer,”" documents the required ASME Code Section XI, IWA-4170(b), reconciliation of the construction codes for a component built to a later edition of the Code, which the staff finds acceptable. Additionally, MNSA installations are accessible for maintenance, removal, and replacement. The provisions of NB-3671.7 are therefore nominally satisfied. It is also recognized that the MNSA is designed to prevent separation of the device from the wall under all service loadings, and thus acts as a complete replacement of the "J" weld between the Alloy 600 sleeve and the pressurizer. It therefore replaces both the sealing and the structural integrity of the "J" welds, and thus becomes part of the reactor pressure boundary.

In its letter dated March 15, 2002, by reference to letter CNRO-2002-00010, dated March 1, 2002, from Entergy to NRC, "Use of Mechanical Nozzle Seal Assemblies" for use at Waterford 3, and the subsequent letter dated April 4, 2002, (Letter CNRO-2002-00018), Entergy also provided an evaluation to address potential corrosion of the nozzle bore holes, galvanic corrosion (Grafoil Seal to Low Alloy Steel), and stress corrosion cracking (SCC) of the MNSA components. The results of this evaluation are summarized as follows:

(1) A through-wall crack in the nozzle could be a source of corrosion. However, the borated water will stagnate and will not replenish, except perhaps during shutdown when the RCS is drained. The level of the boric acid will not exceed that of the primary coolant at the beginning of a fuel cycle. In addition, low primary side oxygen levels in pressurized

water reactors (PWRs) will result in corrosion potentials below the critical cracking potentials for these materials in high temperature water.

(2) Boric acid corrosion of the materials of construction for the MNSA has been addressed by use of corrosion resistant materials, testing, and analysis.

(3) Corrosion of the bolts (SA 453 (A-286)), while susceptible to corrosion, is mitigated by use of the collection area and two seals, which diverts any leakage away from the bolts, and inspection of the bolts (addressed below).

(4) If leakage occurs beyond the primary seal into the area formed by the MNSA-2 and the pressurizer, it may wet the compression collar and low alloy steel. The leakoff nozzle may permit oxygen to ingress into the crevice area resulting in an aerated environment. Release of steam through the leakoff nozzle will potentially limit the oxygen in the crevice region. Remaining oxygen will be consumed in the corrosion of the low alloy steel. Therefore, the environment will be similar to that resulting from primary coolant leakage into control element drive mechanism crevices. Minor amounts of corrosion (several mils maximum) of low alloy steel corrosion, and no stainless steel corrosion will occur. Leakage will be observed via the leakoff nozzle and inspection of the counterbore hole during the next outage walkdown, and repaired or replaced.

(5) Machining of the outside diameter (OD) of the nozzle during the counterbore machining will not lead to SCC for several reasons:

a. The OD of the nozzle was machined during original fabrication and the additional machining should not significantly alter the residual stresses present;
b. The nozzle will not be welded, eliminating the residual stresses associated with the partial penetration weld at the pressurizer inside diameter (ID);
c. The temperature at the OD is lower than the ID. Since PWSCC is a thermally activated process, time to initiate and propagate cracks at the OD will be longer.

(6) A history of galvanic corrosion problems, in applications where low alloy steel is in contact with a Grafoil seal in an environment of an electrically conductive fluid (water), exists. This particular combination is used in other applications where the low alloy (or carbon steel) is frequently inspected (for example, steam generator secondary side manway and hand hole applications). The Grafoil seal, grade GTJ, is chemically resistant to attack from nearly all organic and inorganic fluids, and is very resistant to borated water. The MNSA-2 application is similar (i.e., Grafoil material is in contact with low alloy steel and visual inspections will be conducted at each refueling outage to identify signs of leakage), and for these reasons, significant galvanic corrosion is not expected. The licensee also noted that, in the absence of leakage past the Grafoil seal, the boric acid solution in the annulus region, below the seal, will become stagnant and will not allow replenishment of oxygen, thereby limiting the corrosion potential.

(7) ASME Code Section XI Preservice requirements, applicable to the MNSA-2 during each 10-year inservice inspection (ISI) interval, include a system leak test at the end of each refueling outage and bolting examination, based on the schedule of percentages required. For the MNSA-2 installed on the pressurizer nozzles and heater sleeves, the Bolting B-G-2 examination requirements would allow the VT-1 examination to be

performed as follows: (a) in place under tension, and (b) when the connection is disassembled or when the bolting is removed. This examination is required once each 10-year interval.

(8) The requirements of ASME Code Section XI Pressure Tests and alternatives of Code Case N-416, on the pressure testing of mechanical joints made in the installation of pressure retaining replacements, are applicable to the MNSA-2. The tests and a VT-2 inspection, at temperatures and pressures appropriate to ANO-2 Pressure-Temperature (P-T) limits, will be performed as a part of plant restart.

Stress Evaluation

The MNSA-2 design is supported by the manufacturer technical analysis and tests that meet the design criteria specified in ASME Code Section III, Subsection NB, 1989 Edition, no Addenda. The technical analysis includes the required ASME Code Section XI, IWA-4170(b), reconciliation of the construction codes for the use of a component built to a later edition of the Code, which the staff finds acceptable. Additionally, MNSA installations are accessible for maintenance, removal, and replacement. The provisions of NB-3671.7 are therefore satisfied.

The acceptance of the original MNSAs was based on industry experience, which demonstrated that the structural integrity and leak tightness of the MNSAs, and the structural integrity of the components to which the MNSAs are attached, was maintained at least through one or two cycles. The staff has also reviewed qualifying seismic and other structural tests performed by the manufacturer that demonstrate the structural integrity of the MNSA-2s. Entergy has also provided revised ASME Code Section III Class 1 fatigue analysis of the pressurizer, modified to account for the presence of the MNSA-2 counterbore and bolt holes, and demonstrated that the fatigue requirement of NB-3222.4(e), namely, the cumulative usage factor (CUF) not exceed 1.0 under the licensing design conditions, is met for the life of the plant. Based on a preliminary assessment, the staff considers the probability of exceeding the ASME Code Section III Class 1 CUF limit in the short-term operation of the two cycles requested by the licensee as low. However, for operation beyond the requested two cycles, the staff will need to complete the assessment of the stress and fatigue and other related information that may pertain to long-term usage, before approval can be granted for extended operation of the installed MNSA-2s.

Summary

Based on the above evaluation of potential corrosion effects, the staff concludes that there are no significant corrosion issues associated with the application of MNSA-2 to pressurizer nozzles and heater sleeves, with the exception of the two modified instrument nozzles. The data indicates that corrosion of the nozzle hole will also be acceptable over the requested two-cycle period of use.

With respect to the two modified instrument nozzles, further clarification of the scope of the relief is required. The socket weld between the inserted new nozzle and the old nozzle is the new pressure boundary. Cracks in the "J"-groove welds have the potential to show leakage at the surface of the pressurizer in the annulus region between the old nozzle and the base material, and if the socket weld were to crack, the leakage is observed at the socket weld. Since "...*the MNSA-2 is a mechanical device designed to replace the function of partial* *penetration J-groove welds that attach Alloy 600 nozzles or heater sleeves to the pressurizer*..." (as stated in your application dated March 15, 2002), for evidence of leakage at the surface of the pressurizer, the proposed MNSA-2 repair would be appropriate. On the other hand, if the evidence of leakage is at the socket weld, the proposed MNSA-2 repair would not be appropriate. Normal weld repair techniques would be required.

In addition, if leakage is identified on the surface of the pressurizer and the MNSA-2 repair is utilized, Code weld inspections are still required to identify any subsequent leakage at the socket weld. If Code inspections of the socket welds are hampered by installation of MNSA-2, then removal of MNSA-2 may be required to perform the appropriate inspections.

In the April 2002 refueling outage walkdowns, the two modified instrument nozzles did not show any signs of leakage.

Entergy indicated in its submittal, that with continued evaluation of the MNSA-2, they may seek relief in the future to use the MNSA-2 for permanent application. The staff has not reviewed the use of the MNSA-2 for long-term usage. If a permanent application is submitted, staff will evaluate all current and any new data that may pertain to long-term usage.

The licensee will adhere to the following limitations regarding the MNSA-2 that will be installed on any leaking pressurizer nozzles or heater sleeves at ANO-2 as a result of this relief request.

1. This request for alternative repair of pressurizer nozzles and heater sleeves is only requested and approved for up to two cycles of operation.

2. Entergy has used minimum wall thickness in its reinforcement calculations to assure that the pressurizer shell thickness is adequate.

3. Entergy will evaluate the area surrounding the leaking nozzles or heater sleeves during the counterbore machining process to verify that no significant degradation of the pressurizer wall annulus region has occurred.

4. If the MNSA-2 device leaks, the bolts may be exposed to borated water or steam under conditions in which deposits or slurries develop. Under these conditions and at stress levels present in the MNSA-2 application, the bolts will operate satisfactorily for at least one fuel cycle. Should a leaking MNSA-2 be discovered, it shall be repaired/replaced as part of the walkdown inspections performed in response to Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants." These walkdown inspections are performed prior to entering unit outages. Therefore, the existence of leaking MNSA conditions would be limited to one cycle.

5. As required by IWA-4820, a VT-1 preservice inspection will be performed on all MNSA-2 installations in accordance with IWB-2200.

6. During plant startup (Mode 3) after initial MNSA-2 installation and during subsequent plant restarts following scheduled outages, the MNSA-2 will be pressure tested and inspected for leakage. To ensure quality of installation and continued operation with the absence of leakage, a pressure test with visual inspection will be performed on each of the installed MNSA-2s with any insulation removed. The test will be performed as part

of plant restart and will be conducted at normal operating pressure, with the test temperature determined in accordance with the ANO-2 P-T Limits, as stated in the ANO-2 Technical Specifications. Additionally, VT-2 examination of the external edge of the counterbore region will be performed to verify no leakage is present that would not be detected by the leakoff nozzle.

7. With respect to the two modified instrument nozzles, the socket weld between the inserted new nozzle and the old nozzle is the new pressure boundary. Cracks in the "J"-groove welds have the potential to show leakage at the surface of the pressurizer in the annulus region between the old nozzle and the base material, and if the socket weld were to crack, the leakage is observed at the socket weld. Since "...*the MNSA-2 is a mechanical device designed to replace the function of partial penetration J-groove welds that attach Alloy 600 nozzles or heater sleeves to the pressurizer*..." (as stated in your application dated March 15, 2002), for evidence of leakage at the surface of the pressurizer, the proposed MNSA-2 repair would be appropriate. On the other hand, if the evidence of leakage is at the socket weld, the proposed MNSA-2 repair would not be appropriate. Normal weld repair techniques would be required.

The NRC staff has reviewed the proposed licensee actions and limitations noted above, and concludes that they are sufficient to assure proper installation and operation of the MNSA-2 for their intended use and duration.

4.0 <u>CONCLUSION</u>

The NRC staff concludes that, pursuant to 10 CFR 50.55a(a)(3)(i), the use of MNSA-2s as an alternative to an ASME Code Section XI repair on any leaking nozzles or heater sleeves of the type described above, may be authorized for a period not to exceed two operating cycles, since it is found to provide an acceptable level of quality and safety. This authorization is valid for the next two operating cycles of the current ISI interval for ANO-2, which ends on March 25, 2010.

Principle Contributors: T. Bloomer, M. Hartzman

Date: July 3, 2002

cc:

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