



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

August 3, 2009

Mr. Samuel L. Belcher
Vice President Nine Mile Point
Nine Mile Point Nuclear Station, LLC
P.O. Box 63
Lycoming, NY 13093

SUBJECT: NINE MILE POINT NUCLEAR STATION, UNIT NO. 1 – REQUEST TO UTILIZE THE ALTERNATIVE OF APPLYING ASME CODE CASE N-730 FOR THE REPAIR AND INSERVICE INSPECTION OF CONTROL ROD DRIVE BOTTOM HEAD PENETRATIONS FOR THE LICENSE RENEWAL PERIOD OF EXTENDED OPERATION (TAC NO. MD9604)

Dear Mr. Belcher:

By letter dated August 29, 2008, as supplemented by letters dated May 14 and June 25, 2009, Nine Mile Point Nuclear Station, LLC (NMPNS, the licensee) submitted relief request (RR) 1ISI-02, for Nine Mile Point, Unit No. 1 (NMP1), proposing alternatives to the requirements of Title 10 of the *Code of Federal Regulations*, Part 50, Section 55a (10 CFR 50.55a), concerning the requirements of the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," for the repair of its control rod drive (CRD) bottom head penetrations.

In proposed Alternative 1A, NMPNS requests the use of ASME Code Case N-730, "Roll Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1," as an alternative permanent repair for any non-previously roll-expanded CRD housing penetrations that may exhibit leakage during the license renewal period of extended operation or for the re-roll expansion of any previously roll expanded CRD housing that exhibits a repeat occurrence for leakage. In proposed Alternative 2A, NMPNS requests the use of ASME Code Case N-730, but with the post-roll leakage test conducted at a lower pressure. The request would allow use of the proposed alternatives for the license renewal period of extended operation (August 23, 2009, to August 22, 2029).

The Nuclear Regulatory Commission (NRC) staff has reviewed NMPNS's regulatory and technical analysis in support of RR-1ISI-02. Based on the information provided by NMPNS, the NRC staff has concluded that proposed Alternative 1A meets the four evaluation criteria specified in Section 5 of ASME Code Case N-730, and provides an acceptable level of quality and safety for the repair of NMP1 CRD bottom head penetrations. Alternative 1A is authorized until such time as the Code Case is published in a future version of RG 1.147. Consequently, pursuant to 10 CFR 50.55a(a)(3)(i), Alternative 1A is authorized for the license renewal period of extended operation, pertaining to roll-expansion repair of the NMP1 CRD bottom head penetrations. The NRC staff does not approve the proposed Alternative 2A because the benefit obtained from not performing the post-roll leakage test at the required pressure does not outweigh the negative implication regarding a repaired component's operating safety.

S. Belcher

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The NRC staff's safety evaluation is enclosed. If you have any questions, please contact Rich Guzman at (301) 415-1030 or via email at Richard.Guzman@nrc.gov.

Sincerely,

A handwritten signature in black ink that reads "Nancy L. Salgado". The signature is written in a cursive style with a large initial "N".

Nancy L. Salgado, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-220

Enclosure:
As stated

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO THE REQUEST TO USE ALTERNATIVES FOR
THE REPAIR AND INSERVICE INSPECTION OF CONTROL ROD DRIVE STUB TUBES FOR
THE LICENSE RENEWAL PERIOD OF EXTENDED OPERATION
NINE MILE POINT NUCLEAR STATION, LLC
NINE MILE POINT NUCLEAR STATION, UNIT NO. 1
DOCKET NO. 50-220

1.0 INTRODUCTION

By letter dated August 29, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML082530250), as supplemented by letters dated May 14 and June 25, 2009 (ADAMS Accession Nos. ML091410447 and ML091830049, respectively), Nine Mile Point Nuclear Station, LLC (NMPNS, the licensee) submitted relief request (RR) 1ISI-02, for Nine Mile Point, Unit No. 1 (NMP1), proposing alternatives to the requirements of Title 10 of the *Code of Federal Regulations*, Part 50, Section 55a (10 CFR 50.55a), concerning the requirements of the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," for the repair of its control rod drive (CRD) bottom head penetrations.

In proposed Alternative 1A, NMPNS requests the use of ASME Code Case N-730, "Roll Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1," as an alternative permanent repair for any non-previously roll-expanded CRD housing penetrations that may exhibit leakage during the license renewal period of extended operation or for the re-roll expansion of any previously roll expanded CRD housing that exhibits a repeat occurrence for leakage. In proposed Alternative 2A, NMPNS requests the use of ASME Code Case N-730, but with the post-roll leakage test conducted at a lower pressure. The request would allow use of the proposed alternatives for the license renewal period of extended operation (i.e., from August 23, 2009, to August 22, 2029).

2.0 REGULATORY EVALUATION

The inservice inspection (ISI) of the ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda, as required by 10 CFR 50.55a(g), except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) of 10 CFR Part 50 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) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, 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 ISI interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, which was 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.

If leakage is detected by visual examinations during the ISI from the ASME Code Class 1 components, such as the CRD bottom head penetrations, the applicable guidance and requirements are found in ASME Code, Section XI, IWA-4000, "Repair/Replacement Activities," and IWB-3142, "Acceptance." However, the licensee requested to use ASME Code Case N-730 or ASME Code Case N-730 with a post-roll leakage test conducted at reduced pressure to repair its CRD bottom head penetrations in coming outages, in lieu of the requirements specified in the ASME Code, Section XI.

3.0 TECHNICAL EVALUATION

3.1 Component Identification, ASME Code Requirements, and Proposed Alternatives

Components for which Relief is Requested

This relief request applies to NMP1 CRD bottom head penetrations.

ASME Code Requirements

ASME Code, Section XI, 2001 Edition through 2003 Addenda, IWA-4000, "Repair/Replacement Activities," requires that all repair and replacement be performed in accordance with the provisions of IWA-4000. Additionally, IWB-3142, "Acceptance," provides acceptance criteria for components, which includes removal of the relevant condition.

Proposed Alternative 1A

Instead of meeting the above-mentioned requirements of ASME Code, Section XI, IWA-4000 and IWB-3142, NMPNS requested approval of ASME Code Case N-730 as an alternative permanent repair for (1) any additional CRD housing penetrations that exhibit leakage during the license renewal period commencing August 23, 2009, or (2) the re-roll expansion of any previously roll expanded CRD housing that still exhibits leakage. NMPNS stated in its application dated August 29, 2008, that it will perform volumetric (ultrasonic test) examinations and system leakage tests on the 33 existing roll-expansion repairs in accordance with requirements of ASME Code Case N-730 to provide added assurance of CRD housing structural integrity and a zero leakage acceptance criteria, respectively.

Proposed Alternative 2A

If a CRD housing penetration leak is detected during the leakage test required by IWB-5000, the CRD housing would be roll expanded in accordance with ASME Code Case N-730 during that outage. NMPNS proposes to follow ASME Code Case N-730, paragraph 6.6 to perform VT-2 visual examination for leakage from previously roll expanded CRD housing penetrations in accordance with IWB-5000. However, as an alternative to the rated test pressure required by IWB-5000, NMPNS proposes to perform the post-roll VT-2 examination at approximately 900 psig.

3.2 Staff Evaluation of the Basis for the Proposed Alternative 1A

The licensee's May 14, 2009, response to a staff request for additional information (RAI) provides NMPNS's evaluation in accordance with Section 5 of the ASME Code Case N-730, supporting the proposed roll expansion.

Section 5.1 of ASME Code Case N-730 requires the post-roll CRD housing thickness to meet the primary stress limits of the ASME Code, Section III. The licensee performed a plant-specific analysis and concluded that after 6.5% wall thinning the load capacity of the CRD housing remains greater than the load capacity of the stub-tube-to-housing J-groove weld, demonstrating that the primary load carrying capacity of the repaired CRD penetrations meets the ASME Code Section III requirements. The licensee also reviewed secondary stresses and fatigue usage factors and found that the repaired CRD penetrations meet the relevant ASME Code Section III requirements. Thus, the staff determined that the proposed Alternative 1A meets the ASME Code Case N-730 Section 5.1 requirement.

Section 5.2 of ASME Code Case N-730 requires the post-roll CRD penetration satisfy all plant-specific design criteria related to structural integrity. The licensee performed a plant-specific evaluation considering specified load combinations and design-basis events. The licensee determined that the upward scram loads are the limiting loads. To demonstrate that the CRD penetration assembly can resist the scram loads, the licensee calculated the required roll band length using the ASME Code Case equation and found the length to be 1.7 inches. Since the design specification for the NMP1 roll expansion of CRD penetrations calls for a roll band length of 4.5 inches, the staff agrees with the licensee that the post-roll CRD penetration will satisfy all plant-specific design criteria related to structural integrity. Thus, the proposed Alternative 1A meets the ASME Code Case N-730 Section 5.2 requirement.

Section 5.3 of ASME Code Case N-730 requires crack growth due to stress corrosion cracking and fatigue be predicted. For the NMP1 CRD penetrations, cracks in the following three locations are within the scope of ASME Code Case N-730: (a) CRD stub tube base metal, (b) CRD stub-tube-to-housing J-groove weld, and (c) CRD stub-tube-to-vessel attachment weld. The licensee stated that if cracking is detected in the welds defined in (b) and (c), evaluations required by Section 5.0 of this Code Case will be performed. The licensee's letter of June 25, 2009, further clarified that the evaluation will also be performed if cracking is detected in the location defined in (a). Thus, the proposed Alternative 1A meets the ASME Code Case N-730 Section 5.3 requirement.

Section 5.4 of ASME Code Case N-730 requires evaluation of a postulated axial crack in the vessel attachment weld if the source of the leakage is identified there. NMPNS performed a plant-specific evaluation of a postulated flaw in the vessel attachment weld and concluded that structural integrity of the vessel is maintained. This evaluation includes comparing key parameters of the NMP1 CRD penetration with those of the generic fracture mechanics evaluation in the technical-basis document for ASME Code Case N-730 (XGEN-2005-10, Appendix A). With less driving force and higher material resistance, NMPNS has demonstrated that the NMP1 CRD penetration is bounded by the generic XGEN-2005-10 Appendix A analysis. Thus, the proposed Alternative 1A meets the ASME Code Case N-730 Section 5.4 requirement.

As discussed above, the staff finds that the licensee has met the four evaluation criteria specified in Section 5 of ASME Code Case N-730, and demonstrates that an acceptable level of quality and safety can be maintained for the repaired NMP1 CRD bottom head penetrations. Further, in its submittal dated August 29, 2008, NMPNS provided plant-specific operating experience, which indicated that (1) the licensee can roll-expand CRD bottom head penetrations to achieve a zero leakage condition and (2) hydrogen water chemistry and noble metal chemical application (HWC/NMCA) has been an effective method to mitigate further cracking and leakage. Therefore, the staff finds proposed Alternative 1A acceptable.

3.3 Staff Evaluation of the Basis for the Proposed Alternative 2A

The licensee's May 14, 2009, response to a staff RAI stated that during the refueling outage, NMPNS will perform the normal ASME Code, Section XI IWB-5000 required leakage test at the rated test pressure of 1030 psig. However, if leakage is confirmed from the CRD bottom head penetrations, NMPNS's compliance with ASME Code Case N-730 Section 6.6 post-roll expansion leakage test requirement would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety. NMPNS provided plant activities associated with nuclear and non-nuclear heatup leakage tests and considered performing these leakage tests at a pressure of 1030 psig a hardship. The licensee also considered the post-roll leakage test to be a repeat of the normal ASME Code, Section XI non-nuclear heatup test that had just been performed.

Section 6.6 of ASME Code Case N-730 requires post-roll CRD housing be subjected to VT-2 visual examination in conjunction with a system leakage test in accordance with IWB-5000. This is consistent with the requirement of IWA-4540 for repair/replacement activities performed by welding or brazing on a pressure-retaining boundary to ensure structural integrity of the repaired component during operation. The first leakage test performed by the licensee is for detection of leakage from the pressure boundary, including the CRD housing. The second leakage test (performed only if a CRD housing is repaired using roll expansion) is a demonstration of the structural and leakage integrity of the repaired component. Therefore, the staff does not consider the post-roll leakage test a repeat of the normal ASME Code, Section XI non-nuclear heatup test that had been performed for pressure boundary leakage detection. Performing a post-roll leakage test at the ASME Code Case specified pressure would result in plant activities similar to those taken by every plant periodically for its leakage test. Therefore, the staff does not agree that requiring the licensee to perform the post-roll pressure test in accordance with the ASME Code Case constitutes a hardship or unusual difficulty.

Further, performing the leakage test at the required pressure does have a compensating increase in the level of quality and safety compared to performing the leakage test at a reduced pressure. The ASME Code Case requirement to perform the post-roll system leakage test at normal operating pressure is consistent with the ASME Code philosophy that the system should be tested to the pressure that it will be operating at before being placed back into service. The staff does not find the licensee's technical argument of incrementally reducing the test pressure by 130 psi to be a compelling justification in order to grant the requested alternative to the ASME Code Case requirement. Hence, the staff does not approve the proposed Alternative 2A because the benefit obtained from not performing the post-roll leakage test at the required pressure does not outweigh the negative implication regarding a repaired component's operating safety.

4.0 CONCLUSIONS

The NRC staff has reviewed NMPNS's regulatory and technical analysis in support of RR-11SI-02. Based on the information provided by NMPNS, the NRC staff has concluded that proposed Alternative 1A meets the four evaluation criteria specified in Section 5 of ASME Code Case N-730, and provides an acceptable level of quality and safety for the repair of NMP1 CRD bottom head penetrations. Alternative 1A is authorized until such time as the Code Case is published in a future version of RG 1.147. At that time, if the licensee intends to continue implementing the Code Case, the licensee must follow all provisions in ASME Code Case N-730 with conditions as specified in RG 1.147, if any. Consequently, pursuant to 10 CFR 50.55a(a)(3)(i), Alternative 1A is authorized for the license renewal period of extended operation, pertaining to roll-expansion repair of the NMP1 CRD bottom head penetrations. The NRC staff does not approve the proposed Alternative 2A because the benefit obtained from not performing the post-roll leakage test at the required pressure does not outweigh the negative implication regarding a repaired component's operating safety.

All other requirements of the ASME Code, Sections III and XI, for which alternative has not been specifically requested and approved remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: S. F. Sheng

Date: August 3, 2009

S. Belcher

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The NRC staff's safety evaluation is enclosed. If you have any questions, please contact Rich Guzman at (301) 415-1030 or via email at Richard.Guzman@nrc.gov.

Sincerely,

/RA/

Nancy L. Salgado, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-220

Enclosure:
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