November 12, 2004

Mr. Christopher M. Crane
President and Chief Nuclear Officer
AmerGen Energy Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: OYSTER CREEK NUCLEAR GENERATING STATION - ALTERNATIVE REPAIR OF CONTROL ROD DRIVE HOUSING INTERFACE WITH REACTOR VESSEL (TAC NO. MC1099)

Dear Mr. Crane:

By letter dated October 21, 2003, as supplemented on July 20, August 23, and September 8, 2004, AmerGen Energy Company, LLC (AmerGen) requested approval of an alternative repair under Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i), of the control rod drive (CRD) housing penetrations at Oyster Creek Nuclear Generating Station (OCNGS). AmerGen requested to extend the approval of the previously approved roll-expansion repairs to CRD housing penetrations 42-43 and 46-39, and to perform re-roll repairs to the same if necessary to meet specific leakage criteria. In addition, AmerGen requested the use of this alternative repair for any additional penetrations that may exhibit leakage.

The Nuclear Regulatory Commission staff reviewed the referenced submittals (see enclosed safety evaluation) and determined that AmerGen's proposed alternative will provide reasonable assurance of the integrity of the CRD housing interface with the reactor pressure vessel, and concluded that the proposed alternative will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized until the next refueling outage (i.e., RFO 21).

If you have any questions, please call the Project Manager, Mr. Peter Tam at 301-415-1451.

Sincerely,

/RA/

Richard J. Laufer, Chief, Section 1
Project Directorate 1
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-219

Enclosure: As stated

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ALTERNATIVE REPAIR OF CONTROL ROD DRIVE (CRD) HOUSING INTERFACE

WITH REACTOR VESSEL

AMERGEN ENERGY COMPANY, LLC

OYSTER CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-219

1.0 INTRODUCTION

By letter dated October 21, 2003 (Reference 1), AmerGen Energy Company, LLC (the licensee) submitted for Nuclear Regulatory Commission (NRC) staff review a relief request for an alternative repair of the CRD housing penetrations for Oyster Creek Nuclear Generating Station (OCNGS). The licensee requested to extend the approval of the previously approved (Reference 2) roll-expansion repairs to CRD housing penetrations 42-43 and 46-39, and to perform re-roll repairs to CRD housing penetrations 42-43 and 46-39, if necessary, to meet specific leakage criteria. In addition, the licensee requested the use of this alternative repair for any additional penetrations that may exhibit leakage.

A similar request was approved by the NRC in a safety evaluation (SE) dated October 18, 2002 (Reference 2), for one cycle (up to Refueling Outage R20). The licensee is requesting approval to extend the use of this alternative repair for an additional refueling cycle, up to refueling outage R21. In response to questions of clarification raised by the NRC staff, the licensee submitted additional information by letters dated July 20 (Reference 3), August 23 (Reference 4), and September 8, 2004 (Reference 5), to support its original request. References 1, 3, 4, and 5 constitute the application, the subject of this safety evaluation (SE).

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g), requires that nuclear power facility components must meet the requirements contained in specific editions of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for Inservice Inspection and Repair and Replacement Programs. Specifically, ASME Code, Section XI, IWA-4000, describes the ASME Code repair process and requires the removal of the flaw and a subsequent weld repair. ASME Code, Section XI, IWA-5250 requires that the source of leakage detected during the conduct of a pressure test on a system be located and evaluated for corrective measures and repair. Pursuant to 10 CFR 50.55a(a)(3), proposed alternatives to the requirements of 10 CFR 50.55a(g) may be used provided the applicant demonstrates (i) that the proposed alternatives would provide an acceptable level of

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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.

As an alternative to the ASME Code repair, the licensee proposed to follow repair techniques and criteria stated in the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Topical Report, "Roll/Expansion Repair of Control Rod Drive and In-Core Instrument Penetrations in BWR Vessels (BWRVIP-17)," with some modifications.

The NRC staff conveyed the review results of BWRVIP-17 by a letter dated March 13, 1998. The NRC staff's position articulated in the March 13, 1998, letter is that the corrective action required by the ASME Code, upon discovery of a flaw in a Class 1 pressure retaining boundary component, is either to repair the flaw or replace the flawed component in order to return it to a condition of ASME Code compliance. An ASME Code-acceptable repair of a crack in a CRD stub tube or in-core penetration would require a weld repair. Although the roll/expansion method may, for some time period, control the symptom of the flaw (leakage), it does not repair the flaw; therefore, it does not meet the criteria or the intent of a permanent repair method. The NRC staff determined that the BWRVIP-17 report does not provide a sufficient basis for authorizing a permanent alternative pursuant to 10 CFR 50.55a(a)(3). As such, the NRC staff denied the BWRVIP-17 generic application for a permanent repair in its March 13, 1998, letter.

In Reference 2, the NRC staff approved the roll-expansion repairs to CRD housing penetrations 42-43 and 46-39 for one cycle (up to R20). The letter also recommended that if the licensee intended to use this alternative as a permanent repair, it should pursue this alternative repair of the CRD housings with the ASME Code Committee to accept this as a permanent repair through an ASME Code Case. The licensee has pursued an ASME Code, Section XI Code Case regarding this roll-expansion repair of leaking CRD and in-core penetrations. The ASME Code, Section XI Focus Group on Welding and Special Repair Processes is further developing this ASME Code Case. However, the ASME Code Case is not expected to be approved until after OCNGS's R20. Therefore, the licensee is requesting approval to extend the use of the roll repair for an additional refueling outage (i.e., R21).

3.0 TECHNICAL EVALUATION

3.1 Background

The NRC staff's SE dated November 16, 2000 (Reference 6), provides a detailed description of the history of the CRD penetration leaks at OCNGS. During R18, visual inspections performed during the reactor pressure vessel (RPV) leak test identified water leaking from the under-vessel area at the mirror insulation in the vicinity of CRD housings 42-43 and 46-39. Further inspection determined that the leakage originated at the interface of the RPV lower head and CRD housing.

The penetrations were roll-expansion-repaired in accordance with BWRVIP-17 during R18. As requested by NRC letter dated October 18, 2002 (Reference 2), the licensee submitted the R19 inspection results of the CRD housing penetrations and root cause analysis of CRD housing penetrations 42-43 and 46-39 by letter dated January 22, 2003 (Reference 7). The CRD penetrations are located in the reactor vessel lower head and each consists of a stainless steel stub tube that is welded, using alloy 82/182, to the reactor vessel lower head during the reactor vessel fabrication process. The stainless steel CRD housing is then welded in the field to the stub tube. Performance of R19 inservice inspection found no CRD housing penetration leakage. In addition, a planned visual inspection of the two roll-repaired CRD housings was performed in an attempt to find the root cause of the leakage identified in R18. An adjacent control rod guide tube was removed to provide access through the core plate for the CRD housing inspection. Visual inspection of CRD housings and stub tubes 42-43 and 46-39 did not identify any leakage paths. The most probable root cause of the CRD housing leakage is a crack in the stainless steel stub tube (which was furnace-sensitized during the heat treatment of the reactor vessel) which propagated through the stub tube weld overlay. The furnace-sensitized stub tubes were repaired during initial construction and had weld cladding applied as part of the repair. Alloy 182 was used for some of the cladding on the stub tubes, which has been observed to be susceptible to stress corrosion cracking in BWRs.

3.2 ASME Code Requirements

ASME Code, Section XI, for Inservice Inspection and Repair and Replacement Programs, IWA-4000, describes the ASME Code-repair requirements. An ASME Code repair requires the removal of the flaw and a subsequent weld repair. Additionally, ASME Code, Section XI, IWA-5250, requires that the source of leakage detected during the conduct of a pressure test on a system be located and evaluated for corrective measures and repair. The CRD housings are considered ASME Code, Section XI, Class 1 components.

3.3 Licensee's Proposed Alternative to the ASME Code Requirements

In accordance with 10 CFR 50.55a(3)(i), the licensee's application requested approval of an alternative to the ASME Code weld repair, which is required by 10 CFR 50.55a(g). The alternative repair consists of roll-expansion repairs to the CRD housing penetrations. This request is similar to the July 26, 2002 (Reference 8), request submitted by the licensee for OCNGS that was approved by the NRC in Reference 2. NRC approval was for roll-expansion repair for one cycle, from R19 up to the next refueling outage (R20). In the current application, the licensee is requesting approval to extend the use of this alternative repair for an additional fuel cycle, up to Refueling Outage R21.

3.3.1 Proposed Alternative Repair

The licensee's proposed alternative is to follow repair techniques and criteria stated in BWRVIP-17, with some modifications which include revised leakage rates. This report provides the technical basis and criteria for performing a non-ASME Code repair to an ASME Code component.

During Refueling Outage R18, the repair activity involved a roll expansion of CRD housings 42-43 and 46-39 that were plastically expanded into the bore region of the RPV lower head. This roll expansion process was previously used to repair RPV lower head housings at Nine Mile Point Unit 1 (NMP1), which employs a CRD housing design similar to that of OCNGS. In the SE dated March 25, 1987 (Reference 9), the NRC staff approved the roll expansion process for NMP1 as a temporary repair until such time as a permanent ASME Code repair could be completed. In the SE dated November 16, 2000, the NRC staff, as stated above, approved the roll expansion process for OCNGS for one cycle, as a temporary repair until such time as a permanent ASME Code repair could be completed.

The licensee implemented the methodology and tooling that was developed for the NMP1 roll expansion repair to repair OCNGS's CRD housings 42-43 and 46-39. The licensee stated that the roll expansion repair mitigated leakage from the cracking of (1) the stub tube, (2) the stub-tube-to-housing weld, or (3) the RPV-to-stub-tube weld.

3.3.2 Design Objectives

The licensee indicated that, to date, the roll expansion process eliminated leakage from CRD housings 42-43 and 46-39. Similar results in eliminating CRD housing penetration leakage are expected for any future roll-expansion repairs. The housings were plastically expanded within the RPV lower head bore to create a radial contact pressure between the housing and the vessel bore. Proper contact pressure was achieved by controlling the radial expansion of the housing and by utilizing additional passes to increase the contact length. The licensee stated that the process will have no harmful effects on affected CRD housings.

3.3.3 Design Criteria

CRD housings 42-43 and 46-39 were diametrically expanded to ensure that the contact pressure at the housing to RPV lower head bore was about 3 to 5 times the RPV system pressure (i.e., 3000 psi - 5000 psi). During the rolling process, the CRD housing expands locally along the rolled interfaces. Because the yield strength of the RPV lower head is greater than that of the CRD housing, the net effect is plastic deformation and wall thinning of the CRD housing. Wall thinning of 3- to 5-percent in the housing thickness is required to achieve a continuous contact pressure between the housing and the vessel bore. Experience has shown that a roll length between 4.5 to 5.5 inches combined with wall thinning in the range of 3%-5% is effective in mitigating leakage. The diameter of the CRD housing is increased by 0.070 inches ± 0.006 inches. The roll expansion process, equipment, and personnel are qualified on a mockup to ensure that process parameters are maintained during in-plant application.

The actual CRD housing wall thinning was in the range of 5.8% for CRD 42-43 and 6% for CRD 46-39. The licensee provided a discussion regarding these wall thinning results by letter dated November 14, 2000 (Reference 10). The report concluded that, while greater than the nominal range for a typical initial roll, the wall thinning achieved for CRDs 42-43 and 46-39 was within design parameters and there were no negative impacts.

3.3.4 Penetration Leakage Acceptance Limits

The licensee stated that the leakage that can be generated through all possible locations is not considered safety-significant since allowable total unidentified leakage is limited to 5 gpm and the allowable increase in unidentified leakage within any 24-hour period of steady-state operation is limited to 2 gpm per OCNGS Technical Specifications (TSs). Additionally, acceptable leakage limits, as documented in BWRVIP-17, will be followed. These leakage limits are similar to those approved for NMP1 in the NRC SE dated March 25, 1987. The leakage limits reflect whether the inspection for leakage occurs during a short (<7 days) or extended (>7 days) outage. In accordance with the NRC's approval of NMP1 leakage limits, the maximum number of leaking housings or stub tubes will not exceed five. However, the licensee's letter of August 23, 2004 (Reference 4), provided revised leakage rates which are restated in Tables 1 and 2 of this SE.

3.3.5 Repair Evaluation and Qualification

The licensee stated that the roll repair will meet the qualification criteria in Section 3 of BWRVIP-17 as it applies to OCNGS, without exception.

3.3.6 Pre-Repair and Post-Repair Inspection

Before performing the repair, the housing will be ultrasonically tested (UT) to verify its structural integrity in the area to be rolled and at the location of the CRD housing to stub-tube weld (including the portion of the housing above and below the weld with coverage of the heat-affected zone). The examinations will be performed in accordance with an intergranular stress-corrosion cracking (IGSCC)-qualified procedure. Dimensional inspections will be performed, as appropriate, to determine the pre-rolled inside diameter (ID) of the CRD housing. Additionally, all repaired CRDs will be stroke timed and scram tested before returning to service.

Following repair and before plant restart, the UT will be repeated and dimensional examinations performed. The purpose of the follow-up UT examination is to confirm that no cracks developed during rolling. The purpose of the dimensional inspection is to determine the as-rolled inside diameter of the housing so that the wall thinning can be verified. An ASME Code, Section XI, inservice leak test and post-repair pressure test will be performed to determine the extent, if any, of remaining leakage.

A VT-2 visual examination will be performed during the pressure test to satisfy the requirements of ASME Code, Section XI, IWA-5246. The examinations will be performed at the nominal operating pressure of the Class 1 boundary, based on ASME Code, Section XI, IWA-4000, requirements for pressure testing the installation of mechanical joints.

During subsequent refueling outages, UT examination of the housing will be performed when normal CRD maintenance activities make access to the housing inside diameter available.

3.4 Bases for Requesting Relief

3.4.1 Component Failure Analysis

Because the leakage location was indeterminate, an ASME Code-compliant weld repair could not be specified by the licensee. Although the exact origination of the leak was not determined, several possibilities exist, which include: (1) the stub tube, (2) the stub-tube-to-housing weld, or (3) the RPV-to-stub-tube weld. All of these components are constructed of stainless steel. The leaking stub tubes were sensitized during stress relief of the reactor vessel during its construction. It should be noted that stub tubes were cracked prior to operation perhaps by the chlorides in the seaside environment. The sensitized stub tubes were repaired and clad with 308L stainless steel weld material and 182 nickel-based weld material to limit the likelihood of cracking while in service.

The most likely cause of leakage of a stainless steel weld in this service is crack growth resulting from IGSCC, which is well understood. All industry experience related to stainless steel cracking has shown ample time to react from the time of significant leakage to failure. In addition, prior to performing the repair, the CRD housing will be ultrasonically examined to verify its structural integrity in the area to be rolled and at the location of the CRD housing-to-stub-tube weld. This examination will include that portion of the housing above and below the stub-tube-to-RPV weld.

3.4.2 Safety Analysis for the Repaired Penetration

In the October 21, 2003, submittal, the licensee referred to the July 20, 2002, submittal for the details of the proposed alternative. The following areas were addressed:

(1) Leakage from Housing to Stub-Tube Welds, Stub-Tube-to-Vessel Welds, or Through-Wall Leakage in the Stub Tube

The leakage that can be generated through any and all of these locations is not considered safety-significant since any leakage will be measured as part of the unidentified leak rate, which has a TSs limit of 5 gpm. Additionally, the existing requirements limit the increase in unidentified leakage within any 24-hour period of steady-state operation to 2 gpm. Any leakage will be well within plant system make-up capabilities. Therefore, leakage is controlled. In addition, the licensee provided in its August 23, 2004, letter revised leakage limits that are more conservative than the previous limits (reproduced in Tables 1 and 2 of this SE).

(2) Rod Ejection Due to Total Stub-Tube Failure

Rod ejection from total stub-tube-to-housing failure is not a credible scenario because the weld nugget attached to the CRD housing would not allow the housing or rod to be ejected if the stub tube was completely cracked.

In the extremely unlikely event that rod ejection occurs, the system design includes the CRD shoot-out steel installed under the vessel, which will limit rod ejection such that total ejection and/or missile generation is not possible. Leakage from a rod housing total displacement has been determined to be about 150 gpm. The core spray system is designed for a large-break loss-of-coolant accident event. Therefore, the leakage associated with a rod ejection is well within the capability of the core spray system. Additionally, this equipment is positioned below the CRDs and designed for the maximum force that could be imposed by a ruptured CRD housing, so that axial motion would be prohibited or limited.

The ability of the collet fingers to stop rod ejection has been investigated using dynamic drop tests. Free fall drop tests of weights equal to the rod weight were conducted to simulate index tube impact on the collet. Height of the free fall was varied to cover a range of impact velocities from zero to 15 feet per second (maximum possible rod ejection velocity in the CRD is calculated to be 10 feet per second). In each test, the ability of the collet to stop the ejection and hold the index tube was demonstrated. Thus, even in the event of a housing failure, the control rod would not be ejected from the core (OCNGS Updated Final Safety Analysis Report, Section 3.9.4.4).

(3) Loads During Scram

Loads on the housing that result from a scram (CRD deceleration) could lift the housing relative to the head. The upward force is from the inertia of the drive and the control blade as its upward velocity is stopped at the end of the insertion (or scram) stroke. The possibility of upward motion of a housing at the end of the scram has been investigated.

Vessel pressure above 372 psi results in a downward force on the housing that is sufficient to resist motion caused by the end of scram force (including a suddenly applied load factor of 2). Therefore, the housing will not lift and the rods will remain in place. If the scram occurs below 372 psi, the insertion function of the drive will already have been accomplished.

(4) CRD Misalignment Such That Rod Insertion Is Affected

CRD misalignment can only occur with a 360-degree through-wall crack in the CRD housing-to-stub-tube weld, stub-tube-to-vessel weld, or rod ejection. Misalignment will be minimized, should it occur, by the roll repair. Testing will be performed to verify drive operability. Rod movement is verified periodically, and any potential problems will be identified by normal, required surveillance testing.

(5) CRD Housing Displacement

The roll expansion repair can cause the top end of the CRD housing to be displaced relative to the lower flange in the horizontal direction, which could potentially cause misalignment of the control rod blade within the reactor core and create difficulties in control rod blade insertion. As discussed in the NRC SE for NMP1 (dated June 29, 1984), the effect of CRD housing misalignment with respect to the reactor core was evaluated by General Electric. Test results indicate that there is no significant increase in scram time for a 1-inch displacement of the CRD housing. The maximum displacement of the NMP-1 CRD housing was 0.35 inch; therefore, the functional requirement of the CRD to insert the control rod blades will not be adversely affected by the roll expansion repair. Additionally, scram time testing will be performed on all drives that will undergo the rolling process.

(6) Structural Loads

Stress analysis performed by Combustion Engineering for NMP-1 has shown that the load carrying capacity of the rolled area exceeds that of the weld; therefore, the load carrying capacity will not be compromised by rolling. Furthermore, the fatigue usage factors were found to remain essentially the same after implementation of the roll expansion repair. Although this is not a plant-specific analysis for Oyster Creek, the general conclusions provides assurance of the structural integrity for an additional refueling cycle since the effects on load carrying capacity and fatigue usage factors have been shown to be minimal. After implementation of the roll expansion repair, the CRD housing and RPV lower head will continue to meet plant design fatigue requirements.

4.0 NRC Staff Evaluation of the Proposed Alternative

Based on industry experience, roll expanding of the CRD housing to the RPV has been identified as an appropriate alternative temporary repair for use at OCNGS. To date, the roll expansion process has been successful in eliminating leakage from CRD housings 42-43 and 46-39. The housings were plastically expanded within the RPV lower head bore to create a radial contact pressure between the housing and the vessel bore. Proper contact pressure is achieved by controlling the radial expansion of the housing and by utilizing additional passes to increase the contact length. The process will have no harmful effects on CRD housing 42-43 and 46-39 stub tubes or the reactor vessel. Potential failures, which could occur as a result of this repair, have been evaluated as discussed in Section 3.4 above.

The roll repair will meet the qualification criteria in Section 3 of BWRVIP-17 as it applies to OCNGS, without exception, and the nominal 3- to 5-percent minimum thinning to achieve continuous contact. Additionally, the alternative provides for the pre-repair and post-repair inspections to ensure the adequacy of this proposed repair.

The licensee's letters dated July 20 and September 8, 2004, confirm that it will continue to perform a VT-2 visual examination for leakage on all CRD housings, and a UT inspection of the CRD housings that are roll-repaired, when normal CRD maintenance activities make access to the housing inside diameter available. In addition, the licensee stated in its July 20, 2004, letter that one of the roll-repaired CRD housings may become accessible this outage (R20) and subject to UT examination. Accordingly, the NRC staff requests that the licensee provide, within 90 days of the examination, the results of the refueling outage (R20) inspections described above. In addition, the licensee committed by its July 20, 2004, letter, to perform a visual inspection of the roll-repaired CRD housings each time access is gained under the vessel, including forced outages. Access is gained under the vessel for every refueling outage. For other planned or forced outages, access is gained only when there is a need (i.e., due to occupational dose concerns) to enter the drywell. In its September 8, 2004, letter, the licensee also confirmed that if additional roll repairs of CRD housings and/or re-roll of CRD housings 42-43 and 46-39 are performed during Refueling Outage R20, the licensee will perform a visual inspection (VT-1) of the stub tube and stub tube-to-vessel attachment welds of these additional rolled and/or re-rolled penetrations at the next refueling outage (R21). This VT-1 inspection is used to identify the location and to characterize the flaw in these penetrations.

On the basis that use of the alternative repair in BWRVIP-17, along with the associated pre-repair and post-repair inspections will provide adequate assurance of structural integrity, the NRC staff finds that the proposed alternative would provide an acceptable level of quality and safety until Refueling Outage R21.

The licensee stated that acceptable leakage limits, as documented in BWRVIP-17, will be followed. However, the NRC staff's position is that the BWRVIP-17 leakage limits are not acceptable because it is inconsistent with the NRC staff's general policy that reactor coolant pressure boundary leakage is not acceptable. As a result of discussions between the NRC staff and the licensee, the licensee provided the August 23, 2004, letter, which revised leakage limits and associated repair actions (reproduced in Tables 1 and 2, attached). The leakage limits specified by Tables 1 and 2 to be used for refueling outage R20 are significantly lower than the limits used in BWRVIP-17, and provide an acceptable level of safety until the next refueling outage (R21). In addition, Tables 1 and 2 specify a zero leakage limit for refueling outage R21 and subsequent outages. Therefore, at the conclusion of Refueling Outage R21, any leaking CRD housings will have to be repaired to meet the zero leakage requirement prior to returning the unit to power operation. Accordingly, the NRC staff finds the Table 1 and 2 leakage limits and repair actions provide an acceptable level of quality and safety.

In its submittals of July 20 and September 8, 2004, the licensee confirmed that the use of hydrogen water chemistry, including noble metal chemistry addition, will continue through the subject period. The licensee's continuing use of such measures should improve resistance to IGSCC of the CRD housings.

The NRC staff has evaluated the licensee's proposed alternative for OCNGS and finds it acceptable until the next refueling outage (R21). This alternative includes the previous roll-expansion repairs to CRD housing penetrations 42-43 and 46-39, potential re-roll repairs to these two CRD housing penetrations, and roll-expansion repairs of additional CRD housing penetrations that may exhibit leakage. Since the initial wall thinning for CRD housing 42-43 is 5.8%, and 6.0% for CRD housing 46-39, as discussed in Section 3.3.3 above, any re-roll repairs to a nominal wall thinning of 6% for these housings will be limited. The accuracy of the nominal 6% re-roll is established as 5.5% to 6.5% wall thinning. Therefore, if a re-roll repair is necessary, the maximum increment of wall thinning during the re-roll for CRD housing 42-43 is 0.7% and for CRD housing 46-39 is 0.5%.

5.0 CONCLUSION

The licensee's proposed alternative repair will ensure the continued integrity of the CRD housings and reactor vessel, and ensure that the associated components perform their intended safety function. The alternative includes controls over repair processes that have been established to ensure that the repair will be performed in a safe and effective manner.

The NRC staff determines that the licensee's proposed alternative will provide reasonable assurance of the integrity of the CRD housing interface with the RPV, and the NRC staff concludes that the proposed alternative will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized until the next refueling outage (R21).

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

6.0 REFERENCES

(1) Letter from M. P. Gallagher (AmerGen) to NRC Document Control Desk, Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel, October 21, 2003 (ADAMS Accession Number ML033010434).

(2) Letter from R. J. Laufer (NRC) to J. L. Skolds (Exelon), Approval of Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel, October 18, 2002 (ADAMS Accession Number ML022910149).

(3) Letter from M. P. Gallagher (AmerGen) to NRC Document Control Desk, Response to Request for Additional Information Concerning Alternative Repair of Control Rod Drive

Housing Interface with Reactor Vessel, July 20, 2004 (ADAMS Accession Number ML042100269).

(4) Letter from C. N. Swenson (AmerGen) to NRC Document Control Desk, Response to Request for Additional Information Concerning Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel, August 23, 2004 (ADAMS Accession Number ML042440590).

(5) Letter from M. P. Gallagher (AmerGen) to NRC Document Control Desk, Response to Request for Additional Information Concerning Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel, September 8, 2004 (ADAMS Accession Number ML042590575).

(6) Letter from M. Gamberoni (USNRC) to R. DeGregorio (AmerGen), Approval of Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel, November 16, 2000 (ADAMS Accession Number ML003769346).

(7) Letter from E. J. Harkness (AmerGen) to NRC Document Control Desk, Inservice Inspection Data Reports, January 22, 2003 (ADAMS Accession Number ML030300510).

(8) Letter from M. P. Gallagher (AmerGen) to NRC Document Control Desk, Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel, July 26, 2002 (ADAMS Accession Number ML022190364).

(9) Letter from R. Auluck (USNRC) to C. V. Mangan (Niagara Mohawk Power Corporation), Approval of Request to Utilize an Alternative to the Requirements of 10 CFR 50.55a(g), March 25, 1987 (ADAMS Accession Number ML003671360).

(10) Letter from R. J. DeGregorio (AmerGen) to NRC Document Control Desk, Modification to Proposed Alternative Repair of Control Rod Drive Housing Interface with Reactor Vessel, November 14, 2000 (ADAMS Accession Number ML003769879).

Principal Contributors: J. Honcharik
M. Hartzman

Date: November 12, 2004

Attachments:
Attachment 1 - Table 1, CRD Penetration - Allowable Leakage Rates for Inspections During Plant Outages with a Scheduled Duration of Less than or Equal to 7 Days
Attachment 2 - Table 2, CRD Penetration - Allowable Leakage Rates for Inspections During Plant Outages with a Scheduled Duration of Greater than 7 Days

TABLE 1
CRD Penetration - Allowable Leakage Rates for
Inspections During Plant Outages
with a Scheduled Duration of
Less than or Equal to 7 Days

Condition	Allowable Leak Rates [3]		Required Actions [1]
	800-1100 psig	Depressurized	
Previously Unrolled	80 drops/min.	20 drops/min.	• If leakage rate is zero, then acceptable for startup. • If leakage is greater than zero, but less than or equal to allowable leakage rate, then acceptable for startup. However, roll expand to 4% or perform ASME Code weld repair at next refueling outage. [2] • If leakage is greater than allowable leakage rate, then roll expand to 4% or perform ASME Code weld repair at this outage.
Rolled Once	70 drops/min.	15 drops/min.	• If leakage rate is zero, then acceptable for startup. • If leakage is greater than zero, but less than or equal to allowable leakage rate, then acceptable for startup. However, roll expand to 6% or perform ASME Code weld repair at next refueling outage. [2] • If leakage is greater than allowable leakage rate, then roll expand to 6% or perform ASME code weld repair at this outage.
Rerolled	60 drops/min.	10 drops/min.	• If leakage rate is zero, then acceptable for startup. • If leakage is greater than zero, but less than or equal to allowable leakage rate, then acceptable for startup. However, perform ASME code weld repair at next refueling outage. [2] • If leakage is greater than allowable leakage rate, then perform ASME Code weld repair at this outage.

NOTE:

[1] Any roll repairs intended to be left in service after, or performed at Refueling Outage R21 requires submittal of a relief request to the NRC 6 months prior to entering Refueling Outage R21 for approval.

[2] At the conclusion of the unit's Refueling Outage R21, all CRD penetrations, unrolled, rolled, rerolled, or weld repaired will meet a zero leakage requirement prior to returning the unit to power operation.

[3] Allowable leakage rates greater than zero leakage will no longer be acceptable as of the beginning of Refueling Outage R21.

TABLE 2
CRD Penetration - Allowable Leakage Rates for
Inspections During Plant Outages
with a Scheduled Duration of
Greater than 7 Days

Condition	**Allowable Leak Rates [3]**		**Required Actions [1]**
	800-1100 psig	**Depressurized**	
Previously Unrolled	No leakage.	No leakage	• If leakage rate is zero, then acceptable for startup. • If greater than zero leakage, then roll expand to 4% or perform ASME Code weld repair at this outage.
Rolled Once	70 drops/min.	15 drops/min.	• If leakage rate is zero, then acceptable for startup. • If leakage is greater than zero, but less than or equal to allowable leakage rate, then acceptable for startup. However, roll expand to 6% or perform ASME Code weld repair at next refueling outage.[2] • If leakage is greater than allowable leakage rate, then roll expand to 6% or perform ASME Code weld repair at this outage.
Rerolled	60 drops/min.	10 drops/min.	• If leakage rate is zero, then acceptable for startup. • If leakage is greater than zero, but less than or equal to allowable leakage rate, then acceptable for startup. However, perform ASME Code weld repair at next refueling outage.[2] • If leakage is greater than allowable leakage rate, then perform ASME Code weld repair at this outage.

NOTE:

[1] Any roll repairs intended to be left in service after, or performed at Refueling Outage R21 requires submittal of a relief request to the NRC 6 months prior to entering Refueling Outage R21 for approval.

[2] At the conclusion of the unit's Refueling Outage R21, all CRD penetrations, unrolled, rolled, rerolled, or weld repaired will meet a zero leakage requirement prior to returning the unit to power operation.

[3] Allowable leakage rates greater than zero leakage will no longer be acceptable as of the beginning of Refueling Outage R21.

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