October 6, 2006

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

SUBJECT: OYSTER CREEK NUCLEAR GENERATING STATION - RELIEF REQUEST RE: APPLICATION OF DRAFT ASME CODE CASE N-730 (TAC NO. MD1070)

Dear Mr. Crane:

By letter dated March 31, 2006, as supplemented by letters dated June 23, August 14, and September 15, 2006, AmerGen Energy Company, LLC submitted Relief Request (RR) OC-06-01. RR OC-06-01 proposed to utilize draft American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs [boiling-water reactors], Section XI, Division 1," dated February 15, 2006. The proposed alternative to the ASME Code would be applied to the repair of control rod drive bottom head penetrations 42-43 and 46-39, and any additional penetrations exhibiting leakage at the Oyster Creek Nuclear Generating Station (Oyster Creek).

Based on the information provided in RR OC-06-01, the Nuclear Regulatory Commission (NRC) staff concludes that the alternative proposed for the fourth 10-year inservice inspection (ISI) interval will provide an acceptable level of quality and safety. Therefore, pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternative for the remainder of the Oyster Creek fourth 10-year ISI interval.

The detailed results of the NRC staff's review are provided in the enclosed Safety Evaluation. If you have any questions concerning this action, please call Mr. G. Edward Miller of my staff at (301) 415-2481.

Sincerely,

/RA/

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-219

Enclosure:
Safety Evaluation

cc w/encl: See next page

Oyster Creek Nuclear Generating Station

cc:

Site Vice President - Oyster Creek
Nuclear Generating Station
AmerGen Energy Company, LLC
P.O. Box 388
Forked River, NJ 08731

Senior Vice President of
Operations
AmerGen Energy Company, LLC
200 Exelon Way, KSA 3-N
Kennett Square, PA 19348

Kathryn M. Sutton, Esquire
Morgan, Lewis, & Bockius LLP
1111 Pennsylvania Avenue, NW
Washington, DC 20004

Kent Tosch, Chief
New Jersey Department of
Environmental Protection
Bureau of Nuclear Engineering
CN 415
Trenton, NJ 08625

Vice President - Licensing and
Regulatory Affairs
AmerGen Energy Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

Mayor of Lacey Township
818 West Lacey Road
Forked River, NJ 08731

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P.O. Box 445
Forked River, NJ 08731

Director - Licensing and Regulatory Affairs
AmerGen Energy Company, LLC
Correspondence Control
P.O. Box 160
Kennett Square, PA 19348

Manager Licensing - Oyster Creek
Exelon Generation Company, LLC
Correspondence Control
P.O. Box 160
Kennett Square, PA 19348

Regulatory Assurance Manager
Oyster Creek
AmerGen Energy Company, LLC
P.O. Box 388
Forked River, NJ 08731

Assistant General Counsel
AmerGen Energy Company, LLC
200 Exelon Way
Kennett Square, PA 19348

Ron Bellamy, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

Correspondence Control Desk
AmerGen Energy Company, LLC
200 Exelon Way, KSA 1-–1
Kennett Square, PA 19348

Oyster Creek Nuclear Generating Station
Plant Manager
AmerGen Energy Company, LLC
P.O. Box 388
Forked River, NJ 08731

October 6, 2006

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

SUBJECT: OYSTER CREEK NUCLEAR GENERATING STATION - RELIEF REQUEST RE: APPLICATION OF DRAFT ASME CODE CASE N-730 (TAC NO. MD1070)

Dear Mr. Crane:

By letter dated March 31, 2006, as supplemented by letters dated June 23, August 14, and September 15, 2006, AmerGen Energy Company, LLC submitted Relief Request (RR) OC-06-01. RR OC-06-01 proposed to utilize draft American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs [boiling-water reactors], Section XI, Division 1," dated February 15, 2006. The proposed alternative to the ASME Code would be applied to the repair of control rod drive bottom head penetrations 42-43 and 46-39, and any additional penetrations exhibiting leakage at the Oyster Creek Nuclear Generating Station (Oyster Creek).

Based on the information provided in RR OC-06-01, the Nuclear Regulatory Commission (NRC) staff concludes that the alternative proposed for the fourth 10-year inservice inspection (ISI) interval will provide an acceptable level of quality and safety. Therefore, pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternative for the remainder of the Oyster Creek fourth 10-year ISI interval.

The detailed results of the NRC staff's review are provided in the enclosed Safety Evaluation. If you have any questions concerning this action, please call Mr. G. Edward Miller of my staff at (301) 415-2481.

Sincerely,

/RA/

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-219

Enclosure:
Safety Evaluation

cc w/encl: See next page
DISTRIBUTION:

PUBLIC	RidsOgcRp	RidsNrrDorl
LPLI-2 R/F	GHill (2)	RidsNrrDorlLpl1-2
CSheng	RidsNrrPMGMiller	RidsNrrLACRaynor
RidsAcrsAcnwMailCenter	RidsRgn1MailCenter	KGruss

ADAMS Accession Number: **ML062700140**

OFFICE	LPLI-2/PM	LPLI-2/LA	DCI/CFEB/BC	OGC	LPLI-2/BC
NAME	GEMiller:osr	CRaynor	KGruss	DRoth	HChernoff
DATE	9/27/06	10/6/06	9/26/06	10/5/06	10/6/06

OFFICIAL RECORD COPY

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO RELIEF REQUEST OC-06-01

AMERGEN ENERGY COMPANY, LCC

OYSTER CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-219

1.0 INTRODUCTION

By letter dated March 31, 2006, as supplemented by letters dated June 23, August 14, and September 15, 2006, AmerGen Energy Company, LLC (AmerGen or the licensee) submitted Relief Request (RR) OC-06-01. RR OC-06-01 proposed to utilize draft American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs [boiling-water reactors], Section XI, Division 1," dated February 15, 2006. The proposed alternative (with four specific deviations) to the ASME Code, would be applied to the repair of control rod drive (CRD) Bottom Head Penetrations 42-43 and 46-39, which were performed in 2000. The proposed alternative would also be applied to any future repairs of CRD bottom head penetrations exhibiting leakage at the Oyster Creek Nuclear Generating Station (Oyster Creek).

The proposed alternative (without deviations) would allow the application of draft ASME Code Case N-730 for the repair of leaking CRD bottom head penetrations at Oyster Creek for the remainder of the fourth 10-year inservice inspection (ISI) interval at Oyster Creek. It should be noted that the Nuclear Regulatory Commission (NRC) has previously approved the existing repairs on a one-time basis three times.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(a)(3), alternatives to the ASME Code requirements may be 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 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 ISI 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, 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. The fourth 10-year ISI interval for Oyster Creek began on October 15, 2002. The ISI ASME Code of record for Oyster Creek's fourth 10-year ISI interval is the 1995 Edition through 1996 Addenda. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code, incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed therein and subject to NRC approval.

AmerGen submitted RR OC-06-01 for Oyster Creek pursuant to 10 CFR 50.55a(a)(3)(i), as a proposed alternative to certain ASME Code requirements for the repair of leaking CRD bottom head penetrations.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected:

RR OC-06-01 applies to the previously-repaired Oyster Creek CRD bottom head penetrations 42-43 and 46-39, and any additional CRD bottom head penetrations that exhibit leakage for the remainder of the fourth 10-year ISI interval.

3.2 ASME Code Requirements from Which Relief is Requested:

ASME Code Section XI, 1995 Edition through 1996 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.

3.3 Licensee's Proposed Alternative:

In RR OC-06-01, AmerGen provided the following basis for application of draft ASME Code Case N-730 at Oyster Creek:

> [Oyster Creek] requests the use of Draft Code Case N-730, "Roll-Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1," for the repair of CRD housing penetrations 42-43 and 46-39. Additionally, [Oyster Creek] is requesting approval of the Code Case as an alternative repair for any additional penetrations that may exhibit leakage for the remainder of the Oyster Creek Generating Station Fourth Ten-Year Inservice Inspection Interval.
>
> The technical basis for the Code Case is provided in the Code Case N-730 Technical basis Report, "Technical Basis for ASME Code Case N-730 Roll-Expansion of Class 1 Control Rod Drive (CRD) Bottom Head Penetrations in BWRs, Section XI, Division 1," Report XGEN-2005-10, Revision 2, March 2006.
>
> 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. A visual inspection of the two roll-repaired CRD housings was performed in an attempt to find the root cause of the leakage identified in [refueling outage] 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.

The previous repair of CRD housing penetrations 42-43 and 46-39 was performed in accordance with BWRVIP-17, "Roll/Expansion Repair of Control Rod Drive and In-Core Instrument Penetrations in BWR Vessels (BWRVIP-17)," dated November 1996, as discussed in the Reference 1 through 13 letters.

An ultrasonic exam of the inside diameter of CRD housing 46-39 was performed in the [refueling outage] R20 outage (Fall 2004). No indications were identified. As discussed in the Reference 10 letter, [Oyster Creek] has been visually inspecting the two (2) roll repairs each time access is gained to under the vessel, which may include forced outage conditions. To date, no additional leakage has been identified with these CRD housings. Draft Code Case N-730 permits no leakage from a roll expanded CRD housing.

Noble Metals Chemicals Addition (NMCA) was injected in [refueling outage] R19 (2002), and Hydrogen Water chemistry (HWC) has been in operation since February 1992. HWC availability has typically exceeded 98% since 2002.

3.4 NRC Staff Evaluation of the Proposed Alternative:

During refueling outage (RFO) 18 (which occurred during the fall of 2000), AmerGen performed visual inspections during the reactor pressure vessel (RPV) head leak test and identified leakage in the vicinity of CRD Bottom Head Penetrations 42-43 and 46-39. The penetrations were repaired by roll-expansion in accordance with BWRVIP-17. This repair was approved for one cycle until the 19th RFO (which occurred during the fall of 2002) in an NRC safety evaluation (SE) dated November 16, 2000. This approval was subsequently extended until the 20th RFO (which occurred during the fall of 2004). This second approval was documented in an

NRC SE dated October 18, 2002. The October 18, 2002, SE also recommended that Oyster Creek pursue NRC approval of the repair performed in 2000 as a permanent alternative through the use of an ASME Code Case. The NRC staff's review of AmerGen's request for a permanent repair was documented in an SE dated November 12, 2004, which granted the third approval of the same roll-expansion repairs until the 21st RFO. To date, the repaired CRD Bottom Head penetrations have been operated for 6 years without having leakage indications.

AmerGen submitted draft ASME Code Case N-730, dated February 15, 2006, as an attachment to its March 31, 2006, submittal. The NRC staff reviewed the draft ASME Code Case, including the requirements on analysis and pre-repair, post-repair, and future ultrasonic (UT) inspections.

AmerGen requested NRC staff approval to apply the February 15, 2006, draft Code Case N-730 for housing penetrations that show indications of leakage in the future. The NRC staff evaluated the justification provided by AmerGen. The NRC staff found the use of the draft Code Case is acceptable, considering: (1) that the roll band length to be used is longer than what was applied to the repaired CRD housing penetrations, which are supported by XGEN-2005-10, Revision 3, making ejection of the CRD housing penetrations very unlikely; (2) a performance demonstration will be used to verify personnel capabilities and an adequate repair procedure, which greatly increases the probability for success; (3) the application of a conservative, plant-specific, fracture mechanics analysis using the approach discussed in XGEN-2005-10, Revision 3, is appropriate; and (4) that application of pre-repair, post-repair, and future ISI UT examinations be demonstrated acceptably on a mockup and personnel be qualified in accordance with Section XI, Appendix VII, Supplement 2 the use of the draft Code Case is acceptable.

In its review of AmerGen's proposed alternative, the NRC staff evaluated the differences between the process used for the 2000 repair and the draft ASME Code case N-730. The NRC staff's evaluation focused primarily on whether CRD Bottom Head Penetrations 42-43 and 46-39 repairs meet the requirements of draft ASME Code Case N-730.

In its June 23, 2006, supplement, AmerGen provided a table which listed the following four aspects of the 2000 CRD housing penetration repair that deviated from the draft ASME Code Case N-730 requirements. Those exceptions were: (1) the role band length; (2) personnel qualification requirements; (3) the analysis; and (4) nondestructive examination (NDE) during the roll-expansion repair. Qualitative justification for the acceptance of these exceptions were also provided.

For the first exception, AmerGen's August 14, 2006, supplement provided a quantitative evaluation of the roll band length using the formula in the technical basis document XGEN-2005-10, Revision 3. This evaluation reviewed the shorter roll band length of 2000 repairs, which were completed prior to the roll band length requirement being in effect. The evaluation concludes that the role band length is adequate to resist the bounding scram load of the Oyster Creek CRD. Thus, the NRC staff concludes that the roll band length is acceptable.

For the second exception, the NRC staff expressed concern about the potential consequences resulting from inadequate personnel qualification. Currently, the roll-repairs have a 6-year history of leak-free operation. Were the repairs performed improperly, problems such as leakage, would have already surfaced. Considering that the criteria, such as percent wall thinning, were verified at the time of repair, and that there is no evidence of poor workmanship, the NRC staff concludes that the lack of personnel qualification documentation has been adequately addressed.

For the third exception, AmerGen's June 23, 2006, supplement referenced a generic fracture mechanics analysis for a postulated crack in the vessel attachment weld, which is contained in XGEN-2005-10, Revision 3. The NRC staff reviewed this generic fracture mechanics analysis.

The NRC staff found that this generic analysis is conservative and assumes that the entire attachment weld is cracked. AmerGen's August 14, 2006, submittal contained a plant-specific assessment using the generic fracture mechanics analysis identifying the impact on the crack growth, applied stress, and fracture toughness using Oyster Creek data. AmerGen's assessment demonstrated that the generic analysis bounds the Oyster Creek CRD Bottom Head Penetrations. Therefore, the NRC staff concludes that AmerGen's use of the generic fracture mechanics analysis in XGEN-2005-10, Revision 3, is acceptable.

For the fourth exception, the 2000 NDEs of the roll-expansion-repaired CRD penetrations were less rigorous than those required by the draft ASME Code Case. The housing-to-stub tube welds, or J-welds, of CRD Bottom Head Penetrations 42-43 and 46-39 were examined by UT testing during the 2000 repair and were found free of indications. Further, the results of UT examinations performed in 2004 at the inside diameter of CRD Bottom Head Penetration 46-39 are consistent with the 2000 UT examination results, showing no indications. The 6-year operation of the repaired CRD Bottom Head Penetrations without leakage is an indication that the rolled region was free of indications in 2000 because the application of a roll-expansion on a cracked CRD housing is likely to cause further cracking during the roll-expansion, thereby causing leakage during subsequent operation. Although a plant-specific mockup was not used for the UT examination procedure before and after the repair of the CRD Bottom Head Penetrations 42-43 and 46-39, AmerGen stated in its September 15, 2006, supplement that it will conduct future ISIs of these two penetrations in accordance with the authorized use of the draft ASME Code Case. Therefore, the NRC staff finds that the fourth exception has been adequately addressed by AmerGen.

In summary, the NRC staff finds that AmerGen has adequately justified application of the February 15, 2006, version of ASME Code Case N-730 for the repair of CRD Bottom Head Penetrations, including resolution of the listed deviations from the draft Code Case for existing repairs.

4.0 CONCLUSION

The NRC staff has reviewed AmerGen’s submittal and determined that, in accordance with 10 CFR 50.55a(a)(3)(i), the proposed alternative program will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternative for the remainder of the Oyster Creek fourth 10-year IST interval.

All other ASME Code requirements for which relief was not specifically requested and approved in this RR remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: S. Sheng

Date: October 6, 2006