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PSEG
Nuclear L.L.C.

10 CFR 50.55a

LR-N09-0222
September 18, 2009

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Hope Creek Generating Station
Facility Operating License No. NPF-57
NRC Docket No. 50-354

Subject: Request for Alternative to Nozzle-to-Vessel Weld and Inner Radius Examinations

In accordance with 10 CFR 50.55a, "Codes and standards," PSEG Nuclear LLC (PSEG), hereby requests NRC approval of a proposed alternative to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," (ASME Section XI), for nozzle-to-vessel weld and nozzle inside radius examinations.

The details of the proposed alternative are provided in Attachment 1. The proposed alternative is consistent with ASME Code Case N-702, "Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds." The NRC approved the generic technical basis for use of ASME Code Case N-702 in a safety evaluation on December 19, 2007 (ADAMS Accession No. ML073600374). Applicability of the generic technical basis to Hope Creek is demonstrated in Appendix A to Attachment 1.

PSEG requests approval of this request by September 30, 2010 to support planning activities for Hope Creek refueling outage RF16, currently scheduled to begin in Fall 2010.

There are no commitments contained in this letter.

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NRR

If you have any questions or require additional information, please contact Mr. Paul Duke at 856-339-1466.

Sincerely,

Jeffrie J. Keenan
Manager - Licensing
PSEG Nuclear LLC

Attachment:
1. Relief Request HC-RR-I3R-06

cc: S. Collins, Administrator, Region I, NRC
R. Ennis, Project Manager - USNRC
NRC Senior Resident Inspector - Hope Creek
P. Mulligan, Manager IV, NJBNE
T. Devik - Commitment Tracking Coordinator
L. Marabella - Corporate Commitment Tracking Coordinator

Proposed Alternative
In Accordance with 10 CFR 50.55a(a)(3)(i)
--Alternative Provides Acceptable Level of Quality and Safety--

1. ASME Code Components Affected

ASME Code Class: 1

Examination Category: B-D, Full Penetration Welded Nozzles in Vessels

Item Number: B3.90 (Nozzle-to-Vessel Welds) and B3.100 (Nozzle Inner Radius Sections)

Description: See table below

Description	Size inches	B3.90 Total	Reduced B3.90 Exams	B3.100 Total	Reduced B3.100 Exams
Reactor Recirculation Inlet Nozzles N2A, N2B, N2C, N2D, N2E, N2F, N2G, N2H, N2J and N2K	12	10	3	10	3
Main Steam Nozzles N3A, N3B, N3C, and N3D	26	4	1	4	1
Core Spray Nozzles N5A and N5B	10	2	1	2	1
Reactor Pressure Vessel (RPV) Head Nozzles N6A and N6B N7	6 4	3	1	3	1
Jet Pump Instrumentation Nozzles N8A and N8B	4	2	1	2	1
Low Pressure Coolant Injection (LPCI) Nozzles N17A, N17B,N17C, N17D	12	4	1	4	1

2. Applicable Code Edition and Addenda

Hope Creek is currently in its third ten-year inservice inspection (ISI) interval and complies with ASME Code Section XI, 2001 Edition, 2003 Addenda. Additionally, for ultrasonic examinations, Section XI, Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of the 2001 Edition is implemented as required (and modified) by 10 CFR 50.55a.

3. Applicable Code Requirements

Class 1 nozzle-to-vessel weld and nozzle inner radii examination requirements are given in Subsection IWB, Table IWB-2500-1, "Examination Category B-D, Full Penetration Welded Nozzles in Vessels - Inspection Program B," Item Numbers B3.90, "Nozzle-to-Vessel Welds" and B3.100, "Nozzle Inside Radius Section," respectively. Volumetric examination is required each interval for all nozzles with full penetration

welds to the vessel shell (or head) and integrally cast nozzles. All of the nozzle assemblies identified are full penetration welds.

4. Reason for Request:

The proposed alternative provides an acceptable level of quality and safety, and the reduction in scope is expected to provide dose savings of approximately 6.5 to 7 Rem over the remainder of the interval.

5. Proposed Alternative and Basis for Use

Proposed Alternative:

In accordance with 10CFR50.55a(a)(3)(i), relief is requested from performing the required examinations on 100 percent of the listed nozzle assemblies. As an alternative, in accordance with ASME Code Case N-702, PSEG will perform examinations of 25 percent of the reactor pressure vessel nozzle inner radius sections and nozzle-to-vessel welds, including at least one nozzle from each system and nominal pipe size. For each of the identified nozzle assemblies, both the inner radius and the nozzle-to-shell weld would be examined. The following nozzle assemblies would be selected for examination: three of the ten 12-inch recirculation inlet nozzle (N2) assemblies; one of the four 26-inch main steam nozzle (N3) assemblies; one of the two 10-inch core spray nozzle (N5) assemblies; one of the three RPV head nozzle (N6 and N7) assemblies; one of the two 4-inch jet pump instrumentation nozzle (N8) assemblies; and one of the four 12-inch LPCI nozzle (N17) assemblies.

Code Case N-702 states that VT-1 visual examination may be used in lieu of volumetric examination for the inner radii (Item No. B3.100). However, this allowance in ASME Code Case N-702 is not included in the proposed alternative. PSEG currently uses ASME Case N-648-1, "Alternative Requirements for Inner Radius Examinations of Class 1 Reactor Vessel Nozzles, Section XI, Division 1," within the limitations imposed by the NRC staff in Regulatory Guide (RG) 1.147, Revision 15, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," which allows VT-1 visual examination for nozzle inner radii. During the remainder of the interval, Hope Creek will perform either UT examinations or VT-1 examinations per ASME Code Case N-648-1 as described above.

Basis for Use:

Electric Power Research Institute (EPRI) Technical Report 1003557, "BWRVIP-108: BWR Vessel and Internals Project Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," provides the basis for ASME Code Case N-702. The evaluation found that failure probabilities at the nozzle blend radius region and nozzle-to-vessel shell weld due to a low temperature overpressure event are very low (i.e., $<1 \times 10^{-6}$ for 40 years) with or without inservice inspection. The report concludes that inspection of 25

percent of each nozzle type is technically justified. The BWRVIP also submitted the non-proprietary version of this report by letter dated November 21, 2007 (ADAMS Accession No. ML073300050).

This EPRI report was approved by the NRC in a safety evaluation (SE) dated December 19, 2007 (ADAMS Accession No. ML073600374). Section 5.0, "Plant Specific Applicability," of the SE states that licensees who plan to request relief from the ASME Code, Section XI requirements for RPV nozzle-to-vessel shell welds and nozzle inner radius sections may reference the BWRVIP-108 report as the technical basis for the use of ASME Code Case N-702 as an alternative. However, each licensee should demonstrate the plant-specific applicability of the BWRVIP-108 report to their units in the relief request by showing that all the following general and nozzle-specific criteria are satisfied:

(1) The maximum reactor pressure vessel (RPV) heat up/cooldown rate is limited to less than 115°F/hour.

For recirculation inlet (N2) nozzles:

(2) $(pr/t)/C_{RPV} < 1.15$

where
p = RPV normal operating pressure,
r = RPV inner radius,
t = RPV wall thickness, and
C_{RPV} = 19332 (i.e., 1000 psi x 110 inch/5.69 inch, based on the BWRVIP-108 recirculation inlet nozzle/RPV FEM model);

(3) $[p(r_o^2 + r_i^2) / (r_o^2 - r_i^2)]/C_{NOZZLE} < 1.15$

where
p = RPV normal operating pressure,
r_o = nozzle outer radius,
r_i = nozzle inner radius, and
C_{NOZZLE} = 1637 (i.e., [1000 psi x $(13.988^2 + 6.875^2) / (13.988^2 - 6.875^2)$], based on the BWRVIP-108 recirculation inlet nozzle/RPV FEM model);

For recirculation outlet (N1) nozzles:

(4) $(pr/t)/C_{RPV} < 1.15$

where,
p = RPV normal operating pressure,
r = RPV inner radius,
t = RPV wall thickness, and

C_{RPV} = 16171 (i.e., 1000 psi x 113.2 inch/7.0 inch, based on the BWRVIP-108 recirculation outlet nozzle/RPV FEM model); and

(5) $[p(r_o^2 + r_i^2) / (r_o^2 - r_i^2)]/C_{NOZZLE} < 1.15$

where,
p = RPV normal operating pressure,
r_o = nozzle outer radius,
r_i = nozzle inner radius, and
C_{NOZZLE} = 1977 (i.e., [1000 psi x ($22.31^2 + 12.78^2$) / ($22.31^2 - 12.78^2$)], based on the BWRVIP-108 recirculation outlet nozzle/RPV FEM model).

All HCGS RPV nozzle-to-vessel shell full penetration welds and nozzle inner radii sections, with the exception of the recirculation outlet nozzles, meet the general and nozzle-specific criteria in BWRVIP-108. Therefore, ASME Code Case N-702 is applicable. See Appendix A for details.

Use of ASME Code Case N-702 provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(a)(3)(i) for all RPV nozzle-to-vessel shell full penetration welds and nozzle inner radii sections, with the exception of the recirculation outlet nozzles.

6. Duration of Proposed Alternative

This request for relief is applicable to the remainder of the Hope Creek third ten-year ASME Section XI ISI interval which began December 13, 2007 and ends December 12, 2017.

7. Precedents

The NRC recently approved similar requests for the Duane Arnold Energy Center (ADAMS Accession Number ML082040046), Perry Nuclear Power Plant (ADAMS Accession No. ML082960729), Columbia Generating Station (ADAMS Accession No. ML090790588) and Clinton Power Station (ADAMS Accession No. ML092300394).

8. References

1. ASME Section XI 2000 edition, 2003 addenda, Section XI of the ASME Boiler and Pressure Vessel Code

2. ASME Boiler and Pressure Vessel Code, Code Case N-702, "Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-To-Shell Welds Section XI, Division 1," February 20, 2004.

3. EPRI Technical Report 1003557, "BWRVIP-108: BWR Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the

Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," October 2002.

4. ASME Boiler and Pressure Code, Code Case N-648-1, "Alternative Requirements for Inner Radius Examinations of Class 1 Reactor Vessel Nozzles, Section XI, Division 1." September 7, 2001.

5. BWRVIP letter 2002-323, Carl Terry, BWRVIP Chairman, to NRC Document Control Desk, "Project No. 704 – BWRVIP-108: BWR Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," November 25, 2002.

6. Matthew A. Mitchell, Office of Nuclear Reactor Regulation, to Rick Libra, BWRVIP Chairman, "Safety Evaluation of Proprietary EPRI Report, 'BWRVIP Vessel and Internals Project, Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Inner Radius (BWRVIP-108),'" December 19, 2007.

7. Hope Creek Technical Specification 3/4.4.6 "Pressure/Temperature Limits"

Plant-Specific Applicability

Hope Creek Nozzle-specific criteria recirculation inlet / outlet

Nozzle	Operating Pressure (psig)	RPV Inner Radius (inches)	RPV Wall Thickness (inches)	Nozzle Inner Radius (inches)	Nozzle Outer Radius (inches)
N2	1005.3	126.5	6.102	5.75	12.40
N1	1005.3	126.5	6.102	12.78	22.64

(1) The maximum reactor pressure vessel (RPV) heat up/cooldown rate is limited to less than 115°F/hour.

Hope Creek Technical Specification Limiting Condition for Operation 3.4.6.1 limits the maximum heatup and cooldown rates to less than or equal to 100° F in any one hour period.

For recirculation inlet nozzles

(2) $(pr/t)C_{RPV}$ = **1.08** < 1.15
p = RPV normal operating pressure, 1005.3 psig
r = RPV inner radius, 126.5 inches
t = RPV wall thickness, 6.102 inches
C_{RPV} = 19332, based on the BWRVIP-108 recirculation inlet nozzle/RPV FEM model.

(3) $[p(r_o^2 + r_i^2) / (r_o^2 - r_i^2)] / C_{NOZZLE}$ = **0.95** < 1.15
p = RPV normal operating pressure, 1005.3 psig
r_o = nozzle outer radius, 12.40 inches
r_i = nozzle inner radius, 5.75 inches
C_{NOZZLE} = 1637, based on the BWRVIP-108 recirculation inlet nozzle/RPV FEM model.

For recirculation outlet nozzles

(4) $(pr/t)C_{RPV}$ = **1.29** > 1.15
p = RPV normal operating pressure, 1005.3psig
r = RPV inner radius, 126.5 inches
t = RPV wall thickness, 6.102 inches
C_{RPV} = 16171, based on the BWRVIP-108 recirculation outlet nozzle/RPV model.

(5) $[p(r_o^2 + r_i^2) / (r_o^2 - r_i^2)] / C_{NOZZLE} = \mathbf{0.98} < 1.15$
p = RPV normal operating pressure, 1005.3 psig
r_o = nozzle outer radius, 22.64 inches
r_i = nozzle inner radius, 12.78 inches
C_{NOZZLE} = 1977, based on the BWRVIP-108 recirculation outlet nozzle/RPV FEM model.

Therefore the N1 recirculation outlet nozzles are not included in this relief request as they do not meet Criterion 4 under the NRC Safety Evaluation (SE) of BWRVIP-108 for use of ASME Code Case N-702 via relief request.