From: <john.hufnagel@exeloncorp.com>
To: <dja1@nrc.gov>, <rkm@nrc.gov>
Date: 03/29/2006 1:41:00 PM
Subject: Responses to AMP-264 and AMP-361

Donnie,

Attached are two PDF files with the responses to AMP/AMR Audit questions AMP-264 (One Time Inspection) and AMP-361 (Bolting Integrity).

Please let me know if you have any problems with opening these files. They are now included in the Audit database.

- John.

<<Q & A Response AMP-264 (3-29-06).pdf>> <<Q & A Response AMP-361 (3-29-06) .pdf>>

CC: <donald.warfel@exeloncorp.com>, <marka.miller@exeloncorp.com>, <louis.corsi@exeloncorp.com>

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Subject:	Responses to AMP-264 and AMP-361
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From:	<john.hufnagel@exeloncorp.com>
Created By:	john.hufnagel@exeloncorp.com

Recipients
nrc.gov
OWGWPO01.HQGWDO01
DJA1 (D. Ashley)

nrc.gov
TWGWPO01.HQGWDO01
RKM (Roy Mathew)

exeloncorp.com
louis.corsi CC
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Q & A Response AMP-264 (3-29-06).pdf		92049
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Item No
AMP-264

Date Received: 1/25/2006

Source
AMP Audit

Topic:
One Time Inspection

Status: Open

Document References:
B.1.24

NRC Representative Lofaro, Bob

AmerGen (Took Issue): Hufnagel, Joh

Question

AMP-TBD (Audit2 B.1.24-8): The OCGS Inspection Sample Basis document for the one-time inspection, dated 08/16/2005, states in Section A that the one-time inspection sample size will include 10% of the total butt welds in Class 1 piping under 4", and the actual inspection locations will be based on physical accessibility, exposure levels, NDE techniques, etc. and will be determined by the site. Please provide the following information:
a) How will the sample selection process ensure that samples of all different pipe sizes less than 4" are inspected (i.e., 1", 2", 3" etc.)?
b) Are there any Class 1 pipes less than 4" NPS in the scope of this AMP that are not butt welded (e.g., socket welded)? If so, how will these non-butt welded pipes be inspected since UT examination is not suitable for socket welds?
c) What is Oyster Creek's operating experience with Class 1 piping less than 4 inch NPS in terms of cracking?

Assigned To: Miller, Mark

Response:

a) The one-time inspection for Class 1 piping, piping components, and piping elements for cracking initiation and growth due to thermal and mechanical loading, stress corrosion cracking, and intergranular stress corrosion cracking includes a representative sample of the susceptible items, and, where practical, focuses on the bounding or lead items most susceptible to cracking due to time in service, severity of operating conditions, or lowest design margin.

Applying ASME Code Case N-578-1, "Risk Informed Requirements for Class 1, 2, or 3 Piping, Method B Section XI, Division 1" is one method other applicants have used for determining sample size for one-time inspections. With this method, butt welds are evaluated based on risk and "binned" into high, medium, and low risk categories. The selected sample for one-time inspection volumetric examination then included 10 % of the high and medium risk butt welds. Oyster Creek however has not employed risk informed ISI and does not currently have a risk based evaluation that categorizes the Class 1 butt welds into risk categories. This evaluation is extensive and to perform this evaluation at this time is not practical so ASME Code Case N-578-1 will not be utilized. Instead, the one-time inspection sample size will include 10% of the total butt welds in Class 1 piping less than 4" NPS. The actual inspection locations will be based on physical accessibility, exposure levels, NDE techniques, etc. and will be determined with site involvement. UT techniques consistent with the ASME Code and 10 CFR Part 50, Appendix B that permit the inspection of the inside surfaces of the item will be used for the inspection of butt welds.

Oyster Creek piping is based upon the ANSI B31.1 (1963) Power Piping specification. The Class 1 piping classification is based upon ASME Section XI. The Oyster Creek line specifications, Piping and Instrument drawings, Isometric Configuration drawings and input from the Oyster Creek ISI coordinator were used to determine the location and population of butt welds less than or equal to four inches. The population includes welds on the Reactor Recirculation System, the CRD return line, the reactor vessel bottom head drain line, the reactor head vent line (Main Steam system), and the Reactor Water Cleanup System. The butt welds less than 4" NPS in these systems are two and three inch in size (there is no 2 ½ inch Class 1 piping; nor are there any butt welds on the 1 inch Class 1 piping). The proposed sample includes a representative sample of welds from these systems and includes both two and three inch NPS pipe.

b) The majority of Class 1 piping less than 4" NPS is socket welded. The ASME Section XI Class 1 piping program requires surface examination of socket welded connections. The One-Time Inspection program will not include in-situ volumetric examination of socket welded connections. The One-Time Inspection program will include opportunistic examinations of Class 1 socket welded connections less than 4" NPS. Socket weld failures will be evaluated in accordance with the Oyster Creek 10 CFR Part 50, Appendix B corrective action program to determine failure mechanisms and corrective actions. In addition, the plant modification process will require that any class 1 socket welded connection less than 4" NPS that has been removed during the installation of a plant modification be examined for cracking and cracking mechanisms. LRCR #276 has been initiated to revise the program commitments accordingly.

c) Based on a review of the Oyster Creek CAP System (Corrective Action Program) from 1998 through present, cracking due to SCC, IGSCC, or thermal and mechanical loading has not been found on class 1 piping less than 4" NPS. An evaluation of Oyster Creek OE from 1985 through 2000 was performed in 2000 in response to industry concerns related to vibration related and thermal fatigue failures of small bore piping. That review identified one (1) event in which a safety related small bore socket welded connection failed. This failure was attributed to a defective weld rather than vibration related or thermal fatigue.

Mechanical/Vibration Fatigue: Vibration induced socket weld failures is a material degradation issue that can result in crack initiation and growth. Small bore pipe and socket welded vent and drain connections in the immediate proximity of vibration sources tend to be most susceptible to high cycle mechanical fatigue. Vibration fatigue does not lend itself to periodic in-service examinations as a means of managing this aging mechanism. Vibration induced fatigue is fast acting and is typically detected early in a component's life. The nature of this mechanism is such that, generally, almost the entire fatigue life of the component is expended during the initial phase of crack initiation. Once a crack initiates, failure quickly follows. The period of time between crack initiation, i.e. a crack size that is detectable by volumetric examination, and the failure of the pressure boundary is very small and is usually measured in days to months and not years. An evaluation of Oyster Creek OE from 1985 through 2000 was performed in 2000 in response to industry concerns related to vibration related and thermal fatigue failures of small bore piping. That review identified one (1) event in which a safety related small bore socket welded connection failed. This failure was attributed to a defective weld rather than vibration related or thermal fatigue. Based upon the Oyster Creek plant specific operating experience, and rationale provided above, cracking due to vibration-induced fatigue is not considered an aging effect for the period of extended operation.

Thermal Fatigue: A relatively small number of thermal related failures have occurred in small-bore piping (reference: Pacific Northwest National Laboratory report PNNL-13930, "Program Plan for Acquiring and Examining Naturally Aged Materials and Components for Nuclear Reactors," dated December 2001). Fatigue failures in safety related systems and components have been rare and fatigue in pressure-retaining equipment is generally detected as small cracks or leaks, caught before reaching a size that could cause a pressure boundary rupture. Thus fatigue is not considered a safety issue (reference: TR-104534, "EPRI Fatigue Management Handbook," dated December 1994). Of those that have occurred, the more common source of thermal fatigue was either (1) cracking associated with the interaction of valve leakage and cyclic effects and (2) cyclic turbulent penetration effects of isolated small-bore piping or drain lines. An evaluation of Oyster Creek OE from 1985 through 2000 was performed in 2000 in response to industry concerns related to vibration related and thermal fatigue failures of small bore piping. That review identified one (1) event in which a safety related small bore socket welded connection failed. This failure was attributed to a defective weld rather than vibration related or thermal fatigue. The issue of thermal fatigue is the subject of EPRI Report 1000701, "Interim Thermal Fatigue Management Guideline (MRP-24)," dated January 2001 which is referenced in GALL program XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping" in program Element 1 "Scope of Program." As discussed in PBD-B.1.24, EPRI Report 1000701 recommends specific locations for assessment and/or inspection where cracking and leakage has been identified in nominally stagnant non-isolable piping attached to reactor coolant systems in domestic and similar foreign PWRs. These inspection recommendations do not apply to Oyster Creek which is a BWR. However, Oyster Creek has evaluated the potential for cracking in nominally stagnant non-isolable piping attached to reactor coolant systems and it was concluded that there are no systems with unisolable sections that could be subjected to thermal stratification or oscillations. This evaluation is summarized as follows: Information Notice (IN) 97-46 discusses a situation that occurred at Oconee Unit 2 where cracks developed in an unisolable section of a combined makeup (MU) and high-pressure injection (HPI) line. The Information Notice goes on to reference NRC Bulletin 88-08 and its supplements. Bulletin 88-08 describes the circumstances that occurred at Farley 2 where a crack developed in an unisolable section of ECCS piping. The crack resulted from high cycle thermal fatigue caused by relatively cold water leaking through a closed globe valve. Oyster Creek performed a review of systems connected to the Reactor Coolant System in response to NRC Bulletin 88-08 and its Supplements to determine whether unisolable sections of piping connected to the Reactor Coolant System could be subjected to stresses from temperature stratification or temperature oscillations. It was concluded that there are no systems with unisolable sections which could be subjected to thermal stratification or oscillations. The piping system evaluations encompassed both the weldments (as required by Bulletin 88-08) and the base metal (as required by Supplement 1 to Bulletin 88-08).

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Stress Corrosion Cracking: Three simultaneous conditions must be present for IGSCC to occur: susceptible material, environment, and tensile stress. Tensile stress at the weld root, which is exposed to impurities in the reactor coolant that can accelerate the initiation and propagation of IGSCC, is typically produced during butt welding of piping components and is less of a concern with socket welded connections. The Oyster Creek One-Time Inspection program for class 1 piping less than 4" NPS will focus on full penetration butt welds which are more susceptible (bounding) than socket welded connections to the stress corrosion cracking aging mechanism.

LRCR #: 276 *LRA A.5 Commitment #:* B.1.24

IR#:

Approvals:

Prepared By: Miller, Mark 3/20/2006

Reviewed By: Muggleston, Kevin 3/21/2006

Approved By: Warfel, Don 3/29/2006

NRC Acceptance (Date):

NRC Information Request Form

Item No	*Date Received:*	*Source*
AMP-361	3/17/2006	AMP Audit
Topic:	*Status:*	Open

PBD-AMP-B.1.12 Bolting Integrity

Document References:

NRC Representative Davis, Jim

AmerGen (Took Issue): Beck, Chip

Question

This question was received in an email from Donnie Ashley, NRC Project Manager, to George Beck, dated 3/17/06.

PBD -AMP- B.1.12, "Bolting Integrity" identifies an enhancement to NUREG-1801 for elements 1, 2, and 7. This enhancement is not identified in OCGS LRA B1.12. Is the LRA supplemented to reflect this?

Assigned To: Corsi, Lou

Response:

During preparation of PBD we identified the need for enhancement. LRCR-242 was generated to revise Appendix A and B for Bolting Integrity, which contains the enhancement to include reference to EPRI TR-104213 in the site procedure.

LRCR #: 242 *LRA A.5 Commitment #:* 12

IR#:

Approvals:

Prepared By:	Corsi, Lou	3/17/2006
Reviewed By:	Getz, Stu	3/17/2006
Approved By:	Warfel, Don	3/17/2006

NRC Acceptance (Date):