From: <john.hufnagel@exeloncorp.com>
To: <dja1@nrc.gov>, <rkm@nrc.gov>
Date: 04/25/2006 1:50:48 PM
Subject: Additional info for discussion

Donnie and Roy,

Attached is the response for AMP-358 on fatigue analysis and an slightly updated version of AMP-072 to clarify one aspect. We'll call you shortly. Thanks.

- John.

<<AMP-072.pdf>> <<AMP--358.pdf>>

CC: <donald.warfel@exeloncorp.com>, <fred.polaski@exeloncorp.com>

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Subject: Additional info for discussion
Creation Date: 04/25/2006 1:49:43 PM
From: <john.hufnagel@exeloncorp.com>

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MESSAGE	1145	25 April, 2006 1:49:43 PM
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AMP-072.pdf	84247	
AMP--358.pdf	94707	
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Item No	*Date Received:*	*Source*
AMP-072	9/23/2005	AMP Audit
Topic:	*Status:*	Open

ASME Section XI, Subsection IWE

Document References:
B.1.27-4

NRC Representative Morante, Rich

AmerGen (Took Issue): Hufnagel, Joh

Question

(B.1.27-4):In the OCGS AMP B.1.27 discussion of operating experience, the applicant discusses three (3) areas where containment degradation has been observed. These are the upper region of the drywell shell; the sand bed region at the base of the drywell; and the suppression chamber (Torus) and vent system.Suppression chamber (Torus) and vent system – The applicant states that the coating is inspected every outage and repaired, as required, to protect the torus shell and the vent system from corrosion, and refers the reader to program B.1.33 for additional details. Under operating experience in LRA B.1.33, the applicant states that Torus and vent header vapor space Service Level I coating inspections performed in 2002 found the coating in these areas to be in good condition. Inspection of the immersed coating in the Torus identified blistering. The blistering occurred primarily in the shell invert but was also noted on the upper shell near the water line. The majority of the blisters remained intact and continued to protect the base metal. However, several blistered areas included pitting damage where the blisters were fractured. A qualitative assessment of the identified pits was performed and concluded that the measured pit depths were significantly less than the established acceptance criteria. The fractured blisters were repaired to reestablish the protective coating barrier.Please provide the following information pertaining to past operating experience and LR aging management for the suppression chamber (Torus) and vent system:
(a) Please provide the plant documentation that describes the blistering and pitting, the qualitative assessment performed, the established acceptance criteria, and the corrective action taken, preferably in both hard copy and electronic format.
(b) Was ASME Section XI, Subsection IWE applied, to develop the acceptance criteria?
(c) Was the inspection that discovered the blistering and cracking conducted under IWE, a coatings monitoring and maintenance program, or another program? If another program, please identify the program.
(d) Are both the IWE and Coatings AMPs credited to manage loss of material due to corrosion for the suppression chamber (Torus) and vent system, for the extended period of operation? If not, please provide the technical basis for concluding that both AMPs do not need to be credited.

Assigned To: Ouaou, Ahmed

Response:

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a) Inspection of the suppression chamber (Torus) and vent system coating is conducted by divers every other outage in accordance with engineering specification SP-1302-52-120. The specification provides inspection and acceptance criteria for the coating. It also provides inspection and acceptance criteria for pitting, as a contingency to be used in the event failure of the coating results in pitting. The coating is monitored for cracks, sags, runs, flaking, blisters, bubbles, and other defects described in the Protective Coating Monitoring and Maintenance Program (B.1.33).

The specification requires inspection of the torus and vent system surfaces for coating integrity. If pitting is observed, then isolated pits of 0.125" in diameter have an allowed maximum depth of 0.261" anywhere in the shell provided the center-to-center distance between the subject pits and neighboring isolated pits or areas of pitting corrosion is greater that 20 inches. Multiple pits that can be encompassed by a 2.5-inch diameter circle are limited to a maximum depth of 0.141 inches provided the center to center distance between the subject pitted area and neighboring isolated pits or areas of pitting corrosion is greater that 20 inches. Pits that do not meet these criteria are documented and sent to engineering for evaluation and acceptance.

Plant documentation that describes the blistering and pitting, and qualitative assessment performed, the established acceptance criteria, and corrective actions taken, is included in PBD-AMP-B.1.27 Notebook and available for Staff review.

b) The Torus and Vent System coating is classified Service Level I Coating as described in the Protective Coating Monitoring and Maintenance Program (B.1.33). The Program was evaluated against the 10 Element of NUREG-1801 XI.S8, Protective Coating Monitoring and Maintenance Program and found consistent without enhancements or exceptions. Acceptance criteria are evaluated in element 3.6 of the Oyster Creek Protective Coating Monitoring and Maintenance Program (PBD-AMP-B.1.33). The inspection is performed by ASME Section XI Level II and Level III inspectors.

Acceptance criteria for pits is based on engineering analysis that uses the method of Code Case N597 as guidance for calculation of pit depths that will not violate the local stress requirements of either ASME Section III, 1977 Edition or Section VIII, 1962 Edition.

c) The Inspection that discovered the blistering was conducted under the Protective Coating Monitoring and Maintenance Program. Examinations are performed by ASME Section XI Level II and Level III inspectors.

d) Yes, both IWE and Coatings AMPs are credited to manage loss of material due to corrosion for the suppression chamber (Torus) and the vent system for the extended period of operation.

04/19/2006 Supplemental Information Discussed with the NRC Audit Team:
1) The following clarification was provided regarding torus coating inspections. During the period of extended operation, torus coating inspection will be performed in all 20 torus bays at a frequency of every other refueling outage for the current coating system. Should the coating system be replaced, the inspection frequency and scope will be re-evaluated. Inspection scope will, as a minimum, meet the requirements of ASME, Subsection IWE. This specific commitment will be added to the LRA

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Appendix A.5 Commitment List, as part of Commitment 33 associated with the Protective Coating Monitoring and Maintenance program.
2) Condition Report No. 373695 Assignments 2 and 3 have been initiated to drive program improvements for the monitoring and trending of Torus design margins and to develop refined acceptance criteria and thresholds for entering coating defects and unacceptable pit depths into the Corrective Action process for further evaluation. These improvements will be incorporated into the inspection implementing documents prior to the next performance of these inspections, which is also prior to the period of extended operation. This commitment will be described in a letter to the NRC.
3) The answers provided for question AMP-210 were written to address specific concerns of the AMP audit team and were centered around worse case Torus thickness margins existing on the Torus shell due to corrosion. This supplemental information is being provided to reinforce that based on all available inspection results, the average thickness of the Torus remains at 0.385". Based on the results of the inspections performed through 1993 (14R), it was concluded that the Torus shell thickness had remained virtually unchanged following the repair and recoating efforts performed in 1984. The was communicated to the NRC via letter C321-94-2186 dated November 3, 1994, Amendment No. 177 to DPR-16 and SER dated February 21, 1995 for the EMRV Tech Spec change. Coating inspections performed subsequent to 1993 (14R) continue to confirm that the Torus shell thickness has remained virtually unchanged following the repair and recoating efforts performed in 1984 and that the average thickness of the Torus remains at 0.385". Torus integrity will continue to be evaluated during future inspections (performed every other refueling outage) into the period of extended operation.

Clarity concerning pit corrosion was provided. Pit corrosion less than or equal to 0.040" was not repaired during the 1984 Torus repair and recoating effort based on available margins and was found to be acceptable without any size restriction since it satisfied minimum uniform thickness requirements. Inspection activities subsequent to 1984 have identified 5 isolated pits that exceed 0.040". These areas have been mapped for trending and analysis during future inspections. These areas are as follows:
- 1 pit of 0.042" in bay 1
- 1 pit of 0.0685" in bay 2
- 2 pits of 0.050" in bay 6
- 1 pit of 0.058" in bay 10

Shell thicknesses have been evaluated against code requirements and found to satisfy all Design and Licensing Basis requirements. Therefore, the integrity of the Torus shell has been verified to have adequate shell thickness margins to ensure Design and Licensing Basis requirements can be maintained.
4. Answer b) above is supplemented as follows: In regard to the use of Code Case N-597 for the evaluation of pits, see AMP-210 for additional information.
5. Answer a) above is revised as follows: Pits greater than 0.040 inches in depth shall be documented and submitted to engineering for evaluation.

LRCR #: 296 *LRA A.5 Commitment #:* B.1.33

IR#:

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Approvals:

Prepared By:	Ouaou, Ahmed	4/20/2006
Reviewed By:	Miller, Mark	4/20/2006
Approved By:	Warfel, Don	4/20/2006

NRC Acceptance (Date):

NRC Information Request Form

Item No	*Date Received:*	*Source*
AMP-358	2/17/2006	AMP Audit
Topic:	*Status:*	Open

CUF Reevaluation

Document References:

3.1

NRC Representative Chang, Ken

AmerGen (Took Issue): Warfel, Don

Question

QUESTIONS OF RORC MEETING (06-03) REPORT

As part of the review for AMP B.3.1, Metal Fatigue of Reactor Coolant pressure boundary the project team reviewed OC's PORC meeting (06-03) report, summarized the presentation, and reviewed OC-2006 E-001, Rev O, Revised Method for Determination of Fatigue Cumulative Usage Factor. OC used modern codes and revised STET the acceptance criteria for fatigue CUF. The PORC disposition is approved with recommendations with conditions. The project team does not question the use of the modern code, since it is a reasonable step to take, but has the following questions requiring clarification or justification.:

1.) Some RPV components are designed to a criterion established by GE specification 21A1105. Please provide a copy for NRC Staff review.

2.)The project team agrees that the design code of record does not require or specify fatigue analysis requirements. Nor were there any regulating design requirements for fatigue analysis at the time of design. An explanation is requested as to why GE included a prudent measure to limit the CUF to 0.8. Why didn't GE allow CUF of 1.0? Was CUF of 1.0-0.8=0.2 intentionally reserved for margin" The PORC report stated that this is not considered as a departure from the design (CUF 1.0) methodology. Please justify the statement.

3.) PORC question (2) states that : this activity involves a change to the methodology for the determination of the Fatigue CUF. What change does it refer to? As for determination of CUF=SUM (ni/ Ni) where ni is actual on design cycles and Ni is the allowable cycles for the I- th transient pair. Please clarify.

4) It seems to the project team that there is no change in methodology. The only thing changed is the CUF limit (from 0.8 to 1.0)) Was GE consulted to verify that it is acceptable w/o violating some original design concerns.

5) If OC changes the CUF from, 0.8 (design) to 1.0 for LR, how could one conclude that this activity has no adverse affect w/o justification? If they change from 0.8 to 0.7, the logic is obvious.

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6) Is GE SPEC 21A1105 voided? If so, what is the new spec OC used today for the PEO?

7) OC credited the new fatigue analysis as justification to the change of CUF. Please consider, if everything (condition) remains unchanged, if the original design meets CUF of 0.8, naturally, one will meet CUF if 1.0 today. What is the purpose of these analysis? Why don't you show that the CUF today is less than 0.8 but will be allowed to go up to 1.0 including environmental impact for the PEO?

8) The team would like to review the basis of justifying the CUF for FW Nozzle and Recir. Outlet Nozzle & RPV outlet.

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This question was supplemented at the request of Mr. Ken Chang on 4/20/06 to include the following:

The NRC staff has revised this question to request the following additional assurance: Oyster Creek shall certify the revised fatigue analysis performed to demonstrate compliance to ASME Section III by a certified Professional Engineer competent in ASME III Class 1 analysis, or, shall notify the NRC prior to the period of extended operation so that the staff can perform its own certification of the analysis. Mr. Ken Chang has agreed that implementing one of these two approaches will satisfy the NRC team's needs.

Assigned To: May, Mike

Response:

1. A copy of GE Specification 21A1105 was supplied to the NRC Staff during the Friday February 17, 2006 breakout session.

2. a) From UFSAR section 5.3.1.1, the following statement provides the basis for the General Electric method of performing fatigue analysis for the Oyster Creek reactor vessel; "For reactor pressure vessels designed and built prior to the adoption of the ASME Boiler and Pressure Vessel Code Section III, the General Electric Company developed a method for performing a fatigue analysis which would provide assurance that vessels installed in General Electric designed nuclear power plants would safely withstand all anticipated operating and transient conditions, both normal and emergency. This method was based upon the method of analysis developed for Naval reactors and upon industry's experience using it." The UFSAR also concludes that the General Electric Specification defined analysis results in a completed vessel for the Oyster Creek plant, which has safety margins that are generally equivalent to those which would result from using Section III methodology. General Electric's selection of a cumulative usage factor limit of 0.8 (versus 1.0) was to assure the Oyster Creek reactor pressure vessel design would remain bounded by the pending ASME Section III methodology and acceptance criterion. There is no evidence that consideration was given to reserving margin for any other reason (e.g., for system transients or unspecified cyclic conditions not considered in original analysis). The reanalyzed fatigue usage factors were performed

to the ASME Section III requirements to demonstrate acceptability to the corresponding acceptance limit of 1.0.

b) The Exelon 50.59 evaluations reviewed if using ASME Section III instead of the methods by GE to calculate fatigue usage represented a departure from a method of evaluation described in the UFSAR used in establishing design bases. The OC procedure for preparing 50.59 evaluations, based on NEI 96-07, provides the guidance that: Use of a new NRC-approved methodology (e.g. ASME Section III) to reduce uncertainty, provide more precise results, or other reason is not a departure from a method of evaluation described in the UFSAR, provided such use is (a) based on sound engineering practice, (b) appropriate for the intended application, and (c) within the limitations of the applicable SER. Oyster Creek is using the ASME Boiler and Pressure Vessel Code Section III methodology to revise its design basis fatigue analyses for the reactor vessel; and the NRC has approved the use of ASME Boiler and Pressure Vessel Code Section III via 10CFR50.55a, which is within the limitations of the Oyster Creek Licensing Basis. Therefore, implementing the ASME Boiler and Pressure Vessel Code Section III method for analyzing fatigue is not considered a departure from a method of evaluation described in the UFSAR.

3. The licensing change allows Oyster Creek to revise design basis analysis from the methods described in GE specification 21A1105 to the NRC-approved methods of the ASME Boiler and Pressure Vessel Code Section III. The licensing basis change provides Oyster Creek the ability to implement revised analysis to establish new allowable cycles [N(i)], using the methods described in ASME Boiler and Pressure Vessel Code Section III. The difference in methodology is primarily associated with the difference between the s-N fatigue curve provided in the GE specification and the fatigue curve in the ASME Section III code. The process of summing transient pairs to determine total fatigue usage remains unchanged.

4. As part of the preparation of the Oyster Creek License Renewal application, limiting fatigue analyses of the reactor pressure vessel prepared per the original GE purchase specification for the RPV have been revised in accordance with the NRC approved ASME Boiler and Pressure Vessel Code Section III as permitted by Appendix L of ASME Section XI. As stated in Appendix L the new fatigue usage values are compared to 1.0. This is not only a change in acceptance limit but also a change in methodology, since fatigue usage factors were revised using the fatigue curve in ASME Section III instead of the fatigue curve provided in the GE specification.

Oyster Creek has assumed the responsibility of the RPV design basis analysis in accordance with the Code requirements, and therefore, GE concurrence of the changes is not required nor was it requested..

5. Oyster Creek has revised the fatigue analysis for the limiting RPV locations in accordance with the methods established in NRC approved ASME Boiler and Pressure Vessel Code Section III, as permitted by ASME Section XI IWB-3740. As stated in ASME XI Appendix L the revised usage factor are compared to 1.0. Since all of the revised usage factors are less than the acceptance limit there are no adverse effects.

6. The GE specification (21A1105) is still the current specification for the RPV. This specification will

be updated to reflect the change in methodology as part the design change process.

7.As part of the effort for License Renewal the current licensing basis RPV fatigue analysis was evaluated to demonstrate satisfactory results for the period of extended operation. When the current licensing basis RPV fatigue analysis was reevaluated, using actual thermal cycles based on plant data, it was determined that for some locations the forty-year fatigue usage may exceed the 0.8 acceptance limit imposed by the GE spec. These locations required a more refined analysis. Under the rules of 10CFR50.55a and Section XI, Subsection IWB, the Licensee is allowed to use Appendix L of Section XI to analyze the effects of fatigue on components. Appendix L directs that ASME Section III fatigue usage factor evaluation procedures be used to determine if they are acceptable for continued service. The fatigue usage factors for the reanalyzed components are less than 0.8 before environmental effects are included for License Renewal. However, there is no technical basis not to compare the usage factors to 1.0 since Appendix L establishes 1.0 as the appropriate acceptance limit. Age.

8. The revised analysis for the above components can be found in Exelon Design Analysis SIA# OC-05Q-303 Revision 1. The appropriate fatigue analyses are available to the audit teams at the station.

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Supplemental response resulting from the 4/20/2006 meeting with the NRC:

All supporting calculations and reports prepared by Structural Integrity Associates (SIA) for the fatigue activities associated with the Oyster Creek License Renewal Application were approved (and in many cases prepared) by a registered Professional Engineer. The registered Professional Engineer has significant experience with ASME Code Section III fatigue analyses, and is approved in accordance with SIA's Quality Assurance Program to be a qualified certifier of ASME Code, Section III, Division 1 Design Specifications and Design Reports. The approval of the Professional Engineer signifies acknowledgement that all documents are correct and complete to the best of his knowledge, that he is competent to approve the documents accordingly, and that all documents meet the intent of the pertinent sections of Section III, Subsection NB of the ASME Boiler and Pressure Vessel Code (in accordance with the referenced Edition and Addenda) for Class 1 fatigue analysis.

In addition, certification of this work by a Professional Engineer will be performed by July 31, 2006. A commitment to perform this certification will be submitted by letter to the NRC.

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

IR#:

Approvals:

Prepared By:	Hufnagel, John	4/20/2006
Reviewed By:	Beck, George	4/20/2006

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Approved By: Warfel, Don 4/20/2006

NRC Acceptance (Date):