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U.S. Nuclear Regulatory Commission
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Hope Creek Generating Station
Facility Operating License No. NPF-57
NRC Docket No. 50-354

Subject: Response to NRC Request for Additional Information, dated December 13 2010, related to the One Time Inspection and Selective Leaching of Materials Aging Management Programs associated with the Hope Creek Generating Station License Renewal Application

Reference: Letter from Ms. Bennett Brady (USNRC) to Mr. Thomas Joyce (PSEG Nuclear, LLC) "REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE HOPE CREEK GENERATING STATION LICENSE RENEWAL APPLICATION FOR ONE TIME INSPECTION AND SELECTIVE LEACHING (TAC NO. ME1832)", dated December 13, 2010

In the referenced letter, the NRC staff requested additional information related to the One Time Inspection and Selective Leaching of Materials aging management programs associated with the Hope Creek Generating Station License Renewal Application (LRA). Enclosure A to this letter contains the response to that request for additional information, including revisions to the associated aging management program descriptions originally contained in LRA Appendices A and B.

Enclosure B provides an update to the affected portions of the License Renewal Commitment List (LRA Appendix A, Section A.5), as a result of this RAI response. There are no other new or revised regulatory commitments associated with this letter.

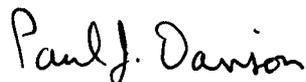
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If you have any questions, please contact Mr. Ali Fakhar, PSEG Manager - License Renewal, at 856-339-1646.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 1/6/11

Sincerely,



Paul J. Davison
Vice President, Operations Support
PSEG Nuclear LLC

Enclosures: A. Response to Request for Additional Information
B. Update to License Renewal Commitment List

cc: William M. Dean, Regional Administrator – USNRC Region I
B. Brady, Project Manager, License Renewal – USNRC
R. Ennis, Project Manager – USNRC
NRC Senior Resident Inspector – Hope Creek
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L. Marabella, Corporate Commitment Tracking Coordinator
P. Duca, Hope Creek Commitment Tracking Coordinator

Enclosure A

**Response to Request for Additional Information related to the One Time
Inspection and Selective Leaching of Materials Aging Management Programs
associated with the
Hope Creek Generating Station License Renewal Application**

RAI B.2.1.22-1

RAI B.2.1.23-1

RAI B.2.1.22-1

Background:

Generic Aging Lessons Learned (GALL) aging management program (AMP) XI.M32, "One-Time Inspection" states in element 4, "detection of aging effects" that the inspection includes a representative sample of the system population, and, where practical, focuses on the bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin.

License renewal application (LRA) Section B.2.1.22, One-Time Inspection, states that the program elements include (a) determination of the sample size based on an assessment of materials of fabrication, environment, plausible aging effects and mechanisms, and operating experience; and (b) identification of the inspection locations in the system or component based on the aging effect. The LRA also states that the inspection sample includes one-time inspection of more susceptible materials in potentially more aggressive environments (e.g., low or stagnant flow areas) to manage the effects of aging.

Issue:

Due to the uncertainty in determining the most susceptible locations and the potential for aging to occur in other locations, the staff noted that large (at least 20 percent) sample sizes may be required in order to adequately confirm an aging effect is not occurring. The applicant's One-Time Inspection Program did not include specific information regarding how the population of components to be sampled or the sample size will be determined.

Request:

Provide specific information regarding how the population of components to be sampled and the size of the sample of components that will be inspected will be determined.

PSEG Response:

Hope Creek will implement a One-Time Inspection aging management program (Hope Creek LRA Appendix B, Section B.2.1.22) which will include adequate inspections to address each of the material, environment, and aging effect combinations. Chemistry programs are generally effective in removing impurities from intermediate and high flow areas. However, chemistry programs may not be as effective in low flow or stagnant areas because of poor mixing. The sample plan will be developed with a focus on inspecting bounding or lead components most susceptible to aging in potentially more aggressive environments (e.g., low or stagnant flow areas). This approach provides assurance that the aging of the components is being adequately managed by verifying the effectiveness of the chemistry related aging management program (AMP).

The sample plan will be determined by establishing sample groups based on aging effects and environments. The sample groups will be populated with the components and their materials of fabrication. Selection of the components for inspection, wherever

possible, will be biased towards inspecting bounding or lead components of the most susceptible materials with the potentially more aggressive environments (e.g., low or stagnant flow areas), and selecting components with the lowest design margin. A sample size of 20% of the population (up to a maximum of 25 inspections) will be established for each of the sample groups. The maximum of 25 inspections for each of the sample groups is consistent with the methodology discussed in Section 4, "Sampling Program Description" of EPRI TR-107514, *Age-Related Degradation Inspection Method and Demonstration In Behalf of Calvert Cliffs Nuclear Power Plant License Renewal Application*.

Hope Creek LRA Sections A.2.1.22 and B.2.1.22 and Table A.5, Commitment Number 22 are revised to identify the sampling methodology described above. In addition, while preparing this RAI response it was noted that LRA section B.2.1.22 refers to a specific version of the ASME Section XI code that will not be in affect at the time of One-Time Inspection program implementation, therefore, a revision is also made to remove that specific reference.

The LRA Appendix A, Section A.2.1.22, on page A-21 is revised due to this RAI as follows: (Note: Pre-existing text, from the LRA is formatted in normal font; new text is bold and italicized. Pre-existing text has been repeated here to provide context for the changes.)

A.2.1.22 One-Time Inspection

The One-Time Inspection aging management program is a new program that will provide reasonable assurance that an aging effect is not occurring, or that the aging effect is occurring slowly enough to not affect a component intended function during the period of extended operation, and therefore will not require additional aging management. The program will be credited for cases where either (a) an aging effect is not expected to occur but there is insufficient data to completely rule it out, (b) an aging effect is expected to progress very slowly in the specified environment, but the local environment may be more adverse than that generally expected, or (c) the characteristics of the aging effect include a long incubation period. Major component types covered by the program include piping, piping elements and piping components, reactor vessel and nozzles, heat exchangers and tanks.

The One-Time Inspection aging management program will be used for the following:

1. To confirm the effectiveness of the Water Chemistry program to manage the loss of material, cracking, and the reduction of heat transfer aging effects for aluminum, copper alloy, ductile cast iron, gray cast iron, nickel alloy, steel, stainless steel and cast austenitic stainless steel in treated water, steam, sodium pentaborate, and reactor coolant environments.
2. To confirm the effectiveness of the Fuel Oil Chemistry program to manage the loss of material aging effect for copper alloy, steel, galvanized steel and stainless steel in a fuel oil environment.

3. To confirm the effectiveness of the Lubricating Oil Analysis program to manage the loss of material and the reduction of heat transfer aging effects for copper alloy, gray cast iron, steel and stainless steel in a lubricating oil environment.
4. To confirm loss of material in carbon steel piping and fittings is insignificant in an air/gas-wetted (internal) environment.

The sample plan for inspections associated with the One-Time Inspection program will be developed to ensure there are adequate inspections to address each of the material, environment, and aging effect combinations. A sample size of 20% of the population (up to a maximum of 25 inspections) will be established for each of the sample groups.

Inspection methods will include visual examination or volumetric examinations. Acceptance criteria are in accordance with industry guidelines, codes, and standards, including the applicable edition of ASME Boiler and Pressure Vessel Code, Section XI. The One-Time Inspection program provides for the evaluation of the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize an intended function before the end of the period of extended operation. Should aging effects be detected, the program triggers actions to characterize the nature and extent of the aging effect and determines what subsequent monitoring is needed to ensure intended functions are maintained during the period of extended operation.

The new program, including performance of physical inspections and evaluation of results, will be implemented prior to the period of extended operation to manage the effects of aging for selected components within the scope of license renewal.

The LRA Appendix B, Section B.2.1.22, Program Description, on pages B-108 and 109 are revised due to this RAI as follows: (Note: Pre-existing text, from the LRA is formatted in normal font; new text is bold and italicized; deleted text is indicated with strikethroughs. Pre-existing text has been repeated here to provide context for the changes.)

B.2.1.22 One-Time Inspection

Program Description

The One-Time Inspection aging management program is a new program that will provide reasonable assurance that an aging effect is not occurring, or that the aging effect is occurring slowly enough to not affect a components intended function during the period of extended operation, and therefore will not require additional aging management. The program will be credited for cases where either (a) an aging effect is not expected to occur but there is insufficient data to completely rule it out, (b) an aging effect is expected to progress very slowly in the specified environment, but the local environment may be more adverse than that generally expected, or (c) the characteristics of the aging effect include a long incubation period. Major component types covered by the program include piping, piping elements and piping components, reactor vessel and nozzles, heat exchangers and tanks.

The One-Time Inspection aging management program will be used for the following:

1. To confirm the effectiveness of the Water Chemistry program to manage the loss of material, cracking, and the reduction of heat transfer aging effects for aluminum, copper alloy, ductile cast iron, gray cast iron, nickel alloy, steel, stainless steel and cast austenitic stainless steel in treated water, steam, sodium pentaborate, and reactor coolant environments.
2. To confirm the effectiveness of the Fuel Oil Chemistry program to manage the loss of material aging effect for, copper alloy, steel, galvanized steel and stainless steel in a fuel oil environment.
3. To confirm the effectiveness of the Lubricating Oil Analysis program to manage the loss of material and the reduction of heat transfer aging effects for copper alloy, gray cast iron, steel and stainless steel in a lubricating oil environment.
4. To confirm loss of material in carbon steel piping and fittings is insignificant in an air/gas-wetted (internal) environment.

The new program elements include (a) determination of the sample size based on an assessment of materials of fabrication, environment, plausible aging effects and mechanisms, and operating experience; (b) identification of the inspection locations in the system or component based on the aging effect; (c)

determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined; and (d) evaluation of the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize an intended function before the end of the period of extended operation. When evidence of an aging effect is revealed by a one-time inspection, the engineering evaluation of the inspection results will identify appropriate corrective actions.

~~The inspection sample includes one-time inspection of more susceptible materials in potentially more aggressive environments (e.g., low or stagnant flow areas) to manage the effects of aging.~~ ***The sample plan for inspections associated with the One-Time Inspection program will be developed to ensure there are adequate inspections to address each of the material, environment, and aging effect combinations. The sample plan will be determined by establishing sample groups based on aging effects and environments. The sample groups will be populated with the components and their materials of fabrication. Selection of the components for inspection, wherever possible, will be biased towards inspecting bounding or lead components of the most susceptible materials with the potentially more aggressive environments (e.g., low or stagnant flow areas), and components with the lowest design margin. A sample size of 20% of the population (up to a maximum of 25 inspections) will be established for each of the sample groups.*** Qualified personnel following station procedures that are based on applicable codes and standards, including ASME and 10 CFR 50, Appendix B, will perform the inspections. Examination methods will include volumetric examination (UT or RT) or visual examination (VT-1, VT-3, or equivalent). Acceptance criteria are in accordance with industry guidelines, codes, and standards, including ASME Boiler and Pressure Vessel Code, Section XI, 2001 Edition, 2003 Addenda ***the applicable edition of ASME Boiler and Pressure Vessel Code, Section XI.***

The One-Time Inspection aging management program is a condition monitoring program with elements that are effective in detecting the identified aging effects and evaluating the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize an intended function before the end of the period of extended operation.

The inspections will be scheduled within 10 years prior to the period of extended operation, as close to the end of the current operating license as practical with margin provided to ensure completion and evaluation of the inspection results including identification of any appropriate corrective actions prior to commencing the period of extended operation.

Refer to Enclosure B of this letter for the update to the One Time Inspection aging management program commitment (license renewal commitment 22) associated with this RAI response.

RAI B.2.1.23-1

Background

GALL AMP XI.M33, "Selective Leaching of Materials" states in element 1, "scope of program" that the program includes a one-time visual inspection and hardness measurement of a selected set of sample components to determine whether loss of material due to selective leaching is not occurring for the period of extended operation.

LRA Section B.2.1.23, Selective Leaching, states that the program is consistent with the elements of GALL AMP XI.M33.

Issue

Due to the uncertainty in determining the most susceptible locations and the potential for aging to occur in other locations, the staff noted that large (at least 20%) sample sizes may be required in order to adequately confirm an aging effect is not occurring. The applicant's Selective Leaching Program did not include specific information regarding how the selected set of components to be sampled or the sample size will be determined.

Request

Provide specific information regarding how the selected set of components to be sampled will be determined and the size of the sample of components that will be inspected.

PSEG Response:

Hope Creek will implement a Selective Leaching of Materials aging management program (Hope Creek LRA Appendix B, Section B.2.1.23) which will include a one-time inspection of components with susceptible material and environment combinations to verify that loss of material due to selective leaching is not occurring. The sample size and inspection locations for the one-time inspections associated with the Selective Leaching of Materials aging management program will be developed to ensure that a representative sample of material/environment combinations is selected with a focus on leading indicator components. This approach provides assurance that aging of the components is being adequately managed to ensure the component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

The representative sample size and one-time inspection locations will be determined based on the population of components with the two susceptible materials of fabrication. A sample size of 20% of the population of copper alloy components susceptible to selective leaching will be established with up to a maximum of 25 inspections performed. Similarly, a sample size of 20% of the population of gray cast iron components susceptible to selective leaching will be established with up to a maximum of 25

inspections performed. The maximum sample size for each of the two material groups is consistent with the methodology discussed in Section 4, "Sampling Program Description" of EPRI TR-107514, *Age-Related Degradation Inspection Method and Demonstration In Behalf of Calvert Cliffs Nuclear Power Plant License Renewal Application*.

One-time inspections will include each material/environment combination of in-scope components for each material-based sample population. The specific inspection locations for each of the material-based sample populations will be identified to include the bounding or leading components most susceptible to selective leaching based on time in service, severity of operating conditions/environments (e.g., stagnant or low flow areas), and lowest design margins.

Hope Creek LRA Sections A.2.1.23 and B.2.1.23 and Table A.5, Commitment Number 23 are revised to identify the sampling methodology described above.

The LRA Appendix A, Section A.2.1.23, on page A-22 is revised due to this RAI as follows: (Note: Pre-existing text, from the LRA or previous RAI packages, is formatted in normal font; new text is bold and italicized. Pre-existing text has been repeated here to provide context for the changes.)

A.2.1.23 Selective Leaching of Materials

The Selective Leaching of Materials aging program is a new program that will include one-time inspections of a representative sample of susceptible components to determine where loss of material due to selective leaching is occurring in susceptible material and environment combinations. The program will also include aging management activities, for material and environment combinations where selective leaching is identified, to manage loss of material due to selective leaching. Components include valve bodies, heat exchanger components, pump casings, piping and fittings, strainer bodies, and tanks. One-time inspections will include visual examinations, supplemented by hardness tests, and other examinations, as required. One-time inspections will include visual examinations, supplemented by hardness tests, and other examinations, as required. If selective leaching is found, the condition will be evaluated to determine the need to expand inspection scope.

One-time inspections of susceptible material and environment combinations, where selective leaching has not previously been confirmed, will be performed in the last 10 years of the current term, prior to entering the period of extended operation. ***A sample size of 20% of susceptible components will be subjected to a one-time inspection with a maximum of 25 inspections for each of the susceptible material groups.*** For material and environment combinations where selective leaching is identified, aging management activities, such as periodic inspections, will be implemented to manage aging such that the component intended function is maintained consistent with the current licensing basis through the period of extended operation.

The LRA Appendix B, Section B.2.1.23, Program Description, on page B-113 is revised due to this RAI as follows: (Note: Pre-existing text, from the LRA or previous RAI packages, is formatted in normal font; new text is bold and italicized. Pre-existing text has been repeated here to provide context for the changes.)

B.2.1.23 Selective Leaching of Materials

Program Description

The Selective Leaching of Materials aging management program is a new program that will include one-time inspections to determine where loss of material due to selective leaching is occurring in susceptible material and environment combinations. The program will also include aging management activities, for material and environment combinations where selective leaching is identified, to manage loss of material due to selective leaching. The scope of the program will include components made of susceptible materials and located in potentially aggressive environments. Components include valve bodies, heat exchanger components, pump casings, piping and fittings, strainer bodies, and tanks. Susceptible materials at Hope Creek are gray cast iron, copper alloy with greater than 15% zinc and aluminum bronze with greater than 8% aluminum. Environments include raw water, closed cooling water, soil (ground water), and treated water.

The Selective Leaching of Materials aging management program will be implemented prior to the period of extended operation. The program is a condition monitoring aging management program and will provide for visual inspections, hardness tests, and other appropriate examinations, as required, to identify and confirm existence of the loss of material due to selective leaching. If degradation is found, the condition of affected components will be evaluated to determine the impact on their ability to perform intended functions during the period of extended operation. Condition monitoring and expanded sampling will be utilized, as required, to ensure the components perform as designed.

The Selective Leaching of Materials Program will develop a new procedure to perform visual inspections supplemented by hardness tests and other examinations, as required, to determine if selective leaching is occurring. As such, there are no preventative or mitigative attributes associated with this program. In treated water and closed cycle cooling water environments, chemistry is monitored in accordance with the Water Chemistry and Closed-Cycle Cooling Water System Programs, respectively, to minimize corrosive contaminants and to control pH. In some cases, corrosion-inhibiting additives are used. These activities are considered effective in reducing selective leaching.

One-time inspections of susceptible material and environment combinations, where selective leaching has not previously been confirmed, will be performed in the last 10 years of the current term, prior to entering the period of extended operation. ***The one-time inspections will be performed on a representative sample of components with susceptible material and environment combinations. A sample size of 20% of susceptible components will be subjected to a one-time inspection with a maximum of 25 inspections for each of the susceptible material groups (i.e., copper alloy and gray cast iron).***

For material and environment combinations where selective leaching is identified, aging management activities, such as periodic inspections and trending, will be implemented to manage aging such that the component intended function is maintained consistent with the current licensing basis through the period of extended operation.

Refer to Enclosure B of this letter for the update to the Selective Leaching of Materials aging management program commitment (license renewal commitment 23) associated with this RAI response.

Enclosure B

Update to License Renewal Commitment List

The following table identifies revisions made to license renewal commitments 22 and 23 as a result of the RAIs contained in this package. Pre-existing text, from the LRA or previous RAI packages, is formatted in normal font; new text is bold and italicized. Pre-existing text has been repeated here to provide context for the changes. The specific RAIs that led to the commitment revisions are listed in the "SOURCE" column adjacent to the beginning of the new text. Any other actions described in this submittal represent intended or planned actions. The intended or planned actions are described for the information of the NRC and are not regulatory commitments.

A.5 License Renewal Commitment List

NO.	PROGRAM OR TOPIC	COMMITMENT	UFSAR SUPPLEMENT LOCATION (LRA APP. A)	ENHANCEMENT OR IMPLEMENTATION SCHEDULE	SOURCE
22	One-Time Inspection	<p>One-Time Inspection is a new program and will be used for the following:</p> <ol style="list-style-type: none"> 1. To confirm the effectiveness of the Water Chemistry program to manage the loss of material, cracking, and the reduction of heat transfer aging effects for aluminum, copper alloy, ductile cast iron, gray cast iron, nickel alloy, steel, stainless steel, and cast austenitic stainless steel in treated water, steam, sodium pentaborate and reactor coolant environments. 2. To confirm the effectiveness of the Fuel Oil Chemistry program to manage the loss of material aging effect for copper alloy, steel, galvanized steel and stainless steel in a fuel oil environment. 3. To confirm the effectiveness of the Lubricating Oil Analysis program to manage the loss of material and the reduction of heat transfer aging effects for copper alloy, gray cast iron, 	A.2.1.22	Program to be implemented prior to the period of extended operation. One-time inspections to be performed within the ten-year period prior to the period of extended operation.	Section B.2.1.22

NO.	PROGRAM OR TOPIC	COMMITMENT	UFSAR SUPPLEMENT LOCATION (LRA APP. A)	ENHANCEMENT OR IMPLEMENTATION SCHEDULE	SOURCE
		<p>steel and stainless steel in a lubricating oil environment.</p> <p>4. To confirm loss of material in carbon steel piping and fittings is insignificant in an air/gas-wetted (internal) environment.</p> <p><i>The sample plan for inspections associated with the One-Time Inspection program will be developed to ensure there are adequate inspections to address each of the material, environment, and aging effect combinations. A sample size of 20% of the population (up to a maximum of 25 inspections) will be established for each of the sample groups.</i></p>			<p><i>Hope Creek Letter LR-N11-0006 RAI B.2.1.22-1</i></p>
23	Selective Leaching of Materials	<p>Selective Leaching of Materials is a new program that will include one-time inspections of a representative sample of susceptible components to determine where loss of material due to selective leaching is occurring. A sample size of 20% of susceptible components will be subjected to a one-time inspection with a maximum of 25 inspections for each of the susceptible material groups. Where selective leaching is identified, further aging management activities will be implemented such that the component intended function is maintained consistent with the current licensing basis through the period of extended operation.</p>	A.2.1.23	<p>Program to be implemented prior to the period of extended operation. One-time inspections to be performed within the ten-year period prior to the period of extended operation.</p>	<p>Section B.2.1.23</p> <p>Hope Creek Letter LR-N10-0319 LRA Supplement</p> <p><i>Hope Creek Letter LR-N11-0006 RAI B.2.1.23-1</i></p>