ENERGY NORTHWEST

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January 14, 2011
GO2-11-011

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

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397**
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
LICENSE RENEWAL APPLICATION

References: 1) Letter, GO2-10-11, dated January 19, 2010, WS Oxenford (Energy Northwest) to NRC, "License Renewal Application"

2) Letter dated November 1, 2010, NRC to SK Gambhir (Energy Northwest), "Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application," (ADAMS Accession No. ML102930593)

Dear Sir or Madam:

By Reference 1, Energy Northwest requested the renewal of the Columbia Generating Station (Columbia) operating license. Via Reference 2, the Nuclear Regulatory Commission (NRC) requested additional information related to the Energy Northwest submittal.

Transmitted herewith in the Attachment 1 is the Energy Northwest response to the Request for Additional Information (RAI) contained in Reference 2.

As a result of a walkdown in May 2010, the License Renewal Team determined that the material specified for the oil fog lubricators in the Diesel Engine Starting Air System, as documented in Table 3.3.2-17 of Reference 1, was incorrect. Rather than a copper alloy, as stated in rows 24, 25, 26, and 27, the material is steel. The discussion of this issue is provided in Attachment 2.

A143
NRR

Changes to the LRA as a result of the RAI responses and the oil fog lubricator material discrepancy are contained in Amendment 20, provided in the enclosure. No new commitments are included in this response. The LRA Table A-1, Commitment 61 is revised to reflect the changes in the Boron Carbide Monitoring Program.

If you have any questions or require additional information, please contact Abbas Mostala at (509) 377-4197.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the date of this letter.

Respectfully,

SR Gambhir
Vice President, Engineering

Attachment: 1. Response to Request for Additional Information
2. Oil Fog Lubricator Material

Enclosure: License Renewal Application Amendment 20

cc: NRC Region IV Administrator
NRC NRR Project Manager
NRC Senior Resident Inspector/988C
EFSEC Manager
RN Sherman – BPA/1399
WA Horin – Winston & Strawn
EH Gettys - NRC NRR (w/a)
AD Cunanan - NRC NRR (w/a)
BE Holian - NRC NRR
RR Cowley – WDOH

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

"Request for Additional Information for the Review of the Columbia Generating Station, License Renewal Application,"
(ADAMS Accession No. ML102930593)

Holston OTI vs periodic program

RAI 3.2.2.1.Y-1

Background

License Renewal Application (LRA) Table 3.3.1, Item 3.3.1-58 addresses external steel piping and pump surfaces exposed to air-indoor uncontrolled, which are being managed for loss of material due to general corrosion. The LRA credits the External Surfaces Monitoring Program to manage the aging effects for the air-indoor uncontrolled environment. In LRA Tables 3.3.2-9, Containment Vacuum Breaker System, 3.3.2-21, Equipment Drains Radioactive Systems, and 3.3.2-24, Floor Drain Radioactive System, for piping, and LRA Tables 3.3.2-22, Fire Protection System, 3.3.2-42, Standby Service Water System, and 3.3.2-43, Tower Makeup Water System, for pump casings, the applicant cites plant-specific Note 303 which states, "The Supplemental Piping/Tank Inspection will manage loss of material at the air-water interface." The Generic Aging Lessons Learned (GALL) Report recommends GALL aging management program (AMP) XI.M36 "External Surfaces Monitoring" program to ensure that these aging effects are adequately managed. The associated aging management review (AMR) line items cite generic Note E.

Issue

The staff noted that the applicant's plant-specific Note 303 is not clear on whether only the Supplemental Piping and Tank Inspection Program will be utilized or if it will be utilized in conjunction with the External Surfaces Monitoring Program for external surfaces at the air-water interface zone. The staff also noted that the Supplemental Piping and Tank Inspection Program is a one-time inspection program, where the GALL AMP XI.M36 is based on periodic inspections.

Request

1. State whether the external surfaces within the air-water interface will be inspected by both the Supplemental Piping and Tank Inspection and External Surfaces Monitoring Programs.

2. If only the Supplemental Piping and Tank Inspection Program will be utilized, justify why a one-time inspection program is acceptable when the GALL Report recommends a periodic inspection program.

Energy Northwest Response

1. The External Surfaces Monitoring Program manages the effects of surfaces exposed to an air-indoor uncontrolled environment. Other programs (depending on the system) will address the surfaces below the water line. The table below provides a summary of the systems and environments with the credited programs. Therefore, the combination of the External Surfaces Monitoring Program and the other appropriate water environment programs will manage the aging effects. The Supplemental Piping/Tank Inspection will address the air-water interface that has a potentially aggressive environment due to wetting and drying on a one-time confirmatory basis to demonstrate that other programs adequately manage the aging effects. The one-time inspection basis for the Supplemental Piping/Tank Inspection is acceptable because it verifies the effectiveness of other programs.

2. As discussed above, the Supplemental Piping/Tank Inspection will be used as a confirmatory inspection of other programs and will not be used alone.

A summary table and detailed discussion are provided below.

System	LRA Table	Program	Environment
Containment Vacuum Breaker System	3.3.2-9	External Surfaces	Air-indoor, uncontrolled
		BWR Water Chemistry	Treated water
		Chemistry Program Effectiveness	Treated water
Equipment Drains Radioactive Systems	3.3.2-21	External Surfaces	Air-indoor, uncontrolled
		BWR Water Chemistry	Treated water
		Chemistry Program Effectiveness	Treated water
Floor Drain Radioactive System	3.3.2-24	External Surfaces	Air-indoor, uncontrolled
		BWR Water Chemistry	Treated water
		Chemistry Program Effectiveness	Treated water
Fire Protection System	3.3.2-22	External Surfaces	Air-indoor, uncontrolled
		Fire Water	Raw water

System	LRA Table	Program	Environment
Standby Service Water System	3.3.2-42	External Surfaces	Air-indoor, uncontrolled
		Open-Cycle Cooling Water	Raw water
Tower Makeup Water System	3.3.2-43	External Surfaces	Air-indoor, uncontrolled
		Open-Cycle Cooling Water	Treated water
		Open-Cycle Cooling Water	Raw water

As discussed in license renewal application (LRA) Table 3.3.1 Item 58, the Supplemental Piping/Tank Inspection is credited for the external surfaces of steel components at the air-water interface with a Generic Note E. The air-water interface has the potential to be an aggressive environment where contaminants may concentrate due to alternate wetting and drying. Above the air-water interface the subject components are exposed to an air-indoor uncontrolled environment. The Supplemental Piping/Tank Inspection addresses the potential for a unique environment at the air-water interface and supplements other periodic programs credited for aging management. The External Surfaces Monitoring Program will manage the effects of aging for subject components above the air-water interface. Below the water line, the BWR Water Chemistry Program, with verification by the Chemistry Program Effectiveness Inspection, will manage the treated water environment or the Open-Cycle Cooling Water Program will manage the raw water environment, as applicable. The following paragraphs provide additional information regarding the external surfaces of steel piping and pump casings.

The downcomers in the Containment Vacuum Breaker System have an air-water interface where the components enter the suppression pool. Above the water line, the environment is the indoor air and below the water line the components are subject to a treated water environment. As indicated by LRA Table 3.3.2-9 rows 11, 13, and 14, the "Air-indoor uncontrolled" environment is managed by the External Surfaces Monitoring Program and the "Treated water" environment is managed by the BWR Water Chemistry Program, with verification by the Chemistry Program Effectiveness Inspection.

Piping in the EDR and FDR systems has an air-water interface where it enters the suppression pool. Above the water line, the environment is the indoor air and below the water line the components are subject to a treated water environment. The "Air-indoor uncontrolled" environment is managed by the External Surfaces Monitoring Program and the "Treated water" environment is managed by the BWR Water Chemistry Program, with verification by the Chemistry Program Effectiveness Inspection, as indicated by LRA Table 3.2.2-21 Rows 18, 20, and 21 and Table 3.2.2-24 Rows 14, 17, and 18.

The Fire Protection System pumps (FP-P-1, 2A, and 2B) have an air-water interface where the pump columns enter the circulating water basin. Above the water line, the environment is the indoor air and below the water line the components are subject to a raw water environment. As indicated by LRA Table 3.2.2-22 Rows 101 and 103, the "Air-indoor uncontrolled" environment is managed by the External Surfaces Monitoring Program and the "Raw water" environment is managed by the Fire Water Program.

The Standby Service Water System pumps (HPCS-P-2, SW-P-1A, and SW-P-1B) have an air-water interface where the pump columns enter the spray pond. Above the water line, the environment is the indoor air and below the water line the components are subject to a raw water environment. As indicated by LRA Table 3.2.2-42 Rows 73, 74, 78, and 79, the "Air-indoor uncontrolled" environment is managed by the External Surfaces Monitoring Program and the "Raw water" environment is managed by the Open-Cycle Cooling Water Program.

The Tower Makeup System pumps (TMU-P-1A, 1B, and 1C) have an air-water interface where the components enter the water in the Make-up Water Pump House well. Above the water line, the environment is the indoor air and below the water line the components are subject to a raw water environment. The "Air-indoor uncontrolled" environment is managed by the External Surfaces Monitoring Program and the "Raw water" environment is managed by the Open-Cycle Cooling Water Program, as indicated by LRA Table 3.2.2-43 Rows 24 and 26.

For consistency and completeness, LRA Amendment 20, adding plant-specific note 0303 to Row 102 of Table 3.2.2-22, is provided in the enclosure.

RAI B.2.17-1

Background

GALL AMP XI.M32 states that use of a one-time inspection is appropriate when: (a) an aging effect is not expected to occur but the data is insufficient to rule it out with reasonable confidence; (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. GALL AMP XI.M32 also states that for these cases, the one-time inspection should provide confirmation that either the aging effect is indeed not occurring, or the aging effect is occurring very slowly so as not to affect the component or structure's intended function during the period of extended operation.

The GALL Report Table VII.H2, Item VII.H2-2 states that steel piping, piping components, and piping elements exposed to diesel exhaust can undergo loss of material and recommends a plant-specific AMP.

Issue

The LRA Table 3.3.2-16, Row Numbers 14, 27, 32 and 38, refers to the above item and cites generic Note E and plant-specific Note 0322, which states that the environment is predominantly outdoor air with infrequent, and for short duration, exposure to diesel exhaust. The applicant credited the Diesel Systems Inspection Program as the AMP to manage this aging effect. However, it is not clear to the staff how the Diesel System Inspection Program, which is a one-time inspection program, will appropriately manage aging of this component, because the recommended GALL AMP would include periodic inspections to detect the associated aging effect.

Request

Justify how the one-time inspections proposed by the Diesel Systems Inspection Program are adequate to manage loss of material for steel components exposed internally to outdoor air by explaining how, for each component managed by the program, one of the following criteria for use of a one-time inspection is satisfied: (a) the aging effect is not expected to occur but the data is insufficient to rule it out with reasonable confidence; (b) the 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.

Energy-Northwest Response

Based on a teleconference with NRC staff on October 26, 2010, Energy Northwest is re-evaluating the use of one-time inspections described in the License Renewal Application. A comprehensive response to this issue will be provided under separate cover letter. The information related to this request for additional information will be provided at that time.

RAI B.2.18-1

Background

GALL AMP XI.M32 states that use of a one-time inspection is appropriate when: (a) an aging effect is not expected to occur but the data is insufficient to rule it out with reasonable confidence; (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. GALL AMP XI.M32 also states that for these cases, the one-time inspection should provide confirmation that either the aging effect is indeed not occurring, or the aging effect is occurring very slowly so as not to affect the component or structure's intended function during the period of extended operation.

In LRA Section B.2.18, the applicant stated that its Diesel-Driven Fire Pump Inspection Program will be used to identify loss of material in the interior of the fire protection system diesel engine steel exhaust piping exposed to outdoor air and the copper alloy, gray cast iron (steel), and stainless steel heat exchangers exposed to raw water (antifreeze). The applicant also stated that the inspection checks for reduction in heat transfer and cracking due to stress corrosion cracking of susceptible materials.

GALL Report Item VIII.B1-6 recommends GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" to manage loss of material for steel piping exposed internally to outdoor air. GALL AMP XI.M38 includes periodic inspections of the internal surfaces of components to manage loss of material. GALL Report Items VII.C1-3, VII.C1-5, and V.A-8 recommend GALL AMP XI.M20, "Open Cycle Cooling Water" to manage loss of material for copper alloy, steel, and stainless steel heat exchanger components, respectively. GALL AMP XI.M20 includes periodic inspections, surveillance testing, and water chemistry controls to manage loss of material and reduction of heat transfer. The GALL Report for copper alloy, steel, and stainless steel components exposed to raw water recommend GALL AMP XI.M27, "Fire Water System" to manage loss of material. GALL AMP XI.M27 also recommends periodic inspections and surveillance testing to manage loss of material and fouling.

Issue

It is not clear to the staff how a one-time inspection program is appropriate to manage loss of material and reduction of heat transfer for these material and environment combinations given that: (a) loss of material is expected to occur for steel piping exposed to outdoor air; (b) loss of material and reduction in heat transfer is expected to occur for copper alloy, steel, and stainless steel heat exchanger components exposed to raw water; (c) the GALL Report recommends periodic inspection programs to manage aging for these material and environment combinations; and (d) a one-time inspection program is only to be used when an aging effect is not expected or is expected to progress very slowly.

Request

Justify how the one-time inspections proposed by the Diesel-Driven Fire Pump Inspection Program are adequate to manage loss of material and reduction of heat transfer for copper alloy, steel, and stainless steel components exposed internally to outdoor air or raw water by explaining how, for each component managed by the program, one of the following criteria for use of a one-time inspection is satisfied: (a) the aging effect is not expected to occur but the data is insufficient to rule it out with reasonable confidence; (b) the 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.

Energy-Northwest Response

Based on a teleconference with NRC staff on October 26, 2010, Energy Northwest is re-evaluating the use of one-time inspections described in the License Renewal Application. A comprehensive response to this issue will be provided under separate cover letter. The information related to this request for additional information will be provided at that time.

RAI B.2.48-1

Background

The GALL AMP XI.M32 states that use of a one-time inspection is appropriate when: (a) an aging effect is not expected to occur but the data is insufficient to rule it out with reasonable confidence; (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. GALL AMP XI.M32 also states that for these cases, the one-time inspection should provide confirmation that either the aging effect is indeed not occurring, or the aging effect is occurring very slowly so as not to affect the component or structure's intended function during the period of extended operation.

In LRA Section B.2.48, the applicant stated that its Service Air System Inspection Program will be used to identify the material condition of piping and valve bodies exposed to an internal air environment. The applicant also stated that the inspection checks for loss of material due to general corrosion.

The GALL Report recommends GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" Program to manage loss of material for steel piping exposed internally to air. GALL AMP XI.M38 includes periodic inspections of the internal surfaces of components to manage loss of material.

Issue

It is not clear to the staff how a one-time inspection program is appropriate to manage loss of material for these material and environment combinations given that: (a) loss of material is expected to occur for steel piping exposed internally to air; (b) the GALL Report recommends periodic inspection programs to manage aging for these material and environment combinations; and (c) a one-time inspection program is only to be used when an aging effect is not expected or is expected to progress very slowly.

Request

Justify how the one-time inspections proposed by the Service Air System Inspection Program are adequate to manage loss of material for steel components exposed internally to air by explaining how, for each component managed by the program, one of the following criteria for use of a one-time inspection is satisfied: (a) the aging effect is not expected to occur but the data is insufficient to rule it out with reasonable confidence; (b) the 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.

Energy-Northwest Response

Based on a teleconference with NRC staff on October 26, 2010, Energy Northwest is re-evaluating the use of one-time inspections described in the License Renewal Application. A comprehensive response to this issue will be provided under separate cover letter. The information related to this request for additional information will be provided at that time.

Spent Fuel Pool

RAI B.2.54-1

Background

Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR) Section A.1.2.3.1, states that the scope of the program should include the specific structures and components of which the program manages the aging.

In addition, SRP-LR Section A.1.2.3.4, states that detection of aging effects should occur before there is a loss of the structure and component intended functions. The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended functions will be adequately maintained for license renewal under all current licensing basis design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new or one-time inspections to ensure timely detection of aging effects.

In its response dated August 19, 2010, the applicant states that the Boron Carbide Monitoring Program detects degradation of boron carbide (B_4C) neutron absorbers in the spent fuel storage racks by B_4C coupon inspection. The applicant further stated that boron loss is determined through measurement of the boron areal density (i.e., neutron attenuation testing) in the coupons. In addition, per the corrective action program, the applicant also indicated that *in situ* areal measurement density techniques such as Boron-10 Areal Density Gauge for Evaluating Racks (BADGER) testing may be performed to determine boron loss.

Issue

LRA Section B.2.54 does not indicate the location and number of B_4C coupons used in the Boron Carbide Monitoring Program and whether or not coupon inspection will be performed in the period of extended operation. Furthermore, the applicant indicated that neutron attenuation testing will be performed, but the frequency of testing was not stated.

Request

1. Indicate the number of B_4C coupons available for use for the Boron Carbide Monitoring Program.

    a. Discuss the number of coupons inspected during each inspection and whether coupon inspection will be performed throughout the period of extended operation.

    b. Provide past inspection test results for the coupons, including boron areal density measurements.

2. Provide the frequency for which neutron attenuation testing, either *in situ* or coupons, will be performed during the period of extended operation.

3. Discuss the location, neutron flux, and mounting of the sample coupons relative to the fuel assemblies.

    a. If the coupons are at a location of low neutron flux they will not be representative or bounding of the higher flux racks in the pool. As such, discuss how the loss of material and reduction of neutron absorbing capacity in the racks will be monitored or inspected.

    b. Guidance on an acceptable program is available in License Renewal Interim Staff Guidance (LR-ISG) 2009-01, "Aging Management of Spent Fuel Pool Neutron-Absorbing Materials other than Boraflex." Describe how your program is consistent with LR-ISG-2009-01.

4. Provide the associated license renewal final safety analysis report supplement and commitment to perform this program in the period of extended operation.

Energy Northwest Response:

1. There are 14 coupons in the coupon canister within the Spent Fuel Pool (SFP).

   a. One coupon is removed from the spent fuel pool for inspection every four years. This inspection interval will be continued through the period of extended operation (PEO). There is a sufficient number of coupons to continue the inspection through the PEO at the same frequency.

      Each coupon in the SFP has a matching controlled coupon in storage. Both coupons, the irradiated coupon from the SFP and the controlled coupon, are inspected and the results are compared.

   b. Energy Northwest has performed visual exams on coupons every four years beginning in 1999 and no signs of degradation have been seen. Results from the 1995 isotopic abundance analyses are provided below. The laboratory results showed no degradation of the boron carbide material. The table below shows the atom percent of the boron 10 and boron 11 isotopes. The first three sample ID rows are from coupon #4 which had been in the spent fuel pool. The first three lines correspond to three separate locations that were tested on coupon #4. Lines 4, 5, and 6 are the results from three separate locations on the corresponding control coupon #4.

Row	Sample ID	Isotope	Atom Percent
1	B_4C R4 - #1	B^{10}	20.00
		B^{11}	80.00
2	B_4C R4 - #2	B^{10}	20.00
		B^{11}	80.00
3	B_4C R4 - #3	B^{10}	20.03
		B^{11}	79.97
4	4C - 1	B^{10}	20.04
		B^{11}	79.96
5	4C - 2	B^{10}	20.04
		B^{11}	79.96
6	4C - 3	B^{10}	20.05
		B^{11}	79.95

2. Initial *in situ* testing of the Spent Fuel Rack neutron absorbing material will be performed prior to the PEO to determine the current state of the racks. Additional *in situ* testing will be based on the results of this initial testing, but at an interval not to exceed ten years. The SFP coupons will continue to be tested on a 4 year frequency unless the frequency of the *in situ* testing is set at a frequency less than or equal to six years. *In situ* testing at such a frequency would render the coupon testing meaningless.

3. The coupons are mounted on the outside of the racks at roughly the middle height of the bundles. This is in a low flux region of the SFP.

   a. The coupon testing program will be compared with the *in situ* testing results and the comparison will determine the future of the coupon testing program. Additional periodic *in situ* testing will be performed based on the results of the initial *in situ* testing at a frequency not to exceed ten years.

   b. Columbia's plant specific Boron Carbide Monitoring Program was submitted under letter GO2-10-117, dated August 19, 2010, SK Gambhir (Energy Northwest) to NRC, "Response to Request for Additional Information, License Renewal Application." As a plant specific program an element to element comparison was not provided. However, the elements of Columbia's plant specific program as previously submitted and as amended to the response to this RAI is consistent with and meets the intent of the program to the guidance provided in LR-ISG-2009-01.

4. The FSAR supplement associated with the Boron Carbide Monitoring Program is found in Appendix A (section A.1.2.54) of the LRA and the corresponding commitment to continue with this program for the PEO is contained in Table A-1 (item 61). Both of these items were provided per Amendment 2 to the LRA as previously submitted under letter GO2-10-117. Amendment 20 to the LRA to address the change to the commitment is provided in the enclosure.

Oil Fog Lubricator Material

There is no request for additional information associated with this issue.

Based on approved plant documents, the material for the oil fog lubricator was identified as copper alloy and aluminum. This fact was questioned after a system walkdown found some of the oil fog lubricator bowls were made of steel and others were made of aluminum. The License Renewal Team researched the issue and found a discrepancy between documents. The qualification information document (QID) incorrectly stated the material for the bowl was copper alloy. The vendor information in plant files shows that the bowl is made of steel. A substitution evaluation performed for the component approved aluminum as an acceptable substitute for steel. The issue was entered into the corrective action program (CAP) and the QID file has been corrected.

The License Renewal Application (LRA) Table 3.3.2.17, rows 24, 25, 26 and 27 are changed and new row 74 is added in Amendment 20 to reflect steel instead of copper alloy. This introduces a new material and environment combination for the oil fog lubricator. However, the material and environment combination, the aging mechanism, and aging management program (AMP) were addressed in the aging management review for other system components. Therefore, the new material and environment combination does not require the review of a new aging mechanism or the development of a new AMP. No change of the applicable AMPs, Air Quality Sampling, Lubricating Oil Analysis, Lubricating Oil Inspection, External Surfaces Monitoring, and Diesel Starting Air Inspection, is necessary because of the change in material. Therefore, the identification of the new material and environment combination for the oil fog lubricators does not introduce a new aging mechanism or new program to control aging in the Diesel Engine Starting Air System.

License Renewal Application
Amendment 20

Section No.	Page No.	RAI Response
Table 3.3.2-17, Rows 24, 25, 26, & 27	3.3-201	No RAI, See Attachment 2
Table 3.3.2-17, Insert A for new row 74	3.3-206	No RAI, See Attachment 2
Table 3.3.2-17 New row 74	3.3-206b	No RAI, See Attachment 2
Table 3.3.2-22 Row 102	3.3-246	3.2.2.1.Y-1
Table A-1 Item 61	A-68a	B.2.54-1
B.2.54	208b	B.2.54-1

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
19	Heat Exchanger (tubes) (DSA-HX-2)	Structural integrity	Copper Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
20	Oil Fog Lubricator	Pressure boundary	Aluminum Alloy	Air (Internal)	None	None	N/A	N/A	G
21	Oil Fog Lubricator	Pressure boundary	Aluminum Alloy	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	N/A	N/A	G
22	Oil Fog Lubricator	Pressure boundary	Aluminum Alloy	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	N/A	N/A	G
23	Oil Fog Lubricator	Pressure boundary	Aluminum Alloy	Air-indoor uncontrolled (External)	None	None	N/A	N/A	G
24	Oil Fog Lubricator	Pressure boundary	~~Copper Alloy > 15% Zn~~	Air (Internal)	~~None~~	~~None~~	N/A	N/A	G
25	Oil Fog Lubricator	Pressure boundary	~~Copper Alloy > 15% Zn~~	Lubricating oil (Internal)	Loss of material	Lubricating Oil Analysis	VII.H2-~~10~~ 20	3.3.1-~~26~~ 14	A
26	Oil Fog Lubricator	Pressure boundary	~~Copper Alloy > 15% Zn~~	Lubricating oil (Internal)	Loss of material	Lubricating Oil Inspection	VII.H2-~~10~~ 20	3.3.1-~~26~~ 14	A
27	Oil Fog Lubricator	Pressure boundary	~~Copper Alloy > 15% Zn~~	Air-indoor uncontrolled (External)	~~None~~	~~None~~	~~N/A~~	~~N/A~~	~~G~~

Loss of material

Air Quality Sampling

Steel

Loss of material

External Surfaces Monitoring

VII.I-8

3.3.1-58

A

Amendment 20

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
64	Valve Body	Pressure boundary	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
65	Valve Body	Pressure boundary	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G
66	Valve Body	Pressure boundary	Steel	Air (Internal)	Loss of material	Diesel Starting Air Inspection	N/A	N/A	G
67	Valve Body	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
68	Valve Body	Structural integrity	Stainless Steel	Air (Internal)	None	None	N/A	N/A	G
69	Valve Body	Structural integrity	Stainless Steel	Air-indoor uncontrolled (External)	None	None	VII.J-15	3.3.1-94	A
70	Valve Body	Structural integrity	Steel	Air (Internal)	Loss of material	Air Quality Sampling	N/A	N/A	G 0314
71	Valve Body	Structural integrity	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A

Insert new rows 72 and 73 for Table 3.3.2-17 as shown on page 3.3-206a.

Insert A from Page 3.3-206b

Insert A for Page 3.3-206

Table 3.3.2-17 Aging Management Review Results – Diesel Engine Starting Air System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
74	Oil Fog Lubricator	Pressure boundary	Steel	Air (Internal)	Loss of material	Diesel Starting Air Inspection	N/A	N/A	G

Table 3.3.2-22 Aging Management Review Results –Fire Protection System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
97	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
98	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Gray Cast Iron	Raw water (External)	Loss of material	Selective Leaching Inspection	VII.G-14	3.3.1-85	A
99	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Moist air (Internal)	Loss of material	Supplemental Piping/Tank Inspection	VII.G-23	3.3.1-71	E 0303
100	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
101	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	External Surfaces Monitoring	VII.I-8	3.3.1-58	A
102	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Air-indoor uncontrolled (External)	Loss of material	Supplemental Piping/Tank Inspection	VII.I-8	3.3.1-58	E
103	Pump Casing (FP-P-1,2A,2B)	Pressure boundary	Steel	Raw water (External)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A
104	Pump Casing (FP-P-110)	Pressure boundary	Gray Cast Iron	Raw water (Internal)	Loss of material	Fire Water	VII.G-24	3.3.1-68	A

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Table A-1
Columbia License Renewal Commitments

Item Number	Commitment	FSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
61) Boron Carbide Monitoring Program	The Boron Carbide Monitoring Program is an existing program that will be continued for the period of extended operation.	A.1.2.54	~~Ongoing~~

Insert A from page A-68b

Initial in situ testing of the Spent Fuel Rack neutron absorbing material will be performed prior to the period of extended operation to determine the current state of the racks. Additional in situ testing will be based on the results of this initial testing, but at an interval not to exceed ten years.

Initial in situ testing prior to the period of extended operation, then onging.

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operating experience. A visual examination of the B_4C sample coupons is made to evaluate surface appearance, size, shape and color. Mechanical testing of B_4C samples is done on a periodic basis to determine if physical degradation is occurring in the plate material. In addition, chemical testing will take place on a periodic basis to determine if leaching of the boron content is occurring.

Detection of Aging Effects:

The amount of boron loss from the B_4C panels is determined through measurement of the boron areal density in the coupons. Visual inspections and measurements, as appropriate, are used to determine and assess the extent of degradation in the Boron Carbide before there is a loss of intended function. This can be supplemented with verification of boron loss in the spent fuel racks through areal density measurement techniques such as the (Boron-10 Areal Density Gage for Evaluating Racks) BADGER device.

Monitoring and Trending:

The periodic inspection measurements and analysis are to be compared to values of previous measurements and analysis to provide a continuing level of data for trend analysis. Also, studies by other utilities using similar B_4C material for high density spent fuel racks will be monitored for information.

Acceptance Criteria:

The 5% subcriticality margin of the spent fuel racks is to be maintained for the period of extended operation. Corrective actions are initiated if the test results find that the 5% subcriticality margin cannot be maintained because of the current or projected future degradation. The fuel rack loading pattern will be determined by Reactor Engineering and one or more samples will be analyzed for B-10 content. If data continues to suggest less than 5% subcriticality, then blackness testing such as BADGER testing may be performed on the racks as a result of corrective action performed.

Corrective Actions:

This element is common to Columbia programs and activities that are credited with aging management during the period of extended operation and is discussed in LRA Section B.1.3.

Initial in situ testing of the Spent Fuel Rack neutron absorbing material will be performed prior to the period of extended operation to determine the current state of the racks. Additional in situ testing will be based on the results of this initial testing, but at an interval not to exceed ten years.