ENERGY NORTHWEST

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GO2-11-016

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 October 20, 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. ML102730355)

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 is the Energy Northwest response to the Request for Additional Information (RAI) contained in Reference 2. The enclosure contains Amendment 19 to the Columbia License Renewal Application. No new commitments are included in this response.

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

A143
NRR

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

Respectfully,

SK Gambhir
Vice President, Engineering

Attachment: Response to Request for Additional Information

Enclosure: License Renewal Application Amendment 19

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. ML102730355)

RAI B.2.5-2 Buried Pipe Follow-up RAI

Background

Given that there have been a number of recent industry events involving leakage from buried or underground piping, the staff needs further information to evaluate the impact that these recent industry events might have on the applicant's Buried Piping and Tanks Inspection Program. By letter dated June 30, 2010, the staff issued a request for additional information (RAI) B.2.5-1 requesting that the applicant provide information regarding how Columbia Generating Station (Columbia) will incorporate the recent industry operating experience (OE) into its aging management reviews (AMRs) and aging management programs (AMPs). The applicant responded on August 26, 2010. In reviewing the response, the staff had further questions.

Issue

1) The license renewal application (LRA) states that circulating water, diesel fuel oil, fire protection, radwaste building HVAC, standby service water, tower make-up water, and condensate nuclear systems include in-scope buried piping. The applicant's response did not provide specifics on the number of buried or underground pipe and tank inspections that would be conducted. The staff believes that in order to provide a reasonable assurance that in-scope buried piping and tanks will be capable of performing its current license basis (clb) function(s) and not release hazardous materials (i.e., material which, if released, could be detrimental to the environment such as diesel fuel and radioisotopes that exceed the Environmental Protection Agency drinking water standards) to the environment, each category of in-scope buried piping based on material, safety/Code class, and potential to contain hazardous material should be inspected. The LRA and supplemental material did not contain enough specifics on the planned inspections for the staff to determine if the inspections would be adequate to manage the aging effect for in-scope buried pipes and tanks based on material, safety/Code class, and potential to contain hazardous material categories.

2) The applicant's response did not state if they would utilize examination methods other than excavation and direct visual inspection of buried piping. The staff acknowledges that examining buried pipe from the exterior surface may not be possible sometimes due to plant configuration (e.g., the piping is located underneath foundations); nevertheless, it is important to expose a large enough length of the piping in order to establish reasonable assurance of the condition of the piping system. The staff believes that in instances where it is not possible to

examine the program designated length of piping during each inspection, an alternative examination should be proposed. For example, the staff notes that it is reasonable to substitute an ultrasonic volumetric examination from the interior of the pipe provided the surface is properly prepared.

3) The LRA does not contain details on (a) which in-scope buried piping systems are protected by a cathodic protection system, (b) the availability of the cathodic protection system, and (c) what periodic testing is conducted on the cathodic protection system. The staff's position is that cathodic protection is an important preventive measure for steel piping.

4) Neither the LRA nor the RAI response described the quality of the backfill in the vicinity of buried in-scope piping. The presence of rocks and sharp objects in the backfill around buried pipes is a leading precursor of degradation of buried piping. Over time ground movement causes these materials to come in contact with the buried pipe resulting in damage to the pipe's coating or external surfaces. Also, based on the staff's review of LRA Section 2.3, the Updated Final Safety Analysis Report (UFSAR) and the License Renewal boundary Drawings, it is not clear to the staff if the in-scope buried piping for the radwaste building HVAC has a safety related function.

Request

1) For buried in-scope piping and tanks, respond to the following:
   i. Understanding that the total number of inspections performed will be dictated by plant-specific and industry operating experience, what minimum number of inspections of buried in-scope piping are planned during the 30-40 year, 40-50 year, and 50-60 year operating period? When defining the minimum number of planned inspections, categorize the buried in-scope piping inspection quantities into material, code/safety-related piping, and potential to contain hazardous material.
   ii. As part of the planned inspections, what lengths of piping will be excavated and have a direct visual inspection?
   iii. While it is clear to the staff that the diesel fuel oil piping contains hazmat material, the staff does not have sufficient information to determine if the Circulating water, fire protection, radwaste building HVAC, standby service water, tower make-up water, and condensate nuclear systems contain hazmat. Which of these systems contain hazmat during normal operation?
   iv. For in-scope buried piping containing hazmat, what percent of total linear feet will be inspected during each ten year period, beginning at a time period, ten years prior to the period of extended operation?
   v. If there are no planned inspections for in-scope buried piping containing hazmat, justify why it is acceptable to not inspect in-scope buried piping containing hazardous materials.
   vi. How many inspections will be conducted for the buried diesel fuel oil storage tanks during the 30-40 year, 40-50 year, and 50-60 year operating period? If each tank will not be inspected at least once during the 30-60 year operating

period, justify why any lesser number of inspections will be effective at providing a reasonable assurance that the buried in-scope tanks will meet their current licensing basis function.

2) For buried in-scope piping respond to the following:
   i. If excavated direct visual inspections of buried pipe are not possible, describe what alternative inspection methods will be utilized.
   ii. Justify why alternative volumetric examination method, beyond ultrasonic examinations, will be effective at providing a reasonable assurance that the buried in-scope piping system will meet their CLB function, if it is used to conduct an interior wall thickness as an alternative for excavating and visually inspecting a buried piping segment.
   iii. If a volumetric examination method is used in lieu of direct visual examination, what percentage of interior axial length of the pipe will be inspected?

3) For buried in-scope steel piping respond to the following:
   i. Which piping systems are cathodically protected? Include portions of a system that are cathodically protected, and portions of a system that are not cathodically protected.
   ii. If a piping system or portions of a system are not cathodically protected:
      a. Justify how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.
      b. State what augmented inspections will be conducted. If no augmented inspections are planned, justify how a reasonable assurance will be established that the piping will meet its CLB throughout the period of extended operation.
   iii. State the availability of the cathodic protection system. If portions of the system are not available 90% of the time or allowed to be out of service for greater than 90 days in any given year, justify how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.
   iv. If annual ground potential surveys of the cathodic protection system are conducted, what is the acceptance criteria. If annual ground potential surveys are not conducted, justify how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.

4) For buried in-scope piping respond to the following:
   i. Describe and provide details on the quality of the backfill in the vicinity of in-scope buried pipes.
      a. If there is no information on the condition of the quality of backfill beyond initial installation specifications (i.e., no documented observations of the quality of the backfill), justify why the planned inspections are adequate to detect potential degradation as a result of coating damage or holidays, or damage to the exterior surface of non-coated piping.

5) State if the in-scope buried piping for the radwaste building HVAC has a safety related function.

Energy Northwest Response

Energy Northwest is in the process of revising the Buried Piping and Tanks Inspection Program as currently described in the License Renewal Application based on NRC expectation to follow NUREG-1801 (GALL Report) Rev. 2. Energy-Northwest is evaluating Columbia's Buried Piping and Tanks Inspection Program with the XI.M41 Buried and Underground Piping and Tanks Program described in the current version of the GALL Report Rev. 2 (ML103490041). Therefore, a comprehensive response to this issue will be provided under a separate cover letter.

RAI 3.2.2-1 -Elastomers

Background

The program description for GALL AMP XI.M32, "One-time Inspection Program" states in part,

> "The program includes measures to verify the effectiveness of an aging management program (AMP) and confirm the insignificance of an aging effect. Situations in which additional confirmation is appropriate include (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. For these cases, there is to be 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 intended function during the period of extended operation."

LRA Section B.2.27 states that the Flexible Connection Inspection Program is a new one-time inspection that will detect and characterize the material condition of elastomeric components that are exposed to treated water, dried air, gas, and indoor air environments. Additionally, the following LRA Tables have flexible connection AMR line items exposed to air-indoor uncontrolled (external) that credit the Flexible Connection Inspection Program:

Table
3.2.2-5 Standby Gas Treatment
3.3.2-4 Containment Exhaust Purge and Containment Supply Purge
3.3.2-15 Diesel Cooling Water
3.3.2-22 Fire Protection

Issue

The staff does not believe that it is possible to state that the aging effects of all elastomeric materials meets at least one of the three criteria contained in the program description for GALL AMP XI. M32. Many elastomers will harden and loose strength over a sixty year period particularly in the presence of ultraviolet light, ozone, or radiation, and the degradation mechanism expected to occur, does not necessarily progress slowly, nor does it include a long incubation period. The "detection of aging effects" program element of GALL AMP XI. M32 states that one time inspections should be performed in accordance with examples provided in the accompanying GALL AMP table, and in cases where "If the applicant chooses to use an alternative to the recommendations in this table, a technical justification should be provided as an exception to this AMP. This exception should list the AMR line item component, examination technique, acceptance criteria, evaluation standard and a description of the justification." The staff notes that while the applicant stated that the use of physical manipulation and prodding will augment visual inspections of elastomeric material, there is no justification why a one-time inspection is acceptable for any specific material and environment combination in relation to the three criteria in GALL AMP XI.M32.

Request

Justify the utilization of a one-time inspection program to confirm the insignificance of an aging effect, for each specific elastomeric material exposed to a specific environment (e.g., temperature, radiation, ultraviolet light, ozone, chemical effects) listed in the above table to confirm that (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 establish that each component will be capable of meeting their CLB function(s) throughout the period of extended operation.

Energy Northwest Response

Based on a teleconference with the Project Manager and other NRC staff on October 26, 2010, Energy Northwest is in the process of re-evaluating the use of one-time inspections as currently described in the License Renewal Application. A comprehensive response to this issue will be provided in response to RAI B.2.14-1 contained in the letter dated November 5, 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. ML103010080). The information related to this request for additional information will be provided at that time.

RAI 3.3.2-1

Background

The applicant stated that the following items exposed to moist air (internal and air-uncontrolled (external) or air-indoor uncontrolled (external) have no aging effect and no AMP is proposed.

LRA Table	Component	Material
3.3.2-41	Sight Glasses	Polymer
3.3.2-16	Flexible Connections	Elastomer
3.3.2-20	Flexible Connections	Elastomer
3.5.2-13	Cable Tie Wraps	Nylon
3.5.2-13	Piping and Mechanical Equipment Insulation	Fiberglass

Issue

Non-metallic components constructed of the polymer, elastomer, nylon, and fiberglass materials are susceptible to aging due to exposure to radiation, ozone, high temperature or ultraviolet light. The applicant stated in plant-specific note 0532, that the nylon tie wraps are allowed outside the radiologically controlled area where they will not be exposed to environmental stresses such as extreme temperature, ultraviolet radiation, or harsh chemicals. However, it is not clear to the staff that the applicant has taken into consideration the ultraviolet radiation produced by fluorescent or mercury vapor lights.

Request

1) Justify why radiation, ozone, high temperature, and/or ultraviolet light levels in the vicinity of the polymer sight glasses would not lead to (or contribute to) aging effects during the period of extended operation.

2) Justify why ultraviolet light levels or high temperature in the vicinity of the elastomeric flexible connections would not lead to (or contribute to) aging effects during the period of extended operation.

3) Justify why ultraviolet light levels produced by fluorescent or mercury vapor lights or ozone in the vicinity of the nylon cable tie wraps would not lead to (or contribute to) aging effects during the period of extended operation.

4) Justify why radiation or ozone in the vicinity of the fiberglass piping and mechanical equipment insulation would not lead to (or contribute to) aging effects during the period of extended operation.

Energy Northwest Response

1) The polymer sight glass (SLC-LG-1) listed in license renewal application (LRA) Table 3.3.2-41 for the Standby Liquid Control (SLC) System is made of polycarbonate, which is a polymer (plastic). A review of various industry sources and environmental data concludes that there are no aging effects for the subject polycarbonate sight glass (SLC-LG-1). The sight glass (SLC-LG-1) is located on the SLC test tank (SLC-TK-2), and components in this location will be exposed to 5.7×10^4 rads through the period of extended operation. This is below the polycarbonate lowest radiation threshold of 7×10^5 rads reported in Electric Power Research Institute (EPRI) NP-2129. Polycarbonate has excellent resistance to ozone with no effects reported for exposure to ozone in excess of 1000 ppm. Polycarbonate is resistant to heat up to temperatures of 250°F. The sight glass (SLC-LG-1) is located in the Reactor Building, and the highest normal temperature in the Reactor Building is 130°F. The ASM International Materials Handbook indicates that while polycarbonate properties may deteriorate by exposure to ultraviolet (UV) radiation, degradation of polycarbonate due to UV radiation only occurs when used in outdoor applications. The sight glass is located indoors and is not exposed to outdoor UV light. Therefore, the polycarbonate (polymer) sight glass will not be subject to aging effects during the period of extended operation from its exposure to radiation, ozone, elevated temperature, or UV light.

2) A review of various industry sources and environmental data concludes that there are no aging effects for the internal and external environments of the subject elastomer flexible connections (DE-FLX-2A1, 2A2, 2B1, 2B2, and 4) in LRA Table 3.3.2-16. Thermal exposure is an applicable aging mechanism for elastomers when ambient temperature is greater than 95°F. The elastomer flexible connections (DE-FLX-2A1, 2A2, 2B1, 2B2, and 4) are located in the Diesel Generator Building. The highest normal temperature in the Diesel Generator Building is 95°F. Hardening and loss of strength due to UV light is an applicable aging mechanism for elastomers when the material is natural rubber. The elastomer flexible connections (DE-FLX-2A1, 2A2, 2B1, 2B2, and 4) are made of neoprene rubber, which is not a natural rubber.

   The flexible connections in the Diesel Lubricating Oil (DLO) System (DLO-FLX-7A1, A2, B1, B2, and C, and DLO-FLX-11A1, A2, B1, B2, and C) that are in LRA Table 3.3.2-20 are made of either Buna-N or fluoroelastomer rubber (elastomer). Thermal exposure is an applicable aging mechanism for elastomers when ambient temperature is greater than 95°F. The elastomer flexible connections (DLO-FLX-7A1, A2, B1, B2, and C, and DLO-FLX-11A1, A2, B1, B2, and C) are located in the Diesel Generator Building. The highest normal temperature in the Diesel Generator Building is 95°F. Hardening and loss of strength due to UV light is an applicable aging mechanism for natural rubber. The elastomer flexible connections (DLO-FLX-7A1, A2, B1, B2, and C, and DLO-FLX-11A1, A2, B1, B2, and C) are made of Buna-N or fluoroelastomer, which are not natural rubbers.

3) Nylon tie wraps may be used, per plant procedure, for applications outside the Radiologically Controlled Area (RCA) where they will not be exposed to environmental stresses such as extreme temperatures, ultraviolet radiation, or harsh chemicals. According to the License Renewal Electrical Handbook, nylon material has a 60-Year Service-Limiting temperature of 119°F. The temperature capability of nylon tie wraps exceeds the temperature values for non-RCA areas such as the Standby Service Water Pump house or the Circulating Water Pump House. It is noted the Circulating Water Pump House has a maximum design temperature is 120°F which is 1°F greater than the 60-Year Service-Limiting temperature of 119°F for nylon tie wraps. The normal operating temperature from plant experience in the Circulating Water Pump House is much lower than 120°F. The Circulating Water Pump House HVAC systems function continuously during plant operation and shutdown. The HVAC systems consist of switchgear room air conditioning system, six (6) roof ventilators and exhaust fans. The Circulating Water Pump House HVAC systems thermostat set range for cooling mode is between 70°F and 90°F. Therefore there are no aging effects related to extreme temperature requiring management for nylon cable tie wraps. Since these Nylon tie wraps may be used outside the RCA only, potential for degradation due to chemical contaminants in the air (e.g., sulfur dioxide) and exposure to oxidizing agents (e.g., UV radiation or ozone) is not significant in an air-indoor environment. The absence of exposure of the Nylon material to sunlight greatly reduces the potential for aging due to UV radiation.

A search of the Columbia operating experience was performed to identify equipment failures due to age failure of cable tie wraps. Relevant tie wrap operating experience generally pertains to the tie wrap as either housekeeping or Foreign Material Exclusion (FME) concern. Plant specific operating experience dealt with Circulating Water system main condenser where foreign material intrusion items from the cooling towers (i.e. plastic tie wraps fretting against tubes) caused heat exchanger tube leaks and loss of power generation. The condenser spargers at Columbia were replaced during years 1984-1998 which caused main condenser tube failures.

A review of the industry experience identified two occurrences of component failures due to tie wraps at another operating plant (LER 03-004-00 ML040420592 and December 2003 Monthly Operating Report ML040210741). Both of these occurred within active equipment. No information on how the cable tie wrap became lodged in the active component was provided in the LER or Operating Report. Additionally, it was not determined if the failures were age related or due to maintenance activities.

Based on the review of plant and industry operating history and procedure exclusion for use of Nylon tie wraps in applications where they might be exposed to environmental stresses such as extreme temperatures, ultraviolet radiation, or harsh chemicals, the Nylon materials under consideration will not be exposed to environmental conditions that result in aging effects requiring management during the period of extended operation.

4) Aging management reviews have determined that no aging management is required for fiberglass insulation materials exposed to air-outdoor or air-indoor environments. Plant Specific and industry operating experience review on calcium silicate and fiberglass insulation has not identified any age-related degradation. Refer to the response to RAI 3.5.2.3.13-01 regarding fiberglass insulation submitted under cover letter GO2-10-164 for more detailed information.

RAI 3.3.2-2

Background

In LRA Tables 3.3.2-32 and 3.5.2-13, the applicant stated that for polymer piping and elastomeric waterstops, expansion boots and waterproofing membrane exposed to soil (external) there are no aging effects thus no AMP is proposed.

Issue

The staff understands that damage to buried polymer pipe and elastomeric components during installation is not an aging management issue. However, the staff also understands that buried polymer pipe and elastomeric components can be damaged by exposure to backfill that contains large or sharp material during both installation and operation. During operation, large or sharp objects a short distance away can migrate to the outside surface of the pipe or component due to ground movement caused by normal seasonal changes or movement of heavy loads above the buried pipe. Once in contact with the exterior surface of the pipe or component, this movement can cause wear to the material.

Request

Provide historical data on the quality of the backfill used in the vicinity of polymer piping and elastomeric waterstops, expansion boots and waterproofing membranes that would support the conclusion that aging will not occur due to large or sharp material contained in the backfill.

Energy Northwest Response

At Columbia, backfill material has been placed in accordance with plant procedures and specifications and the quality of the backfill is governed by the quality class of the structures or components in the nearby vicinity. Quality class I (QC I) backfill is provided at or around QC I structures and components and quality class II (QC II) backfill is provided at or around QC II structures or components. All structures in scope of license renewal for Columbia are either QC I or QC II. Overall, the quality of the backfill is regulated by the gradation of the soil material used as backfill. The gradation requirements are the same for both QCI and QC II backfill except for the amount of fines passing the #200 sieve (0-5% for QC I backfill and 0-10% for QC II backfill). Additionally, the procedure requires that all backfill material be free of trash, roots, organic, frozen or other unsuitable material and bedding material be provided around pipes and conduits.

The gradation requirements for QC I and QC II backfill provided in the applicable site procedure were compared to those for ASTM D448 size number 10, as referenced by Table 2a of XI.M41 in NUREG-1801 (GALL) Rev. 2 for polymer piping. Based on this comparison the backfill material per ASTM D448 size 10 would have a maximum size material less than 3/8" (100% of material passes thru the 3/8" sieve) while the backfill material allowed per Columbia procedure could contain a maximum size of 3" (95-100% passes thru 3" sieve). Thus, Columbia's backfill material is not as restrictive as ASTM D448 size 10 with relation to maximum size of material. As noted above, Columbia's procedure requires that bedding material be provided around all piping. This bedding material at Columbia can have a maximum size material of 3/8" which is larger than the gradation requirements for ASTM D448 size 10 which calls for 100% passing the 3/8" sieve (i.e., all material is smaller than 3/8" and passes thru the 3/8" sieve).

LRA Table 3.3.2-32 contains the aging management review results for the Process Sampling System. As described in LRA Section 3.3.2.1.32, and as listed in Table 3.3.2-32, Process Sampling System components in the scope of license renewal are not exposed to a soil environment.

Also, LRA Table 3.3.2-22, row number 76 is polymer piping in the Fire Protection System that is exposed to a soil environment. This polymer piping is shown on LR-M573-2, Coordinates B-7, which was updated for a separate matter in LRA Amendment 2. The portion of piping connecting the fire protection bladder tank (FP-TK-110) to its level gage is made of Polyvinyl Chloride (PVC) and is identified as plastic (polymer). This line runs from beneath the bladder tank to the level gauge. Therefore, the portion of the line in the scope of license renewal, up to post indicating valve (PIV) FP-V-341, is located underground and considered to be buried.

Additionally, LRA Table 3.5.2-13, row numbers 154, 156 and 158 are elastomer expansion boots, waterproofing membrane, and waterstop structural bulk commodities, respectively, that are associated with below grade foundations for the various buildings and structures in the scope of license renewal. Guard pipe expansion boots accommodate differential movement between structure and piping. Waterproofing membranes are installed below grade to exterior horizontal and vertical surfaces to prevent water in-leakage. Waterstops are integral parts of walls, floors and foundations. They are installed inside wall or floor junctions to prevent water in-leakage. Expansion boots (bellows) to accommodate differential movement between structure and piping are rubber. Waterstops are PVC (but are evaluated with elastomers). Waterproofing membranes (vapor barriers) are polyelthylene sheets. Below grade water stops are installed between wall and foundation mat junctions, waterproofing membranes are installed below grade to structure exterior horizontal and vertical surfaces, and piping expansion bellows used to accommodate differential movement between structure and piping are installed below grade exposed to structural backfill.

Furthermore, the fire protection bladder tank, and a portion of the level gauge piping (level gauge itself located in the water filtration building) are inside a 7' chain-link fence. As such, movement of heavy loads above the buried piping is minimal, with the bladder tank replaced every 20 years or so. The expansion joints, waterproofing membranes, and waterstops are associated with structural joints and foundations, as described above, and movement of heavy loads above the structural commodities is similarly minimal to none.

Therefore, the backfill quality described above, confirmed during inspection of buried piping, and the lack of or minimal movement of heavy loads above buried polymer (PVC) piping or elastomeric structural commodities provides reasonable assurance that aging will not occur due to large or sharp material contained in the backfill.

The quality of backfill at Columbia will also be further confirmed as part of the Buried Piping and Tanks Inspection Program. Energy-Northwest is evaluating Columbia's Buried Piping and Tanks Inspection Program with the XI.M41 Buried and Underground Piping and Tanks Program described in the current version of the GALL Report Rev. 2 (ML103490041). Additional discussion of backfill quality will be provided under a separate cover letter, with the comprehensive response to RAI B.2.5-2.

RAI 3.3.2.2.13-2

Background

In RAI 3.3.2.2.13-1, the staff requested the applicant to justify why improper design, application or operation resulting in the loss of material due to wear for elastomer seals and components in HVAC systems exposed to air-indoor uncontrolled (internal or external) is not considered an aging effect requiring aging management during the extended period of operation. In its response, the applicant stated, "Consistent with the Statements of Consideration for 10 CFR 54, Section III.d.(1), improper design, faulty manufacturing processes, improper application, faulty maintenance, improper operation, or personal errors may cause events that result in significant wear of components, but this cause of degradation is not aging related. Therefore, loss of material due to wear is not an applicable aging effect for the elastomeric components that are subjects to an-air-indoor uncontrolled environment."

Issue

The staff notes that the statement that the applicant excerpted from the 10 CFR 54 Statements of Consideration was written in a context of why it was acceptable for the rule to focus the Integrated Plant Assessment on aging effects versus aging mechanisms. The associated text from the Statements of Consideration is as follows:

> "The corrective actions that should be taken following identification of functional degradation logically include determination of the cause of the degradation, which could involve mechanisms other than aging (e.g., faulty manufacturing processes, faulty maintenance, improper operation, or personnel errors). If one or more aging mechanisms are the cause of functional degradation, corrective actions should focus, as appropriate, on prevention, elimination, or management of the effects caused by the mechanism(s) in the future. Licensees are required by current regulations to develop and implement programs that ensure that conditions adverse to quality, including degraded system, structure, and component function, are promptly identified and corrected."

The staff notes that the above excerpt was not directly related to wear as might be inferred by the applicant's response to the RAI; however, the staff acknowledges that there are other mechanisms beyond age related mechanisms that can cause a loss of material, including those that cause wear. These other mechanisms (e.g., faulty manufacturing processes, faulty maintenance, improper operation, or personnel errors) are not subject to consideration during the development of the Integrated Plant Assessment because they would be identified by station personnel and corrected by the corrective action program. Nevertheless, within the definition of the term "wear" in GALL Report Section IX.F, there are three factors to consider that could cause age related wear due to the design of the joint, including (a) relative motion between two surfaces, under the influence of hard abrasive particles, (b) frequent manipulation, or (c) in clamped joints where relative motion is not intended but may occur due to a loss of the clamping force.

It is unclear to the staff whether there are any in-scope components that are designed in such a way that they could be impacted by the three age related factors considered in the definition of wear.

Request

1) State whether there any in-scope elastomeric HVAC components which are designed with relative motion that are exposed to an internal or external environment that includes hard abrasive particles.

2) State whether any in-scope elastomeric HVAC components that are susceptible to wear that over time, due to their frequent manipulation could challenge the CLB function(s) of the component.

3) State whether any in-scope elastomeric HVAC components that have clamped joints where relative motion is not intended but may occur due to a loss of the clamping force over time causing wear that could challenge the CLB function(s) of the component.

Energy Northwest Response

1) There are no in-scope elastomeric HVAC components that are exposed to an internal or external environment that includes hard abrasive particles which are designed with relative motion. With the exception of one flexible connection in the Pump House Mixed Air (PMA) System, there is a filter upstream of all elastomeric HVAC components. Therefore, the internals of the flexible connections are not exposed to hard abrasive particles. All of the elastomeric HVAC components are located indoors and this "Air-indoor uncontrolled" external environment means the elastomeric HVAC components are not exposed to hard abrasive particles externally. Additionally, all HVAC flexible connections are made of neoprene rubber, which has very good resistance to abrasion.

2) There are no in-scope elastomeric HVAC components that are subject to wear over time due to their frequent manipulation. The only instances in which the elastomeric flexible connections (suction and discharge boots) between fans and air-handling units are manipulated are during fan unit replacements. A review of plant records has indicated fan replacements have occurred infrequently. Fans in the Radwaste Building HVAC System were last replaced in 2005, while the fans in the Reactor Building HVAC System were last replaced in 2007. No fan replacements have occurred in either the Pump House or Diesel Building HVAC Systems.

3) There are no in-scope elastomeric HVAC components that have clamped joints where relative motion may occur due to a loss of the clamping force over time. Hose clamps are not used for mating the elastomeric flexible connections (suction and discharge boots) to ductwork, fan units, or air-handling units. HVAC flexible connections are bonded to angle iron, which is mated to the HVAC components with bolting.

A review of plant operating history did find instances of tears that have been found in several suction and discharge boots (flexible connections) on air-handling units of the HVAC systems. The tears, located in the corners where the boots are crease and wrinkled, were attributed to normal operational wear; the remainder of the boot material remained pliable (i.e., no hardening) and no operability issues were identified. These elastomeric components will be managed by the Flexible Connection Inspection Program.

Based on a teleconference with the Project Manager and other NRC staff on October 26, 2010, Energy Northwest is in the process of re-evaluating the use of one-time inspections as currently described in the License Renewal Application. A comprehensive response to this issue will be provided in response to RAI B.2.14-1 contained in the letter dated November 5, 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. ML103010080). The information related to this request for additional information will be provided at that time. However, the activity will address all age-related degradation of subject components.

RAI B.2.25-5

Background

GALL AMP XI.M26, "Fire Protection" recommends that a periodic visual inspection and functional test is performed at least once every six months for the halon and carbon dioxide fire suppression systems.

LRA Section B.2.25, as amended by letter dated August 19, 2010, states an exception to the "parameters monitored or inspected" and "detection of aging effects," program elements. The applicant stated that "functional tests and inspections of the halon and carbon dioxide fire suppression systems that are included in the Fire Protection Program are performed at an interval greater than biannually, which has been demonstrated to be adequate, based on the absence of any related problems as reported through the corrective action program."

Issue

The LRA does not provide the frequency of the visual inspection and functional tests of the halon 1301 and carbon dioxide fire suppression systems.

Request

Provide the frequency of the periodic visual inspection and functional tests for the halon 1301 and carbon dioxide fire suppression systems and its basis, including the frequency in the current licensing basis and any technical specification requirements. If the inspection frequency is greater than at least once every 18 months, justify the inspection frequency, including a detailed summary of any deficiencies found during the last three visual inspection and functional tests for each system.

Energy Northwest Response

Halon:

Halon 1301 is only located in the Main Control Room subfloor cable ducts. The following surveillances are performed for the Halon system. These surveillances do not include the alarm only ionization detection. The functional actuation test is performed every 12 months.

Other inspections are conducted as part of other Halon system surveillance activities, such as:

- 12 month tank pressure check
- 2 year thermal detector channel functional test
- 3 year tank weight check
- 5 year flow check (flow nitrogen through piping to ensure not blocked)
- 5 year visual inspection of the Halon confinement barriers
- 5 year squib initiator replacement

The Halon tanks are inspected when they are removed from their installed location in order to be weighed every three years. Current procedures do not require documentation of acceptable condition of the tanks, but any problems observed would be documented in the corrective action program (CAP). A search was made for any entries in the CAP dealing with the in-scope halon tanks and none were found. Since the preventive maintenance task does not require documentation of the visual inspection, this issue has been entered into the CAP and the task will be revised to require documentation of the visual inspection in conjunction with weighing the tanks. In addition, the 12 month tank pressure check procedure will be revised to include a visual inspection of the accessible surface of the tanks. In the installed condition, the halon tanks have portions of the surface which are inaccessible.

The tanks are installed in the Main Control Room (air-indoor uncontrolled environment) which is a temperature controlled environment and the surface of the tanks is normally dry, so the inaccessible surfaces are not expected to exhibit any aging effects different than the surfaces that are accessible. The weighing of the tanks every three years requires the tank to be removed and the entire surface will be inspected. Therefore the annual inspection of the accessible surfaces combined with the three year inspection of the entire surface is sufficient to ensure that the tanks will perform their intended functions during the period of extended operation.

The Halon system is a non-essential system (does not support post-fire safe shutdown) and its surveillance is not in Licensee Controlled Specification 1.10. Columbia is committed to NFPA 12A-1973 for design, but there are no current license bases commitments for Halon surveillance.

Since the functional testing is done every 12 months, a justification of the frequency and detailed summary of the results is not being provided.

Carbon Dioxide:

Carbon dioxide suppression is only located within the generator exciter enclosure. This system is surveilled every 2 years which performs functional testing for all aspects of the system. The carbon dioxide storage tank FP-TK-1 is visually inspected externally every 96 weeks (1.85 years). A review of the past preventative maintenance (PM) task completion dates shows the actual PM interval has been approximately annually.

The carbon dioxide system is a non-essential system and its surveillance is not in Licensee Controlled Specification 1.10. FSAR F.2.7 states, "...*Periodic inspection and testing of carbon dioxide suppression system.....is in accordance with either Section F.2.1 NFPA codes, insurer criteria, or applicable industry guidance as documented in the engineering evaluations per Section F.4.2.3.*" The 2 year functional testing interval is based on engineering evaluation which shows good performance. In addition, the generator exciter enclosure can only be safely entered during shutdown. Columbia is on a two year refueling cycle. The carbon dioxide storage tank 96 week PM interval was determined by the preventative maintenance optimization program.

The last three functional surveillances and PM's had no failures.

RAI 3.3.2.2.10.2-2

Background

The GALL Report, Chapter VII.A4, Auxiliary Systems, Spent Fuel Pool Cooling and Cleanup (BWR), item VII.A4-5, recommends that GALL AMP XI.M2, "Water Chemistry" be used to manage loss of material due to pitting and crevice corrosion for aluminum piping exposed to treated water, and that the program be augmented by GALL AMP XI.M32, "One-Time Inspection" to verify the effectiveness of water chemistry control. In several other GALL line items (V.D2-19, VII.E3-7,VII.D2-1, and VIII.E-15) for the same material, environment, and aging effect combination, the GALL Report also recommends that GALL AMP XI.M2, "Water Chemistry" be used to manage aging and be augmented by GALL AMP XI.M32, "One-Time Inspection" to verify the effectiveness of water chemistry control.

LRA Table 3.5.2-2, row number 16 states that aluminum spent fuel pool gates exposed to treated water are being managed for loss of material by the BWR Water Chemistry Program. The item references GALL Report item VII.A4-5, LRA Table 3.3.1 item 3.3.1-24, and cites generic note C and plant specific notes 0513 and 0514. Plant specific note 0513 states that "monitoring of the fuel pool level and leak chase channels activities also indirectly manage this component." Plant specific note 0514 states that the spent fuel pool is "not a low flow or stagnant flow area" and that NUREG-1801 Chapter VII.A2 Spent Fuel Storage and its spent fuel gates do not require the Water Chemistry Program to be augmented by a one-time inspection.

In LRA Section 3.3.2.2.10.2, which is associated with item 3.3.1-24, the applicant states that loss of material for the stainless steel spent fuel pool gates is managed by the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection which will provide a verification of the effectiveness of the BWR Water Chemistry Program. The section also states that "there are no aluminum components subject to AMR in the auxiliary systems that are exposed to treated water." However, there are no associated line items for aluminum spent fuel pool gates which cite a program to verify the effectiveness of the BWR Water Chemistry Program.

Issue

It is unclear to the staff how utilization of fuel pool level and leak chase channel activities will serve to manage the loss of material for the spent fuel pool gates.

It is unclear to the staff why the spent fuel pool is not considered a low flow or stagnant area where water chemistry control may not be effective and would require verification of the effectiveness of the chemistry control program.

There are inconsistencies between LRA Section 3.3.2.2.10.2, and Table 3.5.2-2, item 16, as to whether the spent fuel pool gates are (1) stainless steel or aluminum; and (2) whether they are subject to aging management using both the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection or only the BWR Water Chemistry Program. It is unclear to the staff why the applicant states in Section 3.3.2.2.10.2 that there are no aluminum components subject to the AMR in the Auxiliary Systems when aluminum is identified in Table 3.5.2-2.

Request

1) Reconcile the inconsistencies between LRA Section 3.3.2.2.10.2, and Table 3.5.2-2, item 16 and:
   a. State the material of construction for the spent fuel pool gates, and
   b. State the aging management program(s) being used to manage loss of material for the spent fuel pool gates.

2) If the spent fuel pool gates are not being managed by an effectiveness verification program,
   a. Justify how monitoring (by what frequency and parameters) fuel pool level and leak chase channels will aid in management of the spent fuel gates for loss of material, and
   b. Justify why the spent fuel pool is not considered a low flow or stagnant area.

Energy Northwest Response

1) Reconciliation

a. The material of construction for spent fuel pool gates is aluminum. The spent fuel pool gates, storage racks, and storage rack neutron absorber were civil discipline components in the license renewal process and the material of construction for spent fuel pool gates was incorrectly described in LRA Section 3.3.2.2.10.2. In addition, the statement in LRA Section 3.3.2.2.10.2 last paragraph "There are no aluminum components subject to AMR in the Auxiliary systems that are exposed to treated water" was written in the perspective of mechanical discipline which did not include the spent fuel pool gates. The LRA is therefore amended to resolve the inconsistencies between LRA Section 3.3.2.2.10.2, and Table 3.5.2-2, item 16.

b. The aging management program being used to manage loss of material for the spent fuel pool gates is amended to include both the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection to be consistent with NUREG-1801 item VII.A4-5. The Chemistry Program Effectiveness Inspection is credited and coupled to the BWR Water Chemistry Program, in order to confirm that the BWR Water Chemistry Program is effective in managing potential loss of material. The addition of the Chemistry Program Effectiveness Inspection also applies to spent fuel pool storage racks and spent fuel rack neutron absorbers in LRA Table 3.5.2-2 items 18 and 38 for consistency.

2) Justification

a. Part 1 response to this RAI amends the LRA to include an effectiveness verification program for the spent fuel pool gates, spent fuel pool storage racks and spent fuel rack neutron absorbers.

NUREG-1801 Rev. 1 Chapter III.A5 does not contain an aluminum item that corresponded to spent fuel pool gates, plant specific note 0513 was intended to mimic NUREG-1801 item III.A5-13 (fuel pool liner) requirement since the gates experience the same environment as the spent fuel pool liner and are also part of the fuel pool water containment boundary. NUREG-1801 item III.A5-13 prescribes aging management of stainless steel fuel pool liner by Water Chemistry Program, monitoring of the spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels. As part of the LRA amendment to this RAI response, plant specific note 0513 is amended to "not used" and reference to this note removed from Table 3.5.2-2.

b. The spent fuel pool was not considered a low flow or stagnant area as indicated in plant specific note 0514 because during normal operations the Fuel Pool Cooling (FPC) System provides cooling and cleaning of the spent fuel pool containing discharged fuel assemblies. The FPC pumps, rated at 575 gpm, normally circulate the pool water in a closed loop, taking suction from the skimmer surge tanks, circulating the water through a heat exchanger and a filter demineralizer, and discharging it through the diffusers at the bottom of the fuel pool. The FPC system is described in FSAR Section 9.1.3.2.

NUREG-1801 XI.M2 Water Chemistry AMP states the water chemistry programs are generally effective in removing impurities from intermediate and high flow areas. The Generic Aging Lessons Learned (GALL) report identifies those circumstances in which the water chemistry program is to be augmented to manage the effects of aging for license renewal. For example, the water chemistry program may not be effective in low flow or stagnant flow areas. The industry experience cited were degradations occurred in PWR primary systems; they were safety injection lines (NRC INs 97-19 and 84-18), charging pump casing cladding (NRC INs 80-38 and 94-63), instrument nozzles in safety injection tanks (NRC IN 91-05), and safety-related SS piping systems that contain oxygenated, stagnant, or essentially stagnant borated coolant (NRC IN 97-19). Operating experience in low flow or stagnant flow areas pertains primarily to mechanical components, piping and piping components.

NUREG-1801 item III.A5-13 (fuel pool liner) may provide an indication that the spent fuel pool is not considered a low flow or stagnant area since the required aging management program for the fuel pool liner is Chapter XI.M2, "Water Chemistry" without the coupling of XI.M32 “One-Time Inspection” verification program. The same logic may also be applied to NUREG-1801 items VII.A2-6 and VII.A2-7 (spent fuel storage racks) where the required aging management program for the spent fuel storage racks is Chapter XI.M2, "Water Chemistry" without the coupling of XI.M32 “One-Time Inspection” verification program.

Since there're no quantitative measures as to when a treated water environment is considered low flow or stagnant, LRA plant specific note 0514 is amended to “not used” and reference to this note removed from Table 3.5.2-2.

Affected LRA sections are 3.3.2.2.10.2, Table 3.3.1, Table 3.5.2-2, Notes 0513 and 0514, and B.2.12. (See the Enclosure for LRA Amendment 19)

License Renewal Application Amendment 19

LRA Section Number	Page Number	RAI Number
3.3.2.2.10.2	3.3-53	3.3.2.2.10.2-2
3.3.2.2.10.2	3.3-53a	3.3.2.2.10.2-2
3.3.2.2.10.2	3.3-54	3.3.2.2.10.2-2
Table 3.3.1 Item Number 3.3.1-24	3.3-70	3.3.2.2.10.2-2
Table 3.5.2-2 Row No. 16	3.5-87	3.3.2.2.10.2-2
Table 3.5.2-2 Row No. 18	3.5-88	3.3.2.2.10.2-2
Table 3.5.2-2 Row No. 36	3.5-90a	3.3.2.2.10.2-2
Notes 0513 and 0514	3.5-139	3.3.2.2.10.2-2
B.2.12	B-60	3.3.2.2.10.2-2

LRA markup for
RAI 3.3.2.2.10.2-2

monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the Fuel Oil Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components and tanks exposed to fuel oil. Fouling is not identified as an aging effect for fuel oil.

3.3.2.2.9.2 Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to general, pitting, and crevice corrosion and microbiologically-influenced corrosion (MIC) for steel piping components, heat exchanger components, gear units, and tanks exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion and MIC through examination of steel piping components, heat exchanger components, gear units, and tanks.

3.3.2.2.10 Loss of Material due to Pitting and Crevice Corrosion

3.3.2.2.10.1 Steel Piping with Elastomer Lining or Stainless Steel Cladding

There is no steel piping with elastomer lining or stainless steel cladding subject to AMR in the Auxiliary systems.

3.3.2.2.10.2 ~~Piping, Piping Components, Piping Elements, and Heat Exchanger Components~~ ← Replace Section with Insert A from Page 3.3-53a

~~Loss of material due to pitting and crevice corrosion for stainless steel heat exchanger components and stainless steel piping components exposed to treated water is managed by the BWR Water Chemistry Program. Additionally, loss of material for stainless steel spent fuel pool gates, storage racks, and storage rack neutron absorber sheathing exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material through examination of stainless steel heat exchanger, piping, spent fuel pool gates, and spent fuel storage racks components.~~

~~Loss of material for the spent fuel storage rack stainless steel coverings over the boron carbide absorbers is managed by the BWR Water Chemistry Program alone. As these stainless steel plates are not in low flow or stagnant flow areas, one-time inspection is not required.~~

~~Loss of material due to pitting and crevice corrosion for components in the Process Sampling Radioactive and Equipment Drains Radioactive systems that are not~~

Amendment 19

Insert A to pages 3.3-53 and 3.3-54

3.3.2.2.10.2 Piping, Piping Components, Piping Elements, and Heat Exchanger Components

Loss of material due to pitting and crevice corrosion for stainless steel heat exchanger components and stainless steel piping components exposed to treated water is managed by the BWR Water Chemistry Program. Additionally, loss of material for the aluminum spent fuel pool gates, stainless steel storage racks, and stainless steel storage rack neutron absorber sheathing exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material through examination of stainless steel heat exchanger, piping, aluminum spent fuel pool gates, and stainless steel spent fuel storage racks components.

Loss of material due to pitting and crevice corrosion for components in the Process Sampling Radioactive and Equipment Drains Radioactive systems that are not submerged within the suppression pool is managed by the Monitoring and Collection Systems Inspection, which will detect and characterize loss of material.

~~submerged within the suppression pool is managed by the Monitoring and Collection Systems Inspection, which will detect and characterize loss of material.~~

~~There are no aluminum components subject to AMR in the Auxiliary systems that are exposed to treated water.~~ ← Replace Section with Insert A from Page 3.3-53a

3.3.2.2.10.3 HVAC Piping, Piping Components, and Piping Elements

The Open-Cycle Cooling Water Program is credited with the management of loss of material for copper alloy heat exchanger tubes exposed to external condensation. The Cooling Units Inspection is a one-time inspection that will detect and characterize loss of material due to pitting and crevice corrosion for copper alloy HVAC heat exchanger tubes in an external environment with potential for wetting. Loss of material for copper alloy piping and in-line components is managed by the External Surfaces Monitoring Program.

3.3.2.2.10.4 Piping, Piping Components, and Piping Elements – Lubricating Oil

Loss of material due to pitting and crevice corrosion for copper alloy piping components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. Loss of material for copper alloy heat exchanger components exposed to lubricating oil is also managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to pitting and crevice corrosion through examination of copper alloy piping and heat exchanger components. Copper alloys with less than 15% zinc and less than 8% aluminum are not susceptible to loss of material due to pitting or crevice corrosion and do not require management.

3.3.2.2.10.5 HVAC Piping, Piping Components, and Piping Elements and Ducting

Loss of material for aluminum and stainless steel piping and piping components, heat exchanger components, tanks, and drain pans exposed to condensation is managed by the Cooling Units Inspection, the Open-Cycle Cooling Water Program, or the External Surfaces Monitoring Program. The Cooling Units Inspection is a one-time inspection that will detect and characterize loss of material for these components.

3.3.2.2.10.6 Fire Protection System

Loss of material due to pitting and crevice corrosion is an applicable aging effect only if the materials are exposed to an aggressive environment. The only copper or copper alloy fire protection system piping components exposed to internal ambient environments are [flexible connections,] spray nozzles, strainers bodies, [tubing] and valve bodies. The components are open to local ambient air conditions such that condensation will not occur and are not subject to continuous wetting or alternate wetting and drying that would constitute

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-24	Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The BWR Water Chemistry Program, in conjunction with the Chemistry Program Effectiveness Inspection, is credited to manage loss of material for stainless steel piping, piping components, and piping elements in the auxiliary systems exposed to treated water. This item is also applied to accumulators, bolting, and tank screens in the auxiliary systems exposed to treated water. A Note C is applied. ~~This item is also applied to spent fuel pool gates, storage racks, and storage rack neutron absorber sheathing in the Reactor Building exposed to treated water. The BWR Water Chemistry Program alone is credited for these components. A Note C is applied. See associated Table 3.5.2-2 notes for discussion.~~

Replace paragraph with "This item is also applied to the aluminum spent fuel pool gates, stainless steel storage racks, and stainless steel storage rack neutron absorber sheathing in the Reactor Building exposed to treated water. A Note C is applied. See Table 3.5.2-2."

Table 3.5.2-2 Aging Management Review Results - Reactor Building									
Row No.	**Component / Commodity**	**Intended Function[1]**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Volume 2 Item**	**Table 1 Item**	**Notes**
11	Roof Decking	EN, SPB, SSR	Galvanized Steel	Air - indoor	None	None	III.B5-3	3.5.1-58	C
12	Roof Masts	SRE	Galvanized Steel	Air - outdoor	Loss of material	Structures Monitoring Program	III.B2-7	3.5.1-50	C
13	Secondary Containment Air Locks (includes railroad bay and double air lock doors)	MB, SPB, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A2-12	3.5.1-25	A
14	Secondary Containment Air Locks (includes railroad bay and double air lock doors)	MB, SPB, SSR	Carbon Steel	Air - outdoor	Loss of material	Structures Monitoring Program	III.A2-12	3.5.1-25	A
15	Spent Fuel Pool Gates	SSR	Aluminum	Air - indoor	None	None	III.B5-2	3.5.1-58	C
16	Spent Fuel Pool Gates	SSR	Aluminum	Treated water	Loss of material	BWR Water Chemistry Program	VII.A4-5	3.3.1-24	C ~~0513~~ ~~0514~~

Add "Chemistry Program Effectiveness Inspection"

Table 3.5.2-2 Aging Management Review Results - Reactor Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
17	Spent Fuel Pool Liner	SSR	Stainless Steel	Treated water	Loss of material	BWR Water Chemistry Program Spent Fuel Pool Water Monitoring per Tech Spec Monitoring of leakage from the leak chase channels	III.A5-13	3.5.1-46	A 0512
18	Spent Fuel Storage Racks	SSR	Stainless Steel	Treated water	Loss of material	BWR Water Chemistry Program	VII.A4-11	3.3.1-24	C ~~0514~~
19	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR	Carbon Steel	Air - indoor	Loss of material	Structures Monitoring Program	III.A2-12	3.5.1-25	A
20	Structural Steel: Beams, Columns, Plates, and Trusses (includes welds and bolted connections)	EN, SSR	Galvanized Steel	Air - indoor	None	None	III.B5-3	3.5.1-58	C
21	Sump Liners	SNS	Stainless Steel	Air - indoor	None	None	III.B5-5	3.5.1-59	C
22	Sump Liners	SNS	Stainless Steel	Raw water	Loss of material	Structures Monitoring Program	VII.C3-7	3.3.1-78	E 0515
23	Biological Shield Wall	EN, MB, SHD, SSR	Concrete	Air - indoor	None	Structures Monitoring Program	N/A	N/A	I 0501

Add "Chemistry Program Effectiveness Inspection"

Amendment 19

Insert A to Page 3.5-90

Table 3.5.2-2 Aging Management Review Results - Reactor Building

Row No.	Component / Commodity	Intended Function[1]	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Volume 2 Item	Table 1 Item	Notes
38	Spent Fuel Rack Neutron Absorbers	ABN, SSR	Boron Carbide	Treated water	Loss of material and loss of neutron absorbing capacity	Boron Carbide Monitoring Program	VII.A2-3	3.3.1-13	E
			Stainless Steel (sheathing)		Loss of material	BWR Water Chemistry Program	VII.A4-11	3.3.1-24	C ~~0514~~

Add "Chemistry Program Effectiveness Inspection"

Replace strikeout text with "Not used."

Replace strikeout text with "Not used."

Plant-Specific Notes:	
0510	~~Aging management for loss of material of the neutron absorber stainless steel sheathing is required by the listed AMP. Columbia plant-specific AMR concluded boron carbide plates (B4C) do not require aging management for the period of extended operation for their neutron absorbing function based on plant-specific examination and industry operating experience. However, Columbia has already committed in the CLB to perform boron carbide coupon sample testing and this current commitment will continue to verify the specific design values of the B4C neutron absorbing parameters and demonstrate that the effects of aging are not significant. FSAR Section 9.1.2.3.2 states the CLB commitment, "To ensure the integrity of the spent fuel storage racks in the event that water has leaked into the racks, specially designed control samples, consisting of B4C plates in vented (to pool water) canisters, are placed in a readily accessible position in the spent fuel pool. These samples are subjected to periodic examinations to check for possible deterioration and they are also analyzed to ensure that the boron has not leached from the plates." The current CLB commitment along with continued monitoring of industry operating experience will provide adequate assurance that any age related degradation of the B4C will be detected.~~
0511	The new fuel storage racks are located in a dry mild environment inside the new fuel storage vault. The new fuel storage racks are made from aluminum with stainless steel fasteners. The use of stainless steel fasteners in aluminum to avoid detrimental galvanic corrosion in a predominantly air environment, is a recommended practice and has been used successfully for many years by the aluminum industry.
0512	The AMP manages loss of material due to crevice and pitting corrosion. Cracking due to SCC is not applicable. Spent fuel pool water level monitoring is per Technical Specifications. Leak chase channel monitoring is via operator rounds.
0513	~~The gates experience the same environment as the spent fuel pool liner. The BWR Water Chemistry Program manages Loss of material due to crevice and pitting corrosion. Cracking due to SCC is not applicable. Since the gates are part of the fuel pool water containment boundary, monitoring of fuel pool level and leak chase channels activities also indirectly manage this component.~~
0514	~~This NUREG-1801 item specifies the AMP is to be augmented by a "One-Time Inspection." Augmented One time inspection is not applicable to the spent fuel pool since it is not a low flow or stagnant flow area. Also, NUREG-1801 Chapter VII.A2 Spent Fuel Storage does not require Water Chemistry to be augmented by a "One-Time Inspection." Augmented inspection applies to piping, piping components, and piping elements, not the spent fuel racks or gates.~~
0515	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. Chapter II or Chapter III of NUREG-1801 does not list exposed to raw water environment for stainless steel components. The identified AMP is used to manage aging effects for the period of extended operation.
0516	The lead panels are encapsulated within stainless steel casing.
0517	The shield walls at Columbia are made up of free-standing or stacked solid bricks (blocks) sandwiched between metal (siding) panels. The panel sections (and blocks) are held in place under all load conditions by angle sections anchored to the concrete wing walls at the pipe chases. Concrete block shield walls do not function like a typical block wall within a structure and are not subjected to degradations found from industry experience (i.e., aging effects cited in IEB 80-11.)

B.2.12 Chemistry Program Effectiveness Inspection

Program Description

The Chemistry Program Effectiveness Inspection is a new one-time inspection that will detect and characterize the material conditions in representative low-flow and stagnant areas of plant systems influenced by the BWR Water Chemistry Program, the Fuel Oil Chemistry Program, and the Closed Cooling Water Chemistry Program (which are mitigation programs). The inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, general, galvanic, or pitting corrosion (in treated water or fuel oil environments) has occurred. The inspection provides direct evidence as to whether, and to what extent, microbiologically-influenced corrosion (MIC) in a fuel oil environment has occurred. The inspection also provides direct evidence as to whether, and to what extent, cracking due to SCC of susceptible materials in susceptible locations has occurred.

Implementation of the Chemistry Program Effectiveness Inspection will provide confirmation of program effectiveness and further assurance that the integrity of susceptible components is maintained consistent with the current licensing basis during the period of extended operation.

NUREG-1801 Consistency

The Chemistry Program Effectiveness Inspection is a new one-time inspection for Columbia that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section XI.M32, "One-Time Inspection."

Exceptions to NUREG-1801

None.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope of Program
  Add "aluminum,"
  The scope of the Chemistry Program Effectiveness Inspection includes the surfaces of copper alloy, copper alloy > 15% zinc (Zn), steel, gray cast iron, nickel alloy, and stainless steel (including cast austenitic stainless steel) components in treated water environments. The scope includes gray cast iron, copper alloy, copper alloy > 15% Zn, steel, and stainless steel components in fuel oil environments.

- Preventive Actions
  No actions are taken as part of the Chemistry Program Effectiveness Inspection to prevent aging effects or to mitigate aging degradation.