ENERGY NORTHWEST

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GO2-11-125

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. ML 102850735)

3) Letter dated January 27, 2011, SK Gambhir (Energy Northwest) to NRC, "Response to Request for Additional Information License Renewal Application," (GO2-11-020)

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. In Reference 3, Energy Northwest responded to Reference 2. Following the conversation held on July 19, 2011 with Mr. Arthur Cunanan, NRC License Renewal Project Manager, and other NRC staff members, Energy Northwest decided to supplement the response to RAI B.2.40-1 Supplement 1 provided in Reference 3.

This letter is to inform the NRC that the bolted connections that were inspected under the Metal-Enclosed Bus Program were replaced with welded connections this year during refueling outage 20.

Enclosure 1 contains Amendment 39 to the Columbia License Renewal Application. No new commitments are included in this response.

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Energy Northwest used "bolted connections" to fasten rigid pieces of the Metal-Enclosed Bus (MEB) together. The purpose of these bolted connections was to allow easy shipment of the bus sections to the site. At the time of original plant construction, welding rigid sections of bus together on-site was not a common practice, as it is today. A design change was issued to provide design details and installation instructions for a modification that reduced planned maintenance and improved the design of the rigid and flexible connections of the MEB by replacing the existing bolted connections between sections of the MEB with welded connections. The welded connections were installed on all sections of the MEB. The bolted braided flexible connections (i.e., links) at the medium voltage switchgear and transformer remain the same. These bolted connections are not part of the MEB program scope as they are considered part of active components (Switchgear and Transformer).

The reason for upgrading the MEB through the installation of welded connections was to significantly reduce the potential for bolts to loosen on the MEB and effectively create a fault which could potentially shutdown the unit. Also, this modification eliminated the time and cost of preventative maintenance required to check the torque on the bolted bus sections of the MEB.

In addition to the large amount of industry-related operating experience related to torquing problems on bolted MEB connections, the cause of the main turbine trip at Columbia Generating Station on August 5, 2009 was determined to be related to a loose bolted connection on the 6.9 kV MEB.

The bus manufacturer has indicated that fatigue failure or cracking of the new welded flex connections (made of laminations) is not expected. However, the effects of thermal expansion on the laminations will be validated through future visual inspections (by looking for cracks in the laminations), which will be included in the Metal-Enclosed Bus Program. Industry operating experience identified fatigue failure of laminated flexible connections due to vibration induced by connected equipment and forced air cooling. Fatigue failure of the laminated flex connections due to vibration is not expected because the MEB is isolated from the transformer by the bolted flexible links connecting the MEB to the transformer and the MEB does not utilize forced air cooling.

The Metal-Enclosed Bus Program is revised by Amendment 39 to visually inspect the welded flex connections to ensure that the flex connections do not have any breaks or cracks in the welds. Removable insulation boots were installed around all welded flex connections (as part of the plant modification) to allow for easy visual inspection. Inspection frequencies on the flex connections will be determined upon reviewing the results of the visual inspection of a third of the new welded connections that is planned to be performed after the first outage following the installation, but the Metal-Enclosed Bus Program will require inspection of a sample of the welded flex connections at least once every 10 years with the first inspections to be completed prior to the end of the current license. No additional maintenance activities are being added by this change.

Inspections of the filament and butt welds for rigid connections are not required since these welds are designed to meet the life span of the bus itself. The bus material and welded connection are both made of aluminum. The weld filler is an aluminum alloy.

The welding specification required that each weld have a 10% weld bead (i.e., overweld). By having a 10% overweld, the cross sectional area of the bus at the weld is larger than the cross section of the bus when it was bolted together.

The manufacturer has indicated based on their experience of installing welded connections on MEB, no appreciable operating experience identifies potential problems with the welds. The installation of welded connections on aluminum sections of iso-phase bus is a common design practice for the manufacturer and no known failures have resulted. Furthermore, welded connections have already been installed on select connections of the MEB at Columbia Generating Station and no failures have resulted. Industry experience, including that of Columbia Generating Station, has demonstrated that welding bus bar together in lieu of bolted connections is a common practice and has not resulted in a failure. Installation welding procedures met the requirements of AWS D1.2 and the bus manufacturer's welding specification.

No other changes are being made to the Metal-Enclosed Bus Program (other than some editorial changes for clarification). The program will still require that in-scope bolted connections (if they are ever reinstalled) be subject to inspection by thermography through infra-red windows. It will also continue to require inspection of the internal bus enclosure, bus insulation, the internal bus supports and the bus enclosure joints, seals, and gaskets for signs of aging.

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,

DA Swank
Acting Vice President, Engineering

Enclosure: License Renewal Application Amendment 39

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

LICENSE RENEWAL APPLICATION AMENDMENT 39

Section Number	Page Number	RAI Response
B.2.40	B-156	Supplement to RAI B.2.40-1 Supplement 1
B.2.40	B-157	Supplement to RAI B.2.40-1 Supplement 1

The Metal-Enclosed Bus Program is credited with detecting aging effects for in-scope metal-enclosed bus. The in-scope bus is limited to non-segregated metal-enclosed bus in the ~~6.9-kV and~~ 4.16-kV electrical systems associated with the off-site power supply (via transformer E-TR-S).

- Preventive Actions
  The Metal-Enclosed Bus Program is an inspection program; no actions are taken to prevent or mitigate aging degradation.

- Parameters Monitored or Inspected
  The Metal-Enclosed Bus Program will inspect bus insulation for anomalies, such as embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. The internal bus enclosure will be inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The internal bus supports (i.e., internal to the enclosure) will be inspected for structural integrity and any sign of cracks.

  The welded flexible connection laminations will be visually inspected for damage or cracks due to fatigue.

  The Metal-Enclosed Bus Program will inspect a sample of bus bolted connections via thermography for signs of loose connections. The in-scope bus will be checked from the exterior with the bus energized to provide ~~gross~~ detection of circuit hot spots. through Infra-red windows

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  The Metal-Enclosed Bus Program will inspect the bus joints, seals, and gaskets when the assembly covers are removed for inspection of the internal components.

- Detection of Aging Effects
  The Metal-Enclosed Bus Program will utilize thermography to check the bolted connections in the non-segregated metal-enclosed bus that is within the license renewal scope. The thermography inspection will be performed for representative portions of the in-scope non-segregated metal-enclosed bus.

  welded flexible connection laminations,

  The Metal-Enclosed Bus Program also includes visual inspection of the internal bus enclosure, bus insulation, and internal bus supports. The bus enclosure will be inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. The bus insulation will be inspected for anomalies, such as signs of embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. The internal bus supports (internal to the enclosure) will be inspected for structural integrity and signs of cracking. The elastomers used to seal the bus enclosure assembly will be inspected for embrittlement, cracking, loosening, flaking, peeling, and other indications of aging degradation.

  Welded flexible connection laminations will be inspected for cracking or other signs of fatigue.

  Both the thermography inspection and the visual inspections will be performed at least once every 10 years, with the first inspections to be completed ~~within the 10 year period~~ prior to the end of the current operating license.

The external surfaces of the bus assemblies and the external bus enclosure supports (the structural supports for the entire bus assembly) will be inspected under the Structures Monitoring Program.

- Monitoring and Trending
  The Metal-Enclosed Bus Program will not include trending actions. If anomalies are found during the inspection process, they will be addressed at that time through the corrective action program.

- Acceptance Criteria
  The acceptance criteria for the thermography portion of the Metal-Enclosed Bus Program will be based on acceptance criteria already used in the thermography process at Columbia. The acceptance criteria for the visual inspection portion (of the bus enclosure) will be that the metal-enclosed bus conductor insulation is free from unacceptable visual indications of surface anomalies, such as embrittlement, cracking, melting, swelling, and discoloration, and that the metal-enclosed bus is also free from unacceptable indications of corrosion, cracking, foreign debris, excessive dust buildup, or evidence of moisture intrusion. In addition, the elastomers used to seal adjacent bus enclosures (exterior) are to be free from indications of aging degradation, such as embrittlement, cracking, loosening, flaking, and peeling. The seal cover gaskets will be inspected when the bus assembly covers are removed for inspection of the internal components. The seal cover gaskets (elastomers) are to be free from indications of aging degradation, such as embrittlement, cracking, loosening, flaking, and peeling.

The welded flexible connection laminations are to be free from unacceptable visual indications of fatigue, such as cracking.

The external surfaces of the bus assemblies and the external bus enclosure supports (the structural supports for the entire bus assembly) will be inspected under the Structures Monitoring Program.

- 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 Section B.1.3.

  In addition, for the Metal-Enclosed Bus Program, further investigation and evaluation are performed when the acceptance criteria are not met. Corrective actions may include (but are not limited to) cleaning, drying, an increased inspection frequency, replacement, or repair of the affected metal-enclosed bus components. If an unacceptable condition or situation is identified, a determination is made as to whether the same condition or situation is applicable to other accessible or inaccessible metal-enclosed bus.