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November 3, 2005
GO2-05-178

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 REGARDING THE LICENSE AMENDMENT REQUEST FOR A ONE-TIME EXTENSION TO TECHNICAL SPECIFICATION 3.7.1**

Reference: Letter GO2-05-145, dated August 17, 2005, from WS Oxenford (Energy Northwest) to NRC, "License Amendment Request for One-time Extension of the Completion Time for Condition B of Technical Specification 3.7.1 and Exemption from Note 1 of Required Action B.1"

Dear Sir or Madam:

Transmitted herewith is the response to a Request for Additional Information (RAI). A telecom between the NRC and Energy Northwest discussing this RAI was conducted on October 17, 2005. This response provides additional information on the Energy Northwest PRA model used to assess the change in risk associated with the referenced amendment request and provides additional information on the risk reduction associated with the identified compensatory measures.

No new commitments are made in this response. If you have any questions or require additional information, please contact Michael Brandon at (509) 377-4758.

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

Respectfully,

WS Oxenford
Vice President, Technical Services
Mail Drop PE04

Attachment: Response to Request for Additional Information

cc: BS Mallett – NRC RIV
BJ Benney – NRC NRR
NRC Senior Resident Inspector/988C
RN Sherman – BPA/1399
WA Horin – Winston & Strawn

A001

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Item 1

Provide a discussion of the error factor or the uncertainty calculated for the Columbia Probabilistic Risk Assessment (PRA) model and the methodology used to calculate this statistic.

Response

The error factors for the failure distribution of the Division 2 Service Water Pump (SW-P-1B) modeled in the PRA to support this license amendment request are 3.7 for both the "Fail-to-start" and "Fail-to-run" terms. Details of the main uncertainty characteristics for SW-P-1B are provided below:

1. The parametric uncertainty distributions for SW-P-1B in terms of "Fail-to-start" and "Fail-to-run" failure probabilities are shown in the following table:

		SW-P-1B Fail-to-start		**SW-P-1B Fail-to-run**
Distribution Type		Lognormal		Lognormal
Median		2.80E-4		1.75E-6
Error Factor		3.7		3.7
Variance		1.30E-7		5.09E-12
5th Percentile		7.57E-5		4.73E-7
95th Percentile		1.04E-3		6.48E-6
Failure Rate		3.84E-4		2.40E-6

2. The Monte-Carlo methodology was applied to the cutset equation R55Z-SWB (equation of Zero-Maintenance Model with SW-P-1B out of service) using the PRA processing code WinNUPRA (based on 15,000 randomly generated simulation histories). The output from the WinNUPRA calculation is imported directly in the following:

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=====================================================================
WinNUPRA 2.1              SW-B-ZM.UNC           Licensed to: COLUMBIA
=====================================================================

   Uncertainty Analysis Results of equation file: C:\REV5-1 5-2
   MYSELF\EQNS\R55Z-SWB.EQN

   Basic File:      C:\REV5-1 5-2 MYSELF\DATA\CGS5600.BED

   Parameter File(s):  C:\Rev5-1 5-2 myself\DATA\CGS5600.prm
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Number of simulation histories: 15000

Analysis Performed:

Top event mean unavailability =          4.17E-005
Distribution variance (2nd moment) =     3.25E-010
Distribution standard deviation =        1.80E-005

                  Confidence          Unavailability
                  ==========          ==============
                      99.5               1.36E-004
                      99.0               1.07E-004
                      97.5               8.38E-005
                      95.0               6.92E-005
                      90.0               5.75E-005
                      80.0               4.81E-005
                      75.0               4.55E-005
                      70.0               4.33E-005
                      60.0               4.00E-005
                      50.0               3.74E-005
                      40.0               3.53E-005
                      30.0               3.32E-005
                      25.0               3.22E-005
                      20.0               3.12E-005
                      10.0               2.90E-005
                       5.0               2.74E-005
                       2.5               2.63E-005
                       1.0               2.52E-005
                       0.5               2.45E-005
```

Item 2

Provide a discussion of PRA quality with emphasis on the Division 2 SW subsystem.

Response

A discussion of the Columbia PRA quality from the perspective of internal, fire, and seismic events is provided below:

1. Internal Event PRA

The PRA model used for the internal events calculation is the version that was updated in April 2005 (designated as Columbia Version 5.2). The Columbia PRA is a highly detailed model that addresses a full spectrum of initiating events, accident sequences, modeled systems, human error probabilities, and common cause events. The quantification used is based on the fault tree linking methodology using the WinNUPRA software (Version 2.1), which is widely used in the industry with Validation and Verification by SCIENTECH, Inc. The fault trees are quantified with a truncation limit of 2E-9, and the event trees are quantified with a truncation limit of 5E-12.

Two major external review processes have been performed after the IPE was initially completed (GL 88-20) in 1992. The first review was conducted by the BWR Owner's Group Certification Program in 1997. The second review was commissioned by Energy Northwest and conducted by ERIN Engineering in January 2004 based on RG 1.200 Appendix A (ASME Standard, RA-SA-2003). Columbia is an NRC Pilot Plant for using RG 1.200 in the application of the Diesel Generator (DG) Completion Time (CT) Extension submittal. The ERIN review team determined the Columbia Level 1 and Level 2 PRAs included the necessary and sufficient scope and level of detail to satisfy the RG 1.200 criteria for the calculation of ΔCDF (change in core damage frequency), ΔLERF (change in large early release frequency), ICCDP (incremental conditional core damage probability) and ICLERP (incremental conditional large early release probability) for the application. In addition, as a part of the RG 1.200 requirements, ERIN Engineering examined the PRA modeling uncertainties and identified a set of "Key Assumptions." The key assumptions identified were subsequently evaluated by sensitivity analyses and were shown to be insignificant for DG CT Extension.

As part of the RG 1.200 Pilot Program, a team of NRC staff and contractors independently reviewed the Columbia PRA model documentation, industry peer review results, and utility self-assessment report. This review at Columbia was conducted the week of June 7, 2004.

The Columbia PRA is maintained and updated under an internal PRA configuration control program in accordance with Energy Northwest procedures. Since 1992, there have been numerous updates. The most recent updates since 2004 have incorporated significant modeling improvements and a recent data update. These updates resulted in changes to the plant importance ranking distributions including the Division 2 SW subsystem. The Risk Achievement Worth for the Division 2 SW subsystem was reduced from 17 to 10.

2. Fire PRA

The Columbia Fire PRA is a full scope at-power assessment with a recent revision completed in January 2004. Major attributes are listed below:

1) The Fire PRA is modeled with Initiating Frequencies based on the EPRI TR-1003111, November 2001 database, transient and fixed ignition sources, failure of manual-extinguish, automatic suppression, propagation, and SCRAM likelihoods. The output of the Fire PRA model directly transfers to the applicable internal event accident sequences of the Columbia PRA model. A total of 95 fire zones were evaluated. The effort to develop this latest revision was led by external industry experts/consultants.
2) Cable routing and circuit analysis for non-App R cables are included.
3) Multiple hot shorts are modeled with some recovery actions.
4) The Human Reliability Analysis includes considerations of smoke, heat, fire location, and fire stresses.

5) A detailed model of the control room was developed that includes 5 fire event trees.
6) The analysis addresses both Level 1 and large-early-release sequences.
7) An independent review by ERIN Engineering of the Fire PRA was performed in January 2004. Following this review and the resolution of comments, the review team considered the quality was adequate to support the DG CT Extension submittal.

3. Seismic PRA

The Columbia Seismic PRA was enhanced and updated in December 2004 by ERIN Engineering to be consistent with (to the extent practicable) Capability II or higher of the current ANS standard on external events risk assessment (ANSI/ANS-58.21-2003, March 2003) and the EPRI Seismic Probabilistic Risk Assessment Implementation Guide, dated December 2003. The Seismic PRA makes use of the Columbia internal events PRA models (with appropriate modifications to address seismic issues) where appropriate (Supporting Requirement SA-A3). Both Level 1 and LERF are modeled.

Item 3

Provide a discussion of the proposed compensatory measures and the associated benefit in quantifiable terms, if possible.

Response

The proposed risk management actions and their potential benefits are tabulated below:

	Proposed Risk Management Actions in the Submittal	**Potentially Quantifiable PRA Benefits**
1	On an 8 hour frequency, Energy Northwest will verify correct breaker alignment and indicated power availability for each offsite power circuit. As part of this verification, Energy Northwest will contact the BPA Munro and Dittmer Dispatching Centers to verify no unusual conditions exist that could affect the reliability of the plant offsite power circuits.	Reduction in grid related contribution to LOOP frequency(1)
2	Declare the required feature(s) supported by EDG-2 inoperable within 4 hours of discovery of the inoperability of the redundant required feature(s).	Not readily quantifiable or PRA benefit would be small
3	Determine within 24 hours of entering TS 3.7.1, that EDG-1 and EDG-3 are not inoperable due to a common cause failure or perform the monthly testing pursuant to TS SR 3.8.1.2 on EDG-1 and EDG-3 within 24 hours.	Not readily quantifiable or PRA benefit would be small

4	The normal entrances to the Columbia Generating Station transformer yard will be locked and posted. Planned maintenance in the transformer yard will be suspended. Access to the transformer yard is controlled in accordance with plant procedure PPM 1.9.13, Transformer Yard Access and Controls.	Reduction in plant centered contribution to LOOP frequency[2]
5	Periodic daily briefings will be conducted on the status of the Division 2 SW subsystem restoration to station management.	Not readily quantifiable or PRA benefit would be small
6	Energy Northwest will reduce the duration of maintenance on the Division 2 SW subsystem as much as practical by using a 24-hour work schedule, dedicated project management, and dedicated support for the activity.	Reduction in delta CDP
7	Energy Northwest will install protected train signs for the protected systems.	Not readily quantifiable or PRA benefit would be small
8	Energy Northwest will ensure that no maintenance activities are performed in the transformer yard that could directly cause a loss of offsite power event unless required to ensure the continued reliability and availability of the offsite power sources.	Reduction in plant centered contribution to LOOP frequency[2]
9	BPA will be informed of the unavailability of the Division 2 SW subsystem and will be requested to defer discretionary maintenance on the local network around Columbia Generating Station. The local network is defined as all 500 kV, 230 kV and 115 kV transmission system equipment located in an area bounded by the Midway Substation, White Bluffs Substation, Benton Substation, and Ashe Substation.	Reduction in grid related contribution to LOOP frequency[1]
10	Energy Northwest will request BPA notification of any emergent conditions that could affect local grid stability or reliability.	Not readily quantifiable or PRA benefit would be small
11	A check of the weather forecast will be performed to anticipate severe weather. Severe weather is currently defined in plant procedures as wind gusts greater than or equal to 58 mph, hail greater than or equal to ¾" in diameter, visual sighting of a funnel cloud or tornado, or lighting strikes in the local area. The work will be performed when the weather forecast is favorable.	Reduction in weather contribution to LOOP frequency[3]
12	Energy Northwest will not perform elective maintenance and testing on risk significant equipment without approval from the Plant General Manager. Required surveillance testing on risk significant equipment will be performed only if it cannot be rescheduled around the 144-hour period.	Not readily quantifiable or PRA benefit would be small
13	Energy Northwest will provide simulator training for the applicable control room operating crews to practice procedures for performing plant shutdown without the Division 2 SW subsystem and for coping with Station Blackout.	Reduction in shutdown risk if plant conditions warrant[4]

14	Energy Northwest will augment fire watches and limit and control welding, grinding, brazing, and transient combustibles in the vicinity of protected equipment. PRA insights will be used to identify areas for augmented fire watches and operator actions to reduce the impacts of postulated hot shorts on risk significant motor-operated valves.	Reduction in fire induced CDF to the plant[5]

[1] The combined grid contribution to LOOP is estimated to reduce the existing value by 25%.
[2] The combined plant centered contribution to LOOP is estimated to reduce the existing value by 50%.
[3] The weather related contribution to LOOP is estimated to reduce the existing value by 50%.
[4] The shutdown risk (manual shutdown with Division 2 SW subsystem out of service) would be further reduced in the Conditional CDP from currently calculated value of 5.7E-7.
[5] The reduction to ICDP from Fire PRA has been credited in the calculation reported in the submittal.

Summary

Based on engineering judgment, the combined PRA quantifiable benefits from Notes (1), (2), and (3) above would reduce the LOOP Initiating Frequency from the baseline value 3.61E-2/yr to 1.87E-2/yr (equivalent to a 48% reduction). For Columbia, LOOP and SBO are the dominating risk contributors that represent 47% of the total CDF. Therefore, the above risk management actions should make significant reductions to the CDF as well as CDP. The non-recovery data used in the LOOP and SBO event trees could slightly offset the above mentioned benefit due to the change in weighting distribution between plant-centered, weather, and grid non-recoverability. The amount of offset is, however, not estimated to be significant.

Note (4) above is not for an at-power condition; therefore, it is not further discussed. The effect of Note (5) above has no impact to the internal event PRA but reduced the fire induced PRA risk significantly (~94%).