



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 10, 2011

Mr. S. K. Gambhir, Vice President,
Engineering
Columbia Generating Station
Energy Northwest
MD PE04
P. O. Box 968
Richland, WA 99352

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE
COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION –
SEVERE ACCIDENT MITIGATION ALTERNATIVE REVIEW (TAC NO. ME3121)

Dear Mr. Gambhir:

By letter dated January 19, 2010, Energy Northwest submitted an application to the U.S. Nuclear Regulatory Commission (NRC or the staff) to renew Operating License NPF-21 for Columbia Generating Station pursuant to Title 10 of the *Code of Federal Regulations* Part 54. The NRC staff is reviewing the information contained in the license renewal application and the associated Environmental Report. The staff has identified, in the enclosure, areas where additional information is needed to complete the Severe Accident Mitigation Alternatives review. Further requests for additional information may be issued in the future.

Items in the enclosure were discussed with Mr. Abbas Mostala. A mutually agreeable date for the response is within 60 days from the date of this letter. If you have any questions, please contact me at 301-415-3748 or by e-mail at daniel.doyle@nrc.gov.

Sincerely,

A handwritten signature in black ink that reads "Daniel Doyle".

Daniel Doyle, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
As stated

cc w/encl: Listserv

**Request for Additional Information
Regarding the Analysis of Severe Accident Mitigation Alternatives
for the Columbia Generating Station License Renewal Review**

Background:

The U.S. Nuclear Regulatory Commission (NRC) issued previous requests for additional information (RAI) related to the Columbia Generating Station (CGS) Severe Accident Mitigation Alternatives (SAMA) review to Energy Northwest by letter dated July 1, 2010 (ADAMS Accession Number ML101760421). Energy Northwest provided a partial response to the RAIs by letter dated September 17, 2010 (ADAMS Accession Number ML102660151). The NRC issued two subsequent RAI letters to provide clarification on the Energy Northwest partial response (ADAMS Accession Numbers ML102870984 and ML103330246). Energy Northwest provided a second RAI response letter dated January 28, 2011 (ADAMS Accession Number ML110330395).

The purpose of these RAIs is to provide clarification on Energy Northwest's response dated January 28, 2011. All of the RAIs in this letter refer to the January 28 RAI response letter.

Requests:

RAI 1:

Table B-4 does not provide an analysis of SAMA CC-21, which was screened as Criterion C. If modeled similar to SAMA CP-01, SAMA CC-21 (procedure change) would be cost-beneficial. Clarify the disposition of this SAMA.

RAI 2:

Tables A-10, A-12, and A-14 provide a large early release frequency (LERF) importance analysis for internal, fire, and seismic events, respectively, and associated SAMA assessment. Tables A-6 through A-7 show that release category M/I is generally a much more significant contributor to population dose/economic impact than the LERF (H/E) release category, with release category H/I also being a significant contributor. Clarify how releases categories M/I and H/I are considered in the LERF importance analysis.

RAI 3:

The Level 1 and Level 2 seismic basic events importance lists (Tables A-13 and A-14) identify, in addition to the two initiating events, only a few basic events, and those identified appeared to be flag events, split fractions, or success terms. Neither seismically-induced failures nor random failures appear to be addressed in this importance analysis. Clarify how the seismic importance lists were developed. In the response, specifically discuss how the seismic probabilistic safety assessment (PSA) model treats both seismically-induced failures and random failures. If random failures are not included in the seismic analysis, explain how this model incompleteness impacts the SAMA evaluation.

ENCLOSURE

RAI 4:

Table A-1 presents a total fire core damage frequency (CDF) of 3.6E-6/yr on the Rev. 6.2 Model column header, but the contributing fire sequences under that column header sum to 3.92E-6/yr. Environmental Report Table E.3-1, on the other hand, presents a total fire CDF of 7.4E-6/yr and Table E.4-5 presents release categories that appear to support (i.e., frequencies when summed equals 7.4E-6/yr) that total. Clarify these discrepancies.

RAI 5:

The truncation limits for internal events, fire and seismic models used in the quantification of Revision 6.2 Level 1 and Level 2 CDFs range from 5×10^{-14} to 1×10^{-8} . In response to an NRC staff RAI (September 17, 2010), Energy Northwest explained that in general a four-order difference between the calculated total and truncation limit was maintained, except in a few cases where a lesser difference was appropriate. In a telephone clarification, Energy Northwest further explained that the expression "appropriate" referred to cases in which the calculated CDF appeared to converge using a lower truncation limit. Clarify if the following statement is applicable for both the Revision 6.2 and 7.1 PSA models: "In general a four-order-of-magnitude difference between the calculated total and truncation limit was maintained, except in a few cases where a lower truncation limit resulted in convergence between the calculated CDF and truncation limit."

RAI 6:

The fire events listed in Table A-1 are almost entirely different from the fire events listed in Table E.3-7 of the Environmental Report. It appears that the Table A-1 fire events are identified by initiating event category rather than fire compartment (although the Table A-1 column header uses the term "Fire Compartment"). Clarify the difference between the fire events listed in the Environmental Report and table A-1 of the RAI response.

RAI 7:

Additional Comment #2 discussed in the January 19, 2011, conference call (ADAMS Accession Number ML110400510) does not appear to have been addressed. The Phase I screening for SAMAs AC/DC-05, CB-02, CB-05, CC-13, and FR-02 need to be re-evaluated based on the total risk reduction benefit and associated implementation cost.

RAI 8:

Comment #2 discussed in the January 19, 2011, conference call (ADAMS Accession Number ML110400510) does not appear to have been entirely addressed. Explain the reason for the increase in fire population dose risk for SAMAs CW-02, CW-03, and CW-04 (Analysis Cases 18 and 19 in Table B-3) and the increase in internal events CDF and population dose-risk for SAMA AC/DC-30R (Analysis Case 45 in Table B-2).

RAI 9:

The calculated total for the internal, fire, and seismic events listed for the release categories presented in Tables A-3, A-4, and A-5 (5.61E-06/yr, 1.02E-05/yr, and 4.31E-06/yr respectively)

are not the same as the total CDFs given for internal, fire, and seismic events in Table A-1 (7.4E-6/yr, 1.4E-6/yr, and 4.9E-6/yr respectively). Explain these differences. Also, the percentage contributions presented in Tables A-3, A-4, and A-5 total to much less than 100% for each table (e.g., totals to 75% in the case of the internal events release categories).

RAI 10:

Table A-1 (seismic) shows that the CDF for a couple of the seismic damage states (i.e., S2P2, S20P2) was completely eliminated in PSA Rev. 7.1. Explain.

RAI 11:

Section 2.2 provides a sensitivity analysis of the assumed 0.3 hot short probability (if CPTs were known to be present for the circuits; otherwise, 0.6) for three selected SAMAs that address fire events. The basis for selecting the three SAMAs is the risk reduction worth significance of the hot shorts they address and that they address numerous important functions. Clarify Energy Northwest's basis for believing that the sensitivity analysis results for these three SAMAs bound the effect for other fire SAMAs. In the response, specifically address the potential for multiple hot shorts in series and whether the factor of 2 impact determined for SAMA FR-07b is bounding for the fire SAMAs. Alternatively, specifically assess the impact of using a 0.6 hot short probability (or 0.3 if these circuits are known to be protected by CPTs) on the analysis results for fire-related SAMAs FR-08, FR-09R, FR-12R, and FR-11R.

Also, the hot short probability assumption could result in an underestimate of the estimated risk reduction for SAMAs identified principally to address internal events if the SAMA addresses cutsets that contain hot shorts. Assess the impact of using a 0.6 hot short probability (or 0.3 if these circuits are known to be protected by CPTs) on the analysis results for non-fire-related SAMAs AC/DC-15, AC/DC-23, AC/DC-27, CC-02, CP-01, CW-02, CW-07, CC-24R, FW-05R, and OT-09R, which have significant fire risk reduction contribution to the total estimated benefit.

RAI 12:

Table 2-3 notes that the "Late" time category (i.e., greater than 24 hours) is not used in PSA model Rev. 7.1. Clarify that all Level 2 sequences are mapped into "early" or "intermediate" release categories. If not, assess the impact of this incompleteness on the results of the sensitivity study.

March 10, 2011

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Sincerely,

/RA/

Daniel Doyle, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosure:
As stated

cc w/encl: Listserv

ADAMS Accession No. ML110670379

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|--------|------------|-------------|-------------|-------------|
| OFFICE | LA:DLR | PM:RPB1:DLR | BC:RPB1:DLR | PM:RPB1:DLR |
| NAME | SFiguroa | DDoyle | BPham | DDoyle |
| DATE | 03/09/2011 | 03/09/2011 | 03/09/2011 | 03/10/2011 |

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Letter to S. Gambhir from D. Doyle dated March 10, 2011

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