



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

December 2, 2010

Mr. S. K. Gambhir, Vice President,  
Technical Services  
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 –  
SAMA 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 30 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](mailto:daniel.doyle@nrc.gov).

Sincerely,

A handwritten signature in cursive script 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: Distribution via 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 issued a previous request 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 RAI by letter dated September 17, 2010 (ADAMS Accession Number ML102660151).

The purpose of this RAI is to provide clarification on Energy Northwest's partial response dated September 17, 2010 (referred to in this document as "the response").

**Requests:**

**RAI 3.b-1**

Given that the use of NUREG/CR-6850 was limited to only the refinement of electrical hot short probabilities, describe the conservatisms remaining in the fire Probabilistic Safety Assessment (PSA) beyond those that may have been associated with the use of NUREG/CR-6850 used to support SAMA analysis.

**RAI 3.d(ii)-1**

Where control power transformers are not present, NUREG/CR-6850 indicates hot short probabilities may be double the 0.3 value (i.e., 0.6). If the treatment "did not take into account the specific circuit and cabling configurations," what is the basis on which the 0.3 value "was judged to be an appropriate representative ... and reasonable for the license renewal application (LRA)?" Furthermore, what is the basis for concluding that the response to RAI 6.j will "account for" this "potential modeling uncertainty?"

**RAI 3.i-1**

In the response, Table 3.i-1 (as well as Table E.4-4 in the environmental report (ER)) shows that plant damage state (PDS) 2C (Transient with stuck-open SRV or LOCA with loss of containment heat removal and containment failure occurs prior to core damage with the reactor vessel at low pressure) does not apply to the internal events PSA, but does apply to fire PSA, while at the same time PDS 2D (Transient with loss of containment heat removal and containment fails prior to core damage with the reactor vessel at high pressure) applies to the internal events PSA but not the fire PSA. This appears to be inconsistent. Furthermore, it is not clear why the fire PSA does not include fire-induced containment bypass events (see page 54 of the response). Clarify the apparent discrepancy between consideration of PDS 2C and 2D in the fire PSA. Provide justification on why the fire PSA does not include fire-induced containment bypass events.

ENCLOSURE

**RAI 5.a-1i**

The response states that 72 cost-beneficial industry SAMAs were evaluated. Of these, 51 SAMAs were determined to not be applicable to CGS, have already been implemented at CGS, or were already considered in the ER. This suggests that 21 of the 72 SAMAs were further evaluated. In addition, the RAI response states that these "remaining industry cost-beneficial candidates, along with the 4 candidates specifically identified in the RAI, are listed in Table 5.a-1, and an assessment of the applicability to CGS is provided." This suggests that Table 5.a-1 should have 25 SAMA candidate entries; however, the table only provides an assessment of 16 SAMAs. Clarify the discrepancy between the 25 SAMAs that should have been further considered, and the 16 SAMAs that were further considered in Table 5.a-1.

**RAI 5.d-1i**

In the response in Table 5.d-1 there are several basic events (e.g., HS-CIAV-MO30A, HS-CIAV-MO20, CIAHUMNV104BH3-F) that were not considered because the fire PSA conservatively does not credit the air accumulators installed at each of the safety relief valves and so the basic event is judged to not be a realistic contribution to risk. Provide an assessment of what the risk reduction worth would be for these events if the air accumulators were credited and whether this would lead to additional SAMA candidates.

**RAI 5.I-1i**

The proposed SAMA was evaluated using the baseline assumptions and for a sensitivity case assuming a 3% discount rate. Provide an assessment of this proposed SAMA for the uncertainty analysis sensitivity case presented in response to RAI 6.j and follow-up RAI 6.j-1i.

**RAI 5.I-1ii**

Provide the detailed cost-benefit results for this proposed SAMA (i.e., Tables 11-2, 11-3, and 11-4 results).

**RAI 6.b-1i**

SAMAs AC/DC-02, AC/DC-03, AC/DC-15, and AC/DC-16 were evaluated using the baseline assumptions. Provide an assessment of these SAMAs for the uncertainty analysis sensitivity case presented in response to RAI 6.j.

**RAI 6.c(i)-1**

The response did not answer the question. Provide the time available to recover offsite power with reactor core isolation cooling (RCIC) operating assumed in the baseline PSA without the SAMA.

**RAI 6.c(ii)-1**

The response did not provide the requested information for SAMA CW-03. Provide a description of the PSA model changes for this SAMA in layman terms.

**RAI 6.h(c, d)-1**

Both SAMAs FR-07a and FR-07b provide cost estimates based on assuming that polymeric cables would be replaced by metal-sheathed (“armored?”) ones so as to prevent electrical circuit failure. Depending upon the failure mode involved (short circuit, short to power [“hot short”], open circuit, grounded circuit, etc.), the use of metal-sheathed cables may or may not prevent the assumed electrical failure from occurring (cable degradation can occur due solely to heat transfer even if there is no flame impingement directly on the cable jacketing). Specifically, if the electrical failure could result from degradation within a specific cable, such as an intra-cable hot short, vs. degradation requiring two or more cables to interact, such as an inter-cable hot short, the use of metal sheathing may not preclude failure. Discuss the specific electrical failure modes that the SAMA intends to prevent and justify that the use of metal-sheathed cables will prevent these from occurring.

**RAI 6.j-1ii**

It is unclear how the “Estimated Benefit” in Table 6.j-2 was developed using the uncertainty factors provided in Table 6.j-1. For example, for SAMA AC/DC-27, assuming 7% discount rate, the baseline total benefit from the ER was stated to be \$56,044 for internal events, \$184,421 for fire events, \$0 for seismic events, and \$56,044 for other external events, resulting in a total baseline (internal + external) benefit of \$296,509. Applying the uncertainty factors from Table 6.j-1 in an uncertainty benefit of \$151,319 ( $\$56,044 \times 2.7$ ) for internal events, \$571,705 ( $\$184,421 \times 3.1$ ) for fire events, and \$151,319 ( $\$56,044 \times 2.7$ ) for other external events, resulting in a total uncertainty (internal + external) benefit of \$874,343. However, Table 6.j-2 reports the estimated benefit to be \$586,944. The uncertainty factors should be applied to all of the elements of the benefit calculation (i.e., APE, AOC, AOE, and AOSC) since each is weighted by CDF. Describe how the uncertainty analysis was performed and justify the “Estimated Benefits” provided in Table 6.j-2.

**RAI 6.j-1iv**

SAMA CC-03b was determined to be cost-beneficial in the uncertainty analysis. Describe Energy Northwest’s plans regarding further evaluation of this SAMA and any other SAMAs determined to be cost-beneficial in response to RAIs and the forthcoming sensitivity study.

December 2, 2010

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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: Distribution via Listserv

ADAMS Accession No. ML103330246

\*concurrence via e-mail

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DATE	12/01/10	11/30/10	12/02/10	12/02/10

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Letter to S. Gambhir from D. Doyle dated December 2, 2010

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