



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

December 1, 2010

LICENSEE: Energy Northwest  
FACILITY: Columbia Generating Station  
SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALL HELD ON  
OCTOBER 22, 2010, BETWEEN THE U.S. NUCLEAR REGULATORY  
COMMISSION AND ENERGY NORTHWEST CONCERNING DRAFT  
REQUESTS FOR ADDITIONAL INFORMATION PERTAINING TO THE  
SEVERE ACCIDENT MITIGATION ALTERNATIVES REVIEW OF THE  
COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION

The U.S. Nuclear Regulatory Commission (NRC or the staff) and representatives of Energy Northwest (the applicant) held a telephone conference call on October 22, 2010, to discuss and clarify the staff's draft requests for additional information (RAIs) concerning the Severe Accident Mitigation Alternatives review of the Columbia Generating Station license renewal application. The telephone conference call was useful in clarifying the intent of the staff's draft RAIs.

Enclosure 1 provides a list of the participants and Enclosure 2 contains a list of the draft RAIs discussed with the applicant, including a brief description of the status of the items.

The applicant had an opportunity to comment on this summary.

A handwritten signature in cursive script that reads "Daniel I. Doyle".

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

Docket No. 50-397

Enclosures:

1. List of Participants
2. List of Draft Requests for Additional Information

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LIST OF PARTICIPANTS  
COLUMBIA GENERATING STATION  
LICENSE RENEWAL APPLICATION  
SEVERE ACCIDENT MITIGATION ALTERNATIVES REVIEW  
TELEPHONE CONFERENCE CALL

OCTOBER 22, 2010

PARTICIPANTS

AFFILIATIONS

Daniel Doyle	U.S. Nuclear Regulatory Commission (NRC)
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DRAFT REQUESTS FOR ADDITIONAL INFORMATION  
COLUMBIA GENERATING STATION  
LICENSE RENEWAL APPLICATION  
SEVERE ACCIDENT MITIGATION ALTERNATIVES REVIEW

OCTOBER 22, 2010

**Background:**

The U.S. Nuclear Regulatory Commission (NRC or the staff) and representatives of the applicant, Energy Northwest (EN), held a telephone conference call on October 22, 2010, to discuss and clarify the following draft requests for additional information (RAIs) concerning the Severe Accident Mitigation Alternatives (SAMA) review of the Columbia Generating Station (CGS) license renewal application (LRA).

The NRC issued a previous RAI related to the SAMA review to EN by letter dated July 1, 2010 (ADAMS accession number ML101760421). EN provided a partial response to the RAIs by letter dated September 17, 2010 (ADAMS accession number ML102660151).

The purpose of the draft RAIs discussed during this telephone conference is to provide clarification on EN's partial response (referred to in this document as "the response") dated September 17, 2010.

The future EN response to the remaining RAIs from the NRC letter dated July 1, 2010, will include a sensitivity study meant to address potential impacts on the SAMA analysis associated with a major revision of the CGS Probabilistic Safety Assessment (PSA) following submission of the Environmental Report. The scope of the sensitivity study was discussed in this telephone conference.

**Requests:**

**Draft RAI 1.a-1**

The response identifies four plant changes that have been incorporated into the PSA model and an upgrade of the PSA model to Regulatory Guide 1.200, Rev. 2, since PSA Model Version 6.2 used in the SAMA analysis. It is stated that the core damage frequency (CDF) has increased, while the large early release frequency (LERF) has decreased in the resultant new PSA Model Version 7.1. Provide the CDF and LERF for PSA Model Version 7.1 and characterize the magnitude of the change in CDF and LERF due to 1) the plant changes and 2) the upgrade to Regulatory Guide 1.200, Rev. 2. Typically, the LERF trends with the CDF. Please explain why the LERF decreases while the CDF increases.

**Discussion:**

This draft RAI will be withdrawn. EN will provide the CDF and LERF from Rev. 7.1 of the PSA model and include a discussion of the major drivers for the changes from Rev. 6.2 of the PSA. Specifically, EN will explain why the LERF decreased while the CDF increased. This discussion will be included in the sensitivity study.

ENCLOSURE 2

#### **Draft RAI 1.e-1**

The response identifies a few exceptions to the statements that for event trees “the CGS PSA has generally maintained a difference of five orders of magnitude between individual sequences truncation and the final CDF”. The response also referred to a “few” event tree truncation exceptions caused by Level 1 software limitations on maximum cutsets mentioned. For these exceptions clarify what the actual truncation limit used was and provide an estimate of the impact on the total internal events, fire, and seismic CDF.

Discussion:

This draft RAI will be withdrawn. EN stated that the auto-truncation feature in WinNUPRA was disabled entirely for Rev. 7.1 of the PSA. EN will provide a discussion of the basis for the truncation limits that were selected for Rev. 7.1 of the PSA. This discussion will be included in the sensitivity study.

#### **Draft RAI 2.d-1**

The response to this RAI states that upgraded Modular Accident Analysis Program (MAAP) cases have been produced for PRA Model Version 7.1. Describe how these MAAP cases have changed from those used for PSA Model Version 6.2 used in the ER and provide the bases for selecting the new cases.

Discussion:

This draft RAI will be withdrawn. EN stated that the release categories have changed for Rev. 7.1 of the PSA. As such, EN will provide a discussion of the bases for the selection of the MAAP cases for each category for Rev. 7.1 of the PSA. This discussion will be included in the sensitivity study.

#### **Draft 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 PSA beyond those that may have been associated with the use of NUREG/CR-6850 used to support SAMA analysis.

Discussion:

EN will provide a response to this question.

#### **Draft RAI 3.d(i)-1**

The response states that the “electronic database used to select and locate cables does not include all conduit locations” but concludes that the “model incompleteness is judged to be encompassed by the provided sensitivity analysis.” It is not clear that model incompleteness, e.g., not accounting for the effects of fires in locations where cables are not known *a priori* not to be present (“exclusionary approach”), can be conclusively assumed to be bounded by a particular uncertainty band (i.e., the 95% percentile). Provide the basis for judging the significance of the incomplete modeling. Include in the response a characterization of the

extent of the incomplete modeling (e.g., a comparison of the quantity/length of cabling needing to be traced to the total) and its risk significance (e.g., Are any of the cabling not modeled related to safety or safety related components or equipment?).

Discussion:

This draft RAI was combined with draft RAI 3.d(v)-1 and issued as RAI 3.d(i)-1 by letter dated November 10, 2010 (ADAMS accession number ML102870984).

#### **Draft 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 LRA?" Furthermore, what is the basis for concluding that the response to RAI 6.j will "account for" this "potential modeling uncertainty?"

Discussion:

EN agreed to provide a sensitivity analysis associated with hot short probability using the 0.6 value and a comparison of the increased factor in delta CDF.

#### **Draft RAI 3.d(v)-1**

The response repeats that "most, but not all" of the multiple spurious equipment operations (MSOs) that may need to be modeled have been captured and that, for those not captured, the response to RAI 6.j will account for the incompleteness. While the response to RAI 6.j provides a sensitivity analysis based on the 95<sup>th</sup> percentile CDF, this does not necessarily address the potential for new scenarios that may result from MSOs, vs. using increased probabilities for existing scenarios arising only from single spurious operations. Provide the basis for concluding that the potential MSO incompleteness has been "accounted for" by the sensitivity analysis.

Discussion:

This draft RAI was combined with draft RAI 3.d(i)-1 and issued by letter dated November 10, 2010 (ADAMS accession number ML102870984) as RAI 3.d(i)-1.

#### **Draft RAI 3.i-1**

In the response, Table 3.i-1 (as well as Table E.4-4 in the ER) shows that 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.

Discussion:

EN will provide a response to this question.

**Draft RAI 5.a-1**

- i. 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.
- ii. Table 5.a-1 identifies several SAMAs that are “to be evaluated in the PSA 7.1 sensitivity study” or are “to be based on PSA 7.1 sensitivity study.” Clarify the meaning of the difference between these two statements and justify treating the SAMAs differently in the forthcoming sensitivity study.

Discussion:

Draft RAI 5.a-1i: EN will provide a response to this question.

Draft RAI 5.a-1ii: This draft RAI will be withdrawn. There is no difference in meaning between the two phrases.

**Draft RAI 5.d-1**

- i. 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 SRV's and so the basic event is judged to not be a realistic contribution to risk. Provide an assessment of what the RRW would be for these events if the air accumulators were credited and whether this would lead to additional SAMA candidates.
- ii. Table 5.d-1 identifies two new SAMAs: 1) install early fire detection system (or similar, such as “aspirating smoke detection”) and 2) improve DG-2 availability. The response provides no cost-beneficial evaluation of these SAMAs and does not state that the evaluation will be provided in the forthcoming sensitivity study. Provide a cost-benefit evaluation of these two SAMAs.

Discussion:

Draft RAI 5.d-1i: EN will provide a response to this question.

Draft RAI 5.d-1ii: This draft RAI will be withdrawn. EN will include the new SAMA candidates (identified in the response to RAI 5.d) in the sensitivity study using Rev. 7.1 of the PSA.

**Draft RAI 5.I-1**

- i. 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 clarification question #17 below.
- ii. Provide the detailed cost-benefit results for this proposed SAMA (i.e., Tables 11-2, 11-3, and 11-4 results).
- iii. Provide an updated assessment of this proposed SAMA in the forthcoming sensitivity study.

Discussion:

Draft RAI 5.I-1i: EN will provide a response to this question. Analogous information will be provided for Rev. 7.1 of the PSA in the sensitivity study. Pacific Northwest National Laboratory (PNNL) provided clarification that the phrase "clarification question #17 below" refers to the question in 6.j-1i.

Draft RAI 5.I-1ii: EN will provide a response to this question. Analogous information will be provided for Rev. 7.1 of the PSA in the sensitivity study.

Draft RAI 5.I-1iii: This draft RAI will be withdrawn. EN will include the new SAMA candidate (identified in the response to RAI 5.I) in the sensitivity study using Rev. 7.1 of the PSA which evaluates the sensitivity to uncertainty using the 95<sup>th</sup> percentile for CDF.

**Draft RAI 6.b-1**

- i. 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.
- ii. Provide an updated assessment of these SAMAs in the forthcoming sensitivity study.

Discussion:

Draft RAI 6.b-1i: EN will provide a response to this question. Analogous information will be provided for Rev. 7.1 of the PSA in the sensitivity study.

Draft RAI 6.b-1ii: This draft RAI will be withdrawn. EN will include the requested SAMA candidates in the sensitivity study using Rev. 7.1 of the PSA which evaluates the sensitivity to uncertainty using the 95<sup>th</sup> percentile for CDF.

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

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

Discussion:

PNNL provided clarification regarding the specific question. EN will provide a discussion of the time assumptions in RCIC modeling for this SAMA.

**Draft 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.

Discussion:

EN will provide the requested information for SAMA CW-03.

**Draft RAI 6.c(v)-1**

Referring to RAI 3.d(ii)-1 above, provide a cost-benefit evaluation of SAMA FR-07b assuming a revised baseline hot short probability of 0.6 rather than 0.3 used in the ER.

Discussion:

This draft RAI will be withdrawn as it is deemed redundant to draft RAI 3.d(ii)-1 above.

**Draft 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.

Discussion:

EN will provide a response to this question.

#### Draft RAI 6.j-1

- i. The uncertainty analysis presented in response to this RAI did not re-evaluate the Phase 1 SAMAs using the maximum uncertainty benefit (from eliminating all internal and external risk) from applying the uncertainty factors provided in Table 6.j-1. Specifically, the maximum baseline benefit in the ER is reported to be \$1.9M, while applying the Table 6.j-1 uncertainty factors would increase the maximum benefit to \$5.6M (NRC staff estimate). Provide an assessment of each Phase 1 SAMA eliminated using Screening Criterion D and E to determine whether any Phase 1 SAMAs originally screened should have a Phase 2 cost-benefit evaluation performed. Provide a Phase 2 cost-benefit evaluation for any SAMA not screened.
- ii. 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.
- iii. Using the above methodology results in SAMA HV-02 also being cost beneficial. Justify why this SAMA should not also be considered for implementation through the normal processes for evaluating possible plant changes at CGS.
- iv. SAMA CB-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.

#### Discussion:

Draft RAI 6.j-1i: This draft RAI was issued as RAI 6.1-1 by letter dated November 10, 2010 (ADAMS accession number ML102870984).

Draft RAI 6.j-1ii: EN will provide a response to this question. Analogous information will be provided for Rev. 7.1 of the PSA in the sensitivity study.

Draft RAI 6.j-1iii: This draft RAI will be withdrawn. The cost benefit analysis in draft RAI 6.j-1ii will be used to evaluate the viability of SAMA HV-02, and the response to draft RAI 6.j-1iv will discuss the further evaluation of this SAMA candidate and other cost-beneficial SAMA candidates.

Draft RAI 6.j-1iv: EN will provide a response to this question. PNNL provided clarification that the identified SAMA candidate ID should have been CC-03b.

**Draft RAI 1/2/5-1**

Please confirm that the information below will be provided.

RAI Responses Committing to Provide Information in the Forthcoming Sensitivity Study:

- 1.a Impact of Version 7.1 on SAMA evaluation to be provided in Sensitivity Study.
- 1.c Impact of resolution of PSA review comments on SAMA evaluation to be provided in Sensitivity Study.
- 2.c Sensitivity study will assess impacts of unresolved peer review findings.
- 2.f Sensitivity study will assess improvement of operator procedures and training (RAI 5.e).
- 5.a Table 5.a-1 identifies 8 additional industry SAMAs that will be evaluated in the sensitivity study.
- 5.c Sensitivity study will provide Level 1 and 2 importance lists for internal events, fire, and seismic PSA Version 7.1.
- 5.e Sensitivity study will evaluate new SAMA to increase operator awareness (also identified in RAI 5.a).
- 5.j Sensitivity study will evaluate new SAMA to strengthen the seismic ruggedness of MCC-7F and MCC-8F.
- 5.m SAMA FW-04 will be evaluated in the sensitivity study.

Discussion:

This draft RAI will be withdrawn. EN confirmed that the sensitivity study will provide the information as discussed in RAI responses 1.a, 1.c, 2.c, 2.f, 5.a, 5.c, 5.e, 5.j, and 5.m.

December 1, 2010

LICENSEE: Energy Northwest

FACILITY: Columbia Generating Station

SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALL HELD ON OCTOBER 22, 2010, BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND ENERGY NORTHWEST CONCERNING DRAFT REQUESTS FOR ADDITIONAL INFORMATION PERTAINING TO THE SEVERE ACCIDENT MITIGATION ALTERNATIVES REVIEW OF THE COLUMBIA GENERATING STATION LICENSE RENEWAL APPLICATION

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*/RA/*

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

Docket No. 50-397

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Memorandum to Energy Northwest from Daniel I. Doyle dated December 1, 2010

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