NRR-DMPSPEm Resource

From: Valentin-Olmeda, Milton
Sent: Thursday, November 29, 2018 3:07 PM
To: Diane Aitken
Cc: St. Peters, Courtney; Reisi Fard, Mehdi; Sebrosky, Joseph; Titus, Brett
Subject: North Anna SPRA (Fukushima 50.54f) Audit Follow-Up Clarification Question on Plant Modifications

Diane,

As discussed in our 11/29/18 conference call, part of the ongoing audit of the seismic probabilistic risk assessment (PRA) submittal (ADAMS Accession No. ML18093A445), here is a follow-up clarification question associated to plant-response portion of the submittal.

Follow-up Question 4.01 (Topic #16)

The licensee provided an updated response via the Dominion ePortal to the plant-response model audit question 4 (Topic #16) sent on October 9, 2018 (ADAMS Accession No. ML18282A150). This updated response identifies plant modifications to achieve seismic risk improvements. The update also addresses FLEX diesel generator (DG) failure rates and a surrogate Human Failure Event (HFE) for transport of FLEX equipment. The response provided a sensitivity study that increased the FLEX DG failure rates by a factor of 10 and the human error probability of the HFE in question by a factor of five.

Table 1 presented in response to Question #4 provides the risk reductions that could be obtained by eliminating top risk contributors identified in the seismic PRA submittal. The table includes the risk reduction calculated for combinations of failures that when taken together exceeds or begins to approach a decrease in seismic CDF of 1E-05 per year or in seismic LERF of 1E-06 per year. Table 2 of the response provides the results of a cost benefit analysis for elimination of these single and combinational risk contributors. However, further information is needed by NRC staff to agree with the conclusions of Table 2 that there are no candidate seismic risk plant improvements that are cost-justified. In the following paragraphs NRC staff makes four observations about the cost-benefit presented in the response.

The first observation is that Table 1 identifies four relay chatter failure events that were combined together and “screened-in” because the total seismic LERF reduction associated with the combination exceeded 1E-06 per year. This combination was the only relay chatter combination evaluated for cost benefit in Table 2. The NRC staff notes that, accordingly to Table 1 of the response, the risk reduction associated with eliminating the risk associated with SEIS-RS-P-1AB-RLY is a decrease in seismic LERF of 8.52E-07 per year. Therefore, it appears to the NRC that elimination of this failure (i.e., inside RS pump relay chatter) along with the elimination of one of three other seismic relay failures (e.g., SEIS-EE-BKR-HJ8-RLY, SEIS-RS-P-3AB-RLY, or SEIS-RS-P-2AB-RLYSS) would result in decrease in seismic LERF of >1E-06 per year. The NRC staff notes that the cost of eliminating two sources of relay chatter failures should be less than the cost of eliminating four sources of relay chatter failure. Accordingly, the NRC staff requests that these combinations be addressed in an update of the licensee’s cost-benefit analysis.

The second observation concerns the results of the sensitivity study presented in the response, in which the assumed FLEX DG failure rates were increased by a factor of 10 and the HFE associated with transport of the FLEX DG was increased by a factor of 5. The NRC staff notes that in the sensitivity analysis presented in the response that the Fussell Vesely (FV) importance valve of SEIS-EE-BKR-HJ8-RLY (4kV to 480V bus breakers – relay chatter) increased by a factor of 2. Therefore, it appears that elimination of this failure along with SEIS-SW-P-1AB-RLY (Service water pumps – relay

chatter) or SEIS-CH-P-1ABC-RLY (Charging pumps – relay chatter) would result in decrease in CDF of >1E-05 per year. Therefore, the NRC staff requests that these combinations be addressed in an update of the licensee's cost-benefit analysis.

The third observation concerns Table 2 of the response. The response states that for calculation of the maximum benefit of seismic risk reduction options a mean annual offsite dose impact of 7.5 was used which is the value used in the Guidance Worksheet (ADAMS Accession No. ML17146A206). The NRC staff notes, however, that the value used in the Generic Environmental Impact Statement for License Renewal for the North Anna Power Station (see NUREG-1437 Supplement 7, Section 5.2, page 5-7) is 25 rem/year rather than 7 rem/year (i.e., the spreadsheet was in error). Also, the response states that a base maximum benefit value of $1M was used in the cost-benefit analysis. This value seems low to NRC staff even if a mean annual offsite dose impact of 7.5 is assumed. Based on this value and the discussion in the response, it is not clear to the NRC staff whether the on-site exposure and onsite economic costs were included in the determination of the maximum benefit. NRC staff's calculation of the base maximum benefit of a reactor unit is $3.8M. The NRC staff notes that exclusion of the costs associated with the onsite impacts along with use of a mean annual offsite dose impact of 7.5 rather than 25 rem/year significantly impacts the calculated cost-benefits.

The fourth observation concerns the cost estimates presented in Table 2 of the response. The NRC staff notes that although some description of the potential plant improvement is provided, no basis for the cost estimate is included. The NRC staff notes that the Guidance Worksheet provides a cost estimate for installing seismically qualified relays of $55,000 per relay (See reference to the Palisades Severe Accident Mitigation Alternatives (SAMA) analysis.) In addition, Section 5.7.2 of the submittal states that the seismic PRA does not credit operator actions to reset the relays due mainly to time constraints. Given that reducing the seismic risk contribution from relay chatter would have a significant impact on overall seismic risk, it appears to NRC that operator action to reset relays after a seismic event might be an important risk reduction strategy to consider in an update to Table 2.

In light of the observations above, please address the following items:

a) Update the cost benefit analysis by using a mean annual offsite dose impact of 25 rem/year and by including the on-site exposure and onsite economic cost.

b) For the base case (no sensitivities considered), include the LERF decrease associated with the elimination of the following three pairs of failures: SEIS-RS-P-1AB-RLY with SEIS-EE-BKR-HJ8-RLY, SEIS-RS-P-1AB-RLY with SEIS-RS-P-3AB-RLY, and SEIS-RS-P-1AB-RLY with SEIS-RS-P-2AB-RLYSS.

c) For the sensitivity case values (FLEX DG and HEF), include the CDF decrease associated with the elimination of the following two pairs of failures: SEIS-EE-BKR-HJ8-RLY with SEIS-SW-P-1AB-RLY and SEIS-RS-P-1AB-RLY with SEIS-CH-P-1ABC-RLY.

d) If eliminating the risk associated with pairs of seismically induced relays chatter events does not decrease the seismic CDF by 1E-05 per year or the LERF by 1E-06 per year in the updated analysis, then include combinations of three or four relay chatter failure events whose elimination do decrease the seismic CDF by 1E-05 per year or the LERF by 1E-06 per year.

e) Include the bases for the cost estimates. In particular, include the cost bases for installing seismically qualified relays to replace relays that contribute significantly to seismic risk. Also, provide the cost basis for implementing procedural changes that would provide guidance to operators to reset relays following a seismic event, if it can be shown that this operation action can reduce the seismic CDF by 1E-05 per year or seismic LERF by 1E-06 per year.

For each item, please provide all qualitative arguments that may support your conclusions, and the basis for values used or assumptions made in your analysis.

We look forward to hearing back from you regarding the date for when to expect a response to this follow-up audit question. Prompt and complete responses will prevent delays in our review schedule.

Please give me a call if you have any questions regarding this email.

Respectfully,

Milton Valentín, PM
US NRC Division of Licensing Projects
Beyond Design Basis Management (Fukushima)
Office of Nuclear Reactor Regulation
Milton.Valentin@nrc.gov
301-415-2864

Hearing Identifier: NRR_DMPS
Email Number: 689

Mail Envelope Properties (Milton.Valentin-Olmeda@nrc.gov20181129150700)

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From: Valentin-Olmeda, Milton

Created By: Milton.Valentin-Olmeda@nrc.gov

Recipients:
"St. Peters, Courtney" <Courtney.St.Peters@nrc.gov>
Tracking Status: None
"Reisi Fard, Mehdi" <Mehdi.Reisifard@nrc.gov>
Tracking Status: None
"Sebrosky, Joseph" <Joseph.Sebrosky@nrc.gov>
Tracking Status: None
"Titus, Brett" <Brett.Titus@nrc.gov>
Tracking Status: None
"Diane Aitken" <diane.aitken@dominionenergy.com>
Tracking Status: None

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