

From: [Philpott, Stephen](#)
To: [David L Williams](#)
Cc: [Valentin-Olmeda, Milton](#)
Subject: Second Request for Supporting Information (Fragility Questions) for the D.C. Cook SPRA Audit Review
Date: Monday, April 27, 2020 12:57:00 PM

Good afternoon Dave,

The purpose of this email is to request the following information to support the audit review of the Donald C. Cook Nuclear Plant, Units 1 and 2 (CNP) 50.54(f) seismic probabilistic risk assessment (SPRA) submittal dated November 4, 2019 (ADAMS Accession No. [ML19310D805](#)). The NRC staff is using a technical checklist (see ADAMS Accession No. [ML18173A017](#)) to guide this review. The following audit questions will support this effort. Please provide your responses to the following questions via your Scientech (OneCWCloud) e-Portal SPRA audit site.

Note that we have continued the question numbering from the first set of clarification questions (Plant-Response Model Questions) sent by my e-mail on March 25, 2020, to avoid any confusion in referencing specific questions and responses.

Donald C. Cook Nuclear Plant, Units 1 and 2 (CNP)

Fragility Clarification Questions

Question 6 – Topic # 6 - Use of Seismic Response Scaling (SPID Section 6.3.2)

In Section 4.4.2.2 of the submittal, it is not clear to the NRC staff whether the scaling or screening capacity approach was used to evaluate fragilities of the Nuclear Steam Supply System (NSSS) components. If the scaling approach was used, please clarify, in accordance with SPID Section 6.3.2, whether the scaling of responses were based on the following: (1) previously developed in-structure response spectra (ISRS); (2) shape of the previous uniform hazard spectrum/review-level earthquake (UHS/RLE); (3) shape of new UHS/RLE; and (4) structural natural frequencies, mode shapes, and participation factors. Please also clarify how non-linear effects were considered if the spectral shape of the new UHS/RLE and the design basis ground motion are “non-similar”. If the scaling approach was not used, please describe the methodology used to evaluate the fragility of NSSS components.

Question 7 – Topics # 4 - Adequacy of the Structural Model (SPID Section 6.3.1); # 7 - Use of New Response Analysis for Building Response, ISRS, and Fragilities; # 9 - Use of the CDFM/Hybrid Methodology for Fragility Analysis (SPID Section 6.4.1); and # 12 - Selection of Dominant Risk Contributors that Require Fragility Analysis Using the Separation of Variables Methodology (SPID Section 6.4.1)

Sections 3.1.1, 4.3.2, and 4.4 of the submittal states that an earthquake equivalent to 0.8 times the uniform hazard response spectra (UHRS) at 1E-5 mean annual probability of exceedance, designated as the review level earthquake (RLE), was used to evaluate building responses and fragility estimation. The basis for this ground motion for the SPRA is not discussed in the submittal. Please clarify the rationale for the RLE hazard level used in the SPRA.

Question 8 – Topic # 4 - Adequacy of the Structural Model (SPID Section 6.3.1)

The structural response document (Reference #63, CNP document 15C4313-3RPT-003, “Summary of Building Response Analysis for Cook Nuclear Plant (CNP) Unit 1 and Unit 2 SPRA”) describes the lumped mass stick model (LMSM) of the containment building (CB), which includes three unique stick models of the containment shell and dome, crane wall, and primary shield wall. In addition, the East Main Steam Stop Enclosure (EMSSE) was added to the CB model. The LMSM was used to develop in-structure response spectra (ISRS) for the fragility assessment of the components and systems housed in EMSEE. To address Checklist Topic #4, the NRC staff is requesting clarifications for the following:

- a) The structural response document (15C4313-3RPT-003) stated that the LMSM of the EMSEE reflect the dynamic behavior of the 3D shell model of the structure. Please clarify how the response of EMSEE from the 3D model was verified in the composite CB LMSM.
- b) During the staff review of the structural response document (15C4313-3RPT-003), Section 3.0 and Attachment B, the staff noted that although the individual LMSM models do not satisfy all the Criteria 1 through 7 of SPID section 6.3.1 (e.g., models do not include vertical floor response), CNP determined that the overall model of the containment building structure meets the criteria of the SPID. Please provide the basis for the determination that this model meets the SPID criteria.

Question 9 – Topics # 4 - Adequacy of the Structural Model (SPID Section 6.3.1)

The disposition of facts and observations (F&Os) following the close-out peer review is documented in Table A.8-1: Summary of CNP Open F&Os Impact to SPRA Results. There are some F&Os that remain “Open” and some are “Partially Resolved.” In all cases CNP concluded that the “SPRA results are not expected to be impacted.” Although CNP provided paths to closing the F&Os, it is not clear to the NRC staff when CNP plans to close out the F&Os. In some cases, the CNP dispositions are either not sufficiently documented or require further analyses. Please clarify the dispositions for the following two F&Os:

- a) In response to F&O 28-2 (Partially Resolved), which required demonstration that by assuming single-point attachment for dynamic coupling, the structural response of the Containment Building (CB) is realistic, the disposition stated that the “CB modeling simplifications have no impact” on the structural response and detailed studies are not required. However, the disposition did not offer a basis for this conclusion. Please provide a more complete justification for the CNP resolution of F&O 28-2, or identify where this justification is documented in the submittal or supporting documents.
- b) In response to F&O 28-11 (Open) regarding the variability of structural properties, the disposition stated the impact of structural variability on the fragility for the risk-significant components will be reviewed. Please provide the basis for the statement that “SPRA results are not expected to be impacted” without the results from the proposed sensitivity analysis.

Please let me know when the responses are made available so that we can proceed with

the audit review. If a conference call would be helpful to clarify or further explain any of these audit question, please let me know and I will be happy to arrange a call.

Thank you,
Steve

Steve Philpott
Project Manager
U.S. Nuclear Regulatory Commission (NRR/DORL/LPMB)
phone: 301-415-2365
e-mail: Stephen.Philpott@nrc.gov