Dominion Energy Nuclear Connecticut, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy®

October 3, 2019

10 CFR 50.69
10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Serial No.: 19-393
NRA/GDM: R1
Docket No.: 50-336
License No.: DPR-65

**DOMINION ENERGY NUCLEAR CONNECTICUT, INC.**
**MILLSTONE POWER STATION UNIT 2**
**LICENSE AMENDMENT REQUEST TO ADOPT 10 CFR 50.69**
**RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION**

By letter dated January 17, 2019 (Serial No. 18-145) [ADAMS Accession No. ML19023A427], Dominion Energy Nuclear Connecticut, Inc. (DENC), submitted a license amendment request (LAR) for Millstone Power Station Unit 2 (MPS2). The proposed amendment would modify the MPS2 licensing basis to allow for the implementation of the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.69, "Risk-informed categorization and treatment of structures, systems, and components for nuclear power plants."

In a September 5, 2019 e-mail from Mr. Richard Guzman (NRC Project Manager) to Mr. Shayan Sinha (Dominion Energy Nuclear Regulatory Affairs), the NRC technical staff requested additional information to facilitate their review of the proposed LAR. The NRC request and DENC's response are provided in the attachment to this letter.

The information provided in this letter does not affect the conclusions of the significant hazards consideration or the environmental assessment included in the January 17, 2019 LAR.

Should you have any questions regarding this submittal or require additional information, please contact Mr. Gary D. Miller at (804) 273-2771.

Sincerely,

Mark D. Sartain
Vice-President – Nuclear Engineering and Fleet Support

COMMONWEALTH OF VIRGINIA )
)
COUNTY OF HENRICO )

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mark D. Sartain, who is Vice President – Nuclear Engineering and Fleet Support of Dominion Energy Nuclear Connecticut, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 3rd day of October, 2019.

My Commission Expires: March 31, 2022.

Diane E. Aitken
Notary Public

DIANE E. AITKEN
NOTARY PUBLIC
REG. #7763114
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES MARCH 31, 2022

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NRR

Commitments made in this letter:

1. DENC will review the completed reevaluation of external floods to ensure that the potential for external flooding will be incorporated into the categorization consistent with the guidelines for external events evaluation described in NEI 00-04. The 50.69 categorization procedure will be updated to reference the reevaluation of external floods to ensure that both SSCs relied on in unscreened scenarios and SSCs whose failure would cause screened scenarios to become unscreened are appropriately identified and categorized according to Figure 5-6 in NEI 00-04.

2. A sensitivity study will be performed per NEI 00-04 to increase the component common cause events to their 5th and 95th percentile values as part of the required 50.69 PRA categorization sensitivity cases. Additionally, a sensitivity study will be performed on the independent FLEX failures using the 5th and 95th percentile values.

Attachment:
Response to NRC Request for Additional Information, License Amendment Request to Adopt 10 CFR 50.69

cc: U.S. Nuclear Regulatory Commission
Region I
2100 Renaissance Blvd, Suite 100
King of Prussia, PA 19406-2713

R. V. Guzman
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop 08-C 2
11555 Rockville Pike
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Millstone Power Station

Director, Radiation Division
Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

**Attachment**

# RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION LICENSE AMENDMENT REQUEST TO ADOPT 10 CFR 50.69

**Dominion Energy Nuclear Connecticut, Inc.**
**(DENC)**
**Millstone Power Station Unit 2**

**RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION**
**LICENSE AMENDMENT REQUEST TO ADOPT 10 CFR 50.69**

**MILLSTONE POWER STATION UNIT 2**

**NRC COMMENT:**

*By letter dated January 17, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19023A427), Dominion Energy Nuclear Connecticut, Inc. (Dominion Energy, the licensee), submitted a license amendment request (LAR) for Millstone Power Station Unit 2 (Millstone 2). The proposed amendment would modify the licensing basis to allow for the implementation of the provisions of Title 10 of the Code of Federal Regulations (10 CFR), Section 50.69, "Risk-informed categorization and treatment of structures, systems, and components for nuclear power plants," and provide the ability to use probabilistic risk assessment (PRA) models, the internal events PRA (IEPRA), and internal flooding PRA (IFPRA), for the proposed 10 CFR 50.69 categorization process.*

*Regulatory Guide (RG) 1.201, Revision 1, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to their Safety Significance," May 2006 (ADAMS Accession No. ML061090627), endorses, with regulatory positions and clarifications, the Nuclear Energy Institute (NEI) guidance document NEI 00-04, Revision 0, "10 CFR 50.69 SSC [Structure, System, and Component] Categorization Guideline," July 2005 (ADAMS accession No. ML052910035), as one acceptable method for use in complying with the requirements in 10 CFR 50.69. Both RG 1.201 and NEI 00-04 cite RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," February 2004 (ADAMS Accession No. ML040630078), which endorses industry consensus PRA standards, as the basis against which peer reviews evaluate the technical acceptability of a PRA. Revision 2 of RG 1.200, issued March 2009, is available at ADAMS Accession No. ML090410014.*

*Section 3.1.1 of the LAR states that Dominion Energy will implement the risk categorization process of 10 CFR 50.69 in accordance with NEI 00-04, Revision 0, as endorsed by RG 1.201. However, the licensee's LAR does not contain enough information for the U.S. Nuclear Regulatory Commission (NRC) staff to determine if the licensee has implemented the guidance appropriately in NEI 00-04, as endorsed by RG 1.201, as a means to demonstrate compliance with all of the requirements in 10 CFR 50.69, including technical adequacy of the PRA models. The NRC staff requests additional information (RAI) for the following areas in order to complete its assessment.*

## NRC REQUEST FOR ADDITIONAL INFORMATION AND DENC RESPONSE

### RAI 01 – F&O resolution Implementation Items

*In the disposition for finding number SC-A5-01, the licensee states that, "before implementation, the MPS2 PRA internal events model of the SGTR accident sequence will be revised to remove credit for achieving safe and stable conditions at 32 hours." Provide the following:*

- *Propose a mechanism that ensures SC-A5-01 will be resolved prior to implementation of the 10 CFR 50.69 categorization process (e.g. an implementation item). This mechanism should include an explicit description of changes that will be made to the PRA model or documentation to resolve this issue.*

### DENC Response to RAI 01

The facts and observations (F&O) finding number SC-A5-01 has been resolved in the Millstone Power Station Unit 2 (MPS2) PRA model (MPS2-R05h) by removing credit to mitigate the Steam Generator Tube Rupture (SGTR) accident sequence where safe and stable conditions were achieved at 32 hours. This is consistent with the peer review process to ensure compliance with the ANS/ASME RA-Sa-2009 PRA standard.

### RAI 02 – SSCs Categorized Based on Other External Hazards

*Section 3.2.4 of the LAR states, in part, that "[a]ll remaining hazards [except seismic or fires] were screened from applicability and considered insignificant for every SSC and, therefore, will not be considered during the categorization process. This statement appears to indicate that Dominion proposes to treat all SSCs as Low Safety Significant (LSS) with respect to other external events. However, the LAR also states that "[a]s part of the categorization assessment of other external hazard risk, an evaluation is performed to determine if there are components being categorized that participate in screened scenarios and whose failure would result in an unscreened scenario." The two cited statements from the LAR seem to be in conflict. Attachments 4 and 5 of the LAR provide a summary of the other external hazards screening results, but does not appear to address any considerations related to applying Figure 5-6 of NEI 00-04 guidance to those hazards. Considering these observations,*

a. *Provide clarification about which external hazards that will be evaluated according to the flow chart in NEI 00-04, Section 5.4, Figure 5-6, and which are screened out of all categorization evaluations.*

b. *The extreme wind or tornado screening results in Enclosure 1, Attachment 4 states: "[w]ind loadings are designed for 115 mph winds with gusts up to 140 mph." The frequency of these winds is not provided. Please provide the frequency of these winds or otherwise summarize how the structures screen out of, or will be included in, the categorization process.*

c. *The extreme wind or tornado screening results in Enclosure 1, Attachment 4 states that "structures are designed for tornadoes having a frequency of less that 1E-6/yr," and that "service water pumps, Diesels, and EDG room ventilation all have missile strike probabilities less than 1E-6/yr." Please summarize how Figure 5-6 has been applied to these SSCs to identify SSCs whose failure might result in these screened scenarios becoming unscreened. Alternatively, provide a mechanism that ensures that the potential for extreme wind or tornados will be incorporated into the categorization consistent with the guidelines for external events evaluation described in NEI 00-04.*

d. *The external flooding screening results in Enclosure 1, Attachment 4 states that Dominion has not yet completed the 10 CFR 50.54(f) request on Reevaluation of External Floods. The item is closed by stating that, "as part of the reevaluation, any identified discrepancies will be tracked in the corrective action program." It is unclear how the results of the reevaluation have been or will be included in the categorization process. Propose a mechanism that ensures that the potential for external flooding will be incorporated into the categorization consistent with the guidelines for external events evaluation described in NEI 00-04. The mechanism should ensure that both SSCs relied on, in unscreened scenarios, and SSCs whose failure would cause screened scenarios to become unscreened are appropriately identified and categorized according to Figure 5-6 in NEI 00-04.*

**DENC Response to RAI 02a**

All external hazards (excluding internal fires and seismic hazards) will be evaluated in accordance with the flow chart in NEI 00-04, Section 5.4, Figure 5-6, "Other External Hazards." This figure provides the NRC approved process to be used to determine Structures, Systems, and Components (SSC) safety significance for other external hazards (excluding internal fires and seismic hazards). Dominion Energy Nuclear Connecticut, Inc. (DENC) is following NEI 00-04, Section 5.4, for assessment of other external hazards. Therefore, DENC is subjecting the external hazards (excluding internal fires and seismic hazards) to the process described by the flow chart in NEI 00-04, Figure 5-6. As part of the categorization assessment of "other external hazard" risk, an evaluation is performed to determine if there are components being categorized that participate in screened scenarios and whose failure would result in an unscreened scenario. Those components would be categorized as high safety significant (HSS).

**DENC Response to RAI 02b**

The first paragraph in the Extreme Wind or Tornado external hazard screening item included in Enclosure 1, Attachment 4, of the LAR discusses the design wind loadings with a 100-year recurrence period. The following paragraphs for that item in Attachment 4 of the LAR document the screening of External Winds and Tornadoes in accordance with progressive screening criterion, PS4. As noted in the response to RAI 02a, DENC is following NEI 00-04, Section 5.4, for assessment of other external hazards. For example, if the SSC (e.g., structure) being categorized participates in the screening of other external hazards (e.g., extreme winds or tornados) and postulated failure of the SSC results in an unscreened scenario, then the SSC will be categorized as High Safety Significant (HSS).

**DENC Response to RAI 02c**

As noted in the response to RAI 02a, the external hazards for extreme winds and tornados were screened events. DENC will follow the external hazards process (excluding internal fires and seismic hazards) described by the flow chart in NEI 00-04, Figure 5-6.

**DENC Response to RAI 02d**

DENC will review the completed reevaluation of external floods to ensure that the potential for external flooding will be incorporated into the categorization consistent with the guidelines for external events evaluation described in NEI 00-04. The 50.69 categorization procedure will be updated to reference the reevaluation of external floods to ensure that both SSCs relied on in unscreened scenarios and SSCs whose failure would cause screened scenarios to become unscreened are appropriately identified and categorized according to Figure 5-6 in NEI 00-04.

**RAI 03 – Alternate Non-PRA Method for Fire to Categorize SSCs**

*Sections 50.69(c)(1)(ii) of 10 CFR requires that the licensee determine the SSC's functional importance using an integrated, systematic process for addressing initiating events (internal and external), SSCs, and plant operating modes, including those not modeled in the plant-specific PRA.*

*Section 3.2.2 of the LAR states in part, "[t]he MSP2 categorization process will use the Fire Safe Shutdown Equipment List (SSEL) for evaluation of safety significance related to fire hazards." It further states that this approach addresses conditions defined by 10 CFR 50, Appendix R, NRC Branch Technical Position CMEB 9.5-1, regulatory exemptions, and fire induced Multiple Spurious Operations to identify equipment. The*

*LAR states that the alternate approach proposed is considered to be a conservative method, compared to FIVE or fire PRA, based on industry assessments.*

*Section 3.3 of NEI 00-04, Revision 0 provides limited guidance for determining the technical adequacy attributes required for these types of analyses for this specific application. Regulatory Guide 1.201, Revision 0 states in part, "as part of the plant-specific application requesting to implement 10 CFR 50.69, the licensee or applicant will provide the bases supporting the technical adequacy of its non-PRA-type analyses for this application." Address the following regarding the proposed alternate approach:*

a. *Provide justification that the Fire SSEL method is technically adequate relative to the acceptable methods in NEI 00-04. Include in the justification, (1) the industry assessments referenced in the LAR, (2) a summary of the industry evaluations and results that support the conclusion that Millstone's proposed approach to use the fire SSEL is conservative, and (3) discussion for how additional SSCs will be assigned High Safety Significant (HSS) categorization in comparison to using an acceptable method (e.g., additional HSS SSCs would not be identified by a FIVE or fire PRA analysis).*

b. *Clarify whether fire detection and suppression (and fire dampers) equipment is included in the Millstone Unit 2 SSEL. If not included, summarize how the risk-significance of this equipment will be evaluated to determine whether the equipment is HSS or LSS.*

**DENC Response to RAI 03a**

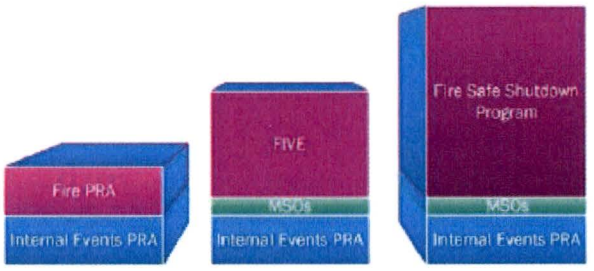
The proposed approach for identifying HSS SSCs for Internal Fire Hazards, by use of the Safe Shutdown Equipment List (SSEL), is similar to the NEI 00-04 acceptable method for Seismic Hazards in that the measure of safety significance categorizes all system functions and associated SSCs that are involved in the safe-shutdown success paths as HSS. The justification is provided below.

At an NRC public meeting held on September 6, 2017 (ML17228A732), NEI and industry stakeholders met with the NRC to describe a proposed approach for identifying HSS SSCs in the 10 CFR 50.69 application for Internal Fire Hazards.

The industry 10 CFR 50.69 Coordinating Committee performed a study involving several plants to compare the number of HSS SSCs identified by each of three approaches, 1) Fire Probabilistic Risk Assessment (FPRA), 2) Fire Induced Vulnerability Evaluation (FIVE), and 3) SSEL. Each approach is more conservative than the previous approach resulting in more HSS SSCs (as shown in the below graph).

As shown in the graph[1] below, a summary of the industry evaluations performed as part of the study concluded that the proposed SSEL approach is conservative by introducing significantly more SSCs assigned an HSS categorization than use of a FPRA or FIVE. Additionally, the SSEL approach included all the SSCs identified by the FPRA and the FIVE approach. The reason the SSEL approach is more conservative than using FIVE results is that FIVE uses a successive screening methodology and the SSEL does not. The industry assessments referenced by the LAR are contained in ML17249A072.

For DENC, the far-right column showing the Fire Safe Shutdown program, which is the SSEL, would also include components identified in deviations/exceptions taken by the Fire Protection Program, and Fire Protection System SSCs (including detection and suppression SSCs and fire dampers).




Use of the Fire SSEL provides a conservative alternative approach to addressing fire for 50.69 categorization

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Therefore, the DENC approach is conservative and inclusive with respect to identifying HSS SSCs that would be identified by a FPRA or FIVE approach.

Additional SSCs will be assigned HSS using a conservative approach. During system categorization, the SSCs associated with the system are assessed for safety significance consistent with the NEI 00-04 process. In addition to categorizing equipment on the Appendix R SSEL as HSS, all Fire Protection Equipment, including detection, suppression, and barriers (e.g., fire dampers) will be categorized as HSS.

**DENC Response to RAI 03b**

Fire detection, suppression, and barriers (e.g., fire dampers) are not included in the MPS2 SSEL, but, as stated in response to RAI 03a, will be categorized as HSS.

[1] Slide 18 from ML17249A072

**RAI 04 – Addition of FLEX to the PRA Model**

*The NRC memorandum dated May 30, 2017, "Assessment of the Nuclear Energy Institute 16-06, 'Crediting Mitigating Strategies in Risk-Informed Decision Making,' Guidance for Risk-Informed Changes to Plants Licensing Basis" (ADAMS Accession No. ML17031A269), provides the NRC's staff assessment of identified challenges and strategies for incorporating FLEX equipment into a PRA model in support of risk-informed decision making in accordance with the guidance of RG 1.200. The LAR does not state whether the licensee has incorporated FLEX mitigating strategies and associated equipment into the PRA models for Millstone. For the NRC staff to assess the potential incorporation of FLEX equipment into the Millstone PRA model(s), provide the following:*

a. *State whether FLEX equipment and strategies have been credited in the PRA model(s). If not incorporated or their inclusion is not expected to impact the PRA results used in the categorization process, no additional response is requested.*

b. *If the equipment or strategies have been credited, and their inclusion is expected to impact the PRA results used in the categorization process, provide the following information separately for each of the PRA model(s) (i.e., IEPRA (includes flooding), external hazards PRA(s)), and external hazards screening as appropriate:*

   i. *A discussion detailing the extent of incorporation, i.e. summarize the supplemental equipment and compensatory actions, including FLEX strategies that have been quantitatively credited for each of the PRA models used to support this application.*

   ii. *A discussion detailing the methodology used to assess the failure probabilities of any modeled equipment credited in the licensee's mitigating strategies (i.e., FLEX). The discussion should include justification explaining the rationale for parameter values, and whether the uncertainties associated with the parameter values are considered in accordance with the ASME/ANS PRA Standard as endorsed by RG 1.200.*

   iii. *A discussion detailing the methodology used to assess operator actions related to FLEX equipment and the licensee personnel that perform these actions. The discussion should include:*

      1. *A summary of how the licensee evaluated the impact of the plant-specific human error probabilities and associated scenario-specific performance shaping factors listed in (a)-(j) of supporting requirement HR-G3 of the ASME/ANS RA-Sa-2009 PRA standard.*

2. *Whether maintenance procedures for the portable equipment were reviewed for possible pre-initiator human failures that renders the equipment unavailable during an event, and if the probabilities of the pre-initiator human failure events were assessed as described in HLR-HR-D of the ASME/ANS RA-Sa-2009 PRA standard.*

3. *If the licensee's procedures governing the initiation or entry into mitigating strategies are ambiguous, vague, or not explicit, a discussion detailing the technical bases for the probability of failure to initiate mitigating strategies.*

c. *The ASME/ANS RA-Sa-2009 PRA standard defines PRA upgrade as the incorporation into a PRA model of a new methodology or significant changes in scope or capability that impact the significant accident sequences or the significant accident progression sequences. Section 1-5 of Part 1 of ASME/ANS RA-Sa-2009 PRA Standard states that upgrades of a PRA shall receive a peer review in accordance with the requirements specified in the peer review section of each respective part of this Standard.*

   i. *Provide an evaluation of the model changes associated with incorporating mitigating strategies, which demonstrates that none of the following criteria is satisfied: (1) use of new methodology, (2) change in scope that impacts the significant accident sequences or the significant accident progression sequences, (3) change in capability that impacts the significant accident sequences or the significant accident progression sequences;*

   *OR*

   ii. *Propose a mechanism to ensure that a focused-scope peer review is performed on the model changes associated with incorporating mitigating strategies, and associated Fact and Observations (F&Os) are resolved to meet Capability Category II prior to implementation of the 10 CFR 50.69 categorization program. An example would be a table of listed implementation items referenced in a license condition.*

**DENC Response to RAI 04a**

FLEX strategies have been credited in the MPS2 PRA model. The FLEX strategies model the as-built, as-operated response to an internal events Station Blackout scenario. Consequently, not incorporating this mitigation strategy into the PRA model would deviate from the ASME PRA Standard.

**DENC Response to RAI 04b.i**

The FLEX strategies at MPS2 are credited to prevent core damage during Station Blackout events in the internal events and internal flooding models. The modeling of the FLEX strategies for MPS2 consists of a simplified logic structure which combines the modeled FLEX strategies under one top gate, U2-FLEX.

The first modeled FLEX strategy involves maintaining availability of vital instrumentation, which includes load shedding the DC buses thereby extending vital instrumentation for greater than 24 hours. The second modeled FLEX strategy involves manually controlling Turbine Driven Auxiliary Feedwater (TDAFW) pump flow after DC power is shed and incorporates existing logic for long term cooling via the TDAFW pump. The third modeled FLEX strategy involves providing alternate sources to replenish the Condensate Storage Tank (CST) by aligning one of the two portable Beyond Design Basis (BDB) transfer pumps (one pre-staged in the Turbine Building, the other in the BDB Storage Dome), as well as the associated hoses and fittings. The last modeled strategy is the refueling of the portable BDB diesel transfer pump.

**DENC Response to RAI 04b.ii**

The credited portable equipment in the FLEX strategies are the two portable transfer pumps used to provide makeup supply to the CST. The failure to start and failure to run data, as well as common cause failures were developed using the generic NUREG/CR-6928 values for a diesel driven pump multiplied by a factor of 5. The factor of 5 is a reasonable increase to compare the difference between mobile equipment and permanently installed equipment. The equipment failure data will be considered as a source of uncertainty. A sensitivity will be performed per NEI 00-04 to increase the component common cause events to their 5th and 95th percentile values as part of the required 50.69 PRA categorization sensitivity cases. Additionally, a sensitivity study will be performed on the independent FLEX failures using the 5th and 95th percentile values.

**DENC Response to RAI 04b.iii.1**

FLEX-related operator actions credited in the internal events model were evaluated per ASME/ANS RA-Sa-2009 PRA standard supporting criterion HR-G3. The EPRI HRA Calculator was used to quantify the events; explicitly addressing all performance shaping factors (PSFs) identified in HR-G3. The specific consideration of these PSFs for each operator action is documented in the MPS2 PRA model documentation. This methodology was peer reviewed in March 2018 and no findings were identified.

**DENC Response to RAI 04b.iii.2**

An analysis, performed in accordance with HR-A1 and HR-B1 of the ASME/ANS RA-Sa-2009 PRA standard, was conducted to determine if modeling pre-initiator human failure events (HFEs) associated with the MPS2 FLEX is warranted. The analysis concluded that no pre-initiators were required to be added to the PRA model.

**DENC Response to RAI 04b.iii.3**

In a loss of offsite power (LOOP) event with the failure of the permanently installed emergency diesel generators and alternate AC sources, the operators initiate EOP 2530, Station Blackout. At step 17, the operators determine if emergency power can be restored within 60 minutes and are directed to make the call within 45 minutes of the event. The procedure steps are explicit.

**DENC Response to RAI 04c.i/ii**

Dominion evaluated the inclusion of FLEX modeling and concluded that it was an upgrade. A focus scope peer review was conducted in March 2018. The peer review concluded that the FLEX modeling met Capability Category II with no findings.

**RAI 05 – Identification of Key Assumptions and Sources of Uncertainty**

*Section 3.2.7 of the LAR states that, "the detailed process of identifying, characterizing and qualitative screening of model uncertainties is found in Section 7.2 of NUREG-1855 and Section 3.1.1 of EPRI TR- 1016737." In addition, Section 3.2.7 states that "the list of assumptions and sources of uncertainty were reviewed to identify those which would be significant for the evaluation of this application."*

a. *Describe the approach used to initially define, identify and characterize the "significant" assumptions and sources of uncertainty for this application.*

b. *Section 3.2.7 of the LAR states that for any "non-conservative treatment, or methods that are not commonly accepted, the underlying assumption or source of uncertainty was reviewed to determine its impact on this application." Another guideline for additional evaluation in RG 1.200 is if there are different reasonable alternative assumptions. Provide a discussion about the additional evaluation applied to assumptions or uncertainties in any of these three categories.*

c. *Presumably some assumptions and sources of uncertainty required more evaluation than other assumptions and sources of uncertainty to determine whether they were "key" or not. Insofar as not discussed under a. or b. above,*

*provide some discussions and examples illustrating the range of evaluations performed, including a summary of any sensitivity studies performed.*

**DENC Response to RAI 05a**

"Significant" assumptions and sources of uncertainty are synonymous with "key" assumptions and sources of uncertainty as defined by U.S. Regulatory Guide 1.200 Revision 2, which specifically notes:

> "A key assumption is one that is made in response to a key source of model uncertainty in the knowledge that a different reasonable alternative assumption would produce different results, or an assumption that results in an approximation made for modeling convenience in the knowledge that a more detailed model would produce different results. For the base PRA, the term "different results" refers to a change in the risk profile (e.g., total CDF and total LERF, the set of initiating events and accident sequences that contribute most to CDF and to LERF) and the associated changes in insights derived from the changes in the risk profile. A "reasonable alternative" assumption is one that has broad acceptance within the technical community and for which the technical basis for consideration is at least as sound as that of the assumption being challenged.
>
> A key source of uncertainty is one that is related to an issue in which there is no consensus approach or model and where the choice of approach or model is known to have an impact on the risk profile (e.g., total CDF and total LERF, the set of initiating events and accident sequences that contribute most to CDF and to LERF) such that it influences a decision being made using the PRA. Such an impact might occur, for example, by introducing a new functional accident sequence or a change to the overall CDF or LERF estimates significant enough to affect insights gained from the PRA."

Each PRA notebook was reviewed for identified assumptions and sources of uncertainties. The characterization of assumptions and sources of uncertainties are based on whether the assumption and/or source of uncertainty is key to the 50.69 risk-informed application.

**DENC Response to RAI 05b**

The terms "non-conservative treatment" and "methods that are not commonly accepted" are used to support categorization of assumptions and sources of uncertainties. The identification of key assumptions and sources of uncertainty is based on the U.S. Regulatory Guide 1.200 Revision 2 definition.

**DENC Response to RAI 05c**

The following table provides randomly selected examples of assumptions and sources of uncertainty that required more evaluation than other assumptions and sources of uncertainty to determine whether they were "key" or not. Note, these examples are directly extracted from the PRA notebook with only slight changes to address referencing issues and whether the example is key to the 50.69 risk-informed application.

There are sensitivity studies for key assumptions and sources of uncertainty as identified in the MPS2 50.69 LAR.

| **PRA Notebook Examples of Assumptions and Sources of Uncertainty** | **Disposition of Key To 50.69 Risk-Informed Application** |
|---|---|
| QU.4 - *Model Assumptions and Uncertainties*<br>12. Containment sump / strainer performance (Ref. EPRI-1016737 Table A-1)<br><br>All PWRs are improving ECCS sump management practices, including installation of new sump strainers at most plants. There is not a consistent method for the treatment of ECCS sump performance.<br><br>Containment Sump/Strainer Performance:<br><br>MPS2 currently models plugging of sump strainers based on data from the mid-1990s. Other Dominion models used data based on WCAP-16882, Rev 1, "PRA Modeling of Debris-Induced Failure of Long Term Core Cooling via Recirculation Sumps," Westinghouse Electric Co. Nov 2009. | The modeling is slightly non-conservative and is therefore considered a source of uncertainty. A sensitivity study will be performed using recent sump plug/blockage data.<br><br>This assumption/source of uncertainty is **key** to the 50.69 risk-informed application. |
| DOM-DA.1 - *Data Analysis – Generic Database and Component Boundaries*<br>3. Prior generic data parameters are based on conservative component event screenings and data-subset selection (Ref. NUREG/CR-6928). Performing Bayesian updating helps remove conservatism found in the industry data and provides a more accurate estimation (Ref. EPRI TR-3002000774 "EPRI Guidelines for PRA Data Analysis"). | This assumption is a consensus model assumption and is not considered a source of uncertainty.<br><br>No sensitivity study was required.<br><br>This assumption/source of uncertainty is **not key** to the 50.69 risk-informed application. |

| PRA Notebook Examples of Assumptions and Sources of Uncertainty | Disposition of Key To 50.69 Risk-Informed Application |
|---|---|
| MPS2-IF.2 - *Flood Scenario Development*<br>For the purposes of this analysis and SR IFSN-A4, like the zero drain capacity assumption above (prior assumption in MPS-IF.2 notebook), the sump volumes are not calculated and are also estimated to have a capacity of zero; additionally, the sump pumps are assumed to not run. Like the above zero drain capacity conservatism, sumps follow the same premise that by having a zero sump pump capacity, the critical flood height of SCCs is reached sooner than if a sump's volume and pumping of a sump are included as part of the flood scenario. Since the volume of the sump is not included in the calculation of the height of water in the room, water level in the room will rise faster than it would otherwise. Since there will be less time to reach the CFH, there is less time to terminate the flood before the CFH is reached. For very large flows from floods and major floods into a room, the sumps are insignificant and would have little impact on the time to reach CFH. For small flows from small floods and propagations, the sumps may have an impact on the rate of rise of the flood water (and if the flow into the room is small enough, all the water entering the room could be removed by the sump) and is considered a conservative source of uncertainty. Since sump water removal was estimated to be zero for the MPS2 flood analysis, the CFH for equipment for smaller flood flow rates may be reached sooner which may result in some higher value flooding cutsets in the MPS2 PRA. This assumption is applied to all scenarios unless noted otherwise. | Assumption made based on level of detail, e.g.- modeling simplification<br><br>No sensitivity study was required.<br><br>This assumption/source of uncertainty is **not key** to the 50.69 risk-informed application. |
| SC.1 - *Success Criteria Analysis*<br>All successful sequences are carried to the point where stable hot shutdown conditions exist or stable long term cooling conditions exist. In general, sequences are terminated at 24 hours, given that there is sufficient basis for having achieved a stable condition by that time. The low decay heat levels at that time allow extended recovery times for failed equipment or other corrective actions. There are some scenarios where a mission time other than 24 hours is considered for mitigating systems. These variations in mission time are discussed in Table 2 of the systems analysis SY.2 notebook for assumptions and success criteria. | The success criteria are consistent with those used for other similar plants. This assumption is not expected to have any significant impact on CDF or LERF results.<br><br>No sensitivity study was required.<br><br>This assumption/source of uncertainty is **not key** to the 50.69 risk-informed application. |

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| SY.2 - System Analysis Assumptions and System Success Criteria<br>It is assumed that if both MSIVs fail to close following a Steamline Break downstream of the NRVs, AFW fails. Following a failure to close the MSIV associated with SG #1, operators are directed to isolate the AFW flow to SG #1 by closing 2-FW-43A. If flow cannot be isolated, they are assumed to close crosstie valve 2-FW-44, and both MDAFW pumps are stopped. Thus, only the Terry Turbine is available for steam generator cooling, supplying only SG #2. Following a failure to close the MSIV associated with SG #2, operators are directed to isolate the AFW flow to SG #2 by closing 2-FW-43B. If flow cannot be isolated, they are assumed to close crosstie valve 2-FW-44, and the Terry Turbine is stopped. Thus, only the MDAFW pumps are available for steam generator cooling, supplying only SG #1. | Assumption is based on plant-specific design and response or on actual plant operating practices<br><br>No sensitivity study was required.<br><br>This assumption/source of uncertainty is **not key** to the 50.69 risk-informed application. |