10 CFR 50.55a

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

August 24, 2017

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 17-079B
NRA/DEA R0
Docket Nos. 50-338/339
License Nos. NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
PROPOSED ISI ALTERNATIVES N1-14-NDE-010 AND N2-14-NDE-005
REACTOR PRESSURE VESSEL NOZZLE WELD INSPECTIONS
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
(CAC NOS. MF9534 AND MF9535)

By letter dated March 27, 2017, Virginia Electric and Power Company (Dominion Energy Virginia) submitted proposed inservice inspection (ISI) alternatives N1-I4-NDE-010 and N2-I4-NDE-005 for North Anna Power Station (NAPS) Units 1 and 2, respectively [ADAMS Accession No. 17090A429]. The proposed alternatives would extend the interval for reactor vessel nozzle welds, Category B-F pressure retaining welds, from 10 years to 20 years in accordance with WCAP-17236-NP-A, Revision 0, Risk-Informed Extension of the Reactor Vessel Nozzle Inservice Inspection Interval. Dominion Energy Virginia requested approval of the proposed alternatives by March 1, 2018.

In a May 22, 2017 teleconference, the NRC requested information regarding the technical adequacy of the PRA Model used to prepare proposed ISI alternatives N1-I4-NDE-010 and N2-I4-NDE-005 be submitted to support review and approval of the proposed Reactor Vessel Nozzle Weld Examinations Extensions. In a letter dated June 5, 2017, Dominion Energy Virginia provided the requested information with a table of Supporting Requirements that were not met for Capability Category II during the North Anna Power Station (NAPS) 2013 Full Peer Review and a table of Findings from the NAPS 2013 Full Peer Review.

In an email dated July 21, 2017, the Nuclear Regulatory Commission (NRC) transmitted a request for additional information (RAI) related to ISI alternatives N1-I4-NDE-010 and N2-I4-NDE-005. The response to the RAI is provided in Attachment 1.

If you have any questions, please contact Ms. Diane Aitken at (804) 273-2694.

Sincerely,

Mark Sartain
Vice President Nuclear Engineering and Fleet Support

Commitments made in this letter: None

A047
NRR

Attachment

1. Response to RAI-APLB 1 for NAPS 1 and 2 RV Nozzle Weld Examinations Extensions

cc: U.S. Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Avenue, NE Suite 1200
Atlanta, GA 30303-1257

Mr. J. E. Reasor, Jr.
Old Dominion Electric Cooperative
Innsbrook Corporate Center
4201 Dominion Blvd.
Suite 300
Glen Allen, Virginia 23060

NRC Senior Resident Inspector
North Anna Power Station

Mr. James R. Hall
NRC Senior Project Manager-North Anna
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop O-8 G9A
11555 Rockville Pike
Rockville, Maryland 20852-2738

Ms. K. R. Cotton-Gross
NRC Project Manager-Surry
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop O-8 G9A
11555 Rockville Pike
Rockville, Maryland 20852

ATTACHMENT 1

RESPONSE TO RAI RAI-APLB 1 FOR NAPS 1 AND 2 RV NOZZLE WELD EXAMINATIONS EXTENSIONS

VIRGINIA ELECTRIC AND POWER COMPANY
(DOMINION ENERGY VIRGINIA)

NORTH ANNA POWER STATION UNITS 1 AND 2

By letter dated March 27, 2017, Virginia Electric and Power Company (Dominion Energy Virginia) submitted proposed in-service inspection (ISI) alternatives N1-I4-NDE-010 and N2-I4-NDE-005 for North Anna Power Station (NAPS) Units 1 and 2, respectively [ADAMS Accession No. 17090A429]. The proposed alternatives would extend the interval for reactor vessel nozzle welds, Category B-F pressure retaining welds, from 10 years to 20 years in accordance with WCAP-17236-NP-A, Revision 0, "Risk-Informed Extension of the Reactor Vessel Nozzle Inservice Inspection Interval." In an email dated July 21, 2017, the Nuclear Regulatory Commission (NRC) transmitted a request for additional information (RAI) related to ISI alternatives N1-I4-NDE-010 and N2-I4-NDE-005. This attachment provides Dominion Energy Virginia's response to the RAI.

RAI-APLB1

Section 4, "Limitations and Conditions for Acceptance," of TR WCAP-17236-NP-A specifies conditions and limitations that must be addressed by licensees proposing to use its methodology to justify extension of the ISI interval from 10 to 20 years for the ASME Code, Section XI, Category B-F, and B-J RPV nozzle welds that do not contain Alloy 82/182 material.

The third bullet on page 4-3 of the TR requires licensees to address probabilistic risk assessment (PRA) quality in their relief request. The licensee's supplement dated June 5, 2017, provided some of the information needed to address PRA quality for the purposes of the proposed ISI alternatives N1-14-NDE-010 and N2-14-NDE-005. Based on the information provided, it appears that PRA quality is being demonstrated without relying on the previously approved RI-ISI program, because a more current full-scope peer review is available. However, the information provided was insufficient to determine whether the PRA quality requirements were met.

Please clarify which method is proposed for demonstrating PRA quality and provide the necessary additional information as indicated. Either approach (a or b) may be used to demonstrate PRA quality.

a) If Dominion elects to rely on the approved RI-ISI program to demonstrate PRA quality:

   Please provide any updated information appropriate for the application since the approved RI-ISI application.

b) Alternatively, Dominion may describe the technical adequacy of the PRA used in the relief request, by addressing the following questions:

i. Provide additional information on the resolution of the peer review findings in light of this application by:
   1. Specifying how each finding was resolved for those findings which were not documentation-only issues (summarize the changes that were made to address the finding), or

   2. Comparing the peer review results to the acceptance criteria established in Electric Power Research Institute (EPRI) Report 1021467, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs," (ADAMS Accession No. ML 12171A450), as modified by the limitations and conditions of the associated NRC Safety Evaluation (ADAMS Accession No. ML 11262A206). Indicate how the peer review findings were resolved if they were not documentation-only issues.

Indicate whether any updates, other than those described in the response to (i) above, were made to the PRA which are relevant to this application since the peer review described in the supplemental submittal dated June 5, 2017.

Response to RAI-APLB 1

Dominion Energy has elected to use approach (b) described above to demonstrate the technical adequacy of the PRA used to support proposed ISI alternatives N1-I4-NDE-010 and N2-I4-NDE-005 for NAPS Units 1 and 2 because the PRA model has been revised and peer reviewed since approval of the RI-ISI program.

A description of the resolution for each peer review finding is provided in Table i.1 below:

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
AS-A10-01	Discussion of the transient initiating event group does not clearly describe the impact of loss of condenser vacuum which affects steam dump capability and operability of main feed water and the spurious Safety Injection (SI) event which could challenge the Power-Operated Relief Valve (PORV). Loss of condenser vacuum is not explicitly modeled and is treated as a transient with main feedwater (MFW), which affect steam dump capability and main feedwater. Spurious SI event increases Reactor Coolant System (RCS) pressure and subsequently open a PORV when operator fails to terminate the SI. Basis for Significance: General transient event tree logic should capture the differences.	All of the events identified by the peer reviewer have been reviewed. A loss of condenser vacuum resulting in a loss of main feedwater is not a vulnerability at NAPS since the CST will provide water makeup to main feedwater through the condenser hotwell. The impact of loss of condenser cooling on operability of the steam dump valves was addressed in the NAPS-R07c model logic. A review of the spurious SI logic was performed as part of the NAPS-R07d model update and found the modeling to be appropriate without additional modifications.	None. This issue has been resolved.
AS-B6-01	No discussion could be identified in the Accident Sequence (AS) calculation and supporting information with respect to plant configurations and maintenance practices creating dependencies among various system alignments. Basis for Significance: System alignments could have an impact on the risk profile if unique plant configurations or maintenance practices are used.	Unresolved.	A review was performed to evaluate coincident maintenance that would include identification of dependencies among plant alignments or component unavailabilities. No such dependencies were identified.
AS-C1-01	Accident sequence analysis is a key element of PRA to integrate many other elements of PRA, but accident sequence notebook needs to improve for further application and update. For instance operator actions are generally described without specific governing procedures and basic event name modeled in Human Reliability Analysis (HRA). Observations in AS-C2 provide more specific examples. Observations in AS-C1-02 and AS-C2-01 and 02 provide more specific examples. Basis for Significance: This would facilitate emergent risk informed applications using documents with better traceability.	Unresolved.	This is a documentation issue. A documentation enhancement that would facilitate emergent risk informed applications will not significantly impact the quantifications performed to support this application.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
AS-C2-01	1. Inconsistent documentation for mitigation tops with designators (e.g., -LATE, -EARLY, etc.). Additionally, some of the mitigation top discussions are inappropriate for the initiator being discussed OR the cross reference to the applicable mitigation top discussion is invalid. For example, for the LOOP initiator, the BAF mitigation top discusses the failure of MFW, even though MFW is not used in the LOOP event tree. 2. Accident sequence notebook does not include a description of the accident progression for each sequence or group of similar sequences. 3. Operator action is described in the accident sequence notebook, but there is limited timing information and no link with HRA information. Basis for Significance: This would improve traceability of accident sequence model and facilitate further risk informed applications.	Unresolved.	This is a documentation issue. Increased gate name consistency and the improvement of traceability between an accident sequence analysis and HRA analysis will not impact the quantifications performed to support this application.
DA-B2-01	Outliers with zero demands are included in groups with frequently-tested components.	This PRACC item was addressed in the NAPS-R07d interim model update. Outliers with 0 demands were removed from type codes that contained large numbers of demands. New Type Codes were created for these outliers and the associated Basic Events (BEs) were updated.	None. This issue has been resolved.
DA-C14-01	Coincident maintenance events for intersystem events have not been looked at. Need to evaluate historical maintenance schedules to detect patterns of typical maintenance combinations and then add these identified coincident maintenance events to the model. Basis for Significance: These events could have an impact on the annual risk results. Some plants have experienced a significant impact to their results from including such events in the model.	This PRACC item was addressed in the NAPS-R07d interim model update. The evaluation of coincident maintenance events for intersystem events was addressed by enhancing the component unavailability analysis by including the analysis of scheduled maintenance to detect patterns of typical component combinations.	None. This issue has been resolved.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
DA-D8-01	No discussion of evaluation of the impact of plant modifications on the data could be found in any of the below: -Guidance Documents on Data (2061, 2063) -Data Calculation and Supporting Analyses - SY.3 System Notebooks Therefore this SR is considered to be Not Met. Basis for Significance: This item could change the results from the PRA.	The Dominion Energy PRA Configuration Control procedure has been revised to clarify the requirements for reviewing design changes. The current PRA Configuration Control procedure requires a quarterly review to be performed on all implemented design changes to evaluate any potential impact to the PRA, including an impact on data. A review of this finding was performed as part of the NAPS-R07d interim model update. To address the finding, a new section on Data Collection and Component Failures was added to the Data Analysis documentation which includes additional details on how Dominion PRA evaluates and addresses plant modifications for impact to data.	None. This issue has been resolved.
DA-D8-02	No discussion of evaluation of the impact of plant modifications could be found in any of the below: -Guidance Documents on Data (2061, 2063) -Data Calculation and Supporting Analyses -System Notebooks Basis for Significance: Data could be impacted by a plant mod and effect risk results.	See Dominion Resolution for F&O DA-D8-01.	None. This issue has been resolved.
HR-D3-01	The additional NRC notes add a requirement for adherence to NUREG-0700, Human-System Interface Design Review Guidelines. The basis for stating that no cases were identified where the quality is lacking needs to reference NUREG-0700 as the process for validating the quality of the man-machine interface. Basis for Significance: Additional NRC requirement to go from Cat. I to Cat. II.	Unresolved.	This is a documentation issue. The North Anna PRA uses the HRA Calculator software which adheres to the guidelines of NUREG-0700. Clarification to the basis of adherence to NUREG-0700 will not impact the quantification of LOCA sequences which was performed to support this application.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
HR-G2-01	Dependency not assessed for recoveries credited in post-initiators using the CBDTM HRA methodology. Basis for Significance: Potential to underestimate human error probabilities.	This PRACC item was addressed in the NAPS-R07d interim model update. In the NAPS-R07d interim model update, action was taken to update post-initiator Human Failure Events (HFEs) to include the appropriate dependency level for the CBDTM method in the HRA Calculator. Action was also taken to address dependency factors that were not previously assessed for recoveries credited in post-initiators using CBDTM method.	None. This issue has been resolved.
HR-G3-01	Cat. II requires an evaluation of the quality of operator training on the HFE of interest, including whether the training is classroom training or simulator training and the frequency of such training. The frequency field in the HRA Calculator was not filled out for the NAPS post-initiator HFEs. Basis for Significance: Provides documentation for the quality of operator training for the HFE of interest.	Unresolved.	This is a documentation issue. The documentation of quality of operator training for HFEs will not significantly impact the quantification of LOCA sequences which was performed to support this application.
HR-G6-01	HR-G6 requires a check of the consistency of the post-initiator HEP quantifications. The instructions are to review the HFEs and their final HEPs relative to each other to check their reasonableness given the scenario context, plant history, procedures, operational practices, and experience. HR.2 states that an operator survey, which collects operator response times, was performed to meet this requirement. However, the surveys do not really check the consistency of the HEP quantifications. Basis for Significance: Confirm that quantifications are reasonable.	Unresolved.	This is a documentation issue. An additional survey to review HEP consistency will not significantly impact the quantification of LOCA sequences which was performed to support this application.
HR-G7-01	There were some cases of unanalyzed dependency combinations found in the cutsets of cutset file U1-CDF-Avg Maintenance-R07.cut. Examples include cutsets 3119, 22480, 22642, 22643, 22868, 23050. The applicable truncation limits used in the dependency analysis need to be adjusted to eliminate unanalyzed combos in the cutsets. Basis for Significance: Some cutsets may have higher failure probabilities than presently quantified.	This PRACC item was addressed in the NAPS-R07d interim model update. For this interim model update, the cutsets were reviewed to identify cutsets with multiple HEPs to determine the level dependency and add new joint HEPs as needed.	None. This issue has been resolved.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
HR-I3-01	NAPS HR.1, HR.2, HR.3 section 2.3 and HR.4 section 5 addresses assumptions and uncertainties. The only source of model uncertainty listed is lack of ERO credit which in reality can be accounted for using the recoveries available in the HRA calculator. NUREG/CR-1278 lists sources of uncertainty which could be referenced. Basis for Significance: Need better documentation of sources of uncertainty.	Unresolved.	This is a documentation issue. The documentation of additional sources of uncertainty will not significantly impact the quantification of LOCA sequences which was performed to support this application.
IE-A6-01	Common cause and routine system alignments are generally appropriately considered for complicated safety system initiating event fault trees. However, for other systems (notably, electrical systems) there is no discussion or evidence of a review for initiators either due to common cause of electrical systems or due to routine system alignments. GARD NF-AA-PRA-101-204C identifies that transformers, battery chargers, and inverters are candidates for common cause. These common cause failures are modeled in the core damage mitigation fault trees. However, these common cause failures are not considered as initiating events, particularly for RSST 4KV transformers, vital inverters, and 125VDC battery chargers. Also, for example, unavailability of a backup battery charger may drive a plant shutdown given loss of the normally operating charger. In addition, could not find a discussion of why common cause blockage of service water travelling screens was not considered. Basis for Significance: IE-A6 CAT II requires a systematic evaluation of initiating events, including events resulting from multiple failures resulting from common cause or from routine system alignments. Notebook IE.1 says that due to the independency of busses, the loss of more than one bus at a time is assessed as negligible frequency, however this statement does not consider common cause. No evidence of a systematic evaluation is evident.	A review of the issues identified in this finding was performed as part of the NAPS-R07d interim model update. The EP fault trees were revised to incorporate a number of additional initiating events, including loss of RSST common cause, loss of inverter power to SOV panels, and loss of battery charger power to the DC buses. The logic for the modeling of loss of SW was also reviewed. The PRA model includes single and common cause failures of the traveling screens in the SSIE model. The plant typically operates with 1 of 2 SW pumps supplying each SW header, so the SSIE model includes failures of the traveling water screens on operating pumps. The SSIE logic also accounts for the need for the standby components to start if a running component fails. The review of the SW SSIE logic concluded that the logic is appropriate based on system design and operation.	None. This issue has been resolved.
IE-C1-01	Plant specific-only data is used for some initiating events. The Spurious SI initiating event has only one failure, but there is no justification for not incorporating generic data. Basis for Significance: Initiating event SPUR-SIS uses plant-specific data, but no justification is made that there is adequate plant-specific data to characterize the parameters.	Unresolved.	The application only quantified loss of coolant accident (LOCA) sequences. There is no impact to the application from findings related to non-LOCA initiating events.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
IE-C3-01	Many recovery actions are credited in the Supporting System Initiating Event (SSIE) fault trees. No discussion or analysis was found to justify these credits. Basis for Significance: SR IE-C3 requires justification for credited recoveries in initiating events. These recoveries are also used in the post-initiating event mitigation tree.	Unresolved.	The application only quantified LOCA sequences. There is no impact to the application from findings related to non-LOCA initiating events.
IFPP-B1-01	It is suggested to add an overall site layout drawing into the IF.1A notebook with the other individual building level layout drawings to aid in reader understanding of the buildings' relationships to each other and a table of such buildings and their disposition in the flooding study (i.e. include/retain, screened, etc.) prior to or in conjunction with the Appendix R information being used as a flooding study input. Basis for Significance: Deemed a finding for document enhancement due to the inability to perform as detailed a review as could be possible given documentation updates. The flooding notebooks seem to present the results more so than the starting point through the endpoint with some discussion given in Section 2.1 of the IF.1A notebook related to using Appendix R information and the overall process.	Unresolved.	This is a documentation issue. The quantification performed to support this application only included LOCA sequences, so there is no impact to the application from this internal flooding finding.
IFPP-B3-01	No discussion is given in the various internal flooding notebooks with regard to the plant partitioning process or conclusions as what sources of uncertainty may be present or may have been introduced as part of the partitioning task. Assumptions are given in Section 2.3 of the IF.1B notebook related to flood area definitions, though no discussion of their potential impacts to the analysis are given. Sources of uncertainty related to the flooding initiating events pipe mode are included in Section 6.0 of the IF.2 notebook and repeated in Section 2.0 of the QU.4 notebook (with no other internal flooding related uncertainties added in this QU.4 notebook) while Section 5.0 of the IF.3 notebook indicates that sensitivities related to internal flooding are contained in the QU notebooks, though only sensitivity cases related to HEP and CCF values were noted which contained the overall internal flooding events in the sensitivity case model quantifications. Basis for Significance: The SR was deemed 'not met' thus a finding level is appropriate.	Unresolved.	The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
IFQU-A6-01	While the flooding-specific HFEs are developed with detailed assessments, several of the noted items in the SR were not accounted for. Items noted from review of SR IFQU-A6: (b) The impact of the flooding on cues that the control room uses for a non-flooding HFEs is not discussed in the supporting spreadsheet of the internal flooding HRA notebook for internal events HFEs used in the flooding analysis. (a) The impact of the flooding on additional workload and stress in the control room for a non-flooding HFEs is not discussed in the supporting spreadsheet of the internal flooding HRA notebook for internal events HFEs used in the flooding analysis. In addition, the stress levels for the flooding-specific events were evaluated at low stress levels, which is inconsistent with the intent of the SR. In addition, there appears to be inconsistent timings for the HEPs defined between the HRA calculator inputs and the NOTEBK-PRA-NAPS-IF.2 for time to perform the action (which is usually 1 minute less than the time to damage) being noted in the NOTEBK-PRA-NAPS-IF.2 notebook and the time to damage being used in the HRA calculator. This slight difference is not expected to cause significant changes, but should be reviewed for consistency and updated as needed. Basis for Significance: The SR was deemed 'not met' thus the level of finding is appropriate.	Unresolved.	The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.
IFQU-A9-01	One internal flooding source system, firewater, was noted as not always failed when its piping is the flooding source. Credit of the alternate pump cooling from firewater is still possible under flooding initiating events from firewater piping. Basis for Significance: Revision of the PRA model is required, thus a level of finding is deemed appropriate.	Unresolved.	The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
IFQU-B1-01	Several internal flooding HRA documentation inconsistencies were noted during review. Examples include: -the HRA notebook NOTEBK-PRA-NAPS-HR.10 and the internal flooding notebook NOTEBK-PRA-NAPS-IF.2 do not list the same set of flooding-specific HFEs -all of the HFEs listed in the HRA notebook NOTEBK-PRA-NAPS-HR.10 do not appear in the PRA model, event REC-FLD-ABSWLL appears as a flag event -the internal flooding notebook NOTEBK-PRA-NAPS-IF.2 presents HFE HEP-ISO-TBSWLL which is not contained in the HRA calculator which does contain event REC-FLD-TBSWLL, however, neither event appears in the PRA model. Basis for Significance: Information is needed in the flooding/HRA notebooks, thus a finding rather than a small item that would warrant a suggestion.	Unresolved.	This is a documentation issue. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.
IFSN-A5-01	The critical height of all PRA-related SSCs is not given in an easy to identify single location such as the table listing of PRA-related Systems, Structures, and Components (SSCs) within the various internal flood areas. In addition, the critical height is not always defined in the other sections of the internal flooding notebooks such as walkdowns or area scenario discussions, only for the end-state important SSCs. Basis for Significance: SR requires spatial location of SSCs which was not consistently done.	Unresolved.	The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.
IFSN-A8-01	Assumptions of doors failing without allowing water accumulation may be a beneficial failure for the flood room/area where the accumulation would not occur due to the assumption of the door failing open immediately. Basis for Significance: Potential non-conservatism without significant analysis to ensure treatment is okay.	Unresolved.	The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
IFSN-B2-02	The included pipe break flow rates do not always include a calculation for the full diameter break size, and in addition, there is no consideration of pump run out flow rate comparison to the calculated break flow rate in the various internal flooding notebooks. Also, the flooding flow rate used to determine the consequential impacts for each flooding area should be listed in the area scenario discussions. Basis for Significance: Information is needed in the flooding notebooks, thus a finding rather than a small item that would warrant a suggestion.	Unresolved.	The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.
IFSO-A4-01	Inadvertent actuation of fire protection system outside of Aux Building not modeled or screened. Inadvertent actuation of fire protection system inside of Aux Building not discussed. Basis for Significance: SR specifically calls for inadvertent actuation to be considered.	Unresolved.	The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.
IFSO-A5-01	The capacities of various sources are limited by an assumption that all flood isolations could be performed within 60 minutes. No basis is given for this assumption, and the potential of all scenarios using a purely assumptive basis for such inherent screening of potential impacts should also model non-isolated scenarios for the same pipe break source. Also, the treatment is inconsistent with an IF HFE that is evaluated past 60 minutes. This F&O applies to the following SRs: IFSO-B1, IFQU-A6, IFQU-A5, IFSN-A9, IFSN-A15, IFSN-A16, IFSN-A10, IFSN-A14, and IFSN-B2. Basis for Significance: This assumption greatly impacts the risk from internal floods. REC-FLD-IRR has available time of 84 minutes, yet still analyzed for failure probability.	Unresolved.	The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.
IFSO-B3-01	There is no uncertainty analysis related to flood sources. Basis for Significance: Missing uncertainty analysis. SR unmet.	Unresolved.	This is a documentation issue. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding finding.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
LE-G1-01	There is no adequate roadmap that facilitates peer review of the Level 2/LERF documentation. This is exacerbated by the significant reliance on historical documents going back to the original IPE report. Basis for Significance: There are several dated self-assessment documents. For LE, about 1/3 of the SRs do not have any discussion of how the SR is met and where the documentation can be found. Moreover, because of the conversion of the Volume numbers (e.g. LE.2 to LE.1), there is additional confusion added for LE. Many of the referenced sections in the self-assessment (e.g., Section 5.4.1 of LE.1 (old LE.2)) appear to no longer exist. Finally, unlike the other technical elements that have completely revised the analysis, the Level 2 relies significantly on historical documents including the 20 year old IPE, SM-1243 and SM-1464.	Unresolved.	This is a documentation issue. Development of a peer review SR road map will not impact the quantifications performed to support this application.
QU-B5-01	Section 3.2 of fleet wide PRA procedure NF-AA-PRA-28 describes method to break the circular logic appropriately and table 3 in SY.2 attachment lists circular logic break gates, but further review of the logic indicates the circular logic is not handled properly. A Gate 2-EP-CB-12A-LC "NO ELECTRIC POWER 125 V DC BUS 2-I (U2 ESGR) (CIRC LOGIC BREAK)" is modeled under EDG 2H. The 125V DC power supply with circular logic break is supplied power only from the battery under LOOP condition which is required by the EDG. However the battery power is ANDed with battery charger failures as below: 2-EP-CB-12A-PS-LC AND 2-BY-BC-2-I-FAIL 2-BY-BC-2C-I-FAIL 2-BY-B-2-I Basis for Significance: Improper breaking of circular logics would result in improper accident sequence evaluation.	This PRACC item was addressed in the NAPS-R07c interim model update. Analyzed all circular logic breaks for consistency with standard logic gates, and modified fault trees as needed to improve consistency.	None. This issue has been resolved.
QU-B8-01	NAPS PRA developed logic to eliminate mutually exclusive situations to correct cutsets containing mutually exclusive events. However a mutually exclusive logic "U1-EVENTS-NO-AUTO-PRZ-PRES-NX" may delete LOSC sequence because the logic produces U12-LOSS-SW-EVENTS*LOSCS combination. This logic seems to delete LOSCS logic associated with total loss of SW event which results in loss of RCP seal cooling and injection. Basis for Significance: Incorrect mutually exclusive logic deletion may result in improper accident sequence evaluation.	This PRACC item was addressed in the NAPS-R07c interim model update. Verified that new cutsets generated when the applicable mutually exclusive (MUTX) gates were removed were valid. These MUTX gates were then permanently removed from the model to remove any potential non-conservatism.	None. This issue has been resolved.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
QU-F5-01	Quantification code limitations are stated as being contained in the user manuals to the various software codes and there is no discussion provided in the .NOTEBK-PRA-NAPS-QU.1 or QU.2 notebooks. Basis for Significance: Finding based on need for actual information in the notebook(s).	Unresolved.	This is a documentation issue. The inclusion of specific software limitations in Dominion Energy PRA Documentation will not impact the quantifications performed to support this application.
SC-B1-01	The large break LOCA success criterion used in the PRA appears to be inconsistent with the Chapter 14 UFSAR analysis. Basis for Significance: For large LOCA, NAPS SC.1 R 3, Section 5.2.2, Table 5.2-2 shows for the injection phase that 2/2 accumulators on intact loops and 1 of 2 LHSI pumps are needed. The basis is stated to be the UFSAR. However, the large break LOCA analysis in Chapter 14/15 of the UFSAR is based on the most limiting single failure, typically, an emergency diesel generator. The UFSAR thus may credit charging flow (of the order of 650 gpm). Therefore, the success criterion that is assumed in the PRA may be a smaller set of equipment than the analysis on which it is supposedly based, without justification for excluding the charging pump.	This PRACC item was addressed in the NAPS-R07d interim model update. The Large LOCA modeling was revised to explicitly require High Pressure Injection to successfully mitigate the accident and prevent core damage.	None. This issue has been resolved.
SY-A14-01	There was no evidence that plugging of manual valves was considered for instances where an exposure time is valid. For example, if a manual valve is normally open in a standby train, it is susceptible to plugging over an exposure time between system alignment rotations (could be every 2 weeks). Applying an exposure to the manual valve plugging failure data may result in a failure probability higher than check valve fails closed failure probability (which is currently modeled). This could be a significant contributor for RHR HX and pump manual valves that could have a very long exposure rate between tests or alignments. Basis for Significance: The generic assumption about plugging of manual valves does not provide evidence that plugging was considered over the exposure time for the standby trains. The system notebooks did not seem to provide any sort of modeling notes on this topic either. If using the SY-A15 screening, it should be documented that this case meets SY-A15. This could be a significant contributor for RHR HX and pump manual valves that could have a very long exposure rate between tests or alignments.	This PRACC item was addressed in the NAPS-R07d interim model update. Manual valve plugging Basic Events for systems that are normally in standby were added to the model. Normally running systems were also reviewed and BEs added for plugging of manual valves in running systems.	None. This issue has been resolved.

Table i.1 – Resolution of Peer Review Findings

F&O	Summary of Finding	Dominion Resolution	Impact on RI-ISI Application
SY-C1-01	The dependency matrix appears to address dependency for front-line systems and mechanical support systems, but appears incomplete for electrical support systems. For example, no dependency is listed for 125VDC panel 2-BY-B-2-II or MCC 2-EP-MCC-2A1-2. In some instances the support system gate is provided, in other instances only the system name is provided. Basis for Significance: This issue made it difficult to assess the completeness of the dependency analysis. This issue made it difficult to assess the completeness of the identification of the systems needed to provide or support the safety functions contained in the accident sequence analysis.	Unresolved.	This is a documentation issue. The examples identified are modeled correctly but the associated documentation requires additional detail. The improvement of the dependency matrix documentation will not significantly impact the quantifications performed to support this application.

A comparison was made between the PRA Standard supporting requirements assessed as not meeting Capability Category II based on the peer review results and the acceptance criteria established in Electric Power Research Institute (EPRI) Report 1021467. The results are documented in the table below.

Table i.2 – Comparison of Unmet SRs to EPRI Report 1021467 Acceptance Criteria

SR	CC II Met?	EPRI Report 1021467-A Assessment for RI-ISI / Limits & Conditions from NRC SER	Impact to Application
AS-A10	No	CC-I	None. This issue has been resolved in the PRA model that was used to support this application. See F&O AS-A10-01 for details on resolution.
AS-B6	No	Spans the three capability categories	None. A review was performed to evaluate coincident maintenance that would include identification of dependencies among plant alignments. No such dependencies were identified.
AS-C1	No	Spans the three capability categories	None. This SR was considered Not Met due to a need to enhance documentation. A documentation enhancement that would facilitate emergent risk informed applications will not significantly impact the quantifications performed to support this application.
DA-B2	No	CC-I & CC-II	None. This issue has been resolved in the PRA model that was used to support this application. See F&O DA-B2-01 for details on resolution.
DA-C14	No	Spans the three capability categories	None. This issue has been resolved in the PRA model that was used to support this application. See F&O DA-C14-01 for details on resolution.
DA-D8	No	Spans the three capability categories	None. This issue has been resolved in the PRA model that was used to support this application. See F&Os DA-D8-01 and DA-D8-02 for details on resolution.
HR-D3	No	CC-I	None. This SR was considered Not Met due to a need to enhance documentation related to following the guidelines of NUREG-0700. The North Anna PRA uses the HRA Calculator software which adheres to the guidelines of NUREG-0700. Clarification to the basis of adherence to NUREG-0700 will not impact the quantification of LOCA sequences which was performed to support this application.
HR-G3	No	CC-I	None. This SR was considered Not Met due to a need to enhance documentation. The documentation of quality of operator training for HFEs will not significantly impact the quantification of LOCA sequences which was performed to support this application.

Table i.2 – Comparison of Unmet SRs to EPRI Report 1021467 Acceptance Criteria

SR	CC II Met?	EPRI Report 1021467-A Assessment for RI-ISI / Limits & Conditions from NRC SER	Impact to Application
HR-G6	No	Spans the three capability categories	None. This SR was considered Not Met due to a need to enhance documentation. An additional survey to review HEP consistency will not significantly impact the quantification of LOCA sequences which was performed to support this application.
HR-I3	No	Need not be met	None. This SR need not be met for this application per EPRI Report 1021467-A, "Nondestructive Evaluation: PRA Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs".
IE-A6	No	CC-I	None. This issue has been resolved in the PRA model that was used to support this application. See F&O IE-A6-01 for details on resolution.
IE-C3	No	Need not be met	None. This SR need not be met for this application per EPRI Report 1021467-A, "Nondestructive Evaluation: PRA Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs".
IFPP-B3	No	Not discussed in EPRI Technical Report 1021467-A due to the TR report using ASME/ANS Standard RA-Sb-2005. This SR was not incorporated into ASME/ANS Standard until RA-Sa-2009.	None. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding SR not meeting Capability Category II.
IFQU-A6	No	Previously referred to as IF-E5a in the ASME/ANS Standard RA-Sb-2005 and in EPRI Technical Report 1021467-A. This SR is now referred to as IFQU-A6 in ASME/ANS Standard RA-Sa-2009. Based on EPRI Technical Report 1021467-A : Spans the three capability categories	None. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding SR not meeting Capability Category II.
IFSN-A10	No	Previously referred to as IF-C4 in the ASME/ANS Standard RA-Sb-2005 and in EPRI Technical Report 1021467-A. This SR is now referred to as IFSN-A10 in ASME/ANS Standard RA-Sa-2009. Based on EPRI Technical Report 1021467-A : Spans the three capability categories	None. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding SR not meeting Capability Category II.
IFSN-A14	No	Previously referred to as IF-C6 in the ASME/ANS Standard RA-Sb-2005 and in EPRI Technical Report 1021467-A. This SR is now referred to as IFSN-A14 in ASME/ANS Standard RA-Sa-2009. Based on EPRI Technical Report 1021467-A : CC-II	None. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding SR not meeting Capability Category II.

Table i.2 – Comparison of Unmet SRs to EPRI Report 1021467 Acceptance Criteria

SR	CC II Met?	EPRI Report 1021467-A Assessment for RI-ISI / Limits & Conditions from NRC SER	Impact to Application
IFSN-A16	No	Previously referred to as IF-C8 in the ASME/ANS Standard RA-Sb-2005 and in EPRI Technical Report 1021467-A. This SR is now referred to as IFSN-A16 in ASME/ANS Standard RA-Sa-2009. Based on EPRI Technical Report 1021467-A : CC-II	None. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding SR not meeting Capability Category II.
IFSN-A5	No	Previously referred to as IF-C2c in the ASME/ANS Standard RA-Sb-2005 and in EPRI Technical Report 1021467-A. This SR is now referred to as IFSN-A5 in ASME/ANS Standard RA-Sa-2009. Based on EPRI Technical Report 1021467-A : Spans the three capability categories	None. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding SR not meeting Capability Category II.
IFSO-A5	No	Previously referred to as IF-B3 in the ASME/ANS Standard RA-Sb-2005 and in EPRI Technical Report 1021467-A. This SR is now referred to as IFSO-A5 in ASME/ANS Standard RA-Sa-2009. Based on EPRI Technical Report 1021467-A : Spans the three capability categories	None. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding SR not meeting Capability Category II.
IFSO-B3	No	Not discussed in EPRI Technical Report 1021467-A due to the TR report using ASME/ANS Standard RA-Sb-2005. This SR was not incorporated into ASME/ANS Standard until RA-Sa-2009.	None. The application only quantified LOCA sequences. There is no impact to the application from this internal flooding SR not meeting Capability Category II.
LE-G1	No	Spans the three capability categories	None. This SR was considered Not Met due to a need to enhance documentation. Development of a peer review SR road map will not impact the quantifications performed to support this application.
QU-B5	No	Spans the three capability categories	None. This issue has been resolved in the PRA model that was used to support this application. See F&O QU-B5-01 for details on resolution.
SY-C1	No	Spans the three capability categories	None. This SR was considered Not Met due to a need to enhance documentation. Enhancement of the dependency matrix documentation will not significantly impact the quantifications performed to support this application.

There were several updates to the PRA model used to support this application since the most recent peer review. These updates were included in the interim to a full revision of the North Anna PRA model of record to address peer review findings and to ensure the PRA model reflects the as-built, as-operated plant. Of these model updates, NAPS-R07d and NAPS-R07e interim model updates include model upgrades.

The changes made to the North Anna PRA model since the last Peer Review are summarized below:

NAPS-R07a

The NAPS-R07a model was the first model change after the 2013 peer review of the NAPS R07 PRA model. The NAPS-R07a model update was performed primarily to correct the unavailability events which were underestimated in the NAPS-R07 model. In addition, the following changes were also made:

- Correction to the component cooling cross-tie modeling and the change to the OCD HEPs.
- Addition of recoverable and non-recoverable charging pump maintenance events
- Addition of logic for EDG sequencing following a LOOP
- Revision to alignment fractions and component run probabilities

NAPS-R07b

The NAPS-R07b interim model update was small in scope and included adding the ability to makeup to the RWST from the opposite unit's blender for each unit. The modeling was also adjusted to account for the timing of a sequence where initial lineup of Auxiliary Feedwater (AFW) from the Emergency Condensate Storage Tank (ECST) is successful but ECST refill from the Condensate Storage Tank (CST) is not successful.

NAPS-R07c

The NAPS-R07c interim model update was performed to resolve issues against the NAPS PRA model related to the minimum quality requirements for MSPI technical adequacy documented in FAQ 14-01. These changes included:

- Common cause failure for load shed modeling for non-plant centered LOOPs was added for Unit 1 and 2
- Re-evaluation and revision of circular logic breaks
- Added logic to Unit 2 to reflect alternate power supplies to Unit 2 emergency busses
- Changed logic for the number of Steam Generators (SGs) required to be fed by MFW during an Anticipated Transient Without SCRAM (ATWS) scenario
- The instrument channel failures that were modeled over a 24-hour mission time were changed to be modeled as type 0 failures (as a place holder for being modeled as demand (type 1) failures during the next data update)
- Revised spurious SI initiating event frequencies to base the values on industry data

NAPS-R07d

The NAPS-R07d interim model update was performed to address issues against the NAPS PRA model. The NAPS-R07d interim model update included the following changes:

- Added transfer logic under U1-SBO and U2-SBO for convolution modeling
- Added the convolution factor basic events (REC-ADJ-CONV), deleted PROB-DG-MT, REC-1OSP, and REC-2OSP events, deleted ROSP type codes
    - The addition of EDG run failure convolution events to LOOP and Station Blackout sequences is considered a PRA Model upgrade.
    - This upgrade has no impact on this application because only LOCA sequences were quantified to support the application.
- Revised EP fault trees to incorporate initiating events for loss of RSST common cause, loss of inverter power to Solenoid Operated Valve (SOV) panels, and loss of battery charger power to the DC busses
- Added manual valve plugging BEs for systems that are normally in standby
- Normally running systems were also reviewed and BEs added for plugging of manual valves in running systems
- Created new type 'B' HEP, " HEP-B-0HV-SWPH-VENT" to model operator failure to recover SWPH ventilation after a spurious closure of one train of ventilation dampers with the other train tagged out for maintenance

NAPS-R07e

The NAPS-R07e model was quantified to support this application. The NAPS-R07e interim model update included two significant changes to the model:

- The Unit 2 fault tree logic was adjusted to credit the newly installed low-leakage N-9000 seal packages in all three Reactor Coolant Pumps. This change eliminated the mid-range RCP seal induced LOCA sequences for Unit 2. The logic for Unit 1 still includes all RCP seal induced LOCAs as one RCP still has the old style seal installed.
    - The modeling of Flowserve N-9000 RCP seals for RCP Seal LOCA sequences is considered a PRA Model upgrade.
    - This upgrade has no impact on this application because only LOCA sequences were quantified to support the application.

- Beyond Design Basis FLEX strategy equipment and operator actions were added to the model for Extended Loss of AC Power (ELAP) sequences. The FLEX equipment modeled includes the portable generators and the portable diesel driven RCS injection pump. Operator actions required to place this equipment in service and refuel the equipment as required were also added to the model. The modeling was simplified such that failure of either the equipment or operator action fails the entire FLEX function.

- The modeling of FLEX equipment and Operator Actions for Station Blackout sequences is considered a PRA Model upgrade.
- This upgrade has no impact on this application because only LOCA sequences were quantified to support the application.