William R. Gideon
Vice President
Brunswick Nuclear Plant
P.O. Box 10429
Southport, NC 28461

o: 910.457.3698

February 27, 2017

Serial: BSEP 17-0020

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

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-71 and DPR-62
Docket Nos. 50-325 and 50-324
Supplement - License Amendment Request Regarding Relocation of Specific Surveillance Frequency Requirements to a Licensee-Controlled Program

References:

1. Letter from William R. Gideon (Duke Energy) to U.S. Nuclear Regulatory Commission, *Application For Technical Specification Change Regarding Risk-Informed Justification for the Relocation of Specific Surveillance Frequency Requirements to a Licensee-Controlled Program*, dated December 21, 2015, ADAMS Accession Number ML16004A249

2. Letter from William R. Gideon (Duke Energy) to U.S. Nuclear Regulatory Commission, *Response to Request for Additional Information, Revision to Requested Implementation Schedule, and Status Update - License Amendment Request Regarding Relocation of Specific Surveillance Frequency Requirements to a Licensee-Controlled Program*, dated November 17, 2016, ADAMS Accession Number ML16348A548

Ladies and Gentlemen:

By letter dated December 21, 2015 (i.e., Reference 1), Duke Energy Progress, LLC, submitted a license amendment request (LAR) for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. The proposed amendment would modify the Technical Specifications (TSs) by relocating specific surveillance frequencies to a licensee-controlled program with the implementation of Nuclear Energy Institute (NEI) 04-10, "Risk-Informed Technical Specification Initiative 5b, Risk-Informed Method for Control of Surveillance Frequencies." Additionally, the change would add a new program, the Surveillance Frequency Control Program, to TS Section 5.5, "Programs and Manuals." The changes are consistent with Nuclear Regulatory Commission (NRC) approved Technical Specification Task Force (TSTF) Standard Technical Specifications (STS) Change TSTF-425, "Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b," Revision 3.

By letter dated November 17, 2016 (i.e., Reference 2), Duke Energy requested that review of the proposed TSTF-425 LAR be temporarily placed on hold pending completion of the following action.

> Duke Energy will conduct a focused-scope peer review in accordance with Regulatory Guide 1.200, Revision 2, for the internal flooding technical elements based on the enhancements made since the 2010 peer review. All finding-level F&Os from the 2010 peer review, as well as any finding-level F&Os from the new focused-scope peer review itself, will be resolved.

This action has been completed. Therefore, Duke Energy requests that the NRC resume review of the proposed TSTF-425 LAR. The results of the review, including discussion of the resolutions of finding-level Findings and Observations (F&Os), are provided in the attached enclosure.

No new regulatory commitments are contained in this letter.

Please refer any questions regarding this submittal to Mr. Lee Grzeck, Manager – Regulatory Affairs, at (910) 457-2487.

I declare, under penalty of perjury, that the foregoing is true and correct. Executed on February 27, 2017.

Sincerely,

William R. Gideon

MAT/mat

Enclosure:

Focused-Scope Peer Review Results

cc (with enclosure):

U. S. Nuclear Regulatory Commission, Region II
ATTN: Ms. Catherine Haney, Regional Administrator
245 Peachtree Center Ave, NE, Suite 1200
Atlanta, GA 30303-1257

U.S. Nuclear Regulatory Commission
ATTN: Mr. Andrew Hon (Mail Stop OWFN 8G9A) **(Electronic Copy Only)**
11555 Rockville Pike
Rockville, MD 20852-2738
Andrew.Hon@nrc.gov

U.S. Nuclear Regulatory Commission
ATTN: Ms. Michelle P. Catts, NRC Senior Resident Inspector
8470 River Road
Southport, NC 28461-8869

Chair - North Carolina Utilities Commission **(Electronic Copy Only)**
4325 Mail Service Center
Raleigh, NC 27699-4300
swatson@ncuc.net

Mr. W. Lee Cox, III, Section Chief **(Electronic Copy Only)**
Radiation Protection Section
North Carolina Department of Health and Human Services
1645 Mail Service Center
Raleigh, NC 27699-1645
lee.cox@dhhs.nc.gov

<u>Focused-Scope Peer Review Results</u>

Background

By letter dated December 21, 2015, Duke Energy Progress, LLC, submitted a license amendment request (LAR) for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. The proposed amendment would modify the Technical Specifications (TSs) by relocating specific surveillance frequencies to a licensee-controlled program with the implementation of Nuclear Energy Institute (NEI) 04-10, "Risk-Informed Technical Specification Initiative 5b, Risk-Informed Method for Control of Surveillance Frequencies." Additionally, the change would add a new program, the Surveillance Frequency Control Program (SFCP), to TS Section 5.5, "Programs and Manuals." The changes are consistent with Nuclear Regulatory Commission (NRC) approved Technical Specification Task Force (TSTF) Standard Technical Specifications (STS) Change TSTF-425, "Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b," Revision 3.

By letter dated November 17, 2016, Duke Energy requested that review of the proposed TSTF-425 LAR be temporarily placed on hold pending completion of the following action.

> Duke Energy will conduct a focused-scope peer review in accordance with Regulatory Guide 1.200, Revision 2, for the internal flooding technical elements based on the enhancements made since the 2010 peer review. All finding-level F&Os from the 2010 peer review, as well as any finding-level F&Os from the new focused-scope peer review itself, will be resolved.

This action has been completed. Therefore, Duke Energy requests that the NRC resume review of the proposed TSTF-425 LAR. The results of the review, including discussion of the resolutions of finding-level Findings and Observations (F&Os), are provided below.

Based on completion of this action, Duke Energy requests that the NRC resume review of the proposed TSTF-425 LAR.

BSEP IFPRA Focused-Scope Peer Review

The BSEP internal flooding probabilistic risk assessment (IFPRA) review consisted of a focused peer review of the updated IFPRA sections that pertained to the supporting requirements (SR) addressed in the F&Os generated in the 2010 peer review. These SR requirements were evaluated to determine if they adequately met Capability Category II (CC-II) of the 2009 ASME PRA Standard (i.e., Reference 1). It was noted by the peer review team that, although the previous F&Os were used in part to identify the SRs on which to focus, the review was considered a stand-alone peer review that will become the document of record for the current PRA internal flooding analysis. All F&Os from 2010 peer review are considered closed, with new F&Os having been generated from the 2016 review.

The BSEP IFPRA was assessed against the requirements of the 2009 ASME PRA Standard (i.e., Reference 1) with considerations from any Clarifications and Qualifications provided in Regulatory Guide (RG) 1.200, Revision 2 (i.e., Reference 2). As a result of the review, 10 SRs were assessed to be Met to Capability Category II with no finding; 9 SRs met Capability Category II with a finding; and 1 SR met Capability Category I (CC-1). Nine SRs were evaluated as Not Met. Table 1 provides a summary of the F&Os generated for each of the high level requirements (HLR) of the Standard.

Table 1. Summary of Results for BSEP IFPRA Focused-Scope Peer Review

High Level Requirement	SR's Met w/o Finding	SR's Met w/Finding	SR's Met Cat I	SR's Not Met
IFPP	1			
IFSO	3	2		
IFSN	4	5		2
IFEV	1		1	2
IFQU	1	2		5
Total	**10**	**9**	**1**	**9**

Duke Energy's resolution of the identified F&Os are provided in Tables 2 through 4. Table 2 contains the 9 F&O's that were considered to be Not Met. The resolution of the finding, and the impact on the SFCP are provided. Table 3 provides the resolution of the single F&O met at CC-I, and Table 4 contains the resolution of the Met with Finding F&Os. All findings from the IFPRA focused-scope peer review are considered to be resolved.

References

1. ASME/ANS RA-Sa-2009, *Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications,* Addendum A to RA-S-2008, ASME, New York, NY, American Nuclear Society, La Grange Park, Illinois, February 2009.

2. Regulatory Guide 1.200, *An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk- Informed Activities*, Revision 2, U.S. Nuclear Regulatory Commission, March 2009.

Table 2. Resolution of "Not Met" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
IFSN-A3 Not Met	Automatic or operator response to terminate or contain floods was not identified for the significant sequences. Only two operator actions were developed, based on timing, and generally applied to flooding scenarios.	The original analysis included two bounding, generic operator actions that were applied to all appropriate sequences based on similar timing and characteristics of the flood sequences. The significant flooding scenarios have been re-analyzed, and an additional, scenario-specific operator action that would terminate or contain the flood has been developed in accordance with SR HR-F1 from section 2-2.5 of the Standard. Specifically, the flooding model was run with no credit for operator action to determine the risk significant scenarios. "Risk significant" was taken to mean, "contributing more than 1% to Internal Flooding Core Damage Frequency (CDF)." This returned three flood scenarios that initially contributed 97% to flooding CDF; all other scenarios contributed approximately 0.5% or less to CDF. The three top scenarios are all similar – large diameter service water breaks in the lower elevations of the Reactor Building which cause submergence failure of Core Spray, Residual Heat Removal (RHR) and High Pressure Coolant Injection (HPCI). Timing of the three scenarios was compared, and the more limiting timing was chosen as a system window for a new operator action. The model was re-quantified with the scenario-specific operator action, and additional, similar scenarios (i.e., for both CDF and Large Early Release Frequency (LERF)) were identified and included. The generic operator actions	An additional, scenario-specific operator action to terminate or contain floods was added to the model, and the risk was reassessed and documented. There is no risk-significant impact on PRA results in the SFCP.

Table 2. Resolution of "Not Met" F&Os from BSEP Internal Flooding PRA Focused Peer Review

SR	Finding	Resolution	TSTF-425 Impact
		were retained for other appropriate scenarios. The accident sequences were assessed in the cutset review and determined to be appropriate. Updated documentation was developed in the human reliability analysis (HRA) Calculator.	
IFSN-A11 Not Met	Multi-Unit Scenarios are discussed in section F.2.1 and F.4.8.5 with assumptions in F.1.3. There are no modeled multi-unit Floods. However, cable spreading room MCC's fail at 3 ft., but the doors adjacent to the MCC's and 3 foot curb fail at 2.3 to 2.5 ft., depending on direction of propagation; therefore, this would seem to be a multi-unit flood that was not accounted for or discussed. Metal doors between U1 & U2 turbine buildings are not credited to fail creating a multi-unit turbine building flood; however, other doors in the U1 and U2 turbine buildings fail at 4 inches, and there is no justification for not evaluating turbine building multi-unit flood propagation through these doors. Drawings do not match the doors in the space (roll up vs opposing swing doors).	Multi-unit flood propagation is modeled and discussed for the cable spreading rooms. Specifically, Section 4.8.6 of BSEP's internal flooding analysis discusses floods originating in one cable spreading room which propagate to the opposite unit's cable spreading room, as well as to the battery rooms. Table F.B.1 of the calculation identifies 68 retained flood initiating events with propagation pathways involving the two cable spreading rooms and four battery rooms. A sampling of the scenarios documented as propagating to the opposite unit was performed to verify that they are included in the flood PRA. No discrepancies were identified. Note that the doors adjacent to the motor control centers (MCCs) and the 3-foot curb referenced in the F&O are actually located in the 20 foot elevation of the turbine buildings, not in the cable spreading room. This F&O also addresses propagation pathways for internal floods originating in the turbine buildings. Specifically, the F&O questions why the exterior roll-up doors are assumed to fail at 4 inches water level while the roll-up door between units is not. Investigation of this issue determined that a propagation pathway between the Unit 1 and Unit 2	Multi-unit floods in the battery rooms have been validated to be modeled correctly. A bounding analysis for a potential multi-unit propagation pathway in the turbine building has been assessed and incorporated in the model. There is no risk-significant impact on PRA results in the SFCP.

Table 2. Resolution of "Not Met" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
		turbine buildings cannot be excluded. In order to account for this potential propagation pathway, a conservative bounding analysis was developed and included in the flood PRA. This bounding analysis takes no credit for the roll-up door between the two turbine buildings for preventing flood propagation above 4 inches of water accumulation. Therefore, it effectively assumes that any flood in either turbine building that can accumulate 4 inches of water on the floor of that turbine building within 8 hours becomes a 3 foot flood in both units.	
IFEV-A4 Not Met	See IFSN-A11 Same Finding	This SR requires that, for multi-unit sites with shared systems or structures, multi-unit impacts on structures, systems and components (SSCs) and plant initiating events caused by internal flood scenario groups be included. This is essentially the same as SR IFSN-A11 which requires that multi-unit scenarios be included. SSCs impacted by multi-unit spray initiating events are modeled, as documented in Tables F.C.1 and F.C.2 of BSEP's internal flooding analysis. Table F.C.1 contains service water pipe spray initiating events that fail both the Unit 1 and Unit 2 service water pumps. Multi-unit flood propagation is modeled and discussed for the cable spreading rooms in section 4.8.6 and Table F.B.1. These sections address SSCs impacted by floods originating in one cable spreading	The multi-unit impacts on SSCs and initiating events from flooding scenarios are included in the model, and documentation has been updated. There is no risk-significant impact on PRA results in the SFCP.

Table 2. Resolution of "Not Met" F&Os from BSEP Internal Flooding PRA Focused Peer Review

SR	Finding	Resolution	TSTF-425 Impact
		room which propagate to the opposite unit's cable spreading room, as well as to the battery rooms. This is discussed in more detail in the response to F&O IFSN-A11. Multi-unit turbine building scenarios and their impact on SSCs/initiating events have been incorporated into the PRA via the bounding analysis discussed in the response to F&O IFSN-A11.	
IFEV-A5 Not Met	New Methodology was applied to use pipe length and flood and major flood frequency based on diameter and flow rate. The analysis should have evaluated flood frequency for small pipe and flows, and Flood frequency AND Major Flood frequency for large pipe and flows. However, the analysis only applied major flood frequencies to large pipe, omitting flood frequency from large pipe which is the dominant frequency. Table F.15 provides the different frequencies from the EPRI Tech Report, but they are applied incorrectly in the analysis as shown in Table F.16.	The existing flood scenario frequencies have been adjusted to include both the Electric Power Research Institute (EPRI) Flood and Major Flood initiating event frequencies. Table F.15 of the internal flooding calculation provides a mapping of piping frequencies and their associated system designation. The updated EPRI values are from TR 3002000079. Since the flooding frequency data in the calculation and the EPRI data have different pipe size breakpoints, the pipe size intervals were adjusted to match. The corresponding frequencies were then adjusted by the ratio of new EPRI flood and major flood frequency to existing major flood frequency. The appropriate multiplier was then applied to each scenario based on pipe size and fluid system type. This assumes all floods are Major Floods that bound both Flood and Major Flood frequency contributions.	The flood scenario frequencies have been adjusted to include the Flood frequency for large pipes and flows. There is no risk-significant impact on PRA results in the SFCP.

Table 2. Resolution of "Not Met" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
IFQU-A5 Not Met	The HRA Analysis provided does not meet the applicable requirements for HRA Analysis. The BSEP internal flooding model uses only two flood isolation HEPs, XOPER_F25 and XOPER_F60. The first is based on minimum time of 25 min needed to respond to a flooding event. It is not clear what the basis is for 60 min time used for the second HEP or its assumed value of 1E-3. These two HEPs are applied to model isolation of all initiators with greater than 25 minutes critical damage time, therefore the model is overly simplified with the potential of producing both overly conservative and non-conservative results. In the HRA Calculator, the alarm time used is 1 min, and cognition time is 5 min, which may not be bounding since this HEP is applied to numerous flood scenarios of differing delay times which is not considered.	A scenario-specific human error probability (HEP) that meets the requirements of the Standard was developed (i.e., see response to F&O IFSN-A3) and included in the updated model and quantification. The guidance in SR HR-F1 of Section 2-2.5 of the Standard for developing human failure events (HFEs) was followed, and the HRA Calculator, v5.1, which meets the requirements of the Standard, was used. An operator interview was conducted on February 6, 2017, to validate the procedures and assumptions used as the basis for the modeling. All assumptions and bases for the performance shaping factors (PSFs) were documented in the HRA Calculator. Dependency analysis was considered for both CDF and LERF in regards to the new flooding operator action, and documentation of dependency levels has been included in the assessment. The accident sequences were assessed in the cutset review, and descriptions of the top cutsets were included in the documentation.	A new, scenario-specific HEP to mitigate the top flooding scenarios has been developed and included in the quantification of the model. The HEP meets the requirements of the Standard, so there is no risk-significant impact on PRA results in the SFCP.

Table 2. Resolution of "Not Met" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
IFQU-A6 Not Met	See IFQU-A5 Finding	A new, scenario-specific Internal Flooding operator action was developed (i.e., see response to F&O IFSN-A3) and included in the quantification of the model (i.e., see response to SR IFQU-A5). The HRA Calculator, v5.1, was used to develop the HEP, and it included assessment of scenario-specific PSFs. Documentation of the PSFs is included in the HRA Calculator documentation: • Workload and stress during a large service water break are assessed and validated in an operator interview. • Cue availability has been verified for the sump alarms, which are the cue for this action. • Accessibility restrictions have been taken into account, given the sump alarms, even if accessibility is restricted due to flood level in the core spray room, a header low-pressure alarm should cue operators to the flood source. • The procedures used for this action are flood-specific. That is, they deal directly with pipe leakage/rupture.	Scenario-specific impacts on PSF's have been assessed in the scenario-specific HEP. There is no risk-significant impact on PRA results in the SFCP.
IFQU-A9 Not Met	Though Direct Effects and Submergence were evaluated, indirect effects of Pipe Whip and Jet Impingement have not been fully identified; therefore, no quantified effects were evaluated. In order to quantify the effects of pipe whip and jet impingement, first one	The BSEP PRA screens pipe whip and jet impingement failures for HELB events in the reactor building based on the plant design considerations, as documented in BSEP's Updated Final Safety Analysis Report (UFSAR). The UFSAR describes design elements for pipe restraints to prevent pipe whip and jet impingement impact on SSCs in the reactor building and primary containment. High	Pipe whip and jet impingement will have minimal impact on the PRA results based on design requirements in the reactor and containment

Table 2. Resolution of "Not Met" F&Os from BSEP Internal Flooding PRA Focused Peer Review

SR	Finding	Resolution	TSTF-425 Impact
	needs to identify the potential of such events. For flood scenarios involving a high energy line break (HELB), the evaluation did not IDENTIFY the susceptibility of each SSC identified in IFSN-A5 to jet impingement, pipe whip, temperature, and pressure failure mechanisms. Therefore, no quantification of these effects was performed.	energy lines in the turbine building, however, are not explicitly discussed in the UFSAR. A review of PRA equipment in the turbine building was performed using information from the fire PRA to assist in identifying potential damage scenarios. The fire PRA provides spatial damage sets throughout the turbine building that can provide insight into potential pipe whip scenarios. The fire scenario conditional core damage probabilities (CCDPs) can be used as pipe whip and jet impingement surrogate CCDPs to provide an estimate of the impacts on core damage. The total contributions to CDF for jet impingement and pipe whip is approximately 1E-07 per year and therefore would not impact PRA conclusions under the SFCP. Using the fire CCDPs is conservative because the fire PRA includes failure modes such as spurious failures that are not included in HELB mechanical damage. The pipe whip and jet impingement zones of influence are also limited due to the concrete biological shielding in the turbine building that would limit exposed equipment.	buildings, and a screening assessment for the turbine buildings. There is no risk-significant impact on PRA results in the SFCP.
IFQU-B1 Not Met	Information provided for model quantification and sequence identification did not facilitate peer review. Cutsets typically consisted of the initiating event identifier and applied	All of the F&O responses have been incorporated into the model, and the model has been re-quantified. A cutset review was completed in accordance with the Standard, the accident sequences have been reviewed and documented, and descriptions of the top cutsets for CDF and LERF have been included in the calculation. Significant contributors to CDF and	This is a documentation issue only. Documentation of the cutset set review and descriptions of the top sequences for

Table 2. Resolution of "Not Met" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
	flags. The descriptions of these cutsets were lacking in sufficient detail regarding flooding induced equipment failures and mitigating action failures.	LERF have been identified, and a sampling of non-significant accident sequences were reviewed for reasonableness.	CDF and LERF have been added to the calculation. There is no risk-significant impact on PRA results in the SFCP.
IFQU-B2 Not Met	The documentation did not justify screening of the flood sources, and did not explain sufficiently the description of cutsets and sequences for dominant floods. There is an inconsistency in documentation between how conventional service water and nuclear service water are identified in the flood analysis, flood database, and PRA model sequences.	Documentation of the processes used to determine the applicable flooding sequences and the quantification of the model has been added in accordance with the requirements of the Standard. The accident sequences/cutsets were reviewed of consistency and correctness, and the sequence-specific HEP that was added was validated. The basis for this documentation F&O included several specific items that have also been addressed individually. The process that describes how flood sources were screened was documented, and the list of potential flood sources retained for further analysis has been updated (i.e., see F&O responses IFSN-A15 and IFSN-A16). The fault trees and initiating event frequencies have been updated based on changes documented in the other F&O responses, and the model has been re-quantified. The detailed descriptions of the cutsets and accident sequences have been added (i.e., see F&O responses IFQU-B1).	This is a documentation issue only. Documentation of the updated quantification and results of the analysis have been included for CDF and LERF. Descriptions of the top cutsets have also been added to the calculation. There is no risk-significant impact on PRA results in the SFCP.

Table 2. Resolution of "Not Met" F&Os from BSEP Internal Flooding PRA Focused Peer Review

SR	Finding	Resolution	TSTF-425 Impact
		The Conventional Service Water and Nuclear Service Water modeling has been validated and clarified.	

Table 3. Resolution of "Met CC1" F&Os from BSEP Internal Flooding PRA Focused Peer Review

SR	Finding	Resolution	TSTF-425 Impact
IFEV-A6 Met CC1	The BSEP historical plant-specific flood data is included in section F.1.1 of RSC-10-05, noting it appears to be limited to major events. The impact from this plant-specific information on calculation of pipe rupture frequencies is not discussed. It should be demonstrated through analysis of plant-specific flooding information that it has no impact on generic failure rates. In other words, if Bayesian update of generic data is performed with plant-specific information, the generic failure rates will not be significantly affected (prior and posterior distributions are similar). It does not appear that all flooding events were collected, only major events were documented. The analysis simply applies generic information, with no documentation or justification for not integrating plant specific information.	The Duke Energy Consolidated Asset Suite (CAS) was queried to identify Nuclear Condition Reports (NCRs) associated with flood events induced by maintenance activities as well as piping and component failures. A detailed review of 887 BSEP NCRs reveals that the majority of the cases were either a pipe leak or spray whose discharged water was insignificant and had no impact on PRA-related equipment. There were no direct plant transients as a result of any events. No maintenance-induced flooding events were retained due to either not meeting the screening criteria or being a maintenance activity not characteristic of at-power operation performed during an outage. All of the events were either detected immediately and the faulted component/piping segment put under clearance, or found as a part of routine inspection or test and appropriate corrective action was taken before the leak/sprays escalated to an unacceptable level leading to a flooding scenario. As a result of this review, it is demonstrated that the BSEP plant-specific experience does not contain significant flooding events that represent an outlier to the generic industry data used in the internal flooding analysis. It is concluded, therefore, that the NCRs reviewed do not impact the plant level and flood compartment level frequencies for the BSEP internal flooding PRA, and that the internal flooding PRA meets the requirements of SR IFEV-A6 at CCII.	The BSEP operating experience has been compiled and reviewed, and the analysis demonstrates that there are no events that impact the generic failure rates used in the analysis. This SR is considered to be met at CC II. There is no risk-significant impact on PRA results in the SFCP.

Table 4. Resolution of "Met with Finding" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
IFSO-A4 MET with Finding	No discussion of fire suppression inadvertent actuation as a source or effects were provided in the analysis. In sections F.5, F.12, and F8.3 they discuss failures of pipes and tanks, flexible connections and gaskets, and maintenance induced floods. No discussion of inadvertent actuation of fire suppression as a source was included.	Inadvertent actuation of fire suppression systems has been added to the model, and the model has been re-quantified. EPRI Report 3002000079 includes plant level frequencies for inadvertent actuation of fire suppression systems. The plant level spurious fire protection system actuation mean frequency from Table 7-3 of the EPRI Report is 8.44E-04. This frequency is partitioned over the entire plant to each of the wet pipe fire protection systems based on the quantity of small bore (i.e., less than 2 inch diameter) fire protection piping. The spray scenarios frequency due to inadvertent actuation was added to the pipe spray scenario frequencies where applicable.	Inadvertent actuation of fire suppression has been added to the model. There is no risk-significant impact on PRA results in the SFCP.
IFSO-B2 MET with Finding	The IFSO-A section lacks documentation on several modeling requirements that are shown to be correct through investigation. • In IFSO-A1, no drain backflow propagation identification provided in the documentation. Investigation shows that drains flow to an exterior rad waste building floor drain collection tank from all locations which would justify the assumption in F.1.3; however, there is no discussion, drawings, or justification provided in the analysis for screening.	Documentation has been developed for and added to the Internal Flood calculation for each of these modeling requirements. • The system diagrams and system description for the Liquid Radwaste System were collected, reviewed, and documented in the IFPRA calculation as described in the response to IFSN-B2. The floor drain flow to the Radwaste Building and the conclusion that drain backflow is not a flooding concern in the other buildings was verified.	This is a documentation issue only, and the documentation has been developed and included in the calculation. There is no risk-significant impact on PRA results in the SFCP.

Table 4. Resolution of "Met with Finding" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
	• In IFSO-A1 there is little to no documentation of doors and door failures contributing to propagation and critical height determination. • Capacity of the sources per IFSO-A5 is not documented, it was identified this information is in the flooding database but it is not discussed in the flooding calculation.	• The documentation of door failure critical height determination has been included per the response to IFSN-A2. • A list of all potential flood sources was updated and documented as described in the response to IFSN-A15. The capacities of those systems retained for further assessment are included in the updated documentation and were compared to the capacities from the database table used in the flooding propagation analysis. Capacities used for all sources in the original propagation analysis bounded the capacities for all systems described in the response to IFSN-A15.	
IFSN-A2 MET with Finding	There are multiple issues regarding door failure. These issues directly impact flood propagation both within a unit and multi-unit floods. Though the flood database appears to address door failure via critical height, there is very limited documentation and no clear flood propagation analysis provided to justify propagation paths and timing. There is no supporting analysis for when different door types fail depending on the flood propagation direction.	The basis for this F&O was the lack of detailed discussion in the documentation for three specific scenarios/assumptions in the model: • treatment of propagation through doors on the 20 foot elevation of the reactor building down stairs to the RHR and core spray rooms; • propagation through doors in the turbine building that could lead to multi-unit floods, and • door failure as a function of propagation direction. Each of these was reassessed in the model,	This is a documentation issue only, and additional documentation has been developed and included. There is no risk-significant impact on PRA results in the SFCP.

Table 4. Resolution of "Met with Finding" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
		and detailed discussions have been included. • Treatment of propagation from the 20 foot elevation to the RHR/core spray rooms was determined to be adequate and conservative. The doors to the RHR rooms are not required to be closed (and in fact, were open during the PRA walkdowns), and they have a large gap (i.e., approximately 1/2 inch) between the bottom of the door and the floor. The doors to the RHR room were conservatively assumed to pass roughly the same amount of water as the openings to the core spray rooms, and no modification is necessary. • Propagation in the turbine building is a multi-unit flood consideration that has been addressed in the response to F&O IFSN-A11. The door failure assumptions for this multi-unit scenario are consistent with other door failures in the model and are conservative with respect to the direction they fail in multi-unit flood scenarios. • Discussion of the basis for door failure as a function flood propagation direction has been added to the documentation. For example, a door failure height of 2.3 feet (approximately 1/3 of door height) was used for hollow metal doors that open outward, while a failure height of 4.6 feet (approximately 2/3 of door height) was	

Table 4. Resolution of "Met with Finding" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
		assumed for hollow metal doors that open inward. A simplistic finite element model, using a "typical" set of dimensions and materials, was performed to obtain an estimate for door failure, whether against the latch or door jamb. The results show that the door failure heights used in the analysis are reasonable. Other door types are included in the calculation. Each of the elements in the basis for this finding has been addressed, and the documentation has been added.	
IFSN-A8 MET with Finding	From IFSO-A4, the effects of gaskets and expansion joint failures were not propagated beyond failing the attached equipment. Section F.4.8 discusses the propagation between rooms, and basis for drain paths. No propagation from gaskets or expansion joints was modeled.	The CDF and LERF contributions from gasket and expansion joint failures, including effects from propagation, have been included in the internal flooding models. Table F.25 of IFPRA calculation contains the listing of expansion joints and gaskets along with their failure rates. The component failures have been mapped to the associated initiating events in the model. New scenarios and their propagation impacts based on similar pipes in the flood zone have been developed and assessed for the expansion joint and gasket flooding scenarios.	Effects of gasket and expansion joint failures on propagation have been added to the model. There is no risk-significant impact on PRA results in the SFCP.
IFSN-A15	Did not provide a comprehensive list of flood sources that were screened out with justification.	The BSEP Internal Flooding analysis identified all potential flooding sources and screened those sources as required by the Standard. The final listing of the internal flood sources were	This is a documentation issue only, and detailed

Table 4. Resolution of "Met with Finding" F&Os from BSEP Internal Flooding PRA Focused Peer Review

SR	Finding	Resolution	TSTF-425 Impact
MET with Finding	It does not appear in documentation that they screen flood sources directly; however, it appears they have screened out systems like potable water and other small water systems. For large water systems that they model they appropriately model down to very small pipe and did not screen.	captured in the flooding analysis, but the screening process was not clearly documented. The screening was re-performed, and the screening process has been provided. All potential flood sources that were screened have been listed. The detailed documentation of the screening process meets the requirements of IFSN-A15.	documentation has been added to the calculation. There is no risk-significant impact on PRA results in the SFCP.
IFSN-A16 MET with Finding	Insufficient justification is given for screening maintenance induced floods due to operator action in section F.8.3. Analysis screens out flood areas using human mitigating actions, however sufficient justification is not provided, such as maintenance induced flood mitigation.	The analysis met the requirement of the Standard; however, the documentation was lacking. The documentation has been updated to describe the approach taken to satisfy the supporting requirements of the Standard. Potential flood sources were not screened based on operator actions. Sources/systems were screened if they contained no on-line preventive maintenance. This was determined by two methods: by reviewing the on-line Preventive Maintenance schedule, and by eliminating those systems not scheduled to be breached at power. The screened list was verified by interviews with the BSEP on-line work control manager, former BSEP Senior Reactor Operators (SROs), and Subject Matter Experts (SMEs). Detailed documentation of the screening process has been added. A discussion has also	This is only a documentation issue, and documentation has been added to describe the process for screening potential flood sources. There is no risk-significant impact on PRA results in the SFCP.

Table 4. Resolution of "Met with Finding" F&Os from BSEP Internal Flooding PRA Focused Peer Review			
SR	**Finding**	**Resolution**	**TSTF-425 Impact**
		been included that describes the analysis performed for multi-unit flood scenarios from maintenance on a shutdown unit.	
IFSN-B2 MET with Finding	No documentation of a Drain Backflow propagation evaluation provided. Documentation was not provided for drain backflow analysis assumption. Investigation shows that drains flow to an exterior rad waste building floor drain collection tank from all locations; however, there is no discussion, drawings, or justification provided in the analysis for screening. This does not affect results of the analysis it is simply lack of sufficient documentation and is assessed in IFSN-B2.	System Floor and Equipment drains and Liquid Radwaste System description and diagrams were reviewed and included in the documentation. The system documentation validates that the floor drains flow to an exterior building and that there is no flooding concern due to backflow through the drains.	This is a documentation issue only, and the system descriptions and drawings have been added. There is no risk-significant impact on PRA results in the SFCP.
IFQU-A1 MET with Finding	See Documentation Finding IFQU-B2	Accident sequences were reviewed as part of the cutset review for the updated CDF results. Descriptions of the top flooding sequences have been added to the documentation of the results (i.e., per response to IFQU-B2).	This is a documentation issue only, and the accident sequences have been reviewed and documented. There is no risk-significant impact on PRA results in the SFCP.

Table 4. Resolution of "Met with Finding" F&Os from BSEP Internal Flooding PRA Focused Peer Review

SR	Finding	Resolution	TSTF-425 Impact
IFQU-A10 MET with Finding	See Documentation Finding IFQU-B2	LERF sequences were reviewed as part of the cutset review for the updated results. Descriptions of the top flooding sequences have been added to the documentation of the LERF results (i.e., per response to IFQU-B2).	This is a documentation issue only, and the accident sequences have been reviewed and documented. There is no risk-significant impact on PRA results in the SFCP.