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

10 CFR 50.90

SUSQUEHANNA STEAM ELECTRIC STATION SUPPLEMENT TO LICENSE AMENDMENT REQUESTING ADOPTION OF TSTF-505, REVISION 2
PLA-7984

Docket No. 50-387 and 50-388

References:

1) Susquehanna letter to NRC, "Proposed Amendment to Licenses NPF-14 and NPF-22: License Amendment Request to Revise Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, 'Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b' (PLA-7897)," dated April 8, 2021 (ADAMS Accession No. ML21098A206).

2) NRC letter to Susquehanna, "Regulatory Audit Plan in Support of License Amendment Request to Revise Technical Specifications to Adopt Risk-Informed Completion Times (EPID L-2021-LLA-0062)," dated June 15, 2021 (ADAMS Accession No. ML21153A137).

Pursuant to 10 CFR 50.90, Susquehanna Nuclear, LLC (Susquehanna), submitted, in Reference 1, a request for an amendment to the Technical Specifications (TS) for the Susquehanna Steam Electric Station (SSES), Units 1 and 2, Facility Operating License numbers NPF-14 and NPF-22. The proposed amendment would modify TS requirements to permit the use of Risk Informed Completion Times in accordance with Technical Specifications Task Force (TSTF) Traveler TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times, RITSTF Initiative 4b."

The NRC notified Susquehanna in Reference 2 of the intent to conduct a regulatory audit virtually from June 28 through December 31, 2021. During the virtual audit, Susquehanna personnel and associated contractors met with members of the NRC staff to discuss specific questions provided by the NRC staff.

Enclosure 1 to this letter provides a response to several of the audit questions posed by the NRC staff during the regulatory audit. As a result of the responses to several of the questions included in Enclosure 1, Susquehanna identified some revisions necessary to enhance the information provided in Tables E1-1, E1-2, and E1-4 of Enclosure 1 to Reference 1. Enclosure 2 to this letter provides revised versions of the tables and supersede the previously provided versions in their entirety.

Enclosure 3 to this letter provides revised TS markup pages as a result of responses to audit questions. Enclosure 4 provides the corresponding clean TS pages. Enclosure 5 provides revised TS Bases markups and is provided for information only.

Susquehanna has reviewed the information supporting a finding of No Significant Hazards Consideration and the Environmental Consideration provided to the NRC in Reference 1 and determined the information provided herein does not impact the original conclusions in Reference 1.

There are no new or revised regulatory commitments contained in this submittal.

Should you have any questions regarding this submittal, please contact Ms. Melisa Krick, Manager – Nuclear Regulatory Affairs, at (570) 542-1818.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on March 8, 2022

K. Cimorelli

Enclosures:
1. Response to Regulatory Audit Questions
2. Revised Enclosure 1 Tables
3. Marked-Up Technical Specification Pages
4. Revised (Clean) Technical Specification Pages
5. Marked-Up Technical Specification Bases Pages (Provided for Information Only)

Copy: NRC Region I
Mr. C. Highley, NRC Sr. Resident Inspector
Ms. A. Klett, NRC Project Manager
Mr. M. Shields, PA DEP/BRP

Enclosure 1 of PLA-7984

Responses to Regulatory Audit Questions

Response to Regulatory Audit Questions

On April 8, 2021, Susquehanna Nuclear, LLC (Susquehanna), submitted a license amendment request (LAR) for the Susquehanna Steam Electric Station (SSES), Units 1 and 2 (Reference 1). Specifically, Susquehanna requested a revision to the Technical Specifications (TS) to permit the use of Risk Informed Completion Times (RICTs) in accordance with Technical Specifications Task Force (TSTF) Traveler TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times, RITSTF Initiative 4b." By letter dated June 15, 2021, the NRC informed Susquehanna of the intent to conduct a regulatory audit virtually from June 28 through December 31, 2021 (Reference 2). During the virtual audit, Susquehanna personnel and associated contractors met with members of the NRC staff to discuss specific questions provided by the NRC staff. Selected NRC questions and the Susquehanna responses are provided below.

Audit Question Q-001

[Provide] Additional justification for adding "following isolation" in the completion times for Actions A.2, C.2, and D.2 in TS 3.6.1.3.

Susquehanna Response

The proposed changes to TS 3.6.1.3, Required Actions A.2 and C.2 are consistent with the changes proposed to the BWR/4 Standard TS in TSTF-505 (Reference 3) for Limiting Condition for Operation (LCO) 3.6.1.3, Required Actions A.2 and C.2. These changes are discussed in Section 2.2.3 of the Revised Model Safety Evaluation for applications adopting TSTF-505 (Reference 4). Therefore, the proposed changes to SSES Required Actions A.2 and C.2 are encompassed within the generic approval of TSTF-505 and do not require further justification.

Condition D, however, is a Susquehanna-specific Condition for which there is no commensurate Condition in the standard TS. The Condition exists to reflect the unique design of the H_2O_2 Analyzer penetrations at SSES. A Risk Informed Completion Time (RICT) is not proposed to be applied to Required Action D.1, and the phrase "following isolation" is proposed to be added to the Completion Time for Required Action D.2 for consistency with the remainder of TS 3.6.1.3. The following discussion should have been included in Attachment 1, Section 2.3 of Reference 1.

Susquehanna proposes to make a change to the Completion Time for TS 3.6.1.3, Required Action D.2. Currently, the Required Action is to "Verify the affected penetration flow path is isolated" with a Completion Time of "Once per 31 days." Susquehanna is proposing to revise the Completion Time to "Once per 31 days following isolation"; i.e., to add the phrase "following isolation" to the end of the Completion Time. The proposed change is consistent with changes proposed to the Completion Times of Required Actions A.2 and C.2 of TS 3.6.1.3. The change was necessary for the Completion Time for Required Action A.2 to account for the

ability to use a RICT in Required Action A.1. By adding the flexibility to use a RICT to determine a time to isolate the penetration as required by Required Action A.1, the periodic verification in Required Action A.2 must then be based on the time "following isolation." A RICT cannot be applied to Required Action C.1, but the same change is made to the Completion Time for Required Action C.2 for consistency with the Completion Time for Required Action A.2 in TSTF-505. Susquehanna proposes to make the same change to the Completion Time for Required Action D.2 for consistency with the Completion Times for Required Actions A.2 and C.2.

Because a RICT cannot be applied to Required Action D.1, the isolation of the penetration must always occur within 72 hours of identifying inoperable PCIVs. Thus, the proposed change would allow at most a 72 hour extension prior to the first performance of Required Action D.2, which is less than the potential 30 day extension allowed for the initial performance of Required Action A.2, as approved by TSTF-505. Additionally, the potential 72 hour extension prior to the first performance of Required Action D.2 is less than the 186 hour extension allowed for all subsequent performances of Required Action D.2 per Surveillance Requirement 3.0.2. Further, operations policy statements and procedures provide guidance for equipment control throughout the plant and require use of status change mechanisms for any component manipulations. Thus, components are not expected to be found in a state other than the ones in which they are left, thereby providing confidence that the maximum additional 72 hours to perform the initial verification in Required Action D.2 will not result in anything other than satisfactorily demonstrating the penetration flow path remains isolated.

Audit Question Q-002

EITHER:

Confirm that F&O [Fact & Observation Finding] 1-18 has been resolved by showing that Susquehanna has (1) reviewed and updated the list of internal events PRA [Probabilistic Risk Assessment] modeling assumptions and sources of uncertainty based on the disposition of the 2020 F&O closure review team, (2) provided dispositions that are specific to this application, and (3) addressed, in accordance with NEI [Nuclear Energy Institute (NEI) Topical Report] 06-09, Revision 0-A, any assumptions or sources of uncertainty determined to be potentially key to this application (e.g., performed a sensitivity study demonstrating that they have an inconsequential impact on the risk-informed completion time (RICT) calculations, or identified programmatic changes to compensate for this modeling uncertainty). Also, confirm whether Report EC-RISK-0056, "Assessment of Key Assumptions and Sources of Uncertainty for Risk-Informed Applications" (dated February 08, 2021), which predates the TSTF-505 LAR dated April 8, 2021, represents the review update of the internal events PRA uncertainty analysis.

OR:

If the licensee cannot confirm that F&O 1-18 has been resolved per the above, then explain how the licensee will ensure (e.g., via a license condition or an implementation requirement), prior to implementation of the Risk-Managed Technical Specifications (RMTS) program, that it will: (1) review and update the list of internal events PRA modeling assumptions and sources of uncertainty, (2) update the associated dispositions that are specific to this application, and (3) fully address any impacts on the RMTS program (including those determined to be key for this application) in accordance with NEI 06-09, Revision 0-A.

Susquehanna Response

The Full Power Internal Events (FPIE) F&O 1-18 was closed during the 2021 F&O Closure Review Meeting which was performed in accordance with the NEI Appendix X Process (Reference 61). Susquehanna document NQPA-B-NA-012, (Reference 5), provides the response to F&O 1-18. Appendix B of NQPA-B-NA-012 outlines the review of SSES FPIE assumptions, and sources of uncertainty.

Audit Question Q-003

a. Describe how the plant configurations (i.e., TS LCO conditions) were chosen in the sensitivity studies to assess the impact of potential key assumptions and sources of uncertainty. Also include in this discussion the bases for selecting these plant configurations.

b. Justify how the process described in part (a), above, is sufficient to conclude that, based on the sensitivity study RICT estimates, the impact of the associated modeling uncertainty on the RICT calculations is inconsequential.

Susquehanna Response

Question 3.a

Where applicable, the plant configurations (i.e., TS LCO conditions) were chosen based on the safety function that the system in question supported and what LCOs would likely have elevated importance values given the issue in question. If the source of uncertainty was not directly tied with a system, then a variety of TS LCO conditions were chosen. The sensitivity analyses included an examination of the base case results as well as the results of the impact on the RICT values for the chosen TS LCO conditions. Table Q3-1 provides more information about the selected TS LCO conditions explored for the sensitivity cases.

Table Q3-1
Basis for Chosen TS LCO Conditions

Sensitivity Case	Description	Chosen LCO Conditions
1	Room heatup calculations (Emergency Safeguard Service Water (ESSW) pumphouse ventilation with doors open)	TS LCO Conditions were chosen based on relationship with the ESSW pumphouse equipment (Emergency Service Water (ESW) and Residual Heat Removal Service Water (RHRSW)). This included Residual Heat Removal (RHR) suppression pool cooling, an RHRSW subsystem, one diesel generator (DG), and an ESW subsystem.
2	Vapor suppression capabilities at vessel failure	Representative TS LCO Conditions were chosen to explore a range of cases that might be susceptible to the calculated Large Early Release Frequency (LERF) values that would be impacted by this source of uncertainty. This included Reactor Protection System (RPS), Emergency Core Cooling System (ECCS) Instrumentation, one low pressure ECCS system, High Pressure Coolant Injection (HPCI), Reactor Core Isolation Cooling (RCIC), and one DG.
3	Control Rod Drive (CRD) injection capability after containment failure	TS LCO Conditions were selected to explore a range of cases that might be susceptible to loss of containment heat removal scenarios that would be impacted by this source of uncertainty. This included suppression pool cooling, RHRSW, ESW, and one DG. These systems were deemed to be more risk significant given an increase in the likelihood that the containment failure size disrupts the capability to inject with CRD.
4	Potential for inadvertent flooding of steam lines to fail the Safety Relief Valves (SRVs)	TS LCO Conditions were selected to explore a range of cases that might be susceptible to loss of Reactor Pressure Vessel (RPV) depressurization capabilities that would be impacted by this source of uncertainty. This included HPCI, RCIC, and suppression pool cooling. These systems were deemed to be more risk significant given an increase in the likelihood that the SRVs fail given inadvertent flooding of the steam lines.

Table Q3-1
Basis for Chosen TS LCO Conditions

Sensitivity Case	Description	Chosen LCO Conditions
5	Potential for inadvertent flooding of steam lines to fail HPCI and RCIC	TS LCO Conditions were selected to explore a range of cases that might be susceptible to loss of HPCI or RCIC that would be impacted by this source of uncertainty. This included HPCI, RCIC, one DG, and an ESW subsystem. These systems were deemed to be more risk significant given an increase in the likelihood that HPCI or RCIC fail given inadvertent flooding of the steam lines.
6	Portable Equipment Reliability	TS LCO Conditions were selected to explore a range of cases that might be susceptible to loss of the portable equipment that would be impacted by this source of uncertainty. This included HPCI, suppression pool cooling, one or two offsite Alternating Current (AC) power circuits, one DG, and also the combination of one offsite circuit and a DG. These systems were deemed to be more risk significant given an increase in the failure probabilities associated with the portable equipment credited in the model.

Question 3.b

The process which included an examination of the changes to the base case results as well as changes to judiciously selected sample TS LCO conditions is consistent with the guidance in NEI 06-09, Revision 0-A, (Reference 8) which indicates the following with respect to the performance of sensitivity studies:

> Although this assessment is not intended to be exhaustive, the general guidance should be that the impact of the key modeling uncertainties and associated key assumptions is limited when reasonable alternate modeling assumptions do not result in significant increases to plant risk.

Based on the results presented and discussed in EC-RISK-0056 (Reference 6) and the revised results for the ESSW pumphouse ventilation in response to audit question Q-004, the impact of the associated sources of uncertainty do not warrant any additional Risk Management Actions (RMAs) for RICT implementation.

<u>Audit Question Q-004</u>

EITHER:

Report the results of a sensitivity study in which the increase in the operator failure probability in the sensitivity case is set low enough that it is not unrealistic but high enough that it tests the modeling uncertainty to demonstrate that this modeling uncertainty is not “key” for the RMTS program and has an inconsequential impact on the RICT calculations. Also, describe this sensitivity study and justify the appropriateness of the selected operator failure probability used in the sensitivity case. Provide the bases for the chosen plant configurations (i.e., TS LCO conditions) in this sensitivity study.

OR:

Describe the programmatic changes to compensate for this modeling uncertainty and the basis for them (e.g., identification of additional RMAs, program restrictions, or the use of bounding analyses which address the impact of the uncertainty). This discussion should also identify the TS LCO conditions in scope of RMTS for which the RICT calculations are impacted by this uncertainty and discuss how the RICTs are impacted (e.g., describe and provide the results of applicable sensitivity studies). If the programmatic changes include identification of additional RMAs, then (1) describe how these RMAs will be identified prior to the implementation of the RMTS program, consistent with the guidance in Section 2.3.4 of NEI 06-09, Revision 0-A; and (2) provide RMA examples that may be considered during a RICT program entry to minimize any potential adverse impact from this uncertainty, and explain how these RMAs are expected to reduce the risk associated with this uncertainty.

OR:

Provide a detailed justification (e.g., propose an implementation item to update the PRA to address this modeling uncertainty and discuss how this update addresses this uncertainty; describe and provide the results of a different type of sensitivity study) that this modeling uncertainty does not need to be addressed in the RMTS program as required by Section 2.3.4 of NEI 06-09-A.

<u>Susquehanna Response</u>

Additional sensitivity studies were performed to assess the impact of uncertainty associated with the operator action to open the pump house doors. A factor of 3x was chosen as a reasonably conservative value for the dependent and independent human error probabilities (HEPs) (i.e., set low enough that it is not unrealistic but high enough that it tests the modeling uncertainty). A factor of three is appropriate as a sensitivity value because it is representative of

the change in reliability between a mean value and an upper bound (95th percentile) for typical reliability distributions. For example, for a lognormal distribution the ratio of the 95th percentile to the mean value would be approximately 2.4 for an error factor of 3 and 3.5 for an error factor of 10.

TS LCO Conditions were selected to explore a range of cases that might be susceptible to the operator action for opening the pumphouse doors. This included RHR suppression pool cooling, an RHRSW subsystem, an ESW subsystem, and one DG. These systems were deemed to be more risk significant given an increase in the HEP for opening the ESSW Pumphouse doors. The changes to the operator action for the sensitivity cases are shown in Table Q4-1. The results are summarized in Table Q4-2.

Table Q4-1
Pumphouse Ventilation Operator Actions

Basic Event	Description	Base Value	Sensitivity Value
016-N-N-VENT-O (FPIE Model)	Operator Fails to Open ESSW Pumphouse for RHRSW Ventilation	1.16E-03	3.48E-03
016-N-N-VENT-OF (FPRA Model)	Operator Fails to Open ESSW Pumphouse for RHRSW Ventilation	1.09E-02	3.27E-02
016-N-N-VENT-O (Flood Model)	Operator Fails to Open ESSW Pumphouse for RHRSW Ventilation	1.20E-03	3.60E-03
Various	Multiple dependent HEPS involving 016-N-N-VENT-O or 016-N-N-VENT-OF	Various	All set to 3x base value

Table Q4-2
Pumphouse Ventilation Human Error Probability Sensitivity RICT Estimate Results

TS	TS/LCO Condition	Base Model RICT Estimate (days)	Sensitivity RICT Estimate (days)	Percent Change for Total CDF	Percent Change for Total LERF
3.6.2.3.A	One RHR suppression pool cooling subsystem inoperable	30	30	2.2%	0.5%
3.7.1.B	One RHRSW subsystem inoperable	30	30	1.7%	0.5%
3.7.2.C	One ESW subsystem inoperable	2.7	2.6	1.3%	0.2%
3.8.1.B	One DG inoperable	30	30	25.7%	10.5%

As can be seen in Table Q4-2, the RICTs are not very sensitive to the assumed pumphouse ventilation HEP values. Most of the cases resulted in no more than about 1 percent change in the total Core Damage Frequency (CDF) and LERF values and either no or very small change to the calculated RICT values. TS 3.8.1, Condition B showed the largest increase, but this case had calculated RICTs from CDF much greater than the backstop of 30 days and were more limited by the total LERF value. That is, the calculated RICT for TS 3.8.1, Condition B went from 41.4 to 33.3 days. As such, this is not judged to be significant given the conservative nature of this sensitivity study.

Based on the results of the sensitivity studies described above, the pumphouse ventilation HEP is not identified as a key source of uncertainty for the RICT Program. Additionally, as noted in Enclosure 12 of Reference 1, RMAs will be informed by the Real-Time Risk (RTR) tool, station procedures, and other information to help identify configuration-specific RMA candidates to manage the risk associated with internal events, internal flooding, and fire events. These RMAs can include the identification of important operator actions for incorporation into briefings when they are significant to the configuration.

Audit Question Q-005

Describe the FLEX [Diverse and Flexible Coping Strategies] strategies credited for the internal events (including internal flooding) and fire PRA models.

Susquehanna Response

There are three high level FLEX strategies credited in the FPIE and Fire PRA (FPRA) models. This includes aligning two of the three turbine marine generators to the Engineered Safeguard

System (ESS) 4160 VAC buses, venting containment via the Hardened Containment Vent System (HCVS), and providing extended RPV injection via RCIC with eventual transition to portable pumper truck injection. Each of these are discussed in turn.

Alignment of Turbine Marine Generators

The alignment of the FLEX turbine marine generators is dictated by Susquehanna procedure DC-FLEX-010 (Reference 9). The purpose of DC-FLEX-010 is to provide instructions to supply 4160 VAC power to the eight ESS buses (1A201, 1A202, 1A203, 1A204, 2A201, 2A202, 2A203, and 2A204) within six hours after an Extended Loss of AC Power (ELAP) is declared. The procedure connects temporary turbine marine generators to the DG and ESS bus to energize the Class 1E 480 VAC electrical distribution system and repower the Class 1E battery chargers. Note that electrical alignments, load shedding, and fuel oil strategy deployment and assembly are performed in parallel with FLEX electrical equipment deployment. Success of this strategy involves Direct Current (DC) load shed, deployment & alignment of the turbine marine generators, AC load shedding, and refueling the turbine marine generators.

Venting Containment via HCVS

Venting containment through the HCVS is dictated by Susquehanna procedures ES-173-007 and ES-273-007, for Units 1 and 2, respectively (References 10 and 11). This procedure is used to vent the suppression chamber through the HCVS. Success of this flowpath vents the drywell through the suppression pool and out of the HCVS directly outside of secondary containment. This vent path is available in a Station Blackout (SBO) and is the preferred vent path in an ELAP or a Beyond Design Bases Event. This is also the preferred vent path for anticipatory venting in an ELAP event.

Extended RPV Injection

The FLEX strategy for RPV injection includes initial injection from RCIC. Extended RCIC operation requires successful alignment of the turbine marine generators to provide power to the Class 1E battery chargers as described above such that DC power remains available to RCIC. Extended RCIC operation with suction from the suppression pool also requires alignment of the portable pumper truck to provide lube oil cooling. For Unit 1, this action is directed by DC-FLEX-101 (Reference 12); the commensurate Unit 2 procedure is DC-FLEX-201 (Reference 13). Long term success requires eventual transition of RPV injection to a low-pressure system (i.e., portable pumper truck, but this function can also be provided by the installed diesel driven fire pump). Transition to the low-pressure injection system also requires that RPV pressure be reduced to between 150-300 psig while RCIC is operating and prior to depressurizing further to allow low pressure injection to provide inventory makeup.

Audit Question Q-006

Identify the FLEX equipment credited and whether that equipment is portable or permanently installed, and:

a. Discuss whether the credited FLEX equipment (regardless of whether it is portable or permanently installed) is similar to other plant equipment credited in the PRA (e.g., systems, structures, and components (SSCs) with sufficient plant-specific or generic industry data).

b. For credited FLEX equipment that is not similar to other plant equipment credited in the PRA:

   i. Discuss the data and failure rates used to support its modeling and provide the rationale for using the chosen data and any "conservative adjustments" that were made to the generic reliability values for similar equipment. Discuss whether the uncertainties associated with the parameter values are in accordance with the ASME/ANS [American Society of Mechanical Engineers / American Nuclear Society] PRA Standard, as endorsed by RG [Regulatory Guide] 1.200, Revision 2.

   ii. Describe the sensitivity study performed to assess the impact of uncertainty associated with equipment failure probabilities on calculated RICTs and present the results of that study. Justify how the increase in equipment failure probabilities used in the sensitivity case constitutes bounding realistic estimates. Also, discuss the bases for the chosen TS LCO conditions in the sensitivity study. Because the 30-day RICT back-stop condition could mask the impact of this uncertainty in the sensitivity study, discuss whether the RICTs for plant configurations involving more than one LCO entry (e.g., where the calculated RICTs are less than the 30-day backstop) are significantly impacted by this uncertainty.

   iii. Discuss whether the uncertainty associated with equipment failure probabilities is a key source of uncertainty for the RMTS program. If this uncertainty is "key," then describe and provide a basis for how this uncertainty will be addressed in the RMTS program (e.g., programmatic changes such as identification of additional RMAs, program restrictions, or the use of bounding analyses which address the impact of the uncertainty). If the programmatic changes include identification of additional RMAs, then (1) describe how these RMAs will be identified prior to the implementation of the RMTS program, consistent with the guidance in Section 2.3.4 of NEI 06-09, Revision 0-A; and (2) for those TS LCOs in LAR Enclosure 12 ("Risk Management Action Examples") that are significantly impacted by this uncertainty, provide updated RMAs that may be considered during a RICT program entry to minimize any potential adverse impact from this uncertainty, and explain how these RMAs are expected to reduce the risk associated with this uncertainty.

Susquehanna Response

Question 6.a

The credited FLEX equipment includes the 4160 VAC turbine marine generators, the HCVS, and the pumper truck. The unique equipment reliability values are based on similarities to other equipment. The 4160 VAC turbine marine generators are assumed to be similar to the DGs, the HCVS did not introduce any unique component types, and pumper truck is assumed to be similar to diesel driven pumps.

Question 6.b.i

The data and failure rates for the turbine marine generators and pumper truck are shown in Table Q6-1. A factor of 2x the data for similar component types was judged as reasonably conservative until more appropriate generic data becomes available. A lognormal distribution with an error factor of 5 is assumed for these type codes which is sufficient to meet the PRA standard for these non-risk significant component types.

Table Q6-1
FLEX Equipment Type Codes

Type Code	Description	Basis	Failure Rate
DGT [1]	Start and Run Failure Rate for FLEX 4160 V Turbine Generators	2 x [(DGS + 23 x (DGR)] 2 x [7.4E-3 + 23 x 8.5E-4]	5.37E-02
PTT [2]	Start and Run Failure Rate for Fire Protection Pumper Truck	2 x [(DDP + 23 x (DDR)] 2 x [5.5E-3 + 23 x 9.5E-5]	1.53E-02

1. Start and run failure rate for turbine marine generators.
2. Start and run failure rate for fire protection pumper truck.

Question 6.b.ii

Additional sensitivity studies were performed to assess the impact of uncertainty associated with the FLEX equipment failure probabilities on calculated RICTs. A factor of 5x was chosen as a very conservative bounding value for the FLEX portable equipment failure probabilities. TS LCO Conditions were selected to explore a range of cases that might be susceptible to the FLEX portable equipment reliability values. This included HPCI, RHR suppression pool cooling, one offsite AC power circuit, one DG, and the combination of one offsite circuit and a DG. Sensitivity studies were also included for additional select LCO combinations that have RICTs

less than 30 days. This included one Automatic Depressurization System (ADS) valve and one Core Spray (CS) Loop, one ESW pump in each subsystem, and two offsite AC power circuits. The results are summarized in Table Q6-2.

As can be seen in Table Q6-2, the RICT Completion Times are not very sensitive to the assumed FLEX equipment reliability values. Most cases resulted in less than a five percent change in the total CDF and LERF values and either no or very small change to the calculated RICT values. Two cases were slightly above five percent (i.e., LCO 3.8.1, Conditions B and D) but both of these cases were above the backstop RICT value of 30 days. One case (LCO 3.8.1, Condition C) did impact the calculated RICT value by a little more than ten percent, but this is judged not be significant considering the TS Condition and the very bounding nature of the sensitivity study.

Table Q6-2
FLEX Equipment Reliability Sensitivity RICT Estimate Results

TS	TS/LCO Condition	Base Model RICT Estimate (days)	Sensitivity RICT Estimate (days)	Percent Change for Total CDF	Percent Change for Total LERF
3.5.1.D	HPCI system inoperable	30	30	2.3%	0.0%
3.5.1.G	One ADS valve and Condition A (i.e., one CS Loop)	10.2	10.2	0.4%	0.0%
3.6.2.3.A	One RHR suppression pool cooling subsystem inoperable	30	30	2.9%	0.0%
3.7.2.A	One ESW Pump in Each Subsystem	3.7	3.7	2.4%	0.8%
3.8.1.A	One offsite AC power circuit inoperable	30	30	4.3%	0.3%
3.8.1.B	One DG inoperable	30	30	7.2%	0.1%
3.8.1.C	Two or more offsite AC power circuits inoperable	6.8	6.0	13.1%	2.2%
3.8.1.D	One offsite AC power circuit AND one DG inoperable	30	30	7.4%	0.2%

Question 6.b.iii

Based on the results of the sensitivity studies described above, the FLEX equipment reliability values are not identified as a key source of uncertainty for the RICT Program.

Audit Question Q-007

a. Identify the FLEX operator actions credited in the PRA and discuss whether any of these operator actions contain actions described in Sections 7.5.4 and 7.5.5 of NEI 16-06.

b. For credited operator actions related to FLEX equipment that contain actions described in Sections 7.5.4 and 7.5.5 of NEI 16-06:

   i. Describe the sensitivity study performed to assess the impact of uncertainty associated with FLEX HEPs (both the FLEX independent and dependent HEPs) on calculated RICTs and present the results of that study. Justify how the increase in the FLEX HEPs used in the sensitivity case constitutes bounding realistic estimates. Also, discuss the bases for the chosen TS LCO conditions in the sensitivity study. Because the 30-day RICT back-stop condition could mask the impact of this uncertainty in the sensitivity study, discuss whether the RICTs for plant configurations involving more than one LCO entry (e.g., where the calculated RICTs are less than the 30-day backstop) are significantly impacted by this uncertainty.

   ii. Discuss whether the uncertainty associated with FLEX HEPs is a key source of uncertainty for the RMTS program. If this uncertainty is "key," then describe and provide a basis for how this uncertainty will be addressed in the RMTS program (e.g., programmatic changes such as identification of additional RMAs, program restrictions, or the use of bounding analyses which address the impact of the uncertainty). If the programmatic changes include identification of additional RMAs, then (1) describe how these RMAs will be identified prior to the implementation of the RMTS program, consistent with the guidance in Section 2.3.4 of NEI 06-09, Revision 0-A; and (2) for those TS LCOs in LAR Enclosure 12, "Risk Management Action Examples," that are significantly impacted by this uncertainty, provide updated RMAs that may be considered during a RICT program entry to minimize any potential adverse impact from this uncertainty, and explain how these RMAs are expected to reduce the risk associated with this uncertainty.

Susquehanna Response

Question 7.a

The credited FLEX operator actions are listed below in Table Q7-1. Three of the actions (013-PUMPER-TRUCK-O, 024-ELAP-O, and 150-LUBE_COOLER-O) do include some of the types of steps described in Sections 7.5.4 and 7.5.5 of NEI 16-06 (Reference 14). The operator actions related to use of the HCVS (173-HCVS-CR-O and 173-HCVS-ROS-O) do not include any of the types of steps described in Sections 7.5.4 and 7.5.5 of NEI 16-06. The values listed in Table Q7-1 are for the FPIE PRA model and for the FPRA model.

Table Q7-1
FLEX Operator Actions

Basic Event	Description	FPIE Value	FPRA Value
013-PUMPER-TRUCK-O	Operators Fail to Implement DC-B5B-102/202 for Pumper Truck Injection	1.68E-02	1.68E-02
024-ELAP-O [Note 1]	Operator Fails to Align the Turbine Marine Generators	8.85E-02	8.39E-02
150-LUBE_COOLER-O	Operators Fail to Implement DC-FLEX-101 (RCIC Lube Oil Cooling and Ventilation)	4.19E-02	4.83E-02
173-HCVS-CR-O	Operator Fails to Vent w/ HCVS from the Control Room	6.92E-03	7.92E-03
173-HCVS-ROS-O	Operator Fails to Manually Vent w/ HCVS from the Remote Operating Station	7.02E-03	9.05E-03

1. There was an execution recovery dependence factor (DF) for a subtask within the fire version of the operator action to align the Turbine Marine Generators for FLEX conditions (024-ELAP-OF) that was different than the FPIE version (024-ELAP-O). When that DF is set to the same value in both versions, the FPIE and FPRA values agree exactly. The DF from the FPIE version will be maintained in both versions moving forward (this action is being tracked via Susquehanna Risk Model Impact Evaluation 20211110-002, and Susquehanna action DPA-73-DI-2019-11506). However, there is minimal impact on the HEP values used and this discrepancy would not materially impact the results of the base FPRA or the results of the sensitivity studies provided below.

Question 7.b.i

Additional sensitivity studies were performed to assess the impact of uncertainty associated with the FLEX portable equipment HEPs on calculated RICTs. A factor of 3x was chosen as a reasonably conservative bounding value for the dependent and independent HEPs. Consistent with the guidance in NEI 04-10 (Reference 15), a factor of three is appropriate as a sensitivity value because it is representative of the change in reliability between a mean value and an upper bound (95th percentile) for typical reliability distributions. For example, for a lognormal distribution the ratio of the 95th percentile to the mean value would be approximately 2.4 for an error factor of 3 and 3.5 for an error factor of 10. TS LCO Conditions were selected to explore a range of cases that might be susceptible to the FLEX portable equipment HEP values. This included HPCI, RHR suppression pool cooling, one offsite AC power circuit, one DG, and the combination of one offsite circuit and a DG. Sensitivity studies were also included for additional select LCO combinations that have RICTs less than 30 days. This included one ADS valve and one CS Loop, one ESW pump in each subsystem, and two offsite AC power circuits. The results are summarized in Table Q7-2.

Table Q7-2
FLEX Human Error Probability Sensitivity RICT Estimate Results

TS	TS/LCO Condition	Base Model RICT Estimate (days)	Sensitivity RICT Estimate (days)	Percent Change for Total CDF	Percent Change for Total LERF
3.5.1.D	HPCI system inoperable	30	30	2.2%	0.4%
3.5.1.G	One ADS valve and Condition A (i.e., one CS Loop)	10.2	10.2	0.4%	0.1%
3.6.2.3.A	One RHR suppression pool cooling subsystem inoperable	30	30	2.8%	0.3%
3.7.2.A	One ESW Pump in Each Subsystem	3.7	3.7	2.1%	1.1%
3.8.1.A	One offsite AC power circuit inoperable	30	30	4.2%	0.6%
3.8.1.B	One DG inoperable	30	30	6.4%	0.4%
3.8.1.C	Two or more offsite AC power circuits inoperable	6.8	6.1	11.2%	2.1%
3.8.1.D	One offsite AC power circuit AND one DG inoperable	30	30	6.6%	0.4%

As can be seen in Table Q7-2, the RICT Completion Times are not very sensitive to the assumed FLEX HEP values. Most of the cases resulted in less than a five percent change in the total CDF and LERF values and either no or very small change to the calculated RICT values. TS 3.8.1, Conditions B and D had calculated RICTs much greater than the backstop of 30 days and were limited by the LERF value such that it also had negligible impact. TS 3.8.1, Condition C did result in about a ten percent reduction in the RICT value, but this is not judged to be significant given the conservative nature of this sensitivity study.

Question 7.b.ii

Based on the results of the sensitivity studies described above, the FLEX portable equipment HEP values are not identified as a key source of uncertainty for the RICT Program. Additionally, as noted in Enclosure 12 of Reference 1, RMAs will also be informed by the RTR tool, station procedures, and other information to help identify configuration-specific RMA candidates to manage the risk associated with internal events, internal flooding, and fire events. These RMAs can include the identification of important operator actions for incorporation into briefings when they are significant to the configuration.

Audit Question Q-008

Given the challenges of modeling FLEX mitigation strategies, explain whether the review of the FLEX modeling was included in the last peer review of the PRA models. If it was not, then justify how the model changes associated with incorporating FLEX mitigating strategies does not constitute a PRA upgrade as defined in Section 1-2 of ASME/ANS RA-Sa-2009, as endorsed by RG 1.200, Revision 2.

Susquehanna Response

The last full peer review of the Susquehanna PRA models was performed for the FPRA model in early 2018 (Reference 16). It is noted in Section 1 of that report:

> Additionally, to account for procedural and hardware changes associated with EPG/SAG [Emergency Procedure Guideline / Severe Accident Guideline], Revision 3, and mitigating strategies involving FLEX equipment and installation of a Hardened Containment Vent System (HCVS) at SSES, an OCT17 model was created, which is the starting point for the Fire PRA model.

Therefore, the FLEX modeling was included in the last peer review of the PRA models.
In any event, additional information is also provided to support that incorporating the FLEX mitigation strategies does not constitute an upgrade for SSES.

Incorporation of FLEX into the SSES PRA model is a reflection of plant modifications and procedure changes. Updating the model to reflect such a change is necessary to maintain the model as representative of the as-built, as-operated plant. Accident sequences progress in the same manner as before, except there is the possibility of extended time for power to be available and alternate injection sources. Risk estimation capability is not changed, all FLEX system implementations were made utilizing the existing PRA methodology.

The model changes associated with incorporating FLEX mitigating strategies and their disposition regarding (1) new methodology, (2) change in scope and (3) change in capability are noted in Table Q8-1.

The term "new method" used in this disposition is consistent with Table A-1 of RG 1.200, Revision 2 (Reference 17).

The Scope attribute is defined consistent with Section C of RG 1.200, i.e., "The scope of the PRA ...is defined in terms of (1) the metrics used to characterize risk, (2) the plant operating states for which the risk is to be evaluated, and (3) the causes of initiating events (hazard groups) that can potentially challenge and disrupt the normal operation of the plant and, if not prevented or mitigated, would eventually result in core damage and/or a large release."

Consistent with concepts in RG 1.200, as well as the basis for Capability Category (CC) distinctions in the PRA Standard, the term capability used in this disposition is defined in terms of degree of analysis detail and plant-specific realism. Implementation of this criterion in the context of determining whether a specific PRA change represents an upgrade is whether the change would increase the CC (from Not Met or CC-I to CC-II) for one or more Supporting Requirements (SRs).

Table Q8-1
Summary of FLEX Model Changes in the SSES PRA

PRA Model Change	New Method (1)	Change in Scope (2)	Change in Capability (3)	Significant Impact on Sequences (4)	Comment
Alignment of Turbine Marine Generators	No	No	No	---	The SSES modeling of the 4160 VAC buses was modified to include the required equipment and operator actions necessary to align the FLEX turbine marine generators to supply 4160 VAC power to the eight ESS buses (1A201, 1A202, 1A203, 1A204, 2A201, 2A202, 2A203, and 2A204) within six hours. Failure rate values for new equipment is described in response to Q-006. All the HEPs for FLEX components were evaluated with the same methodology used for all HEPs in the SSES PRA models as documented in the SSES Human Reliability Analysis (HRA) notebook (Reference 18). No new methods were employed. The scope of the model remains identical and no change in the CCs for any SR apply.
Venting Containment via the HCVS	No	No	No	---	This is an edit to the existing fault tree logic for containment venting and corresponding top logic in the event trees. No new methods were employed. The scope of the model remains identical and no change in the CCs for any SR apply.
Extended RPV Injection	No	No	No	---	The fault tree and event tree logic were adjusted to allow extended RCIC operation. This requires successful alignment of the turbine marine generators to provide power to the Class 1E battery chargers as described above such that DC power remains available to RCIC. Extended RCIC operation with suction from the suppression pool also requires alignment of the portable pumper truck to provide lube oil cooling. Long term success requires eventual transition of RPV injection to a low pressure system (i.e., portable pumper truck, but this function can also be provided by the installed diesel driven fire pump). Transition to the low pressure injection system also requires that RPV pressure be reduced to between 150-300 psig while RCIC is operating and prior to depressurizing further to allow low pressure injection to provide inventory makeup. No new methods were employed. The scope of the model remains identical and no change in the CCs for any SR apply.

Table Notes

1. New Method: Consistent with Table A-1 of RG 1.200, Revision 2, the term “new method” refers to an analysis method (i.e., not documentation method) that is new to the subject PRA even if the method itself is not new and has been applied in other PRAs. This term also

encompasses newly developed methods in the industry that have been implemented in the base PRA in question.

2. Change in Scope: Consistent with Section C of RG 1.200, Revision 2, the term PRA scope is defined in terms of the following three attributes:

   The metrics used to characterize risk, (2) the plant operating states for which the risk is to be evaluated, and (3) the causes of initiating events (hazard groups) that can potentially challenge and disrupt the normal operation of the plant and, if not prevented or mitigated, would eventually result in core damage and/or a large release.

3. Change in Capability: Consistent with concepts in RG 1.200, Revision 2 as well as the basis for CC distinctions in the PRA Standard, this term is defined in terms of degree of analysis detail and plant-specific realism. Implementation of this criterion in the context of determining whether a specific PRA change represents an upgrade is whether the change would increase the CC (from Not Met or CC-I to CC-II) for one or more SRs.

4. Impact on Significant Accident Sequences or Significant Accident Progression Sequences: This term encompasses both Level 1 (core damage) and Level 2 (post-core damage) accident sequences. This criterion is interpreted in this context of "PRA Upgrade" as the top 95 percent of sequences and whether the makeup of those sequences have been significantly impacted. Whether the makeup of the top 95 percent of the sequences is determined to be significantly impacted is based on a qualitative consideration as to whether the change in the sequences would likely change decision making when applying the PRA in risk applications. For example, top sequences in the top 95 percent that for the model change drop out of the top 95 percent would be a case where justification should be provided as to why the change in question is not considered an upgrade or it should be identified as an upgrade. NOTE: Per the ASME PRA Standard Addenda A and RG 1.200, Revision 2 definition of PRA upgrade, this criterion is logically AND'ed with the other criteria of first having to be a change in scope or a change in capability.

<u>Audit Question Q-009</u>

a. Provide a summary of how the SOKC [State of Knowledge Correlation] was performed for the base Susquehanna PRA models used to support the RMTS application. Provide and discuss the results of this SOKC investigation and whether the SOKC uncertainty has a significant impact on the RICT calculations.

b. Provide and discuss the results of a comparison study between the RICT values calculated using point estimate risk versus mean risk for various LCO conditions in scope of RMTS. The LCO conditions selected for this comparison study should have a point estimate RICT

less than 30 days (i.e., the 30-day backstop does not mask the comparison results), and are considered most likely to be impacted by the SOKC uncertainty (i.e., point estimate RICT versus mean RICT). Provide the bases for the chosen LCO conditions in this comparison study. Also, provide the intermediate risk results from these RICT calculations (e.g., the CDFs and LERFs for the baseline case using point estimates and sensitivity case using mean values from the FPIE, Internal Flooding PRA (IFPRA), and FPRA).

c. Based on the results above, provide a summary of how the SOKC will be addressed for RICT calculations during RMTS implementation (i.e., based upon the risk metrics to be considered), and explain how this process/approach is consistent with NUREG-1855, Revision 1.

Susquehanna Response

Question 9.a:

The base Susquehanna PRA models evaluate SOKC uncertainties via Monte Carlo sampling using the UNCERT software. Although the mean CDF and LERF values derived via Monte Carlo sampling are indeed higher than the corresponding base case point estimate CDF and LERF values, the RICT Program is minimally impacted due to the fact that it is a "delta" type application (i.e., acceptability is based on the difference between a base model and a model with equipment unavailable). That is to say that both the base results and the configuration-specific results would increase by using the mean values (rather than the point estimates), but the delta calculations would be minimally impacted. The sensitivity analysis on the RICT program is discussed in part (b) of this response.

Question 9.b:

As a sensitivity, the delta risk was evaluated for point estimate and mean values for representative TS conditions. The cases were chosen to cover a variety of TS conditions which would be less than 30 days. Monte Carlo simulation was then used with 50,000 samples to calculate the corresponding mean values. Table Q9-1 provides the overview results of these calculations which show that the delta-risk results using mean and point estimate values are very similar and are not significant to the RICT Program (i.e., less than 0.5-day change for each sampled case). Table Q9-2 provides the intermediate results of the calculations that support Table Q9-1 (i.e., the CDFs and LERFs for the baseline case using point estimates and sensitivity case using mean values from the FPIE, IFPRA, and FPRA).

Table Q9-1
Summary of Mean vs Point Estimate Results

	CDF Point Estimate (/yr)	CDF Propagated Mean (/yr)	LERF Point Estimate (/yr)	LERF Propagated Mean (/yr)
Base Result	4.32E-05	4.52E-05	5.15E-06	5.25E-06
TS 3.3.5.1.B	**Instrumentation ECCS - As required by Required Action A.1**			
TS Result	7.99E-05	7.93E-05	3.75E-05	3.64E-05
Delta	3.67E-05	3.41E-05	3.23E-05	3.12E-05
% Increase in Delta	n/a	-7.1%	n/a	-3.5%
RICT (days)	30.0	30.0	11.3	11.7
TS 3.5.1.A	**One Low Pressure ECCS Subsystem Inoperable**			
TS Result	5.43E-04	5.45E-04	2.12E-05	2.10E-05
Delta	5.00E-04	5.00E-04	1.60E-05	1.58E-05
% Increase in Delta	n/a	0.0%	n/a	-1.6%
RICT (days)	7.3	7.3	22.8	23.2
TS 3.5.1.G	**One ADS Valve and Condition A (e.g., One CS Loop)**			
TS Result	4.03E-04	3.99E-04	3.54E-05	3.54E-05
Delta	3.59E-04	3.54E-04	3.03E-05	3.01E-05
% Increase in Delta	n/a	-1.6%	n/a	-0.5%
RICT (days)	10.2	10.3	12.1	12.1
TS 3.7.2.A	**One ESW Pump in Each Subsystem**			
TS Result	1.02E-03	1.02E-03	2.18E-05	2.21E-05
Delta	9.77E-04	9.76E-04	1.66E-05	1.68E-05
% Increase in Delta	n/a	-0.1%	n/a	1.3%
RICT (days)	3.7	3.7	22.0	21.7
TS 3.8.1.C	**Two Offsite Circuits Inoperable**			
TS Result	5.80E-04	5.99E-04	2.75E-05	2.81E-05
Delta	5.37E-04	5.54E-04	2.24E-05	2.29E-05
% Increase in Delta	n/a	3.2%	n/a	2.0%
RICT (days)	6.8	6.6	16.3	16.0

Table Q9-2
Details of Mean vs Point Estimate Results

	CDF Point Estimate (/yr)	CDF Propagated Mean (/yr)	LERF Point Estimate (/yr)	LERF Propagated Mean (/yr)
FPIE Base	1.23E-06	1.54E-06	2.46E-07	3.29E-07
FPRA Base	4.11E-05	4.28E-05	4.70E-06	4.71E-06
IFPRA Base	8.90E-07	8.91E-07	2.06E-07	2.06E-07
Total Base	4.32E-05	4.52E-05	5.15E-06	5.25E-06
TS 3.3.5.1.B	**Instrumentation ECCS - As required by Required Action A.1**			
FPIE Result	1.29E-06	1.60E-06	2.46E-07	3.05E-07
FPRA Result	7.60E-05	7.51E-05	3.65E-05	3.54E-05
IFPRA Result	8.94E-07	8.95E-07	2.06E-07	2.07E-07
Seismic Penalty	1.70E-06		5.10E-07	
Total for Configuration	7.99E-05	7.93E-05	3.75E-05	3.64E-05
Delta for Configuration	3.67E-05	3.41E-05	3.23E-05	3.12E-05
TS 3.5.1.A	**One Low Pressure ECCS Subsystem Inoperable**			
FPIE Result	1.45E-06	2.26E-06	2.46E-07	2.92E-07
FPRA Result	5.39E-04	5.40E-04	2.02E-05	2.00E-05
IFPRA Result	9.08E-07	9.08E-07	2.06E-07	2.05E-07
Seismic Penalty	1.70E-06		5.10E-07	
Total for Configuration	5.43E-04	5.45E-04	2.12E-05	2.10E-05
Delta for Configuration	5.00E-04	5.00E-04	1.60E-05	1.58E-05
TS 3.5.1.G	**One ADS Valve and Condition A (e.g., One CS Loop)**			
FPIE Result	1.46E-06	1.83E-06	2.46E-07	2.88E-07
FPRA Result	3.96E-04	3.92E-04	3.40E-05	3.39E-05
IFPRA Result	3.52E-06	3.52E-06	6.55E-07	6.56E-07
Seismic Penalty	1.70E-06		5.10E-07	
Total for Configuration	4.03E-04	3.99E-04	3.54E-05	3.54E-05
Delta for Configuration	3.59E-04	3.54E-04	3.03E-05	3.01E-05
TS 3.7.2.A	**One ESW Pump in Each Subsystem**			
FPIE Result	2.97E-06	3.48E-06	2.54E-07	3.73E-07
FPRA Result	9.98E-04	9.99E-04	2.06E-05	2.08E-05
IFPRA Result	1.72E-05	1.72E-05	3.98E-07	3.99E-07
Seismic Penalty	1.70E-06		5.10E-07	
Total for Configuration	1.02E-03	1.02E-03	2.18E-05	2.21E-05
Delta for Configuration	9.77E-04	9.76E-04	1.66E-05	1.68E-05
TS 3.8.1.C	**Two Offsite Circuits Inoperable**			
FPIE Result	3.85E-05	4.64E-05	1.06E-06	1.31E-06
FPRA Result	5.08E-04	5.18E-04	2.48E-05	2.51E-05

Table Q9-2
Details of Mean vs Point Estimate Results

	CDF Point Estimate (/yr)	CDF Propagated Mean (/yr)	LERF Point Estimate (/yr)	LERF Propagated Mean (/yr)
IFPRA Result	3.18E-05	3.31E-05	1.17E-06	1.18E-06
Seismic Penalty	1.70E-06		5.10E-07	
Total for Configuration	5.80E-04	5.99E-04	2.75E-05	2.81E-05
Delta for Configuration	5.37E-04	5.54E-04	2.24E-05	2.29E-05

Question 9.c:

As demonstrated in Table Q9-1, the sampled cases demonstrate a small change in RICT estimates (i.e., less than 0.5-day) between the mean values and the point estimate values. Therefore, it is concluded that the SOKC uncertainties are considered negligible to the RICT Program and that the point estimates are adequate for informing the difference between plant configurations (i.e., the "delta" risk between different plant configurations). This approach is consistent with NUREG-1855 (Reference 19).

Audit Question Q-010

EITHER:

Demonstrate that the total risk for Susquehanna Units 1 and 2 is in conformance with RG 1.174 risk acceptance guidelines (i.e., CDF < 1E-04 and LERF < 1E-05 per year) after the total mean internal events (including internal flooding) and fire CDF and LERF values are calculated to account for the SOKC and for potential changes in risk due to any updates to PRA models performed in response to NRC staff requests. Identify the fire PRA parameters that are assumed to be correlated in the parametric uncertainty analysis of fire events (e.g., fire ignition frequencies, non-suppression probabilities, severity factors, spurious probabilities, fire human error probabilities), as well as the sources used for the associated uncertainty distributions (e.g., NUREG-2169, NUREG/CR-1278, NUREG/CR-7150, and EPRI [Electric Power Research Institute] HRA Calculator uncertainty distributions).

OR:

Explain how the licensee will ensure (e.g., via a license condition or implementation requirement) that, prior to implementation of the RMTS program: (1) the total mean internal events (including internal flooding) and fire CDF and LERF will be calculated to account for the SOKC and updates to PRA models performed in response to NRC staff requests; and (2) the

updated total risk (including seismic risk) values are still in conformance with the RG 1.174 risk acceptance guidelines (i.e., CDF < 1E-04 and LERF < 1E-05 per year).

Susquehanna Response

The parametric uncertainty evaluations for the PRA models are documented in the following notebooks / reports:

- FPIE PRA Summary and Quantification Report EC-RISK-0040 (Reference 7)
- IFPRA Summary and Quantification Report EC-RISK-0539 (Reference 20)
- FPRA Summary and Quantification Report EC-RISK-1187 (Reference 21)
    - Fire Ignition Frequencies –NUREG-2169 uncertainty distributions (Reference 22)
    - Non-Suppression Probabilities –NUREG/CR-1278 uncertainty distributions (Reference 23)
    - Severity Factors – Generic FPIE lognormal uncertainty distributions
    - Spurious Probabilities –NUREG/CR-7150 uncertainty distributions (Reference 24)
    - Fire HEPs –EPRI HRA Calculator uncertainty distributions

Using the UNCERT software, a Monte Carlo simulation was performed for both CDF and LERF using 50,000 samples to calculate the mean risk metrics that reflect the SOKC considerations.

Table Q10-1 summarizes the total CDF and total LERF for all hazards using the point-estimate and parametric mean values. As shown in the table, total CDF and total LERF conform with the RG 1.174 (Reference 25) risk acceptance guidance (i.e., CDF < 1E-04 and LERF < 1E-05 per year) using both the point-estimate values and the parametric mean values. Therefore, it is concluded that the point-estimate values are good representations of the mean CDF and LERF values.

Table Q10-1
Comparison of Point-Estimate and Parametric Mean Values

Hazard	Point-Estimate (/Yr)	Parametric Mean (/Yr)	Delta (/Yr)	Percent Difference
UNIT 1 CDF				
FPIE	1.21E-06	1.48E-06	2.70E-07	22.31%
IFPRA	9.61E-07	9.12E-07	-4.90E-08	-5.10%
FPRA[1]	5.03E-05	5.27E-05	2.40E-06	4.77%
Total	**5.25E-05**	**5.51E-05**	**2.62E-06**	**5.00%**
UNIT 1 LERF				
FPIE	2.23E-07	3.24E-07	1.01E-07	45.29%
IFPRA	2.10E-07	2.09E-07	-1.00E-09	-0.48%
FPRA[1]	6.02E-06	6.93E-06	9.10E-07	15.12%
Total	**6.45E-06**	**7.46E-06**	**1.01E-06**	**15.65%**
UNIT 2 CDF				
FPIE	1.24E-06	1.52E-06	2.80E-07	22.58%
IFPRA	4.54E-07	4.52E-07	-2.00E-09	-0.44%
FPRA[1]	5.97E-05	6.33E-05	3.60E-06	6.03%
Total	**6.14E-05**	**6.53E-05**	**3.88E-06**	**6.32%**
UNIT 2 LERF				
FPIE	2.24E-07	2.70E-07	4.60E-08	20.54%
IFPRA	1.54E-07	1.54E-07	0.00E+00	0.00%
FPRA[1]	5.96E-06	7.01E-06	1.05E-06	17.62%
Total	**6.34E-06**	**7.43E-06**	**1.10E-06**	**17.29%**

1. The fire results are based on the OCT17R2F0 model. Parametric uncertainty evaluations have not been performed on the "F1" model (i.e., most current model, and documented in EC-RISK-0048 (Reference 26)). However, the differences between the two models ("F0" and "F1") are minimal (less than a five percent change in CDF or LERF) and the results shown in the table should be minimally impacted if the "F1" model was evaluated.

Audit Question Q-011

Explain whether shared systems are credited in the internal events (including internal flooding) and fire PRA models for both units that support the RICT calculations and, if so, then (1) identify those systems, and (2) either explain how the shared systems are modeled for each unit in a dual unit event demonstrating that shared systems are not over-credited in the PRA models, or if the PRA models do not address the impact of events that can create a concurrent demand for the system shared by both units, then justify that this exclusion has an inconsequential impact the RICT calculations.

Susquehanna Response

SSES is a two-unit site that has systems and components which are shared between the two units. The SSES PRA logic model, including FPIE, FPRA, and IFPRA hazards, models some of these shared systems and components. Information related to the modeling of shared systems and components credited in the SSES PRA is provided in the SSES PRA System Notebooks; see the section on “Shared Components.”

Table Q11-1 summarizes the shared systems and components across both units and how dual unit events impact those systems and components.

Table Q11-1
Summary of Shared Systems / Components in SSES PRA

Shared Systems / Components	**Description of Shared Systems / Components**	**PRA Modeling of Shared Systems / Components**
ESW System	The ESW pumps are shared by both units. All ESW pumps are powered from the corresponding Unit 1 4160 VAC electrical buses. Additionally, the initiation logic is normally powered from Unit 1 125 VDC electrical buses and can be aligned to Unit 2 if required.	ESW is designed to provide simultaneous support to Unit 1 and Unit 2. As a result, the SSES PRA model logic does not require unit “alignment” or “preference” during the quantification of a dual unit event.

Table Q11-1
Summary of Shared Systems / Components in SSES PRA

Shared Systems / Components	Description of Shared Systems / Components	PRA Modeling of Shared Systems / Components
RHRSW System	The RHRSW System provides a cross connection between the two units. The return lines to the Spray Pond are also cross connected at the discharges of the RHR heat exchangers. Therefore, much of the SSES PRA system logic for RHRSW is common to both units. Although RHRSW is a shared system, the RHRSW pumps are designated as “1A”, “1B”, “2A” and “2B” because of their power supplies. The initiation logic for RHRSW pump “1A” can be powered from either the Unit 1 or Unit 2 125 VDC electrical bus, and the initiation logic for RHRSW pump “1B” can be powered from either the Unit 1 or Unit 2 125 VDC electrical bus; the initiation logic for the Unit 2 RHRSW pumps can only be powered from the Unit 2 125 VDC electrical buses.	RHRSW is designed to provide simultaneous support to Unit 1 and Unit 2. As a result, the SSES PRA model logic does not require unit “alignment” or “preference” during the quantification of a dual unit event.

Table Q11-1
Summary of Shared Systems / Components in SSES PRA

Shared Systems / Components	Description of Shared Systems / Components	PRA Modeling of Shared Systems / Components
Refueling Water Storage Tank (RWST)	The RWST is common to both units and provides additional inventory to the Condensate Storage Tanks (CSTs). The water volume in the RWST is shared between the two units. The RWST volume can be manually aligned to one or both CSTs if required. The volume depletion of the RWST is dependent upon the CST alignment, the unit, and its system requirement. As a result, the water available is one half the volume of water at a height greater than the CST nozzle connection to the pump.	Since the RWST is shared between the two units, the SSES PRA model assumes that only half of the water from the RWST is available for each CST. This assumption informed the development of the overall CST and RWST success criteria. As a result, the SSES PRA model logic does not require unit "alignment" or "preference" during the quantification of a dual unit event.
125 VDC Electrical Distribution	Although each unit has a separate 125 VDC electrical distribution system, each unit can supply the common loads shared by the two units. The normal alignment is to have these common loads supplied via Unit 1 125 VDC. The DGs utilize manual transfer switches to provide alternate power sources for the DGs. Unit 1 125 VDC distribution panels provide the normal source of DC power; Unit 2 provides alternate supply.	Each unit has an independent 125 VDC electrical distribution system. Common loads are normally powered from Unit 1 but can be powered from Unit 2 if needed. In short, each unit can provide 125 VDC power to unit specific loads, and common loads. As a result, the SSES PRA model logic does not require unit "alignment" or "preference" during the quantification of a dual unit event.

Table Q11-1
Summary of Shared Systems / Components in SSES PRA

Shared Systems / Components	Description of Shared Systems / Components	PRA Modeling of Shared Systems / Components
Blue Max Diesel Generator	The Blue Max Diesel Generator is a 480 VAC portable diesel generator. It is a self-contained power source, which can provide 480 VAC power to station battery chargers (Unit 1, Unit 2, or both units simultaneously) when the normal 480 VAC power supplies are unavailable. In the SSES PRA, Blue Max is credited for extended operation following design battery depletion at four hours. The SSES PRA considers extended operation to be required for the success of long-term high-pressure injection, and late depressurization.	Blue Max is designed to provide simultaneous support to Unit 1 and Unit 2. As a result, the SSES PRA model logic does not require unit “alignment” or “preference” during the quantification of a dual unit event.
13.8 kVAC Electrical Distribution	The SSES Startup Transformers and electrical buses are shared by both units and provide independent sources of offsite electrical power. Startup Transformer “T-10” and Electrical Distribution Bus “10” supply one division of ESS electrical power in each unit, while Startup Transformer “T-20” and Electrical Distribution Bus “20” supply the other division. Electrical Distribution Bus “10” provides power to the Unit 1 13.8 kVAC auxiliary electrical bus, while Electrical Distribution Bus “20” provides power to the Unit 2 13.8 kVAC auxiliary electrical bus. These Unit auxiliary buses can be cross tied should one source of offsite power fail.	The 13.8 kVAC Electrical Distribution System is designed to provide simultaneous support to Unit 1 and Unit 2. As a result, the SSES PRA model logic does not require unit “alignment” or “preference” during the quantification of a dual unit event.

Table Q11-1
Summary of Shared Systems / Components in SSES PRA

Shared Systems / Components	Description of Shared Systems / Components	PRA Modeling of Shared Systems / Components
4160 VAC Engineered Safeguards Transformers	The SSES ESS transformers are shared by each unit's 4160 VAC electrical distribution systems. During normal operation, each ESS transformer supplies one 4160 VAC ESS electrical bus per unit. If the preferred power supply is not available, the alternate power supply is automatically aligned. Each ESS transformer is capable of supplying power to four 4160 VAC ESS electrical buses simultaneously (i.e., can simultaneously power two 4160 VAC ESS electrical buses per unit).	Each ESS Transformer is designed to provide simultaneous support to Unit 1 and Unit 2. As a result, the SSES PRA model logic does not require unit "alignment" or "preference" during quantification of a dual unit event.
DGs	The DG System is common to both units. The four DGs ("A", "B", "C", "D" and "E" as an independent spare for any of the other DGs) are shared between Unit 1 and Unit 2. The motor control centers (MCCs) that support the DGs can be powered from either unit's 480 VAC electrical distribution system. Any aligned DG can supply its respective ESS bus in both units (i.e., the DGs are designed to provide sufficient power for the electrical loads required for a simultaneous shutdown of both reactors).	Each DG is designed to provide simultaneous support to Unit 1 and Unit 2. As a result, the SSES PRA model logic does not require unit "alignment" or "preference" during quantification of a dual unit event.

Table Q11-1
Summary of Shared Systems / Components in SSES PRA

Shared Systems / Components	Description of Shared Systems / Components	PRA Modeling of Shared Systems / Components
Turbine Marine Generators	Three Turbine Marine Generators are stored in the SSES FLEX Building and are available to provide limited 4160 VAC power given a SBO and an ELAP. Only two of the three Turbine Marine Generators are required for success. All eight 4160 VAC electrical busses are powered by two Turbine Marine Generators operating in parallel.	Two Turbine Marine Generators can provide power to all eight ESS electrical buses (i.e., simultaneous support to Unit 1 and Unit 2). As a result, the SSES PRA model logic does not require unit "alignment" or "preference" during quantification of a dual unit event.

Audit Question Q-012

Explain how the impact of seasonal variations on the PRA modeling will be evaluated ("as needed") during a RICT evolution and justify that this approach is consistent with the guidance in NEI 06-09 and its associated NRC safety evaluation.

Susquehanna Response

Related to seasonal variations, NEI 06-09, Revision 0-A (Reference 8), states:

> If the PRA model is constructed using data points or basic events that change as a result of time of year or time of cycle (examples include moderator temperature coefficient, summer versus winter alignments for HVAC, seasonal alignments for service water), then the RICT calculation shall either 1) use the more conservative assumption at all time, or 2) be adjusted appropriately to reflect the current (e.g., seasonal or time of cycle) configuration for the feature as modeled in the PRA.

The SSES PRA model is not constructed using data points or basic events that change as a result of time of year or time of cycle. The applied data is either bounding (e.g., initial RWST temperature of 120°F), or averaged across the year (e.g., frequency of a Loss of Offsite Power (LOOP) due to weather). For HVAC systems, maximum operating temperatures are typically

well above the expected sustained air temperature. For example, the E DG Building's HVAC system is designed to maintain a temperature below 120°F. The maximum air temperatures for Berwick, Pennsylvania does not typically exceed 90°F. The PRA also considers operational requirements, such as TS 3.7.1, which specifies the Spray Pond average temperature limit (less than or equal to 85°F).

Therefore, an evaluation of the impact of seasonal variations on the PRA modeling is not required.

Specific to LOOP, no standard industry practice exists for seasonal adjustments to such frequencies. Existing industry and site data do not support determination of a LOOP frequency multiplier. A 2015 informal benchmarking study of eight utilities found no consensus on assessing severe weather. Because there is no definitive industry guidance on how to calculate an increase in LOOP frequency due to severe weather conditions, no adjustment is deemed to be necessary.

Audit Question Q-013

a. LAR Table E1-1 states for TS LCO 3.5.1 ("ECCS – Operating"), Condition D ("HPCI System Inoperable") that both the design basis and PRA success criterion is "one of one train (i.e., one HPCI pump)." It appears that LCO 3.5.1, Condition D defeats the design basis success criterion and, therefore, represents a TS loss of function. TSTF 505, Revision 2 (ADAMS Accession No. ML18183A493) does not authorize determination of a RICT when the condition represents a loss of TS function. Therefore, explain why LCO 3.5.1, Condition D does or does not represent a TS loss of function. Include clarification of the design basis success criteria for the High-Pressure Coolant Injection (HPCI) system.

b. The equipment in the Design Success Criteria column of Table E1 cannot be equipment in the staff requests a correction to Table E1.

c. If the design basis and PRA success criteria are not consistent, then the staff requests the licensee to explain the basis for the differences and justification for the PRA success criteria.

Susquehanna Response

Question 13.a

The Design Success Criteria for HPCI in Reference 1, Table E1-1 did not provide additional ways in which the design function of HPCI (i.e., to provide makeup and core cooling in the event of an accident) can be performed.

The ECCS network has built-in redundancy so that adequate cooling can be provided, even in the event of specified failures. The following equipment makes up the ECCS:

- HPCI
- CS System (two loops)
- Low Pressure Coolant Injection (LPCI) Mode of RHR System (two loops)
- ADS

In the event that the one train of HPCI is inoperable, the ADS will decrease pressure in the reactor vessel to a point at which the low pressure ECCS (CS and LPCI) are capable of injecting into the core. The combination of ADS and CS or LPCI results in performance of the design function of HPCI. Therefore, entry into LCO 3.5.1, Condition D, does not constitute a loss of TS function and LCO 3.5.1, Condition D can be included in the scope of the RICT Program.

It should be noted that the same combination of ADS and CS or LPCI provides a redundant means of performing the design function of RCIC as well. Therefore, entry into LCO 3.5.3, Condition A also does not constitute a loss of TS function and LCO 3.5.3, Condition A, can be included in the scope of the RICT Program.

Table E1-1 from Reference 1 has been revised to include these alternative means of performing the design function of HPCI and RCIC in the Design Success Criteria column. While updating the design success criteria for these two Conditions, it was identified that the PRA success criteria also did not list all the applicable ways the PRA model can credit the performance of the functions of HPCI and RCIC. As such, the PRA Success Criteria column in Table E1-1 have also been updated to include appropriate alternative means for performing the PRA functions of HPCI and RCIC. Revised Table E1-1 is included in Enclosure 2 to this letter.

Question 13.b

As stated in the response to Question 13.a, Table E1-1 from Reference 1 has been revised to reflect the additional ways in which the function of the HPCI and RCIC systems can be performed. The deletions requested by the staff have been incorporated into the updates of Table E1-1.

Question 13.c

The design success criteria for ADS are five out of six valves. This is based on the fact that the design of ADS complies with the single failure criterion; i.e., with any one of the six ADS valves inoperable for any reason, the reactor can still be de-pressurized in the event of a Design

Basis Accident (DBA). The design success criteria do not identify the minimum number required to perform the safety function; they provide a level at which the plant is required to be analyzed to demonstrate the ability to withstand postulated DBAs.

The PRA success criteria for ADS is only three out of six valves; i.e., one division of ADS. Note that for Anticipated Transient Without a Scram (ATWS) scenarios, the ADS PRA Success Criteria are all six valves. In support of the PRA development, a thermal hydraulic analysis was performed and demonstrated only three of six ADS valves are required to de-pressurize the reactor assuming control rods are inserted. This is documented in the Event Tree and Success Criteria Notebook (Reference 27).

In summary, the design success criteria are based on the single failure criterion and represent the complement of equipment with which the DBA analyses are performed. The PRA success criteria are based on a realistic model that was evaluated in support of PRA model development.

Audit Question Q-014

LAR Table E1-1 states for TS LCO 3.5.1 ("ECCS – Operating"), Condition B ("One LPCI pump in one or both LPCI subsystems inoperable"), that the "PRA success criteria are generally consistent with the design basis." However, the table also shows that for a LOCA [Loss of Coolant Accident] in the "bottom head," the PRA success criterion is "one RHR pump in each division." This appears to be more stringent than the design basis success criterion (i.e., one of four LPCI pumps) and associated with a specific accident sequence. Therefore, explain this apparent inconsistency and confirm whether the more stringent PRA success criterion is for one possible low likelihood event.

Susquehanna Response

The SSES LPCI System is a mode of the RHR System; i.e., LPCI utilizes the RHR pumps. Each unit has two RHR subsystems. Each RHR subsystem has two 100 percent capacity pumps. As a result, one RHR pump is required for success of the LPCI subsystem.

For the SSES PRA, the success of LPCI (see logic under gate "149-N-N-1LPCIWRKS") requires one of four RHR pumps to be operational; one subsystem is required. This is true for sequences that do not involve a medium LOCA (MLOCA) in the bottom head.

For sequences that involve a MLOCA in the bottom head (a low likelihood and non-risk significant sequence), the PRA requires one RHR pump from each subsystem; i.e., two subsystems of LPCI are required (see logic under gate "149-N-N-2LPCI_WRKS").

Audit Question Q-015

LAR Table E1-1 states for TS LCO 3.7.2 ("Emergency Service Water (ESW) System"), Conditions A, B, and C, that the "success criteria are consistent with the design basis." However, the table indicates that the design basis success criterion is "one ESW pump in each loop," and the PRA success criterion is "one of two subsystems." The design basis and PRA success criteria do not appear to be equivalent. Therefore, explain how the design basis and PRA success criteria are consistent based on the wording in Table E1-1. If the licensee cannot confirm that the design basis and PRA success criteria are consistent, then explain the basis for the difference and the justification for the PRA success criteria. Provide updated Table E1 to clarify terms (division, loop, subsystem, etc.).

Susquehanna Response

The SSES ESW System is a shared system across both units. The ESW system has two independent divisions. Each ESW division has two pumps. The "A" and "C" pumps are division 1, and the "B" and "D" pumps are division 2. Each division is designed to supply 100 percent of the ESW requirements to both units and the common DGs simultaneously. For the SSES PRA, success of an ESW division (i.e., "loop") requires success of one corresponding ESW pump (A or C for division 1; B or D for division 2). Therefore, the PRA success criterion is consistent with the design success criterion (i.e., one ESW pump per division).

For the DG cooling, one of four ESW pumps is required for success (i.e., one division of ESW). This success criterion is based on a single ESW pump flowrate of 6,000 gpm and the most limiting required ESW flow for a DBA with one loop of ESW failed; reported to be 4,262 gpm.

For Turbine Building Component Cooling Water (TBCCW) and Reactor Building Component Cooling Water (RBCCW) cooling, one of two ESW pumps from division 1, and one of two ESW pumps from division 2 are required for success (i.e., two divisions, one pump per division). The PRA success criteria is documented in the TBCCW system notebook and the RBCCW system notebook (References 28 and 29, respectively).

For all other systems, one of two ESW pumps is required for success of an ESW division.

Discussion of TBCCW PRA Success:

For the PRA, TBCCW success is defined as the system providing an adequate supply of cooling water for Condensate Pump Motor cooling, Instrument Air Compressor cooling, Service Air Compressor cooling, and CRD Pump cooling. To achieve success, one TBCCW pump and one TBCCW heat exchanger must be in operation, associated valves must remain open, and cooling water (from Service Water or ESW) must be available. Note that the ESW flow balance requires

both ESW loops to be in operation if used to cool TBCCW heat exchangers. Therefore, the PRA requires both ESW trains for success when cooling TBCCW.

Discussion of RBCCW PRA Success:

For the PRA, RBCCW success is defined as the system providing an adequate supply of cooling water for Containment Instrument Gas compressor cooling. To achieve success, one RBCCW pump and one RBCCW heat exchanger must be in operation, associated valves must remain open, and cooling water (from Service Water or ESW) must be available. Note that the ESW flow balance requires both ESW loops to be in operation if used to cool RBCCW. Therefore, the PRA requires both ESW trains for success when cooling RBCCW.

Audit Question Q-016

Explain how I&C [Instrumentation and Control] equipment that is applicable or impacts the RICT calculations is modeled or considered in the PRA. Include in this discussion: (1) the scope of the I&C equipment that is explicitly modeled (e.g., bistables, relays, sensors, integrated circuit cards), (2) description of the level of detail that the PRA model supports (e.g., whether all channels of an actuation circuit are modeled), (3) discussion of the generic data and plant-specific data used, and (4) discussion of the associated TS functions for which a RICT can be applied.

Susquehanna Response

The response to each of the four sub-questions is provided herein:

1. See Table Q16-1.

2. See Table Q16-1.

3. In some cases, the SSES PRA does model instrumentation as required to support the modeled system(s). The failure data is handled in the same fashion as other modeled equipment/components modeled in the SSES PRA using available generic data sources for the modeled instruments.

4. See Table Q16-1, below. Each of the instrumentation TS in the scope of the RICT Program is listed in Table Q16-1, with a description of the I&C modeling. Enclosure 4, Section 2 of Reference 1 provides an evaluation of I&C Systems. The following table provides PRA details related to the LCOs identified in Enclosure 4, Section 2 of Reference 1.

Table Q16-1
Instrumentation Review

Instrumentation	Description of Modeling
3.3.1.1 – Reactor Protection System (RPS) Instrumentation	
Intermediate Range Monitors Average Power Range Monitors Reactor Vessel Steam Dome Pressure-High Reactor Vessel Water Level-Low, Level 3 Main Steam Isolation Valve-Closure Drywell Pressure-High Scram Discharge Volume Water Level-High Turbine Stop Valve-Closure Turbine Control Valve Fast Closure, Trip Oil Pressure-Low Reactor Mode Switch-Shutdown Position	Individual RPS instrumentation inputs to the RPS logic system are not modeled explicitly in the PRA. The SSES PRA utilizes a simple fault tree to represent the mechanical and electrical failures to scram. The mechanical failures are under gate "GT-CCFMEATWS-PE" and the electrical logic is under gate "1ELEC_ATWS"." The mechanical failure to scram is represented by a single basic event (CCFMEATWS-PE). The electrical portion includes a single event for RPS electrical scram failure (CCFELATWS-PE), backup from Alternate Rod Insertion (ARI) and a conditional manual scram failure probability (1ELATWS-MAN-O). ARI has two divisions (Division 1 and Division 2), with ARI logic modeled for each division. All four pressure switches, PSB211(2)N045A(B, C, D), "Reactor Steam Dome High Pressure EOC/RPT Breakers," are required for ARI success. In the context of the RICT Program, surrogate events are chosen to represent failure of the reactor protection system. This modeling is identified in Table E1-1 of Reference 1.
Manual Scram	The SSES PRA credits operator actions to manually scram the reactor as a backup to electrical scram failures under gate "1ELATWS-MAN-O). Manual Rod Insertion (MRI) modeling was not developed as it was determined to be ineffective in response to the PRA modeled ATWS scenarios of interest which require rapid operator response prior to the time when MRI could be effective.
3.3.2.1 – Control Rod Block Instrumentation	
Rod Block Monitor	The SSES PRA does not explicitly model this instrumentation. In the context of the RICT Program, surrogate events are chosen to represent failure of the RPS. This modeling is identified in Table E1-1 of Reference 1.
Rod Worth Minimizer Reactor Mode Switch - Shutdown Position	The SSES PRA does not explicitly model this instrumentation. **Note:** This instrumentation is not within the scope of the RICT Program.
3.3.2.2 – Feedwater – Main Turbine High Water Level Trip Instrumentation	
Reactor Vessel Water Level – High, Level 8	The SSES PRA models the failure of Feedwater to trip given a Level 8 trip signal. This logic is found under gate "1(2)45-N-N-LVL8-1" and is used to model the potential for reactor vessel overfill, and flooding of the steam lines. The SSES PRA models three channels of the level trip logic (A, B, C). Each channel has a power supply, and level switch; PDTC321N004(A, B, C), "Reactor Water Level to Feedwater Turbine Trip Permissive." Two of three channels must fail for the Level 8 trip to fail. The PRA also models the operator action to control Feedwater flow following a Level 8 trip failure. If both the trip logic, and the operator action fail, a Feedwater overfill will occur, which could result in a loss of the High-Pressure Injection steam driven systems; HPCI, RCIC, and FW are all steam driven systems.

Table Q16-1
Instrumentation Review

Instrumentation	Description of Modeling
3.3.4.1 – End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation	
Turbine Stop Valve – Closure	The SSES PRA models the turbine stop valve closure limit switches (two per division), ZSC721(2)N006A(B, C, D), "Turbine Stop Valve < 95% Open / RPS Trip." This logic is under gate "1(2)64-I(II)-N-TURTRIP" in the fault tree logic. For each division (Division 1 or Division 2), the EOC trip logic requires both the turbine stop valve limit switches (ZOC721N006A(B, C, D), or both the fast trip pressure switches (PSLC721N005A(B, C, D) (i.e., a failure of one limit switch and one pressure switch will fail the automatic EOC trip). For fire related scenarios in specific fire zones, the PRA models the implementation of fire specific procedures that allow for a manual EOC trip. The manual credit is located under gate "164-EOC-NF" in the fault tree logic.
Turbine Control Valve Fast Closure, Trip Oil Pressure – Low	The SSES PRA models the turbine control valve fast closure signals from the pressure switches (two per division), PSLC721(2)N005A(B, C, D), "Turbine CV Fast Close / SCRAM Trip Logic." This logic is under gate "1(2)64-I(II)-N-TURTRIP" in the fault tree logic. For each division (Division 1 or Division 2), the EOC trip logic requires both the turbine stop valve limit switches, or both the fast trip pressure switches (i.e., a failure of one limit switch and one pressure switch will fail the automatic EOC trip). For fire related scenarios in specific fire zones, the PRA models the implementation of fire specific procedures that allow for a manual EOC trip. The manual credit is location under gate "164-EOC-NF" in the fault tree logic.
3.3.4.2 – Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation	
Reactor Vessel Water Level – Low Low, Level 2	The ATWS-RPT consists of two independent trip systems. Each trip system has two channels of "Reactor Steam Dome Pressure – High" and two channels of "Reactor Vessel Water Level-Low Low." Each ATWS-RPT trip system is a two of two logic. Therefore, either low reactor level or high reactor pressure will cause a trip. The SSES PRA does not model the Level 2 signal; only the pressure signals are modeled.
Reactor Steam Dome Pressure –High	The SSES PRA models pressure switches to provide actuation logic. Logic actuation of Division 1 requires successful operation of pressure switches PSB211(2)N045A(C), "Reactor Steam Dome High Pressure EOC/RPT Breakers." Division 2 logic requires operation of pressure switches PSB211(2)N045B(D). A failure of any one pressure switch will fail the ARI function (four of four logic). This logic is found under gate "1(2)58-N-N-RODINSERT" and is part of the failure to scram fault tree logic.
3.3.5.1 – Emergency Core Cooling System (ECCS) Instrumentation: Core Spray System	
Reactor Vessel Water Level – Low Low Low, Level 1	The SSES PRA models the reactor vessel low level ECCS initiation via LISB211(2)N031A(B, C, D), "Reactor Vessel Water Level ECCS Actuation." This logic is found under gate "1(2)51-I-A(C)-LOGIC" or the "1(2)51-II-B(D)-LOGIC" in the SSES PRA fault tree logic. This logic also includes modeling of the actuation relays.
Drywell Pressure – High	The SSES PRA models high drywell pressure ECCS initiation via PSE111(2)N011A(B, C, D), "Drywell Hi Pressure ECCS Actuation." This logic is found under gate "1(2)51-I-A(C)-LOGIC" or the "1(2)51-II-B(D)-LOGIC" in the SSES PRA fault tree logic. This logic also includes modeling of the actuation relays.
Reactor Steam Dome Pressure – Low (Initiation)	The SSES PRA models the "K10" relays which are the "Reactor Low Level or High Drywell Pressure Plus Low Reactor Pressure Logic" relays. In general, this relay looks for LOCA conditions to initiate ECCS. The PRA does not differentiate between the ECCS Initiation and ECCS Injection Permissive.
Reactor Steam Dome Pressure – Low (Injection Permissive)	The SSES PRA models the reactor Low Pressure Core Spray and LPCI permissive via PISB211(2)N021A(B, C, and D), "Reactor Pressure Core Spray / LPCI Permissive." This logic is found under gate "1(2)51-I-A(C)-LOGIC" or the "1(2)51-II-B(D)-LOGIC" in the SSES PRA fault tree logic. This logic also includes modeling of the actuation relays K32A(B) and K19A(B), "Reactor Low Pressure Sensor Relay."

Table Q16-1
Instrumentation Review

Instrumentation	Description of Modeling
Manual Initiation	In specific scenarios, the SSES PRA credits operator actions to manually start low pressure pumps. The fault tree logic, including credited Human Failure Events, is found under gate "1(2)OPRHRCS."
3.3.5.1 – Emergency Core Cooling System (ECCS) Instrumentation: Low Pressure Coolant Injection (LPCI) System	
Reactor Vessel Water Level – Low Low Low, Level 1	The SSES PRA models the reactor vessel low level ECCS initiation via LISB211(2)N031A(B, C, D), "Reactor Vessel Water Level ECCS Actuation." This logic is found under gate "1(2)49-I-A(C)-PPINI" or the "1(2)49-II-B(D)-PPINI" in the SSES PRA fault tree logic. This logic also includes modeling of the actuation relays. For each train of LPCI (A, B, C, D) the SSES PRA models initiation signals from Division 1 and Division 2. A failure of both divisions will fail initiation of the train.
Drywell Pressure – High	The SSES PRA models high drywell pressure ECCS initiation via PSE111(2)N011A(B, C, D), "Drywell Hi Pressure ECCS Actuation." This logic is found under gate "1(2)49-I-A(C)-PPINI" or the "1(2)49-II-B(D)-PPINI" in the SSES PRA fault tree logic. This logic also includes modeling of the actuation relays. For each train of LPCI (A, B, C, D) the SSES PRA models initiation signals from Division 1 and Division 2. A failure of both divisions will fail initiation of the train.
Reactor Steam Dome Pressure – Low (Initiation)	The SSES PRA models the "K10" relays which are the "Reactor Low Level or High Drywell Pressure Plus Low Reactor Pressure Logic" relays. In general, this relay looks for LOCA conditions to initiate ECCS. The PRA does not differentiate between the ECCS Initiation and ECCS Injection Permissive.
Reactor Steam Dome Pressure – Low (Injection Permissive)	The SSES PRA models the reactor Low Pressure Core Spray and LPCI permissive via PISB211(2)N021A(B, C, and D), "Reactor Pressure Core Spray / LPCI Permissive." This logic is found under gate "1(2)49-I-A(C)-PPINI" or the "1(2)49-II-B(D)-PPINI" in the SSES PRA fault tree logic. This logic also includes modeling of the actuation relays K32A(B) and K19A(B), "Reactor Low Pressure Sensor Relay." For each train of LPCI (A, B, C, D) the SSES PRA models initiation signals from Division 1 and Division 2. A failure of both divisions will fail initiation of the train.
Reactor Steam Dome Pressure – Low (Recirculation Discharge Valve Permissive)	Low reactor steam dome pressure signals are used as permissives for RHR LPCI mode recirculation discharge and bypass valve closures. The SSES PRA assumes that the RHR System is in normal alignment. The SSES PRA models the instrumentation and relays required to align the "F015" valves for LPCI injection. All other PRA credited modes of RHR (i.e., Suppression Pool Cooling, and Drywell Containment Spray Cooling) require operator actions to properly align the system (i.e., automatic actuation and alignment of these RHR modes is not credited in the PRA). The PRA models the instrumentation PISB211(2)N021A(B, C, D), "Reactor Pressure Core Spray / LPCI Permissive," and the required relays.
Manual Initiation	In specific scenarios, the SSES PRA credits operator actions to manually start low pressure pumps. The fault tree logic, including credited Human Failure Events, is found under gate "1(2)OPRHRCS."
3.3.5.1 – Emergency Core Cooling System (ECCS) Instrumentation: High Pressure Coolant Injection (HPCI) System	
Reactor Vessel Water Level – Low Low, Level 2	The SSES PRA models the Level 2 HPCI initiation logic inputs via the wide range RPV water level switches LISB211(2)N031A(B, C, D). This logic is found under gate "1(2)52-II-N-LLHPCISIG1(2)" in the SSES PRA fault tree logic. This logic also includes modeling of the actuation relays. The initiation logic for each parameter is arranged in a one-out-of-two taken twice configuration.
Drywell Pressure – High	The SSES PRA does not model the initiation of HPCI due to high drywell pressure. All transient and LOCA accident scenarios that require HPCI will initiate HPCI due to a low reactor water level condition.
Reactor Vessel Water Level – High, Level 8	The SSES PRA models the failure of HPCI to trip given a Level 8 trip signal. This logic is found under gate "1(2)52-II-N-LVL8-1" and is used to model the potential for reactor vessel overfill, and flooding of the steam lines.

Table Q16-1
Instrumentation Review

Instrumentation	Description of Modeling
Condensate Storage Tank Level – Low	The SSES PRA models the spurious closure of CST level switches LSLLE411N002 and LSLLE411N003. Failure of either switch will result in a loss of the CST as a suction source to HPCI. Transfer of the HPCI pump suction source from the CST to the SP is assumed to occur on low CST level (the transfer logic is assumed to be successful). This assumption is noted in the SSES HPCI System Notebook (Reference 30).
Manual Initiation	The SSES PRA credits the manual initiation of HPCI for specific scenarios (i.e., when the required time to manually initiate is available). This logic is under gate "1(2)52-MANUAL_INI" in the fault tree logic. Although not explicitly modeled in the PRA logic, the HRA evaluation considers the necessary cues and controls to perform this action.
3.3.5.1 – Emergency Core Cooling System (ECCS) Instrumentation: Automatic Depressurization System (ADS) Trip System A and B	
Reactor Vessel Water Level – Low Low Low, Level 1	The SSES PRA models ADS initiation due to low reactor water level. Level instrumentation LISB211N031A(B, C, D) is modeled under gate "1(2)83-I(II)-N-AUTO" in the fault tree logic.
Drywell Pressure – High	The SSES PRA models ADS initiation due to high drywell pressure. Pressure instrumentation PSE111N010A(B, C, D) is modeled under gate "1(2)83-I(II)-N-AUTO" in the fault tree logic.
Automatic Depressurization System Initiation Timer	The SSES PRA models the ADS timer via the basic events "1(2)83RTE1C628B21CK5A" and "1(2)83RTE1C631B21CK5B" in the fault tree logic.
Reactor Vessel Water Level – Low, Level 3 (Confirmatory)	The SSES PRA models ADS initiation due to low reactor water level. Level instrumentation LISB211N031A(B, C, D) is modeled under gate "1(2)83-I(II)-N-AUTO" in the fault tree logic.
Core Spray Pump Discharge Pressure – High	The SSES PRA models the Core Spray pump permissive under gates "1(2)83-I-N-PUMP_K9A" and "1(2)83-II-N-PUMP_K9B" in the fault tree logic. The modeled switches are PSE211N009A(B).
Low Pressure Coolant Injection Pump Discharge Pressure – High	The SSES PRA models the Core Spray pump permissive under gates "1(2)83-I-N-PUMP_K9A" and "1(2)83-II-N-PUMP_K9B" in the fault tree logic. PSE211(2)N016A(B) and PSE111(2)N020C(D).
Automatic Depressurization System Drywell Pressure Bypass Actuation Timer	The SSES PRA models the ADS bypass timer via the basic events "1(2)83RTE1C628B21CK4A" and "1(2)83RTE1C631B21CK4B" in the fault tree logic.
Manual Initiation	The SSES PRA credits operator actions to manually initiate ADS. The fault tree logic, including credited Human Failure Events, is found under gate "1(2)83-MANUAL."
3.3.5.3 – Reactor Core Isolation Cooling (RCIC) System Instrumentation	
Reactor Vessel Water Level – Low Low, Level 2	The SSES PRA models RCIC automatic actuation. Reactor vessel low water level is monitored by four indicating type level switches. Division 1 is monitored by level switches LISB211(2)N031A and LISB211(2)N031C. Division 2 is monitored by LISB211(2)N031B and LISB211(2)N031D. The Division 2 signal is relayed to the RCIC logic by the RHR logic and RHR relays E11A-79B and E11A-K80B. A one out of two twice logic arrangement is utilized to initiate RCIC on a reactor vessel water Level 2 condition. Either of the following failure combinations would fail the initiation signal; LISB211(2)N031A and LISB211(2)N031B or LISB211(2)N031C and LISB211(2)N031D. The RCIC initiation relays are K2, K3, and K5. These relays are responsible for actuation of different RCIC components when the initiation signal occurs (there are some differences between the units), but the individual relays are not modeled in the PRA.

Table Q16-1
Instrumentation Review

Instrumentation	Description of Modeling
Reactor Vessel Water Level – High, Level 8	The SSES PRA models the failure of RCIC to trip given a Level 8 trip signal. This logic is found under gate "1(2)50-I-N-LVL8-1" and is used to model the potential for reactor vessel overfill, and flooding of the steam lines. **Note:** This instrumentation is not within the scope of RICT Program.
Condensate Storage Tank Level – Low	The SSES PRA models the spurious closure of CST level switches LSLE511N035A and LSLE511N035E. Failure of either switch will result in a loss of the CST as a suction source to RCIC. Transfer of the RCIC pump suction source to the suppression pool is assumed to occur on low CST level. Transfer of the RCIC pump suction source from the CST to the SP is assumed to occur on low CST level (the transfer logic is assumed to be successful). This assumption is noted in the SSES RCIC System Notebook (Reference 31).
Manual Initiation	The SSES PRA credits the manual initiation of RCIC for specific scenarios (i.e., when the required time to manually initiate is available). This logic is under gate "1(2)50-MANUAL_INI" in the fault tree logic. Although not explicitly modeled in the PRA logic, the HRA evaluation considers the necessary cues and controls to perform this action. **Note:** This instrumentation is not within the scope of RICT Program.
3.3.6.1 – Primary Containment Isolation Instrumentation: Main Steam Line Isolation	
Reactor Vessel Water Level – Low Low Low, Level 1 Main Steam Line Pressure – Low Main Steam Line Flow – High Condenser Vacuum – Low Reactor Building Main Steam Tunnel Temperature – High Manual Initiation	Regarding Primary Containment Isolation, the SSES PRA model does not comprehensively model individual isolation signals. In the context of the RICT Program, surrogate events are chosen to either represent failure of containment and/or the failure to isolate the associated system. This modeling is identified in Table E1-1 of Reference 1. Specific to the closure of Main Steam Isolation Valves (MSIVs), the SSES PRA uses reactor level as a surrogate for all the isolation signals that can cause the MSIVs to close. Additional information related to containment isolation can be found in the SSES PRA Containment Isolation System Notebook (Reference 32).
3.3.6.1 – Primary Containment Isolation Instrumentation: Main Steam Line Isolation (Drain Valves)	
Reactor Vessel Water Level – Low Low Low, Level 1 Main Steam Line Pressure – Low Main Steam Line Flow – High Condenser Vacuum – Low Reactor Building Main Steam Tunnel Temperature – High Manual Initiation	Regarding Primary Containment Isolation, the SSES PRA model does not comprehensively model individual isolation signals. In the context of the RICT Program, surrogate events are chosen to either represent failure of containment and/or the failure to isolate the associated system. This modeling is identified in Table E1-1 of Reference 1. Specific to drain valves, the SSES PRA considers the loss of flow via open drain valves to be a low probability event, and is therefore not modeled. Additional information related to containment isolation can be found in the SSES PRA Containment Isolation System Notebook (Reference 32).

Table Q16-1
Instrumentation Review

Instrumentation	Description of Modeling
3.3.6.1 – Primary Containment Isolation Instrumentation: Primary Containment Isolation	
Reactor Vessel Water Level – Low, Level Reactor Vessel Water Level – Low Low, Level 2 Reactor Vessel Water Level – Low Low Low, Level 1 Drywell Pressure – High Standby Gas Treatment System (SGTS) Exhaust Radiation – High Manual Initiation	Regarding Primary Containment Isolation, the SSES PRA model does not comprehensively model individual isolation signals. In the context of the RICT Program, surrogate events are chosen to either represent failure of containment and/or the failure to isolate the associated system. This modeling is identified in Table E1-1 of Reference 1. Specific to containment isolation, the MSIVs are the only modeled containment isolation system that needs to close. Additional information related to containment isolation can be found in the SSES PRA Containment Isolation System Notebook (Reference 32).
3.3.6.1 – Primary Containment Isolation Instrumentation: High Pressure Coolant Injection (HPCI) System Isolation	
HPCI Steam Line Δ Pressure – High HPCI Steam Supply Line Pressure – Low HPCI Turbine Exhaust Diaphragm Pressure – High Drywell Pressure – High HPCI Pipe Routing Area Temperature – High HPCI Equipment Room Temperature – High HPCI Emergency Area Cooler Temperature – High Manual Initiation	Regarding Primary Containment Isolation, the SSES PRA model does not comprehensively model individual isolation signals. In the context of the RICT Program, surrogate events are chosen to either represent failure of containment and/or the failure to isolate the associated system. This modeling is identified in Table E1-1 of Reference 1. Specific to containment isolation, the MSIVs are the only modeled containment isolation system that needs to close. Additional information related to containment isolation can be found in the SSES PRA Containment Isolation System Notebook (Reference 32).
3.3.6.1 – Primary Containment Isolation Instrumentation: Reactor Core Isolation Cooling (RCIC) System Isolation	
RCIC Steam Line Δ Pressure – High RCIC Steam Supply Line Pressure – Low RCIC Turbine Exhaust Diaphragm Pressure – High Drywell Pressure – High RCIC Pipe Routing Area Temperature – High RCIC Equipment Room Temperature – High RCIC Emergency Area Cooler Temperature – High Manual Initiation	Regarding Primary Containment Isolation, the SSES PRA model does not comprehensively model individual isolation signals. In the context of the RICT Program, surrogate events are chosen to either represent failure of containment and/or the failure to isolate the associated system. This modeling is identified in Table E1-1 of Reference 1. Specific to containment isolation, the MSIVs are the only modeled containment isolation system that needs to close. Additional information related to containment isolation can be found in the SSES PRA Containment Isolation System Notebook (Reference 32).

Table Q16-1
Instrumentation Review

Instrumentation	Description of Modeling
3.3.6.1 – Primary Containment Isolation Instrumentation: Reactor Water Cleanup (RWCU) System Isolation	
RWCU Differential Δ Flow – High RWCU Penetration Area Temperature – High RWCU Pump Area Temperature – High RWCU Heat Exchanger Area Temperature – High SLC System Initiation Reactor Vessel Water Level – Low Low, Level 2 RWCU Flow – High Manual Initiation	Regarding Primary Containment Isolation, the SSES PRA model does not comprehensively model individual isolation signals. In the context of the RICT Program, surrogate events are chosen to either represent failure of containment and/or the failure to isolate the associated system. This modeling is identified in Table E1-1 of Reference 1. Specific to containment isolation, the MSIVs are the only modeled containment isolation system that needs to close. Additional information related to containment isolation can be found in the SSES PRA Containment Isolation System Notebook (Reference 32).
3.3.6.1 – Primary Containment Isolation Instrumentation: Shutdown Cooling System Isolation	
Reactor Steam Dome Pressure – High Reactor Vessel Water Level – Low, Level 3 Manual Initiation	Regarding Primary Containment Isolation, the SSES PRA model does not comprehensively model individual isolation signals. In the context of the RICT Program, surrogate events are chosen to either represent failure of containment and/or the failure to isolate the associated system. This modeling is identified in Table E1-1 of Reference 1. Specific to containment isolation, the MSIVs are the only modeled containment isolation system that needs to close. Additional information related to containment isolation can be found in the SSES PRA Containment Isolation System Notebook (Reference 32).
3.3.6.1 – Primary Containment Isolation Instrumentation: Traversing Incore Probe Isolation	
Reactor Vessel Water Level – Low, Level 3 Drywell Pressure – High	Regarding Primary Containment Isolation, the SSES PRA model does not comprehensively model individual isolation signals. In the context of the RICT Program, surrogate events are chosen to either represent failure of containment and/or the failure to isolate the associated system. This modeling is identified in Table E1-1 of Reference 1. Specific to containment isolation, the MSIVs are the only modeled containment isolation system that needs to close. Additional information related to containment isolation can be found in the SSES PRA Containment Isolation System Notebook (Reference 32).
3.3.8.1 – Loss of Power (LOP) Instrumentation	
4.16 kV Emergency Bus Undervoltage (Loss of Voltage < 20%)	The SSES PRA models the relays related to the 20 percent undervoltage. The SSES PRA model includes the "27A" relays, the timer relay "62A2", and the trip relay "27AX". Failure of this logic will result in a loss of the corresponding 4160 VAC bus. This logic is under gate "1(2)04-I-A(C)-1(2)A201(3)UV" (Division 1), and "1(2)04-II-B(D)-1(2)A202(4)UV" for (Division 2) in the fault tree. The SSES PRA does not assume credit for SSCs affected by a degraded voltage condition. The PRA models nominal power, LOOP, and SBO conditions.

Table Q16-1
Instrumentation Review

Instrumentation		Description of Modeling
	4.16 kV Emergency Bus Undervoltage Low Setting (Degraded Voltage 65%)	The SSES PRA models the relays related to the 65 percent undervoltage condition. The SSES PRA model includes the "27B (3 and 4)" relays, the timer relay "62B2", and the trip relay "27AX". Failure of this logic will result in a loss of the corresponding 4160 VAC bus. This logic is under gate "1(2)04-I-A(C)-1(2)A201(3)UV" (Division 1), and "1(2)04-II-B(D)-1(2)A202(4)UV" for (Division 2) in the fault tree. The SSES PRA does not assume credit for SSCs affected by a degraded voltage condition. The PRA models nominal power, LOOP, and SBO conditions.
	4.16 kV Emergency Bus Undervoltage LOCA (Degraded Voltage 93%)	The SSES PRA does not explicitly model the relays related to the 93 percent undervoltage condition; the "27B (1 and 2)" relays. In the context of the RICT application, surrogate events are chosen to represent the failure of the 93 percent degraded voltage relays. This modeling is identified in Table E1-1 of Reference 1. Additional information related to the modeling of LOP instrumentation can be found in the SSES PRA Offsite and 13 kV System Notebook (Reference 60)

Audit Question Q-017

EITHER:

Describe and provide the results of a sensitivity study performed for each digital system modeled in the PRA demonstrating that the uncertainty associated with PRA modeling the digital I&C systems has inconsequential impact on the RICT calculations.

OR:

Identify the LCOs impacted by digital I&C system modeling and for which RMAs will be applied during a RICT. Explain and justify the criteria used to determine what level of impact to the RICT calculation requires additional RMAs.

Susquehanna Response

SSES utilizes digital control systems for Feedwater and Recirculation control; there are no other digital control systems. The SSES PRA does not model these digital control systems. For this reason, no sensitivity was performed, and no LCOs are impacted by digital control system modeling.

Audit Question Q-019

EITHER:

Confirm that the Susquehanna Maintenance Rule program incorporates the use of performance criteria to evaluate SSC performance as described in the NRC-endorsed guidance in NUMARC 93-01.

OR:

Describe the approach or method used by Susquehanna for SSC performance monitoring, as described in Regulatory Position C.3.2 of RG 1.177, for meeting the fifth key safety principle. In the description, include criteria (e.g., qualitative or quantitative), along with the appropriate risk metrics, and explain how the approach and criteria demonstrate the intent to monitor the potential degradation of SSCs in accordance with the NRC SE for NEI 06-09.

Susquehanna Response

The SSES Maintenance Rule program is developed in accordance with the guidance of NUMARC 93-01 (Reference 33). Per Susquehanna procedure NDAP-QA-0413 (Reference 34), performance criteria are developed for SSCs within the scope of the Maintenance Rule, and are

established to monitor performance at the system, train, component, and/or plant level. Specific performance criteria are developed in accordance with Susquehanna procedure NSEP-AD-0413C (Reference 35) which follows the guidance of NUMARC 93-01.

Audit Question Q-020

EITHER:

Justify that the incomplete fire PRA modeling associated with MSO [Multiple Spurious Operation] scenario “2aj” has an inconsequential impact on the calculated RICTs.

OR:

If the licensee cannot justify that the incorporation of MSO scenario “2aj” has an inconsequential impact on the calculated RICTs, then describe how the licensee will ensure that MSO scenario “2aj” is incorporated into the fire PRA model prior to implementation of the RICT program.

Susquehanna Response

MSO scenario 2aj has been incorporated into the FPRA prior to implementation of the RICT Program. CAFTA model logic for MSO 2aj has been added to the Susquehanna FPRA in order to resolve F&O 1-9.

Piping and Instrumentation Diagrams (P&IDs) were reviewed to determine the flow path of the CST to the hotwell. This flow path is provided by a standpipe in the CST which limits the water to a level of 135,000 gallons and is isolated by three valves in parallel (HV10514, LV10514D, and LV10514C). Water volume below the 135,000 gallon level is preserved for HPCI and RCIC such that if a drain down to the hotwell occurs, CRD injection will not be available. Therefore, failure of the CRD injection can occur if one of the three valves spuriously opens and allows water to flow to the hotwell.

Of the three valves that can cause this undesired drain down, one is a motor operated valve, HV10514, and the other two are Air Operated Valves (AOVs), LV10514C and LV10514D. The AOVs are operated by current to pressure converters which are fed inputs from the same level transmitters. Circuit analysis was performed for HV10514 and LV10514D (LV10514C impacts were captured by the “D” cables) and basic events and model logic were created to represent the failure of these valves to remain closed, leading to the drain down pathway described in MSO 2aj. Since the two AOVs share the same cables that can cause spurious opening of the valves, only one equipment function state was used to represent both components.

Audit Question Q-021

EITHER:

Discuss the PRA components that are supported by the unlocated cable, and justify (preferably using the sensitivity recommended by the peer-reviewers) that the treatment of the unlocated cable has an inconsequential impact on the calculated RICTs.

OR:

If the licensee cannot justify that the treatment of the unlocated cable has an inconsequential impact on the calculated RICTs, then explain how the licensee will either ensure that the cable is located and properly modeled in the fire PRA prior to implementation of the RICT program or identify appropriate RMAs for this key assumption, consistent with the treatment of key assumptions in NEI 06-09-A.

Susquehanna Response

As a result of ongoing FPRA refinements, cable FK2Q3014J has been located, and the fire impacts are now incorporated in the FPRA cable and raceway data. This cable is now part of the FPRA model that will be used to calculate RICTs. To locate this cable, a report from the Susquehanna Cable and Raceway Information Management Program (CRIMP) was used to identify the necessary cable to raceway information. Because the CRIMP database reflects the as-built, as-operated plant configuration for raceway routing, no assumed routing for this cable is required.

Audit Question Q-022

EITHER:

Identify the active partitions that have been credited in the FPRA and provide justification that they will perform reliably in the accident scenarios for which they are credited. Include discussion of systems that rely on supporting systems, such as alternating current power or a water supply, to perform their functions. If barriers such as dampers and doors are considered to be active partitions, then identify the mechanism that changes the position of the door or damper (e.g., fusible link plus gravity, operator action) to confirm that the mechanism does not rely on an active support system.

OR:

Explain how removal of the credit taken for active partitions has an inconsequential impact on the RICT calculations.

<u>Susquehanna Response</u>

Table Q22-1 provides a listing of the credited active partitioning elements between physical analysis units (PAUs) and provides a basis for the credit. These partitioning elements consist of normally open doors and dampers. The basis for credit of fire dampers is the fire rating, which is contained within the naming convention of the active partitioning elements. The naming scheme for the dampers provided in Table Q22-1 is as follows:

FPD-(RATING)-AA-B-C

Where:

- Rating: The following ratings are specified:
    - 1.5 hour
    - 3 hour
    - 3M (3 hour motor operated smoke damper)
    - 3P (3 hour pneumatic operated smoke damper)
- AA = Area number corresponding to the drawing key-plan
- B = Elevation number
- C = Sequence closure

The fire rating of every damper is based on a passive system in the form of a fusible link. From Design Basis Document DBD019 (Reference 37):

> All fire dampers are equipped with fusible link(s). Fire dampers with a "P" designation are also equipped with a CO_2 actuated pneumatic release. Fire dampers with an "M" designation are fusible link actuated dampers associated with smoke removal dampers.

Motor operated dampers are activated in the event of a fire via fusible link. The motor operator is for control of smoke. Similarly, pneumatic (CO_2) operated dampers are activated in the event of a fire via fusible link. The pneumatic operation is to maintain CO_2 concentration in the room where a CO_2 system protects the room. In sum, the fusible link is a passive system and serves as the basis for the fire rating, and thus the FPRA credit, for dampers as partitioning elements.

Active fire partitions (normally open fire doors and fire dampers) that are not a fire area barrier may be credited when the partitioning element is identified on the Fire Zone boundary drawings and in Susquehanna calculations EC-013-1006 (Reference 38) or EC-013-1009 (Reference 39), and confirmed - when applicable - by walkdowns. According to the specification for doors at Susquehanna, normally open fire doors are to be equipped with hold-open devices with fusible links. These mechanisms for doors do not rely on an active support system. The reliabilities of both doors and dampers are evaluated as part of the multi-compartment analysis using barrier failure probabilities.

Table Q22-1
FPRA Credited Active Partitioning Elements

PAU A	PAU B	Room A	Room B	Damper	Door	Drawing
0-31H_A	2-31C	C-015	II-030	3 HR-3-17-1-2	N/A	C-1786
0-31H_A	0-31H_B	C-015	II-055	3 HR-3-17-1-1SC	N/A	C-1786
0-32A_A	1-32B	C-100	I-111	3 HR-3-8-2-1SC, 3-8-2-2	N/A	C-1781
0-32A_A	1-32I	C-100	I-128	3 HR-3-8-2-3, 3-8-2-4, 3-8-2-5SC, 3-8-2-6	1.5 HR Fire Door 37	C-1781
0-32A_A	2-32B	C-100	II-111	3 HR-3-17-2-1, 3-17-2-2SC	N/A	C-1781
0-32A_A	2-32I	C-100	II-128	3 HR 3-17-2-3, 3-17-2-4, 3-22-2-1SC, 3-22-2-2	1.5 HR Fire Door 38	C-1787
0-22C	0-22A	C-116	C-120	3 HR-3-21-2-1	N/A	C-1747
0-24E	0-24F	C-202	C-206	3 HR-3P-21-4-22SC, 3P-21-4-23SC, 3P-21-4-24SC	N/A	C-1749
0-24E	0-24F	C-202	Duct Enclosure North 698	3 HR-3P-12-4-14SC, 3P-12-4-15SC	N/A	C-1749
0-24E	0-24F	C-202	Duct Enclosure South 698	3 HR-3P-21-4-20, 3P-21-4-21	N/A	C-1749
0-24B	0-24C	C-204	C-208	3 HR-3P-12-4-4, 3M-12-4-5, 3P-12-4-6, 3-12-4-17, 3-12-4-18	N/A	C-1749
0-33H	1-33B	C-212	I-219	3 HR-3-8-3-2SC, 3-8-3-3, 3-8-3-4SC, 3-8-3-5SC	3 HR Fire Door 221	C-1782

Table Q22-1
FPRA Credited Active Partitioning Elements

PAU A	PAU B	Room A	Room B	Damper	Door	Drawing
0-33H	2-33B	C-212	II-219	3 HR 3-17-3-2SC, 3-17-3-3, 3-17-3-4SC, 3-17-3-5SC	3 HR Fire Door 244	C-1788
0-33H	2-33A	C-212	II-220	3 HR-3-17-3-1	N/A	C-1788
0-33H	2-34A	C-212	II-301	3 HR-3-13-11-3SC, 3-13-11-4SC	N/A	C-1782
0-35A	Jan-35	C-400	I-422	3 HR-3-7-4-1SC, 3-7-4-2SC	N/A	C-1784
0-35A	Feb-35	C-400	II-422	3 HR-3-22-4-1SC, 3-18-4-1SC, 3-18-4-2SC	N/A	C-1790
0-26G	0-26F	C-401	C-404	3 HR-3-12-6-7	N/A	C-1751
0-26G	0-26H	C-401	C-409	3 HR-3-12-6-8	N/A	C-1751
0-26I	0-26J	C-402	C-403	3-21-6-5	N/A	C-1751
0-26I	0-26H	C-402	C-409	3 HR-3-21-6-6	N/A	C-1751
0-26E	0-26H	C-406	C-409	3 HR-3-12-6-6	N/A	C-1751
0-26A	0-26H	C-408	C-409	3 HR-3-21-6-4	N/A	C-1751
0-26H	0-26K	C-409	C-410	3 HR-3-12-14-7SC, 3-12-14-8SC, 3-12-14-9, 3M-21-14-13, 3-21-14-15SC, 3-21-14-16SC, 3-21-14-17SC, 3-21-14-18SC, 3-21-14-19SC, 3-21-14-20SC	N/A	C-1752
0-26H	0-26L	C-409	C-411	3 HR-3P-12-14-16	N/A	C-1752
0-26H	0-26K	C-409	C-412	3 HR-3-21-14-21, 3P-21-14-22	N/A	C-1752
0-26H	0-26L	C-409	C-413	3 HR-3P-12-14-14, 3-12-14-15	N/A	C-1752
0-26H	0-26K	C-409	C-414	3 HR-3P-21-14-23, 3-21-14-24	N/A	C-1752
0-26H	0-26L	C-409	C-416	3 HR-3P-12-14-17	N/A	C-1752
0-26K	0-26L	C-410	C-411	3 HR-3P-12-14-10	N/A	C-1752
1-31F_A	1-31E	I-052	I-053	3 HR-3-1-1-1, 3-1-1-2	N/A	C-1780
1-2B	1-2D	I-102	I-109	1.5 HR-1.5P-25-2-1, 1.5P-25-2-2, 1.5P-25-2-3SC, 3-25-2-4	N/A	C-1721

Table Q22-1
FPRA Credited Active Partitioning Elements

PAU A	PAU B	Room A	Room B	Damper	Door	Drawing
1-32B	1-32C	I-111	I-112	3 HR-3-4-2-2	N/A	C-1781
1-32C	0-32A_B	I-112	I-130	3 HR-3-4-2-1	N/A	C-1781
1-32E	1-32F	I-126	I-127	3 HR-3-1-2-1, 3-1-2-2	N/A	C-1781
1-32F	1-32I	I-127	I-128	3 HR-3-9-2-1, 3-9-2-2, 3-9-2-3, 3-9-2-4	1.5 HR Fire Door 35	C-1781
1-33B	1-33A	I-210	I-220	3 HR-3-4-3-1SC	N/A	C-1782
1-33D	1-33B	I-216	I-217	3 HR-3-1-3-1, 3-1-3-2SC	N/A	C-1782
2-31F_A	2-31E	II-052	II-053	3 HR-3-16-1-1, 3-16-1-2	N/A	C-1786
2-31F_B	2-31K	II-054	II-058	3 HR-3-16-1-3, 3 HR-3-16-1-4	N/A	C-1786
2-2A_A	2-2A_B	II-105	II-109	1.5 HR-1.5-32-2-2	N/A	C-1729
2-32B	2-32C	II-111	II-112	3 HR-3-13-2-2	N/A	C-1787
2-32C	0-32A_D	II-112	II-130	3 HR-3-13-2-1	N/A	C-1787
2-32E	2-32F	II-126	II-127	3 HR-3-16-2-1, 3-16-2-2	N/A	C-1787
2-32F	2-32I	II-127	II-128	3 HR-3-22-2-1SC, 3-22-2-2, 3-22-2-3	1.5 HR Fire Door 36	C-1787
2-33D	2-33B	II-216	II-217	3 HR-3-16-3-2, 3-16-3-3	N/A	C-1788

Audit Question Q-023

EITHER:

Confirm that all internal events modeling updates performed to resolve internal event F&Os that could impact fire risk were incorporated into the FPRA.

OR:

If the licensee cannot confirm that all internal events modeling updates performed to resolve F&Os that could impact fire risk were incorporated into the FPRA, then explain how the licensee will ensure that all internal events modeling updates performed to resolve F&Os that could impact fire risk are incorporated into the FPRA prior to implementation of the RICT program.

OR:

Explain how all the internal events modeling updates performed to resolve internal event F&Os have an inconsequential impact on the RICT calculations contribution from FPRA.

Susquehanna Response

The Susquehanna PRA utilizes a common backbone model (CBM) that is shared across multiple hazards; FPIE, FPRA, and IFPRA. The CBM consists of fault tree logic (with hazard-specific flags, hazard specific HRA, mitigating system logic, accident sequence logic, etc.), flag logic, mutually exclusive logic, and recovery logic. Along with the CBM, hazard specific FRANX files are used to insert hazard specific data, initiating events, etc. into the CBM. In short, one logic model is used across all hazards.

Based on the CBM approach, FPIE modeling updates are also reflected in that hazard-specific models. The same is true for logic changes made during FPRA or IFPRA model updates.

Audit Question Q-024

Confirm whether the licensee used any reduced transient HRRs [Heat Release Rates] below the bounding 98 percent HRR of 317 kilowatts (kW) from NUREG/CR-6850. If yes, then

EITHER:

Demonstrate that using reduced transient HRRs has an insignificant impact on this application.

OR:

Justify the use of the reduced HRRs, including:

- Identification of the fire areas where a reduced transient fire HRR is credited and what reduced HRR value was applied.
- A description for each location where a reduced HRR is credited, and a description of the administrative controls that justify the reduced HRR, including how location-specific attributes and considerations are addressed. Include a discussion of the required controls for ignition sources in these locations and the types and quantities of combustible materials needed to perform maintenance. Also, include discussion of the personnel traffic that would be expected through each location.

- The results of a review of records related to compliance with the transient combustible and hot work controls.

Susquehanna Response

Based on the criteria established in Section 3.4 of the Fire Modeling Treatments Notebook (Reference 40), a 145 kW HRR is applied to transient fire scenarios in the following PAUs:

- 0-28A-I: U2 DIV II EQUIPMENT ROOM
- 0-28A-II: U2 DIV I EQUIPMENT ROOM
- 0-28B-I: U1 DIV II EQUIPMENT ROOM
- 0-28B-II: U1 DIV I EQUIPMENT ROOM

The bounding heat release rate for transient fires provided in NUREG/CR-6850 Volume 2, and Supplement 1 (Reference 36) was used in locations where a large number of combustibles could be stored. These include most general locations in the plant such as large equipment areas, general floor areas, and storage areas. Many locations in the plant are small rooms where walking/storage room is very limited. For example, narrow corridors, switchgear rooms, and DC equipment rooms. A smaller transient would be expected in these types of areas and is justified in this section. The use of a lower HRR is considered applicable based on a detailed review of the NUREG/CR-6850 transient fire test. The transient fire test used as the basis of the NUREG/CR-6850 HRR includes:

- The Nowlen Test with and without acetone
- The Van Volkinburg Test which were performed in conditions that are not consistent with the spatial characteristics of areas of concern in the Fire PRA
- The Chavez test which are similar to the Nowlen test with acetone
- The Lee test which are similar to the Nowlen test with acetone
- The Cline test which were not considered in NUREG/CR-6850

Based on the test characterizations, the Van Volkinburg and Cline test are not considered applicable. The remaining tests are grouped as follows,

- Transient fires without wood or acetone: HRR 12 – 60 kW

- Transient fires with acetone: HRR 32 – 145 kW
- Transient fires with wood: HRR 186 – 327 kW

The 145 kW heat release rate represents the possibility that acetone would be present in any combustible fuel packages in these PAUs. Wood is not a material that would be brought to that elevation for use in maintenance activities. More likely combustible materials would include rags and any fluids needed to complete the electrical maintenance for the DC switchgear, battery chargers, and other electrical equipment in these PAUs.

These PAUs are the Unit 1 and Unit 2 DC Equipment Rooms (Division 1 and Division 2). They contain equipment limited to DC power distribution, and equipment required to support station batteries. These PAUs are small rooms with limited floor space available for storage and maintenance activities. Per Susquehanna drawing C-1754 (Reference 41) these PAUs are combustible restricted areas. Combustibles are restricted based on Susquehanna procedure NDAP-QA-0440 (Reference 42), which establishes the permitting process for combustible materials in the plant. Attachment B of this procedure explicitly states the following: “No transient combustibles are to be stored at any location on Elevation 771 of the Control Structure.” Attachment A of NDAP-QA-0440 provides the permit form for combustible or hazardous materials.

Susquehanna Calculation EC-013-1860 (Reference 43) provides recommendations and compensatory measures for the handling of transient combustibles in the “Restricted Areas (Red Zones)”, which the 771’ elevation of the Control Structure is considered.

> On the entire floor for Elevation 771’ of the Control Structure, the Fire Hazards Analysis contained in calculation EC-013-1846 limits the introduction of transient combustibles. Therefore, if any transient combustibles need to be stored in the Restricted Area (Red Zone) for these fire zones, a continuous fire watch should be deployed.

The fire load limits for the safety related areas of the plant are shown on drawing C-1929 (Reference 44) and the CRIMP. All permits for transient combustibles must be approved by the site fire protection engineer and entered into CRIMP. To exceed any allowable combustible limit requires specific technical justification and/or specific compensatory actions and approval by the Site Fire Protection Engineer in accordance with Reference 42.

In addition, it is reasonable to assume a limited need for maintenance activities based on the equipment located within the room. Occupancy for these PAUs is generally low based on the function, size of these PAUs, and considering that these PAUs do not represent typical access/egress paths through the Control Structure. Personnel traffic would be limited to routine inspections by operations and security personnel. For these reasons, the 145 kW HRR was

selected. This lower HRR is reflected in the input parameters used in the Fire Modeling Workbook (Reference 40).

A review of past violations of the transient combustible and hot work controls in these PAUs was performed by querying the plant ActionWay database. The ActionWay search included the following keywords and was performed for records created on or after January 1, 2018:

- "housekeeping" returned 1472 records, of which only 2 were related to the 771' elevation of the control structure. Neither of these violations were related to combustible material.
- "combustible" returned 1070 records, of which only 3 were related to the 771' elevation of the control structure. None of these violations were related to combustible material.
- "violation" returned 1059 records, of which none were applicable to the 771' elevation of the control structure.

The use of three years of historical records to reflect the current operating practices is consistent with what has previously been considered representative operating experience for other licensee applications. Furthermore, because the fire protection program at Susquehanna has demonstrated consistently improved performance since the initial rollout of the FPRA results in 2018, it would not be representative of current operating practice to include more than three years. Based on the results of this review, the application of the 145 kW HRR in these select PAUs is appropriate.

Audit Question Q-025

a. Describe the treatment of sensitive electronics for the FPRA and explain whether it is consistent with the guidance in FAQ [Frequently Asked Question] 13-0004, including the caveats about configurations that can invalidate the approach (i.e., sensitive electronics mounted on the surface of cabinets and the presence of louver or vents).

b. If the treatment of sensitive electronics for the FPRA includes deviations from FAQ 13-0004, then:

   EITHER:

   Identify the deviations, and justify (e.g., through a sensitivity calculation) that the treatment of sensitive electronics has no consequential impact on the RICT calculations.

   OR:

   Identify appropriate RMAs for this key assumption, consistent with the treatment of key assumptions in NEI 06-09-A, prior to implementation of the RICT program.

<u>Susquehanna Response</u>

Question 25.a:

The treatment of sensitive electronics in the SSES FPRA is consistent with the guidance provided in FAQ 13-0004 (Reference 45). FAQ 13-0004 supports use of the damage threshold for thermoset cables for assessing the potential for thermal damage to solid-state and sensitive electronics within an electrical cabinet. The presence of sensitive electronics mounted on the surface of cabinets and the presence of louvers or vents were considered during the ignition and scenario development walkdowns. In general, no sensitive electronics were observed to be located outside of the cabinets or robust enclosures (i.e., caveats in FAQ 13-0004 were not observed). Based on this observation, the application of the lower damage criteria (per NUREG/CR-6850, Section H.2 (Reference 36)) was not warranted.

Question 25.b

Not applicable. See response to Question 25.a.

<u>Audit Question Q-026</u>

a. Confirm and provide the minimum joint HEP [JHEP] value assumed in the FPRA.

b. EITHER:

   If the FPRA used a minimum joint HEP value of less than 1E-05, then demonstrate (e.g., through a sensitivity study) that the minimum joint HEP value(s) used have an inconsequential impact on the RICT application. If a sensitivity study is performed, then provide a description of and the quantitative results from the sensitivity study. Describe the process that will ensure the impact of JHEP values below the thresholds used in future PRA model revisions remains minimal.

   OR:

   If the licensee cannot justify that the minimum joint HEP value has an inconsequential impact on the application, then:

   - Confirm that each FPRA joint HEP value below 1E-5 includes its own justification that demonstrates the inapplicability of the NUREG-1792 lower value guideline (i.e., using such criteria as the dependency factors identified in NUREG-1921 to assess level of dependence). Provide an estimate of the number of these joint HEP values below 1.0E-5, discuss the range of values, and provide at least two different examples

where this justification is applied. Describe how JHEPs below the thresholds will be tracked as the PRA models evolve.

- If the licensee cannot justify joint HEP values used in the fire PRA below 1E-5, then identify appropriate RMAs for this key assumption, consistent with the treatment of key assumptions in NEI 06-09-A, prior to the implementation of the RICT program.

Susquehanna Response

Question 26.a

Section 4.1.3 of the SSES Fire HRA Notebook (Reference 46) describes the Dependency Analysis assessment process and quotes Section 6.2 of NUREG-1921 (Reference 47) which states the following:

> For fire HRA, it is recommended that the application of a lower bound follow the same guidance as was applied to the internal events PRA.

The SSES FPRA applies the same lower bounds applied in the SSES FPIE: a general joint HEP (JHEP) floor value of 1.00E-06 and if one or more of the independent constituent actions within the combination has more than 12 hours available, the applied floor value is 5.00E-07. This second JHEP floor value captures the multiple recovery opportunities inherent to long-term actions, including a change of shift personnel which will involve a complete reevaluation of plant status.

Question 26.b

A sensitivity analysis was performed where all JHEPs nominally less than 1.00E-05 were escalated to 1.00E-05. Table Q26-1 summarizes the results of this sensitivity on a sample of RICT calculations. The sample TS cases were selected because they represent the cases that would most likely be impacted by the assumption and produce RICT estimates less than 30 days.

As shown in Table Q26-1, the delta Fire CDF values are essentially unchanged from the base FPRA model (which uses the 1.00E-06 / 5.00E-07 JHEP floor values). Since the delta values are essentially unchanged, the RICT estimates (in days) are also essentially unchanged.

Therefore, the JHEP floor values used in the FPRA do not impact the results of the RICT calculations and use of the lower JHEP floor values (i.e., 1.00E-06 / 5.00E-07) are appropriate for implementation of the RICT Program.

Future updates to the FPRA dependency analysis will review the sensitivity of the JHEP floor value.

Table Q26-1
JHEP Floor Value RICT Calculation Sensitivity Results for FPRA
(FPIE, IFPRA & Seismic Results Remain Unchanged for Sensitivity Analysis)

			Unit 1 Base Results					Q26 Unit 1 Sensitivity Results (Minimum JHEP = 1.00E-05)		
Case	**Description**	**CDF Vs. LERF**	**Delta FPIE**	**Delta IFPRA**	**Delta Fire**	**Delta Seismic**	**RICT Estimate (Days) (30 Day Maximum)**	**Delta Fire**	**RICT Estimate (Days) (30 Day Maximum)**	**RICT % Change**
TS 3.3.5.1.B	Instrumentation ECCS - As required by Required Action A.1	LERF	3.00E-10	0.00E+00	3.18E-05	5.10E-07	11.3	3.18E-05	11.3	~0.00%
TS 3.5.1.A	One Low Pressure ECCS Subsystem Inoperable	CDF	2.25E-07	1.84E-08	4.98E-04	1.70E-06	7.3	4.98E-04	7.3	~0.00%
TS 3.5.1.G	One ADS Valve and Condition A (i.e., One CS Loop)	CDF	2.33E-07	1.45E-06	4.98E-04	1.70E-06	7.3	4.98E-04	7.3	~0.00%
TS 3.7.2.A	One ESW Pump in Each Subsystem	CDF	1.74E-06	1.63E-05	9.56E-04	1.70E-06	3.7	9.56E-04	3.7	~0.00%
TS 3.8.1.C	Two Offsite Circuits Inoperable	CDF	3.72E-05	3.09E-05	4.66E-04	1.70E-06	6.8	4.67E-04	6.8	-0.17%

Audit Question Q-027

Describe how fire propagation outside of well-sealed MCC cabinets greater than 440 V is evaluated. If well-sealed cabinets less than 440 V are included in the Bin 15 count of ignition sources, then provide justification for using this approach.

Susquehanna Response

In accordance with FAQ 14-0009 (Reference 48), certain MCCs were considered sealed such that a split fraction for non-arcing fires could be applied. A factor of 0.23 was used to represent the fraction of fires assumed to breach a well-sealed MCC cabinet (these are considered to be “arching fires”). Non-arcing fires were considered to not propagate beyond the MCC itself.

For MCCs with vertical sections that were not well-sealed, the numerator and denominator of the ignition frequency was modified to reflect the portion of the MCC that was not well-sealed

(e.g., one not well-sealed section out of seven total vertical sections). For these not well-sealed sections of the MCC, no factor was applied to credit the lack of propagation. This treatment is consistent with the guidance presented in FAQ 14-0009.

Well-sealed cabinets less than 440 V are not included in the Bin 15 count of ignition sources.

Audit Question Q-028

Provide a sensitivity study or other justification demonstrating that assigning weighting factors of “50” per the guidance in FAQ 12-0064 has an inconsequential impact on the RICT calculations.

Susquehanna Response

The Susquehanna FPRA currently does not apply a “very high” transient influence factor (TIF) of 50 (from FAQ 12-0064) to any PAU. FAQ 12-0064 (Reference 49) does not explicitly require the use of the full range of ratings, as shown below:

> The full range of the numerical ranking values is available to the analyst and should, at least nominally, be exercised for each location set. If the full range of the ranking factor values is not exercised, then fire frequency will be distributed more evenly to the applicable fire compartments. If the analyst concludes that a relatively even distribution is the correct answer for the plant and location set, then it is recommended that an explanation should be provided in the PRA documentation.

In order to determine the relative TIF ratings, a panel was held including the plant fire protection engineer and a representative from mechanical maintenance. This panel concluded that no PAUs within the plant generic locations had a level of maintenance or hotwork significantly higher than other PAUs assessed as “high”. Therefore, the “very high” rating was not used. An even distribution is more appropriate given that no PAUs are outliers that would warrant an application of the “very high” factor of 50.

TIFs were assigned to each PAU relative to the other PAUs within the same plant area (Control-Aux-Reactor, Turbine Building, or Plant Wide). A summary of the results of the relative rankings of each PAU within the generic locations are shown in the figures below. In the bar graphs, the vertical axis shows the number of PAUs in each generic location assigned to each of the influence factors. In general, these graphs show that the distribution of TIFs meets the intent of the FAQ by following a bell curve shape with a majority of the PAUs assigned to the “average” factor. No PAUs are assigned to “extremely low”, “very low”, or “very high” ratings.

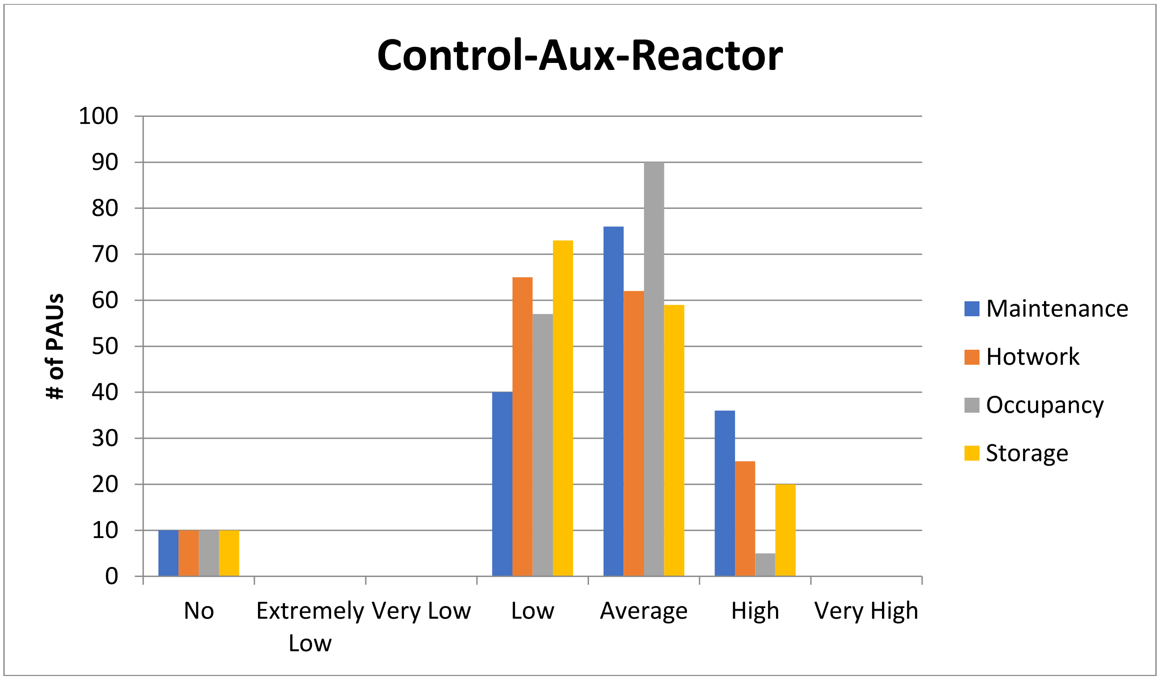

Figure Q28-1
Transient Influence Factor Results for Control-Aux-Reactor Generic Location

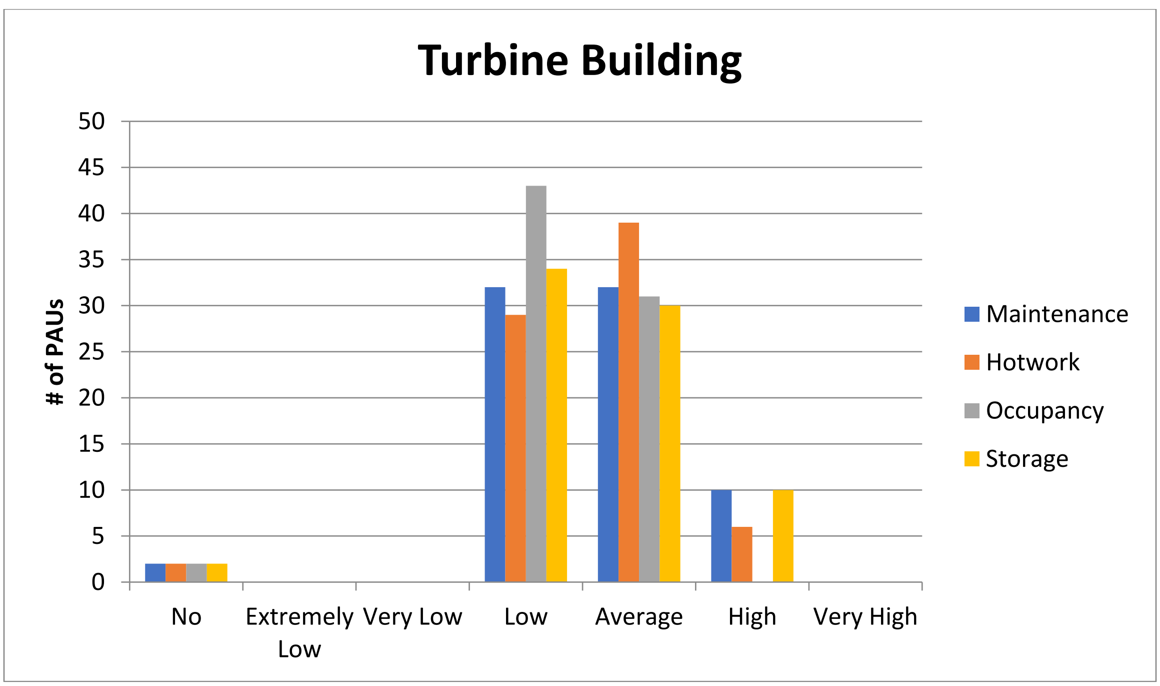

Figure Q28-2
Transient Influence Factor Results for Turbine Building Generic Location

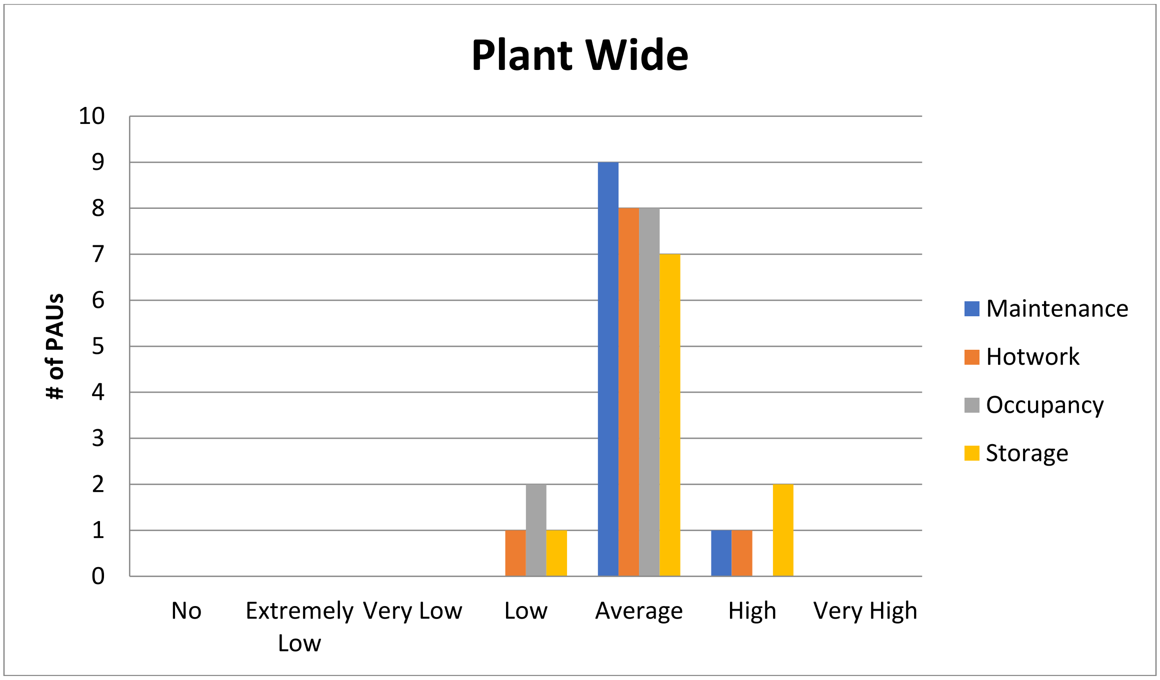

Figure Q28-3
Transient Influence Factor Results for Plant Wide Generic Location

As a sensitivity, the PAUs were reviewed and four PAUs were identified as the most likely candidates for the "very high" TIF. These PAUs are as follows:

- 1-31F_A: Unit 1 Pump Area/Snubber Test Room
- 2-31F_A: Unit 2 Pump Area/Snubber Test Room
- 1-36A: Unit 1 H&V Equipment Room
- 2-36A: Unit 2 H&V Equipment Room

For these PAUs, the maintenance and hotwork categories were elevated from "high" to "very high" as a bounding assessment. This change resulted in an increase in the full-room burnup TIF from 8.23E-04 per year to 3.11E-03 per year for each PAU. Table Q28-1 summarizes the results of this sensitivity on a sample of TSTF-505 RICT calculations. The sample TS cases were selected because they represent the cases that would most likely be impacted by the assumption and produce RICT estimates less than 30 days.

As shown in Table Q28-1, the delta Fire CDF values are essentially unchanged from the base FPRA model (which uses the "high" TIF for maintenance and hotwork). Since the delta values are essentially unchanged, the RICT estimates (in days) are also essentially unchanged.

Therefore, the use of "very high" TIFs does not impact the results of the RICT calculations and use of the base FPRA TIFs is appropriate for implementation of the RICT Program.

Table Q28-1
"Very High" TIF Value RICT Calculation Sensitivity Results For FPRA
(FPIE, IFPRA & Seismic Results Remain Unchanged for Sensitivity Analysis)

			Unit 1 Base Results					Q28 Unit 1 Sensitivity Results ("Very High" TIF for 4 PAUs)		
Case	**Description**	**CDF vs. LERF**	**Delta FPIE**	**Delta IFPRA**	**Delta Fire**	**Delta Seismic**	**RICT Estimate (Days) (30 Day Maximum)**	**Delta Fire**	**RICT Estimate (Days) (30 Day Maximum)**	**RICT % Change**
TS 3.3.5.1.B	Instrumentation ECCS - As required by Required Action A.1	LERF	3.00E-10	0.00E+00	3.18E-05	5.10E-07	11.3	3.18E-05	11.3	~0.00%
TS 3.5.1.A	One Low Pressure ECCS Subsystem Inoperable	CDF	2.25E-07	1.84E-08	4.98E-04	1.70E-06	7.3	4.98E-04	7.3	~0.00%
TS 3.5.1.G	One ADS Valve and Condition A (i.e., One CS Loop)	CDF	2.33E-07	1.45E-06	4.98E-04	1.70E-06	7.3	4.98E-04	7.3	~0.00%
TS 3.7.2.A	One ESW Pump in Each Subsystem	CDF	1.74E-06	1.63E-05	9.56E-04	1.70E-06	3.7	9.56E-04	3.7	~0.00%
TS 3.8.1.C	Two Offsite Circuits Inoperable	CDF	3.72E-05	3.09E-05	4.66E-04	1.70E-06	6.8	4.67E-04	6.8	-0.04%

Audit Question Q-029

Many plants have Unit 1 and 2 adjoined and, thus, have common areas. For these plants, the risk contribution from fires originating in one unit must be addressed for impacts to the other unit given the physical proximity of the other unit and common areas. Therefore, confirm whether Units 1 and 2 have common areas and shared systems, and if yes, then:

a. Explain how the risk contribution of fires originating in one unit is addressed for the other unit given the impacts from the physical proximity of equipment and cables in one unit to

equipment and cables in the other unit. Include identification of locations where fire in one unit can affect components in the other unit.

b. Explain how the FPRA addresses contributions of fires in common areas that can impact components in both units, including the risk contribution of such scenarios. If any such scenarios are not addressed in the FPRA, then provide justification that their exclusion does not impact this application.

Susquehanna Response

Susquehanna does have common areas and shared systems within those areas.

Question 29.a

Fires originating in one unit can impact equipment and cables on the opposite unit. One example of this occurrence is a multi-compartment fire scenario between two PAUs that border one another but are supporting opposite units. In these scenarios, equipment and cables in both PAUs are subject to the damage vector of the fire. The risk contribution of fires on the opposite unit is accounted for by quantifying all fire initiators for all unit endstates. This means that Unit 2 fire initiators are quantified in the Unit 1 FPRA model and vice versa. Review of the FPRA shows the fire initiators that appear in cutsets when the opposite unit is quantified. The cross-unit impacts are captured in the quantification through the cable to raceway to equipment to basic event mapping. In addition, all fires are assumed to result in at least a turbine trip in the analyzed unit, regardless of the fire-induced failures (i.e., a fire in Unit 1 is assumed to result in a turbine trip in Unit 2 for the Unit 2 FPRA model, and vice versa).

The fire scenario development methodology used in the FPRA requires that all targets within the zone of influence (ZOI), regardless of location within the respected units, be selected and analyzed for fire-induced failure. For example, for fire scenarios postulated in common areas, where targets from both units are within the ZOI, all targets are failed due to fire-induced damage and the impact on the unit's fire risk was evaluated based on the component and cable selection associated with that unit.

Many fire zones include cable routing that can impact basic events associated with the opposite unit. The following is a sample of fire scenarios which include impacts on both units:

- %F5_0-28A-II:0-28B-II_-_M (Multi-compartment fire scenario between 0-28A-II and 0-28B-II on the 771' elevation of the Control Structure)

- %F1_233B_-_W (Iso-phase Bus Duct/Boiler/Alcove area on the 683' elevation of the Unit 2 Turbine Building)

- %F1_15AN_1B253_E_OR (Sever fire at MCC 1B253 in 1-5A-N on the 749' elevation of the Unit 1 Reactor Building (RB))

Question 29.b

See response to part (a). In addition, common area fires include cable and equipment from both units within the damage vector. No common area fires were excluded from consideration in the FPRA. A sample of risk contributions from several common areas is provided in Table Q29-1. This list is not comprehensive of all common area risk contributors.

Table Q29-1
Sample of Common Area CDF Contributions

PAU	Unit 1 CDF Fussell-Vessely	Unit 2 CDF Fussell-Vessely
0-26H - CONTROL ROOM	36.38%	28.94%
D-1 - DIESEL GENERATOR BAY A	2.93%	0.37%
0-26R - TSC SOUTH OFFICE SOFFIT	0.02%	8.66%
0-26I - SHIFT SUPERVISOR'S OFFICE	0.01%	7.18%

Audit Question Q-030

LAR Enclosure 9, Table E9-2, states that the Human Reliability Analysis (HRA) for the fire PRA was performed using "industry consensus modeling approaches" but does not cite use of NRC's most current guidance on fire HRA, NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines—Final Report" (ADAMS Accession No. ML12216A104). It is not clear if the licensee considered this guidance in its HRA. Therefore:

a. Confirm whether the licensee considered the guidance in NUREG-1921 to perform the HRA for the fire PRA. If it did, then describe any deviations from the guidance that could be characterized as potential key assumptions or sources of modeling uncertainty.

b. If in response to part (a) deviations from the guidance in NUREG-1921 could be characterized as assumptions or sources of modeling uncertainty, then justify that this modeling uncertainty has an inconsequential impact on the application (e.g., by performing a sensitivity study). If it cannot be determined that this modeling uncertainty has an inconsequential impact on the estimated RICTs, then identify programmatic changes to compensate for this uncertainty and the basis for them (e.g., identification of additional

RMAs, program restrictions, or the use of bounding analyses which address the impact of the uncertainty).

<u>Susquehanna Response</u>

Question 30.a

The SSES Fire HRA was heavily informed by NUREG-1921 (Reference 47) as documented in the “Applied Guidance” sections located throughout EC-RISK-1185 (Reference 46). The guidance presented in NUREG-1921 was largely followed, with some minor exceptions. Most notably, the treatment of fire impacts on accessibility for actions executed outside of the control room, and the scope of errors of commission (EOCs), deviated from the guidance.

Actions Taken Outside the Control Room

Rather than evaluate the specific travel paths for all locally executed actions with respect to the locations of all potentially consequential fires (as described in NUREG-1921 section 4.3.4.5), a more general but bounding approach was taken. Table 3.1-2 of EC-RISK-1185 documents the availability of unique or multiple pathways to each execution location. Actions with unique pathways were failed for fire scenarios that prohibited access to the execution location. For actions where access would be available, a bounding access delay of ten minutes (estimate obtained during operator interviews) was applied to the execution time for all locally executed actions unless the cue occurred over four hours after the fire at time zero. After four hours, the fire was expected to be extinguished, and fire-fighting equipment removed (i.e., access delays were considered unlikely).

This deviation from NUREG-1921 guidance is addressed by the “Operating Environment” uncertainty source evaluated in Table 5.1-1 of EC-RISK-1185 which recognizes that, “conservatism is introduced when the most limiting or challenging conditions are applied.” However, this deviation is characterized as having an inconsequential impact on the application as it does not result in a significant impact on the credited operator actions.

Errors of Commission (EOC)

Section 3.4.1 of NUREG-1921 involves identifying EOCs. While the alarm response procedures were individually reviewed to assess the potential for EOCs, Emergency Operating Procedures (EOPs) were not reviewed for EOCs based on observations documented in NUREG-1921. Namely, EOP-based parameters have redundant channels such that a single spurious indication (as required to meet CC-II of SRs HRA-A3 and HRA-B4) would not mislead an operator and the symptom-based EOPs are designed to provide additional confirmation after significant decision points to allow the crew to correct any misdiagnoses. Further, the operators can identify protected or Safe Shutdown Equipment List (SSEL) indications for specific fire areas by using

Attachment A, “Protected Safe Shutdown Equipment” found in procedure ON-013-001, “Response to Fire”.

EOCs during the performance of EOPs are considered to be low likelihood events. The EOPs are symptom based, requiring multiple verification steps. Considering how fires impact cables, multiple unrelated alarms would likely come in at the same time, which would be unusual, and prompt additional review and scrutiny. Furthermore, if such an error was committed, recovery would be likely; it is recognized that some errors (e.g., depressurization) cannot be recovered. For such critical decisions, operators are highly sensitive to performing such actions and multiple verifications, in consultation with the rest of the crew, would be performed. In short, the likelihood of performing an unrecoverable error from the EOPs would be extremely low. Based on this assessment, this deviation is characterized as having an inconsequential impact on the application.

Question 30.b

See response to part (a). In summary, no deviations from NUREG-1921 guidance constitute significant sources of uncertainty.

<u>Audit Question Q-032</u>

Justify that using a plant-level HCLFP [sic] capacity of 0.3g is sufficient for estimating a bounding seismic CDF for this application given that there are plant SSCs with a HCLFP [sic] capacity of 0.21g. Include discussion of the cited “outliers” that were identified in the SSES IPEEE [Individual Plant Examination of External Events] and the “resolutions” of those outliers for this application.

<u>Susquehanna Response</u>

As discussed in Section 1.4, Summary of Major Findings, of the SSES IPEEE Submittal (Reference 50), the SSES IPEEE seismic margins assessment (SMA) identified four items (two valves and two electrical cabinets) which are acceptable in terms of the SSES seismic design basis but are considered "outliers” when screened against the seismic margins earthquake (SME) of 0.3g Peak Ground Acceleration (PGA). These items are either not strictly required for the SSES SMA SSEL or may be manually operated after the SME.

The sufficiency of the 0.3g value IPEEE screening level as a plant-level High Confidence of Low Probability of Failure (HCLPF) was evaluated in Susquehanna calculation EC-RISK-0045 (Reference 51), and includes discussion of cited outliers with HCLPF values determined to be less than 0.3g in the SSES IPEEE report along with resolutions for those outliers. EC-RISK-0045 was provided to the NRC to support the Regulatory Audit. Section 2.3.2 of EC-RISK-0045 is presented in its entirety below.

In addition to the discussion from EC-RISK-0045 presented below, it is noted that the lowest HCLPF values of 0.21g PGA are driven by seismic interaction of inline piping components. These fragilities will be governed by displacement which is based on low frequency response. The IPEEE SME exceeds the Ground Motion Response Spectra (GMRS) by significant margins at low frequencies, and therefore it is expected that higher fragility values would be determined if the GMRS were considered in place of the IPEEE SME.

Group 1 Outliers

Section 2.3.1 of EC-RISK-0045 provides a review of group 1 outliers. This information is based on the following discussion in NE-94-001, Volume 1, page 1-3:

> Four issues were identified during the course of plant walkdowns where actual field installation did not conform with seismic design qualification test configuration. These issues are: small trolley cranes attached to the top of switchgear cabinets to aid in the maintenance of breakers; control room and relay room cabinets which were originally qualified as individual units, but which are installed in long rows; instances of missing or broken fasteners on electrical equipment cabinets and non-seismic equipment in close proximity; and anchorage of control room CRTs [Cathode Ray Tubes].

For these items, walkdowns were performed and documented as follows:

- Resolution of the small trolley cranes attached to the top of switchgear cabinets is documented in NE-94-001, Volume 1, page 3-40:

  > EDR 94-018 was written to address the breaker hoists on the switchgear. The breaker hoists were removed. A calculation was performed to evaluate the effect of the remaining steel associated with the breaker hoist assembly on the seismic qualification of the switchgear. The switchgear's SQRT [Seismic Qualification Review Team] binder was updated to reflect the breaker hoist issue.

- Control room and relay room cabinets.

- Control room CRT anchorages.

Regarding bullets two and three, the scope of the outliers is documented in NE-94-001, Volume 1, pages 3-77 to 3-88. Eight items are listed, and two outliers are identified:

> Systems Interaction: Yes - Two Outliers

1. At several locations inside the control and relay rooms, adjacent panels in close proximity to each other are not fastened together. This is considered as a deficient condition for the reasons stated above.

2. The existing supports for the color video CRTs in panels #C651 and C601 cannot positively restrain the lateral movement of the CRTs since there is no positive connection between the CRT and its support.

Outliers Resolution

All outliers are being resolved through the SSES Deficiency Management Program.

Specific to item 1, Engineering Deficiency Report (EDR) 94-030 was created to track this issue. This EDR was later converted to Condition Report (CR) CR-51636. As part of closing this CR, Action 71646 was performed. The closure required the generation and completion of design changes 95-9047 and 95-9048. Based on the status of CR-51636, EDR 94-030 is closed.

Specific to item 2, EDR 94-039 was created to track this issue. Because a documented resolution to this EDR cannot be identified, a walkdown was performed to verify that the supports for color video CRTs in Main Control Room panels #C651 and #C601 can positively restrain lateral movement. The walkdown identified that the CRTs have been removed from panel #C651 and panel #C601. Panel #C651 now has LCD monitors. As a result, item 2 is no longer applicable.

Group 2 Outliers

----- excerpt taken from EC-RISK-0045, Revision 0[1]:

As documented in Section 8 of the IPEEE report [1] these four outliers can be operated manually and the SMA team judged that both safe shutdown (SSD) paths pass the screening criteria of 0.3g. Table 2.3-2 presents the four outliers and their corresponding HCLPF values.

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[1] Note that reference numbers listed in the excerpt from calculation EC-RISK-0045 are the reference numbers within EC-RISK-0045. The references are not necessarily included in the reference list of this enclosure. Key references are listed at the end of the calculation excerpt.

Table 2.3-2
List of the Outliers in Group 2 with their corresponding HCLPF (g) values

Item No.	Component Description	Component ID	Limiting Condition	HCLPF (g)	Corresponding Section in Reference 1
1	HPCI Pump Discharge Valve	HV-155-F006	Potential impact with non-Q valve	0.21	3.10.6.8
2	RHR-SPCMb Suppression Pool Inlet Valve	HV-251-F024B	Potential impact with adjacent platform handrail	0.21	3.10.6.8
3	Automatic Transfer Switch	0ATS556	Potential impact with Adjacent HVAC support	0.25	3.10.6.23
4	480V Motor Control Center	MCC-2B237	Potential impact with Adjacent HVAC support	0.26	3.10.6.1

The itemized outliers in Group 2 are discussed briefly as follows:

<u>HPCI Pump Discharge Valve (HV-155-F006) and RHR-SPCMb Suppression Pool Inlet Valve (HV-251-F024B)</u>

As documented in the IPEEE report [1]: Valve HV-155-F006 is evaluated by EPRI 6041 methodology, the governing failure mode is the clearances between the SSEL valve HV-155-F006 and the adjacent valve 155018, valve PSV-15513, and pipe support SP-DBB-120-H2003 are noted to be about 1-1/4”, 1/4", and 1", respectively.

As documented in the IPEEE report [1]: Valve HV-251-F024B is evaluated by EPRI 6041 methodology, the governing failure mode is the clearance between the valve and adjacent handrail. The clearance between the operator of the SSEL valve HV-251F024B and a handrail is noted to be about 1/2".

These outliers are judged to not impact the determination of a plant limiting HCLPF for use in risk-informed applications for the following reasons stated in Reference 1:

1. The dynamic interaction with the adjacent non-Q valve PSV-15513 is the controlling item in the calculated HCLPF value. If impact occurs for SME loading, the affected component on valve HV-155-F006 is the stem protector. Approximately 0.75-inch gap is provided between the stem and the stem protector and consequently should

impact occur only slight bending of the protector will result and not interfere with valve operation.

2. Valve HV-251-F024B is a normally closed isolation valve for RHR return to the suppression pool. The interaction concern is unlikely to interfere with the isolation function of the valve, i.e., the function is unlikely to be required during the earthquake [1]. The valve is required to open for suppression pool cooling (SPC). Per IPEEE notes [1] the interaction concern is only expected to affect the operator of the valve, post-earthquake/interaction. Therefore, plant operators can manually stroke the valve.

   For the scenarios of concern, the operators would have enough time to manually operate the valve [15, 18]. Even in an unlikely scenario where suppression pool cooling was not initiated before the primary containment pressure limit (PCPL) was reached, there is substantial time (on the order of 24 hours or more until containment overpressure failure, assuming the failure of venting), to initiate the SPC by operators within the PRA mission time.

3. Even if valve HV-251-F024B cannot open, as documented in the IPEEE report [1] alternate shutdown cooling can be established by reactor vessel depressurization, establishing RHR suction from the suppression pool through the RHR heat exchangers to the reactor vessel LPCI lines, and returning to the pool via SRVs.

Severe Accident Mitigation Alternatives (SAMA) [20] concludes, given the existence of an alternate means of using the “B” RHR loop for DHR [Decay Heat Removal] when valve HV-251-F024B has failed, the capability to open the valve locally for the expected failure mode, and the margin presents in the methodologies used to assess the HCLPF value of 0.21g, no SAMAs are considered to be required to address the seismically induced failure of HV-251-F024B.

The circumstances related to the potential failure of the HPCI injection valve (HV-155-F006) are similar to those for valve HV-251-F024B in that the assessment of 0.21g HCLPF value is considered to be conservative and that another means of providing the affected function is available. In this case, the alternate HPI [High Pressure Injection] source is another system on the SSEL (RCIC) rather than an alternate use of the same train of the same system. Per SAMA [20], in both cases the affected function is still available. In the event that RCIC fails in conjunction with HV-155-F006, the ADS valves and low-pressure injection/DHR would still be available to provide core cooling. SAMA [20] concludes that no SAMAs are considered to be required to address the seismically induced failure of HV-155-F006.

Automatic Transfer Switch (0ATS556)

0ATS556 provides auto transfer of the power supply to E DG MCC under degraded voltage conditions. During normal operation, 0ATS556 ensures that either 13.8 kV Startup Bus 10 or 13.8 kV Startup Bus 20 supplies power via Transformers (13.8 kV/480 VAC) 0X555 or 0X556 to MCC 0B565 [16]. When DG "E" is in use, however, power to this MCC is supplied from the E DG Bus 0A510 through the Transformer 0X565 [16] The 0ATS556 supplies power from offsite which is lost in a LOOP [16]. LOOP typically occurs at relatively low hazard levels; so even though the HCLPF of 0ATS556 is significantly higher than typical LOOP occurrence (0.25g vs. 0.1g LOOP), this component would not provide significant seismic mitigation credit.

SAMA (Reference 20) concludes that review of FPIE showed that 0ATS556 automatic switch transfer had no impact on DG availability and would likely serve no purpose in a seismic event. The function of the 0ATS556 automatic transfer switch is to transfer the power supply for Class 1E MCC 0B565 to transformer 0X556. Given loss of power to both of these transformers, the breakers between 0ATS556 and MCC 0B565 automatically open and the MCC is powered from 0X565, which is backed by emergency power. If the seismic event fails 0ATS556, the result is minimal because MCC 0B565 would receive power from transformer 0X565. Therefore SAMA [20] concludes that no SAMA is required to address this issue.

480V Motor Control Center (MCC-2B237)

This component was evaluated by EPRI 6041 methodology, the governing failure mode was the identified 1/16" gap between the vertical HVAC duct stiffener and MCC 2B237. The gap was found to be sufficient for SSE [Safe Shutdown Earthquake] loads, but insufficient for SME loads. The function of MCC-2B237 is not risk significant in the SSES FPIE [13].

It was on the SSEL to provide depth for suppression pool cooling. MCC 2B237 controls valves for Div. I RHR and RHRSW associated with heat exchanger A and RHR flow to suppression pool. Even if MCC 2B237 fails, time is available for local manual valve operation [1]. Furthermore, as discussed in Section 2.II.i, manual operation of the SPC valves is credited in the HRA calculator via MAN-OP_SPC_E-O (OPERATOR FAILS TO MANUALLY OPEN/CLOSE VALVES FOR SPC EARLY). Based on the HRA calculator, this action represents the probability that plant operators will fail to perform a local, manual valve manipulation to establish decay heat removal. This action is taken when the powered valve operator has failed, and local action can change the state of the valve. This action is only credited for preventing the violation of PCPL in non-ATWS scenarios [17] and therefore has no impact on COPF [Containment Overpressure Failure].

As documented in SAMA [20], the internal events model has analyzed these operator actions and includes credit for local valve manipulations given the failure of remote operation for loss of DHR scenarios. SAMA [20] concludes that the failure probability of the local valve manipulation has been estimated to be 6E-4 and similar credit is likely available after a seismic event. Given that the RHR and RHRSW valves are located in a seismically sound structure, the environmental performance shaping factors due to building failures should not be an issue. Per SAMA [20] if the Extreme Stress multiplier of 10 from NUREG/CR-1278 (NRC 1983b) is applied to this HEP to account for any psychological effects of the earthquake, the failure probability increases to only 6E-3, which is comparable to the mitigating equipment and alignment failures in previous SAMA submittals (NMC 2005a) (CPL 2004). Per Reference 20, SAMA concludes that no SAMAs are required to address this outlier.

----- end of excerpt

In the excerpt above, the following key References are used:

1. NE-94-001, “Susquehanna Steam Electric Station Individual Plant Examination for External Events”, Pennsylvania Power & Light Company, June 1994.

20. Appendix E, Applicant’s Environmental Report – Operating License Renewal Stage Susquehanna Steam Electric Station, PPL Susquehanna, LLC, Unit 1 [Docket No. 50-387, License No. NPF-014], Unit 2 [Docket No. 50-388, License No. NPF-022], September 2006, (Agency wide Documents Access and Management System (ADAMS) Accession No. ML062630235).

Audit Question Q-037

Identify and justify the mechanism that will be used to ensure that the watertight doors will be closed during a flood event to prevent impact on risk significant equipment.

Susquehanna Response

The station will enter Susquehanna procedures NDAP-00-0030 (Reference 52), and ON-NATPHENOM-001 (Reference 53), upon receiving a warning for severe weather.

In the event of “severe weather” or a “natural disaster,” Susquehanna procedure NDAP-00-0030 directs operators to prepare for severe weather by performing the actions in Attachment A, “Severe Weather Preparations Checklist” Step 10 of the Operations checklist in Attachment A directs operators to “Ensure external flood doors are closed and latched (Doors: 101, 102, 113A, 114A, 119A, 120A, 1614-O, 1615-O, 1616-O, 1617-O, 1701-O, 1704-O, 1705-O, 1706-O, and

1-3)." This procedure is well laid out with clear procedural triggers to initiate the actions required to ensure the doors are closed during an external flooding event.

The procedure defines "severe weather" as follows:

> The Shift Manager has determined that weather conditions have deteriorated to the point that personnel safety or property damage is a concern, even though an official WARNING has not yet been issued." This definition suggests that the Shift Manager has discretion, and that the actions taken in the procedure checklist are not confined to a narrow or specific definition of weather conditions.

It should be noted that during the review of NDAP-00-0030, it was discovered that the doors listed to be closed in the latest revision of the procedure differ slightly from the list provided in Susquehanna calculation EC-RISK-0047, Table 3-1 (Reference 54). The change in required doors is a result of the final calculated flood heights around the site. Specifically, the DG Building (A, B, C, and D) finished floor elevation (677.0 feet NGVD 29) is above the maximum flood level (676.30 feet NGVD 29). The E DG Building elevation (675.5 feet NGVD 29) is above the maximum flood level (675.27 feet NGVD 29) as well, however, the Door 1-3 is located inside a concrete hallway required for missile protection on the bottom of the slope from the main power block. Therefore, water could locally pond to depths higher than the expected max flood height of the surrounding areas. For this reason, E DG Building Door 1-3 is required to be closed for screening the flooding scenario to provide an additional 2.5 feet of protection, but other DG Building doors (1614-O through 1617-O) are not required and considered asset protection measures.

Table Q37-1
Updated List of Doors to be Closed

Door Number	Unit	Building	Elevation
119-A	1	RB	676'
101	1	RB	670'
113-A	1	RB	670'
120-A	2	RB	676'
102	2	RB	670'
114-A	2	RB	670
1701-O	N/A	ESSW	685'-6"
1704-O	N/A	ESSW	685'-6"
1705-O	N/A	ESSW	685'-6"
1706-O	N/A	ESSW	685'-6"
1614-O	N/A	DGABCD	677'
1615-O	N/A	DGABCD	677'
1616-O	N/A	DGABCD	677'

Table Q37-1
Updated List of Doors to be Closed

Door Number	Unit	Building	Elevation
1617-O	N/A	DGABCD	677'
1-3	N/A	DGE	675'-6"
Removable Wall Panels	N/A	DGE	675'-6"

Audit Question Q-038

In the LAR, Enclosure 12, "Risk Management Action (RMA) Examples," the licensee stated that multiple example RMAs may be considered during a RICT program entry to reduce the risk impact and ensure adequate defense-in-depth. Provide a list of RMAs that will to be considered during the implementation of RICT program relating to the following TS Conditions.

(a) TS 3.8.1, Condition C

(b) TS 3.8.4, Condition B

(c) TS 3.8.4, Condition C

(d) TS 3.8.7, Condition A

(e) TS 3.8.7, Condition B

(f) TS 3.8.7, Condition C

(g) TS 3.8.7, Condition D

Susquehanna Response

RMAs both for regular and common cause considerations are developed for the specific configuration following the steps outlined in Enclosure 12 of Reference 1. NEI 06-09 (Reference 8) classifies RMAs into the three categories described below (the following items are representative examples, and do not constitute an exhaustive list of all possible actions)

a. Technical Specification 3.8.1, Condition C

   For TS 3.8.1, "AC Sources – Operating," Condition C, "Two offsite circuits inoperable," RMAs could include:

1. Actions to increase risk awareness and control

   - Briefing of the on-shift operations crew concerning the unit activities, including any compensatory measures established, and review of the appropriate procedures for a LOOP and SBO including bus crossties.

   - Notification of the Transmission System Operator (TSO) of the configuration so that any planned activities with the potential to cause a grid disturbance are deferred.

   - Proactive implementation of RMAs during times of high grid stress conditions prior to reaching the risk management action time, such as during high demand conditions.

2. Actions to reduce the duration of maintenance activities

   - For planned RICT entry, creation of a sub schedule related to the specific evolution which is reviewed for personnel resource availability.

   - Confirmation of parts availability prior to entry into a planned RICT.

   - Walkdown of work prior to execution.

3. Actions to minimize the magnitude of the risk increase

   - Deferral of elective maintenance in the switchyard, on the station electrical distribution systems, and on the main and auxiliary transformers associated with the unit.

   - Protection of all operable DGs.

   - Deferral of planned maintenance or testing that affects the reliability of DGs and their associated support equipment; treat these as protected equipment.

   - Implementation of 10 CFR 50.65(a)(4) fire-specific RMAs associated with the affected offsite sources.

b. Technical Specification 3.8.4, Condition B

For TS 3.8.4, "DC Sources – Operating," Condition B, "One battery 125 VDC or 250 VDC battery bank inoperable," RMAs could include:

1. Actions to increase risk awareness and control

   - Briefing of the on-shift Operations crew concerning the unit activities, including any compensatory measures established, and review of the appropriate procedures for a Loss of DC division and SBO.

   - Briefing of the on-shift operations crew concerning the impact the DC division has on the potential response to plant events such as reduced control systems.

   - For a planned RICT, prior to removal from service, the actions in the associated loss of bus procedure would be reviewed and implemented.

   - Minimize activities that could trip the unit.

2. Actions to reduce the duration of maintenance activities

   - For planned RICT entry, creation of a sub schedule related to the specific evolution which is reviewed for personnel resource availability.

   - Confirmation of parts availability prior to entry into a planned RICT.

   - Walkdown of work prior to execution.

3. Actions to minimize the magnitude of the risk increase

   - Evaluation of weather conditions for threats to the reliability of offsite power supplies.

   - Deferral of elective maintenance in the switchyard, on the station electrical distribution systems, and on the main and auxiliary transformers associated with the unit.

   - Protection of the operable DC electrical buses in the unit.

   - Remove nonessential loads from battery to extend time voltage will remain above minimum required level.

   - Implementation of 10 CFR 50.65(a)(4) fire-specific RMAs associated with the affected battery bank.

c. Technical Specification 3.8.4, Condition C

For TS 3.8.4, Condition C, "One electrical power subsystem inoperable for reasons other than Conditions A or B," RMAs could include:

1. Actions to increase risk awareness and control

   - Briefing of the on-shift Operations crew concerning the unit activities, including any compensatory measures established, and review of the appropriate procedures for a Loss of DC division and SBO.

   - Briefing of the on-shift operations crew concerning the impact the DC division has on the potential response to plant events such as reduced control systems.

   - For a planned RICT, prior to removal from service, the actions in the associated loss of bus procedure would be reviewed and implemented.

   - Minimize activities that could trip the unit.

2. Actions to reduce the duration of maintenance activities

   - For planned RICT entry, creation of a sub schedule related to the specific evolution which is reviewed for personnel resource availability.

   - Confirmation of parts availability prior to entry into a planned RICT.

   - Walkdown of work prior to execution.

3. Actions to minimize the magnitude of the risk increase

   - Evaluation of weather conditions for threats to the reliability of offsite power supplies.

   - Deferral of elective maintenance in the switchyard, on the station electrical distribution systems, and on the main and auxiliary transformers associated with the unit.

   - Protection of the operable DC electrical buses in the unit.

   - Remove nonessential loads from battery to extend time voltage will remain above minimum required level.

- Implementation of 10 CFR 50.65(a)(4) fire-specific RMAs associated with the affected DC subsystem.

d. Technical Specification 3.8.7, Condition A

For TS 3.8.7, "Distribution Systems – Operating," Condition A, "One or more AC electrical power distributions subsystems inoperable" RMAs could include:

1. Actions to increase risk awareness and control

   - Brief shift operations crew concerning the unit activities, including any compensatory measures established, and review of the appropriate procedures for a loss of AC distribution

2. Actions to reduce the duration of maintenance activities

   - For planned RICT entry, creation of a sub schedule related to the specific evolution which is reviewed for personnel resource availability.
   - Confirmation of parts availability prior to entry into a planned RICT.
   - Walkdown of work prior to execution.

3. Actions to minimize the magnitude of the risk increase

   - Deferral of elective maintenance on all safety related AC and DC distribution subsystems
   - Protection of all offsite sources, DGs, and remaining AC power distribution subsystems. Additional equipment may be protected based on the loads lost depending on the specific distribution subsystem that is inoperable.
   - Performing procedurally required actions for loss of AC distribution subsystem
   - Prohibition of trip sensitive activities and activities that could result in a plant transient
   - Minimization of activities on equipment powered by remaining AC distribution subsystems
   - Implementation of 10 CFR 50.65(a)(4) fire-specific RMAs associated with the affected AC distribution subsystem

e. <u>Technical Specification 3.8.7, Condition B</u>

For TS 3.8.7, Condition B, "One or more DC electrical power distributions subsystems inoperable" RMAs could include:

1. Actions to increase risk awareness and control

    - Brief shift operations crew concerning the unit activities, including any compensatory measures established, and review of the appropriate procedures for a loss of DC distribution

2. Actions to reduce the duration of maintenance activities

    - For planned RICT entry, creation of a sub schedule related to the specific evolution which is reviewed for personnel resource availability.

    - Confirmation of parts availability prior to entry into a planned RICT.

    - Walkdown of work prior to execution.

3. Actions to minimize the magnitude of the risk increase

    - Deferral of elective maintenance on all safety related AC and DC distribution subsystems

    - Protection of all offsite sources, DGs, and remaining DC power distribution subsystems. Additional equipment may be protected based on the loads lost depending on the specific distribution subsystem that is inoperable.

    - Performing procedurally required actions for loss of DC distribution subsystem

    - Prohibition of trip sensitive activities and activities that could result in a plant transient

    - Minimization of activities on equipment powered by remaining DC distribution subsystems

    - Implementation of 10 CFR 50.65(a)(4) fire-specific RMAs associated with the affected DC distribution subsystem

f. Technical Specification 3.8.7, Condition C (Unit 2 Only)

For Unit 2 TS 3.8.7, Condition C, "One Unit 1 AC electrical power distribution subsystem inoperable," [NOTE: There is no commensurate Unit 1 Condition] RMAs would include all the same RMAs as provided previously in item d. However, additional actions to address the Susquehanna electrical design which provides power to equipment common to both units via Unit 1 AC distribution systems could include:

1. Actions to increase risk awareness and control

   - Discuss common equipment and the specific interdependencies of the Unit 1 and Unit 2 AC distribution subsystems during shift briefings with the operations crew.

2. Actions to reduce the duration of maintenance activities

   - No additional actions beyond those for a typical loss of AC distribution system.

3. Actions to minimize the magnitude of the risk increase

   - Protection of the remaining operable Unit 2 equipment that is redundant to the equipment rendered inoperable due to inoperability of the Unit 1 AC distribution source (i.e., protection of the Unit 2 equipment in the opposite division to that rendered inoperable).

g. Technical Specification 3.8.7, Condition D (Unit 2 Only)

For Unit 2 TS 3.8.7, Condition D, "Two Unit 1 AC electrical power distribution subsystems on one Division inoperable for performance of Unit 1 SR 3.8.1.19," [NOTE: There is no commensurate Unit 1 Condition] RMAs would include all the same RMAs as provided previously in items d and f. Due to the increased risk associated with two Unit 1 AC distribution subsystems inoperable (as opposed to only one subsystem for item f), it may be determined prudent to perform more of the potential RMAs previously listed.

Audit Question Q-039

For TSTF-505, the design success criterion is a minimum set of the remaining required equipment that has the capacity and capability to provide the TS safety function. In Table E1-1 of Enclosure 1 of the LAR, the licensee stated that the design success criteria for TS 3.8.1, Condition C (two offsite circuits inoperable), are "two offsite circuits." Explain, how, with both required offsite circuits inoperable, can an offsite circuit provide the capacity and capability to safely shut down the reactor and maintain it in safe condition during and after a design basis accident.

<u>Susquehanna Response</u>

The success criterion in Reference 1, Table E1-1, for TS 3.8.1 have been updated as shown in Enclosure 2. If both offsite circuits are inoperable, the onsite DGs (any three) will provide power to adequate equipment to achieve and maintain safe shutdown.

Entry into Condition C means that the offsite electrical power system does not have the capability to affect a safe shutdown and to mitigate the effects of an accident; however, the onsite AC sources have not been degraded. This level of degradation generally corresponds to a total loss of the immediately accessible offsite power sources.

Because of the normal high availability of the offsite sources, this level of degradation may appear to be more severe than other combinations of two AC sources inoperable that involve one or more DGs inoperable. However, two factors tend to decrease the severity of this degradation level:

a. The configuration of the redundant AC electrical power system that remains available is not susceptible to a single bus or switching failure; and

b. The time required to detect and restore an unavailable offsite power source is generally much less than that required to detect and restore an unavailable onsite AC source.

With both required offsite circuits inoperable, sufficient onsite AC sources are available to maintain the unit in a safe shutdown condition in the event of a DBA or transient. In fact, a simultaneous loss of offsite AC sources, a LOCA, and a worst case single failure were postulated as a part of the design basis in the safety analysis.

Table E1-1 has been revised to correct the Design Success Criteria column for this Condition as shown in Enclosure 2 to this letter.

<u>Audit Question Q-040</u>

For TSTF-505, the design success criterion is a minimum set of the remaining required equipment that has the capacity and capability to provide the TS safety function. In Table E1-1 of Enclosure 1 of the LAR, the licensee describes the direct current (DC) power subsystems design for the design success criteria for TS 3.8.4, Conditions A, B, and C.

a. In the design success criteria for TS 3.8.4, Conditions A, B, and C, the licensee stated that the "design success criterion is dependent upon the load supplied." Explain the potential load supplied, as it is not defined in the design success criteria.

b. For TS 3.8.4, Conditions A, B, and C, the licensee states that one of two subsystems is the design success criterion and that four 125-volt DC (VDC) subsystems are available. How many 125-VDC subsystems are required to provide the safety function?

c. For TS 3.8.4, Conditions A, B, and C, the licensee states that one of two subsystems is the design success criterion and that two 250-VDC subsystems are available. How many 250-VDC subsystems are required to provide the safety function?

Susquehanna Response

Question 40.a

The "design success criterion is dependent upon the load supplied" is explained in each of the TS Bases Actions. The DC load during normal operation can be low and the batteries and the chargers are sized for the DBA Conditions and battery recharge in 12 hours. The success criteria discussion monitors the actual loading that is on the affected battery when a charger is inoperable and the charger when the battery is considered inoperable.

LCO 3.8.4, Condition A is related to the loss of one battery charger on one 125 VDC Division or the 250 VDC Division 2 or two battery chargers on 250 VDC Division 1. The statement in Table E1-1 concerning the "design success criterion is dependent upon the load supplied" is not applicable to the battery chargers and it has been removed from Table E1-1 (see Enclosure 2).

LCO 3.8.4, Condition B represents one subsystem with one battery bank inoperable. With one battery bank inoperable, the DC bus is being supplied by the operable battery charger. Any event that results in a loss of the AC bus supporting the battery charger will also result in loss of DC to that subsystem. Recovery of the AC bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., DG control and field flash, AC load shed, and DG output circuit breakers) may rely upon the battery. In addition, the energization transients of any DC loads that are beyond the capability of the battery charger and normally require the assistance of the battery will not be able to be brought online. The two hour limit allows sufficient time to effect restoration of an inoperable battery bank given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.07 V) are identified in TS 3.8.4, 3.8.5, and 3.8.6 together with additional specific Completion Times.

LCO 3.8.4, Condition C represents one subsystem with a loss of ability to completely respond to an event, and a potential loss of ability to remain energized during normal operation. It is therefore imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the affected division. The two hour limit is consistent with the allowed time for an inoperable DC Distribution System division.

If one of the required DC electrical power subsystems is inoperable, as a result of equipment other than the battery or battery charger being inoperable, the remaining DC electrical power subsystems have the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure could, however, result in the loss of minimum necessary DC electrical subsystems to mitigate a worst case accident, continued power operation should not exceed two hours.

Question 40.b

The 125 VDC electrical system at Susquehanna is designed in a manner that the safety function can be performed with a single failure of any component or the loss of an entire 125 VDC Channel. Safe shutdown and accident response is assured with the remaining three 125 VDC channels available. Table E1-1 was updated to reflect this design success criterion (see Enclosure 2).

Question 40.c

The 250 VDC electrical system at Susquehanna is designed in a manner that the safety function can be performed with a single failure of any component or the loss of an entire 250 VDC Division. Since a single failure can be accommodated, safe shutdown is assured with one 250 VDC division available. Table E1-1 was updated to reflect this design success criterion (see Enclosure 2)

Audit Question Q-042

In Attachment 1 of the LAR, for Unit 2 TS 3.8.7, Condition C and D the licensee states that "some components required by Unit 2 receive power through Unit 1 electrical power distribution subsystems." In Susquehanna FSAR [Updated Final Safety Analysis Report], Section 8.3.1.11.1 the licensee states that "there are no Unit 2 specific loads energized from the Unit 1 AC Distribution System."

a. Discuss which Unit 1 electrical power distribution subsystems provide power to Unit 2 components, and discuss which Unit 2 components receive power from Unit 1 electrical power distribution subsystems, especially, the configuration of the distribution system (ex. buses, cross ties) associated with the common load between the two units. In addition, the staff requests the licensee to confirm whether the cross ties (if any) are explicitly modeled in the PRA. NRC also requests a simplified diagram showing distribution from Unit 1 to common loads and from common loads to Unit 2 equipment (from the DG power supplies and to common equipment). Discuss whether there are any crossties between the two units to common loads. Include list of common loads from a system level.

b. Additionally, in Table E1-1 of Enclosure 1 of the LAR, for Unit 2 TS 3.8.7, Conditions C and D, the licensee states, "SSCs are modeled consistent with the TS scope and so can be directly included in the RTR tool for the RICT Program." The staff requests the licensee to identify all shared equipment between Units 1 and 2 and confirm that the shared equipment is explicitly modeled in the PRA.

c. For Unit 2 TS 3.8.7, Conditions C and D, regarding the shared equipment between Unit 1 and Unit 2 in the model, how are common loads set up in the model? Verify whether there are any manual actions required and, if yes, verify whether they are credited in the PRA.

d. Assuming a station LOOP concurrent with a LOCA in one unit, the staff requests the licensee to provide the distribution system configuration for safe shutdown of both units. If any cross ties are being used, the staff requests the licensee to provide the discussion of the operator action.

Susquehanna Response

Question 42.a

The electrical system at SSES is designed in a manner that Unit 1 electrical loads do not power unique Unit 2 electrical loads and vice versa. The electrical and mechanical design of SSES contains multiple shared systems for both Units 1 and 2. The following are the shared systems between Unit 1 and 2:

a) ESW System – FSAR Section 9.2.5

- Power supply for 'A' ESW Pump (0P504A) – 1A201 (No Alternate)
- Power supply for 'B' ESW Pump (0P504B) – 1A202 (No Alternate)
- Power supply for 'C' ESW Pump (0P504C) – 1A203 (No Alternate)
- Power supply for 'D' ESW Pump (0P504D) – 1A204 (No Alternate)

b) RHRSW System – FSAR Section 9.2.6

- Power supply for Unit 1 'A' RHRSW Pump (1P506A) – 1A203 (No Alternate)
- Power supply for Unit 1 'B' RHRSW Pump (1P506B) – 1A204 (No Alternate)
- Power supply for Unit 2 'A' RHRSW Pump (2P506A) – 2A201 (No Alternate)

- Power supply for Unit 2 ‘B’ RHRSW Pump (2P506B) – 2A202 (No Alternate)

c) Ultimate Heat Sink (Spray Pond) – FSAR Sections 3.8.4 & 9.2.7

For spray array valves:

- Division 1: MCC 0B517 powered by Load Center 1B210 powered by 1A201 (No Alternate Power)
- Division 2: MCC 0B527 powered by Load Center 1B220 powered by 1A202 (No Alternate Power)

d) DGs – FSAR Section 8.3.1.4

- See FSAR Figures 8.3-1-1, 8.3-7, and 8.3-8

e) Offsite Power Supplies – FSAR Section 8.2

- See FSAR Figures 8.3-1-1 and 8.3-1-2A

f) Unit 1 AC Distribution System – FSAR Section 8.3.1

- See FSAR Figures 8.3-1-1, 8.3-1-2A, 8.3-7, and 8.3-8.

g) RHR (Fuel Pool Cooling Mode) – FSAR Section 5.4.7.1.1.6

- Power supply for Unit 1 ‘A’ RHR Pump (1P202A) – 1A201 (No Alternate)
- Power supply for Unit 1 ‘B’ RHR Pump (1P202B) – 1A202 (No Alternate)
- Power supply for Unit 1 ‘C’ RHR Pump (1P202C) – 1A203 (No Alternate)
- Power supply for Unit 1 ‘D’ RHR Pump (1P202D) – 1A204 (No Alternate)
- Power supply for Unit 2 ‘A’ RHR Pump (2P202A) – 2A201 (No Alternate)
- Power supply for Unit 2 ‘B’ RHR Pump (2P202B) – 2A202 (No Alternate)
- Power supply for Unit 2 ‘C’ RHR Pump (2P202C) – 2A203 (No Alternate)
- Power supply for Unit 2 ‘D’ RHR Pump (2P202D) – 2A204 (No Alternate)

h) Control Structure HVAC System – FSAR Section 9.4.1

Control Structure HVAC Fans:

- Division 1: MCC 0B136 powered by Load Center 1B230 powered by 1A203 (No Alternate Power)

- Division 2: MCC 0B146 powered by Load Center 1B240 powered by 1A204 (No Alternate Power)

Control Structure Chiller (0K112A/B)

- Division 1: powered by 1A203 (No Alternate Power)

- Division 2: powered by 1A204 (No Alternate Power)

i) DG HVAC – FSAR Section 9.4.7

- HVAC for 'A' DG: MCC 0B516 powered by Load Center 1B210 (alternate 2B210) powered by 1A201 (alternate 2A201 if aligned to 2B210)

- HVAC for 'B' DG: MCC 0B526 powered by Load Center 1B220 (alternate 2B220) powered by 1A202 (alternate 2A202 if aligned to 2B220)

- HVAC for 'C' DG: MCC 0B536 powered by Load Center 1B230 (alternate 2B230) powered by 1A203 (alternate 2A203 if aligned to 2B230)

- HVAC for 'D' DG: MCC 0B546 powered by Load Center 1B240 (alternate 2B240) powered by 1A204 (alternate 2A204 if aligned to 2B240)

- HVAC for 'E' DG: MCC 0B565 and 0B566 powered by 0A510 connects to substituted diesel power supply.

j) ESSW Pumphouse HVAC – FSAR Section 9.4.8

- Division 1: MCC 0B517 powered by Load Center 1B210 powered by 1A201 (No Alternate Power)

- Division 2: MCC 0B527 powered by Load Center 1B220 powered by 1A202 (No Alternate Power)

k) Reactor Building Recirculation Fan – FSAR Section 6.5.3.2

- Division 1: MCC 1B217 powered by Load Center 1B210 powered by 1A201 (No Alternate Power)

- Division 2: MCC 1B227 powered by Load Center 1B220 powered by 1A202 (No Alternate Power)

l) Standby Gas Treatment System – FSAR Section 6.5.1

- Division 1: MCC 0B136 powered by Load Center 1B230 powered by 1A203 (No Alternate Power)

- Division 2: MCC 0B146 powered by Load Center 1B240 powered by 1A204 (No Alternate Power)

m) RWST – FSAR Section 9.2.10 (water tank no power supply)

n) 125 VDC – FSAR Section 8.3.2 (various charger supplies)

Question 42.b

SSES is a two-unit site that has SSCs which are shared between the two units. The SSES PRA logic model, including FPIE, FPRA, and IFPRA hazards, models some of these shared systems and components. Information related to the modeling of shared systems and components credited in the SSES PRA is provided in the SSES PRA System Notebooks; see the section on "Shared Components."

Response to NRC audit question Q-011 provides a table (Table Q11-1) that describes the shared systems, and how the SSES PRA models these systems.

Question 42.c

The following discussion focuses on the following Unit 2 TS Conditions:

- LCO 3.8.7, Condition C: One Unit 1 AC electrical power distribution subsystem inoperable.

- LCO 3.8.7, Condition D: Two Unit 1 AC electrical power distribution subsystems on one division inoperable for performance of Unit 1 Surveillance Requirement 3.8.1.19.

These LCOs are only applicable to Unit 2 and are necessitated by the fact that some common equipment required to support operation of Unit 2 receives power from Unit 1 sources. Specifically, the ESW Pumps and the Control Structure Chillers. It should be noted that in the context of these LCOs, the term "subsystem" is referring to the subsystems identified in TS Table 3.8.7-1, and not an entire electrical division (1 or 2).

Emergency Service Water

As described in Table Q11-1, The Susquehanna ESW System is a shared system, consisting of four pumps. Each pump is powered by a separate Unit 1 4160 VAC ESS electrical bus, as follows:

- ESW pump 0P504A is powered from 4160 VAC ESS electrical bus 1A201, breaker 8.
- ESW pump 0P504B is powered from 4160 VAC ESS electrical bus 1A202, breaker 8.
- ESW pump 0P504C is powered from 4160 VAC ESS electrical bus 1A203, breaker 3.
- ESW pump 0P504D is powered from 4160 VAC ESS electrical bus 1A204, breaker 3.

Consistent with the SSES design, Channel A and Channel C are classified as Division 1, and Channel B and Channel D are classified as Division 2. For LCO 3.8.7, Condition C, the loss of one subsystem will result in the loss of one ESW pump. The remaining three ESW pumps can meet the required load for both units simultaneously. For LCO 3.8.7, Condition D, the loss of two subsystems within the same division (i.e., the loss of A and C or B and D) will result in the loss of two ESW pumps. The remaining ESW pumps can meet the required load for both units simultaneously. The SSES PRA has been developed to model this configuration.

AC Power Distribution

The SSES PRA models select 480 VAC and 208/120 VAC electrical distribution buses. Specifically, the DG MCCs are powered via Unit 1 (preferred) but can be powered via Unit 2 (alternate). The power swap is performed by Automatic Transfer Switches (ATS).

- 480 VAC MCC 0B516 powered from 480 VAC electrical load center 1B210 (preferred) or 480 VAC electrical load center 2B210 (alternate), 0ATS516.
- 480 VAC MCC 0B526 powered from 480 VAC electrical load center 1B220 (preferred) or 480 VAC electrical load center 2B220 (alternate), 0ATS526.
- 480 VAC MCC 0B536 powered from 480 VAC electrical load center 1B230 (preferred) or 480 VAC electrical load center 2B230 (alternate); 0ATS536.

- 480 VAC MCC 0B546 powered from 480 VAC electrical load center 1B240 (preferred) or 480 VAC electrical load center 2B240 (alternate); 0ATS546.

The SSES PRA models the primary and alternate power sources, and the automatic transfer switches.

The following MCCs provide power to the ESSW Pumphouse (location of the ESW and RHRSW pumps) HVAC Systems. The SSES PRA models the need for ESSW Pumphouse HVAC. Each of these MCCs is powered by a separate electrical channel, and division, as follows:

- 480 VAC MCC 0B517 powered from 480 VAC electrical load center 1B210.

- 480 VAC MCC 0B527 powered from 480 VAC electrical load center 1B220.

The 480 VAC MCC 0B565, which provides power to the E DG Building HVAC System, can be powered from 13.8 kV/480 VAC transformers 0X555 or 0X556. During E DG operation, this MCC is powered via transformer 0X565. The SSES PRA only models power to MCC 0B565 from transformer 0X565.

Regarding the equipment listed above, the SSES PRA does not credit manual actions.

The SSES PRA accounts for the dependencies between the modeled electrical loads, and the required electrical distribution equipment. Loss of an electrical distribution bus will result in the loss of the dependent loads unless an alternate power supply is credited.

<u>Control Structure Chillers</u>

Regarding Control Structure Chillers, the SSES PRA does credit this system. These chillers (0K112A and 0K112B) are modeled specifically for MSO concerns.

Question 42.d

During a LOCA/LOOP, the on-site DGs will power all necessary safety related equipment via their normal power supplies with the exception that instead of off-site power feeding these buses, the on-site DGs will be supplying power. The only cross ties are associated with the DGs. These cross ties are controlled by ATS, if required, and there are no operator actions associated with cross ties.

<u>Audit Question Q-045</u>

Regarding TS 3.8.7, Condition C, "One Unit 1 AC electrical power distribution subsystem inoperable," and TS 3.8.7, Condition D, "Two Unit 1 AC electrical power distribution subsystems on one division inoperable for performance of Unit 1 SR 3.8.1.19," the design success criteria for TS 3.8.7, Conditions C and D, are one of two divisions. The NRC staff requests the licensee to explain why the design success criteria are "divisions" and not "subsystems." If the licensee changes the design success criteria based on the response to this question, then the staff requests a revision to Table E1-1 that reflects the change.

<u>Susquehanna Response</u>

Susquehanna LCO 3.8.7 states, "The electrical power distribution subsystems in Table 3.8.7-1 shall be OPERABLE." Table 3.8.7-1 lists the 4160 VAC Load Groups, 480 VAC Load Centers, 480 VAC MCCs, 208/120 VAC Distribution Panels, 250 VDC Buses, and 125 VDC Buses required to be operable to meet LCO 3.8.7. The individual Load Groups, Load Centers, MCCs, Distribution Panels, and buses are annotated to indicate with which channel the named subsystems are associated. Also, the subsystems are organized into Division 1 and Division 2 within Table 3.8.7-1.

The design success criteria for all electrical distribution systems listed in Table 3.8.7-1 are one of two divisions. When the E DG is substituted in for DG A, B, C, or D, the DG E 125 VDC Bus 0D597 is considered to be part of the same division into which the E DG is substituted (Division 1 if substituted for DG A or C; Division 2 if substituted for DG B or D) with respect to the design success criteria of one of two divisions.

Therefore, the design success criteria in Table E1-1 for TS 3.8.7 Conditions A and B were mischaracterized, and have been updated to be "one of two divisions" as shown in Enclosure 2.

<u>Audit Question Q-047</u>

Regarding Table E-1-4, Conditions 2.d and 2.e, and Table E1-5, Function 1.d, the staff requests the licensee to clarify the Tables regarding the accident and transient information.

<u>Susquehanna Response</u>

Reference 1, Table E1-4, Function 2.d is the Inop function of the Average Power Range Monitors (APRMs). When used, this function places a "vote" into the 2-out-of-4 voter logic. As stated in TS Bases 3.3.1.1 Applicable Safety Analyses, LCO and Applicability Section, this function is not specifically credited in the accident analyses. Therefore, Table E1-4 is correct with regards to Function 2.d.

Table E1-4 Function 2.e is the 2-out-of-4 voter function of the APRMs. This function is the APRM interface with the RPS and causes actuation of RPS when the appropriate signals are present. This function is credited in any transient or accident analysis that credits an APRM trip. Table E1-4 Function 2.e is credited for FSAR 15.4.9 "Control Rod Drop Accident", FSAR 15.2 "Increase in Reactor Pressure", FSAR 15.4 "Reactivity and Power Distribution Anomalies" and Table E1-4 was updated to reflect these DBAs (see Enclosure 2).

A point of clarification will also be placed in Table E1-4 Function 2.c. The Neutron Flux – High trip is credited for the ASME Overpressure Analysis contained in FSAR Section 5.2 "Integrity of Reactor Coolant Pressure Boundary" which will be included in the design analyses for Functions 2.c and 2.e.

Table E1-5 Function 1.d is the Inop function of the Rod Block Monitor (RBM). This function will initiate a control rod block when certain internal checks are not met. The RBM system was designed to prevent inadvertent control rod withdrawal given a single failure within the RBM. Either one of the two channels, with the two highest LPRM inputs bypassed, is sufficient to provide an appropriate control rod withdrawal block. The system will initiate a rod block even with a single failure so the Inop function is not explicitly credited in any accident analysis.

Audit Question Q-048

The staff requests the licensee to elaborate on diversity (defense-in-depth) of Function 3.d in TS Table 3.3.5.1-1, including discussion of manual actions.

Susquehanna Response

TS Table 3.3.5.1-1, Function 3.d is the automatic HPCI suction swap from the CST to the Suppression Pool on low CST level. The only diverse method to perform this function is for the operators to manually re-align the HPCI system from the CST to the Suppression Pool. It should be noted that the ADS with a low pressure ECCS available (Core Spray or LPCI) is functionally redundant to HPCI. To remain consistent with other tables throughout the report, Table E1-9 function 3.d will not be revised to reflect the functional diversity of ADS and one low pressure ECCS subsystem.

This manual action is contained in approved plant procedures. The steps are simple operator actions that can be performed in the control room. An evaluation was performed to determine if this manual action represents a Time Critical Operator Action. The evaluation determined that the SSES Fire Protection Review Report (FPRR), Appendix R safe shutdown analysis report, states that after approximately eight hours the CST may have low water level and the operator can manually transfer the HPCI suction to the suppression pool. The FPRR further states that there is adequate water in the CST for HPCI to perform its credited Appendix R function without transfer to the suppression pool. Therefore, the manual action is not a Time Critical

Operator Action and no validation of the timing of the manual action is performed. Further, the PRA model does not credit performance of the manual transfer.

Audit Question Q-049

Regarding Table E1-9, for Function 3.e, Table E1-9 states automatic initiation. The staff requests the licensee to confirm that if the only diversity identified "Diverse Instrumentation" column in tables E1-4 to E-12 and TS 3.3.8.1 is "Manual", such manual actions are credited in the PRA model and/or prescribed in operation manuals and procedures.

Susquehanna Response

For those instruments in Reference 1, Tables E1-4 through E1-12 (excluding Table E1-11 which does not have a “Diverse Instrumentation” column) and the LOP Instrumentation in TS 3.3.8.1 where the only listed Diverse Instrumentation is “Manual”, such manual actions are prescribed in operations manuals or procedures. The manual actions are not time critical operator actions. The manual actions are not credited in the PRA model except for initiation of ADS from the relay rooms and manual local alignment of low pressure ECCS following failure of HPCI.

Audit Question Q-050

The staff requests the licensee to elaborate on diversities (defense in depth) of all functions in TS Table 3.3.8.1-1.

Susquehanna Response

The functions listed in TS Table 3.3.8.1-1 are the undervoltage transfer functions that occur at different degraded grid voltage values. The functions listed in TS Table 3.3.8.1-1 have redundant instrumentation. The voltage detection is tiered which provides defense in depth for the instrumentation including the time delay relays. Additionally, the operator would have multiple indications/alarms of degraded grid voltage and approved plant procedures would direct correct operator action if the automatic actions of the undervoltage relays did not occur.

Audit Question Q-051

Attachment 2 includes markups of the Technical Specifications (TSs) to support the proposed implementation of a RICT program at SSES Unit 1 and Unit 2, respectively. Address the following inquiries and observations relative to these markups:

a. The Unit 1 TS Table 3.3.5.1-1 pages are marked to reduce the table from 6 pages to 5 pages. Provide justification for this change.

b. The proposed administrative controls in TS 5.5.16, paragraph e, include the phase, “this license amendment.” In lieu of the phrase “this license amendment,” discuss whether the phrases “Amendment # xxx” or, as discussed in the TSTF-505 model SE [Safety Evaluation], “this program” would provide more clarity for the paragraph.

c. TS Required Actions 3.7.1.B.1, 3.7.2.B.1, and 3.7.2.C.1 have existing temporarily extended Completion Times for specific events. The licensee has proposed to also include these Required Actions in the RICT program. Discuss how the temporary extensions and the RICT would be implemented.

<u>Susquehanna Response</u>

Question 51.a

In Reference 1, Susquehanna proposed to allow for the calculation of a RICT for LCO 3.3.5.1, Required Actions B.3, C.2, D.2.1, E.2, and F.2. Due to the changes to the five Required Actions, the ACTIONS Table for TS 3.3.5.1 was extended by one page. Rather than inserting a page 3.3-40a for the final page of the ACTIONS Table, Susquehanna determined it was appropriate to roll content across existing pages. This resulted in the need to reduce the number of remaining pages in TS Section 3.3.5.1 by one to fit within the current numbering limitations of the SSES Unit 1 TS (i.e., TS 3.3.5.2 starts on page 3.3-47a). That was performed by condensing Table 3.3.5.1-1 from six pages to five pages. This presentation was chosen because it ensures all instrumentation functions associated with each of the five systems in the table (i.e., CS, LPCI, HPCI, ADS Trip System A, and ADS Trip System B) appear on single pages of the table. This administrative change to condense Table 3.3.5.1-1 did not result in any changes to the requirements delineated therein. Although not a part of TSTF-505, these changes are administrative in nature and do not affect the applicability of TSTF-505 (Reference 3), to the SSES TS.

Question 51.b

Susquehanna reviewed the revised model SE for TSTF-505 (Reference 4), and concurs that the phrase “approved for use with this program” provides more clarity to the wording of the RICT Program in TS 5.5.16. Susquehanna has revised TS 5.5.16.e to reflect this wording change. The revised markup pages are provided in Enclosure 3 to this letter. The revised clean pages are provided in Enclosure 4.

Question 51.c

LCO 3.7.1, Required Action B.1, and LCO 3.7.2, Required Actions B.1 and C.1, each contain temporary Completion Times to support replacement of ESW System Piping at the penetrations into the Unit 1 and 2 RBs. These temporary 14-day Completion Times were approved in License

Amendment 275/257 (Reference 55). Further, Unit 2 LCO 3.8.7, Required Action C.1, has a temporary Completion Time to support replacement of Unit 1 ESS Transformers 1X230 and 1X240. This temporary 7-day Completion Time was approved in Unit 2 License Amendment 263 (Reference 56). These license amendments were approved based on the fact that the remaining operable equipment in the opposite division would be capable of performing the required safety functions.

The TS Bases markups provided in Attachment 4 to Reference 1 explicitly state that the RICT Program cannot be applied to the temporary Completion Times. When planning the work associated with the ESW Pipe or ESS Transformer replacements, Susquehanna will follow existing work planning processes to ensure the work is completed within the timeframe previously allowed by the TS (i.e., the temporary Completion Times of 7 days or 14 days, as appropriate) and that any required compensatory measures are performed. When a temporary Completion Time is used, a RICT is not intended to be calculated, and the incremental changes in risk beyond the front stop Completion Time will not be included in the cumulative risk tracking of the RICT Program.

In order to ensure the RICT Program is not applied when a temporary Completion Time has been entered, Susquehanna proposes to revise the structure of LCO 3.7.1, Condition B, LCO 3.7.2, Conditions B and C, and Unit 2 LCO 3.8.7, Condition C. In each of these Conditions, a new Required Action is created. The ability to apply the RICT Program is identified in the existing Required Actions, and the temporary Completion Times are relocated to the newly created Required Actions without changing the footnote that further clarifies the applicability of the temporary Completion Time. The newly created Required Actions are modified by a Note which states that the RICT Program cannot be applied if the temporary Completion Time is in effect. This presentation visibly separates the temporary Completion Times and the RICT Program allowance within the TS, thereby reinforcing the fact that they cannot be applied together while retaining Susquehanna's ability to use either the temporary Completion Times or the RICT Program, as appropriate. Susquehanna will not transition from one Required Action to the other. Upon entry into the LCO Condition, the appropriate Required Action and corresponding Completion Time will be identified and used throughout the period that the SSC requiring Condition entry is inoperable.

Marked up and clean TS pages are provided in Enclosures 3 and 4 to this letter, respectively. Note that Unit 2 Amendment 263 was issued after the initial application in Reference 1. As such, the revised TS pages in Enclosures 3 and 4 reflect incorporation of Amendment 263 without identifying them with revision bars. Updated TS Bases markups are provided in Enclosure 5 to this letter.

Audit Question Q-052

The staff requests the licensee to upload an updated version of Table E-1 under this question.

Susquehanna Response

The updated version of Table E1-1 is provided in Enclosure 2 to this letter.

Audit Question Q-054

Section C.1.4 of RG 1.200 states that the base PRA (i.e., the model of record) is to represent the as-built, as-operated plant to the extent needed to support the application. The licensee is to have a process that identifies updated plant information that necessitates changes to the base PRA model.

In response to an event involving an open-phase condition (OPC) at the Byron Generating Station on January 30, 2012, the NRC issued Bulletin 2012-01.[1] As part of the initial voluntary industry initiative for mitigation of the potential for the occurrence of an OPC in electrical switchyards,[2] licensees have made the addition of an open-phase isolation system (OPIS). In SRM–SECY-16-0068,[3] the NRC staff was directed to ensure that licensees have appropriately implemented OPIS and that licensing bases have been updated accordingly. NRC staff closed out BL 2012-01 for Susquehanna via letter dated December 6, 2021 (ML21335A422). From the revised voluntary initiative [4] and resulting industry guidance on estimating OPC and OPIS risk in NEI 19-02,[5] it is understood that the risk impact of an OPC can vary widely dependent on electrical switchyard configuration and design. Therefore, OPC could impact the RICTs for some TS LCO conditions within the scope of the RICT program (e.g., conditions associated with TS LCOs 3.8.1, 3.8.7, and 3.8.4). Considering these observations, provide the following information:

a) For Susquehanna, discuss the evaluation of the risk impact associated with OPC events including the likelihood of OPC-initiated plant trips and the impact of those trips on PRA-modeled SSCs. Also, discuss the functionality of the open phase detection system installed at Susquehanna and operator actions needed to operate or respond to the system.

b) Clarify whether any installed equipment and associated operator actions are credited in the PRAs that support this application. If equipment and associated operator actions are credited, then provide the following information:

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[1] U.S. NRC Bulletin 2012-01, "Design Vulnerability in Electric Power System" (ADAMS Accession No. ML12074A115).
[2] Anthony R. Pietrangelo to Mark A. Satorius, ltr re: "Industry Initiative on Open Phase Condition - Functioning of Important-to-Safety Structures, Systems and Components (SSCs)," dated October 9, 2013 (ADAMS Accession No. ML13333A147).
[3] U.S. NRC SRM-SECY-16-0068, "Interim Enforcement Policy for Open Phase Conditions in Electric Power Systems for Operating Reactors," dated March 9, 2017 (ADAMS Accession No. ML17068A297).
[4] Doug True to Ho Nieh, ltr re: "Industry Initiative on Open Phase Condition, Revision 3," dated June 6, 2019 (ADAMS Accession No. ML19163A176).
[5] Nuclear Energy Institute (NEI) 19-02, "Guidance for Assessing Open Phase Condition Implementation Using Risk Insights," Revision 0, April 2019 (ADAMS Accession No. ML19122A321).

i. Describe the equipment and associated actions that are credited in the PRA models.

ii. Describe the impact that this treatment, if any, has on key assumptions and sources of uncertainty for the RICT program.

iii. Discuss HRA methods and assumptions used for crediting alarm manual response.

iv. Discuss how OPC-related scenarios are modeled for non-internal event scenarios such as internal floods, fire, and seismic.

v. Regarding inadvertent actuation of the open phase detection system:

- Explain whether scenarios regarding inadvertent actuation of the system, if applicable, are included in the PRA models that support the RICT calculations.

- If inadvertent actuation scenarios are not included in the PRA models, then provide justification that the exclusion of this inadvertent actuation does not impact the RICT calculations.

c) If OPC and the open phase detection system are not included in the application PRA models, then provide justification that the exclusion of this failure mode and mitigating system does not impact the RICT calculations.

d) As an alternative to Part (c), propose a mechanism to ensure that OPC-related scenarios are incorporated into the application PRA models prior to implementing the RICT program.

<u>Susquehanna Response</u>

Question 54.a

The SSES OPC Evaluation is described in Susquehanna calculation EC-RISK-0029 (Reference 57). The purpose of this evaluation is to perform a risk assessment that informs the decision to implement the Open Phase Detection (OPD) automatic mode or operate the OPD system in the manual mode. As described in the evaluation, the OPC frequency of 5.43E-03 is utilized and is based on the guidance presented in NEI 19-02 (Reference 58).

The SSES OPD system detects open phase conditions on the 230 kV and 500 kV startup transformers (T-10 and T-20) by monitoring incoming power. Two detectors are installed on each transformer. The system can detect single or double open phase conditions with or without a concurrent ground fault, under all transformer loading conditions. The OPD system can

function in automatic mode (i.e., alarm and automatic trip), manual mode (alarm only), or test mode (used when performing maintenance on the system). Based on the current station configuration and operations, the OPD system is operated in the manual mode. In this configuration, if an OPC is detected, the system will only provide control room annunciation.

EC-RISK-0029 considers the impact that an OPC event could have on plant SSCs. The PRA modeling for an OPC event is discussed in the evaluation. This evaluation considers the impacts on 4160 VAC electrical distribution, RBCCW, TBCCW, 250 and 125 VDC electrical distribution, River Water Makeup, and RPS. EC-RISK-0029 provides a general description of the OPC/OPD sequence progression and details of the PRA modeling changes made to support the risk assessment.

As stated in the evaluation, the spurious actuation of the OPD system when operated in the automatic mode is not quantitatively modeled. This assumption allows for a conservative estimate of delta risk between the automatic and manual OPD alternatives. The spurious actuation of the OPD system is qualitatively evaluated and found to result in little change between the automatic and manual OPD alternatives. The evaluation also qualitatively evaluates the potential for spurious actuation across multiple hazards (e.g., fire events, seismic events, and high winds events).

The applied HRA assumes that the OPD is in the manual (i.e., alarm only) mode of operation. As such, the evaluation assumes that operator actions are required to mitigate the effects of the OPC. The required actions are as follows:

- Operators must open the necessary offsite power feed breakers.

- Operators must reset lockout relays, thermal overloads, restart pumps and other non-ESS equipment as time permits.

A detailed evaluation of HEPs is not performed in the evaluation. Instead, the evaluation assumes an industry accepted screening HEP of 1.00E-02, with additional sensitivities utilizing a value of 1.00E-01.

Question 54.b

The installed OPD equipment is not modeled in the SSES PRA model. Required operator actions associated with the OPD equipment are not modeled in the SSES TSTF-505/RICT application PRA model. In short, the modeling changes described in EC-RISK-0029 are not incorporated into the SSES PRA model.

Question 54.b.i

Not applicable. See response to Section “b” of this question.

Question 54.b.ii

Not applicable. See response to Section “b” of this question.

Question 54.b.iii

Not applicable. See response to Section “b” of this question.

Question 54.b.iv

Not applicable. See response to Section “b” of this question.

Question 54.b.v

Not applicable. See response to Sections “a” and “b” of this question.

Question 54.c

EC-RISK-0029 provides the results of the evaluation. The “OPC results” (for the automatic, and manual modes of operation) are compared to the “no OPC results” as presented by Susquehanna Calculation EC-RISK-0016 (Reference 59). Based on the results provided in Table 4 of EC-RISK-0029, the increase in risk due to an open phase condition is very small (within the Region III delta risk limits specified in RG 1.174 (Reference 25)) for both CDF and LERF, considering both the automatic, and manual modes of operation.

Table 4 of EC-RISK-0029 provides a comparison of risk results between the SSES PRA model without consideration for OPC (i.e., baseline risk), and the SSES PRA model with consideration for OPC, with the OPD system in manual mode. Table Q54-1 summarizes these results.

When considering an OPC, the SSES PRA results increase only slightly. As a result, the OPD system, and associated operator actions, are not incorporated into the SSES PRA model.

Table Q54-1
Comparison of Full Power Internal Events Risk Results

Risk Metric	Baseline Risk	Manual OPD Risk	Delta Risk
Unit 1 CDF	1.5987E-06	1.5998E-06	1.1000E-09
Unit 1 LERF	6.8265E-07	6.8292E-07	2.7000E-10
Unit 2 CDF	1.5848E-06	1.6022E-06	1.7400E-08
Unit 2 LERF	6.8372E-07	6.8820E-07	4.4700E-09

Question 54.d

Not applicable. See response to Section “c” of this question.

Audit Question Q-055

Describe the methodology used to re-perform the SLERF [Seismic Large Early Release Frequency] calculations.

Susquehanna Response

The estimate of the SLERF is performed by convolving the plant seismic core damage with an assumed independent (i.e., seismically uncorrelated) seismic fragility to represent the primary containment function. As such, the SLERF calculation is a double convolution of the plant seismic hazard curve with the plant level seismic HCLPF used to calculated Seismic Core Damage Frequency (SCDF) and a separate seismic HCLPF representing the primary containment function. For this estimation, the value (0.3g PGA) of the SLERF fragility HCLPF is the same as that used for the SCDF convolution calculation. This convolution estimation approach has been used in previous RICT seismic penalty calculations and has been accepted by the NRC when a full-scope SPRA is not available. This approach for estimating SLERF for a BWR Mark II plant (i.e., the SSES primary containment design) is judged to be conservative as it produces a Seismic Conditional Large Early Release Probability (SCLERP) greater than 0.5.

A HCLPF of 0.3g PGA with the composite beta factor, ßc = 0.4, is used in the convolution calculations. A HCLPF of 0.3g PGA with ßc = 0.4 produces a median (50 percent) failure probability point of Am = 0.76g PGA.

The SLERF for each hazard interval is the product of:

- The hazard interval initiating event frequency (/yr);

- The plant level fragility (PLF) failure probability for that same hazard interval; and
- The primary containment function fragility failure probability for that same hazard interval.

The primary containment function fragility HCLPF assumes the same fragility values as used for the plant level fragility. The SLERF results per hazard interval are then straight summed to produce the overall total SLERF across the hazard curve. The total estimated SLERF is 8.72E-07/yr.

If a RICT is being entered during a period when the containment is de-inerted, an SCLERP of 1.0 will be assumed to address the increased potential for hydrogen deflagration events. This SCLERP results in a SLERF equal to SCDF (i.e., an SLERF of 1.70E-06 will be applied for this configuration).

References

1. Susquehanna letter to NRC, "Proposed Amendment to Licenses NPF-14 and NPF-22: License Amendment Request to Revise Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, 'Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b' (PLA-7897)," dated April 8, 2021 (ADAMS Accession No. ML21098A206).

2. NRC letter to Susquehanna, "Regulatory Audit Plan in Support of License Amendment Request to Revise Technical Specifications to Adopt Risk-Informed Completion Times (EPID L-2021-LLA-0062)," dated June 15, 2021 (ADAMS Accession No. ML21153A137).

3. TSTF Traveler TSTF-505, "Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b," Revision 2, dated July 2, 2018 (ADAMS Accession No. ML18183A493).

4. NRC letter to TSTF, "Final Revised Model Safety Evaluation of Traveler TSTF-505, Revision 2, 'Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b,'" dated November 21, 2018 (ADAMS Accession No. ML18267A259).

5. Susquehanna Document NQPA-B-NA-012, "SSES Full Power Internal Events Probabilistic Risk Assessment 2021 F&O Resolution Roadmap"

6. Susquehanna Calculation EC-RISK-0056, "Assessment of Key Assumptions and Sources of Uncertainty for Risk-Informed Applications"

7. Susquehanna Calculation EC-RISK-0040, "Summary and Quantification of Model SSES 19ROI1 – Full Power Internal Events Probabilistic Analysis (FPIE)"

8. NEI Topical Report NEI 06-09, "Risk-Informed Technical Specifications Initiative 4b Risk-Managed Technical Specifications (RMTS) Guidelines," Revision 0-A, dated November 2006 (ADAMS Accession No. ML12286A322).

9. Susquehanna Procedure DC-FLEX-010, "4160 VAC Connection to E DG and ESS Buses"

10. Susquehanna Procedure ES-173-007, "Venting Suppression Chamber through the HCVS"

11. Susquehanna Procedure ES-273-007, "Venting Suppression Chamber through the HCVS"

12. Susquehanna Procedure DC-FLEX-101, “Cooling Water to Unit 1 RCIC Oil Cooler Using RHRSW System and Establishing RCIC Room Ventilation”

13. Susquehanna Procedure DC-FLEX-201, “Cooling Water to Unit 2 RCIC Oil Cooler Using RHRSW System and Establishing RCIC Room Ventilation”

14. NEI Topical Report NEI 16-06, “Crediting Mitigating Strategies in Risk-Informed Decision Making,” Revision 0, dated August 2016 (ADAMS Accession No. ML16286A297).

15. NEI Topical Report NEI 04-10, “Risk-Informed Technical Specifications Initiative 5b Risk-Informed Method for Control for Surveillance Frequencies Industry Guidance Document,” Revision 1, dated April 2007 (ADAMS Accession No. ML071360456).

16. Susquehanna Calculation EC-RISK-0043, “Technical Adequacy of the SSES PRA Models – Probabilistic Risk Analysis”

17. NRC Regulatory Guide 1.200, “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities,” Revision 2, dated March 2009 (ADAMS Accession No. ML090410014).

18. Susquehanna Calculation EC-RISK-0039, “Human Reliability Analysis (HRA) – Full Power Internal Events Probabilistic Risk Analysis (FPIE)”

19. NRC NUREG-1855, “Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decisionmaking,” Revision 1, dated March 2017 (ADAMS Accession No. ML17062A466).

20. Susquehanna Calculation EC-RISK-0539, “Internal Flooding Analysis for PRA”

21. Susquehanna Calculation EC-RISK-1187, “Fire Risk Quantification (FQ) and Uncertainty and Sensitivity Analysis (UNC) – Fire Probabilistic Risk Analysis (FPRA)”

22. NRC NUREG-2169, “Nuclear Power Plant Fire Ignition Frequency and Non-Suppression Probability Estimation Using the Updated Fire Events Database, United States Fire Event Experience through 2009,” Revision 0, dated January 2015 (ADAMS Accession No. ML15016A069).

23. NRC NUREG/CR-1278, “Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications,” Revision 0, dated August 1983 (ADAMS Accession No. ML071210299).

24. NRC NUREG/CR-7150, "Joint Assessment of Cable Damage and Quantification of Effects from Fire (JACQUE-FIRE)," Revision 0, Volumes 1, 2, and 3 (ADAMS Accession Nos. ML12313A105, ML14141A129, and ML17331B098).

25. NRC Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 3, dated January 2018 (ADAMS Accession No. ML17317A256).

26. Susquehanna Calculation EC-RISK-0048, "Fire PRA Interim Model OCT17R2F1 Quantification and Sensitivity – Fire Probabilistic Risk Analysis (FPRA)"

27. Susquehanna Calculation EC-RISK-1139, "Susquehanna PRA Model Event Tree Notebook and Success Criteria Post-EPU Level 2"

28. Susquehanna Calculation EC-RISK-1105, "PSA-004.20 – Turbine Building Closed Cooling Water Notebook"

29. Susquehanna Calculation EC-RISK-1119, "PSA-004.21 – Reactor Building Closed Cooling Water Notebook"

30. Susquehanna Calculation EC-RISK-1111, "PSA-004.5 – HPCI System Notebook"

31. Susquehanna Calculation EC-RISK-1106, "PSA-004.06 – RCIC PRA System Notebook"

32. Susquehanna Calculation EC-RISK-0041, "Containment Isolation and Containment Vent – PRA System Notebook"

33. NUMARC Topical Report NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision 4A, dated April 2011 (ADAMS Accession No. ML11116A198).

34. Susquehanna Procedure NDAP-QA-0413, "Implementation of the Maintenance Rule"

35 Susquehanna Procedure NSEP-AD-0413C, "Maintenance Rule Performance Criteria Selection"

36. NRC NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," Volumes 1 and 2 dated September 2005 (ADAMS Accession Nos. ML052580075, and ML052580118), and Supplement 1, dated September 2010 (ADAMS Accession No. ML15167A550).

37. Susquehanna Design Basis Document DBD019, “Fire Protection”

38. Susquehanna Calculation EC-013-1006, “Fire Doors Subject to Technical Requirements”

39. Susquehanna Calculation EC-013-1009, “Fire Dampers Subject to Technical Requirements”

40. Susquehanna Calculation EC-RISK-1181, “Fire Modeling Treatment (FMT) – Fire Probabilistic Risk Analysis (FPRA)”

41. Susquehanna Drawing C-1754, Sheet 1, “Units 1 & 2 Control Structure Fire Zone Plan Elevation 771’-0”

42. Susquehanna Procedure NDAP-QA-0440, “Control of Transient Combustible/Hazardous Materials”

43. Susquehanna Calculation EC-013-1860, “Handling of Transient Combustibles in the Wraparound Zones and Restricted Areas (Red Zones)”

44. Susquehanna Drawing C-1929, “Summary of Fire Zones Combustible Limitations”

45. NRC FAQ 13-004 “Clarifications on Treatment of Sensitive Electronics,” Revision 1, dated June 26, 2013 (ADAMS Accession No. ML13322A085).

46. Susquehanna Calculation EC-RISK-1185, “Human Reliability Analysis (HRA) – Fire Probabilistic Risk Analysis (FPRA)”

47. NRC NUREG-1921, “EPRI/NRC-RES Fire Human Reliability Analysis Guidelines,” Revision 0, dated July 2012 (ADAMS Accession No. ML12216A104) and Supplement 1, dated January 2020 (ADAMS Accession No. ML20035E043).

48. NRC FAQ 14-0009, “Treatment of Well Sealed MC Electrical Panels Greater than 440V,” Revision 1, dated October 20, 2014 (ADAMS Accession No. ML15118A810).

49. NRC FAQ 12-0064, “Hot Work/Transient Fire Frequency: Influence Factors” Revision 1, dated September 5, 2012 (ADAMS Accession No. ML122550050).

50. Susquehanna Report NE-94-001, “Individual Plant Examination for External Events,” Volumes 1 and 2, dated June 1994.

51. Susquehanna Calculation EC-RISK-0045, “High Confidence Low Probability Failure (HCLPF) Value for the Seismic Penalty Calculation – Seismic Margin Analysis for Risk Informed Applications”

52. Susquehanna Procedure NDAP-00-0030, “Severe Weather/Natural Disaster Preparation”

53. Susquehanna Procedure ON-NATPHENOM-001, “Severe Weather/Natural Phenomena”

54. Susquehanna Calculation EC-RISK-0047, “External Hazards Assessment – SSES External Hazards Assessment for Risk Informed Applications”

55. NRC letter to Susquehanna, “Issuance of Amendment Nos. 275 and 257 Re: Temporary Changes to Allow Replacement of the Emergency Service Water System Piping (EPID L-2019-LLA-0004),” dated January 17, 2020 (ADAMS Accession No. ML19248A844).

56. NRC letter to Susquehanna, “Issuance of Amendment No. 263 Re: Temporary Change to Unit 2 Technical Specification 3.8.7 to Allow Replacement of Unit 1 480-Volt Load Center Transformers (EPID L-2020-LLA-0245),” dated November 4, 2021 (ADAMS Accession No. ML21229A157).

57. Susquehanna Calculation EC-RISK-0029, “Open Phase Condition (OPC) Evaluation”

58. NEI Topical Report NEI 19-02, “Guidance for Assessing Open Phase Condition Implementation Using Risk Insights,” Revision 0, dated May 2019 (ADAMS Accession No. ML19172A086).

59. Susquehanna Calculation EC-RISK-0016, “PRA Internal Events Interim Model OCT17 Summary and Quantification”

60. Susquehanna Calculation EC-RISK-1159, “PSA-004.25 – Offsite & 13 kV System Notebook”

61. NEI letter to NRC, “Final Revision of Appendix X to NEI 05-04/07-12/12-16, Close-Out of Facts and Observations (F&Os),” dated February 21, 2017 (ADAMS Accession No. ML17086A431).

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Revised Enclosure 1 Tables

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.1.7.B	One Standby Liquid Control (SLC) subsystem inoperable for reasons other than Condition A	SLC trains	Yes	SLC injection capability	One of two SLC subsystems. Each contains a pump, explosive valve, associated piping, valves, instruments to ensure an operable flowpath.	One of two SLC subsystems	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.
3.3.1.1.A	One or more required channels inoperable.	Instrumentation outlined in TS Table 3.3.1.1-1.	Not explicitly	Scram capability	Refer to Section 2.1 of this Enclosure for full discussion of instrumentation logic	Automatic or manual actuation of the trip system.	Individual Reactor Protection System (RPS) instrumentation inputs to the RPS logic system are not modeled explicitly in the PRA. A conservative surrogate is chosen that represents the failure to scram due to instrumentation. This surrogate is chosen to represent both Condition A and Condition B of TS 3.3.1.1
3.3.1.1.B	One or more Functions with one or more required channels inoperable in both trip systems	See 3.3.1.1.A					

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.2.1.A	One rod block monitor (RBM) channel inoperable	RBMs	No	Prevent uncontrolled power excursion	Refer to Section 2.2 of this Enclosure for full discussion of instrumentation logic	N/A	RBM is not modeled in the PRA. However, should an uncontrolled power excursion occur, additional systems would detect this anomaly and a scram should occur. Therefore, a conservative surrogate is chosen that represents the failure to scram. A surrogate event is chosen which assumes the increased power level caused by an inoperable RBM during control rod manipulations should result in a scram signal, but the automatic scram signal fails and the operators fail to insert a manual scram.
3.3.2.2.A	One feedwater - main turbine high water level trip channel inoperable	Feedwater system and main turbine trip instrumentation	Yes	Trip of feedwater pumps and main turbine	Refer to Section 2.3 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria.	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.
3.3.4.1.A	One or more channels inoperable AND Minimum Critical Power Ratio (MCPR) limit for inoperable End of Cycle Recirculation Pump Trip (EOC-RPT) not made applicable	Recirculation pumps and trip systems	Yes	EOC-RPT capability on turbine trip	Refer to Section 2.4 of this Enclosure for full discussion of instrumentation logic	Two RPT breaker trip systems and inputs.	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. Additional discussion in Table E1-3.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.4.2.A	One or more channels inoperable	Recirculation pumps and trip systems.	Yes	Anticipated Transient without a Scram Recirculation Pump Trip (ATWS-RPT)	Refer to Section 2.5 of this Enclosure for full discussion of instrumentation logic	Two RPT breaker trip systems and inputs.	The PRA model includes the RPT breaker trip upon turbine trip signal (TSV or TCV closure) from RPS, and high steam dome pressure inputs to the RPS and RPT logic, but the Reactor Vessel Water Level – Low Low, Level 2 input is not modeled. The success criteria are consistent with the design basis.
3.3.5.1.B	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	Emergency Core Cooling Systems (ECCS) actuation instrumentation for core spray (CS), low pressure coolant injection (LPCI), high pressure coolant injection (HPCI).	Yes	Initiate ECCS (CS, LPCI, HPCI) - RPV water Level 1 - RPV water Level 2 - Drywell Pressure – High - Reactor Steam Dome Pressure – Low (initiation)	Refer to Section 2.6 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	SSCs are generally modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. Where individual inputs are not explicitly modeled, a conservative surrogate is selected or the failure of the frontline system is used. For example, a failure of relay logic to start HPCI can be represented by a failure of HPCI to start.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.1.C	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	ECCS actuation instrumentation for CS, LPCI mode, HPCI.	Yes	Initiate (injection modes) ECCS (CS, LPCI, HPCI) - Reactor Steam Dome Pressure – Low (injection permissive) CS and LPCI - Manual Initiation CS, LPCI, HPCI - Reactor steam dome pressure low (recirculation discharge valve permissive) LPCI only Trip (HPCI Only) - Reactor Vessel Water Level 8	Refer to Section 2.6 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	SSCs are generally modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. Where individual inputs are not explicitly modeled, a conservative surrogate is selected or the failure of the frontline system is used. For example, a failure of relay logic to start HPCI can be represented by a failure of HPCI to start.
3.3.5.1.D	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	ECCS actuation instrumentation for HPCI for low Condensate Storage Tank (CST) level	Not explicitly	Initiate ECCS (HPCI automatic suction transfer) CST Level - Low	Refer to Section 2.6 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	Instrumentation is not explicitly modeled. Conservative surrogate selected to represent loss of the CST, CST level switch, and failure of HPCI pump suction.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.1.E	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	Automatic Depressurization System (ADS) initiation logic and instrumentation.	Not explicitly	Initiate ADS Trip System A Trip System B - RPV Level 1 - Drywell Pressure – High - RPV Level 3 Confirmatory	Refer to Section 2.6 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	Individual inputs to trip system channels are not explicitly modeled, but trip system channels are modeled and can be used as a surrogate for representing each ADS trip system channel.
3.3.5.1.F	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	ADS initiation logic and instrumentation.	Not explicitly	Initiate ADS Trip System A Trip System B - Initiation Timer - CS pump discharge pressure - LPCI pump discharge pressure - High Drywell Pressure Bypass timer - Manual initiation	Refer to Section 2.6 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	Individual inputs to trip system channels are not explicitly modeled, but trip system channels are modeled and can be used as a surrogate for representing each ADS trip system channel.
3.3.5.3.B	As required by Required Action A.1 and referenced in Table 3.3.5.3-1	Reactor Vessel Water Level - Low Low, Level 2	Yes	RCIC Initiation	Refer to Section 2.7 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.3.D	As required by Required Action A.1 and referenced in Table 3.3.5.3-1	CST Level Sensors	Not explicitly	RCIC automatic suction transfer Initiation	Refer to Section 2.7 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	Instrumentation is not explicitly modeled. Conservative surrogate selected to represent loss of the CST, CST level switch, and failure of RCIC pump suction.
3.3.6.1.A	One or more required channels inoperable	Sensors, relays, and switches required to cause initiation	Not explicitly	Automatic isolation of Primary Containment Isolation Valves	Refer to Section 2.8 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	Individual isolation signals are not comprehensively modeled in the PRA; Therefore, surrogate events are chosen to either represent failure of containment and/or the failure to isolate the associated system.
3.3.8.1.B (Unit 2 only)	One or more required channels associated with Unit 1 4.16 kV Emergency Safeguard System (ESS) Buses in one Division inoperable for the performance of Unit 1 SR 3.8.1.19	Unit 1 4.16 kV ESS Buses and associated channels	Yes	Undervoltage sensing capability 1. Loss of Voltage <20% 2. Degraded Voltage 65% 3. Degraded Voltage 93%	Refer to Section 2.9 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.8.1.B (Unit 1) 3.3.8.1.C (Unit 2)	As required by Action A.1 and referenced in Table 3.3.8.1-1	The Loss of Power (LOP) Instrumentation includes sensors, relays, bypass capability, circuit breakers, and switches that are necessary to trip offsite power circuits and start the diesel generators (DGs)	Not explicitly	Undervoltage sensing capability 1 Loss of Voltage <20% 2. Degraded Voltage 65% 3. Degraded Voltage 93%	Refer to Section 2.9 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	Relays and other components related to the 65% and 20% undervoltage condition are included in the PRA. The 93% undervoltage condition is not modeled. As a result, some SSCs are modeled and can be directly included in the RTR tool for the RICT Program. Where individual inputs are not explicitly modeled, a surrogate is selected. The PRA does not assume credit for SSCs affected by a degraded voltage condition. The PRA models nominal power, loss of offsite power (LOOP), and station blackout (SBO) conditions.
3.3.8.1.C (Unit 1) 3.3.8.1.D (Unit 2)	As required by Action A.1 and referenced in Table 3.3.8.1-1	The LOP Instrumentation includes sensors, relays, bypass capability, circuit breakers, and switches that are necessary to trip offsite power circuits and start the DGs	Not explicitly	Undervoltage sensing capability 1 Loss of Voltage <20% 2. Degraded Voltage 65% 3. Degraded Voltage 93%	Refer to Section 2.9 of this Enclosure for full discussion of instrumentation logic	Same as Design Success Criteria	Relays and other components related to the 65% and 20% undervoltage condition are included in the PRA. The 93% undervoltage condition is not modeled. As a result, some SSCs are modeled and can be directly included in the RTR tool for the RICT Program. Where individual inputs are not explicitly modeled, a surrogate is selected. The PRA does not assume credit for SSCs affected by a degraded voltage condition. The PRA models nominal power, LOOP, and SBO conditions.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.5.1.A	One low pressure ECCS injection/spray subsystem inoperable for reasons other than Condition B	CS and LPCI trains	Yes	Low pressure injection capability	One Core Spray subsystem or one LPCI subsystem (only one pump required)	Same as Design Success Criteria	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.
3.5.1.B	One LPCI pump in one or both LPCI subsystems inoperable	LPCI trains	Yes	Low pressure injection capability	Four pumps. Two 100% capacity pumps per subsystem. One pump for success.	Loss of Coolant Accident (LOCA) in bottom head – One RHR pump in each subsystem Other LOCAs, BOC, and Interfacing System LOCAs – One RHR pump in either subsystem	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The PRA success criteria are generally consistent with the design basis. LOCA in the bottom head is a low likelihood and non risk-significant sequence which is not required to be analyzed in the design bases.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.5.1.D	HPCI system inoperable	HPCI	Yes	High pressure injection capability	5/6 ADS Valves and one of two Core Spray subsystems OR 5/6 ADS valves and one of two LPCI subsystems (only one pump required)	RCIC System OR Feedwater System OR 3/6 ADS valves and one of two Core Spray subsystems OR 3/6 ADS valves and one of two LPCI subsystems	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. The ADS design success criteria are established consistent with the single failure criterion and represent the complement of equipment with which the DBA analyses are performed. The ADS PRA success criteria are based on performance of thermal hydraulic analyses which demonstrated only one division of ADS (i.e., three valves) are required to de-pressurize the reactor assuming control rods are inserted. Additionally, the PRA success criteria take credit for non-safety related RCIC and Feedwater, which cannot be credited in the design success criteria.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.5.1.E	HPCI System inoperable. AND Condition A or Condition B entered	HPCI coincident with one or more LPCI subsystems or one CS subsystem out of service	Yes	High pressure and low pressure injection capability	5/6 ADS valves and remaining low pressure injection capability	RCIC System OR Feedwater System OR 3/6 ADS valves and remaining low pressure injection capability	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. The ADS design success criteria are established consistent with the single failure criterion and represent the complement of equipment with which the DBA analyses are performed. The ADS PRA success criteria are based on performance of thermal hydraulic analyses which demonstrated only one division of ADS (i.e., three valves) are required to de-pressurize the reactor assuming control rods are inserted. Additionally, the PRA success criteria take credit for non-safety related RCIC and Feedwater, which cannot be credited in the design success criteria.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.5.1.F	One ADS valve inoperable	ADS valves and supporting components	Yes	Reactor vessel depressurization	5/6 ADS Valves and one of two Core Spray subsystems OR 5/6 ADS valves and one of two LPCI subsystems (only one pump required) OR HPCI System	RCIC System OR Feedwater System OR 3/6 ADS valves and one of two Core Spray subsystems OR 3/6 ADS valves and one of two LPCI subsystems	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. PRA success criteria are dependent on the initiating event. The ADS design success criteria are established consistent with the single failure criterion and represent the complement of equipment with which the DBA analyses are performed. The ADS PRA success criteria are based on performance of thermal hydraulic analyses which demonstrated only one division of ADS (i.e., three valves) are required to de-pressurize the reactor assuming control rods are inserted. Additionally, the PRA success criteria take credit for non-safety related RCIC and Feedwater, which cannot be credited in the design success criteria.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.5.1.G	One ADS valve inoperable AND Condition A OR Condition B entered	ADS coincident with one or more LPCI subsystems or one CS subsystem out of service	Yes	Reactor vessel depressurization and low pressure injection capability	5/6 ADS valves and remaining low pressure injection capability OR HPCI System	RCIC System OR Feedwater System OR 3/6 ADS Valves and remaining low pressure injection capability	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. The ADS design success criteria are established consistent with the single failure criterion and represent the complement of equipment with which the DBA analyses are performed. The ADS PRA success criteria are based on performance of thermal hydraulic analyses which demonstrated only one division of ADS (i.e., three valves) are required to de-pressurize the reactor assuming control rods are inserted. Additionally, the PRA success criteria take credit for non-safety related RCIC and Feedwater, which cannot be credited in the design success criteria.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.5.3.A	RCIC System inoperable	RCIC	Yes	Supply high pressure makeup water to the RPV.	HPCI System OR 5/6 ADS Valves and one of two Core Spray subsystems OR 5/6 ADS valves and one of two LPCI subsystems (only one pump required)	HPCI System OR Feedwater System OR 3/6 ADS valves and one of two Core Spray subsystems OR 3/6 ADS valves and one of two LPCI subsystems	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. The ADS design success criteria are established consistent with the single failure criterion and represent the complement of equipment with which the DBA analyses are performed. The ADS PRA success criteria are based on performance of thermal hydraulic analyses which demonstrated only one division of ADS (i.e., three valves) are required to de-pressurize the reactor assuming control rods are inserted. Additionally, the PRA success criteria take credit for non-safety related RCIC and Feedwater, which cannot be credited in the design success criteria.
3.6.1.2.C	Primary containment air lock inoperable for reasons other than Condition A or B	Primary containment airlock	Not explicitly	Primary containment boundary maintained	One of two doors to maintain boundary	N/A	The airlocks are not explicitly modeled in the PRA. Containment failure is used as a conservative surrogate for the RICT calculation.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.6.1.3.A	One or more penetration flow paths with one Primary Containment Isolation Valve (PCIV) inoperable, except for purge valve leakage not within limit	Containment penetration flow paths with isolation valves	Not explicitly	Primary containment isolation capability maintained	One of two isolation valves per penetration	Same as Design Success Criteria	Not all primary containment isolation valves are modeled. Containment failure is used as a conservative surrogate for the RICT calculation.
3.6.1.6.A	One suppression chamber-to-drywell vacuum breaker pair inoperable for opening	Suppression chamber-to-drywell vacuum breakers	Yes	Suppression-chamber-to-drywell vacuum mitigation	Four of five vacuum breaker pairs	Same as Design Success Criteria	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.
3.6.2.3.A	One RHR suppression pool cooling subsystem inoperable	RHR suppression pool cooling trains	Yes	RHR suppression pool cooling	One of two subsystems	Same as Design Success Criteria	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.
3.6.2.4.A	One RHR suppression pool spray subsystem inoperable	RHR suppression pool spray subsystems	No	RHR suppression pool spray	One of two subsystems	Same as Design Success Criteria	Suppression pool spray is not modeled in the PRA. A surrogate set of events representing failure of the drywell sprays and the suppression pool cooling subsystem is used to bound the RICT calculation.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.7.1.A	One valve in Table 3.7.1-1 inoperable OR One valve in Table 3.7.1-2 inoperable OR One valve in Table 3.7.1-3 inoperable OR Any combination of valves in Table 3.7.1-1, Table 3.7.1-2, or Table 3.7.1-3 in the same return loop inoperable	Residual Heat Removal Service Water (RHRSW) valves	Yes	RHRSW System and ultimate heat sink (UHS)	One of two subsystems	Same as Design Success Criteria	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.
3.7.1.B	One RHRSW subsystem inoperable	RHRSW subsystem – pumps, flowpaths, and UHS	Yes	RHRSW System and UHS	One of two subsystems	Same as Design Success Criteria	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.7.2.A	One Emergency Service Water (ESW) pump in each subsystem inoperable	ESW pumps	Yes	ESW cooling	One ESW pump in each subsystem	For all cooling loads including TBCCW and RBCCW, one pump in each subsystem For all cooling loads not including TBCCW and RBCCW, one of four pumps	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. The design success criteria are established consistent with the single failure criterion and represent the complement of equipment with which the DBA analyses are performed. The PRA success criteria are based on performance of thermal hydraulic analyses which demonstrated only one ESW pump is required to provide the required cooling to all safety-related ESW loads, but that one pump from each ESW division is required to provide adequate cooling to the non-safety related RBCCW and TBCCW systems. These systems are not required to mitigate a design basis event and are excluded from the design success criteria.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.7.2.B	One or two ESW subsystems not capable of supplying ESW flow to at least three required DGs	ESW subsystems, ESW flow to support DG operation	Yes	ESW cooling flow to DGs	One of two subsystems	One ESW pump in remaining subsystem	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. A RICT is only applied to a single inoperable ESW subsystem. The design success criteria are established consistent with the single failure criterion and represent the complement of equipment with which the DBA analyses are performed. The PRA success criteria are based on performance of thermal hydraulic analyses which demonstrated only one ESW pump is required to provide the required cooling to all safety-related ESW loads.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.7.2.C	One ESW subsystem inoperable for reasons other than Condition B	ESW pumps	Yes	ESW cooling	One of two subsystems	For all cooling loads not including TBCCW and RBCCW, one of four ESW pumps	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis. The design success criteria are established consistent with the single failure criterion and represent the complement of equipment with which the DBA analyses are performed. The PRA success criteria are based on performance of thermal hydraulic analyses which demonstrated only one ESW pump is required to provide the required cooling to all safety-related ESW loads, but that one pump from each ESW division is required to provide adequate cooling to the non-safety related RBCCW and TBCCW systems. These systems are not required to mitigate a design basis event and are excluded from the design success criteria.
3.8.1.A	One offsite circuit inoperable	Offsite power circuits	Yes	Supply AC loads during normal operation	One of two offsite circuits	As needed to supply supported functions	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.8.1.B	One required DG inoperable	DGs and required support systems	Yes	Supply AC loads during abnormal operation	3/4 DGs	As needed to supply supported functions	SSCs are modeled consistent with the TS scope and so can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis
3.8.1.C	Two offsite circuits inoperable	Offsite power circuits	Yes	Supply AC loads during normal operation	3/4 DGs	As needed to supply supported functions	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.
3.8.1.D	One offsite circuit inoperable AND One required DG inoperable	Offsite power circuits DGs and required support systems	Yes	Supply AC loads during normal/ abnormal operation	One of two offsite circuits OR 3/4 DGs	As needed to supply supported functions	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.

Table E1-1
In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.8.4.A	One battery charger on one 125 VDC electrical power subsystem inoperable OR One battery charger on 250 VDC Division II electrical power subsystem inoperable OR Two battery chargers on 250 VDC Division 1 electrical power subsystem inoperable	125 VDC battery chargers 250 VDC battery chargers	Yes	Provide DC power during normal operations and maintain DC battery voltage and float current	For 125 VDC, 3/4 subsystems with their associated battery chargers For 250 VDC, 1/2 subsystems. If Division II 250 VDC, then the subsystem requires its corresponding battery charger. If Division I 250 VDC, then the subsystem requires one of two battery chargers.	As needed to supply supported functions	SSCs are modeled consistent with the TS and can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis.
3.8.4.B	One 125 VDC battery bank inoperable OR One 250 VDC battery bank inoperable	125 VDC battery bank 250 VDC battery bank	Yes	Provide DC power during abnormal operations	For 125 VDC, 3/4 subsystems For 250 VDC, One of two subsystems. Design success criteria is dependent upon the load supplied.	As needed to supply supported functions	SSCs are modeled consistent with the TS scope and so can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis

Table E1-1

In Scope TS/LCO Conditions to Corresponding PRA Functions

SSES TS	TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.8.4.C	One DC electrical power subsystem inoperable for reasons other than Conditions A or B	125 VDC subsystem 250 VDC subsystem	Yes	Provide DC power during normal and abnormal operations	For 125 VDC, 3/4 subsystems For 250 VDC, One of two subsystems. Design success criteria is dependent upon the load supplied.	As needed to supply supported functions	SSCs are modeled consistent with the TS scope and so can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis
3.8.7.A	One or more AC electrical power distribution subsystems inoperable	AC buses, load centers, motor control centers, distribution panels	Yes	Distribute AC power to required loads	One of two divisions	As needed to supply supported functions	SSCs are modeled consistent with the TS scope and so can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis
3.8.7.B	One or more DC electrical power distribution subsystems inoperable	DC electrical power distribution subsystems	Yes	Distribute DC power to required loads	One of two divisions	As needed to supply supported functions	SSCs are modeled consistent with the TS scope and so can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis
3.8.7.C (Unit 2 only)	One Unit 1 AC electrical power distribution subsystem inoperable	AC buses, load centers, motor control centers, distribution panels	Yes	Distribute AC power to required loads	One of two divisions	As needed to supply supported functions	SSCs are modeled consistent with the TS scope and so can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis
3.8.7.D (Unit 2 only)	Two Unit 1 AC electrical power distribution subsystems on one division inoperable for performance of Unit 1 SR 3.8.1.19	AC buses, load centers, motor control centers, distribution panels	Yes	Distribute AC power to required loads	One of two divisions	As needed to supply supported functions	SSCs are modeled consistent with the TS scope and so can be directly included in the RTR tool for the RICT Program. The success criteria are consistent with the design basis

Table E1-2
Example RICT Calculations

TS	LCO Condition	RICT Estimate (Days) (1)(2)
3.1.7.B	One SLC subsystem inoperable for reasons other than Condition A	30.0
3.3.1.1.A	One or more required channels inoperable	0.1(3)
3.3.1.1.B	One or more Functions with one or more Functions with one or more required channels inoperable in both trip systems	0.1(3)
3.3.2.1.A	One RBM channel inoperable	30.0(3)
3.3.2.2.A	One feedwater - main turbine high water level trip channel inoperable	30.0
3.3.4.1.A	One or more channels inoperable AND MCPR limit for inoperable EOC-RPT not made applicable	30.0
3.3.4.2.A	One or more channels inoperable	30.0
3.3.5.1.B	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	11.2
3.3.5.1.C	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	7.3
3.3.5.1.D	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	30.0(3)
3.3.5.1.E	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	30.0(3)
3.3.5.1.F	As required by Required Action A.1 and referenced in Table 3.3.5.1-1	0.1
3.3.5.3.B	As required by Required Action A.1 and referenced in Table 3.3.5.3-1	30.0
3.3.5.3.D	As required by Required Action A.1 and referenced in Table 3.3.5.3-1	30.0
3.3.6.1.A	One or more required channels inoperable	0.0(3)
3.3.8.1.B (Unit 2)	One or more required channels associated with Unit 1 4.16 kV ESS Buses in one Division inoperable for the performance of SR 3.8.1.19	30.0
3.3.8.1.B (Unit 1)	As required by Required Action A.1 and referenced in Table 3.3.8.1-1	30.0
3.3.8.1.C (Unit 2)	As required by Required Action A.1 and referenced in Table 3.3.8.1-1	30.0

Table E1-2
Example RICT Calculations

TS	LCO Condition	RICT Estimate (Days) (1)(2)
3.3.8.1.C (Unit 1)	As required by Required Action A.1 and referenced in Table 3.3.8.1-1	3.6
3.3.8.1.D (Unit 2)	As required by Required Action A.1 and referenced in Table 3.3.8.1-1	2.5
3.5.1.A	One low pressure ECCS injection/spray subsystem inoperable for reasons other than Condition B	7.3
3.5.1.B	One LPCI pump in one or both LPCI subsystems inoperable	30.0
3.5.1.D	HPCI system inoperable	27.5
3.5.1.E	HPCI System inoperable AND Condition A or Condition B entered	6.6
3.5.1.F	One required ADS valve inoperable	30.0
3.5.1.G	One ADS valve inoperable AND Condition A OR Condition B entered	7.3
3.5.3.A	RCIC System inoperable	30.0
3.6.1.2.C	Primary containment air lock inoperable for reasons other than Condition A or B	10.1(3)
3.6.1.3.A	One or more penetration flow paths with one PCIV inoperable except for purge valve leakage not within limit	10.1(3)
3.6.1.6.A	One suppression chamber-to-drywell vacuum breaker pair inoperable for opening	30.0
3.6.2.3.A	One RHR suppression pool cooling subsystem inoperable	30.0
3.6.2.4.A	One RHR suppression pool spray subsystem inoperable	30.0(3)
3.7.1.A	One valve in Table 3.7.1-1 inoperable OR One valve in Table 3.7.1-2 inoperable OR One valve in Table 3.7.1-3 inoperable OR Any combination of valves in Table 3.7.1-1, Table 3.7.1-2, or Table 3.7.1-3 in the same return loop inoperable	30.0
3.7.1.B	One RHRSW subsystem inoperable	30.0
3.7.2.A	One ESW pump in each subsystem inoperable	3.7
3.7.2.B	One or two ESW subsystems not capable of supplying ESW flow to at least three required DGs	2.0
3.7.2.C	One ESW subsystem inoperable for reasons other than Condition B	2.0
3.8.1.A	One offsite circuit inoperable	30.0

Table E1-2
Example RICT Calculations

TS	LCO Condition	RICT Estimate (Days) [(1)(2)]
3.8.1.B	One required DG inoperable	30.0
3.8.1.C	Two offsite circuits inoperable	6.8
3.8.1.D	One offsite circuit inoperable AND One required DG inoperable	30.0
3.8.4.A	One battery charger on one 125 VDC electrical power subsystem inoperable OR One battery charger on 250 VDC Division II electrical power subsystem inoperable OR Two battery chargers on 250 VDC Division I electrical power subsystem inoperable	3.4
3.8.4.B	One 125 VDC battery bank inoperable OR One 250 VDC battery bank inoperable	3.0
3.8.4.C	One DC electrical power subsystem inoperable for reasons other than Conditions A or B	0.4
3.8.7.A	One or more AC electrical power distribution subsystems inoperable.	0.9
3.8.7.B	One or more DC electrical power distribution subsystems inoperable	0.4
3.8.7.C (Unit 2)	One Unit 1 AC electrical power distribution subsystem inoperable	30.0
3.8.7.D (Unit 2)	Two Unit 1 AC electrical power distribution subsystems on one division inoperable for performance of Unit 1 SR 3.8.1.19	30.0

NOTES:

1. RICTs are based on the internal events, internal flood, and internal fire PRA model calculations with seismic penalties. RICTs calculated to be greater than 30 days are capped at 30 days based on NEI 06-09-A. RICTs are rounded to nearest tenth of a day.

2. Per NEI 06-09-A, for cases where the total CDF or LERF is greater than 1E-03/yr or 1E-04/yr, respectively, the RICT Program will not be entered.

3. Not explicitly modeled, surrogate modeling was used to represent the TS function.

Table E1-4
RPS Instrumentation Diversity

Function	Credited Safety Analysis Event		Diverse Instrumentation	Event
	FSAR Section	Transient/Accident		
1. Intermediate Range Monitors				
1.a Neutron Flux – High	15.4.1	Rod Withdrawal Error – Low Power	1) Automatic Initiation - - IRM High Neutron Flux Trip - APRM 2-out-of-4 Voter Logic Trip 2) Manual Scram	AOT
1.b Inop	None	None	Manual Scram	None
2. Average Power Range Monitors				
2.a Neutron Flux – High (Setdown)	15.4	Reactivity and Power Distribution Anomalies	1) Automatic Initiation - - IRM High Neutron Flux Trip - APRM 2-out-of-4 Voter Logic Trip 2) Manual Scram	AOT
2.b Simulated Thermal Power – High	None	None	1) Automatic Initiation - - APRM 2-out-of-4 Voter Logic Trip 2) Manual Scram	None
2.c Neutron Flux – High	15.4.9	Control Rod Drop Accident (CRDA)	1) Automatic Initiation - - APRM 2-out-of-4 Voter Logic Trip 2) Manual Scram	DBA
	5.2.2 15.2	Overpressure Protection Increases in Reactor Pressure	1) Automatic Initiation - - APRM 2-out-of-4 Voter Logic Trip 2) Manual Scram	AOT
2.d Inop	None	None	Manual Scram	None
2.e 2-Out-Of-4 Voter	5.2.2 15.2 15.4 15.4.9	Overpressure Protection Increases in Reactor Pressure Reactivity and Power Distribution Anomalies CRDA	Manual Scram	AOT

Table E1-4
RPS Instrumentation Diversity

Function	Credited Safety Analysis Event		Diverse Instrumentation	Event
	FSAR Section	Transient/Accident		
2.f OPRM Trip	None	None	1) Automatic Initiation - - OPRM 2-out-of-4 Voter Logic Trip 2) Manual Scram	None
3. Reactor Vessel Steam Dome Pressure – High	15.2.1	Pressure Regulator Failure - Closed	1) Automatic Initiation - - IRM Neutron Flux High Trip - APRM 2-out-of-4 Voter Logic Trip - Reactor Vessel Steam Dome High Pressure Trip 2) Manual Scram	AOT - Expected
	15.2.3	Turbine Trip	1) Automatic Initiation - - IRM Neutron Flux High Trip - APRM 2-out-of-4 Voter Logic Trip - Reactor Vessel Steam Dome High Pressure Trip - TSV Closure Trip - TCV Closure Trip 2) Manual Scram	AOT - Expected
	15.2.4	MSIV Closures	1) Automatic Initiation - - IRM Neutron Flux High Trip - APRM 2-out-of-4 Voter Logic Trip - Reactor Vessel Steam Dome High Pressure Trip - MSIV Closure Trip 2) Manual Scram	AOT - Expected
4. Reactor Vessel Water Level – Low, Level 3	15.2.7	Loss of Feedwater Flow	1) Automatic Initiation - - Reactor Vessel Water Level 3 Trip - MSIV Closure Trip 2) Manual Scram	AOT - Expected

Table E1-4
RPS Instrumentation Diversity

Function	Credited Safety Analysis Event		Diverse Instrumentation	Event
	FSAR Section	Transient/Accident		
4. (continued)	15.6.5	LOCAs (Resulting from Spectrum of Postulated Piping Breaks within the Reactor Coolant Pressure Boundary (RCPB)) – Inside Containment (Hereafter simply referred to as "LOCA" within Enclosure 1 Tables)	1) Automatic Initiation - - Reactor Vessel Water Level 3 Trip - High Drywell Pressure Trip 2) Manual Scram	DBA
5. Main Steam Isolation Valve – Closure	15.2.4	MSIV Closures	1) Automatic Initiation - - MSIV Closure Trip - Reactor Vessel Steam Dome High Pressure Trip 2) Manual Scram	AOT - Expected
	15.6.4	Steam System Piping Break Outside Containment	1) Automatic Initiation - - MSIV Closure Trip 2) Manual Scram	DBA
6. Drywell Pressure – High	15.6.5	LOCA	1) Automatic Initiation - - Reactor Vessel Water Level 3 Trip - High Drywell Pressure Trip 2) Manual Scram	DBA
7. Scram Discharge Volume Water Level – High				
7.a Level Transmitter	None	None	1) Automatic Initiation - - SDV High Water Level (level transmitter) Trip - SDV High Water Level (float switch) Trip 2) Manual Scram	None
7.b Float Switch	None	None	1) Automatic Initiation - - SDV High Water Level (float switch) Trip - SDV High Water Level (level transmitter) Trip 2) Manual Scram	None

Table E1-4
RPS Instrumentation Diversity

Function	Credited Safety Analysis Event		Diverse Instrumentation	Event
	FSAR Section	Transient/Accident		
8. Turbine Stop Valve – Closure	15.1.2	Feedwater Controller Failure – Maximum Demand	1) Automatic Initiation - - TSV Closure Trip - TCV Closure Trip - Reactor Vessel Steam Dome High Pressure Trip 2) Manual Scram	AOT - Expected
	15.2.3	Turbine Trip	1) Automatic Initiation - - TSV Closure Trip - TCV Closure Trip - Reactor Vessel Steam Dome High Pressure Trip 2) Manual Scram	AOT - Expected
	15.2.5	Loss of Condenser Vacuum	1) Automatic Initiation - - TSV Closure Trip - TCV Closure Trip - MSIV Closure Trip - Reactor Vessel Steam Dome High Pressure Trip 2) Manual Scram	AOT - Expected
	15.3.1	Recirculation Pump Trip	1) Automatic Initiation - - TSV Closure Trip - TCV Closure Trip 2) Manual Scram	AOT - Expected
9. Turbine Control Valve Fast Closure, Trip Oil Pressure – Low	15.2.2	Generator Load Rejection	1) Automatic Initiation - - TSV Closure Trip - TCV Closure Trip - Reactor Vessel Steam Dome High Pressure Trip 2) Manual Scram	AOT - Expected
10. Reactor Mode Switch – Shutdown Position	None	None	Manual Trip - Manual Scram - Reactor Mode Switch - Shutdown Position - Manually initiate alternate rod insertion (ARI)	None

Table E1-4
RPS Instrumentation Diversity

Function	Credited Safety Analysis Event		Diverse Instrumentation	Event
	FSAR Section	**Transient/Accident**		
11. Manual Scram	None	None	Manual Trip - Manual Scram - Reactor Mode Switch - Shutdown Position - Manually initiate ARI	None

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Marked-Up Technical Specification Pages

Revised Technical Specification Pages

Unit 1 TS Pages
3.7-1, 3.7-2, 3.7-3, 3.7-3a, 3.7-3b, 3.7-3c, 3.7-3d, 3.7-3e, 3.7-4, 3.7-5, 3.7-5a, 3.7-5b, 5.0-18c, and 5.0-18d

Unit 2 TS Pages
3.7-1, 3.7-2, 3.7-3, 3.7-3a, 3.7-3b, 3.7-4, 3.7-5, 3.7-5a, 3.7-5b, 3.8-44, 3.8-45, 3.8-46, 3.8-47, 3.8-48, 3.8-49, 3.8-49a, 5.0-18c, and 5.0-18d

NO CHANGES - CONTENT ROLLED ACROSS PAGES ONLY

3.7 PLANT SYSTEMS

3.7.1 Residual Heat Removal Service Water (RHRSW) System and the Ultimate Heat Sink (UHS)

LCO 3.7.1 Two RHRSW subsystems and the UHS shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

--NOTE--

Enter applicable Conditions and Required Actions of LCO 3.4.8, “Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown,” for RHR shutdown cooling made inoperable by RHRSW System.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. --------------NOTE------------ Separate Condition entry is allowed for each valve. --------------------------------- One valve in Table 3.7.1-1 inoperable. <u>OR</u> One valve in Table 3.7.1-2 inoperable. <u>OR</u> One valve in Table 3.7.1-3 inoperable. <u>OR</u>	A.1 Declare the associated RHRSW subsystems inoperable <u>AND</u> A.2 Establish an open flow path to the UHS. <u>AND</u> A.3 Restore the inoperable valve(s) to OPERABLE status.	Immediately 8 hours 8 hours from the discovery of an inoperable RHRSW subsystem in the opposite loop from the inoperable valve(s) <u>AND</u>

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
Any combination of valves in Table 3.7.1-1, Table 3.7.1-2, or Table 3.7.1-3 in the same return loop inoperable.	A.3	(continued)	72 hours OR In accordance with the Risk Informed Completion Time Program
B. One Unit 1 RHRSW subsystem inoperable.	B.1 OR	Restore the Unit 1 RHRSW subsystem to OPERABLE status.	~~14 days during the replacement of the Unit 2 ESW piping(1)~~ ~~OR~~ 72 hours from discovery of the associated Unit 2 RHRSW subsystem inoperable OR In accordance with the Risk Informed Completion Time Program AND 7 days OR In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	------------------NOTE------------------ The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. -- B.2 Restore the Unit 1 RHRSW subsystem to OPERABLE status.	 14 days during the replacement of the Unit 2 ESW piping[1]
C. Both Unit 1 RHRSW subsystems inoperable.	C.1 Restore one Unit 1 RHRSW subsystem to OPERABLE status.	8 hours from discovery of one Unit 2 RHRSW subsystem not capable of supporting associated Unit 1 RHRSW subsystem AND 72 hours
D. Required Action and associated Completion Time not met. OR UHS inoperable.	D.1 Be in MODE 3. AND D.2 Be in MODE 4.	12 hours 36 hours

[1]This Completion Time is only applicable during the Unit 2 ‘A’ and ‘B’ ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2027.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.1.1	Verify the water level is greater than or equal to 678 feet 1 inch above Mean Sea Level.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.2	Verify the average water temperature of the UHS is: a. ----------NOTE---------- Only applicable with both units in MODE 1 or 2, or with either unit in MODE 3 for less than twelve (12) hours. -------------------- ≤ 85°F; or b. ----------NOTE---------- Only applicable when either unit has been in MODE 3 for at least twelve (12) hours but not more than twenty-four (24) hours. -------------------- ≤ 87°F; or c. ----------NOTE---------- Only applicable when either unit has been in MODE 3 for at least twenty-four (24) hours. -------------------- ≤ 88°F.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.3	Verify each RHRSW manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position or can be aligned to the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.4	Verify that valves HV-01222A and B (the spray array bypass valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.7.1.5	Verify that valves HV-01224A1 and B1 (the large spray array valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.6	Verify that valves HV-01224A2 and B2 (the small spray array valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.7	Verify that valves 012287A and 012287B (the spray array bypass manual valves) are capable of being opened and closed.	In accordance with the Surveillance Frequency Control Program

TABLE 3.7.1-1

Ultimate Heat Sink Spray Array Valves

VALVE NUMBER	VALVE DESCRIPTION
HV-01224A1	Loop A large spray array valve
HV-01224B1	Loop B large spray array valve
HV-01224A2	Loop A small spray array valve
HV-01224B2	Loop B small spray array valve

TABLE 3.7.1-2

Ultimate Heat Sink Spray Array Bypass Valves

VALVE NUMBER	VALVE DESCRIPTION
HV-01222A	Loop A spray array bypass valve
HV-01222B	Loop B spray array bypass valve

TABLE 3.7.1-3

Ultimate Heat Sink Spray Array Bypass Manual Valves

VALVE NUMBER	VALVE DESCRIPTION
012287A	Loop A spray array bypass manual valve
012287B	Loop B spray array bypass manual valve

3.7 PLANT SYSTEMS

3.7.2 Emergency Service Water (ESW) System

LCO 3.7.2 Two ESW subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

Editorial change

ACTIONS

---NOTE---
Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources – Operating," for DGs made inoperable by ESW.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One ESW pump in each subsystem inoperable.	A.1	Restore both ESW pumps to OPERABLE status.	7 days OR In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or two ESW subsystems not capable of supplying ESW flow to at least three required DGs.	B.1 Restore ESW flow to the required DGs to ensure that each ESW subsystem is supplying at least three DGs.	~~14 days during the replacement of the Unit 2 ESW piping[(1)]~~ ~~OR~~ 7 days OR -----------NOTE----------- Not applicable if there is a loss of function. ---------------------------- In accordance with the Risk Informed Completion Time Program
	OR --------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. --- B.2 Restore ESW flow to the required DGs to ensure that each ESW subsystem is supplying at least three DGs.	14 days during the replacement of the Unit 2 ESW piping[(1)]

(1) This Completion Time is only applicable during the Unit 2 ‘A’ and ‘B’ ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2027.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One ESW subsystem inoperable for reasons other than Condition B.	C.1 Restore the ESW subsystem to OPERABLE status. OR --------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. --- C.2 Restore the ESW subsystem to OPERABLE status.	~~14 days during the replacement of the Unit 2 ESW piping[(1)]~~ ~~OR~~ 7 days OR In accordance with the Risk Informed Completion Time Program 14 days during the replacement of the Unit 2 ESW piping[(1)]
D. Required Action and associated Completion Time of Condition A, B or C not met. OR Both ESW subsystems inoperable for reasons other than Conditions A and B.	D.1 Be in MODE 3. AND D.2 Be in MODE 4.	12 hours 36 hours

[(1)] This Completion Time is only applicable during the Unit 2 'A' and 'B' ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2027.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.2.1	------------------------------NOTE------------------------------ Isolation of flow to individual components does not render ESW System inoperable. --- Verify each ESW subsystem manual, power operated, and automatic valve in the flow paths servicing safety related systems or components, that is not locked, sealed, or otherwise secured in position, is in the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.2.2	Verify each ESW subsystem actuates on an actual or simulated initiation signal.	In accordance with the Surveillance Frequency Control Program

5.5 Programs and Manuals

5.5.14 Control Room Envelope Habitability Program (continued)

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.15 Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

a. The Surveillance Frequency Control Program shall contain a list of Frequencies of those Surveillance Requirements for which the Frequency is controlled by the program.

b. Changes to the Frequencies listed in the Surveillance Frequency Control Program shall be made in accordance with NEI 04-10, “Risk-Informed Method for Control of Surveillance Frequencies,” Revision 1.

c. The provisions of Surveillance Requirements 3.0.2 and 3.0.3 are applicable to the Frequencies established in the Surveillance Frequency Control Program.

5.5.16 Risk Informed Completion Time Program

This program provides controls to calculate a Risk Informed Completion Time (RICT) and must be implemented in accordance with NEI 06-09-A, Revision 0, "Risk-Managed Technical Specifications (RMTS) Guidelines." The program shall include the following:

a. The RICT may not exceed 30 days;

5.5 Programs and Manuals

5.5.16 Risk Informed Completion Time Program (continued)

b. A RICT may only be utilized in MODE 1 and 2;

c. When a RICT is being used, any change to the plant configuration, as defined in NEI 06-09-A, Appendix A, must be considered for the effect on the RICT.

   1. For planned changes, the revised RICT must be determined prior to implementation of the change in configuration.

   2. For emergent conditions, the revised RICT must be determined within the time limits of the Required Action Completion Time (i.e., not the RICT) or 12 hours after the plant configuration change, whichever is less.

   3. Revising the RICT is not required if the plant configuration change would lower plant risk and would result in a longer RICT.

d. For emergent conditions, if the extent of condition evaluation for inoperable structures, systems, or components (SSCs) is not complete prior to exceeding the Completion Time, the RICT shall account for the increased possibility of common cause failure (CCF) by either:

   1. Numerically accounting for the increased possibility of CCF in the RICT calculation; or

   2. Risk Management Actions (RMAs) not already credited in the RICT calculation shall be implemented that support redundant or diverse SSCs that perform the function(s) of the inoperable SSCs, and, if practicable, reduce the frequency of initiating events that challenge the function(s) performed by the inoperable SSCs.

e. The risk assessment approaches and methods shall be acceptable to the NRC. The plant PRA shall be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant, as specified in Regulatory Guide 1.200, Revision 2. Methods to assess the risk from extending the Completion Times must be PRA methods approved for use with this program, or other methods approved by the NRC for generic use; and any change in the PRA methods to assess risk that are outside these approval boundaries require prior NRC approval.

3.7 PLANT SYSTEMS

3.7.1 Residual Heat Removal Service Water (RHRSW) System and the Ultimate Heat Sink (UHS)

LCO 3.7.1 Two RHRSW subsystems and the UHS shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

---NOTE---

Enter applicable Conditions and Required Actions of LCO 3.4.8, “Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown,” for RHR shutdown cooling made inoperable by RHRSW System.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. --------------NOTE------------ Separate Condition entry is allowed for each valve. --------------------------------- One valve in Table 3.7.1-1 inoperable. OR One valve in Table 3.7.1-2 inoperable. OR One valve in Table 3.7.1-3 inoperable. OR	A.1 Declare the associated RHRSW subsystems inoperable. AND A.2 Establish an open flow path to the UHS. AND A.3 Restore the inoperable valve(s) to OPERABLE status.	Immediately 8 hours 8 hours from the discovery of an inoperable RHRSW subsystem in the opposite loop from the inoperable valve(s) AND

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
Any combination of valves in Table 3.7.1-1, Table 3.7.1-2, or Table 3.7.1-3 in the same return loop inoperable.	A.3	(continued)	72 hours ~~OR~~ ~~7 days during the replacement of 480 V ESS Load Center Transformers 1X210 and 1X220 in Unit 1[(1)]~~ OR In accordance with the Risk Informed Completion Time Program
B. One Unit 2 RHRSW subsystem inoperable.	B.1 OR	Restore the Unit 2 RHRSW subsystem to OPERABLE status.	~~7 days during the replacement of 480 V ESS Load Center Transformers 1X210 and 1X220 in Unit 1[(1)]~~ ~~OR~~ ~~14 days during the replacement of the Unit 1 ESW piping[(2)]~~ ~~OR~~ 72 hours from discovery of the associated Unit 1 RHRSW subsystem inoperable OR In accordance with the Risk Informed Completion Time Program

		AND 7 days OR In accordance with the Risk Informed Completion Time Program

~~[1]Upon completion of the replacement of the 480 V ESS Load Center Transformers 1X210 and 1X220 in Unit 1, this temporary extension is no longer applicable and will expire on June 15, 2020.~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	------------------NOTE------------------ The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. --- B.2 Restore the Unit 2 RHRSW subsystem to OPERABLE status.	 14 days during the replacement of the Unit 1 ESW piping(1)
C. Both Unit 2 RHRSW subsystems inoperable.	C.1 Restore one Unit 2 RHRSW subsystem to OPERABLE status.	8 hours from discovery of one Unit 1 RHRSW subsystem not capable of supporting associated Unit 2 RHRSW subsystem AND 72 hours
D. Required Action and associated Completion Time not met. OR UHS inoperable.	D.1 Be in MODE 3. AND D.2 Be in MODE 4.	12 hours 36 hours

(~~2~~1)This Completion Time is only applicable during the Unit 1 'A' and 'B' ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2026.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.1.1	Verify the water level is greater than or equal to 678 feet 1 inch above Mean Sea Level.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.2	Verify the average water temperature of the UHS is: a. -----------------------------NOTE--------------------------- Only applicable with both units in MODE 1 or 2, or with either unit in MODE 3 for less than twelve (12) hours. --- ≤ 85°F; or b. -----------------------------NOTE--------------------------- Only applicable when either unit has been in MODE 3 for at least twelve (12) hours but not more than twenty-four (24) hours. --- ≤ 87°F; or c. -----------------------------NOTE--------------------------- Only applicable when either unit has been in MODE 3 for at least twenty-four (24) hours. --- ≤ 88°F.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.3	Verify each RHRSW manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position or can be aligned to the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.4	Verify that valves HV-01222A and B (the spray array bypass valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.1.5	Verify that valves HV-01224A1 and B1 (the large spray array valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.6	Verify that valves HV-01224A2 and B2 (the small spray array valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.7	Verify that valves 012287A and 012287B (the spray array bypass manual valves) are capable of being opened and closed.	In accordance with the Surveillance Frequency Control Program

3.7 PLANT SYSTEMS

3.7.2 Emergency Service Water (ESW) System

LCO 3.7.2 Two ESW subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

Editorial change

ACTIONS

---NOTE---

Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources – Operating," for DGs made inoperable by ESW.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ESW pump in each subsystem inoperable.	A.1 Restore both ESW pumps to OPERABLE status.	7 days OR In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or two ESW subsystems not capable of supplying ESW flow to at least three required DGs.	B.1 Restore ESW flow to the required DGs to ensure that each ESW subsystem is supplying at least three DGs.	~~14 days during the replacement of the Unit 1 ESW piping[(1)]~~ ~~OR~~ 7 days OR -----------NOTE----------- Not applicable if there is a loss of function. ----------------------------- In accordance with the Risk Informed Completion Time Program
	OR --------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. --	
	B.2 Restore ESW flow to the required DGs to ensure that each ESW subsystem is supplying at least three DGs.	14 days during the replacement of the Unit 1 ESW piping[(1)]

[(1)]This Completion Time is only applicable during the Unit 1 ‘A’ and ‘B’ ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2026.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One ESW subsystem inoperable for reasons other than Condition B.	C.1 Restore the ESW subsystem to OPERABLE status.	~~14 days during the replacement of the Unit 1 ESW piping[(1)]~~ ~~OR~~ 7 days OR In accordance with the Risk Informed Completion Time Program
	OR --------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. -- C.2 Restore the ESW subsystem to OPERABLE status.	14 days during the replacement of the Unit 1 ESW piping[(1)]
D. Required Action and associated Completion Time of Condition A, B, or C not met. OR Both ESW subsystems inoperable for reasons other than Conditions A and B.	D.1 Be in MODE 3. AND D.2 Be in MODE 4	12 hours 36 hours

Editorial change

[(1)]This Completion Time is only applicable during the Unit 1 ‘A’ and ‘B’ ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2026.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.2.1	-------------------------------NOTE------------------------------ Isolation of flow to individual components does not render ESW System inoperable. --- Verify each ESW subsystem manual, power operated, and automatic valve in the flow paths servicing safety related systems or components, that is not locked, sealed, or otherwise secured in position, is in the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.2.2	Verify each ESW subsystem actuates on an actual or simulated initiation signal.	In accordance with the Surveillance Frequency Control Program

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Distribution Systems – Operating

LCO 3.8.7 The electrical power distribution subsystems in Table 3.8.7-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. -------------NOTE------------- Not applicable to DG E DC Bus 0D597 ---------------------------------- One or more Unit 2 AC electrical power distribution subsystems inoperable.	--------------------NOTE-------------------- Enter applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources – Operating," for DC source(s) made inoperable by inoperable power distribution subsystem(s). -- A.1 Restore Unit 2 AC electrical power distribution subsystem(s) to OPERABLE status.	8 hours OR ----------NOTES---------- 1. Not applicable if there is a loss of function. 2. Only applicable to AC electrical power sources included in the PRA model. ---------------------------- In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. -------------NOTE------------- Not applicable to DG E DC Bus 0D597. --------------------------------- One or more Unit 2 DC electrical power distribution subsystems inoperable.	B.1	Restore Unit 2 DC electrical power distribution subsystem(s) to OPERABLE status.	2 hours OR -----------NOTE----------- Not applicable if there is a loss of function. ---------------------------- In accordance with the Risk Informed Completion Time Program
C. One Unit 1 AC electrical power distribution subsystem inoperable.	C.1 OR	Restore Unit 1 AC electrical power distribution subsystem to OPERABLE status.	~~7 days during the replacement of 480 V ESS Load Center Transformers in Unit 1[(1)]~~ ~~OR~~ 72 hours OR -----------NOTE----------- Only applicable to AC electrical power sources included in the PRA model. ---------------------------- In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. (continued)	-------------------NOTE------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 7-day Completion Time is in effect. ---	
	C.2 Restore Unit 1 AC electrical power distribution subsystem to OPERABLE status.	7 days during the replacement of 480 V ESS Load Center Transformers in Unit 1[(1)]
D. Two Unit 1 AC electrical power distribution subsystems on one Division inoperable for performance of Unit 1 SR 3.8.1.19.	D.1 Restore at least one Unit 1 AC electrical power distribution subsystems to OPERABLE status.	8 hours OR -----------NOTE----------- Only applicable to AC electrical power sources included in the PRA model. --------------------------- In accordance with the Risk Informed Completion Time Program
E. Required Action and Associated Completion Time of Condition A, B, or C not met.	E.1 Be in MODE 3. AND E.2 Be in MODE 4.	12 hours 36 hours

[(1)] This temporary 7-day completion time is applicable during the replacement of Unit 1 480 V ESS Load Center Transformers 1X230 and 1X240, while Unit 1 is in MODES 4 or 5, and will expire on June 15, 2024.

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
F. Diesel Generator E DC electrical power subsystem inoperable, while not aligned to the Class 1E distribution system.	F.1	Verify that all ESW valves associated with Diesel Generator E are closed.	2 hours
G. Diesel Generator E DC electrical power subsystem inoperable, while aligned to the Class 1E distribution system.	G.1	Declare Diesel Generator E inoperable.	2 hours
H. Two or more electrical power distribution subsystems inoperable that result in a loss of safety function.	H.1	Enter LCO 3.0.3.	Immediately
I. -------------NOTE------------- Not applicable to DG E DC Bus 0D597. ---------------------------------- One or more Unit 1 DC electrical power distribution subsystem(s) inoperable.	I.1 AND I.2	Transfer associated Unit 1 and common loads to corresponding Unit 2 DC electrical power distribution subsystem. Restore Unit 1 and common loads to corresponding Unit 1 DC electrical power distribution subsystem.	2 hours 72 hours after Unit 1 DC electrical power subsystem is restored to OPERABLE status
J. Required Actions and Associated Completion Times of Condition I not met.	J.1	Declare associated common loads inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.7.1	Verify correct breaker alignments and voltage or indicated power availability to required AC and DC electrical power distribution subsystems.	In accordance with the Surveillance Frequency Control Program

Table 3.8.7-1 (page 1 of 2)
Unit 2 AC and DC Electrical Power Distribution Subsystems

TYPE	VOLTAGE	DIVISION I	DIVISION II
AC Buses	4160 V Load Groups	1A201 (Subsys. A) 1A203 (Subsys. C) 2A201 (Subsys. A) 2A203 (Subsys. C)	1A202 (Subsys. B) 1A204 (Subsys. D) 2A202 (Subsys. B) 2A204 (Subsys. D)
	480 V Load Centers	1B210 (Subsys. A) 1B230 (Subsys. C) 2B210 (Subsys. A) 2B230 (Subsys. C)	1B220 (Subsys. B) 1B240 (Subsys. D) 2B220 (Subsys. B) 2B240 (Subsys. D)
	480 V Motor Control Centers	0B516 (Subsys. A) 0B517 (Subsys. A) 1B216 (Subsys. A) 1B217 (Subsys. A) 0B536 (Subsys. C) 0B136 (Subsys. C) 1B236 (Subsys. C) 2B216 (Subsys. A) 2B236 (Subsys. C) 2B237 (Subsys. C) 2B217 (Subsys. A)	0B526 (Subsys. B) 0B527 (Subsys. B) 1B226 (Subsys. B) 1B227 (Subsys. B) 0B546 (Subsys. D) 0B146 (Subsys. D) 1B246 (Subsys. D) 2B246 (Subsys. D) 2B247 (Subsys. D) 2B226 (Subsys. B) 2B227 (Subsys. B)
	208/120 V Distribution Panels	1Y216 (Subsys. A) 1Y236 (Subsys. C) 2Y216 (Subsys. A) 2Y236 (Subsys. C)	1Y226 (Subsys. B) 1Y246 (Subsys. D) 2Y226 (Subsys. B) 2Y246 (Subsys. D)

Table 3.8.7-1 (page 2 of 2)
Unit 2 AC and DC Electrical Power Distribution Subsystems

TYPE	VOLTAGE	DIVISION I	DIVISION II
DC Buses	250 V Buses	2D652 2D254	2D662 2D264 2D274
	125 V Buses	1D612 (Subsys. A) 1D614 (Subsys. A) 1D632 (Subsys. C) 1D634 (Subsys. C) 2D612 (Subsys. A) 2D614 (Subsys. A) 2D632 (Subsys. C) 2D634 (Subsys. C)	1D622 (Subsys. B) 1D624 (Subsys. B) 1D642 (Subsys. D) 1D644 (Subsys. D) 2D622 (Subsys. B) 2D624 (Subsys. B) 2D642 (Subsys. D) 2D644 (Subsys. D)
DG E DC Bus	125 V Bus	0D597	

5.5 Programs and Manuals

5.5.14 Control Room Envelope Habitability Program (continued)

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

Editorial changes

5.5.15 Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical ~~s~~Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

a. The Surveillance Frequency Control Program shall contain a list of Frequencies of those Surveillance Requirements for which the Frequency is controlled by the program.

b. Changes to the Frequencies listed in the ~~s~~Surveillance Frequency Control Program shall be made in accordance with NEI 04-10, "Risk-Informed ~~m~~Method for Control of Surveillance Frequencies," Revision 1.

c. The provisions of Surveillance Requirements 3.0.2 and 3.0.3 are applicable to the Frequencies established in the Surveillance Frequency Control Program.

5.5.16 Risk Informed Completion Time Program

This program provides controls to calculate a Risk Informed Completion Time (RICT) and must be implemented in accordance with NEI 06-09-A, Revision 0, "Risk Managed Technical Specifications (RMTS) Guidelines." The program shall include the following:

a. The RICT may not exceed 30 days;

5.5 Programs and Manuals

5.5.16 Risk Informed Completion Time Program (continued)

b. A RICT may only be utilized in MODE 1 and 2;

c. When a RICT is being used, any change to the plant configuration, as defined in NEI 06-09-A, Appendix A, must be considered for the effect on the RICT.

1. For planned changes, the revised RICT must be determined prior to implementation of the change in configuration.

2. For emergent conditions, the revised RICT must be determined within the time limits of the Required Action Completion Time (i.e., not the RICT) or 12 hours after the plant configuration change, whichever is less.

3. Revising the RICT is not required if the plant configuration change would lower plant risk and would result in a longer RICT.

d. For emergent conditions, if the extent of condition evaluation for inoperable structures, systems, or components (SSCs) is not complete prior to exceeding the Completion Time, the RICT shall account for the increased possibility of common cause failure (CCF) by either:

1. Numerically accounting for the increased possibility of CCF in the RICT calculation; or

2. Risk Management Actions (RMAs) not already credited in the RICT calculation shall be implemented that support redundant or diverse SSCs that perform the function(s) of the inoperable SSCs, and, if practicable, reduce the frequency of initiating events that challenge the function(s) performed by the inoperable SSCs.

e. The risk assessment approaches and methods shall be acceptable to the NRC. The plant PRA shall be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant, as specified in Regulatory Guide 1.200, Revision 2. Methods to assess the risk from extending the Completion Times must be PRA methods approved for use with this program, or other methods approved by the NRC for generic use; and any change in the PRA methods to assess risk that are outside these approval boundaries require prior NRC approval.

Enclosure 4 of PLA-7984

Revised (Clean) Technical Specification Pages

Revised Technical Specification Pages

Unit 1 TS Pages
3.7-1, 3.7-2, 3.7-3, 3.7-3a, 3.7-3b, 3.7-3c, 3.7-3d, 3.7-3e, 3.7-4, 3.7-5, 3.7-5a, 3.7-5b, 5.0-18c, and 5.0-18d

Unit 2 TS Pages
3.7-1, 3.7-2, 3.7-3, 3.7-3a, 3.7-3b, 3.7-4, 3.7-5, 3.7-5a, 3.7-5b, 3.8-44, 3.8-45, 3.8-46, 3.8-47, 3.8-48, 3.8-49, 3.8-49a, 5.0-18c, and 5.0-18d

3.7 PLANT SYSTEMS

3.7.1 Residual Heat Removal Service Water (RHRSW) System and the Ultimate Heat Sink (UHS)

LCO 3.7.1 Two RHRSW subsystems and the UHS shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

--NOTE--

Enter applicable Conditions and Required Actions of LCO 3.4.8, “Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown,” for RHR shutdown cooling made inoperable by RHRSW System.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. --------------NOTE------------ Separate Condition entry is allowed for each valve. ---------------------------------	A.1 Declare the associated RHRSW subsystems inoperable	Immediately
	AND	
One valve in Table 3.7.1-1 inoperable.	A.2 Establish an open flow path to the UHS.	8 hours
OR	AND	
One valve in Table 3.7.1-2 inoperable.	A.3 Restore the inoperable valve(s) to OPERABLE status.	8 hours from the discovery of an inoperable RHRSW subsystem in the opposite loop from the inoperable valve(s)
OR		
One valve in Table 3.7.1-3 inoperable.		
OR		AND

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
Any combination of valves in Table 3.7.1-1, Table 3.7.1-2, or Table 3.7.1-3 in the same return loop inoperable.	A.3	(continued)	72 hours OR In accordance with the Risk Informed Completion Time Program
B. One Unit 1 RHRSW subsystem inoperable.	B.1 OR	Restore the Unit 1 RHRSW subsystem to OPERABLE status.	72 hours from discovery of the associated Unit 2 RHRSW subsystem inoperable OR In accordance with the Risk Informed Completion Time Program AND 7 days OR In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	--------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. ---	
	B.2 Restore the Unit 1 RHRSW subsystem to OPERABLE status.	14 days during the replacement of the Unit 2 ESW piping[1]
C. Both Unit 1 RHRSW subsystems inoperable.	C.1 Restore one Unit 1 RHRSW subsystem to OPERABLE status.	8 hours from discovery of one Unit 2 RHRSW subsystem not capable of supporting associated Unit 1 RHRSW subsystem <u>AND</u> 72 hours
D. Required Action and associated Completion Time not met. <u>OR</u> UHS inoperable.	D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 4.	12 hours 36 hours

[1]This Completion Time is only applicable during the Unit 2 ‘A’ and ‘B’ ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2027.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.1.1	Verify the water level is greater than or equal to 678 feet 1 inch above Mean Sea Level.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.2	Verify the average water temperature of the UHS is: a. ----------------------------NOTE---------------------------- Only applicable with both units in MODE 1 or 2, or with either unit in MODE 3 for less than twelve (12) hours. --- ≤ 85°F; or b. ----------------------------NOTE---------------------------- Only applicable when either unit has been in MODE 3 for at least twelve (12) hours but not more than twenty-four (24) hours. --- ≤ 87°F; or c. ----------------------------NOTE---------------------------- Only applicable when either unit has been in MODE 3 for at least twenty-four (24) hours. --- ≤ 88°F.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.3	Verify each RHRSW manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position or can be aligned to the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.4	Verify that valves HV-01222A and B (the spray array bypass valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.1.5	Verify that valves HV-01224A1 and B1 (the large spray array valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.6	Verify that valves HV-01224A2 and B2 (the small spray array valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.7	Verify that valves 012287A and 012287B (the spray array bypass manual valves) are capable of being opened and closed.	In accordance with the Surveillance Frequency Control Program

TABLE 3.7.1-1

Ultimate Heat Sink Spray Array Valves

VALVE NUMBER	VALVE DESCRIPTION
HV-01224A1	Loop A large spray array valve
HV-01224B1	Loop B large spray array valve
HV-01224A2	Loop A small spray array valve
HV-01224B2	Loop B small spray array valve

TABLE 3.7.1-2

Ultimate Heat Sink Spray Array Bypass Valves

VALVE NUMBER	VALVE DESCRIPTION
HV-01222A	Loop A spray array bypass valve
HV-01222B	Loop B spray array bypass valve

TABLE 3.7.1-3

Ultimate Heat Sink Spray Array Bypass Manual Valves

VALVE NUMBER	VALVE DESCRIPTION
012287A	Loop A spray array bypass manual valve
012287B	Loop B spray array bypass manual valve

3.7 PLANT SYSTEMS

3.7.2 Emergency Service Water (ESW) System

LCO 3.7.2 Two ESW subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

---NOTE---

Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources – Operating," for DGs made inoperable by ESW.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ESW pump in each subsystem inoperable.	A.1 Restore both ESW pumps to OPERABLE status.	7 days <u>OR</u> In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. One or two ESW subsystems not capable of supplying ESW flow to at least three required DGs.	B.1	Restore ESW flow to the required DGs to ensure that each ESW subsystem is supplying at least three DGs.	7 days <u>OR</u> -----------NOTE----------- Not applicable if there is a loss of function. ------------------------------ In accordance with the Risk Informed Completion Time Program
	<u>OR</u> --------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. --		
	B.2	Restore ESW flow to the required DGs to ensure that each ESW subsystem is supplying at least three DGs.	14 days during the replacement of the Unit 2 ESW piping[1]

[1] This Completion Time is only applicable during the Unit 2 ‘A’ and ‘B’ ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2027.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One ESW subsystem inoperable for reasons other than Condition B.	C.1 Restore the ESW subsystem to OPERABLE status.	7 days OR In accordance with the Risk Informed Completion Time Program
	OR	
	--------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. ---	
	C.2 Restore the ESW subsystem to OPERABLE status.	14 days during the replacement of the Unit 2 ESW piping[(1)]
D. Required Action and associated Completion Time of Condition A, B or C not met. OR Both ESW subsystems inoperable for reasons other than Conditions A and B.	D.1 Be in MODE 3. AND D.2 Be in MODE 4.	12 hours 36 hours

[(1)]This Completion Time is only applicable during the Unit 2 ‘A’ and ‘B’ ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2027.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.2.1	-------------------------------NOTE------------------------------- Isolation of flow to individual components does not render ESW System inoperable. --- Verify each ESW subsystem manual, power operated, and automatic valve in the flow paths servicing safety related systems or components, that is not locked, sealed, or otherwise secured in position, is in the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.2.2	Verify each ESW subsystem actuates on an actual or simulated initiation signal.	In accordance with the Surveillance Frequency Control Program

5.5 Programs and Manuals

5.5.14 Control Room Envelope Habitability Program (continued)

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.15 Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

a. The Surveillance Frequency Control Program shall contain a list of Frequencies of those Surveillance Requirements for which the Frequency is controlled by the program.

b. Changes to the Frequencies listed in the Surveillance Frequency Control Program shall be made in accordance with NEI 04-10, "Risk-Informed Method for Control of Surveillance Frequencies," Revision 1.

c. The provisions of Surveillance Requirements 3.0.2 and 3.0.3 are applicable to the Frequencies established in the Surveillance Frequency Control Program.

5.5.16 Risk Informed Completion Time Program

This program provides controls to calculate a Risk Informed Completion Time (RICT) and must be implemented in accordance with NEI 06-09-A, Revision 0, "Risk-Managed Technical Specifications (RMTS) Guidelines." The program shall include the following:

a. The RICT may not exceed 30 days;

5.5 Programs and Manuals

5.5.16 Risk Informed Completion Time Program (continued)

b. A RICT may only be utilized in MODE 1 and 2;

c. When a RICT is being used, any change to the plant configuration, as defined in NEI 06-09-A, Appendix A, must be considered for the effect on the RICT.

   1. For planned changes, the revised RICT must be determined prior to implementation of the change in configuration.

   2. For emergent conditions, the revised RICT must be determined within the time limits of the Required Action Completion Time (i.e., not the RICT) or 12 hours after the plant configuration change, whichever is less.

   3. Revising the RICT is not required if the plant configuration change would lower plant risk and would result in a longer RICT.

d. For emergent conditions, if the extent of condition evaluation for inoperable structures, systems, or components (SSCs) is not complete prior to exceeding the Completion Time, the RICT shall account for the increased possibility of common cause failure (CCF) by either:

   1. Numerically accounting for the increased possibility of CCF in the RICT calculation; or

   2. Risk Management Actions (RMAs) not already credited in the RICT calculation shall be implemented that support redundant or diverse SSCs that perform the function(s) of the inoperable SSCs, and, if practicable, reduce the frequency of initiating events that challenge the function(s) performed by the inoperable SSCs.

e. The risk assessment approaches and methods shall be acceptable to the NRC. The plant PRA shall be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant, as specified in Regulatory Guide 1.200, Revision 2. Methods to assess the risk from extending the Completion Times must be PRA methods approved for use with this program, or other methods approved by the NRC for generic use; and any change in the PRA methods to assess risk that are outside these approval boundaries require prior NRC approval.

3.7 PLANT SYSTEMS

3.7.1 Residual Heat Removal Service Water (RHRSW) System and the Ultimate Heat Sink (UHS)

LCO 3.7.1 Two RHRSW subsystems and the UHS shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

---NOTE---

Enter applicable Conditions and Required Actions of LCO 3.4.8, "Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown," for RHR shutdown cooling made inoperable by RHRSW System.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. --------------NOTE------------ Separate Condition entry is allowed for each valve. --------------------------------- One valve in Table 3.7.1-1 inoperable. <u>OR</u> One valve in Table 3.7.1-2 inoperable. <u>OR</u> One valve in Table 3.7.1-3 inoperable. <u>OR</u>	A.1 Declare the associated RHRSW subsystems inoperable. <u>AND</u> A.2 Establish an open flow path to the UHS. <u>AND</u> A.3 Restore the inoperable valve(s) to OPERABLE status.	Immediately 8 hours 8 hours from the discovery of an inoperable RHRSW subsystem in the opposite loop from the inoperable valve(s) <u>AND</u>

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
Any combination of valves in Table 3.7.1-1, Table 3.7.1-2, or Table 3.7.1-3 in the same return loop inoperable.	A.3	(continued)	72 hours OR In accordance with the Risk Informed Completion Time Program
B. One Unit 2 RHRSW subsystem inoperable.	B.1 OR	Restore the Unit 2 RHRSW subsystem to OPERABLE status.	72 hours from discovery of the associated Unit 1 RHRSW subsystem inoperable OR In accordance with the Risk Informed Completion Time Program AND 7 days OR In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	--------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. ---	
	B.2 Restore the Unit 2 RHRSW subsystem to OPERABLE status.	14 days during the replacement of the Unit 1 ESW piping[(1)]
C. Both Unit 2 RHRSW subsystems inoperable.	C.1 Restore one Unit 2 RHRSW subsystem to OPERABLE status.	8 hours from discovery of one Unit 1 RHRSW subsystem not capable of supporting associated Unit 2 RHRSW subsystem AND 72 hours
D. Required Action and associated Completion Time not met. OR UHS inoperable.	D.1 Be in MODE 3. AND D.2 Be in MODE 4.	12 hours 36 hours

[(1)]This Completion Time is only applicable during the Unit 1 'A' and 'B' ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2026.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.1.1	Verify the water level is greater than or equal to 678 feet 1 inch above Mean Sea Level.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.2	Verify the average water temperature of the UHS is: a. -----------------------------NOTE--------------------------- Only applicable with both units in MODE 1 or 2, or with either unit in MODE 3 for less than twelve (12) hours. --- ≤ 85°F; or b. -----------------------------NOTE--------------------------- Only applicable when either unit has been in MODE 3 for at least twelve (12) hours but not more than twenty-four (24) hours. --- ≤ 87°F; or c. -----------------------------NOTE--------------------------- Only applicable when either unit has been in MODE 3 for at least twenty-four (24) hours. --- ≤ 88°F.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.3	Verify each RHRSW manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position or can be aligned to the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.4	Verify that valves HV-01222A and B (the spray array bypass valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.1.5	Verify that valves HV-01224A1 and B1 (the large spray array valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.6	Verify that valves HV-01224A2 and B2 (the small spray array valves) close upon receipt of a closing signal and open upon receipt of an opening signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.1.7	Verify that valves 012287A and 012287B (the spray array bypass manual valves) are capable of being opened and closed.	In accordance with the Surveillance Frequency Control Program

3.7 PLANT SYSTEMS

3.7.2 Emergency Service Water (ESW) System

LCO 3.7.2 Two ESW subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

--NOTE--
Enter applicable Conditions and Required Actions of LCO 3.8.1, “AC Sources – Operating,” for DGs made inoperable by ESW.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ESW pump in each subsystem inoperable.	A.1 Restore both ESW pumps to OPERABLE status.	7 days <u>OR</u> In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or two ESW subsystems not capable of supplying ESW flow to at least three required DGs.	B.1 Restore ESW flow to the required DGs to ensure that each ESW subsystem is supplying at least three DGs.	7 days <u>OR</u> -----------NOTE----------- Not applicable if there is a loss of function. ------------------------------ In accordance with the Risk Informed Completion Time Program
	<u>OR</u> --------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. --	
	B.2 Restore ESW flow to the required DGs to ensure that each ESW subsystem is supplying at least three DGs.	14 days during the replacement of the Unit 1 ESW piping[(1)]

[(1)]This Completion Time is only applicable during the Unit 1 ‘A’ and ‘B’ ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2026.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One ESW subsystem inoperable for reasons other than Condition B.	C.1 Restore the ESW subsystem to OPERABLE status.	7 days OR In accordance with the Risk Informed Completion Time Program
	OR --------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 14-day Completion Time is in effect. ---	
	C.2 Restore the ESW subsystem to OPERABLE status.	14 days during the replacement of the Unit 1 ESW piping[(1)]
D. Required Action and associated Completion Time of Condition A, B, or C not met. OR Both ESW subsystems inoperable for reasons other than Conditions A and B.	D.1 Be in MODE 3. AND D.2 Be in MODE 4	12 hours 36 hours

[(1)]This Completion Time is only applicable during the Unit 1 ‘A’ and ‘B’ ESW piping replacement while the compensatory measures identified in Enclosure 2 to letter PLA-7830 are in place. Upon completion of pipe replacement activities, this temporary extension is no longer applicable and will expire on June 25, 2026.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.2.1	-------------------------------NOTE------------------------------ Isolation of flow to individual components does not render ESW System inoperable. --- Verify each ESW subsystem manual, power operated, and automatic valve in the flow paths servicing safety related systems or components, that is not locked, sealed, or otherwise secured in position, is in the correct position.	In accordance with the Surveillance Frequency Control Program
SR 3.7.2.2	Verify each ESW subsystem actuates on an actual or simulated initiation signal.	In accordance with the Surveillance Frequency Control Program

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Distribution Systems – Operating

LCO 3.8.7 The electrical power distribution subsystems in Table 3.8.7-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. -------------NOTE------------- Not applicable to DG E DC Bus 0D597 ---------------------------------- One or more Unit 2 AC electrical power distribution subsystems inoperable.	--------------------NOTE-------------------- Enter applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources – Operating," for DC source(s) made inoperable by inoperable power distribution subsystem(s). -- A.1 Restore Unit 2 AC electrical power distribution subsystem(s) to OPERABLE status.	8 hours OR ----------NOTES---------- 1. Not applicable if there is a loss of function. 2. Only applicable to AC electrical power sources included in the PRA model. ------------------------------ In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. -------------NOTE------------- Not applicable to DG E DC Bus 0D597. --------------------------------- One or more Unit 2 DC electrical power distribution subsystems inoperable.	B.1 Restore Unit 2 DC electrical power distribution subsystem(s) to OPERABLE status.	2 hours <u>OR</u> -----------NOTE----------- Not applicable if there is a loss of function. ----------------------------- In accordance with the Risk Informed Completion Time Program
C. One Unit 1 AC electrical power distribution subsystem inoperable.	C.1 Restore Unit 1 AC electrical power distribution subsystem to OPERABLE status. <u>OR</u>	72 hours <u>OR</u> -----------NOTE----------- Only applicable to AC electrical power sources included in the PRA model. ----------------------------- In accordance with the Risk Informed Completion Time Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. (continued)	--------------------NOTE-------------------- The Risk Informed Completion Time Program cannot be applied if the temporary 7-day Completion Time is in effect. ---	
	C.2 Restore Unit 1 AC electrical power distribution subsystem to OPERABLE status.	7 days during the replacement of 480 V ESS Load Center Transformers in Unit 1[(1)]
D. Two Unit 1 AC electrical power distribution subsystems on one Division inoperable for performance of Unit 1 SR 3.8.1.19.	D.1 Restore at least one Unit 1 AC electrical power distribution subsystems to OPERABLE status.	8 hours <u>OR</u> -----------NOTE----------- Only applicable to AC electrical power sources included in the PRA model. ------------------------------ In accordance with the Risk Informed Completion Time Program
E. Required Action and Associated Completion Time of Condition A, B, or C not met.	E.1 Be in MODE 3. <u>AND</u> E.2 Be in MODE 4.	12 hours 36 hours

[(1)] This temporary 7-day completion time is applicable during the replacement of Unit 1 480 V ESS Load Center Transformers 1X230 and 1X240, while Unit 1 is in MODES 4 or 5, and will expire on June 15, 2024.

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
F. Diesel Generator E DC electrical power subsystem inoperable, while not aligned to the Class 1E distribution system.	F.1	Verify that all ESW valves associated with Diesel Generator E are closed.	2 hours
G. Diesel Generator E DC electrical power subsystem inoperable, while aligned to the Class 1E distribution system.	G.1	Declare Diesel Generator E inoperable.	2 hours
H. Two or more electrical power distribution subsystems inoperable that result in a loss of safety function.	H.1	Enter LCO 3.0.3.	Immediately
I. -------------NOTE------------- Not applicable to DG E DC Bus 0D597. --------------------------------- One or more Unit 1 DC electrical power distribution subsystem(s) inoperable.	I.1	Transfer associated Unit 1 and common loads to corresponding Unit 2 DC electrical power distribution subsystem.	2 hours
	<u>AND</u>		
	I.2	Restore Unit 1 and common loads to corresponding Unit 1 DC electrical power distribution subsystem.	72 hours after Unit 1 DC electrical power subsystem is restored to OPERABLE status
J. Required Actions and Associated Completion Times of Condition I not met.	J.1	Declare associated common loads inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.7.1	Verify correct breaker alignments and voltage or indicated power availability to required AC and DC electrical power distribution subsystems.	In accordance with the Surveillance Frequency Control Program

Table 3.8.7-1 (page 1 of 2)
Unit 2 AC and DC Electrical Power Distribution Subsystems

TYPE	VOLTAGE	DIVISION I	DIVISION II
AC Buses	4160 V Load Groups	1A201 (Subsys. A) 1A203 (Subsys. C) 2A201 (Subsys. A) 2A203 (Subsys. C)	1A202 (Subsys. B) 1A204 (Subsys. D) 2A202 (Subsys. B) 2A204 (Subsys. D)
	480 V Load Centers	1B210 (Subsys. A) 1B230 (Subsys. C) 2B210 (Subsys. A) 2B230 (Subsys. C)	1B220 (Subsys. B) 1B240 (Subsys. D) 2B220 (Subsys. B) 2B240 (Subsys. D)
	480 V Motor Control Centers	0B516 (Subsys. A) 0B517 (Subsys. A) 1B216 (Subsys. A) 1B217 (Subsys. A) 0B536 (Subsys. C) 0B136 (Subsys. C) 1B236 (Subsys. C) 2B216 (Subsys. A) 2B236 (Subsys. C) 2B237 (Subsys. C) 2B217 (Subsys. A)	0B526 (Subsys. B) 0B527 (Subsys. B) 1B226 (Subsys. B) 1B227 (Subsys. B) 0B546 (Subsys. D) 0B146 (Subsys. D) 1B246 (Subsys. D) 2B246 (Subsys. D) 2B247 (Subsys. D) 2B226 (Subsys. B) 2B227 (Subsys. B)
	208/120 V Distribution Panels	1Y216 (Subsys. A) 1Y236 (Subsys. C) 2Y216 (Subsys. A) 2Y236 (Subsys. C)	1Y226 (Subsys. B) 1Y246 (Subsys. D) 2Y226 (Subsys. B) 2Y246 (Subsys. D)

Table 3.8.7-1 (page 2 of 2)
Unit 2 AC and DC Electrical Power Distribution Subsystems

TYPE	VOLTAGE	DIVISION I	DIVISION II
DC Buses	250 V Buses	2D652 2D254	2D662 2D264 2D274
	125 V Buses	1D612 (Subsys. A) 1D614 (Subsys. A) 1D632 (Subsys. C) 1D634 (Subsys. C) 2D612 (Subsys. A) 2D614 (Subsys. A) 2D632 (Subsys. C) 2D634 (Subsys. C)	1D622 (Subsys. B) 1D624 (Subsys. B) 1D642 (Subsys. D) 1D644 (Subsys. D) 2D622 (Subsys. B) 2D624 (Subsys. B) 2D642 (Subsys. D) 2D644 (Subsys. D)
DG E DC Bus	125 V Bus	0D597	

5.5 Programs and Manuals

5.5.14 Control Room Envelope Habitability Program (continued)

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.15 Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

a. The Surveillance Frequency Control Program shall contain a list of Frequencies of those Surveillance Requirements for which the Frequency is controlled by the program.

b. Changes to the Frequencies listed in the Surveillance Frequency Control Program shall be made in accordance with NEI 04-10, “Risk-Informed Method for Control of Surveillance Frequencies,” Revision 1.

c. The provisions of Surveillance Requirements 3.0.2 and 3.0.3 are applicable to the Frequencies established in the Surveillance Frequency Control Program.

5.5.16 Risk Informed Completion Time Program

This program provides controls to calculate a Risk Informed Completion Time (RICT) and must be implemented in accordance with NEI 06-09-A, Revision 0, “Risk Managed Technical Specifications (RMTS) Guidelines.” The program shall include the following:

a. The RICT may not exceed 30 days;

5.5 Programs and Manuals

5.5.16 Risk Informed Completion Time Program (continued)

b. A RICT may only be utilized in MODE 1 and 2;

c. When a RICT is being used, any change to the plant configuration, as defined in NEI 06-09-A, Appendix A, must be considered for the effect on the RICT.

   1. For planned changes, the revised RICT must be determined prior to implementation of the change in configuration.

   2. For emergent conditions, the revised RICT must be determined within the time limits of the Required Action Completion Time (i.e., not the RICT) or 12 hours after the plant configuration change, whichever is less.

   3. Revising the RICT is not required if the plant configuration change would lower plant risk and would result in a longer RICT.

d. For emergent conditions, if the extent of condition evaluation for inoperable structures, systems, or components (SSCs) is not complete prior to exceeding the Completion Time, the RICT shall account for the increased possibility of common cause failure (CCF) by either:

   1. Numerically accounting for the increased possibility of CCF in the RICT calculation; or

   2. Risk Management Actions (RMAs) not already credited in the RICT calculation shall be implemented that support redundant or diverse SSCs that perform the function(s) of the inoperable SSCs, and, if practicable, reduce the frequency of initiating events that challenge the function(s) performed by the inoperable SSCs.

e. The risk assessment approaches and methods shall be acceptable to the NRC. The plant PRA shall be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant, as specified in Regulatory Guide 1.200, Revision 2. Methods to assess the risk from extending the Completion Times must be PRA methods approved for use with this program, or other methods approved by the NRC for generic use; and any change in the PRA methods to assess risk that are outside these approval boundaries require prior NRC approval.

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Marked-Up Technical Specification Bases Pages

Revised Technical Specification Bases Pages

Unit 1 TS Bases Pages
3.7-5a, 3.7-6, 3.7-9, and 3.7-10

Unit 2 TS Bases Pages
3.7-5a, 3.7-6, 3.7-6a, 3.7-9, 3.7-10, 3.8-86, 3.8-87, and 3.8-89

(Provided for Information Only)

BASES

ACTIONS (continued)

A.1, A.2, and A.3 (continued)

With any UHS return path valve listed in Tables 3.7.1-1, 3.7.1-2, or 3.7.1-3 inoperable, the UHS return path is no longer single failure proof.

For combinations of inoperable valves in the same loop, the UHS spray capacity needed to support the OPERABILITY of the associated Unit 1 and Unit 2 RHRSW subsystems is affected. As a result, the associated RHRSW subsystems must be declared inoperable.

The 8 hour completion time to establish the flow path provides sufficient time to open a path and de-energize the appropriate valve in the open position.

The 72-hour completion time is based on the fact that, although adequate UHS spray loop capability exists during this time period, both units are affected and an additional single failure results in a system configuration that will not meet design basis accident requirements. Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

If an additional RHRSW subsystem on either Unit is inoperable, cooling capacity less than the minimum required for response to a design basis event would exist. Therefore, an 8-hour Completion Time is appropriate. The 8-hour Completion Time provides sufficient time to restore inoperable equipment and there is a low probability that a design basis event would occur during this period. The Risk Informed Completion Time Program does not apply to the 8 hour Completion Time in Required Action A.3.

B.1

Required Action B.1 is intended to ensure that appropriate actions are taken if one Unit 1 RHRSW subsystem is inoperable. Although designated and operated as a unitized system, the associated Unit 2 subsystem is directly connected to a common header, which can supply the associated RHR heat exchanger in either unit. The associated Unit 2 subsystem is considered capable of supporting the associated Unit 1 RHRSW subsystem when the Unit 2 subsystem is OPERABLE and can provide the assumed flow to the Unit 1 heat exchanger. A Completion time of 72 hours, when the associated Unit 2 RHRSW subsystem is not capable of supporting the associated Unit 1 RHRSW subsystem, is allowed to restore the Unit 1 RHRSW subsystem to OPERABLE status. In this configuration, the remaining OPERABLE Unit 1 RHRSW subsystem is adequate to perform the RHRSW heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE RHRSW subsystem could result in loss of RHRSW

BASES

ACTIONS (continued)

B.1 (continued)

function. The Completion Time is based on the redundant RHRSW capabilities afforded by the OPERABLE subsystem and the low probability of an event occurring requiring RHRSW during this period.

With one RHRSW subsystem inoperable, and the respective Unit 2 RHRSW subsystem capable of supporting the respective Unit 1 RHRSW subsystem, the design basis cooling capacity for both units can still be maintained even considering a single active failure. However, the configuration does reduce the overall reliability of the RHRSW System. Therefore, provided the associated Unit 2 subsystem remains capable of supporting its respective Unit 1 RHRSW subsystem, the inoperable RHRSW subsystem must be restored to OPERABLE status within 7 days. The 7-day Completion Time is based on the remaining RHRSW System heat removal capability.

Alternatively, for the 72 hour and 7 day Completion Times in Required Action B.1, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

B.2

Additionally, the Completion Time to restore the Unit 1 RHRSW system has been extended to 14 days in order to complete the replacement of a portion of the Unit 2 ESW piping. This is a temporary extension of the Completion Time and is applicable during the Unit 2 ESW piping replacement. When utilizing the temporary Completion Time extension, the 72 hour Completion Time, ~~and~~ 7 day Completion Time~~s~~, and the Risk Informed Completion Time Program, as provided for Required Action B.1, do not apply.

In order to cope with the consequences of a LOCA/LOOP in Unit 1 during the extended Completion Time, the following compensatory measure is required: Provisions will be implemented to restore piping integrity to allow use of the Unit 1 RHRSW system within the current LCO Completion Time. Upon completion of the Unit 2 ESW piping replacement, this temporary extension is no longer applicable and will expire on June 25, 2027.

C.1

Required Action C.1 is intended to ensure that appropriate actions are taken if both Unit 1 RHRSW subsystems are inoperable. Although designated and operated as a unitized system, the associated Unit 2 subsystem is directly connected to a common header, which can supply the associated RHR heat exchanger in either unit. With both Unit 1 RHRSW subsystems inoperable, the RHRSW system is still capable of performing its intended design

BASES

ACTIONS

The ACTIONS are modified by a Note indicating that the applicable Conditions of LCO 3.8.1, be entered and Required Actions taken if the inoperable ESW subsystem results in inoperable DGs (i.e., the supply from both subsystems of ESW is secured to the same DG). This is an exception to LCO 3.0.6 because the Required Actions of LCO 3.7.2 do not adequately compensate for the loss of a DG (LCO 3.8.1) due to loss of ESW flow.

A.1

With one ESW pump inoperable in each subsystem, both inoperable pumps must be restored to OPERABLE status within 7 days or in accordance with the Risk Informed Completion Time Program. With the unit in this condition, the remaining OPERABLE ESW pumps are adequate to perform the ESW heat removal function; however, the overall reliability is reduced because a single failure could result in loss of ESW function. The 7 day Completion Time is based on the remaining ESW heat removal capability and the low probability of an event occurring during this time period.

B.1

With one or both ESW subsystems not capable of supplying ESW flow to two or more DGs, the capability to supply ESW to at least three DGs from each ESW subsystem must be restored within 7 days. Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. The ability to calculate a Risk Informed Completion Time is modified by a Note and limited to situations in which a loss of function has not occurred. With the units in this condition, the remaining ESW flow to DGs is adequate to maintain the full capability of all DGs; however, the overall reliability is reduced because a single failure could result in loss of the multiple DGs. The 7 day Completion Time is based on the fact that all DGs remain capable of responding to an event occurring during this time period.

B.2

Additionally, the Completion Time to restore the ESW subsystem has been extended to 14 days in order to complete the replacement of a portion of the Unit 2 ESW piping. This is a temporary extension of the Completion Time and is applicable during the Unit 2 ESW piping replacement. In order to cope with the consequences of a LOCA/LOOP in Unit 1 during the extended Completion Time, the following compensatory action is required: Provisions will be implemented to restore piping integrity to allow the use of the inoperable Unit 1 ESW subsystem within the current LCO Completion Time. Upon completion of the Unit 2 ESW

BASES

ACTIONS (continued)

B.~~1~~2 (continued)

piping replacement, this temporary extension is no longer applicable and will expire on June 25, 2027. The Risk Informed Completion Time Program does not apply to the 14 day Completion Time.

C.1

With one ESW subsystem inoperable for reasons other than Condition B, the ESW subsystem must be restored to OPERABLE status within 7 days or in accordance with the Risk Informed Completion Time Program. With the unit in this condition, the remaining OPERABLE ESW subsystem is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ESW subsystem could result in loss of ESW function.

The 7 day Completion Time is based on the redundant ESW System capabilities afforded by the OPERABLE subsystem, the low probability of an accident occurring during this time period, and is consistent with the allowed Completion Time for restoring an inoperable Core Spray Loop, LPCI Pumps and Control Structure Chiller.

C.2

Additionally, the Completion Time to restore the ESW subsystem has been extended to 14 days in order to complete the replacement of a portion of the Unit 2 ESW piping. This is a temporary extension of the Completion Time and is applicable during the Unit 2 ESW piping replacement. In order to cope with the consequences of a LOCA/LOOP in Unit 1 during the extended Completion Time, the following compensatory action is required: Provisions will be implemented to restore piping integrity to allow the use of the inoperable Unit 1 ESW subsystem within the current LCO Completion Time. Upon completion of the Unit 2 ESW piping replacement, this temporary extension is no longer applicable and will expire on June 25, 2027. The Risk Informed Completion Time Program does not apply to the 14 day Completion Time.

D.1 and D.2

If the ESW subsystem cannot be restored to OPERABLE status within the associated Completion Time, or both ESW subsystems are inoperable for reasons other than Condition A and B (i.e., three ESW pumps inoperable), the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within

BASES

ACTIONS (continued)

A.1, A.2 and A.3 (continued)

The 72-hour completion time is based on the fact that, although adequate UHS spray loop capability exists during this time period, both units are affected and an additional single failure results in a system configuration that will not meet design basis accident requirements. Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

~~The Completion Time to restore the Unit 2 RHRSW inoperable valves has been extended to 7 days in order to complete the replacement of the Unit 1 480 V ESS Load Center Transformers 1X210 and 1X220. This is a temporary extension of the Completion Time and is applicable during the transformer replacement. In order to cope with the consequences of a LOOP, a LOCA in Unit 2 and the shutdown of Unit 1 during the extended Completion Time, the following compensatory actions are required: 1) the affected loop's spray array bypass valves are in the open position and 2) the affected loop's spray array valves are closed. Upon completion of the transformer replacements, this temporary extension is no longer applicable and will expire on June 15, 2020.~~

If an additional RHRSW subsystem on either Unit is inoperable, cooling capacity less than the minimum required for response to a design basis event would exist. Therefore, an 8-hour Completion Time is appropriate. The 8-hour Completion Time provides sufficient time to restore inoperable equipment and there is a low probability that a design basis event would occur during this period. The Risk Informed Completion Time Program does not apply to the 8 hour Completion Time in Required Action A.3.

B.1

Required Action B.1 is intended to ensure that appropriate actions are taken if one Unit 2 RHRSW subsystem is inoperable. Although designated and operated as a unitized system, the associated Unit 1 subsystem is directly connected to a common header which can supply the associated RHR heat exchanger in either unit. The associated Unit 1 subsystem is considered capable of supporting the associated Unit 2 RHRSW subsystem when the Unit 1 subsystem is OPERABLE and can provide the assumed flow to the Unit 2 heat exchanger. A Completion time of 72 hours, when the associated Unit 1 RHRSW subsystem is not capable of supporting the associated Unit 2 RHRSW subsystem, is allowed to restore the Unit 2 RHRSW subsystem to OPERABLE status. In this configuration, the remaining OPERABLE

BASES

ACTIONS (continued)

B.1 (continued)

Unit 2 RHRSW subsystem is adequate to perform the RHRSW heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE RHRSW subsystem could result in loss of RHRSW function. The Completion Time is based on the redundant RHRSW capabilities afforded by the OPERABLE subsystem and the low probability of an event occurring requiring RHRSW during this period.

With one RHRSW subsystem inoperable, and the respective Unit 1 RHRSW subsystem capable of supporting the respective Unit 2 RHRSW subsystem, the design basis cooling capacity for both units can still be maintained even considering a single active failure. However, the configuration does reduce the overall reliability of the RHRSW System. Therefore, provided the associated Unit 1 subsystem remains capable of supporting its respective Unit 2 RHRSW subsystem, the inoperable RHRSW subsystem must be restored to OPERABLE status within 7 days. The 7-day Completion Time is based on the remaining RHRSW System heat removal capability.~~The Completion Time to restore the Unit 2 RHRSW subsystem has been extended to 7 days in order to complete the replacement of the Unit 1 480 V ESS Load Center Transformers 1X210 and 1X220. This is a temporary extension of the Completion Time and is applicable during the transformer replacement. The Unit 2 RHRSW subsystem remains functional since the subsystem has an operable pump, operable flow path and an operable UHS. Upon completion of the transformer replacements, this temporary extension is no longer applicable and will expire on June 15, 2020.~~

Alternatively, for the 72 hour and 7 day Completion Times in Required Action B.1, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

B.2

Additionally, the Completion Time to restore the Unit 2 RHRSW system has been extended to 14 days in order to complete the replacement of a portion of the Unit 1 ESW piping. This is a temporary extension of the Completion Time and is applicable during the Unit 1 ESW piping replacement. When utilizing the temporary Completion Time extension, the 72 hour Completion Time, ~~and~~ 7 day Completion Time~~s~~, and Risk Informed Completion Time Program, as provided for Required Action B.1, do not apply.

BASES

ACTIONS (continued)

B.1 (continued)

In order to cope with the consequences of a LOCA/LOOP in Unit 2 during the extended Completion Time, the following compensatory measure is required: Provisions will be implemented to restore piping integrity to allow use of the Unit 2 RHRSW system within the current LCO Completion Time. Upon completion of the Unit 1 ESW piping replacement, this temporary extension is no longer applicable and will expire on June 25, 2026.

~~With one RHRSW subsystem inoperable, and the respective Unit 1 RHRSW subsystem capable of supporting the respective Unit 2 RHRSW subsystem, the design basis cooling capacity for both units can still be maintained even considering a single active failure. However, the configuration does reduce the overall reliability of the RHRSW System. Therefore, provided the associated Unit 1 subsystem remains capable of supporting its respective Unit 2 RHRSW subsystem, the inoperable RHRSW subsystem must be restored to OPERABLE status within 7 days. The 7-day Completion Time is based on the remaining RHRSW System heat removal capability.~~

C.1

Required Action C.1 is intended to ensure that appropriate actions are taken if both Unit 2 RHRSW subsystems are inoperable. Although designated and operated as a unitized system, the associated Unit 1 subsystem is directly connected to a common header which can supply the associated RHR heat exchanger in either unit. With both Unit 2 RHRSW subsystems inoperable, the RHRSW system is still capable of performing its intended design function. However, the loss of an additional RHRSW subsystem on Unit 1 results in the cooling capacity to be less than the minimum required for response to a design basis event. Therefore, the 8-hour Completion Time is appropriate. The 8-hour Completion Time for restoring one RHRSW subsystem to OPERABLE status, is based on the Completion Times provided for the RHR suppression pool spray function.

With both Unit 2 RHRSW subsystems inoperable, and both of the Unit 1 RHRSW subsystems capable of supporting their respective Unit 2 RHRSW subsystem, if no additional failures occur which impact the RHRSW System, the remaining OPERABLE Unit 1 subsystems and flow paths provide adequate heat removal capacity following a design basis LOCA. However, capability for this alignment is not assumed in long term containment response analysis and an additional single failure in the RHRSW System could reduce the system capacity below that assumed in the safety analysis.

Therefore, continued operation is permitted only for a limited time. One

BASES

ACTIONS (continued)

A.1

With one ESW pump inoperable in each subsystem, both inoperable pumps must be restored to OPERABLE status within 7 days or in accordance with the Risk Informed Completion Time Program. With the unit in this condition, the remaining OPERABLE ESW pumps are adequate to perform the ESW heat removal function; however, the overall reliability is reduced because a single failure could result in loss of ESW function. The 7 day Completion Time is based on the remaining ESW heat removal capability and the low probability of an event occurring during this time period.

B.1

With one or both ESW subsystems not capable of supplying ESW flow to two or more DGs, the capability to supply ESW to at least three DGs from each ESW subsystem must be restored within 7 days. Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. The ability to calculate a Risk Informed Completion Time is modified by a Note and limited to situations in which a loss of function has not occurred. With the units in this condition, the remaining ESW flow to DGs is adequate to maintain the full capability of all DGs; however, the overall reliability is reduced because a single failure could result in loss of the multiple DGs. The 7 day Completion Time is based on the fact that all DGs remain capable of responding to an event occurring during this time period.

B.2

Additionally, the Completion Time to restore the ESW subsystem has been extended to 14 days in order to complete the replacement of a portion of the Unit 1 ESW piping. This is a temporary extension of the Completion Time and is applicable during the Unit 1 ESW piping replacement. In order to cope with the consequences of a LOCA/LOOP in Unit 2 during the extended Completion Time, the following compensatory action is required: Provisions will be implemented to restore piping integrity to allow the use of the inoperable Unit 2 ESW subsystem within the current LCO Completion Time. Upon completion of the Unit 1 ESW piping replacement, this temporary extension is no longer applicable and will expire on June 25, 2026. The Risk Informed Completion Time Program does not apply to the 14 day Completion Time.

BASES

ACTIONS (continued)

C.1

With one ESW subsystem inoperable for reasons other than Condition B, the ESW subsystem must be restored to OPERABLE status within 7 days or in accordance with the Risk Informed Completion Time Program. With the unit in this condition, the remaining OPERABLE ESW subsystem is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ESW subsystem could result in loss of ESW function.

The 7 day Completion Time is based on the redundant ESW System capabilities afforded by the OPERABLE subsystem, the low probability of an accident occurring during this time period, and is consistent with the allowed Completion Time for restoring an inoperable Core Spray Loop, LPCI Pumps and Control Structure Chiller.

C.2

Additionally, the Completion Time to restore the ESW subsystem has been extended to 14 days in order to complete the replacement of a portion of the Unit 1 ESW piping. This is a temporary extension of the Completion Time and is applicable during the Unit 1 ESW piping replacement. In order to cope with the consequences of a LOCA/LOOP in Unit 2 during the extended Completion Time, the following compensatory action is required: Provisions will be implemented to restore piping integrity to allow the use of the inoperable Unit 2 ESW subsystem within the current LCO Completion Time. Upon completion of the Unit 1 ESW piping replacement, this temporary extension is no longer applicable and will expire on June 25, 2026. The Risk Informed Completion Time Program does not apply to the 14 day Completion Time.

D.1 and D.2

If the ESW subsystem cannot be restored to OPERABLE status within the associated Completion Time, or both ESW subsystems are inoperable for reasons other than Condition A and B (i.e., three ESW pumps inoperable), the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

BASES

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, and 3 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Electrical power distribution subsystem requirements for MODES 4 and 5 are covered in the Bases for LCO 3.8.8, "Distribution Systems - Shutdown."

ACTIONS

A.1

With one or more required Unit 2 AC buses, load centers, motor control centers, or distribution panels inoperable but not resulting in a loss of safety function, or two Unit 1 AC electrical power distribution subsystems on one Division inoperable for performance of Unit 1 SR 3.8.1.19, the remaining AC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours. Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. The ability to calculate a Risk Informed Completion Time is modified by two Notes. Note 1 limits the ability to calculate a Risk Informed Completion Time to situations in which a loss of function has not occurred. Note 2 prohibits applying a Risk Informed Completion Time to losses of AC sources which are not included in the PRA model.

The Condition A worst scenario is one division without AC power (i.e., no offsite power to the division and the associated DG inoperable). In this Condition, the unit is more vulnerable to a complete loss of AC power. It is, therefore, imperative that the unit operators' attention be focused on minimizing the potential for loss of power to the remaining division by stabilizing the unit, and on restoring power to the affected division. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because:

BASES

ACTIONS (continued)

A.1 (continued)

a. There is a potential for decreased safety if the attention of unit operators is diverted from the evaluations and actions necessary to restore power to the affected division to the actions associated with taking the unit to shutdown within this time limit.

b. The potential for an event in conjunction with a single failure of a redundant component in the division with AC power. (The redundant component is verified OPERABLE in accordance with Specification 5.5.11, "Safety Function Determination Program (SFDP).")

Condition A is modified by a Note that states that Condition A is not applicable to the DG E DC electrical power subsystem. Condition F or G is applicable to an inoperable DG E DC electrical power subsystem.

Required Action A.1 is modified by a Note that requires the applicable Conditions and Required Actions of LCO 3.8.4 “DC Sources - Operating,” to be entered for DC subsystems made inoperable by inoperable AC electrical power distribution subsystems. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for inoperable DC sources. Inoperability of a distribution subsystem can result in loss of charging power to batteries and eventual loss of DC power. This Note ensures that the appropriate attention is given to restoring charging power to batteries, if necessary, after loss of distribution systems.

B.1

With one or more Unit 2 DC buses inoperable, the remaining DC electrical power distribution subsystems may be capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in one of the remaining DC electrical power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required DC buses must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery or charger. Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. The ability to calculate a Risk Informed Completion Time is modified by a Note and limited to situations in which a loss of function has not occurred.

BASES

ACTIONS (continued)

C.1 (continued)

distribution subsystem could result in the minimum required ESF functions not being supported. The Completion Time of 72 hours is consistent with the Completion Times associated with LCOs for the Unit 2 and common equipment potentially affected by loss of a Unit 1 AC electrical power subsystem. Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. The ability to calculate a Risk Informed Completion Time is modified by a Note and prohibits applying a Risk Informed Completion Time to losses of AC sources which are not included in the PRA model.

C.2

The Completion Time has been extended to 7 days in order to complete the replacement of Unit 1 480 V ESS Load Center Transformers 1X230 and 1X240. This is a temporary extension of the Completion Time. Upon completion of the transformer replacement, this temporary extension is no longer applicable and will expire on June 15, 2024. The Risk Informed Completion Time Program does not apply to the 7 day Completion Time.

D.1

With two required Unit 1 AC buses, load centers, motor control centers, or distribution panels inoperable for the performance of Unit 1 SR 3.8.1.19 but not resulting in a loss of safety function, the remaining AC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours or in accordance with the Risk Informed Completion Time Program. The ability to calculate a Risk Informed Completion Time is modified by a Note and prohibits applying a Risk Informed Completion Time to losses of AC sources which are not included in the PRA model.

E.1and E.2

If the inoperable distribution subsystem cannot be restored to OPERABLE status within the associated Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant