NEXTera ENERGY SEABROOK

September 22, 2021
SBK-L-21098
10 CFR 50.90

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

RE: Seabrook Station
Docket No. 50-443
Renewed Facility Operating License No. NPF-86

Supplement to License Amendment Request 21-01, Revise 120-Volt AC Vital Instrument Panel Requirements

References:

1. NextEra Energy Seabrook, LLC letter SBK-L-21067, License Amendment Request 21-01, Revise 120-Volt AC Vital Instrument Panel Requirements, July 19, 2021 (ADAMS Accession No. ML21202A238)

In Reference 1, NextEra Energy Seabrook, LLC (NextEra) requested an amendment to Renewed Facility Operating License NPF-86 for Seabrook Station Unit 1 (Seabrook). The proposed license amendment would modify the Seabrook Technical Specifications (TS) 3.8.3, Onsite Power Distribution - Operating, by increasing the allowable outage time (AOT) for the 120-volt AC vital instrument panel inverters, establishing a new required action for two inoperable 120-volt AC vital instrument panel inverters of the same electrical train and related administrative changes.

During a September 1, 2021 conference call, the NRC requested supplemental information determined necessary to complete their review.

The enclosure to this letter provides the requested supplemental information. Attachment 1 to the enclosure provides revised Seabrook TS pages marked up to show the proposed changes. Attachment 2 provides revised Seabrook TS Bases pages marked up to show the proposed changes. The TS Bases changes are provided for information only and will be incorporated in accordance with TS Bases Control Program upon implementation of the approved amendment. Attachment 3 provides the revised risk-informed analysis supporting the proposed AOT extensions based on the Seabrook probabilistic risk assessment (PRA). Attachments A and B provide information relating to the External Hazards Screening and Progressive Screening Approach for External Hazards for the risk-informed analysis of Attachment 3. Attachment C provides the Disposition and Resolution of Open Peer Review Findings and Self-Assessment Open Items (F&O's) for the risk-informed analysis of Attachment 3. The enclosure and attachments provided in this letter supersede and replace the corresponding enclosure and attachments of Reference 1. Changes to the enclosure and Attachment 3 are evidenced by revision bars in the right-hand margins.

The supplements included in this response provide additional information that clarifies the application, do not expand the scope of the application as originally noticed, and should not change the NRC staffs original proposed no significant hazards consideration determination as published in the *Federal Register.*

This letter contains no new regulatory commitments.

Should you have any questions regarding this submission, please contact Mr. Matthew Levander, Licensing Manager at 603-773-7631.

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

Executed on the 22nd day of September 2021.

Sincerely,

Brian Booth
Site Vice President - Seabrook Nuclear Power Station
NextEra Energy

Enclosure
Attachments

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**Evaluation of the Proposed Changes**

Seabrook Station

Supplement to License Amendment Request 21-01
Revise 120-Volt AC Vital Instrument Panel Requirements



**ATTACHMENTS**

## 1.0 SUMMARY DESCRIPTION

Pursuant to 10 CFR 50.90, NextEra Energy Seabrook, LLC (NextEra) requests an amendment to Renewed Facility Operating License NPF-86 for Seabrook Nuclear Plant Unit 1 (Seabrook). The proposed license amendment modifies Seabrook Technical Specifications (TS) 3.8.3, Onsite Power Distribution – Operating by increasing the allowable outage time (AOT) for the 120-volt AC vital instrument panel inverters, establishing a new required action for two inoperable 120-volt AC vital instrument panel inverters of the same electrical train and related administrative changes.

## 2.0 DETAILED DESCRIPTION

### 2.1 System Design and Operation

The 120 Vital AC Instrumentation and Control Power System (120 VAC Vital Instrument System) is composed of six independent AC buses designated as 1A through 1F, each having its own uninterruptible power supply (UPS). The 120 VAC Vital Instrument System is the source of AC power for the reactor protection, reactor control and balance of plant instrument systems that are essential to the operation of the plant during normal operations and postulated accident conditions. The 120 VAC Vital Instrument System is comprised of the UPS units and the 120-volt vital instrument distribution panels. The UPS units and the instrument distribution panels are ANS Safety Class 3, Electrical Class 1E compliant and are located in a seismic Category I control building.

Four of the vital UPS units provide separate and independent power supplies to the four NSSS instrumentation channels (designated as channels I, II, III and IV). These four UPS units are powered either from the 480V distribution system or 125-volt DC system (station batteries/chargers) depending on the available 480V bus voltage. The two additional vital UPS units provide redundant power supplies to the balance of plant Train A and Train B vital instrument panels. These two UPS units are normally powered from the 480V system and can also convert 125-volt DC power from station batteries to 120V AC Power. Each vital UPS unit has adequate capacity to carry the associated load continuously.

One of the NSSS channel-associated UPS units and one of the balance-of-plant UPS units also feed separate panels for non-vital instrumentation and controls. The non-safety-related panels are supplied from Class 1E panels through Class 1E circuit breakers. Manually operated maintenance feeds are provided to each of the four NSSS vital instrument panels and both balance-of-plant vital instrument panels by non-Class 1E 480-volt AC Motor Control Centers (MCCs) that are maintained as fully Class 1E qualified. Presently, in the event the associated UPS becomes unavailable, two of the NSSS vital instrument panels and both balance-of-plant vital instrument panels are provided with static transfer switches for automatic and fast transfer of these buses to the maintenance power supplies. In addition to the automatic transfer switch, the manual transfer capability to the maintenance supply is also provided to bypass and isolate the static transfer switch for maintenance. On each UPS, instrumentation is provided to monitor AC and DC input currents and the output current and voltage. Alarms are provided on the station computer for loss of AC voltage on the vital instrument panels. The 120 VAC Vital Instrument System is a two-wire ungrounded system with a ground detection scheme. Each branch circuit at the distribution panel is protected by a thermal magnetic breaker.

In addition to the six vital UPS units, there are three non-safety-related UPS units feeding the station computer and miscellaneous auxiliary loads which require a reliable AC source. These units are also normally powered from the 480V AC system and can also convert 125-volt DC power from station batteries to 120-volt AC power. Two additional non-safety UPS units (with associated batteries for 30 minutes of operation) feed secondary control systems and miscellaneous related loads requiring reliable regulated AC power with short term battery backup. These units are normally powered from the 480V AC system and can also convert DC power from their associated batteries to 120-volt AC power.

The UPS units consist of a rectifier section which converts three-phase 460V AC power to a nominal 125 VDC power and an inverter section which inverts the DC power to single phase 120 VAC power. The inverters (two per train) assure an uninterruptible supply of AC electrical power to the AC vital buses even if the 4.16 kV safety buses are de-energized. The common DC bus which connects the rectifier output, the battery bank, and the input of the inverter, is called the DC link. Blocking circuitry installed in each UPS unit connect the battery source to the internal DC bus and prevents the 125 VDC batteries from supplying the inverter section when ac power is available and is capable of supplying the required output. Should AC power become unavailable or degrade below the allowable voltage, the diode instantly conducts, linking the internal DC bus to the battery supply providing power to the inverter section. Should a UPS become unavailable, an alternate supply is available by an automatic/manual transfer switch for 120 VAC instrument busses 1A, 1B, 1E and 1F, or currently a manual transfer switch for 120 VAC instrument busses 1C and 1D, to supply the main vital bus panels. On each UPS, instrumentation is provided to monitor AC and DC input currents, as well as output current and voltage. Alarms are provided on the station computer for loss of AC voltage on the vital instrument bus.

The 120 VAC Vital Instrument System has a normal, emergency and maintenance mode of operation. Circuit breaker lineup, switch position and the supplying source of power are the key factors in determining the operational mode.

- In normal mode, the vital instrument inverter units receive power from a diesel backed 460 VAC MCC. The 460 VAC power is converted to approximately 125 VDC by the rectifier section which provides the input to the inverter sections. The inverter output is connected to a wave shaping and filtering network prior to connecting to distribution panels which transform the quasi-square wave to a nominal 120 VAC 60Hz sine wave.

- In the emergency operating mode, the rectifier section is inoperable or not capable of being energized from an AC source. Upon loss of the rectifier output or an output reduction below the link voltage, the blocking circuitry connects the vital DC system to the inverter section without interruption to the connecting loads. When connected to the DC supply the loads will continue to receive power from the inverter without interruption or phase shift. The DC system is designed to supply all UPS units during normal operations and postulated accident conditions.

- For maintenance purposes, each vital distribution panel is provided with a connection to a non-safety-related 120 VAC supply powered by a diesel backed 460 VAC MCC. When the UPSs need to be isolated, the maintenance supply circuit breaker to the vital distribution panel is closed and the normal circuit breaker is opened. The UPS distribution configuration for NSSS UPS units 1A and 1B (1-EDE-I-1A and 1-EDE-I-1B) can transfer power from the vital instrument bus inverters to the maintenance supply either automatically or manually without interruption to the connecting loads. Presently, when NSSS UPS units 1C and 1D (1-EDE-I-1C and 1-EDE-I-1D) are required to be isolated for maintenance, the normal main circuit breaker must be opened before the maintenance breaker can be closed resulting in a brief connecting load interruption. For balance-of-plant UPS units 1E and 1F (1-EDE-I-1E and 1-EDE-I-1F), power transfer from the associated instrument bus inverters to the maintenance supply can be automatic or manual without interruption to the connecting loads.

The vital instrument distribution system buses supply loads associates with the A train and B train load groups. To comply with the single failure criteria in IEEE 308-1971 (Reference

6.1), the 120 VAC Vital Instrument System must provide the protective action required to accomplish a protective function in the presence of any single detectable failure within the Class 1E power system concurrent with all identifiable but non-detectable failures, all failures caused by the single failure and all failures caused by the design basis event requiring the protective function. Therefore, a fault or failure on one of the buses will not affect the opposite bus. To protect the system from damage due to natural causes, such as earthquakes, the safety-related component mountings and structures are also designed to meet seismic qualifications in accordance with IEEE 344-1975 (Reference 6.2).

The 120 VAC Vital Instrument System inverters I-EDE-I-IE and I-EDE-I-IF associated with instrument buses IE and IF supply power to balance-of-plant instrumentation. UPS IE, designated for the "A" train, and UPS IF, for the "B" train, derive their AC and DC input power from train "A" and train "B" safety-related power supplies. Each of the two balance-of-plant vital instrument buses are provided with a static transfer switch for automatic, fast transfer of these buses to a maintenance supply from a 480/120-volt AC transformer connected to a non-safety-related power source (with a backup power supply from the emergency diesel generator) in the event of unavailability of the associated UPS. In addition to the automatic transfer switch, manual transfer capability to maintenance supply is also provided to bypass and isolate the static transfer switch for maintenance. On each UPS, instrumentation is provided to monitor AC and DC input currents, as well as output current and voltage. Alarms are provided on the station computer for loss of AC voltage on the vital instrument bus.

2.2 Current Requirements / Proposed Changes

- TS 3.8.3.1, ACTION b, requires for the condition of one AC vital panel not energized from its associated inverter or with the inverter not connected to its associated DC bus, (1) reenergization of the AC vital panel within 2 hours, and (2) reenergization of the AC vital panel from its associated inverter connected to its associated DC bus within 24 hours, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. TS 3.8.3.1, ACTION b, also contains a footnote denoted by an asterisk located adjacent to the 24-hour AOT requirement. The footnote authorized a one-time AOT extension from 24-hours to 7-days for Vital Instrument Panel 1E for the purpose of restoring its associated inverter to operability. The footnote states that the compensatory measures specified in NextEra letter SBK-L-19104 (Reference 6.3) shall remain in effect during the extended AOT and that the one-time authorization expires 45 days following issuance of Amendment [163] (Reference 6.4).

  The proposed change extends from 24 hours to 7 days the AOT to reenergize 120 VAC Vital Instrument Panels 1A, 1B, 1C, 1D, 1E or 1F from its associated inverter connected to its associated DC bus. The proposed change also deletes the asterisk adjacent to the existing 24-hour AOT requirement and deletes the footnote denoted by the asterisk in its entirety.

- The proposed change adds a new TS 3.8.3.1, ACTION d, for the condition of two 120-VAC vital instrument panels of the same electrical train either not energized from their associated inverter or with their inverters not connected to their associated DC bus.

2.3 Reason for the Proposed Change

The proposed license amendment aligns the 120 VAC vital instrument panel requirements with their safety significance by averting the control room operator challenges associated with conducting an orderly shutdown within 24-hours of inverter inoperability with power to the affected instrument panel restored within 2-hours.

## 3.0 TECHNICAL EVALUATION

3.1 Delete ACTION b) Footnote Authorizing One-Time AOT Extension

This Section is not a risk-informed evaluation of the proposed change.

The proposed change deletes the footnote denoted by the asterisk adjacent to the 24-hour AOT requirement in TS 3.8.3.1, ACTION b. The footnote authorized a one-time AOT extension from 24-hours to 7-days for vital instrument panel 1E for the purpose of restoring its associated inverter to operability. The footnote states that the compensatory measures specified in NextEra letter SBK-L-19104 (Reference 6.3) shall remain in effect during the extended AOT and that the one-time authorization expires 45 days following issuance of Amendment [163] (Reference 6.4). The inverter associated with vital instrument panel 1E has since been restored and the one-time AOT extension authorization period has expired. As such, the asterisk adjacent to the 24-hour AOT requirement and the footnote denoted by the asterisk are appropriate for deletion as an administrative change.

3.2 Add New ACTION for Two Inoperable 120 VAC Vital Instrument Panels on Same Train

This Section is not a risk-informed evaluation of the proposed change.

The proposed change adds a new TS 3.8.3.1, ACTION d, for the condition of two 120-volt AC vital instrument panels of the same electrical train either not energized from their associated inverter or with their inverters not connected to their associated DC bus i.e. inoperable. The proposed change is in recognition that the two AC vital instrument panels located on the redundant electrical train would remain capable of supporting the minimum safety functions necessary to shut down and maintain the reactor in a safe condition, assuming no single failure. Under current TS 3.8.3.1, the unit must shutdown in accordance with LCO 3.0.3 for the condition of two vital instrument panels of the same train inoperable since no ACTION exists for more than one inoperable vital instrument panel. In the event of second inverter failure on the same electrical train, the static transfer switch would shift power on the affected 120 VAC instrument panel to the backup AC power supply, just as it would for the initial inverter failure, and operating procedures direct manual transfer to the backup AC power supply if required. For the affected 120 VAC instrument panels, backup power is provided by non-Class 1E 480-volt AC motor control centers (MCCs) different from the MCCs normally powering the inoperable inverters. Although these MCCs are considered non-safety related, they are maintained as fully qualified Class 1E in accordance with station procedures. This ensures reliable backup power is available to the vital instrument panels. As a result, the safety-related instrument bus channels on both affected instrument panels would be re-energized and fully functional within 2-hours of each inverter failure. Moreover, the inoperability of two vital instrument panels of the same train would not place the unit outside of its design basis since the redundant instrument panels of the opposite train remain available to support engineered safety features (ESF) operation. As such, entry into LCO 3.0.3 for two inoperable vital instrument panels of the same train does not align with the safety significance of the panel failures. The proposed 8-hour AOT for the condition of two inoperable vital instrument panels of the same train provides a reasonable balance between the time allotted to restore at least one inverter and exit newly proposed ACTION d and the recognition that electrical distribution system reliability is reduced during the period of instrument panels' inoperability since a single failure in the redundant train could result in the minimum ESF functions not being supported. The 8-hour AOT aligns with Improved Standard Technical Specification 3.8.9, ACTION A, of NUREG 1431, Revision 4 (Reference 6.7) for the condition of one or more inoperable AC electrical power distribution subsystems and is similar to the precedents described in Sections 4.2.1 and 4.2.2 of this amendment request.

3.3 Increase 120 VAC Vital Instrument Panel Allowable Outage Time (AOT)

The proposed license amendment modifies Seabrook TS 3.8.3.1, ACTION b, by increasing the AOT for 120 VAC vital instrument panel inverters 1A, 1B, 1C, 1D, 1E and 1F from 24-hours to 7-days. As evidenced by the precedents provided in Sections 4.2.3, 4.2.4 and 4.2.5 of this amendment request, industry experience has shown that the current 24-hour AOT for restoration of an inoperable vital instrument bus inverter, the typical cause of 120 VAC vital instrument panel inoperability, is insufficient to support troubleshooting and restorative maintenance while the unit is online. When a vital instrument bus inverter becomes inoperable, the on-line work management process must first determine and implement risk-based measures which minimize potential impacts of the inoperability on safety such as establishing barrier postings for guarded equipment, rescheduling planned surveillances, etc. Proper electrical safety tagging must be performed before troubleshooting activities can begin such as physical inspection of the UPS panels and fuses, and alarm checks. Replacement components may not be readily available and, in the case of replacement circuit cards, may require burn-in periods exceeding the 24-hour AOT. Upon repair completion, post-maintenance testing can include lengthy inverter functional testing. As a result, the current 24-hour AOT does not allow adequate time for repairs, particularly should discovery identify additional complications. For these reasons, a one-time AOT extension request is typically prepared and discussed with NRC staff in parallel with the maintenance planning. Moreover, the current 24-hour AOT for inverter inoperability is not commensurate with its impact on safety since TS 3.8.3.1, ACTION b, requires re-energization of the affected vital instrument panel to full functionality within 2-hours of the inverter inoperability. The proposed change extending the AOT from 24-hours to 7-days for 120 VAC vital instrument panel inverters 1A, 1B, 1C, 1D, 1E and 1F would provide for orderly inverter repair while minimizing safety impacts and short-notice requests for prior regulatory authorization to avert a unit shutdown.

In evaluating the proposed AOT extensions, NextEra applied Regulatory Guide (RG) 1.177, "An Approach for Plant-Specific, Risk-Informed Decision-making: Technical Specifications" (Reference 6.8). RG 1.177 describes acceptable methods for assessing the nature and impact of proposed TS changes by considering engineering issues and applying risk insights. The approach provides for probabilistic risk assessment (PRA) state-of-the-art methods in a manner that complements deterministic considerations and traditional defense-in-depth philosophy, consistent with Nuclear Regulatory Commission's (NRC's) policy "Use of Probabilistic Risk Assessment Methods in Nuclear Activities: Final Policy Statement," (Reference 6.9). RG 1.177 establishes a three-tiered approach to licensee evaluation of the risk associated with AOT changes. Tier 1 evaluates the risk impact expressed as changes to the core damage frequency (ΔCDF), incremental conditional core damage probability (ICCDP), large early release frequency (ΔLERF), and incremental conditional large early release probability (ICLERP. Tier 2 evaluates the dominant-risk plant configurations to assure appropriate restrictions will be in place. Tier 3 evaluates the licensee's overall configuration risk management program (CRMP) to assure potentially risk-significant configurations are adequately managed. Tiers 1, 2 and 3 are evaluated by addressing each of the *Engineering Evaluation* elements of RG 1.177 described below.

3.3.1 Regulatory Compliance

No exceptions or exemptions from applicable regulations or accepted industry codes and standards relevant to safe operation are proposed. As a part of the Seabrook electrical distribution system, the 120 VAC instrument panels satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) for TS inclusion as an LCO. The proposed AOT extensions would not contravene compliance with the applicable ACTION(s) and surveillance requirements (SRs) or challenge the 120 VAC instrument panel system capability to function as described in Criterion 3. In the event an inoperable instrument panel inverter cannot be restored within the proposed AOT extensions, the Seabrook TS requires that the LCO be considered not met and the appropriate ACTION must be entered (i.e., be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 24 hours). In this scenario, the plant would proceed with an orderly shutdown in the same manner as the current AOT requirement. Thereby, vital instrument panel capability to function consistent with applicable requirements and safety analysis assumptions is unaffected by the proposed change.

3.3.2 Traditional Engineering Considerations

3.4.2.1 Defense in Depth

During the proposed AOT extensions, defense-in-depth measures will be applied to account for unknown and unforeseen failure mechanisms or other phenomena to assure the safety function of the 120 VAC vital instrument bus system is maintained. This includes the restoration of power to the affected vital instrument panel within 2-hours, as required by existing TS 3.8.3.1, ACTION b. NextEra's online risk management process will assess the impact of the inoperability and maintenance repair on plant safety and undertake appropriate actions to minimize risk. As discussed in Sections 3.4.5 and 3.4.6 of this amendment request, risk-significant plant configurations will not be entered, and risk-reduction measures will be implemented to maintain defense in depth. By implementing the multiple, independent and redundant layers of defense as summarized below, the integrity of barriers to core damage will be maintained.

- The proposed AOT extensions do not affect the balance among the core damage prevention, containment failure prevention and consequence mitigation principles. During the proposed AOT extensions, power to the affected vital instrument panel will be maintained such that the assumptions and inputs associated with plant safety analyses are unaffected. Thereby, the balance of prevention and mitigation strategies remains preserved.

- The proposed AOT extensions do not create an over-reliance on existing programmatic activities as compensatory measures. Station response to an inoperable vital instrument inverter begins with entering the appropriate ACTION and evaluating the risk-significance of the repair consistent with 10 CFR 50.64(a)(4). Extending the AOTs neither modifies the conditions warranting ACTION entry nor the risk-based considerations and station activities which assure safe operation.

- The proposed AOT extensions maintain the redundancy, independence and diversity of systems commensurate with the expected frequency and consequences of system challenges. Since the affected vital instrument panel will be reenergized during the vital instrument inverter repair, the redundancy, independence and diversity of the 120 VAC vital instrument bus system will be unaffected, consistent with RG 1.75, Physical Independence of Electrical Systems (Reference 6.10). Only the redundancy in power supplying the affected vital instrument panel is affected and only for the extended duration of the proposed AOT. As demonstrated in Section 3.4 of this amendment request, the risk associated with the extended AOT duration is sufficiently low.

- Station response to concurrent equipment inoperability is unchanged by the proposed change, including cessation of the maintenance or plant shutdown if warranted. The extended AOT neither increases the likelihood nor the consequences of simultaneous equipment malfunctions since the associated vital instrument bus inverter remains powered and fully functional during the extended AOT. Should simultaneous equipment outages occur, the online risk management process will evaluate and implement appropriate risk-reduction measures.

- Compensatory actions to be taken when entering the extended AOT will be promptly identified and implemented as appropriate for managing the risk associated with the repair consistent with 10 CFR 50.65(a)(4).

- The station's online risk management process will continue to evaluate planned maintenance repair for risk-significant configurations, concurrent equipment outages, abnormal plant conditions, and external events such as challenges to grid stability and adverse weather conditions. The proposed AOT extensions do not alter the manner in which these considerations are factored into the online risk assessment process.

- During the proposed AOT extension, the affected 120 VAC vital instrument panel will be reenergized and fully functional as a result of the alternate power sources that are available. As such, no disruption to the safety function of any vital instrument panel will occur during the proposed AOT extension. All safety analysis assumptions and inputs remain valid.

o The proposed AOT extensions cannot reduce the defenses against or increase the likelihood of a common-cause failure (CCF) or introduce new CCF mechanisms. In the event of an inoperable vital instrument panel inverter, the redundant inverters are sufficiently instrumented and monitored such that any CCF would be quickly identified and appropriate action promptly taken. When a non-conforming or degraded condition is identified, the process of evaluating operability, conducted by a licensed senior reactor operator, assesses the potential for common causes and effects on the other trains and components. If a common cause issue is present, it will be accounted for in the operability determination prior to determining the appropriate ACTION to be entered. No changes are proposed to plant equipment or the manner in which equipment is evaluated for operability, including consideration for CCFs.

o The proposed AOT extensions do not alter any guarded equipment practices which protect vital equipment or equipment tagging practices designed to enhance personnel safety. No new deviations or exceptions are proposed to the methods of establishing and maintaining physical equipment barriers during the repair such that barrier independence would be degraded.

o During the proposed AOT extension, human performance practices such as pre-job briefs, job site reviews, place-keeping, etc., which reduce the likelihood of human errors will continue to be implemented in accordance with plant administrative and implementing procedures. The proposed AOT extensions only extend the time the inoperable vital instrument inverter can be out of service without initiating a plant shutdown. Extending the AOT cannot lessen the defenses against human errors implemented through plant procedures.

- The proposed AOT extensions concern a maintenance activity and thereby cannot alter the intent of any plant or equipment design criteria. The proposed change provides for orderly maintenance which restores an inoperable vital instrument inverter to its plant design as currently licensed using authorized maintenance practices. Any changes to the vital instrument inverter, including performance criteria, setpoints, etc., is subject to screening for prior NRC approval in accordance with 10 CFR 50.59.

3.4.2.2 Safety Margin

During the proposed AOT extension, the affected 120 VAC vital instrument panel would remain fully energized and capable of performing its specified function. As such, the proposed AOT extensions do not affect equipment functions, response times or acceptance criteria, do not introduce new or altered methods of assessing plant performance, and do not alter the manner in which the station would respond to a concurrent equipment malfunction. All safety analysis assumptions and inputs are unaffected and the margin to plant safety limits and limiting safety settings are unchanged. As such, there is no reduction in the margin to safety as a result of the proposed change.

3.3.3 Evaluation of Risk Impact

Attachment 3 of this amendment request provides the evaluation of risk impact for the proposed AOT extensions, including a discussion of PRA scope, technical adequacy, modeling and insights. To further demonstrate the acceptability of the proposed change, the risk impact analysis conservatively assumes the 120 VAC vital instrument panel inverters to be inoperable concurrently, a configuration not allowed by Seabrook TS, and without consideration for compensatory measures. The evaluation determined that the ICCDP and the ICLERP for the proposed AOT extensions are below the RG 1.177 threshold of 1.0E-6 per year ICCDP and 1.0E-07 ICLERP, respectively. The evaluation demonstrated that the increase in plant risk associated with extending the AOT from 24 hours to 7 days for 120 VAC vital instrument panel inverters 1A, 1B, 1C, 1D, 1E and 1F is acceptably small.

3.3.4 Acceptance Guidelines for Technical Specification Changes

The proposed AOT extensions for the 120 VAC vital instrument panel inverters would be a permanent change to the Seabrook TS. The RG 1.177 guidance for permanent AOT changes is consistent with the fundamental principle that changes to TS result in small increases in overall risk to the health and safety of the public. To assure this principal is satisfied, RG 1.177 establishes a three-tiered approach to licensee evaluation of permanent AOT changes from a risk-based perspective, as addressed below:

1. *The licensee has demonstrated that the TS CT change has only a small quantitative impact on plant risk. An ICCDP of less than $1.0x10^{-6}$ and an ICLERP of less than $1.0x10^{-7}$ are considered small for a single TS condition entry (Tier 1).*

The PRA analysis summarized in Section 3.4.3 and Attachment 3 demonstrate that the increase in the ICCDP and ICLERP associated with the proposed AOT extensions has only a small quantitative impact on plant risk, thereby satisfying the Tier 1 criteria established in RG 1.177 for a permanent AOT change.

2. *The licensee has demonstrated that there are appropriate restrictions on dominant risk-significant configurations associated with the change (Tier 2).*

   The PRA analysis summarized in Section 3.4.3 and Attachment 3 did not identify equipment outages or plant configurations having extremely high-risk contributions as a result of the proposed AOT extension. As such, no plant configurations or equipment outages require enhancement to the Seabrook TS or to plant programs and procedures. However, NextEra chooses to implement two qualitative, prudent compensatory measures that improve the Seabrook's defense in depth during the proposed AOT extensions and further increases the available margin to acceptance guidelines, as indicated below. The compensatory measures are not credited in the PRA analysis summarized in Section 3.4.3 and Attachment 3, but the actions will be implemented in recognition that during the period of vital panel inverter inoperability, the reliability of the affected 120 VAC vital instrument panel is reduced while temporarily powered from a maintenance supply reliant on the associated Emergency Diesel Generator (EDG) in the event of a loss of offsite power. These voluntary compensatory measures are:

   1) Entry into a proposed AOT extension will not be planned concurrent with EDG maintenance.

   2) Entry into a proposed AOT extension will not be planned concurrent with maintenance on other RPS, EFSAS or containment isolation actuation instrumentation channels that could result in an affected channel being placed in a tripped condition.

   The absence of dominant risk-significant configurations associated with the proposed AOT extensions and the voluntary compensatory measures which assure appropriate restrictions against dominant risk-significant configurations satisfy the Tier 2 criteria established in RG 1.177 for a permanent AOT change.

3. *The licensee has implemented a risk-informed plant configuration control program. The licensee has implemented procedures to utilize, maintain, and control such a program (Tier 3).*

   During the proposed AOT extensions, any repair activities on the inoperable vital panel inverter would first be evaluated for aggregate risk impacts to the station using NextEra's Risk Management Program and work activity risk management (WARM) procedures. These procedures are employed to evaluate, plan and manage equipment maintenance activities and include an assessment of risk associated with unavailable equipment as required by 10 CFR 50. 65(a)(4). The evaluations provide a forward-looking assessment of potentially risk-significant activities warranting reductions to acceptable levels (i.e. low-risk whenever feasible). Significant risk activities are those having the potential to affect personnel, nuclear or radiological safety, environmental regulations, or power generation. Enhanced preparation, execution and oversight are required for each risk category on a graded scale.

Additionally, an online aggregate risk assessment is performed each shift in accordance with NextEra's Online Risk Management (OLRM) procedures. The assessment employs probabilistic safety analysis calculations for online maintenance, safety train analyses to assure adequate separation and redundancy, and consideration of environmental factors such as severe weather and other challenges to grid stability. The online aggregate risk assessment applies the same fault trees and database as Seabrook's PRA model, and so is fully capable of evaluating changes in CDF and LERF for internal events. Should conditions change that challenge the maintenance repair, such as other equipment malfunctions, the online risk determination would be re-performed to maintain an accurate risk profile for the most limiting plant condition during the current shift. The profile update would include consideration for entry into applicable ACTIONs and for specific measures necessary to reduce the overall aggregate risk up to and including aborting the maintenance in progress. Medium aggregate risk activities and above would prompt work schedule changes which reduce aggregate risk. High aggregate risk (HRA) additionally requires Operations Director approval along with resource commitments, enhanced protective measures and risk reduction contingencies and controls.

The work management and OLRM processes established in plant procedures ensures that plant conditions are taken into account contemporaneously, equipment credited for supporting safe operation are protected, detailed pre-job briefings and job-site reviews are conducted, and that all parties are apprised of the risk impact(s) and their roles and responsibilities prior to mobilizing to perform the maintenance activity. The culmination of these activities is to conduct reviews and evaluations of work schedules before beginning work, determine the safety implications for performance, and assess, monitor and maintain acceptable levels of on-line risk and thereby satisfy the Tier 3 criteria established in RG 1.177 for a permanent AOT change.

### 3.3.5 Comparison of Risk of Available Alternatives

Alternatives to the proposed AOT extension have been considered during 120 VAC vital instrument panel inverter failures such as the preparation of NOEDs and exiting the applicable MODE. Preparation of a NOED is not an appropriate consideration for the risk-based analysis summarized in Section 3.4.3 and Attachment 3 since the outcome from a risk-based perspective would be identical to the proposed change. A unit shutdown was not considered in the risk-based analysis due to the inherent increase in risk associated with shutdown evolutions. NextEra concludes that commencing a unit shutdown within 24-hours of inverter inoperability has greater safety implications than continuing power operation for the extended duration of time needed for the inverter repair given the redundancy in the 120 VAC vital instrument panel functions and their electrical power sources. In all cases, efforts to minimize the period of inverter inoperability while maintaining acceptable risk at-power would be the primary focus in contrast to the additional challenges associated with the commencement of a unit shutdown within 24-hours, and thereby would better suit overall safety.

### 3.3.6 Conclusion

The proposed AOT extensions were evaluated against the deterministic and risk-based considerations presented in RG 1.177, including predicted changes to the CDF and LERF, consistent with the fundamental principle that any increase in risk to the health and safety of the public resulting from the change shall be negligible.

The evaluation found that the proposed AOT extensions satisfy the deterministic considerations for regulatory compliance, defense-in-depth and safety margin. The evaluation further determined that the quantitative impact on plant risk is small (Tier 1), that there are no dominant risk-significant configurations associated with the change (Tier 2) and that procedures to utilize, maintain, and control NextEra's risk-informed plant configuration control program are in place at Seabrook (Tier 3). Thereby, the proposed changes extending the AOT from 24-hours to 7-days for 120 VAC vital instrument panel inverters 1A, 1B, 1C, 1D, 1E and 1F satisfy the RG 1.177 criteria for acceptability.

## 4.0 REGULATORY EVALUATION

### 4.1 Applicable Regulatory Requirements/Criteria

- 10 CFR 50.36(c)(2)(i) states that when a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met.

- 10 CFR 50.65, states, in part, that preventive maintenance activities must be sufficient to provide reasonable assurance that SSCs are capable of fulfilling their intended functions.

- General Design Criteria (GDC) 17 of 10 CFR 50, Appendix A, states, in part, that an onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The onsite electric power supplies, including the batteries, and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure. Each of these circuits shall be designed to be available in sufficient time following a loss of all onsite alternating current power supplies and the other offsite electric power circuit, to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded.

- GDC 21 of 10 CFR 50, Appendix A, states that the protection system shall be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed. Redundancy and independence designed into the protection system shall be sufficient to assure that (1) no single failure results in loss of the protection function and (2) removal from service of any component or channel does not result in loss of the required minimum redundancy unless the acceptable reliability of operation of the protection system can be otherwise demonstrated.

- GDC 22 of 10 CFR 50, Appendix A, states that the protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis. Design techniques, such as functional diversity or diversity in component design and principles of operation, shall be used to the extent practical to prevent loss of the protection function.

- Regulatory Guide 1.75, Revision 2, describes a method acceptable to the NRC staff of complying with Criteria 3, 17 and 21 of Appendix A to 10 CFR Part 50 with respect to the physical independence of the circuits and electric equipment comprising or associated with the Class 1E power system, the protection system,

system actuated or controlled by the protection system, and auxiliary or supporting systems that must be operable for the protection system and the systems it actuates to perform their safety-related functions.

- Regulatory Guide (RG) 1.177 describes methods acceptable to the NRC staff for assessing the nature and impact of proposed TS changes by considering engineering issues and applying risk insights.

- Regulatory Guide 1.200 describes one acceptable approach for determining whether the technical adequacy of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision-making for light-water reactors.

The proposed license amendment complies with the requirements of 10 CFR 50.36(c), 10 CFR 50.65(a)(4), GDCs 17, 21 and 22 of 10 CFR 50, Appendix A, and RGs 1.75, Revision 2, 1.177, Revision 1, and 1.200, Revision 2. All regulatory requirements and applicable guidance will continue to be satisfied as a result of the proposed license amendment.

4.2 Precedents

4.2.1 In Reference 6.11, the NRC issued to D.C. Cook Nuclear Plant, Units 1 and 2, License Amendments Nos. 287 and 269, converting the current TSs (CTSs) to the improved TSs (ITSs), including in part, establishing a new requirement to restore one inverter to operable status within 6 hours for the condition of two inverters in one train inoperable.

4.2.2 In Reference 6.12, the NRC issued to Davis-Besse, License Amendment Nos. 279 converting the current Technical Specifications (CTSs) to the improved Technical Specifications (ITSs), including in part, establishing a new requirement to restore one inverter to operable status within 8 hours for the condition of two inverters in one train inoperable.

4.2.3 In Reference 6.13, the NRC issued to Hope Creek Generating Station, License Amendment No. 215, extending the AOT for the alternating current inverters from 24 hours to 7 days, based on application of the Hope Creek Generating Station probabilistic risk assessment in support of a risk-informed extension and on additional considerations and compensatory actions.

4.2.4 In Reference 6.14, the NRC issued to Salem Nuclear Generating Station, Units 1 and 2, License Amendments Nos. 306 and 307, extending the AOT for the vital instrument bus inverters, from 24 hours for the A, B, and C inverters to 7 days, and from 72 hours for the D inverter to 7 days, based on application of the Salem Nuclear Generating Station probabilistic risk assessment in support of a risk-informed extension and on additional considerations and compensatory actions.

4.2.5 In Reference 6.15, the NRC issued to North Anna Power Stations, Units 1 and 2, License Amendment Nos. 235 and 217 revising the completion time for Required Action A.1 of TS 3.8.7, Inverters Operating" from 24 hours to 7 days for an inoperable instrument bus inverter.

4.3 No Significant Hazards Consideration

The proposed license amendment modifies Seabrook Technical Specifications (TS) 3.8.3, Onsite Power Distribution - Operating by increasing the allowable outage time (AOT) for the 120-volt AC vital instrument panel inverters, establishing a new required action for two inoperable 120-volt AC vital instrument panel inverters of the same electrical train and related administrative changes.

As required by 10 CFR 50.91(a), NextEra evaluated the proposed changes using the criteria in 10 CFR 50.92 and determined that the changes do not involve a significant hazards consideration. An analysis of the issue of no significant hazards' consideration is presented below:

(1) Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The proposed change to increase the AOT for the 120 VAC vital instrument panel inverters does not affect the multiple, redundant sources of electrical power available to the 120-volt AC instrument panels such that no single failure will preclude performance of any safety function, and thereby cannot increase the probability of any previously analyzed accident. Likewise, the proposed change to establish a new action for two inoperable vital instrument panels of the same train cannot increase the probability of a previously analyzed accident since the redundant electrical train remains fully capable of performing the safety function and the proposed AOT is of sufficient duration to minimize the likelihood of a coincident failure in the redundant train, consistent with industry precedent and the Improved Standard Technical Specifications (NUREG 1431, Revision 4). The proposed change cannot increase the consequences of any previously evaluated accident since accident analyses assume single failure of the redundant train and the proposed changes do not affect electrical train redundancy. The proposed changes do not affect any accident initiators or precursors, or alter the design, conditions or configuration of the facility as currently analyzed. All plant equipment will continue to perform consistent with the safety analysis assumptions.

Therefore, the proposed license amendments would not involve a significant increase in the probability or consequences of an accident previously evaluated.

(2) Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed change to increase the AOT for the 120 VAC vital instrument panel inverters and establish a new action for two inoperable vital instrument panels of the same train neither modify plant equipment nor introduce unique operational modes or failure mechanisms. Implementation of the proposed change does not affect the capability of equipment to perform their respective safety functions. The proposed change does not alter the types or increase the amounts of fission product effluents predicted in safety analyses and no increase in individual or cumulative occupational exposure will result. No new accident scenarios, transient precursors or limiting single failures will result from the proposed change since all design and performance criteria will continue to be met and the nuclear unit will continue to be operated within the limits of its licensing basis.

Therefore, the proposed license amendments would not create the possibility of a new or different kind of accident from any previously evaluated.

(3) Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No

The proposed change to increase the AOT for the 120 VAC vital instrument panel inverters and establish a new action for two inoperable vital instrument panels of the same train do not modify equipment functions, response times or acceptance criteria associated with any accident analyses. No new or altered methods of assessing plant performance are introduced and all accident analysis inputs and assumptions remain unaffected. Thereby, no safety limits or limiting safety settings are challenged by the proposed change.

Therefore, the proposed license amendment would not involve a significant reduction in the margin of safety.

Based upon the above analysis, NextEra concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of no significant hazards consideration is justified.

### 4.4 Conclusion

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

## 5.0 ENVIRONMENTAL CONSIDERATION

The proposed license amendment modifies a regulatory requirement with respect to the installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or changes an inspection or surveillance requirement. However, the proposed license amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed license amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed license amendment.

## 6.0 REFERENCES

6.1 IEEE 308-1971, "Criteria for Class 1E Power Systems for Nuclear Power Generating Stations"

6.2 IEEE 344-1975, "Guide for Seismic Qualification of Class 1E Electric Equipment for Nuclear Power Generating Stations"

6.3 NextEra Energy Seabrook, LLC, letter SBK-L-19104, "License Amendment Request 19-02, One-Time Change to the Seabrook Technical Specifications Onsite Power Distribution Requirements", October 3, 2019 (ADAMS Accession No. ML19276G055)

6.4 USNRC letter to NextEra Energy Seabrook, LLC, “Seabrook Station, Unit No. 1 - Issuance of Amendment No. 163 RE: One-Time Change to the Onsite Power Distribution Requirements (EPID L-2019-LLA-0216)” December 5, 2019 (ADAMS Accession No. ML19326C480)

6.5 FPL Energy Seabrook letter, SBK-L-06072, Response to Request for Additional Information Regarding License Amendment Request 05-11, "Changes to Technical Specification 3.8.3.1, Onsite Power Distribution, for Vital Inverter Allowed Outage Time", March 30, 2006 (ADAMS Accession No. ML061430185)

6.6 NRC Final Policy Statement on Technical Specification Improvements for Nuclear Power Reactors, July 22, 1992 (58 FR 39132)

6.7 NUREG-1431, Standard Technical Specifications - Westinghouse Plants, Revision 4.0, Volume 1, Specifications (ADAMS Accession No. ML12100A222)

6.8 Regulatory Guide 1.177, Revision 1, An Approach for Plant-Specific, Risk-Informed Decision Making: Technical Specifications, May 2011 (ADAMS Accession No. ML100910008)

6.9 NRC Policy Statement, "Use of Probabilistic Risk Assessment Methods in Nuclear Activities: Final Policy Statement," Federal Register, Vol. 60, p. 42622 (60 FR 42622), August 16, 1995

6.10 Regulatory Guide 1.75, Revision 2, Physical Independence of Electric Systems, September 1976 (ADAMS Accession No. ML003740265)

6.11 D.C. Cook Nuclear Plant, Units 1 and 2 - Issuance of Amendments for the Conversion to the Improved Technical Specifications with Beyond Scope Issues (TAC Nos. MC2629, MC2630, MC2653 through MC2687, MC2690 through MC2695, MC3152 through MC3157, MC3432 through MC3453), June 1, 2005 (ADAMS Accession No. ML050620034)

6.12 Davis-Besse Nuclear Power Station, Unit No.1 - Issuance of Amendment for the Conversion to the Improved Technical Specifications with Beyond Scope Issues (TAC NOS. MD6319MD6322, MD6324-MD6333, MD6398-MD6403, MD6644-MD6649, AND MD6684), November 20, 2008 (ADAMS Accession No. ML082600600)

6.13 Hope Creek Generating Station, Issuance of Amendment No. 215 RE: Inverter Allowed Outage Time Extension (EPID L-2018-LLA-0101), March 27, 2019, (ADAMS Accession No. ML19065A156)

6.14 Salem Nuclear Generating Station, Unit Nos. 1 and 2 - Issuance of Amendment Nos. 326 and 307 Re: Revise Technical Specifications to Increase Vital Instrument Bus Inverter Allowed Outage Time (EPID L-2018-LLA-0140), January 25, 2019 (ADAMS Accession No. ML19009A477)

6.15 North Anna Power Station, Units 1 and 2 - Issuance of Amendments RE: Extended Inverter Allowed Outage Time (TAC NOS. MB6957 and MB6958), May 12, 2004, (ADAMS Accession No. ML041380438)

## ATTACHMENT 1

## PROPOSED TECHNICAL SPECIFICATION PAGES (MARKUP)

(3 pages follow)

## 3/4.8.3 ONSITE POWER DISTRIBUTION

### OPERATING

### LIMITING CONDITION FOR OPERATION

3.8.3.1 The following electrical busses shall be energized in the specified manner:

a. Train A, A.C. Emergency Busses consisting of:

1) 4160-volt Emergency Bus #E5,
2) 480-volt Emergency Bus #E51,** and
3) 480-volt Emergency Bus #E52.**

b. Train B, A.C. Emergency Busses Consisting of:

1) 4160-volt Emergency Bus #E6,
2) 480-volt Emergency Bus #E61,**
3) 480-volt Emergency Bus #E62,** and
4) 480-volt Emergency Bus #E64.

c. 120-volt A.C. Vital Panel #1A energized from its associated inverter connected to D.C. Bus #11A,*

d. 120-volt A.C. Vital Panel #1B energized from its associated inverter connected to D.C. Bus #11B,*

e. 120-volt A.C. Vital Panel #1C energized from its associated inverter connected to D.C. Bus #11C,*

f. 120-volt A.C. Vital Panel #1D energized from its associated inverter connected to D.C. Bus #11D,*

g. 120-volt A.C. Vital Panel #1E energized from its associated inverter connected to D.C. Bus #11A,*

h. 120-volt A.C. Vital Panel #1F energized from its associated inverter connected to D.C. Bus #11B,*

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* Two inverters may be disconnected from their D.C. bus for up to 24 hours as necessary, for the purpose of performing an equalizing charge on their associated battery bank provided: (1) their vital busses are energized, and (2) the vital busses associated with the other battery bank are energized from their associated inverters and connected to their associated D.C. bus.

** These busses can be considered OPERABLE if the 480 volt bus ties are closed. These bus ties will be under administrative control to ensure loading is within transformer rating.

ELECTRICAL POWER SYSTEMS

ONSITE POWER DISTRIBUTION

OPERATING

LIMITING CONDITION FOR OPERATION

3.8.3.1 (Continued)

i. Train A, 125-volt D.C. Busses consisting of:

1) 125-volt D.C. Bus #11A energized from Battery Bank 1A or 1C, and
2) 125-volt D.C. Bus #11C energized from Battery Bank 1C or 1A.

j. Train B, 125-volt D.C. Busses consisting of:

1) 125-volt D.C. Bus #11B energized from Battery Bank 1B or 1D, and
2) 125-volt D.C. Bus #11D energized from Battery Bank 1D or 1B.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

---------------------------------------------------NOTE-----------------------------------------------

Enter applicable ACTIONS of LCO 3.8.2.1, "DC Sources – Operating," for DC trains made inoperable by inoperable AC power distribution system.

---------------------------------------------------------------------------------------------------------

a. With one of the required trains of A.C. emergency busses (except 480-volt Emergency Bus # E64) not fully energized, reenergize the train within 8 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

   1. With 480-volt Emergency bus #E64 not fully energized, reenergize the bus within 7 days or be in HOT STANDBY within 6 hours and COLD SHUTDOWN within the following 30 hours.

b. With one A.C. vital panel either not energized from its associated inverter, or with the inverter not connected to its associated D.C. bus: (1) reenergize the A.C. vital panel within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours; and (2) reenergize the A.C. vital panel from its associated inverter connected to its associated D.C. bus within 24* hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With one D.C. bus not energized from an OPERABLE battery bank, reenergize the D.C. bus from an OPERABLE battery bank within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

*A one-time AOT extension for an inoperable 120-volt A.C. Vital Panel #1E allows 7 days to restore the inverter to OPERABLE status. Compensatory measures within NEE Letter SBK-L-19104 dated October 3, 2019 will remain in effect during the extended AOT period. The one-time AOT extension shall expire 45 days after issuance of amendment.

INSERT New ACTION d.

d. With two A.C. vital panels of the same electrical train either not energized from their associated inverter, or with their inverters not connected to their associated D.C. bus: (1) reenergize both A.C. vital panels within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours; and (2) reenergize at least one A.C. vital panel from its associated inverter connected to its associated D.C. bus within 8 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

**ATTACHMENT 2**

**PROPOSED TECHNICAL SPECIFICATION BASES PAGES (MARKUP)**

(3 pages follow)

3/4.8.3 ONSITE POWER DISTRIBUTION (continued)

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

- Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded, and
- Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 5 and 6 provide assurance that:

- Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core,
- Systems needed to mitigate a fuel handling accident are available,
- Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available, and
- Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown and refueling condition.

ACTIONS

MODES 1 through 4

With the OPERABLE electrical buses less than required by LCO 3.8.3.1 and without a loss of safety function, the remaining 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.

When a required electrical bus is not energized, the associated loads, such as ESF components normally powered from the electrical bus, must also be declared inoperable.

ACTION a is modified by a Note that requires the applicable ACTIONS of LCO 3.8.2.1 "DC Sources - Operating," be entered for DC trains made inoperable by inoperable power distribution subsystems. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. Inoperability of a distribution system 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.

## 3/4.8.3 ONSITE POWER DISTRIBUTION (continued)

ACTIONS (continued)

MODES 5 and 6

With less than the minimum required on-site power distribution systems sources, the action statement requires immediately suspending core alterations, positive reactivity changes, or movement of irradiated fuel. With respect to suspending positive reactivity changes, operations that individually add limited, positive reactivity are acceptable when, combined with other actions that add negative reactivity, the overall net reactivity addition is zero or negative. For example, a positive reactivity addition caused by temperature fluctuations from inventory addition or temperature control fluctuations is acceptable if it is combined with a negative reactivity addition such that the overall, net reactivity addition is zero or negative. Refer to TS Bases 3/4.9.1, Boron Concentration, for limits on boron concentration and water temperature for MODE 6 action statements involving suspension of positive reactivity changes.

SURVEILLANCE REQUIREMENTS

Operability of the required electrical buses is confirmed by verifying correct breaker alignment and indicated voltage on the buses. The surveillance frequency is controlled under the Surveillance Frequency Control Program.

## 3/4.8.4 ELECTRICAL EQUIPMENT PROTECTIVE DEVICES

Containment electrical penetrations are protected by deenergizing circuits not required during reactor operation. The OPERABILITY of the motor-operated valves thermal overload protection ensures that the thermal overload protection will not prevent safety-related valves from performing their function. The Surveillance Requirements for demonstrating the OPERABILITY of the thermal overload protection are in accordance with Regulatory Guide 1.106, "Thermal Overload Protection for Electric Motors on Motor Operated Valves," Revision 1, March 1977.

TS Bases INSERT

For 120 VAC vital instrument panels 1A, 1B, 1C, 1D, 1E and 1F, ACTION b allows 7-days to restore an inoperable inverter provided the affected vital panel is reenergized within 2-hours. If the affected vital instrument panel cannot be reenergized within 2-hours, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within the following 30 hours. The 7-days allotted to restore a 120 VAC vital panel inverter is based on engineering judgment taking into consideration the time required for inverter repair and the additional risk to which the unit is exposed due to the loss of redundancy in available electrical sources powering the affected 120 VAC vital instrument panel. If the inoperable inverter cannot be restored within the allotted AOT, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within the following 30 hours.

ACTION d allows 8-hours to restore at least one inoperable inverter for the condition of two inoperable inverters of the same electrical train provided both affected 120 VAC vital instrument panels are reenergized within 2-hours. If both affected vital instrument panels cannot be reenergized within 2-hours, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within the following 30 hours. The inoperability of two vital instrument panels of the same train would not place the unit outside of its design basis since the redundant instrument panels of the opposite train remain available to support engineered safety features (ESF) operation. The 8-hours allotted to restore at least one inoperable inverter and exit ACTION d is reasonable given the reduction in electrical system reliability since a single failure in the redundant train could result in the minimum ESF functions not being supported. If at least one inoperable inverter cannot be restored within 8-hours, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within the following 30 hours.

**ATTACHMENT 3**

**EVALUATION OF RISK IMPACT**

## 1. PURPOSE

This evaluation documents the risk assessment associated with the proposed license amendment to modify Seabrook Technical Specifications (TS) 3.8.3, Onsite Power Distribution - Operating, ACTION b, by increasing the allowable outage time (AOT) from the current 24-hour requirement to seven (7) days for 120 VAC vital instrument panel inverters 1A, 1B, 1C, 1D, 1E and 1F. The proposal to change the Tech Specs requirements to allow vital panel inverters 1A, 1B, 1C, 1D, 1E and 1F to be out of service up to 7 days will allow the completion of inverter maintenance without the need to commence a unit shutdown in accordance with TS 3.8.3, ACTION b.

## 2. EVALUATION

INTERNAL EVENTS AND INTERNAL FLOOD

A quantitative Probabilistic Risk Assessment (PRA) was performed using the SEA baseline model of record modified with an application-specific change adding inverters C and D maintenance gates. This application-specific model was used to quantify the values for Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) for the 120 VAC vital instrument panel inverters individually out-of-service.

The E and F inverters are not included in the PRA model of record. The inverters were not modeled because, upon failure of these inverters, there is an automatic transfer to a maintenance power supply. This maintenance supply is from a diesel-backed motor control center through a transformer, and so an inverter failure only represents a marginal loss of redundant supply (i.e. DC power input) to the associated loads but does not fail any equipment. In addition, failure of the E and F inverters do not create an initiating event and do not affect containment function or increase the likelihood of a containment bypass event. These inverters do not supply power to the reactor protection system (RPS). Seabrook Station operating experience demonstrates that failure of these inverters does not result in a plant transient. The maintenance supply (1-EDE-MCC-531, 1-EDE-MCC-631)) for the subject inverters are included in the PRA model and the failure of MCC 531 and 631 bound the assessment for 120 VAC Vital Instrument Panel Inverters E and F.

The CDF and LERF were quantified for the base case (average maintenance) and the Inverter A (XX.EDEI1A.OOS), Inverter B (XX.EDEI1B.OOS), Inverter C (XX.EDEI1C.OOS), Inverter D (XX.EDEI1D.OOS), Inverter E (Bounded with EDEMCC531.FX), Inverter F (bounded with EDEMCC631.FX) AOT case (average maintenance with each inverter out of service). Due to difficulties encountered quantifying the LERF top gate at the desired truncation of 5E-13, each LERF sequence was quantified individually and the results summed similar to the quantification performed in the Seabrook Internal Events PRA Model of Record. For the inverter out-of-service (OOS) cases, the master flag file used was SBK-Master-Flag-INV_*X*_ OOS.txt. These flag files are identical to the flag file for the base cases, SBK-Master-Flag.flg., with the addition of the inverters OOS basic events set to True at the end of the flag file.

CDF and LERF results were used to evaluate the Incremental Conditional Core Damage Probability (ICCDP) and Incremental Conditional Large Early Release Probability (ICLERP), associated with the proposed AOT extension as shown below:

ICCDP = [(conditional CDF with the subject equipment out of service) - (baseline CDF with nominal expected equipment unavailabilities)] * (duration of AOT under consideration)

ICLERP = [(conditional LERF with the subject equipment out of service) – (baseline LERF with

**ATTACHMENT 3**

**EVALUATION OF RISK IMPACT**

Nominal expected equipment unavailabilities)] * (duration of AOT under consideration)

Table 1 provides a summary of the calculated Internal Events and Internal Flood ICCDP and ICLERP. Note that all inverters out of service were run individually and provided the same results for CDF. E and F provided 0 delta LERF and A and C inverters individually out of service provided higher LERF numbers. A and C inverters OOS results are provided for LERF.

**Table 1 - Internal Events and Internal Flood ICCDP and ICLERP**

| | | |
|---|---|---|
| CDF | BASE CASE | 6.15E-06 |
| | Any One Inverter Out of Service | 6.16E-06 |
| | ΔCDF | 1.00E-08 |
| LERF | BASE CASE | 4.32E-08 |
| | Any One Inverter Out of Service | 4.67E-08 |
| | ΔLERF (One Inverter Out of Service) | 3.50E-09 |
| ICCDP | 1.92E-10 | |
| ICLERP | 6.71E-11 | |

SEISMIC

Seismic risk in the Seabrook IPEEE (Reference 7) is based on an acceptable methodology identified in NUREG-1407. The IPEEE assessment incorporates quantification and model elements (such as system fault trees, event trees, random failure rates, common-cause failures, etc.) consistent with state of the practice in the 1990s. Since the methodology for seismic PRA has evolved significantly, the IPEEE assessment cannot be used for quantitative insights. The assessment of inverter AOT extension is based on more recent seismic hazard evaluations for the Near-Term Task Force (NTTF) response and on the current MOR. If a component is not failed during a particular seismic event, it will then only contribute to seismic risk when its corresponding opposite train component is out-of-service due to random failures, which are very low and bounded by the internal events analysis. As such, it can qualitatively be inferred that there would be no significant impact on seismic risk due to extending the AOT for these components.

As an additional set of stand-alone bounding calculations, the potential impact of seismic events on the risk assessment is considered using inputs from the full-power internal events which has been shown to be technically adequate per peer review in accordance RG 1.200, Rev. 2. The steps to determine the potential impact of seismic events for proposed extensions are:

- Determine the accidents that can result from a seismic event
- Determine the systems of interest
- Determine how the system of interest is used to mitigate the seismically induced event
- Determine the impact on risk metrics

The primary seismic event of interest for this assessment is a Loss of Offsite Power (LOOP). The largest seismic events are expected to cause Loss of Coolant Accident (LOCAs) and additional failures, making small changes in the availability of 120 V Alternating Current (A.C.) inverters have a negligible impact as discussed above.

For a seismically-induced LOOP, emergency diesel generators (EDGs) are required to start and run, Auxiliary Feet Water (AFW) is required to provide secondary side heat removal, and Reactor Coolant

**ATTACHMENT 3**

**EVALUATION OF RISK IMPACT**

Pump (RCP) seal cooling must continue or the RCP Shutdown Seal needs to actuate. The only functions that may be impacted by the Allowed Outage Time (AOT) changes are the power systems required to safely shutdown.

The change in risk for seismic events is computed as an incremental conditional core damage probability. Over a one-year time frame, this is generally equivalent to a change in CDF. The general equation is as follows:

$$ICCDP_{INV} = (CDF_{INV} - CDFBASE)T_{INV}$$

Since the model of record assesses the risk assuming the frequency of occurrence of each initiating event, assessing the CCDP/CLERP of a seismically induced LOOP by setting the LOOP initiating event frequency to 1.0 results in an overestimation of the CCDP/CLERP. The CCDP/CLERP was assessed by raising the truncation used to reflect the cutset probability truncation. This was done by dividing the model of record truncation by the LOOP initiating event frequency. The calculation of the CCDP values is quantified conservatively assuming that LOOP recovery is not possible. For the calculation of LERF the truncation was further lowered by one order of magnitude to ensure the generation of a sufficient number of cutsets to estimate the change in risk with the inverters unavailable. These results are shown in Table 2 below.

| Table 2 - Risk Calculation for Seismic Events | | | | | |
|---|---|---|---|---|---|
| | **CDF (/YR)** | **Delta** | | **LERF (/YR)** | **Delta** |
| Base LOOP | 3.7359428E-05 | | Base LOOP | 1.1051411E-08 | |
| A inverter OOS | 3.7359428E-05 | 0.00E+00 | A inverter OOS | 1.0032297E-07 | 8.93E-08 |
| B inverter OOS | 3.7365553E-05 | 6.13E-09 | B inverter OOS | 1.7198319E-08 | 6.15E-09 |
| C inverter OOS | 3.7359428E-05 | 0.00E+00 | C inverter OOS | 1.1051411E-08 | 0.00E+00 |
| D inverter OOS | 3.7359428E-05 | 0.00E+00 | D inverter OOS | 1.1051411E-08 | 0.00E+00 |
| E inverter OOS | 7.6232888E-05 | 3.89E-05 | E inverter OOS | 2.0709090E-08 | 9.66E-09 |
| F inverter OOS | 3.7370291E-05 | 1.09E-08 | F inverter OOS | 1.1051411E-08 | 0.00E+00 |
| | Truncation is 8.17E-11 | | Truncation is 8.17E-12 | | |

Setting $T_{INV}$ to 7 days per year (1.92E-2) yields the estimates of seismic ICCDP and ICLERP in Table 3.

| Table 3 - Seismic ICCDP and ICLERP | | |
|---|---|---|
| **Case** | **Seismic ICCDP** | **Seismic ICLERP** |
| A inverter OOS | 0.00E+00 | 1.71E-09 |
| B inverter OOS | 1.18E-10 | 1.18E-10 |
| C inverter OOS | 0.00E+00 | 0.00E+00 |
| D inverter OOS | 0.00E+00 | 0.00E+00 |
| E inverter OOS | 7.46E-07 | 1.85E-10 |
| F inverter OOS | 2.09E-10 | 0.00E+00 |

The dominant contributor to risk when the E inverter is out of service is loss of FW and loss of the B DG. This is due to the fact that the model does not explicitly model the E inverter, so instead the backup power from the Motor Control Center 531 was made unavailable. This Motor Control Center also powers valves in the Startup Feedwater Pump flow path to the steam generators, so when the Motor Control Center is unavailable the Startup Feedwater pump is also unavailable. While this is an overly conservative assessment of the risk due to the configuration, the change in risk still meets the thresholds outlined in Reg. Guide 1.177 so the conservatism is acceptable.

INTERNAL FIRE

Seabrook completed an Individual Plant Examination of External Events in 1992. Section 1.4 of the IPEE summarizes the major findings and states that fire and seismic events were the only important contributors to external events core damage. The fire related CDF was 1.2E-05 per year and the seismic CDF was 1.2E-05 per year. Since Fire PRA methodology has evolved significantly, the IPEE assessment cannot be used for quantitative insights. Therefore, an additional stand-alone calculation was performed to bound the risk impact for this change using the current full power internal events PRA model which has been shown to be technically adequate per peer review in accordance with RG 1.200.

A bounding calculation used the following process to determine the potential impact of the fire events for the proposed extension:

- Determine fire initiating event frequency
- Determine change in inverter unavailability
- Determine alternate power supplies available for event mitigation
- Calculate impact on risk metrics

The fire ignition frequencies have been calculated from NUREG-2169. The frequencies for all ignition sources, except for Bin 20's [Off-gas/$H_2$ recombiner (BWR)'s] contribution, were summed resulting in the total site fire frequency of 2.00E-1 used in this assessment. No credit for Severity Factors or Non-Suppression Probabilities is applied.

The change in inverter unavailability is determined by subtracting the current test and maintenance basic event probability from the updated probability after a factor of 7 increase (extension from 1 day to 7).

**Table 4 - Inverter Unavailability**

| Inverter | Test & Maintenance BE | Old UA | New UA | $\Delta UA_{INV}$ |
|---|---|---|---|---|
| A | WWW-ESFAS-MAINTA | 1.14E-04 | 7.98E-04 | 6.84E-04 |
| B | WWW-ESFAS-MAINTB | 1.14E-04 | 7.98E-04 | 6.84E-04 |
| C | WWW-SSPS-MAINTA | 1.14E-04 | 7.98E-04 | 6.84E-04 |
| D | WWW-SSPS-MAINTB | 1.14E-04 | 7.98E-04 | 6.84E-04 |

The extended AOT for the inverters will have the greatest risk impact during a loss of offsite power event. Each 4160V A.C. vital bus is backed up by an Emergency Diesel Generator, which provides emergency power for safe shutdown in the event offsite power is lost. The 120VAC power supplies multiple instruments related to process monitoring, control and protection systems. If a single 120VAC inverter is out of service, there is an alternate 480VAC power supply, which is also Emergency Diesel Generator backed, which provides backup power via a 480/120VAC transformer for the specific bus. The resulting change in unavailability would be zero since they would both be failed by the fire. Therefore, the following equation is used to conservatively estimate the change in risk:

**ATTACHMENT 3**

**EVALUATION OF RISK IMPACT**

$$\Delta CDF = FIF \times \Delta UA_{INV} \times P_{Alt\ Power}$$

FIRE ASSESSMENT OF RISK IMPACT TO INVERTER E AND F

The current PRA model does not explicitly model the E and F inverters as they do not create an initiating event, they do not affect containment functions nor increase the likelihood of a containment bypass event, power the reactor protection system, or power the SSPS system. The E inverter is part of the A train of 120VAC power and has the same backup power supply as both the A and C inverter. Therefore, the change in risk for A and C is bounding for the change in risk for E. Similarly, the F inverter is part of the B train of 120VAC power and has the same backup power supply as both the B and D inverter. Therefore, the change in risk for B and D is bounding for the change in risk for F.

Table 5 presents the values estimated for the change in risk for each inverter.

**Table 5 - ΔCDF Fire Calculation**

| Inverter | A | B | C | D |
|---|---|---|---|---|
| **FIF=** | 2.00E-01 | 2.00E-01 | 2.00E-01 | 2.00E-01 |
| **$\Delta UA_{INV}$ =** | 6.84E-04 | 6.84E-04 | 6.84E-04 | 6.84E-04 |
| **$P_{Alt\ Power}$Gate** | MCC531-PP1A2 | MCC631-PP1B2 | MC531-PP1C2 | MCC631-PP1D2 |
| **$P_{Alt\ Power}$ =** | 2.79E-04 | 2.77E-04 | 2.79E-04 | 2.77E-04 |
| **ΔCDF =** | 3.81E-08 | 3.78E-08 | 3.81E-08 | 3.78E-08 |
| **ICCDP** | 7.32E-10 | 7.26E-10 | 7.32E-10 | 7.26E-10 |

The most conservative ICCDP case is for the A or C inverter, 7.32E-10. Since the ICCDP is negligible, the ICLERP impact will also be negligible. Conservatively in the final summary table, all ICCDP is assumed to contribute to ICLERP.

OTHER EXTERNAL EVENTS

With the exception of Internal Fire and Seismic, risk discussion above, all other external hazards were screened from PRA per IPEEE and updated for NTTF for Fukushima. See Attachments A and B.

CONCLUSION

The Seabrook PRA model of record (SBK20) fully meets all the requirements of Part 2 "Internal Events" of the ASME/ANS PRA Standard.

NRC Regulatory Guide 1.177 Revision 1 provides quantitative acceptance guidelines for risk impact related to AOT changes to be considered "small" as ICCDP of less than 1.0E-6 and ICLERP of 1.0E-7 or less. The incremental conditional core damage probability (ICCDP) calculated for extending the AOT from 24 hours to 7 days for 120 VAC vital instrument panel inverters 1A, 1B, 1C, 1D, 1E and 1F, assuming the entire AOT is used, are provided in Table 6. The ICCDP is below the RG 1.177 threshold of 1.0E-6 per year and the ICLERP is below the 1.0E-07 ICLERP threshold. As such, the ICCDP and ICLERP calculated values can be considered small.

**Table 6 - ICCDP & ICLERP Summary**

| | ICCDP | ICLERP |
|---|---|---|

**ATTACHMENT 3**

**EVALUATION OF RISK IMPACT**

| | | |
|---|---|---|
| IE & IF | 1.92E-10 | 6.71E-11 |
| Seismic | 7.46E-07 | 2.01E-09 |
| Fire[1] | 7.32E-10 | 7.32E-10 |
| Total | 7.47E-07 | 2.81E-09 |

Note 1: Fire conservatively assumes all ICCDP contributes to ICLERP.

SAFETY SIGNIFICANCE

Extending the AOT for the 120 VAC vital instrument bus inverters does not adversely affect any mitigating equipment or create an initiating event.

## 3. SOURCES OF MODEL UNCERTAINTY

The Seabrook Station evaluation of sources of model uncertainty and related assumptions was revised for the PRA model of internal events and internal flooding events. The guidance contained in NUREG-1855, Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making (Reference 7), and EPRI TR-1016737, Treatment of Parameter and Model Uncertainty for Probabilistic Risk Assessment (Reference 8), were the bases for the revision. Potential sources of generic and plant-specific uncertainty that represent possible impact on risk-informed applications identified were reviewed thoroughly. No sources of uncertainty were identified as having a significant impact on the results of this evaluation.

## 4. SEABROOK PRA QUALITY AND PEER REVIEW HISTORY

The Seabrook Level 1 and Level 2 PRA Models were initially developed in response to NRC Generic Letter 88-20 (Individual Plant Examination, or IPE). Since the original IPE submittal, the PRA has undergone several model revisions to incorporate improvements and maintain consistency with the as-built, as-operated plant. During that time, the SEA PRA has been the subject of two internal events peer reviews. Overall, the Seabrook PRA is reviewed and updated with a goal of increased fidelity for risk-informed applications, according to Regulatory Guide (RG) 1.200 requirements.

The ASME / ANS PRA Standard (ASME/ANS RA-Sa-2009) (Reference 4) has technical elements, high-level requirements (HLRs), and detailed supporting requirements (SRs). NRC RG 1.200, Revision 2, endorses the ASME/ANS PRA Standard with minor "clarifications." The EPRI ePSA database includes each supporting requirement from the ASME/ANS PRA Standard along with the clarifications from NRC RG 1.200, Revision 2.

Self-assessments against the internal event SRs in the PRA standard were performed in 2005 (ASME RA-Sa-2003), 2007 (ASME RA-Sb-2005), 2010 (ASME/ANS RA-Sa-2009) and 2011 (ASME/ANS RA-Sa-2009). The first three self-assessments considered all internal events, technical elements. The SA-2011 addressed only the open findings against specific SRs.

The 2010 Self-Assessment had assessed the 2009 PRA against each of the 254 internal events supporting requirements in ASME/ANS RA-Sa-2009. That assessment reviewed the results of previous peer reviews and their observations along with the subsequent revisions to the PRA that addressed the observations.

The Seabrook PRA has undergone peer review against ASME PRA Standard (Reference 4), Parts 1 (configuration control), 2 (internal events) and 3 (internal flood events).

**ATTACHMENT 3**

**EVALUATION OF RISK IMPACT**

Peer reviews have been conducted against internal event supporting requirements as follows:

- In 1999, a review of all technical elements was performed using the industry PSA Certification process, the precursor to the PRA Standard.
- In 2005, a focused peer review was performed for the elements AS, SC and HR as well as configuration control. This review was done to PRA Standard ASME RA-Sa-2003.
- In 2009, a focused peer review was performed for all elements of Part 3, Internal Flooding. This review was done to PRA Standard ASME/ANS RA-Sa-2009.
- In 2012, a focused peer review was performed for the element LE. This review was done to PRA Standard ASME/ANS RA-Sa-2009.
- In 2019, a focused peer review was performed on all elements upgraded by the conversion from Riskman to CAFTA. This review was done to PRA Standard ASME/ANS RA-Sa-2009.

In October 2017, all resolved findings were reviewed to Appendix X to NEI 05-04, NEI 07-12, and NEI 12-13, "Close-out of Facts and Observations" (F&Os) as accepted by NRC in the staff memorandum dated May 3, 2017 (ML17079A427).

Attachment C provides a summary of the open findings after the independent review and focused scope peer review. None of the open findings have an impact on the results and conclusions of this LAR.

## 5. APPLICABLE REGULATORY REQUIREMENTS / CRITERIA

The Seabrook PRA is reviewed and upgraded with a goal of increased fidelity for risk-informed applications, according to RG 1.200 requirements.

## 6. REFERENCES

1. USNRC Regulatory Guide 1.177, Revision 1, An Approach for Plant Specific, Risk Informed Decisionmaking: Technical Specifications, May 2011 (ADAMS Accession No. ML100910008)

2. USNRC Regulatory Guide 1.174, Revision 2, An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis, May 2011 (ADAMS Accession No. ML100910006)

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

4. ASME PRA Standard RA-Sa-2009, Addenda to ASME/ANS RA-S–2008 Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications, February 2009.

5. SEA-1FJR-19-042, Seabrook Internal Events PRA Model Update, Rev. 0, 6/2/2020

6. Seabrook Station Probabilistic Safety Study, 2014 Update, SSPSS-14

7. North Atlantic Energy Service Corp. (NAESC), 1992, "Individual Plant Examination External Events Report for Seabrook Station," October 2, 1992 (ADAMS Accession No. ML080100029)

**ATTACHMENT A**

**EXTERNAL HAZARDS SCREENING**

| External Hazard | Screening Result | | |
|---|---|---|---|
| | Screened? (Y/N) | Screening Criterion (Note a) | Comment |
| Aircraft Impact | Y | PS4 | Screened based on low probability of aircraft crash and small target size of SR structures. |
| Avalanche | Y | C3 | Excluded due to site topography that would not support snow buildup that would lead to an avalanche. |
| Biological Event | Y | C1<br>C4<br>C5 | Included implicitly in LOOP initiator (LOSPP, LOSPG). Slow developing with limited impact. Slow developing hazard can be detected and managed. Plant programs are in place to periodically inspect and clean SW screen wash system. |
| Coastal Erosion | Y | C3 | Excluded based on location of SW intake connections approx. 50 feet below sea level, not subject to erosion. |
| Drought | Y | C3 | Excluded since the capacities of the two UHS options are not impacted by drought – Atlantic Ocean and Cooling Tower basin. Also excluded based on structures founded on bedrock and/or engineered fill. |
| External Flooding | Y | C1 | The external flooding hazard at the Seabrook Station site was recently evaluated as a result of the post-Fukushima 50.54(f) Request for Information and the flood hazard reevaluation report (FHRR) was submitted to NRC for review on November 7, 2016 (Reference 16). The results indicate that flooding from all hazards, except local intense precipitation (LIP) and probable maximum storm surge (PMSS), are bounded by the current licensing basis (CLB) and do not pose a challenge to the plant. Flooding from local intense precipitation and probable maximum storm surge were subsequently evaluated in the Seabrook Station Flooding Focused Evaluation (FE). Seabrook's focused evaluation and Mitigating Strategies Assessment (MSA) for flooding conclude that the current station procedures for implementing the FLEX strategy provide an acceptable method of assuring safe shutdown. |
| Extreme Wind or Tornado | Y | PS1<br>PS2 | High winds/tornados were screened out in the Seabrook IPEEE. All seismic Category 1 structures exposed to wind forces are designed to withstand wind velocity at 110 mph at 30 ft above nominal ground elevation. The tornado loadings are based on a 290-mph tangential wind velocity and a 70-mph translational wind velocity, with simultaneous atmospheric pressure drop of 3 psi at a rate of 2 psi per second. Safety-related systems at Seabrook are in general provided with positive tornado missile protection. No modifications have been made that would detract from Seabrook meeting the screening conclusions.<br>Subsequent to the IPEEE, the Emergency Supplemental Power Supply (SEPS DG) was installed in a non-protected enclosure subsequent to IPEEE. Also, as part of IPEEE, was recognized that the design of the SW cooling tower is not completely missile protected and could be subject to high wind/missile hazards, e.g., fans. The high wind/missile hazard/consequence is judged not |

**ATTACHMENT A**

**EXTERNAL HAZARDS SCREENING**

| External Hazard | Screening Result | | |
|---|---|---|---|
| | Screened? (Y/N) | Screening Criterion (Note a) | Comment |
| | | | significant given that the EDGs and Ocean SW pumps/piping are protected from these hazards. |
| Fog | Y | C5 | Fog and mist may increase the frequency of accidents involving aircraft, ship, or vehicle. This weather condition is included implicitly in the weather conditions and accident rate data for these transportation accidents. |
| Forest or Range Fire | Y | C1<br>C3<br>C4<br>C5 | Included implicitly in LOOP initiator (LOSPP). Forest & grass are somewhat distant from the plant and smoke from a forest/grass fire is unlikely to impact both CR air intakes; no immediate impact on equipment. Forest & grass fire unlikely to propagate to the site because of the distance between surrounding forest and SR structures. |
| Frost | Y | C4 | Included implicitly in weather-related LOOP. Can be considered covered by other events such as snow, cold, etc.). |
| Hail | Y | C4<br>C1 | Included implicitly in weather-related LOOP. Impact to buildings/structures bounded by other more extreme events. Can be considered covered by other events such as snow, cold, etc.). |
| High Summer Temperature | Y | C1<br>C5 | Plant AC ventilation is designed for extreme heat load. Backup SW Cooling Tower effectiveness may be limited due to high ambient temperature with high dew point. Slow developing hazard, can be detected and managed. |
| High Tide, Lake Level, or River Stage | Y | C4 | Refer to External Flooding hazard. |
| Hurricane | Y | C4 | Refer to External Flooding hazard and Extreme Wind hazard. |
| Ice Cover | Y | C4 | Included implicitly in weather-related LOOP (LOSPW). Ocean intake is ~50 ft below surface, cannot freeze. Backup standby cooling tower has temperature monitoring and de-icing capabilities. |
| Industrial or Military Facility Accident | Y | C1<br>C2<br>C3<br>C5 | There are no industrial or military facilities in the vicinity that would impact the plant. Therefore, hazard is screened. Design basis sufficient to screen. |
| Internal Flooding | N | None | PRA for this hazard is addressed in the Seabrook Station Internal Flooding PRA |
| Internal Fire | N | None | Internal fire risk consideration will conservatively use the SSEL. Refer to LAR Section 3.2.2 |

**ATTACHMENT A**

**EXTERNAL HAZARDS SCREENING**

| External Hazard | Screening Result | | |
|---|---|---|---|
| | **Screened? (Y/N)** | **Screening Criterion (Note a)** | **Comment** |
| Landslide | Y | C3 | Above ground landslide excluded due to site topography would not support landslide of any significance. Underwater landslide excluded based on location of SW intake connection elevation below sea level, not subject to undermining from underwater landside. |
| Lightning | Y | C4<br>C1 | Included implicitly in LOOP initiator (LOSPW). Weather-related LOOP is used since it includes storms including lightning strikes.<br>The plant grounding system provides protection to emergency AC power to reduce the likelihood of lightning-induced failures.<br>Emergency AC power is designed to reduce the likelihood of lightning-induced failure. Physical and electrical train separation provides additional protection. |
| Low Lake Level or River Stage | Y | C3 | Excluded since the capacities of the two UHS options are not impacted by low water level. The intake for the ocean SW is ~50 feet below sea level. The SW Cooling Tower basin contains a nominal volume of ~3 million gal, sufficient for 7-day supply. |
| Low Winter Temperature - Air | Y | C1<br>C5 | Extreme temperatures are uncommon due proximity of Ocean. Building structures, ventilation and monitoring systems are designed to address low temperatures. Winter preparations are proceduralized to protect the station from low temperatures. |
| Low Winter Temperature - Water | Y | C3 | Ocean intake is ~50 ft below surface, cannot freeze. Backup standby cooling tower has temperature monitoring and de-icing capabilities. |
| Meteorite or Satellite Impact | Y | PS4 | Conservative bounding assessment shows that these events can be screened.<br>Extremely unlikely for satellite debris of any significant size to hit the site. Any such strike would be localized and not expected to cause direct core damage. |
| Pipeline Accident | Y | C3 | Pipelines are not close enough to significantly impact plant structures. UFSAR design basis is sufficient to screen this hazard. |
| Release of Chemicals in Onsite Storage | Y | C1 | UFSAR design basis sufficient to screen this hazard - screened based on plant design. |
| River Diversion | Y | C3 | Excluded since UHS does not depend on river or lake. |
| Sand or Dust Storm | Y | C1<br>C3 | Plant equipment is protected from or designed to preclude foreign material (ventilation inlet filters, etc.) Also excluded due to lack of large quantities of loose sand on site or nearby (beach is 2 miles away). |
| Seiche | Y | C1 | Refer to External Flooding hazard. |
| Seismic Activity | N | None | Seismic risk discussed in evaluation |

**ATTACHMENT A**

**EXTERNAL HAZARDS SCREENING**

| External Hazard | Screening Result | | |
|---|---|---|---|
| | Screened? (Y/N) | Screening Criterion (Note a) | Comment |
| Snow | Y | C1<br>C4<br>C5 | Design includes snow loads and other bounding loads. DG air intakes are well above ground elevation. Plant procedure identifies the need to monitor ventilation air intakes that might be impacted by drifting snow or ice. Included implicitly in weather-related LOOP initiator (LOSPW). |
| Soil Shrink-Swell Consolidation | Y | C3 | Excluded based on structures founded on bedrock and/or engineered fill. |
| Storm Surge | Y | C1 | Refer to External Flooding hazard. |
| Toxic Gas | Y | C3 | Toxic gas covered under release of chemicals in onsite storage, industrial or military facility accident, and transportation accident. UFSAR design basis is sufficient to screen this hazard. |
| Transportation Accident | Y | C4<br>C1 | The potential impact on the site is enveloped by industrial hazards. Ship and vehicle transportation accidents considered the potential for explosive / hazardous releases. Based on these sources, these hazards are not significant challenges to the plant and can be screened. |
| Tsunami | Y | C1 | Refer to External Flooding hazard. |
| Turbine-Generated Missiles | Y | PS4 | Screened based on low probability of turbine blade failure and limited consequences in Turbine Bldg. Screened based on low probability of turbine wheel failure and low probability of impacting SR equipment due to turbine orientation. |
| Volcanic Activity | Y | C3 | Excluded due to distance from nearest potentially active volcano. |
| Waves | Y | C1 | Refer to External Flooding hazard. |
| Note a – See Attachment B for descriptions of the screening criteria. | | | |

## ATTACHMENT B

## PROGRESSIVE SCREENING APPROACH FOR ADDRESSING EXTERNAL EVENTS

| Event Analysis | Criterion | Source | Comments |
|---|---|---|---|
| Initial Preliminary Screening | C1. Event damage potential is < events for which plant is designed. | NUREG/CR-2300 and ASME/ANS Standard RA-Sa-2009 | |
| | C2. Event has lower mean frequency and no worse consequences than other events analyzed. | NUREG/CR-2300 and ASME/ANS Standard RA-Sa-2009 | |
| | C3. Event cannot occur close enough to the plant to affect it. | NUREG/CR-2300 and ASME/ANS Standard RA-Sa-2009 | |
| | C4. Event is included in the definition of another event. | NUREG/CR-2300 and ASME/ANS Standard RA-Sa-2009 | Not used to screen. Used only to include within another event. |
| | C5. Event develops slowly, allowing adequate time to eliminate or mitigate the threat. | ASME/ANS Standard | |
| Progressive Screening | PS1. Design basis hazard cannot cause a core damage accident. | ASME/ANS Standard RA-Sa-2009 | |
| | PS2. Design basis for the event meets the criteria in the NRC 1975 Standard Review Plan (SRP). | NUREG-1407 and ASME/ANS Standard RA-Sa-2009 | |
| | PS3. Design basis event mean frequency is < 1E-5/y and the mean conditional core damage probability is < 0.1. | NUREG-1407 as modified in ASME/ANS Standard RA-Sa-2009 | |
| | PS4. Bounding mean CDF is < 1E-6/y. | NUREG-1407 and ASME/ANS Standard RA-Sa-2009 | |
| Detailed PRA | Screening not successful. PRA needs to meet requirements in the ASME/ANS PRA Standard. | NUREG-1407 and ASME/ANS Standard RA-Sa-2009 | |

**ATTACHMENT C**

**DISPOSITION AND RESOLUTION OF OPEN PEER REVIEW FINDINGS AND SELF-ASSESSMENT OPEN ITEMS**

| **Disposition and Resolution of Open Peer Review Findings and Self-Assessment Open Items** | | | | |
|---|---|---|---|---|
| **Finding No.** | **Supporting Requirement** | **Capability Category (CC)** | **Description** | **Disposition for Inverter AOT Extension LAR** |
| F&O<br>LE-D6-01 | LE-D6 | Not Met | The analysis does not consider an increased probability of thermally induced steam generator tube rupture due to depressurized steam generators that may occur due to secondary side conditions as mentioned in item (b) of the SR. In addition, because thermally induced tube rupture follows hot leg integrity in the event tree, proper consideration of the conditional probabilities should be re-addressed to ensure that it is not receiving a lower probability than it should. As the plant ages, the analysis should also be cognizant that at some point the tubes should no longer be considered 'pristine.' | A change to XSGTI1 (1E-03 to 0.1) was needed to completely resolve this finding. The sensitivity case indicates that this change will increase the overall LERF by less than 1%, which is negligible. This finding has negligible impact on this risk-informed application. This change was implemented in the recent model SBK20. |
| F&O<br>DA- 5-1 | DA-D4 | Met | The Seabrook PRA uses all operating experience when performing the Bayesian update. The use of all operating experience in the Bayesian update can provide non-conservative results for component failure probabilities. For example, if a component has been replaced, previous operating experience is no longer applicable for that component. (This F&O originated from SR DA-D4)<br>Basis for Significance<br>If a non-conservative distribution is used in the reasonableness check, it can skew the results of the check.<br>Possible Resolution Ensure that the operating experience used in the data update is appropriate and applicable with current plant operations, and re-evaluate the Bayesian update. Otherwise, perform a sensitivity analysis with a shorter operating experience to assess the impacts of the current assumption. | The 2019 data update covers the period of July 1, 2013 through August 31, 2018, not all of Seabrook's operating experience. Considering the very small fraction of components in the database replaced during this time, the impact on failure rates is negligible. |
| F&O | DA-E1 | Met | The following documentation issues were identified:<br>1) Table 13.6-1 of the Data Analysis shows the Bayesian validation of the Seabrook type codes. It is noted that the Bayesian update equations used for Beta distributions are incorrect. The equation used to update the beta parameter of the beta distribution should be B_prior + n_exposures - n_failures. The current equation used is B_prior + n_exposures. Note that the current equation used is not consistent with the CAFTA Bayesian update tool.<br>2) Section 13.6.2 of the Data Analysis discusses | Seabrook model was upgraded to CAFTA, including data analysis. Documentation did not clearly explain this process change. Issues are documentation issues only. No impact. |

**ATTACHMENT C**

**DISPOSITION AND RESOLUTION OF OPEN PEER REVIEW FINDINGS AND SELF-ASSESSMENT OPEN ITEMS**

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| DA-5-3 | | | three conditions for checking the reasonableness of the Bayesian update. In the description of the conditions it should be stated '...5th percentile and less than the 95th percentile of the generic/posterior distribution.'<br>3) Section 13.6.2 states that the parameters of interest in the reasonableness check are the: mean values, 5th percentile value, and 95th percentile value. Table 13.6-1 does not provide the mean values.<br>(This F&O originated from SR DA-E1)<br>Basis for Significance<br>These documentation issues need to be addressed to accurately describe the analysis.<br>Possible Resolution<br>1) Update Table 13.6-1 to be consistent with the values and equations used in the CAFTA model.<br>2) Update the discussion in Section 13.6.2 to state 'distribution' instead of 'mean' when referring to the 5th and 95th percentile values.<br>3) Provide the mean values for the distributions in Table 13.6-1. | |
| F&O<br><br>DA-5-5 | DA-E2 | Met | The following documentation issues were identified:<br>1) A review of the CAFTA.rr database shows that there are 6 common cause groups making use of the MGL method: BUSFX, BUSFL, LINES, LINES.YR, LINESMNT, and LINESMNT.YR. A search of the System Analysis notebook states that for BUS56FX 'Note that MGL CCF parameters are used in the 2019 update because the 2015 update to NUREG/CR-5497 did not have information on switchgear CCF failure data.' This statement does not provide a reference to the data source used, and the data notebook does not provide this information either.<br>2) There is no discussion regarding the selection of staggered or non-staggered testing schemes and the use of these calculation methods for the CCF groups.<br>(This F&O originated from SR DA-E2)<br>Basis for Significance<br>These documentation issues need to be addressed to accurately capture the analysis.<br>Possible Resolution<br>The following resolutions are recommended:<br>1) Update the data notebook to discuss the data source used for the MGL parameters still used in the PRA model, or update the MGL parameters to the generic alpha factors from the 2015 update of NUREG/CR-5497.<br>2) Add a clarifying statement to the Data Analysis regarding the selection of staggered or non-staggered testing schemes for the CCF groups. Discussions with Seabrook states that all CCF groups make use of a staggered testing scheme. | Documentation. No impact |

**ATTACHMENT C**

**DISPOSITION AND RESOLUTION OF OPEN PEER REVIEW FINDINGS AND SELF-ASSESSMENT OPEN ITEMS**

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| F&O<br><br>DA-5-7 | DA-E2 | Met | The Bayesian reasonableness check does not discuss any criteria for when there are 0 failures in the plant-specific experience. For these cases, none of the checks will pass the specified criteria. (This F&O originated from SR DA-E2)<br>Basis for Significance<br>There are cases where there were no failures in the plant-specific operating experience so there needs to be documentation of treatment for those cases.<br>Possible Resolution<br>Document the reasonableness check performed for cases where there are 0 plant-specific failures, and the criteria for determining whether or not the plant-specific operating experience is consistent with the prior distribution selected. | Documentation. No impact |
| F&O<br><br>HR-6-1 | HR-G7 | Not Met | 1)Self-assessment identifies limitations with manpower requirements and there still appear to be gaps with HRAC specific inputs for manpower. Additionally, execution locations are also not identified for all actions.<br>2)Not being able to reproduce results.<br>Recreating the dependency analysis using the same cutsets that were used, and creating a combination event recovery rule file resulted in 860 combinations versus the documented 505 combinations in the Section 11 HR document Section 11.8.1.3.<br>3)Manual combination and dependency overrides lacked sufficient justification for assigned dependency levels. For example, combination of HH.OFL0CW.FL and HH.OFL1CW.FA, the current justification taken is for larger timing separation between actions, however, the override taken is equivalent to intervening success. This isn't sufficient justification for the override taken.<br>(This F&O originated from SR HR-G7)<br>Basis for Significance<br>Item 1 has direct impact on the dependency level on combinations of HFE's through the adequate resources decision tree node. The calculator requires the manpower fields or execution locations to be complete to work properly. Not having these filled out is not conservative, as the HRAC interprets the no locations as all dependent events as being in the same location thus inappropriately satisfying adequate resources requirement.<br>Item 2 not being able to reproduce results brings the validity of the analysis into question.<br>Item 3 The dependency overrides have a potentially large effect on model results.<br>Possible Resolution<br>Item 1 Fill out manpower or complete execution location fields for all post initiators.<br>Item 2 Re-perform results and document more clearly so it can be reproduced for independent review.<br>Item 3 Reassess any manual overrides, provide sufficient justification where applicable and readjust the overrides as needed. | The HRA for Seabrook has been redone. The dependency analysis is reproducible. Most of the dependency analysis overrides have been eliminated, and those that remain are justified.<br>No impact to this application. |

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| F&O<br>HR-6-3 | HR-I1 | MET | Section 3.0 of Section 11, Human Actions Analysis, discusses methodology and references PRA-106 "PRA Model Guidelines", Section 106E Methodology for Human Reliability Analysis. PRA-106 is the modeling information for RISKMAN. No discussion could be found for dependency analysis methodology in the conversion report.<br>Similar issue was found to exist in Systems Analysis, Data Analysis, HRA, and Accident Sequence.<br>(This F&O originated from SR HR-I1)<br>Basis for Significance<br>Documentation does not apply to the current methods for listed technical elements.<br>Possible Resolution<br>Update to reflect correct reference for methodology. | The SBK MOR includes a new dependency analysis. Documentation is updated. No impact to this application, |
| F&O<br>HR-6-6 | HR-E4 | MET | There are instances where the information from Appendix 11.1A does not match the HRAC. See example below.<br>HH.OHSB1.FA Tcog 5 minutes versus Appendix 11.A1 Tcog of 20-30 minutes.<br>Also Operator interview Insights in HRAC for HH.OALT1.FL don't seem to match the interview documentation.<br>This appears to be a systemic problem as there were other instances found.<br>(This F&O originated from SR HR-E4)<br>Basis for Significance<br>Not entering timing from interviews affects the dependency analysis as well as not representing the as operated plant.<br>Possible Resolution<br>One possible resolution is to use the timing information from the interviews for input to the HRAC or justify an alternative such as current values. | HH.OHSB1.FA is not in the SBK model or in the HRA Calculator. Operator insights in HRAC for HH.OALT1.FL show that the Tsw could be longer, so the HRAC for this HFE is no impact on this application. HRA was updated and any possible systemic issues identified and addressed. |
| F&O<br>QU-7-2 | QU-B9 | MET | Logic flags have not been set to TRUE or FALSE for all flags prior to the generation of cutsets. The current methodology sets logic flags to TRUE in the recovery rules which occurs after the generation of cutsets. Additional cutsets have been generated in the final results that should not exist as they are nonminimal.<br>(This F&O originated from SR QU-B9)<br>Basis for Significance<br>Additional cutsets are being generated in the results due to flag events remaining in the model that are not set to TRUE or FALSE. For example, cutsets 358 and 405 are non-minimal with cutset 1977 (see CDF-POS123.CUT).<br>Possible Resolution<br>Set flags either to TRUE or FALSE prior to cutset generation (e.g., in the flag file), OR utilize a methodology whereby the quantifier can identify flag events. | Upon inspection, a minimum number of non-minimal cutsets were found in the latest quantification, resulting in a reduction in CDF of less than 0.3%. This will be remedied in the future by having the flags set to True and the cutsets subsumed at the beginning of the recovery rule file. No impact on this application |

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| F&O<br>QU-7-5 | QU-A3 | Cat 1 Met<br>Cat 2 Met<br>Cat 3 Not Met | SOKC is not accounted for in some type codes that use identical data sets. One example is for the type codes NICB1C and NICB1O. Both of these type codes use the same data set, but since they are different type codes UNCERT does not take the same sample for both distributions. This appears to be a common approach when the generic data doesn't delineate between the different failure modes of a component.<br>(This F&O originated from SR QU-E3)<br>Basis for Significance<br>State of knowledge correlation can impact the distribution of the overall CDF/LERF.<br>Possible Resolution<br>One possible resolution could be to Bayesian update these type codes with plant specific data to delineate the data sets such that the type codes used in the model do not use identical data sets. Another approach could be to use a single type code for both failure mode basic events such that the SOKC is taken into account. The resolution should be applied to all occurrences where the SOKC was broken. | SBK20 was updated to resolve all issues. No impact to this application. |
| F&O<br>QU-7-7 | QU-F2 | MET | 1) The FTREX.ini file was not documented. This is necessary to quantify the model and is significant because the default method is not used.<br>2) The criteria establishing convergence is based on <=5% change when compared to the next decade. The example in the standard uses a <5% final change. The final change is interpreted as calculating the percent change at the current truncation level with respect to the previous decade truncation level not the next. The criteria used is adequate, but there is no documentation of definition used to establish convergence.<br>3)There is no discussion of the top basic events and why they make logical sense. A general statement that notes that basic events importance's were reviewed to ensure they make logical sense is not sufficient evidence for the actual review taking place.<br>4) There is no documentation of how the circular logic is broken. A demonstration was performed that identified a couple examples of where in the model circular logic was broken. This identification and modeling technique needs to be documented.<br>(This F&O originated from SR QU-F2)<br>Basis for Significance<br>1) Without the .ini file it is difficult/impossible to reproduce the quantitative results.<br>2) Since the definition of convergence is not the same as the example in the standard, it needs to be defined in the documentation.<br>3) Without the discussion of the top basic events to ensure they make logical sense it is not clear that a detailed review was performed. After discussion with the Seabrook PRA staff, it was determined that the review was performed but not documented.<br>4) Without documentation it is difficult/impossible to | Documentation issues. The latest model shows acceptable convergence. No impact. |

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| | | | review and determine that the circular logic was broken appropriately.<br>Possible Resolution<br>1) Include in the documentation the .ini file or include enough information such that the .ini file could be recreated. For example mentioning that FTREX wrapper was used with WRAP method 3.<br>2) Update the documentation to include the definition of convergence used.<br>3)Update the review to include a discussion of the top basic events and why they make logical sense.<br>4) Document all occurrences of where circular logic was broken and how it was broken. | |
| F&O<br>QU-7-10 | QU-D6 | MET | Component importance measures were not identified. The supporting requirement specifically requires the identification of significant SSCs.<br>(This F&O originated from SR QU-D6)<br>Basis for Significance<br>Not identifying component importance measures can result in the loss of insights for top risk contributors.<br>Possible Resolution<br>Identify and include component importance measures consistent with the definition of significant contributors. | This issue is resolved in the latest model of record. No impact to this application. |