NEXTera ENERGY SEABROOK

10 CFR 50.90

SBK-L-20001

January 24, 2020

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

Seabrook Station
Docket No. 50-443

Subject: License Amendment Request 19-03, Application to Revise Degraded Voltage Time Delay Setpoint

Pursuant to 10 CFR 50.90, NextEra Energy Seabrook, LLC (NextEra) is submitting License Amendment Request (LAR) 19-03 to revise the degraded voltage time delay setpoint. Specifically, the proposed amendment decreases the trip setpoint and allowable value for the 4.16 kV Bus 5 and Bus 6 degraded voltage time delay relays listed in Technical Specifications Table 3.3-4.

The enclosure to this letter provides NextEra's evaluation of the proposed change. Attachment 1 to the enclosure provides a markup of the TS showing the proposed changes. Retyped TS pages containing the proposed changes will be provided when requested by the NRC Project Manager.

As discussed in the evaluation, the proposed change does not involve a significant hazards consideration pursuant to 10 CFR 50.92, and there are no significant environmental impacts associated with the change.

The Seabrook Onsite Review group has reviewed the proposed license amendment. In accordance with 10 CFR 50.91(b) (1), a copy of this letter is being forwarded to the designee of the State of New Hampshire.

There are no new or revised commitments made in this submittal.

NextEra Requests NRC review and approval of this license amendment by January 31, 2021. Implementation would follow within 90 days. The requested change is required to resolve an issue from the 2019 Design Basis Assurance Inspection.

Should you have any questions regarding this letter, please contact Mr. Ken Browne, Safety Assurance and Learning Site Director, at (603) 773-7932.

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

Executed on January 24, 2020.

Sincerely,

Eric McCartney
Site Director (VP) – Seabrook Nuclear Power Plant
NextEra Energy

Enclosure: Evaluation of the Proposed Change

cc: NRC Region I Administrator
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Enclosure

NextEra Energy Seabrook's Evaluation of the Proposed Change

Subject: License Amendment Request 19-03, Application to Revise Degraded Voltage Time Delay Setpoint

Evaluation of the Proposed Change

1.0 SUMMARY DESCRIPTION

UFSAR Section 8.3.1.1b.4(b) describes the 4.16 kV Bus 5 and 6 second level undervoltage protection scheme as follows: If the voltage on a 4.16-kV emergency bus is below that required to ensure the continued operation of safety-related equipment, the second level undervoltage protection scheme is activated. If the activation occurs coincidentally with an accident signal, then the Unit Auxiliary Transformer (UAT) and Reserve Auxiliary Transformer (RAT) incoming line breakers are automatically tripped after a time delay to prevent spurious operation due to transients such as starting of large motors. Technical Specification Table 3.3-4 lists 4.16 kV Bus 5 and 6 degraded voltage time delay relay trip setpoint of 10 seconds, and the allowable value of 10.96 seconds.

During the 2019 Design Basis Assurance Inspection (DBAI), it was identified that the current 10.96 second time delay for a degraded voltage condition concurrent with an accident signal (SI), the overcurrent protective devices for the motor operated valves (MOVs) may trip while powered from offsite power, thereby preventing subsequent MOV operation on the emergency diesel generators (EDG). Specifically, in the event of a safety injection (SI) at a voltage below the degraded voltage relay (DVR) setpoint, but above the loss of voltage relay setpoint, the MOVs may experience a stalled condition causing the motor to draw locked rotor current. For this condition, the MOV thermal overload relay (TOL) could trip and subsequently prevent the MOVs from performing their intended safety function when repowered from the EDG.

Engineering Change (EC) 293173 – Replacement TOL Heaters for Block Start MOVs (Ref. 10), revised TOL heater sizing for the block start MOVs. That EC approves replacing the TOL heaters for the MOVs that operate on an SI signal with resized TOL heaters of a larger size. In addition, EC 293173 approved replacing the degraded voltage time delay relay (62D), and decreasing the setpoint from a nominal 10 seconds to 6 seconds. These changes will ensure the MOVs do not trip during the time delay following an SI signal concurrent with a degraded voltage condition.

The trip setpoint and allowable value for the 4.16 kV Bus 5 and 6 degraded voltage time delay relays are listed in Technical Specifications Table 3.3-4. The purpose of this License Amendment Request (LAR) is to revise the trip setpoint and allowable value for the 4.16 kV Bus 5 and 6 degraded voltage time delay relays listed in Technical Specifications Table 3.3-4.

2.0 DETAILED DESCRIPTION

2.1 System Design and Operation

The 4.16 kV Bus 5 and 6 second level undervoltage protection scheme is as follows: If the voltage on a 4.16-kV emergency bus is below that required to ensure the continued operation of safety- related equipment, the second level undervoltage protection scheme is activated. If the activation occurs coincidentally with an accident signal, then the UAT and RAT incoming line breakers are automatically tripped after a time delay to prevent spurious operation due to transients such as starting of large motors.

The 4.16 kV Bus 5 and 6 degraded voltage time delay relay setpoint should be of a limited duration such that the permanently connected Class 1E loads are not damaged or become unavailable due to protective device actuation. If the voltage has not recovered following the time delay, the bus is disconnected from offsite power. Protective devices for connected Class 1E loads should be evaluated to ensure that spurious tripping does not occur during this time delay period. Consideration should also be given for restarting/reaccelerating the loads, should transfer to the emergency diesel generators be required.

2.2 Current TS Requirements

For the 4.16 kV Bus 5 and 6 Degraded Voltage functional unit, Table 3.3-4, Engineered Safety Features Actuation System Instrumentation Setpoints currently lists a trip set point of *"≥ 3933 volts with a ≤* ***10*** *second time delay"* and an allowable value of *"≥ 3902 volts with a ≤* ***10.96*** *second time delay"*.

2.3 Reason for the Proposed Change

The NRC issued Regulatory Issue Summary (RIS)-2011-12, Adequacy of Station Electric Distribution System Voltages (Ref. 2), in response to several industry findings related to the bases for degraded voltage relay settings and offsite power system design. This RIS provides some general guidelines for the development of degraded voltage relay and offsite power system design calculations. Regulatory Guide (RG) 1.106, Thermal Overload Protection for Electric Motors on Motor-Operated Valves (Ref. 3), provides guidance for sizing thermal overloads, and references IEEE 741-2007, Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations, as providing a methodology for MOV TOL sizing. Annex B of IEEE 741-2007 (2017) explains the use of the I^2t methodology for TOL sizing.

The previous station TOL sizing methodology is established in the design calculation for Motor Control Circuit Protection. This methodology stated:

TOL trip point is then determined such that:

A) When carrying Full Load Amps (FLA) times the service factor, the TOL will not trip in a time period less than three times the stroking time of the MOV.
B) When carrying Locked Rotor Amps (LRA), the TOL should trip in a time within the motor's limiting time for carrying LRA.

If it is not possible to achieve both Criterion A and B due to the TOL characteristics, then Criterion B can be relaxed. Criterion A will not be compromised for any reason.

IEEE 741-2007 (2017) Annex B recommends using the I^2t methodology for selection of TOL relays. A design change revised the calculation in order to use the I^2t methodology for the block start MOV TOLs. The TOL sizing methodology for the block start MOVs in design calculation for Motor Control Circuit Protection, was revised to include the following criteria:

> In addition, for block start MOVs, the trip setpoint shall be determined to ensure that the thermal overload relay will not trip during a degraded voltage condition coincident with an accident signal, and subsequent restart from the Diesel Generator.

A design change approved replacing the TOL heaters for block start MOVs with heaters sized using this new criteria, which results in the installation of larger heaters. In addition, that design change approved replacing the 4.16 kV Bus 5 and 6 degraded voltage time delay relays, and decreasing the setpoint from a nominal 10 seconds (10.96 seconds allowable value) to 6 seconds (6.72 seconds allowable value). The larger TOL heaters together with the decreased time delay setpoint, will prevent inadvertent tripping following an SI during a degraded voltage condition.

2.4 Description of the Proposed Change

The 4.16 kV Bus 5 and 6 Degraded Voltage functional unit, Table 3.3-4, Engineered Safety Features Actuation System Instrumentation Setpoints will be revised for a trip set point of *"≥ 3933 volts with a ≤ **6** second time delay"* and an allowable value of *"≥ 3902 volts with a ≤ **6.72** second time delay"*.

3.0 TECHNICAL EVALUATION

3.1 4.16 kV Bus 5 and 6 Degraded Voltage Time Delay Relay Setpoint:

UFSAR Section 8.3.1.1b.4(b) describes the 4.16 kV Bus 5 and 6 second level undervoltage protection scheme as follows: If the voltage on a 4.16-kV emergency bus is below that required to ensure the continued operation of safety-related equipment, the second level undervoltage protection scheme is activated. If the activation occurs coincidentally with an accident signal, then the UAT and RAT incoming line breakers are automatically tripped after a time delay to prevent spurious operation due to transients such as starting of large motors.

The 4.16 kV Bus 5 and 6 degraded voltage time delay relay setpoint should be of a limited duration such that the permanently connected Class 1E loads are not damaged or become unavailable due to protective device actuation. If the voltage has not recovered following the time delay, the bus is disconnected from offsite power. Protective devices for connected Class 1E loads should be evaluated to ensure that spurious tripping does not occur during this time delay period. Consideration should also be given for restarting/reaccelerating the loads, should transfer to the emergency diesel generators be required.

The 62D time delay relay setpoint shall be selected to ensure that (a) the minimum time delay is greater than the block start 4kV motor loads maximum start times (4.5 seconds), (b) the maximum time delay is less than the 7 seconds minimum trip time criteria used for sizing of the block start MOV TOL heaters.

During the 2019 DBAI inspection it was identified that in the event of a SI signal during a degraded voltage condition between the DVR allowable value of 3902V and the loss of voltage relay allowable value of 2908V, the block start MOV motors may experience a stalled condition causing the motors to draw locked rotor current. It was determined that the TOL trip time for each MOV when operating at locked rotor current ranged from 2.4 seconds to 7.0 seconds. In order to ensure the block start MOVs do not trip during a SI with a degraded voltage condition, the MOV TOL heaters will be replaced with larger heaters sized for a minimum trip time of 7.0 seconds. Coincident with the TOL heater replacement, the 62D time delay relay setpoint will be changed from 10.0 seconds to 6.0

seconds to ensure that the station buses are disconnected from the degraded voltage condition prior to tripping of the block start MOV TOLs. Based on the calculated maximum time that the buses would be subjected to a degraded voltage condition coincident with a safety injection signal of 6.787 seconds (6.72 seconds allowable value + 0.067 second undervoltage relay time delay), the block start MOVs will not trip in the event of a SI during a degraded voltage condition.

The previous time delay setpoint of 10.0 seconds is used within design calculation for Control Circuit Voltage Drop, to evaluate a fuse concern during degraded voltage conditions, and as such, creates a limiting condition for the time delay relay setpoint. The current time delay setpoint of 6.0 seconds is conservative with respect to that evaluation. The design calculation has been revised to acknowledge the revised 62D time delay relay setpoint of 6.0 seconds, but retains the analysis of the previous 10 second time delay relay setpoint as conservative.

3.2 Block Start Motor Capability:

The block start MOV TOL heaters are replaced by a design change with larger heaters, which are sized with a minimum trip time of 7 seconds. The 4.16 kV Bus 5 and 6 degraded voltage time delay relay (62D) setpoint will be decreased from nominal 10 seconds (9.04 to 10.96 seconds) to nominal 6 seconds (5.28 to 6.72 seconds). This will ensure that the MOV TOLs will not trip because they are sized for a minimum trip time of 7 seconds.

The degraded voltage time delay must be chosen to ensure large motors can start following the Safety Injection (SI). The 4 kV motors that start on a SI signal are listed in design calculation. This table includes CS-P-2A/B, SI-P-6A/B, RH-P-8A/B, and FW-P-37B. Motor data sheets were reviewed to ensure these motors would start in less than the 5.28 second minimum degraded voltage time delay. The start times for these motors at a degraded voltage are as follows:

SI-P-6A/B: 4.5s at 70%V
CS-P-2A/B: 3.9s at 70%V
RH-P-8A/B: 2.3s at 80%V
FW-P-37B: 3.4s at 80%V

Therefore, the minimum 5.28 second time delay is adequate to ensure 4 kV motors have enough time to start and accelerate to rated speed.

Design calculations were reviewed to determine if existing protective relay settings are adequate to ensure 4 kV motors will not trip when starting at the loss of voltage relay allowable value of 2908V (72.7% rated motor voltage). FP52504 (Ref. 15) and FP52508 (Ref. 16) show the motor acceleration curves for the SI pump motors and CS pump motors at 70% rated voltage. Comparison of these curves with the trip curves in Calculation 9763-3-ED-00-23-F, "Medium Voltage Protection Relay Coordination" (Ref. 6), shows that these motors will not trip when starting at 70% rated voltage. Design calculation shows the motor acceleration curves for the RH pump motors and EFW pump motor at 80% voltage. Although motor acceleration curves are not available to show motor starting at 70% voltage, a qualitative review of design calculation shows that there is sufficient margin to ensure that these motors will not trip when starting at 2908V.

According to Limitorque Bulletin LM-77 (Ref. 5), the thermal overload for MOVs should be selected to ensure the motor will trip the overload device while at locked rotor current within 10 seconds for AC motors. The revised MOV TOL sizing will not ensure that the motors will trip within 10

seconds, and therefore, the motors may be damaged during a locked rotor condition. However, consistent with RG 1.106, motor protection is secondary to assurance that the valves will be capable of performing their safety function. By reducing the degraded voltage time delay relay setpoint from nominal 10 seconds to 6 seconds, the valve motors would not be subjected to locked rotor current for greater than 6.91 seconds (6.72 seconds allowable value + 0.067 second delay for the undervoltage relay + 0.04 second for the emergency power sequencer + 0.083 second breaker interrupting time). Therefore, they would not be damaged following an SI during a degraded voltage condition before they are powered from the diesel generator.

3.3 CONCLUSIONS

Replacing the 4.16 kV Bus 5 and 6 degraded voltage time delay relay, and revising the nominal time delay setpoint from 10 seconds to 6 seconds is necessary in order to ensure station block start MOVs do not trip for a degraded voltage condition coincident with an accident signal. A nominal 6 second time delay is acceptable in order to ensure adequate time is available for blocking actuation of the degraded voltage protection scheme during motor starting and transient voltage conditions. This change is currently scheduled for the next station refueling outage OR20. Therefore, Technical Specifications Table 3.3-4, Engineered Safety Features Actuation System Instrumentation Trip Setpoints, must be revised in order to reflect the new time delay relay setpoint and allowable value.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

General Design Criterion 17, "Electric Power Systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10CFR50 Licensing of Production and Utilization Facilities" requires that power is available following a loss of coolant accident (LOCA) to assure that core cooling, containment integrity, and other vital safety functions are maintained.

UFSAR Section 8.1.5.3 states that the design of the electric power system is in conformance with Regulatory Guide RG 1.106, "Thermal Overload Protection for Electric Motors on Motor Operated Valves".

UFSAR Section 8.1.5.2 states that the design of the electric power systems is in conformance with IEEE 741-1986. However, use of this standard is limited to Subsection 5.4.3 for the protection of non-Class 1E circuits using containment penetration assemblies.

There are no new regulatory commitments made in this submittal.

4.2 Precedent

The NRC has approved similar license amendments that revised the degraded voltage time delay relay setpoint:

- Nine Mile Point Nuclear Generating Station, Unit 1, Amendment No. 217 (ML15043A270)
- Shearon Harris Nuclear Power Plant, Unit 1, Amendment 143 (ML13297A307)

4.3 No Significant Hazards Consideration

NextEra Energy Seabrook has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10CFR50.92, "Issuance of amendment," as discussed below:

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

Response: No

The proposed amendment revises the 4.16 kV Bus 5 and 6 degraded voltage relay (62D) setpoint and allowable value in Technical Specifications Table 3.3-4, Engineered Safety Features Actuation System Instrumentation Trip Setpoints. This change affects the second level undervoltage protection scheme, which ensures protection and operation of accident loads by automatically tripping the Unit Auxiliary Transformer (UAT) and Reserve Auxiliary Transformer (RAT) incoming line breakers in the event of a degraded voltage condition coincident with an accident signal. The design function of the 62D relay is to block actuation of the degraded voltage protection scheme during transient voltage disturbances and motor starting conditions. By revising the time delay setpoint, this design function is not impacted, and this change is not an accident initiator. The revised time delay setpoint is an adequate duration to block actuation of the degraded voltage protection scheme during motor starting and transient voltage conditions. The revised time delay is also short enough in duration to protect the block start MOVs and prevent tripping. The technical evaluation included as part of this submittal explains that this setpoint change in conjunction with the installation of larger TOL heaters for block start MOVs, will ensure the availability of the block start MOVs to perform their safety function in the event of a degraded voltage condition concurrent with an accident signal.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

Does the proposed amendment create the possibility of a new or different kind of accident from any previously evaluated?
Response: No

The proposed amendment revises the 4.16 kV Bus 5 and 6 degraded voltage relay setpoint and allowable value in Technical Specifications Table 3.3-4, Engineered Safety Features Actuation System Instrumentation Trip Setpoints. The proposed change to revise the 4.16 kV Bus 5 and 6 degraded voltage time delay relay setpoint is not an accident initiator. The proposed change does not involve a physical alteration to the plant (i.e. no new or different type of equipment will be installed) or a change in the methods for operating the plant. There are no new failure modes introduced as a result of this change. There is no impact to the design function of 4.16 kV Bus 5 and 6 second level undervoltage protection scheme, and there is no change to how any components are operated. The 4.16 kV Bus 5 and 6 degraded voltage time delay relays remain capable of performing the intended design

function of blocking actuation of the degraded voltage protection scheme during motor starting and transient voltage conditions, as well as, ensuring the safety function of the block start MOVs.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

Response: No.

Technical Specifications Surveillance Requirement 4.8.1.1.2.f requires verification that during a loss-of-offsite power in conjunction with an SI actuation, the emergency diesel generators start from standby conditions and energize emergency buses within 10 seconds. Revising the 4.16 kV Bus 5 and 6 degraded voltage time delay relay setpoint from 10 seconds to 6 seconds does not impact this capability. This reduction in time delay is conservative with regards to the UFSAR Chapter 15 Accident Analyses. By revising the degraded voltage time delay relay setpoint, this change will resolve an identified concern regarding block start MOV availability in the event of a degraded voltage condition coincident with an accident signal.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, NextEra Energy Seabrook concludes that the proposed amendment presents no significant hazards considerations under the standards set forth in 10CFR50.92(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

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10CFR20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types of 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 amendment meets the eligibility criterion for categorical exclusion set forth in 10CFR51.22(c)(9). Therefore, pursuant to 10CFR51.22(b),

no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

1. Technical Specifications Table 3.3-4, Engineered Safety Features Actuation System Instrumentation Trip Setpoints
2. NRC Regulatory Issue Summary RIS-2011-12, Adequacy of Station Electric Distribution System Voltages
3. Regulatory Guide RG 1.106, Thermal Overload Protection for Electric Motors on Motor-Operated Valves
4. IEEE 741-2007, IEEE Standard for Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations
5. Limitorque Bulletin LM-77
6. Calculation 9763-3-ED-00-23-F, Medium Voltage Protective Relay Coordination and Miscellaneous Relay Settings
7. Calculation 9763-3-ED-00-28-F, Motor Control Circuit Protection
8. Calculation 9763-3-ED-00-66-F, Control Circuit Voltage Drop
9. Calculation SBC-128, Technical Specifications – Setpoints and Allowable Values
10. EC 293173, Replacement TOL Heaters for Block Start MOVs
11. FP21423, Emergency Feedwater Pump Motor Data Sheets
12. FP52767, RHR Pump Motor Outline Drawing
13. FP57380, AC Motor Frame Outline (SI Pump)
14. FP57381, AC Motor Frame Outline (CS Pump)
15. FP52504, Safety Injection Pump Motor Thermal Limit Curve
16. FP52508, Centrifugal Charging Pump Motor Thermal Limit Curve

Attachment 1

Markup of the Technical Specification

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
9. Loss of Power (Start Emergency Feedwater)					
a. 4.16 kV Bus E5 and E6 Loss of Voltage	N.A.	N.A.	N.A.	≥ 2975 volts with a ≤ 1.20 second time delay.	≥ 2908 volts with a ≤ 1.315 second time delay.
b. 4.16 kV Bus E5 and E6 Degraded Voltage	N.A.	N.A.	N.A.	≥ 3933 volts with a ≤ ~~10~~ 6 second time delay.	≥ 3902 volts with a ≤ ~~10.96~~ 6.72 second time delay.
Coincident with: Safety Injection	See Item 1. above for all Safety Injection Trip Setpoints and Allowable Values.				
10. Engineered Safety Features Actuation System Interlocks					
a. Pressurizer Pressure, P-11	N.A.	N.A.	N.A.	≤ 1950 psig	≤ 1962 psig
b. Reactor Trip, P-4	N.A.	N.A.	N.A.	N.A.	N.A.
c. Steam Generator Water Level, P-14	See Item 5. above for all Steam Generator Water Level Trip Setpoints and Allowable Values.				