UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 25, 2021

Mr. Don Moul
Executive Vice President, Nuclear Division
and Chief Nuclear Officer
Florida Power & Light Company
NextEra Energy Seabrook, LLC
Mail Stop: EX/JB
700 Universe Blvd.
Juno Beach, FL 33408

SUBJECT: SEABROOK STATION, UNIT NO. 1 – ISSUANCE OF AMENDMENT NO. 168 RE: CHANGING TIME DELAY SETPOINTS FOR DEGRADED VOLTAGE RELAYS (EPID L-2020-LLA-0012)

Dear Mr. Moul:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 168 to Renewed Facility Operating License No. NPF-86 for Seabrook Station, Unit No. 1. This amendment consists of changes to the Technical Specifications in response to your application dated January 24, 2020, as supplemented by letters dated May 20, 2020, and August 20, 2020.

The amendment revised the trip setpoint and allowable value for the degraded voltage time delay relays for Functional Unit 9.b, "4.16 kV [kiloVolt] Bus E5 and E6 Degraded Voltage."

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's monthly *Federal Register* notice.

Sincerely,

/RA/

Justin C. Poole, Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosures:
1. Amendment No. 168 to NPF-86
2. Safety Evaluation

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

NEXTERA ENERGY SEABROOK, LLC, ET AL.*

DOCKET NO. 50-443

SEABROOK STATION, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 168
License No. NPF-86

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment filed by NextEra Energy Seabrook, LLC, dated January 24, 2020, as supplemented by letters dated May 20, 2020, and August 20, 2020, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

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*NextEra Energy Seabrook, LLC, is authorized to act as agent for the: Hudson Light & Power Department, Massachusetts Municipal Wholesale Electric Company, and Taunton Municipal Lighting Plant and has exclusive responsibility and control over the physical construction, operation, and maintenance of the facility.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-86 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 168, are incorporated into the Renewed Facility Operating License No. NPF-86. NextEra Energy Seabrook, LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 90 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

James G. Danna

Digitally signed by James G. Danna
Date: 2021.02.25 09:25:38 -05'00'

James G. Danna, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility Operating License and Technical Specifications

Date of Issuance: February 25, 2021

ATTACHMENT TO LICENSE AMENDMENT NO. 168

SEABROOK STATION, UNIT NO. 1

RENEWED FACILITY OPERATING LICENSE NO. NPF-86

DOCKET NO. 50-443

Replace the following page of Renewed Facility Operating License No. NPF-86 with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove	Insert
3	3

Replace the following page of the Appendix A, Technical Specifications, with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove	Insert
3/4 3-28	3/4 3-28

(3) NextEra Energy Seabrook, LLC, pursuant to the Act and 10 CFR Part 70, to receive, possess, and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as supplemented and amended;

(4) NextEra Energy Seabrook, LLC, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use at any time any byproduct, source, and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(5) NextEra Energy Seabrook, LLC, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source, or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(6) NextEra Energy Seabrook, LLC, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility authorized herein.

(7) DELETED

C. This renewed license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

NextEra Energy Seabrook, LLC, is authorized to operate the facility at reactor core power levels not in excess of 3648 megawatts thermal (100% of rated power).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 168, are incorporated into the Renewed Facility Operating License No. NPF-86. NextEra Energy Seabrook, LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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 ≤ 6 second time delay.	≥ 3902 volts with a ≤ 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.				

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 168 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-86

NEXTERA ENERGY SEABROOK, LLC

SEABROOK STATION, UNIT NO. 1

DOCKET NO. 50-443

1.0 INTRODUCTION

By letter dated January 24, 2020, as supplemented by letters dated May 20, 2020, and August 20, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML20027A239, ML20142A204, and ML20233A810, respectively), NextEra Energy Seabrook, LLC (NextEra, the licensee) submitted License Amendment Request (LAR) No. 19-03, requesting changes to the Technical Specifications (TSs) for Seabrook Station, Unit No. 1 (Seabrook). Specifically, the LAR proposed to revise the trip setpoint and allowable value for the degraded voltage time delay relays for Functional Unit 9.b, "4.16 kV [kiloVolt] Bus E5 and E6 Degraded Voltage."

The supplemental letters dated May 20, 2020, and August 20, 2020, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on March 24, 2020 (85 FR 16684).

2.0 REGULATORY EVALUATION

2.1 System Description and Background

System Description

Seabrook is a single-unit nuclear power plant with only Unit 1 constructed and operable. In accordance with Updated Final Safety Analysis Report (UFSAR) Section 8.2.1.3, Seabrook has three electrical connections to its 345-kV switching station. One is from the main generator through three single-phase generator step-up transformers to the switching station, and the other two are from each of the two reserve auxiliary transformers to the switching station. The main generator is connected to the generator step-up transformers and to the two unit auxiliary transformers through a generator circuit breaker.

In accordance with UFSAR Section 8.3.1, the secondary side of each unit auxiliary transformer and each reserve auxiliary transformer has two windings with one connected to the plant's 13.8-kV Distribution System, and the other connected to the plant's 4.16-kV Distribution System. The 13.8-kV Distribution System has two buses which supply non-safety-related loads with each bus connected to a different unit auxiliary transformer and reserve auxiliary transformer separately.

The 4.16-kV Distribution System consists of four buses with two being fully redundant Class 1E emergency buses E5 (Train A) and E6 (Train B) and two being non-safety-related buses 3 and 4. Per UFSAR Figure 8.3-1, bus E5 and bus 3 are connected by separate connections to a different unit auxiliary transformer and different reserve auxiliary transformer than bus E6 and bus 4 although with similar connections. The Class 1E buses E5 and E6 supply fully redundant trains of engineering safety feature loads. A dedicated emergency diesel generator (EDG) for each Class 1E bus provides a standby power source.

In accordance with UFSAR Section 8.3.1.1.c.5, the 480-volt (V) load centers, 460-V motor control centers, and distribution panels which supply power to engineering safety feature loads or reactor protection systems are all Class 1E and located in seismic Category I structures. In accordance with UFSAR Section 8.3.1.1.g, motor-operated valves (MOVs) are connected to motor control centers. In accordance with UFSAR Section 8.3.1.1.g.2, for short-time rated motors such as MOVs, the trip setpoint is determined by establishing the values for motor nameplate full load and locked rotor current, thermal time limit for carrying locked rotor current, and the actual stroking time of the MOV. The motor trip set point is then determined as stated in UFSAR Section 8.3.1.1.g.2 for when the motor is carrying either full-load current or locked rotor current.

In accordance with UFSAR Section 8.3.1.1.b.4 and current TS Table 3.3-4, each Class 1E 4.16-kV bus is provided with two levels of undervoltage protection: (1) loss of voltage relays and (2) degraded voltage relays. The loss of voltage relays actuate at a lower trip setpoint of 2975 V (71.5 percent rated bus voltage) than the degraded voltage relays which actuate at a trip setpoint of 3933 V (94.5 percent rated bus voltage). Each loss of voltage relay has a faster time setting (1.2 seconds) than a degraded voltage relay (10 seconds) to enable degraded bus voltage to be restored more quickly to its nominal level. The loss of voltage and degraded voltage relays initiate at the reduced bus voltages stated above, but when activated, each initiates a time delay relay which provides the required time delay for the associated loss of voltage and degraded voltage function. The degraded voltage protection is primarily to ensure the continued operation of safety-related equipment. If an accident signal is coincident with degraded voltage relay actuation, the incoming bus breakers trip, bus loads shed, and the respective EDG starts after a time delay. Degraded voltage relay activation with no accident signal only results in an alarm with the operators taking the required actions.

The degraded voltage time delay setpoint of the 4.16-kV buses E5 and E6 is limited to protect the Class 1E loads from being damaged or unavailable due to protective device actuation. When the voltage has not recovered within the time delay settings, the buses are disconnected from offsite power. Therefore, to ensure that spurious tripping does not occur during this time delay period, the protective devices for connected Class 1E loads are evaluated. The reference to the 62D relay throughout the remainder of this safety evaluation will be to each degraded voltage relay's time delay.

Background

The current Seabrook TS Table 3.3-4 lists 4.16-kV Bus E5 and E6 degraded voltage time delay relay trip setpoint as ≤ 10 seconds, and the allowable value as ≤ 10.96 seconds.

In the LAR, the licensee indicated that the 2019 NRC Design Bases Assurance Inspection (DBAI) report (ADAMS Accession No. ML19184A010) identified an issue relating to "Survivability of Equipment during a Postulated Design Basis Accident Coincident with Degraded Offsite Power System Voltage." In the LAR, the licensee stated that the inspection identified that "the current 10.96 second time delay for a degraded voltage condition concurrent with an accident signal (SI [safety injection]), the overcurrent protective devices for the [MOVs] may trip while powered from offsite power, thereby preventing subsequent MOV operation on the emergency diesel generators (EDG)." The licensee specified that in the event of an SI occurring when the bus voltage is at or below the degraded voltage relay setpoint, but above the loss of voltage relay setpoint, operation of the motor operated valves may result in the valve motor to draw locked rotor current. The licensee's Engineering Change 293173 approved replacing the thermal overload (TOL) relay heaters for the motor operated valves that operate on an SI signal with resized TOL relay heaters of a larger size. The Engineering Change 293173 also approved replacing the degraded voltage time delay relay (62D). To avoid the MOVs tripping during the time delay following an SI signal concurrent with a degraded voltage condition, the setpoints of the time delay relay (62D) are proposed to be decreased from a nominal 10 seconds to a nominal 6 seconds.

In the LAR, the licensee proposed to revise the trip setpoint and allowable value of the Functional Unit 9.b, "4.16 kV Bus E5 and E6 Degraded Voltage," in Table 3.3-4. The licensee stated, in part:

> 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 [relay] heaters.
>
> …
>
> 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 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.

In its supplemental letter dated May 20, 2020, the licensee indicated that the time delay relay has a design response time allocation of < 4 cycles (or approximately 0.067 seconds).

In the LAR, the licensee indicated that, while evaluating the above scenario, it reviewed and applied documents including: NRC Regulatory Issue Summary (RIS) 2011-12, Revision 1, "Adequacy of Station Electric Distribution System Voltages," dated December 29, 2011 (ADAMS Accession No. ML113050583); Regulatory Guide (RG) 1.106, Revision 1, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves," dated March 1977; and the Institute of Electrical and Electronics Engineers (IEEE) Standard 741-2007, "Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations," Annex B I^2t methodology for TOL relay sizing. Utilization of the I^2t methodology was a change from the method used in the previous design calculation.

2.2 Description of Proposed Changes

The LAR proposed to revise the trip setpoint and allowable value for the degraded voltage time delay relays for Functional Unit 9.b, "4.16 kV Bus E5 and E6 Degraded Voltage," in TS Table 3.3-4, "Engineered Safety Features Actuation System Instrumentation Trip Setpoints," for Seabrook. The proposed modification is shown below:

Functional Unit 9.b	Trip Setpoint	Allowable Value
Current	≥ 3933 volts with a ≤ **10** second time delay	≥ 3902 volts with a ≤ **10.96** second time delay
Proposed	≥ 3933 volts with a ≤ **6** second time delay	≥ 3902 volts with a ≤ **6.72** second time delay

2.3 Regulatory Requirements and Guidance

The NRC staff applied the following regulatory requirements and guidance in reviewing the licensee's application:

The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36, "Technical specifications," requires, in part, that each license authorizing operation of a utilization facility include TSs. The regulation at 10 CFR 50.36(c) requires that TSs include items in specific categories, including: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; and (5) administrative controls.

The regulation at 10 CFR 50.36(c)(1)(ii)(A) states that limiting safety system settings are settings for automatic protective devices related to those variables having significant safety functions. Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded.

The regulation at 50.36(c)(3), "Surveillance requirements," states that, "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

General Design Criterion (GDC) 13, "Instrumentation and control," in Appendix A to 10 CFR Part 50 states, "Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges."

GDC 17, "Electric power systems," 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 safety function for each system … shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents. 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."

The guidance in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition," Chapter 8, Branch Technical Position (BTP) 8-6, "Adequacy of Station Electric Distribution System Voltages," Revision 3, dated March 2007 (ADAMS Accession No. ML070710478) (preceded by BTP PSB-1, Revision 2, dated July 1981 (ADAMS Accession No. ML052350520)), states that TSs should include limiting conditions for operation, surveillance requirements, trip setpoints, and maximum and minimum allowable values for loss of voltage relays, degraded voltage relays, and associated time delay devices.

RG 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation," dated December 1999 (ADAMS Accession No. ML993560062), describes a method acceptable to the NRC staff for complying with the NRC's regulations for ensuring that setpoints for safety-related instrumentation are initially within and remain within the technical specification limits. RG 1.105 endorses Part I of Instrument Society of America[1] (ISA)-S67.04-1994, "Setpoints for Nuclear Safety-Related Instrumentation." The NRC staff used this guidance to establish the adequacy of the licensee's setpoint calculation methodologies and the related plant surveillance procedures. Section 4.4, "Combination of Uncertainty," of ISA-S67.04-1994 states that the methods in Subsection 4.4.1, "Square-Root-Sum-of-Squares (SRSS) method," and in Subsection 4.4.2, "Algebraic methods," are acceptable for combining random and non-random uncertainties, respectively. This section also states that the alternate methods, including probabilistic or stochastic modeling, or a combination of SRSS and algebraic methods may also be used.

RG 1.106, Revision 2, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves," dated February 2012, recommends setting the TOL relay protective devices for MOVs per the guidance provided in Annex B of IEEE Standard 741-2007.

RIS 2011-12, Revision 1, clarifies voltage studies necessary for degraded voltage relay (second-level undervoltage protection) setting bases and transmission network/offsite/station electric power system design bases for meeting the regulatory requirements specified in GDC 17. The RIS states, in part:

> Licensee voltage calculations should provide the basis for their DVR [degraded voltage relays] settings, ensuring safety-related equipment is supplied with

[1] In 2008, the name of this organization was changed to the International Society of Automation.

adequate voltage (dependent on equipment manufacturers design requirements), based on bounding conditions for the most limiting safety-related load (in terms of voltage) in the plant.

RIS 2006-17, "NRC Staff Position on the Requirements of 10 CFR 50.36, 'Technical Specifications,' Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels," dated August 24, 2006 (ADAMS Accession No. ML051810077), discusses issues that could occur during testing of limiting safety system settings and which, therefore, may have an adverse effect on equipment operability. The RIS also represents an approach that is acceptable to the NRC staff for addressing as-found and as-left tolerance limits for use in licensing actions.

3.0 TECHNICAL EVALUATION

3.1 4.16 kV Bus E5 and E6 Degraded Voltage Relay Time Delay Setting Criteria

In the LAR, the licensee summarized the following bases for revising the time delay settings for the degraded voltage relays.

- The degraded voltage relay time delay setpoint for buses E5 and E6 should be of a limited duration to:
  - not damage connected Class 1E loads at degraded voltage conditions
  - prevent the unavailability of Class 1E loads due to actuation of their protective devices
  - promptly disconnect a bus from offsite power if bus voltage does not recover after the degraded voltage relay time delay
- The degraded voltage relay time delay setpoint should also ensure that:
  - the minimum time delay is greater than the block starting times of 4 kV motor loads
  - the maximum time delay is less than the minimum trip time for TOL relays for block start MOVs
- In its supplemental letter dated May 20, 2020, in response to NRC staff request for additional information (RAI) #2, the licensee stated that the revised degraded voltage relay time delay setpoint must also meet the following criteria:
  - shall not exceed the maximum time delay assumed in the UFSAR accident analysis
  - shall be of sufficient duration to prevent disconnection from the preferred power source during grid transients and 4 kV motor starts
  - TOL relays for block start MOVs shall not trip in case of an SI signal coincident with a degraded voltage condition

The NRC staff finds that the above criteria for selecting the degraded voltage relay's time delay meet the intent of regulatory guidance documents BTP 8-6 and RIS 2011-12 and, therefore, are acceptable.

3.2 TOL Relay Heater Sizing Calculation for Block Start of MOVs

The NRC staff notes that per general industry practice, the most commonly used device for low voltage motors' overload protection is a TOL relay. A motor winding's temperature is simulated by a temperature rise in a TOL relay's heating element, which varies with motor current. A motor's overload current can cause excessive heating of the motor winding and the in-series TOL relay's heating element resulting in TOL relay activation and disconnection of power to the motor.

In the LAR, the licensee stated that the previous sizes of TOL heaters (heater elements are part of TOL relays) for block start MOVs heaters were based on the following criteria:

A When carrying full-load current (FLA) multiplied by the service factor (SF), the TOL relay will not trip in a time period less than three times the stroking time of the MOV.

B When carrying locked rotor current (LRA), the TOL relay should trip in a time within the motor's limiting time for carrying locked rotor current.

If it is not possible to achieve both A and B due to the TOL relay characteristics, then Criterion B can be relaxed.

In its supplemental letter dated May 20, 2020, in response to NRC staff RAI #1, the licensee stated that Annex B of IEEE 741-2007 recommends using the I^2t methodology for selection of TOL relays. The licensee used the I^2t methodology to revise TOL relay sizes for block start MOVs. The TOL relay sizing methodology for the block start MOVs (in Calculation 9763-3-ED-00-28-F, Motor Control Circuit Protection) was revised by the licensee under 10 CFR 50.59, "Changes, tests, and experiments," to include the following additional criteria:

C When carrying locked rotor current applicable to a degraded voltage condition, the TOL relay shall not trip in less than the maximum time for grid separation due to degraded voltage.

D After carrying locked rotor current applicable to the degraded voltage condition for the time interval described in Condition C, the TOL relay shall not trip for a time period less than three times the MOV stroking time while carrying full-load current times the service factor.

When not possible to achieve Criteria A through D due to TOL relay characteristics, Criterion B can be relaxed. Criteria A, C, and D will not be compromised.

In its supplemental letter dated May 20, 2020, in response to NRC staff RAI #1, the licensee stated that the following steps were followed for TOL relay sizes for block start MOVs to meet the above criteria:

- The desired heater amps (DHA) is calculated: LRA / (Z x 1.25) = DHA.

[Note: Z is the minimum multiple of LRA at desired Trip Time (e.g., 7 seconds, as indicated in Attachment 1 to the supplemental letter dated May 20, 2020)].

- The TOL relay heater size is selected with DHA within minimum and maximum current range of TOL [relay], and the actual heater trip current (Y) is calculated: Minimum Heater Current x 1.25 = Y.
- LRA in multiples of actual heater trip current is calculated: LRA / Y.
- The LRA in multiples of actual heater trip current is then compared to the time current curve for the TOL relay, and the actual LRA minimum and maximum trip times are determined.
- The actual LRA maximum trip time is compared to Criterion B to determine if the TOL [relay] size chosen meets this criterion.
- The actual LRA minimum trip time is compared to Criterion C to determine if the TOL [relay] size chosen meets this criterion.
- The FLA in multiples of actual heater trip current is calculated: FLA x SF / Y.
- The FLA in multiples of actual heater trip current is then compared to the time current curve for the TOL relay, and the actual FLA trip time is determined.
- The actual FLA trip time is compared to Criterion A to determine if the TOL [relay] size chosen meets this criterion.

The successful completion of the above steps verifies that Criteria A, B, and C are met for a given TOL relay and MOV motor. To ensure that Criterion D is met, the following additional steps are completed:

- The total stroke series duration is determined for the valve. This includes the sum of time to disconnect from the grid, inrush and three times the valve full stroke time.
- From TOL [relay] minimum curve the multiple of actual heater trip current is determined at total stroke time duration.
- TOL [relay] Trip current at total stroke time duration is determined by multiplying the multiplier from the step above and actual heater trip current.
- The TOL [relay] trip value I^2t is calculated by multiplying the TOL trip current squared by the valve total stroke series duration.
- The grid disconnect time I^2t is calculated by multiplying the LRA at 90 percent voltage squared by 7 seconds.
- The valve stroke I^2t is calculated by adding the LRA squared multiplied by 1 second with the FLA squared multiplied by 3 times the valve stroke time.

- The total I^2t is calculated by adding the valve stroke I^2t and the grid disconnect I^2t. The total I^2t is then compared to the TOL [relay] trip I^2t value to determine if the TOL [relay] size chosen meets the acceptance Criterion D.

In Attachment 1 to its supplemental letter dated May 20, 2020, the licensee showed in the calculational data sheets that the meeting of the four criteria was obtained through a trial-and-error basis since each comparison between calculation results and criterion was either affirmed or not. Based on that, the NRC staff determined that the above process was repeated until the results for a TOL relay showed that at least the three Criteria A, C, and D were met for a specific MOV motor. The NRC staff finds that the four criteria themselves were logically developed in order to produce the desired results, and that the licensee methodically went through the above logical and proper steps to meet at least Criteria A, C, and D for sizing TOL relays for safety-related MOVs as discussed above.

In Section 3.1 of this safety evaluation, the licensee's criteria for selecting the time delay setting for the degraded voltage relays are presented with the item "the maximum time delay is less than the minimum trip time for TOL relays for block start MOVs" being the most important to MOVs. In its supplemental letter dated May 20, 2020, in response to NRC staff RAI #3, the licensee stated that these MOV motors would not be subjected to LRA for greater than 6.91 seconds. Since the TOL relays' tripping times at LRA (minimum 7 seconds, as discussed in Section 2.1 of this safety evaluation) are greater than the maximum time that the MOV motors will be subjected to LRA (6.91 seconds) for a concurrent SI signal and degraded voltage condition, the NRC staff finds that the revised TOL relays selected for block start MOVs will perform their intended function. The NRC staff also confirms that the revised TOL relays will also continue to meet the intent of RG 1.106.

3.3 Degraded Voltage Relay's Minimum Allowable Trip Time to Permit Block Start of 4 kV Motors

In the LAR, the licensee stated that the 4.16 kV buses E5 and E6 degraded voltage relay's time delay setpoint would be decreased from a nominal 10 seconds to a nominal 6 seconds.

In its supplemental letter dated May 20, 2020, in response to NRC staff RAI #2, the licensee stated that the degraded voltage relay's time delay shall be of sufficient duration to prevent disconnection from the preferred power source during grid transients and 4 kV motor starts.

The degraded voltage time delay value was selected to ensure that large motors can start following an SI signal. The licensee stated that, based on Calculation 9763-3-ED-00-02-F, "Voltage Regulation Study," the following 4 kV motors will start on an SI signal, and the start times for these motors at a degraded voltage condition will be as follows:

- Safety Injection Pumps - SI-P-6A/B: 4.5 seconds at 70 percent V
- Containment Spray Pumps - CS-P-2A/B: 3.9 seconds at 70 percent V
- Residual Heat Removal Pumps - RH-P-8A/B: 2.3 seconds at 80 percent V
- Emergency Feedwater Pump - FW-P-37B: 3.4 seconds at 80 percent V

The licensee stated that, based on the Calculation 9763-3-ED-00-23-F, "Medium Voltage Protective Relay Coordination & Miscellaneous Relay Set Points," and related documents, the above motors will not trip even when starting at the loss of voltage relay's allowable value of 2908 V. Therefore, they would not trip at the degraded voltage relay's lowest allowable value.

The degraded voltage relay's proposed time delay setpoint is a nominal 6.0 seconds in accordance with the LAR. In its supplemental letter dated May 20, 2020, in response to NRC staff RAI #3, the licensee stated that relay accuracy is 0.3 seconds, relay drift is 0.41 seconds, and measurement and test equipment accuracy is 0.01 seconds. The degraded voltage relay's minimum allowable value would therefore be 6.0 seconds minus (0.3 +0.41 +.01) seconds or 5.28 seconds.

As indicated above, the SI-P-6A/B motors have the longest starting time at reduced voltage of 4.5 seconds, which is below the degraded voltage relay's time delay proposed minimum allowable value of 5.28 seconds. Therefore, the NRC staff finds that the licensee has verified that 4 kV motors can start for an SI signal coincident with a degraded voltage condition and will not trip because the degraded voltage relay's time delay at even its minimum allowable setting of 5.28 seconds is greater than their longest starting times.

In its supplemental letter dated May 20, 2020, in response to NRC staff RAI #2, the licensee stated that the EDG start and loading time of 12 seconds was the original bounding assumption for the degraded voltage relay's current time delay setting of 10 seconds. The LAR's proposed degraded voltage relay time delay setting of nominal 6 seconds is conservative with respect to the Engineered Safety Features and Auxiliary Systems accident analysis time response as it is bounded by the original 10 second start time for the EDGs.

3.4 Trip Setpoint, Allowable Value, and As-Found and As-Left Tolerances for the Degraded Voltage Time Delay

Summary of Licensee's Methodology

The NRC staff reviewed the LAR and the summary of the calculations provided in the May 20, 2020, and August 20, 2020, RAI response letters and reviewed the assumptions and values in the licensee's references. The NRC staff confirmed the following with respect to the licensee's methodology:

- The licensee performed its analysis according to Seabrook UFSAR Section 6.3.3.4, stating that, "the total response time for the Safety Injection Signal with a loss of offsite power is 30 seconds" to ensure that "the allowable time delay, including margin, shall not exceed the maximum time delay that is assumed in the final safety analysis report (FSAR) accident analyses."

- The licensee also performed its analysis according to Limitorque Bulletin LM-77, stating that, "the thermal overload should be selected to ensure [that] the motor will trip the overload device while at locked rotor current within 10 seconds for AC motors" to satisfy that "[t]he time delay shall be of limited duration to prevent damage to valve actuator motors operating at locked rotor current (LRA) due to a degraded voltage condition."

- The licensee also used the 4 kV motors that start on an SI signal, which are listed in Table 8.4-1 in Calculation 9763-3-ED-00-02-F, "Voltage Regulation Study," to ensure that "[t]he time delay shall be of sufficient duration to prevent disconnection from the preferred power source during grid transients and 4 kV motor starts."

The licensee established the proposed relay allowable value (maximum time delay) by using the arithmetic sum of the relay accuracy, relay drift, and the Measurement and Test Equipment Accuracy (Assumed) resulting in an allowable value of 6.72 seconds.

NRC Staff's Evaluation

The NRC staff reviewed the LAR to verify that the licensee's setpoint calculation values are adequate to ensure that, with a high confidence level, the required protective actions will be initiated before the associated plant process parameter exceeds its analytical limit. The NRC staff also evaluated the licensee's establishment of the as-left and as-found tolerance limits used for monitoring the performance of the time delay relay during surveillances.

The NRC staff evaluated the proposed amendment using the criteria of RG 1.105, Revision 3, which endorses industry standard ISA-S67.04-1994, Part 1, to determine if setpoints for time delay of safety-related instrumentation are established and maintained within the TS limits. The following definitions, from ISA-S67.04-1994, were used in the staff's evaluation:

Analytical Limit (AL) – Limit of a measure or calculated variable established by the safety analysis to ensure that a safety limit is not exceeded.

Allowable Value (AV) – A limiting value that the trip setpoint may have when tested periodically, beyond which appropriate action shall be taken.

Trip Setpoint (TSP) – A predetermined value for actuation of the final setpoint device to initiate a protective action.

Additionally, Section 4.3.1 and Figure 1 of ISA-S67.04-1994 identify allowances for offsetting the trip setpoint from the AL, and for ensuring that the channel remains below the AV during periodic surveillances. For this safety evaluation, the following terms are used by the NRC staff to support its evaluation:

Trip Margin – an allowance provided between the trip setpoint and the analytical limit to ensure a trip before the analytical limit is reached.

- TSP Trip Margin is an allowance provided between the TSP and the AL (Region A in Figure 1 of ISA-S67.04-1994).

- AV Margin describes the remaining space between the Maximum AV and the AL that is observable during technical specification surveillances where the channel may be determined inoperable (Region C in Figure 1 of ISA-S67.04-1994)

The NRC staff independently confirmed whether there are adequate allowances for instrument channel performance uncertainty between the ALs and TSPs and associated AVs of time delay relay (for Functional Unit 9.b in TS Table 3.3-4) to satisfy the requirements of 10 CFR 50.36(c)(1)(ii)(A).

The licensee proposed to revise the trip setpoint and allowable value time delay of the new degraded voltage relays for Functional Unit 9.b, "4.16 kV Bus E5 and E6 Degraded Voltage," as follows:

	Existing	Proposed
TSP	≤ 10 seconds	≤ 6 seconds
AV	≤ 10.96 seconds	≤ 6.72 seconds

In its supplemental letter dated May 20, 2020, in response to NRC staff RAI #3, the licensee stated that the degraded voltage time delay relay pickup time must be greater than 4.5 seconds and less than 7 seconds. Therefore, a TSP of 6 seconds was chosen.

To ensure that relay pickup time, including tolerances, will occur between 4.5 and 7 seconds, the licensee used the arithmetic sum of the Relay Accuracy (RA), Relay Drift (RD), and Measurement and Test Equipment Accuracy (MTE) to establish the proposed AV as follows:

AV = TSP + (RA + RD + MTE)

Where:

The Relay Adjustable Range is 1.5 to 15 seconds (span: 13.5 seconds)
TSP = The relay trip setpoint is chosen to be 6.0 seconds
RA = Relay Accuracy of 5 percent (Reference Seabrook Document FP31123, 5 kV Metal Clad Switchgear Instruction Manual ((5/100) x 6 seconds))
RA = 0.30 seconds
RD = Relay Drift is assumed to equal 3 percent span ((3/100) x 13.5 seconds) (Consistent with original design).
RD = 0.41 seconds
MTE = Measurement and Test Equipment Accuracy (assumed)
MTE = 0.01 seconds

AV Upper Level = 6 seconds + (0.3 seconds + 0.41 seconds + 0.01 seconds)
= 6.72 seconds

This is the proposed AV Upper Level; the staff independent calculated the AV Lower Level as follows:

AV Lower level = 6 seconds - (0.3 seconds + 0.41 seconds + 0.01 seconds)
= 5.8 seconds

In its supplemental letter dated August 20, 2020, in response to NRC staff RAI #1, the licensee stated that although the vendor datasheet specifies a relay accuracy of 10 percent, the licensee set the relay accuracy as 5 percent of the setting based on previous vendor correspondence for Agastat time delay relays purchased as Class 1E. Station procedure LS0550.09, “Timing Relay Acceptance Testing and Maintenance Program,” requires verification that the relays meet the 5 percent accuracy. The NRC staff notes that successful results of implementing this acceptance test and maintenance procedure are required to enable the use of this relay. If the relays are shown to meet the 5 percent acceptance criteria, they may be used for this application and, therefore, this process is acceptable.

In its supplemental letter dated August 20, 2020, the licensee provided the ALs (Upper and Lower Levels) and AV and TSP (with ± As-Left and As-Found) of the Bus E5 and E6 (seconds) in the following table:

The Degraded Voltage Time Delay Bus E5 and E6 (Seconds)	
Upper AL	7
Upper AV	6.72
TSP	6
TSP + As-Found	6.15
TSP – As Found	5.85
TSP + As-Left	6.15
TSP – As-Left	5.85
Lower AL	4.5

The licensee described how it established the “As-Left” and “As-Found” tolerances, as follows:

> Bus 5 and 6 62D relay calibration is performed by station procedure LX0563.61, 4.16kV Bus Degraded Voltage Protection Channel Calibration and Relay PM. According to this procedure, if the as-found operate time of the 62D relay is not 5.85 to 6.15 seconds, technicians will adjust the relay as necessary to be within the acceptance criteria of 5.85 to 6.15 seconds. This acceptance criteria is chosen to be 50% of the relay accuracy of 0.3 seconds.

Therefore, the licensee has established the “As-Left” tolerance at +/-0.15 seconds.

> The relay drift for the previously installed Agastat 7012 PD was 1% of span (0.45 second). Therefore, the revised relay drift considered in the station setpoint calculation is conservative relative to the previously installed relay. The Bus 5 and 6 62D relays are calibrated every 36 months. Therefore, the associated drift interval is 36 months.
>
> …
>
> However, a review of the calibration history for the 7012 PD relay shows relay operation within the expected accuracy and drift. The replacement Agastat 7012 PC is the same manufacturer and type as the replaced 7012 PD relay. Therefore, the past performance of the 7012 PD relay indicates acceptable future performance for the 7012 PC relay.

In its supplemental letter dated August 20, 2020, the licensee provided the As-Found operate times during past calibrations for the previously installed 10 second time delay (Model 7012 PD).

The licensee also stated that the 7012 PC relay was installed in April 2020 and, therefore, there is no calibration history data for that relay.

The NRC staff notes that the licensee used +/- 0.15 seconds for both the As-Found and the As-Left tolerances. The establishment of the As-Found tolerance to be as small as the As-Left tolerance is conservative and will not result in masking of adverse performance of the time delay relay during performance monitoring surveillances and, therefore, meets the intent of RIS 2006-17.

In its supplemental letter dated August 20, 2020, in response to NRC staff RAI #2, the licensee provided the full proposed 62D time delay relay catalog number (Agastat 7012 PC), and its vendor specification datasheet.

The NRC staff reviewed the summary of the Seabrook degraded voltage relay setpoint uncertainty calculation that supported the proposed AV of Functional Unit 9.b in TS Table 3.3-4 on the LAR, as supplemented. The summary included the relay setting design basis, such as the TSP to be used during calibration surveillances, the uncertainties associated with these settings, the expected relay drift between surveillances, the uncertainties associated with these settings, measurement and test equipment uncertainties, and the As-Found and As-Left Tolerance acceptance values to be applied during technical specification surveillances.

The NRC staff also reviewed the vendor instruction manual of the Agastat 7012 PC Model to verify that this relay has a linear timing range of 1.5 - 15 seconds and that the repeat accuracy at any fixed temperature is 10 percent of setting.

The NRC staff subsequently used the guidance in RG 1.105, Revision 3, to independently confirm whether there are adequate allowances for instrument channel performance uncertainty between the AL and TSP in Seabrook TS Table 3.3-4 for Functional Unit 9.b to satisfy the requirements of 10 CFR 50.36(c)(1)(ii)(A).

The NRC staff performed an independent confirmation evaluation of the following margins to determine whether there is a positive margin: between the AL and the TSP ($Margin_{TSP}$), and between the AL and the AV ($Margin_{AV}$).

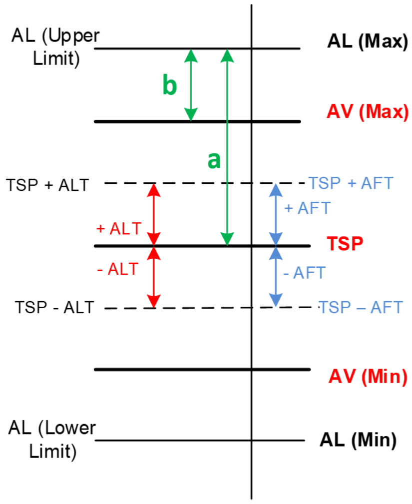
$Margin_{AV}$ (b) = AL - AV
$Margin_{TSP}$ (a) = AL - TSP

Margin Ratio percent = (b/a) x 100 percent

The NRC staff performed a confirmation evaluation of the $Margin_{TSP}$ and $Margin_{AV}$ of the Upper Level time delay only because the proposed maximum degraded voltage time delay relays that detect the degradation of the 4.16 kV buses E5 and E6 should be limited to protect the Class 1E loads from damaged or unavailability.

The NRC staff's evaluation is summarized in the figure below.

Seabrook Buses Degraded Voltage (Function 9.b) Time Delays Relationships



Note: Diagram Not To Scale

	Degraded Voltage Time Delay Bus E5 & E6	
		seconds
1	Upper AL	7
2	Upper AV	**6.72**
3	TSP	**6**
4	As Found	0.15
5	As Left	0.15
6	TSP + As Found	6.15
7	TSP - As Found	5.85
8	TSP + As Left	6.15
9	TSP - As Left	5.85
10	Lower AV	5.8
11	Lower AL	4.5
12	Margin_{AV}	0.28
13	Margin_{TSP}	1
		%
14	Margin Ratio (b/a)*100	28

The NRC staff determined that:

- The TSP inclusive of its As-Found Tolerances, is less than the maximum AV and greater than the minimum AV to ensure that the trip signals will be initiated before TSP reach the AV values.

- The margin ratio percentages between the TSP and AV margins are greater than 28 percent and are adequate. These margins ensure that the trip setpoints have been chosen to ensure that a trip or safety actuation will occur significantly before the measured process reaches the Upper Analytical Limits. The proposed AV setting is an automatic protective action that will correct the abnormal situation before a safety limit is exceeded.

- The proposed maximum/minimum AV is in the time delay setting range of 1.5 to 15 seconds of the Agastat 7012 PC timing relays to maintain these variables and systems within prescribed operating ranges.

Based on the above discussion, the NRC staff finds that the proposed AV of the degraded voltage time delay settings (TSP and AV for the Functional Unit 9.b in TS Table 3.3-4) is consistent with RG 1.105 and satisfies the requirements of 10 CFR 50.36(c)(1)(ii)(A) and GDC 13. Therefore, the proposed TSP (≤ 6 seconds) and AV (≤ 6.72 seconds) of time delay relay settings are acceptable.

<u>NRC Staff's Finding</u>

As described above, the licensee's methodology for establishing the degraded voltage time delay AL and AV is based in part on information from the Seabrook UFSAR, Limitorque Bulletin LM-77, and an evaluation of the performance of the 4 kV motors that start on an SI signal as described in Calculation 9763-3-ED-00-02-F. The licensee used the arithmetic sum method to calculate the proposed settings to ensure that control and monitoring of AV and setpoints are established and maintained in a manner consistent with plant safety function requirements and guidance within RG 1.105, Revision 3. Furthermore, as described in Section 3.4 of this safety evaluation, the NRC staff performed independent confirmatory evaluations of calculated margins and margin comparisons to confirm that required protective actions will be initiated before the associated plant process parameters exceed their analytical limits. Additionally, the licensee's proposed "As-Left" values associated with the setpoint changes were determined in a manner consistent with RIS 2006-17 in establishing the As-Left tolerance. The licensee chose to implement a conservative As-Found tolerance that will not mask adverse performance of the relay during a surveillance. Therefore, the staff finds that the proposed TSP and AV of Functional Unit 9.b in TS Table 3.3-4 are acceptable, because the proposed changes are consistent with RG 1.105, Revision 3, which describes a method acceptable to the NRC for complying with 10 CFR 50.36(c)(1)(ii)(A), GDC 13, and RIS 2006-17. The proposed changes continue to assure that the necessary quality of systems and components is maintained and, therefore, also continue to meet the requirements at 10 CFR 50.36(c)(3).

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the State of New Hampshire and Commonwealth of Massachusetts officials were notified of the proposed issuance of the amendment on February 5, 2021. The officials had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes requirements with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 or changes to surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on March 24, 2020 (85 FR 16684). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that 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.

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Date: February 25, 2021

SUBJECT: SEABROOK STATION, UNIT NO. 1 – ISSUANCE OF AMENDMENT NO. 168 RE: CHANGING TIME DELAY SETPOINTS FOR DEGRADED VOLTAGE RELAYS (EPID L-2020-LLA-0012) DATED FEBRUARY 25, 2021

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