



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

January 28, 2019

Ms. Cheryl A. Gayheart  
Regulatory Affairs Director  
Southern Nuclear Operating Co., Inc.  
3535 Colonnade Parkway  
Birmingham, AL 35243

**SUBJECT: EDWIN I. HATCH NUCLEAR PLANT, UNIT NOS. 1 AND 2 – ISSUANCE OF AMENDMENTS TO REVISE TECHNICAL SPECIFICATION 3.3.8.1, “LOSS OF POWER (LOP) INSTRUMENTATION” (EPID L-2018-LLA-0069)**

Dear Ms. Gayheart:

The U.S. Nuclear Regulatory Commission (NRC, the Commission) has issued the enclosed Amendment No. 293 to Renewed Facility Operating License No. DPR-57 and Amendment No. 238 to Renewed Facility Operating License No. NPF-5 for the Edwin I. Hatch Nuclear Plant, Unit Nos. 1 and 2 (HNP), respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated March 9, 2018.

The amendments revise TS 3.3.8.1, “Loss of Power (LOP) Instrumentation,” to modify the instrument allowable values for the 4.16 kilovolt (kV) emergency bus degraded voltage instrumentation and delete the annunciation requirements for the 4.16 kV emergency bus undervoltage instrumentation for HNP Unit No. 2. In addition, License Condition 2.C.(3)(i) for Unit No. 2 is revised to clarify its intent.

These changes are needed for consistency with HNP electrical power systems modifications required for compliance with License Condition 2.C.(11) for Unit No. 1 and License Condition 2.C.(3)(i) for Unit No. 2. The modifications will eliminate the reliance on manual actions as part of the HNP degraded voltage protection scheme.

C. A. Gayheart

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

Sincerely,

 for

James R. Hall, Senior Project Manager  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-321 and 50-366

Enclosures:

1. Amendment No. 293 to DPR-57
2. Amendment No. 238 to NPF-5
3. Safety Evaluation

cc: Listserv



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

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA

CITY OF DALTON, GEORGIA

DOCKET NO. 50-321

EDWIN I. HATCH NUCLEAR PLANT, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 293  
Renewed License No. DPR-57

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment to the Edwin I. Hatch Nuclear Plant, Unit No. 1 (the facility) Renewed Facility Operating License No. DPR-57 filed by Southern Nuclear Operating Company, Inc. (the licensee), acting for itself, Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and City of Dalton, Georgia (the owners), dated March 9, 2018, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as 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.

2. Accordingly, the license is hereby amended by page changes as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-57 is hereby amended to read as follows:

- (2) Technical Specifications

The Technical Specifications (Appendix A) and the Environmental Protection Plan (Appendix B), as revised through Amendment No. 293, are hereby incorporated in the renewed license. Southern Nuclear 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 from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Michael T. Markley, Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to Renewed Facility  
Operating License No. DPR-57  
and Technical Specifications

Date of Issuance: January 28, 2019

ATTACHMENT TO LICENSE AMENDMENT NO. 293

EDWIN I. HATCH NUCLEAR PLANT, UNIT NO. 1

RENEWED FACILITY OPERATING LICENSE NO. DPR-57

DOCKET NO. 50-321

Replace the following pages of the license and the Appendix A Technical Specifications (TSs) with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages

Insert Pages

License

License

4

4

TSs

TSs

3.3-70

3.3-70

3.3-72

3.3-72

for sample analysis or instrumentation calibration, or associated with radioactive apparatus or components;

- (6) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Section 50.54 of Part 50, and Section 70.32 of Part 70; all applicable provisions of the Act and the rules, regulations, and orders of the Commission now or hereafter in effect; and the additional conditions specified or incorporated below:

- (1) Maximum Power Level

Southern Nuclear is authorized to operate the facility at steady state reactor core power levels not in excess of 2804 megawatts thermal.

- (2) Technical Specifications

The Technical Specifications (Appendix A) and the Environmental Protection Plan (Appendix B), as revised through Amendment No. 293, are hereby incorporated in the renewed license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

The Surveillance Requirement (SR) contained in the Technical Specifications and listed below, is not required to be performed immediately upon implementation of Amendment No. 195. The SR listed below shall be successfully demonstrated before the time and condition specified:

SR 3.8.1.18 shall be successfully demonstrated at its next regularly scheduled performance.

- (3) Fire Protection

Southern Nuclear shall implement and maintain in effect all provisions of the fire protection program, which is referenced in the Updated Final Safety Analysis Report for the facility, as contained in the updated Fire Hazards Analysis and Fire Protection Program for the Edwin I. Hatch Nuclear Plant, Units 1 and 2, which was originally submitted by letter dated July 22, 1986. Southern Nuclear may make changes to the fire protection program without prior Commission approval only if the changes

3.3 INSTRUMENTATION

3.3.8.1 Loss of Power (LOP) Instrumentation

LCO 3.3.8.1 The LOP instrumentation for each Function in Table 3.3.8.1-1 shall be OPERABLE for each diesel generator (DG) required by LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources - Shutdown."

APPLICABILITY: When associated DG is required to be OPERABLE.

ACTIONS

-----NOTE-----  
Separate Condition entry is allowed for each channel.  
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CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable for Functions 1 and 2.	A.1 Restore channel to OPERABLE status.	1 hour
B. One or more channels inoperable for Function 3.	B.1 Verify voltage on associated Unit 1 4.16 kV bus is $\geq 3825$ V.	Once per hour
C. Required Action and associated Completion Time not met.	C.1 Declare associated DG inoperable.	Immediately

Table 3.3.8.1-1 (page 1 of 1)  
Loss of Power Instrumentation

FUNCTION	REQUIRED CHANNELS PER BUS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. 4.16 kV Emergency Bus Undervoltage (Loss of Voltage)			
a. Bus Undervoltage	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≥ 2800 V
b. Time Delay	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≤ 6.5 seconds
2. 4.16 kV Emergency Bus Undervoltage (Degraded Voltage)			
a. Bus Undervoltage	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	
1) Bus 1E			≥ 3280 V
2) Bus 1F			≥ 3280 V
3) Bus 1G			≥ 3280 V
4) Bus 2E			≥ 3952 V
5) Bus 2G			≥ 3892 V
b. Time Delay	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	
1) Unit 1 Buses			≤ 21.5 seconds
2) Unit 2 Buses			≤ 9.8 seconds
3. Unit 1 4.16 kV Emergency Bus Undervoltage (Annunciation)			
a. Bus Undervoltage	2	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≥ 3825 V
b. Time Delay	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≤ 65 seconds





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SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA

CITY OF DALTON, GEORGIA

DOCKET NO. 50-366

EDWIN I. HATCH NUCLEAR PLANT, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 238  
Renewed License No. NPF-5

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment to the Edwin I. Hatch Nuclear Plant, Unit No. 2 (the facility) Renewed Facility Operating License No. NPF-5 filed by Southern Nuclear Operating Company, Inc. (the licensee), acting for itself, Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and City of Dalton, Georgia (the owners), dated March 9, 2018, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as 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.

2. Accordingly, the license is hereby amended by page changes as indicated in the attachment to this license amendment, paragraph 2.C.(2) and paragraph 2.C.(3)(i) of Renewed Facility Operating License No. NPF-5 is hereby amended to read as follows:

2.C.(2) Technical Specifications

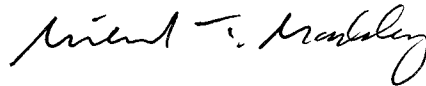
The Technical Specifications (Appendix A) and the Environmental Protection Plan (Appendix B), as revised through Amendment No. 238, are hereby incorporated in the renewed license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

2.C.(3)(i) Degraded Voltage Protection

SNC shall implement the Degraded Voltage modifications to eliminate the manual actions in lieu of automatic degraded voltage protection to assure adequate voltage to safety-related equipment during design basis events for the Unit 2 4.16 kV emergency buses by completion of the Unit 2 2019 Spring Outage, U2R25, and for the required Unit 1 4.16 kV emergency buses by completion of the Unit 1 2020 Spring Outage, U1R29.

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

FOR THE NUCLEAR REGULATORY COMMISSION



Michael T. Markley, Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to Renewed Facility  
Operating License No. NPF-5  
and Technical Specifications

Date of Issuance: January 28, 2019

ATTACHMENT TO LICENSE AMENDMENT NO. 238

EDWIN I. HATCH NUCLEAR PLANT, UNIT NO. 2

RENEWED FACILITY OPERATING LICENSE NO. NPF-5

DOCKET NO. 50-366

Replace the following pages of the license and the Appendix A Technical Specifications (TSs) with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages

Insert Pages

License

License

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TSs

TSs

3.3-70  
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- (6) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain, and is subject to, the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Section 50.54 of Part 50, and Section 70.32 of Part 70; all applicable provisions of the Act and the rules, regulations, and orders of the Commission now or hereafter in effect; and the additional conditions<sup>2</sup> specified or incorporated below:

- (1) Maximum Power Level

Southern Nuclear is authorized to operate the facility at steady state reactor core power levels not in excess of 2,804 megawatts thermal, in accordance with the conditions specified herein.

- (2) Technical Specifications

The Technical Specifications (Appendix A) and the Environmental Protection Plan (Appendix B), as revised through Amendment No. 238, are hereby incorporated in the renewed license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

- (3) Additional Conditions

The matters specified in the following conditions shall be completed to the satisfaction of the Commission within the stated time periods following the issuance of the renewed license or within the operational restrictions indicated. The removal of these conditions shall be made by an amendment to the license supported by a favorable evaluation by the Commission.

- (a) Fire Protection

Southern Nuclear shall implement and maintain in effect all provisions of the fire protection program, which is referenced in the Updated Final Safety Analysis Report for the facility, as contained

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<sup>2</sup> The original licensee authorized to possess, use, and operate the facility with Georgia Power Company (GPC). Consequently, certain historical references to GPC remain in certain license conditions.

(h) TSTF-448, Control Room Habitability

Upon implementation of the Amendments adopting TSTF-448, Revision 3, the determination of control room envelope (CRE) unfiltered air inleakage as required by SR 3.7.4.4, in accordance with TS5.5.14.c.(i), the assessment of CFE habitability as required by Specification 5.5.14.c.(ii), and the measurement of CRE pressure as required by Specification 5.5.14.d, shall be considered met. Following implementation:

- i) The first performance of SR 3.7.4.4, in accordance with Specification 5.5.14.c.(i), shall be within the next 18 months.
- ii) The first performance of the periodic assessment of CFRE habitability, Specification 5.5.14.c.(ii), shall be within 3 years, plus the 9-month Allowance of SR 3.0.2, of the next successful tracer gas test.
- iii) The first performance of the periodic measurement of CRE pressure, Specification 5.5.14.d, shall be within 24 months, plus the 6 months allowed by SR 3.0.2, from the date of the most recent successful pressure measurement test.

(i) Degraded Voltage Protection

SNC shall implement the Degraded Voltage modifications to eliminate the manual actions in lieu of automatic degraded voltage protection to assure adequate voltage to safety-related equipment during design basis events for the Unit 2 4.16 kV emergency buses by completion of the Unit 2 2019 Spring Outage, U2R25, and for the required Unit 1 4.16 kV emergency buses by completion of the Unit 1 2020 Spring Outage, U1R29.

D. This renewed license is subject to the following antitrust conditions:

(1) As used herein:

- (a) "Entity" means any financially responsible person, private or public corporation, municipality, county, cooperative, association, joint stock association or business trust, owning, operating or proposing to own or operate equipment or facilities within the state of Georgia (other than Chatham, Effingham, Fannin, Towns of Union Counties) for

3.3 INSTRUMENTATION

3.3.8.1 Loss of Power (LOP) Instrumentation

LCO 3.3.8.1 The LOP instrumentation for each Function in Table 3.3.8.1-1 shall be OPERABLE for each diesel generator (DG) required by LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources - Shutdown."

APPLICABILITY: When associated DG is required to be OPERABLE.

ACTIONS

-----NOTE-----  
Separate Condition entry is allowed for each channel.  
-----

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable for Functions 1 and 2.	A.1 Restore channel to OPERABLE status.	1 hour
B. One or more channels inoperable for Function 3.	B.1 Verify voltage on associated Unit 1 4.16 kV bus is $\geq 3825$ V.	Once per hour
C. Required Action and associated Completion Time not met.	C.1 Declare associated DG inoperable.	Immediately

Table 3.3.8.1-1 (page 1 of 1)  
Loss of Power Instrumentation

FUNCTION	REQUIRED CHANNELS PER BUS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. 4.16 kV Emergency Bus Undervoltage (Loss of Voltage)			
a. Bus Undervoltage	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≥ 2800 V
b. Time Delay	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≤ 6.5 seconds
2. 4.16 kV Emergency Bus Undervoltage (Degraded Voltage)			
a. Bus Undervoltage	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≥ 3952 V ≥ 3892 V ≥ 3892 V ≥ 3280 V ≥ 3280 V
1) Bus 2E			≥ 3952 V
2) Bus 2F			≥ 3892 V
3) Bus 2G			≥ 3892 V
4) Bus 1E			≥ 3280 V
5) Bus 1G			≥ 3280 V
b. Time Delay	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≤ 9.8 seconds ≤ 21.5 seconds
1) Unit 2 Buses			≤ 9.8 seconds
2) Unit 1 Buses			≤ 21.5 seconds
3. Unit 1 4.16 kV Emergency Bus Undervoltage (Annunciation)			
a. Bus Undervoltage	2	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≥ 3825 V
b. Time Delay	2	SR 3.3.8.1.2 SR 3.3.8.1.3 SR 3.3.8.1.4	≤ 65 seconds



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 293 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-57

AND

AMENDMENT NO. 238 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-5

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

EDWIN I. HATCH NUCLEAR PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-321 AND 50-366

1.0 INTRODUCTION

By letter dated March 9, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18071A363), the Southern Nuclear Operating Company, Inc. (SNC, the licensee) submitted a license amendment request (LAR) for the Edwin I. Hatch Nuclear Plant (HNP), Unit Nos. 1 and 2. The proposed amendment would revise the HNP Unit No. 1 and Unit No. 2 Technical Specifications (TS) requirements of TS 3.3.8.1, "Loss of Power (LOP) Instrumentation," to modify the instrument allowable values (AVs) for the 4.16 kilovolt (kV) emergency bus degraded voltage instrumentation and to delete the annunciation requirements for the 4.16 kV (4160 volt (V)) emergency bus undervoltage instrumentation for HNP Unit No. 2. In addition, the proposed amendment would revise Unit No. 2 License Condition 2.C.(3)(i) to clarify its intent. The proposed license amendment is an interim change to support implementation of the Unit No. 2 portion of the electrical power system modifications, intended to assure adequate voltage to safety-related equipment during design-basis grid voltage events. The proposed modifications are also designed to eliminate reliance on existing manual actions in lieu of an automatic degraded voltage protection scheme, and are scheduled for completion during the next Unit No. 2 refueling outage, in compliance with Unit No. 2 License Condition 2.C.(3)(i).

The licensee states that an additional LAR will be submitted at a later date to support the final license changes for full implementation of the electrical power system modification at both units. Therefore, the AVs associated with the Unit No. 1 4160 V emergency bus LOP instrumentation are not modified, no Unit No. 1 annunciator requirements are deleted as a result of the proposed amendment, and the scope of this safety evaluation is limited to those proposed changes associated with the Unit No. 2 LOP instrumentation only.



## 2.0 REGULATORY EVALUATION

### 2.1 Electrical System Design and Operation

Offsite power is the preferred source of power for the HNP 4160 V emergency buses which power the required safe shutdown components. The electric system transmission network supplies offsite alternating current (AC) electrical power for operating the emergency buses and for startup and shutdown of the HNP units. The network interconnections at HNP consist of four 500 kV transmission lines and four 230 kV transmission lines. A 500/230 kV autotransformer connects the 500 kV switchyard to the 230 kV switchyard. Three physically independent 230 kV circuits are provided from the switchyard to startup auxiliary transformers (SATs) 1C, 1D, 2C, and 2D. SATs 1C and 2C share one 230 kV circuit and SATs 1D and 2D have independent circuits. The normal offsite system operating voltage range for the HNP units is 101.3% to 104.9% of 230 kV. According to the LAR, a minimum voltage level of 101.3% is required for the plant safety systems to perform their safety functions to mitigate the consequences of a loss-of-coolant accident.

The onsite standby AC power supply for HNP Unit No. 1 and HNP Unit No. 2 consists of five diesel generator (DGs) units, which supply standby power to the 4160 V emergency buses. DGs 1A and 1C supply the Unit No. 1 emergency buses, and DGs 2A and 2C supply the Unit No. 2 emergency buses. DG 1B is shared between the two units.

The LOP protection instrumentation monitors voltage on the safety-related 4160 V buses of each HNP unit. Each 4160 V emergency bus has independent LOP instrumentation and relay actuation logic for detecting degraded grid or loss of voltage conditions and initiating an LOP DG start signal. As described in the HNP Unit No. 1 FSAR, Section 8.4.3, and the Unit No. 2 FSAR, Section 8.3.1.1.3, a DG automatic start is initiated by the LOP instrumentation in the event of a complete loss of voltage, a sustained degraded voltage condition, or a failure in any of the voltage sensing redundant instrument trains at the associated DG bus.

The current degraded voltage relays (DVRs) are intended to protect plant equipment from a sustained degraded voltage condition when the 4160 V emergency buses are powered from the offsite power source. The current degraded voltage instrumentation protection scheme initiates a transfer from the primary power source to the alternate or emergency source and disconnects certain electrical loads following a time delay. The current degraded voltage instrumentation protection scheme is separate from the loss of voltage instrumentation protection scheme, using relays with different voltage and time delays, and relies upon both administrative controls and an automatic portion of the degraded voltage protection scheme to ensure bus availability. The current degraded voltage instrumentation logic for each 4160 V emergency bus is monitored by two induction disk type undervoltage relays with inverse time delay. The output of the DVRs is arranged in a two-out-of-two logic to initiate isolation from the degraded power source. For the DG start logic, the relay output is arranged in a one-out-of-two configuration. This arrangement precludes spurious separation from the preferred source of power and also ensures that the DGs get a start signal irrespective of LOP instrument malfunctions.

The current loss of voltage instrumentation protection scheme is similar to the degraded voltage instrumentation scheme with separate loss of voltage relays with different voltage and time delay characteristics. The loss of voltage instrumentation protection scheme and associated setpoints are not altered as a result of the HNP electrical power system modifications and are not in the scope of this LAR. Each emergency bus also has a dedicated low voltage annunciator with signals provided from two relays and associated time delays.

In the existing protection scheme, manual actions are prompted by the low voltage alarm. This alarm alerts plant operators of a degraded grid voltage condition so that manual actions can be coordinated with the transmission system operators to restore grid voltage. At present, these manual actions are needed to protect safety-related equipment from inadequate voltages in the range where automatic protection is not provided by the existing DVRs. The licensee states in Attachment 4 of the LAR that the modified degraded voltage protection scheme is part of an electrical power system modification that replaces the existing single startup auxiliary transformers (SATs) and adds an additional SAT for each unit. The modification also reconfigures the electrical circuit paths between the SATs and the Class 1E electrical distribution system such that no more than two 4160 V emergency buses can be supplied by a single SAT. This new configuration will improve the electrical loading margin associated with each transformer and eliminate the reliance on one SAT supplying electrical power to three 4160 V emergency buses during normal or accident conditions when the other SAT is unavailable; thereby expanding the voltage operating range by which the DVRs can be set. Installation of this plant modification is being performed under the licensee's 10 CFR 50.59 program over two refueling cycles and only the changes to TS 3.3.8.1, "Loss of Power Instrumentation," are within the scope of this LAR.

The modified 4160 V emergency bus degraded voltage protection scheme consists of three initiation channels for each bus. Each channel consists of a DVR with fixed time delay. The logic output is arranged in a two-out-of-three logic configuration for supported components except the DGs. The DG start logic is arranged in a one-out-of-three configuration. In Section 2.1 of the LAR, the licensee stated that the modified LOP instrumentation design includes three solid state DVRs per bus (i.e., 9 per Function per unit) with each DVR relay sensing voltage from an electrically independent 4200 V/120 V potential transformer. A two-out-of-three coincidence logic precludes spurious trips of the offsite power source due to the failure of one instrument channel, while the one-out-of-three DG start logic does not preclude a DG start in the event of a single instrument channel failure.

This proposed change will eliminate the manual actions that are a part of the current HNP Unit No. 2 degraded voltage protection scheme. A similar modification to the degraded voltage protection response scheme for Unit No. 1 will be performed later, and a subsequent LAR for the Unit No. 1 changes will be submitted at a later date.

## 2.2 License Amendment Description

On December 16, 2014, the U.S. Nuclear Regulatory Commission (NRC) issued Amendment No. 271 to Renewed Facility Operating License DPR-57 and Amendment No. 215 to Renewed Facility Operating License NPF-5 for the Edwin I. Hatch Nuclear Plant, Unit Nos. 1 and 2, respectively (ADAMS Accession No. ML14328A323). The amendments revised the Renewed Operating Licenses and added Unit No. 1 License Condition 2.C.(11) and Unit No. 2 License Condition 2.C.(3)(i) to incorporate a degraded voltage protection modification schedule into the Hatch licenses. The licensee states that these license conditions require SNC to implement modifications that will eliminate use of manual actions to satisfy 10 CFR 50.55a(h)(2) requirements as part of the HNP degraded voltage protection scheme, and specify the schedule by which the modifications must be implemented. The proposed LAR is an interim license change to support implementation of the Unit No. 2 portion of the electrical power system modification.

The licensee's planned modifications include the installation of new Class 1E single phase voltage relays to protect the Unit No. 2 4160 V emergency buses. The new solid state DVRs

will have a fixed time delay and a logic output arranged in a two-out-of-three configuration to monitor potential degraded voltage conditions for each 4160 V emergency bus. The two-out-of-three coincidence logic for degraded voltage will prevent false trips of the offsite power source due to the failure of one instrument channel.

The proposed amendments would revise Unit No. 2 License Condition 2.C.(3)(i) and Unit No. 1 and Unit No. 2 TS 3.3.8.1, as follows (changes are indicated in bold & italics):

1. Unit No. 2 License Condition 2.C.(3)(i), "Degraded Voltage Protection":

Current: "SNC shall implement the Degraded Voltage modifications to eliminate the manual actions in lieu of automatic degraded voltage protection to assure adequate voltage to safety-related equipment during design basis events by completion of the Unit 2 2019 Spring Outage, U2R25."

Revised: "SNC shall implement the Degraded Voltage modifications to eliminate the manual actions in lieu of automatic degraded voltage protection to assure adequate voltage to safety-related equipment during design basis events **for the Unit 2 4.16 kV emergency buses** by completion of the Unit 2 2019 Spring Outage, U2R25, **and for the required Unit 1 4.16 kV emergency buses by completion of the Unit 1 2020 Spring Outage, U1R29.**"

2. Unit Nos. 1 and 2, TS 3.3.8.1, "Loss of Power (LOP) Instrumentation":

Current:

LCO 3.3.8.1	The LOP instrumentation for each Function in Table 3.3.8.1-1 shall be OPERABLE.
APPLICABILITY:	MODES 1, 2, and 3, When the associated diesel generator (DG) is required to be OPERABLE by LCO 3.8.2, "AC Sources-Shutdown."
ACTIONS	CONDITION A. "One or more channels inoperable for Functions 1 and 2."  REQUIRED ACTION B.1 "Verify voltage on associated 4.16 kV bus is $\geq$ 3825 V."

Revised:

LCO 3.3.8.1	The LOP instrumentation for each Function in Table 3.3.8.1-1 shall be OPERABLE <b>for each diesel generator (DG) required by LCO 3.8.1, "AC Sources-Operating," and LCO 3.8.2, "AC Sources-Shutdown."</b>
APPLICABILITY:	<b>When associated DG is required to be OPERABLE.</b>
ACTIONS	CONDITION A. "One or more <b>required</b> channels inoperable for Functions 1 and 2."

REQUIRED ACTION B.1 "Verify voltage on associated  
**Unit 1** 4.16 kV bus is  $\geq 3825$  V."

3. Unit No. 1, TS Table 3.3.8.1-1, "Loss of Power Instrumentation"

Current:

Column title, "REQUIRED CHANNELS PER FUNCTION."

Revised:

Column title, "REQUIRED CHANNELS PER **BUS**."

Current:

FUNCTION	ALLOWABLE VALUE
2.a. Bus Undervoltage	$\geq 3280$ V
2.b. Time Delay	$\leq 21.5$ seconds
3. 4.16 kV Emergency Bus Undervoltage (Annunciation)	

Revised:

FUNCTION	ALLOWABLE VALUE
2.a. Bus Undervoltage	
<b>1) Bus 1E</b>	$\geq 3280$ V
<b>2) Bus 1F</b>	$\geq 3280$ V
<b>3) Bus 1G</b>	$\geq 3280$ V
<b>4) Bus 2E</b>	$\geq 3952$ V
<b>5) Bus 2G</b>	$\geq 3892$ V
2.b. Time Delay	
<b>1) Unit 1 Buses</b>	$\leq 21.5$ seconds
<b>2) Unit 2 Buses</b>	$\leq 9.8$ seconds
3. <b>Unit 1</b> 4.16 kV Emergency Bus Undervoltage (Annunciation)	

4. Unit No. 2, TS Table 3.3.8.1-1, "Loss of Power Instrumentation"

Current:

Column title, "REQUIRED CHANNELS PER FUNCTION"

Revised:

Column title, "REQUIRED CHANNELS PER **BUS**"

Current:

FUNCTION	ALLOWABLE VALUE
2.a. Bus Undervoltage	≥ 3280 V
2.b. Time Delay	≤ 21.5 seconds
3. 4.16 kV Emergency Bus Undervoltage (Annunciation)	REQUIRED CHANNELS PER FUNCTION
a. Bus Undervoltage	1
b. Time Delay	1

Revised:

FUNCTION	ALLOWABLE VALUE
2.a. Bus Undervoltage	
<b>1) Bus 2E</b>	<b>≥ 3952 V</b>
<b>2) Bus 2F</b>	<b>≥ 3892 V</b>
<b>3) Bus 2G</b>	<b>≥ 3892 V</b>
<b>4) Bus 1E</b>	<b>≥ 3280 V</b>
<b>5) Bus 1G</b>	<b>≥ 3280 V</b>
2.b. Time Delay	
<b>1) Unit 2 Buses</b>	<b>≤ 9.8 seconds</b>
<b>2) Unit 1 Buses</b>	<b>≤ 21.5 seconds</b>
3. <b>Unit 1</b> 4.16 kV Emergency Bus Undervoltage (Annunciation)	REQUIRED CHANNELS PER <b>BUS</b>
a. Bus Undervoltage	<b>2</b>
b. Time Delay	<b>2</b>

2.3 Regulatory Requirements and Guidance:

The construction permits of HNP Unit No.1 and Unit No, 2 were issued on September 30, 1969, and on December 27, 1972, respectively. Consequently, HNP Unit No. 2 is licensed in conformance with 10 CFR Part 50, Appendix A, "General Design Criteria." HNP Unit No. 1 is licensed in conformance with the 1967 version of 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plant Construction Permits" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML043310029). HNP Unit No.1 Final Safety Analysis Report (FSAR), Appendix F, "Conformance To Atomic Energy Commission (AEC) Criteria," describes the relevant licensing bases for Unit No. 1, as follows:

Section F.2 of this appendix contains an evaluation of the design bases of Hatch Nuclear Plant-Unit 1 (HNP-1) based on the current understanding of the intent of the "General Design Criteria for Nuclear Power Plant Construction," issued for comment in July 1967.

Section F.3 contains an evaluation of the design bases of HNP-1 based on the current understanding of the intent of the "General Design Criteria for Nuclear Power Plants," effective May 21, 1971, and subsequently amended July 7, 1971. Each of the AEC criteria is followed by a discussion of the plant design. Applicable references are made to facilitate comparisons.

The HNP-1 construction permit was received under the 70 general design criteria discussed in section F.2. The HNP-1 design bases were not, therefore, developed in consideration of the 64 new general design criteria discussed in section F.3. The applicant has, however, evaluated the HNP-1 design bases against the new criteria.

The NRC staff considered the following requirements in its review of the LAR:

Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 36 (50.36), "Technical specifications," requires that TSs shall be included in applications for a license authorizing operation of a production or utilization facility.

10 CFR 50.36(c) requires that TSs include items in five specific categories related to station operation. These categories are: (1) safety limits, limiting safety system settings, and limiting control settings, (2) Limiting conditions for operation (LCOs), (3) Surveillance requirements (SRs), (4) Design features, and (5) Administrative controls. The proposed changes discussed in this safety evaluation include changes to LCOs and SRs.

10 CFR 50.36(c)(3) requires that surveillance requirements relating to test, calibration, or inspection are to assure that the necessary quality of systems and components is maintained.

10 CFR 50 Appendix A, General Design Criterion (GDC) 13, "Instrumentation and control," states in part, that 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," requires, in part, that an onsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) 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 and the onsite electric distribution system shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure. In addition, this criterion requires provisions to minimize the probability of losing electric power from any of the remaining supplies as a result of the loss of power from the unit, the transmission network, or the onsite electric power supplies.

HNP Unit No. 2 FSAR Section 8.3.1.2.1 states that the offsite power system and the onsite power systems conform to GDC 17, as discussed in Section 3.1 of the FSAR.

HNP Unit No. 1 FSAR Appendix F, Section F.2 discusses compliance with AEC GDC 39, "Emergency Power for Engineered Safety Features (ESF)," and states:

Sufficient offsite and standby (redundant, independent, and testable) auxiliary sources of electrical power are provided to attain prompt shutdown and continued maintenance of the plant in a safe condition. The capacity of the offsite and onsite power sources are independently adequate to accomplish the required ESF functions, assuming a failure of a single active component in each power system.

10 CFR 50.55a(h)(2), "Protection systems," requires nuclear power plants with construction permits issued after January 1, 1971, but before May 13, 1999, to have protection systems that meet the requirements stated in either Institute of Electrical and Electronics Engineers (IEEE) Standard 279, "Criteria for Protection Systems for Nuclear Power Generating Stations," or IEEE Standard 603-1991, "Criteria for Safety Systems for Nuclear Power Generating Stations," and the correction sheet dated January 30, 1995. The construction permit for HNP Unit No. 2 was issued on December 27, 1972.

The NRC staff also considered the following guidance documents in its review of the LAR:

NRC Regulatory Guide (RG) 1.32, "Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants," describes a method acceptable to the NRC staff for complying with the NRC's regulations with regard to design, operation, and testing of electric power systems in nuclear power plants.

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 TS limits. The RG 1.105 endorses Part I of Instrument Society of America (ISA) Standard 67.04-1994, "Setpoints for Nuclear Safety-Related Instrumentation." The staff used this guide to establish the adequacy of the licensee's setpoint calculation methodologies and the related plant surveillance procedures.

NRC Standard Review Plan (NUREG-0800), Revision 2, "Standard Review Plan for the Review of Safety Analysis Reports for-Nuclear Power Plants: LWR [Light-Water Reactor] Edition," Appendix 8-A, July 1981, Branch Technical Position (PSB)-1, Position 8.1 (ADAMS Accession No. ML052350520). In addition to the undervoltage scheme provided to detect loss of offsite power at the Class 1E buses, a second level of undervoltage protection with time delay should also be provided to protect the Class 1E equipment.

NUREG-0800, Branch Technical Position (BTP) 8-6, "Adequacy of Station Electric Distribution System Voltages," Revision 3 (ADAMS Accession No. ML070710478), outlines the purpose of the DVRs to protect Class 1E safety-related buses from sustained degraded voltage conditions on the offsite power system under accident and non-accident conditions.

Regulatory Issue Summary (RIS) 2011-12, Revision 1, "Adequacy of Station Electric Distribution System Voltages," Revision 1, dated December 29, 2011 (ADAMS Accession No. ML113050583).

IEEE Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations."

NRC Generic Letter 79-36, "Adequacy of Station Electric Distribution Systems Voltages," dated August 8, 1979.

NUREG-1433, "Standard Technical Specifications General Electric BWR/4 Plants," Volume 1 - Specifications, Revision 4.0 (ADAMS Accession No. ML12104A192).

NRC Information Notice 95-05, "Undervoltage Protection Relay Settings Out of Tolerance Due to Test Equipment Harmonics," dated January 20, 1995 (ADAMS Accession No. ML031060397).

ISA-RP67.04.02-2000, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation." This guidance is an unendorsed supplement to ANSI/ISA-S67.04, Part 1, 1994. In some areas, e.g., methodologies including sample equations to calculate total channel uncertainty; common assumption and practices in instrument uncertainty calculations; and application of instrument channel uncertainty in setpoint determinations, the information in RP67.04.02 is useful in interpreting ISA Standard 67.04-1994.

### 3.0 TECHNICAL EVALUATION

The proposed changes in the subject LAR were submitted in support of modifications to improve the degraded voltage protection scheme for the electrical power system at HNP. The NRC staff has reviewed the licensee's regulatory and technical analyses in support of the proposed changes, as described in the Enclosure and Attachments of the LAR. The specific changes are evaluated in the following sections.

#### 3.1 Revised HNP Unit No. 2 License Condition 2.C.(3)(i)

HNP Unit No. 2 revised License Condition 2.C.(3)(i) states:

SNC shall implement the Degraded Voltage modifications to eliminate the manual actions in lieu of automatic degraded voltage protection to assure adequate voltage to safety-related equipment during design basis events ***for the Unit 2 4.16 kV emergency buses*** by completion of the Unit 2 2019 Spring Outage, U2R25, ***and for the required Unit 1 4.16 kV emergency buses by completion of the Unit 1 2020 Spring Outage, U1 R29.*** (Changes in bold and italics).

The licensee stated in Section 3.1 of the LAR that the proposed change to Unit No. 2 License Condition 2.C.(3)(i) is being made to address the staggered installation of the electrical power system modifications that will eliminate the need for manual actions in lieu of automatic degraded voltage protection. Two of the Unit No. 1 4160 V emergency buses and associated DGs are required to support safety-related equipment (e.g., low pressure coolant injection subsystems and the Standby Gas Treatment System) during design basis accidents. The degraded voltage instrumentation upgrade associated with these required buses will not be completed within the implementation schedule specified in the current Unit No. 2 license condition; this fact was noted in Amendment Nos. 271 and 215, for Unit Nos. 1 and 2, respectively, dated December 14, 2014 (ADAMS Accession No. ML14328A323). Therefore, the proposed change revises the Unit No. 2 license condition to explicitly state the implementation schedules for both units. The Unit No. 1 license condition is not affected by the proposed change because both units' degraded voltage instrumentation will be upgraded by the later implementation date currently specified in the Unit No. 1 license condition. The staff finds that the inclusion of additional clarifying text to the Unit No. 2 license condition does not alter its



original intent and is reasonable. Therefore, the NRC staff finds the proposed changes to the license condition's acceptable.

3.2 Changes to HNP Unit No. 1 and Unit No. 2 TS 3.3.8.1 LCO, APPLICABILITY, and ACTIONS

1. Revised LCO 3.3.8.1 states:

The LOP instrumentation for each Function in Table 3.3.8.1-1 shall be **OPERABLE for each diesel generator (DG) required by LCO 3.8.1, "AC Sources-Operating," and LCO 3.8.2, "AC Sources-Shutdown."**

In the LAR, the licensee provided the following bases for the change:

The proposed change to add the phrase, "...for each diesel generator (DG) required by LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources-Shutdown,"" at the end of LCO 3.3.8.1 provides clarification the LOP instrumentation that is required for each unit, since both units require a portion of the other unit's offsite and onsite electrical power system to support shared unit loads and low pressure coolant injection subsystems. Currently, TS Table 3.3.8.1-1 does not specify requirements for each 4.16 kV emergency bus individually because the requirements are the same for all of the 4.16 kV emergency buses. However, the calculated degraded voltage instrumentation AVs that support the electrical power system modification are different for each bus based on the loading characteristics. Therefore, Table 3.3.8.1-1 is revised to specify AV [allowable value] requirements for each bus individually. As a result, the additional text to the LCO statement to only require the requirements associated with DGs required per LCO 3.8.1 and LCO 3.8.2 is a presentation preference, does not alter the meaning or intent of the current TS LCO, and is considered administrative.

The NRC staff reviewed HNP TS 3.8.1, "AC Sources - Operating," which provides the requirements for the AC electrical power source during plant operation (LCO and applicability in Modes 1, 2, and 3), and TS 3.8.2, "AC Source - Shutdown," which provides the requirements for the AC electrical power source during shutdown conditions (LCO and applicability in Modes 4 and 5). Based on its review, the NRC staff agrees with the licensee's conclusion that this change to LCO 3.3.8.1 is administrative, because this change does not modify the intent of the current LCO, nor change the current requirements of the referenced TSs. This change provides clarification of the LOP instrumentation requirements for the AC sources during plant operation and shutdown conditions for each unit, and reflects the fact that revised AVs are associated with each emergency bus modified as part of the HNP electrical power system upgrades. The proposed AV changes are addressed below.

2. Revised TS 3.3.8.1 APPLICABILITY states:

When associated DG is required to be OPERABLE.

In the LAR, the licensee proposed to delete Modes 1, 2, and 3 and the reference to LCO 3.8.2 from the TS 3.3.8.1 APPLICABILITY statement. The licensee stated, in part,

The proposed change to the TS Applicability is an attendant change to the LCO revision and deletes Modes 1, 2, and 3 and reference to LCO 3.8.2. Because the LOP instrumentation supports the required DGs, the Applicability is revised consistent with the Applicability of TS 3.8.3, "Diesel Fuel Oil and Transfer, Lube Oil, and Starting Air," which also supports the [operability requirements of the] required DGs. This proposed change is a presentation preference, does not alter the meaning or intent of the current TS Applicability, and is considered administrative.

The NRC staff reviewed HNP TS 3.8.3, "Diesel Fuel Oil and Transfer, Lube Oil, and Starting Air," and confirmed that the current TS 3.8.3 Applicability statement is the same as that proposed for TS 3.3.8.1, for other components that similarly support the operability of the required DGs. Additionally, the references to LCO 3.8.1 and LCO 3.8.2 requirements in the LCO 3.3.8.1 statement will make the current reference to LCO 3.8.2 in the Applicability of TS 3.3.8.1 unnecessary.

Based on its review, the NRC staff concludes that the proposed deletions of "MODES 1, 2, and 3," and the reference to LCO 3.8.2 from the Applicability statement of TS 3.3.8.1 are administrative changes that do not change the current HNP TS requirements and are, therefore, acceptable.

3. TS 3.3.8.1, Condition A is revised to state:

One or more **required** channels inoperable for Functions 1 and 2.

The NRC staff finds the addition of the word "required" to Condition A acceptable because it reflects the revised Unit No. 2 degraded voltage instrumentation logic. Only two (of three) degraded voltage instrument channels are required to be Operable in accordance with Table 3.3.8.1-1, Function 2; therefore, the proposed Condition would clarify that it only applies to the required number of channels, and does not include inoperable channels beyond the required number.

4. TS 3.3.8.1, Required Action B.1 is revised to state:

Verify voltage on associated **Unit 1** 4.16kV bus is  $\geq 3825$  V.

The NRC staff finds the change to Required Action B.1 acceptable because upon completion of the electrical power system modifications for Unit No. 2, operators will no longer need to manually transfer electrical power sources to the Unit No. 2 4160 V emergency buses during a degraded voltage condition to assure that adequate voltage is supplied to safety-related equipment during design basis events. Only the Unit No. 1 emergency buses will still require voltage monitoring and manual actions pending completion of the modifications affecting those buses. This is consistent with the proposed changes to HNP Unit Nos. 1 and 2 TS Table 3.3.8.1-1, Function 3, "4.16 kV Emergency Bus Undervoltage (Annunciation)," which will apply to Unit No. 1 only.

### 3.3 Changes to HNP Unit No. 1 and Unit No. 2 TS Table 3.3.8.1-1

1. Table 3.3.8.1-1, 2<sup>nd</sup> column title is revised to state:

REQUIRED CHANNELS PER **BUS**

The NRC staff finds that this revision to the TS Table 3.3.8.1-1 column title from "FUNCTION" to "BUS" reflects the modified LOP instrumentation design. The licensee's proposed LOP instrumentation design includes two low voltage relays per bus and three new solid state DVRs per bus. In addition, this change is consistent with Table 3.3.8.1-1 of NUREG-1433, Revision 4. The proposed column title change accurately reflects the LOP instrumentation design, does not affect any safety basis requirements of the current TSs, and is an administrative change. Therefore, the NRC staff finds this change is acceptable.

2. The title of Function 3 is revised to state:

**Unit No. 1 4.16 kV Emergency Bus Undervoltage (Annunciation)**

The NRC staff finds that the proposed addition of "Unit No. 1" into the title of Function 3 in TS Table 3.3.8.1-1 for both Unit Nos. 1 and 2 reflects the modified LOP instrumentation design. Only the Unit No. 1 emergency buses will still require voltage monitoring and manual actions pending completion of the modifications affecting those buses. The proposed Function 3 title change accurately reflects the LOP instrumentation design for the interim period until the corresponding modifications are made for Unit No. 1, does not affect any safety basis requirements of the current TSs, and is an administrative change. Therefore, the NRC staff finds this change is acceptable.

3. The number of required channels per bus for Function 3 in HNP Unit No. 2 TS Table 3.3.8.1-1 is changed from 1 to 2.

The licensee proposed to change the number of "Required Channels Per Bus" from "1" to "2" for Functions 3.a. and 3.b. in HNP Unit No. 2 TS Table 3.3.8.1-1. This revision makes the requirement consistent with the current number of required channels per function (bus) of Functions 3.a and 3.b of the Unit No. 1 TS Table 3.3.8.1-1. In addition, this change is conservative and will ensure that a sufficient number of channels per bus are available to alert the operator if the Unit No. 1 4160 V emergency buses experience a degraded voltage condition. The NRC staff finds that the proposed change does not adversely affect any safety requirements and satisfies the criterion of 10 CFR 50.36(a)(1). Therefore, the NRC staff finds this change is acceptable.

4. Function 2, 4.16 kV Emergency Bus Undervoltage (Degraded Voltage), Item a, Bus Undervoltage, is revised to explicitly list the revised calculated Allowable Values for the new degraded relay actuation voltages for each of the Unit No. 2 required emergency buses. The current AVs are retained for the required Unit No. 1 emergency buses.

In Section 3.2 of the LAR, the licensee provided a summary of its evaluation for the degraded voltage relay setpoints and AVs. As further described in Attachment 4, Section 2.0 of the LAR, the licensee based its methodology for establishing revised allowable values for degraded voltage and time delay for the Unit No. 2 replacement DVRs, on (1) the General Electric topical report NEDC-31336P-A, "General Electric Instrument Setpoint Methodology," to establish the HNP setpoint parameters for the new DVRs; (2) RG 1.105, to define two setpoint margins; and (3) the American National Standards Institute (ANSI) report ISA-RP67.04.02-2000, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation," to establish reasonable calculation assumptions for drift and setpoint analysis. This method combines the uncertainties for degraded voltage instrumentation setpoints by using the square root sum of the squares to ensure that there is a greater than 95% probability of avoiding a spurious trip when the proposed nominal trip setpoint (NTSP) is at its limit.

The NRC staff reviewed the licensee's evaluation to verify that: (1) the licensee used an acceptable setpoint calculation methodology to ensure that control and monitoring setpoints are established and maintained in a manner consistent with plant safety function requirements; and (2) the licensee's setpoint calculation values are adequate to ensure, with a high confidence level, that the required protective actions for the electrical power system will be initiated before the associated plant process parameter exceeds its analytical limit.

The NRC staff confirmed independently that the general HNP setpoint methodology, as well as the licensee's equations for calculating the minimum NTSPs and AV margins for increasing setpoints, are consistent with the performance criteria of RG 1.105 and the method to determine trip setpoints and AVs of ANSI ISA-RP67.04.02.

The NRC staff reviewed the summary of the calculations provided in Attachment 4 of the LAR, "Summary of the HNP Loss of Power Instrumentation Setpoint Methodology." The staff noted that the licensee used the electrical power system analysis and operation software, "Electrical Transient Analyzer Program (ETAP)," Version 12.6.0N, from Operation Technology, Inc. to simulate loss-of-coolant accident (LOCA) conditions with a concurrent degraded grid voltage condition. The licensee stated that the model used was based on the modified electrical power system configuration of three SATs per unit and included loading from safety and non-safety-related loads as well as one SAT out of service. Also, following final configuration of each SAT and following overall installation of the electrical power system modification, the validity of the ETAP model will be confirmed by obtaining field measurements for normal loading and comparing them to the acceptance criteria in the degraded voltage instrumentation calculations. The NRC staff noted that this is consistent with BTP 8-6, Position B.4.d, which requires licensees to compare the analytically derived voltage values against the test results. The test results should not be more than 3 percent lower than the analytical results; however, the difference between the two, when subtracted from the voltage levels determined in the original analyses, should never be less than the Class 1E equipment-rated voltages.

The NRC staff evaluated the calculated setpoint values for the Unit No. 2 4160 V emergency buses 2E, 2F, and 2G in Attachment 4 of the LAR. Table 3.1-1 of Attachment 4 provided the minimum required voltage (MRV) and minimum expected voltage (MEV) for the Unit No. 2 4160 V emergency buses. Table 3.2-1 of Attachment 4 provided the bus undervoltage tolerances. Table 3.2-2 of Attachment 4 provided the AVs and NTSPs for the bus degraded voltage functions. Section 3.2, "4.16 kV Emergency Bus Degraded Voltage – Bus Undervoltage Function," of Attachment 4 of the LAR described the calculation acceptance criteria and the calculation assumptions.

The NRC staff reviewed the information in Attachment 4 of the LAR and summarized it in Figure 1 below.

**Figure 1:** Summary of Proposed Degraded Voltage Settings for Unit No. 2 4160 V Emergency Buses 2E, 2F, and 2G

Bus Degraded Voltage - Undervoltage Trip	2E			2F			2G		
	Primary Voltage	Secondary Voltage	%	Primary Voltage	Secondary Voltage	%	Primary Voltage	Secondary Voltage	%
MEV (VAC)	4145.44	118.44	99.65	4149.60	118.56	99.75	4145.44	118.44	99.65
Upper Operating Limit (VAC)	4053.0	115.8	97.43	3993.5	114.1	96.00	3993.5	114.1	96.00
AV Reset (VAC)	4011	114.6		3952	112.9		3952	112.9	
NTSP Reset (VAC)	4004	114.4		3945	112.7		3945	112.7	
NTSP Trip (VAC)	3983	113.8		3924	112.1		3924	112.1	
AV Trip (VAC)	3952	112.9		3892	111.2		3892	111.2	
Lower Analytical Limit (VAC)	3902.0	111.5	93.80	3843.0	109.8	92.38	3843.0	109.8	92.38
MRV (VAC)	3856.32	110.18	92.70	3707.39	105.93	89.12	3793.92	108.40	91.20

As summarized in Figure 1, the NRC staff confirmed that:

- (a) The proposed AVs and NTSPs of 4160 V Emergency Buses 2E, 2F, and 2G for the new DVRs are less than their MEVs but remain above their MRVs to ensure that the voltages at safety-related equipment powered downstream from each respective safety-related 4160 V bus remain above their minimum level during steady-state and motor starting conditions.
- (b) The proposed NTSPs of Buses 2E, 2F, and 2G will be set to reset at their minimum reset value of 0.5% of settings, consistent with the calculation assumption. The NRC staff verified the licensee's settings assumptions in the calculations below:

$$\begin{aligned} \text{Bus 2E: } & 113.8 \text{ VAC} + (113.8 \times 0.5\%) = 114.4 \text{ VAC} \\ \text{Bus 2F: } & 112.1 \text{ VAC} + (112.1 \times 0.5\%) = 112.7 \text{ VAC} \\ \text{Bus 2G: } & 112.1 \text{ VAC} + (112.1 \times 0.5\%) = 112.7 \text{ VAC} \end{aligned}$$

The calculation results show the NTSPs Set and Reset values are consistent with the values in Table 3.2-1 of Attachment 4 of the LAR. In addition, the 0.5% difference between the Set and Reset values is consistent with the vendor Instruction data (the allowed difference between pickup and dropout voltage to be set as low as 0.5% of setting).

The licensee used the following definitions from ANSI/ISA-67.04.01-1994 for the Analytical Limit (AL), Nominal Trip Setpoint (NTSP), Allowable Value (AV), Margin, and Total Loop Uncertainty (TLU):

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

Nominal Trip Setpoint (NTSP) is a predetermined value for actuation of the final actuation device to initiate protection action.

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

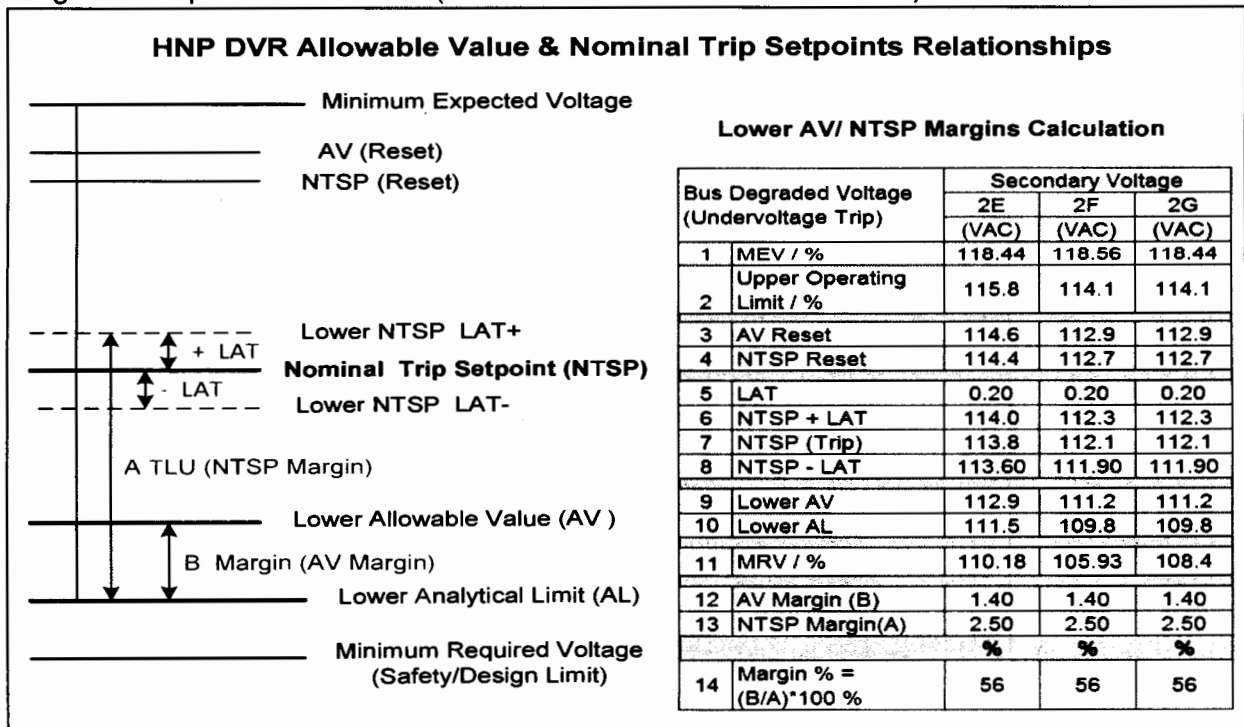
Margin, in setpoint determination, is an allowance added to the instrument channel uncertainty. Margin moves the setpoint farther away from the analytical limit.

- NTSP Margin is an allowance provided between the NTSP and the AL.
- AV Margin is an allowance provided between the Maximum AV and the AL, which is dependent on the process measurement uncertainties, the instrument accuracies and the calibration errors, but does not include error due to instrument drift.

Total Loop Uncertainty (TLU) is the total amount by which an instrument channel's output is in doubt (or the allowance made for such doubt) due to possible errors, either random or systematic. The uncertainty is generally identified within a probability and confidence level. Random error is described as a variable whose value at a particular future instant cannot be predicted exactly but can only be estimated by a probability distribution function. Bias is an uncertainty component that consistently has the same algebraic sign and is expressed as an estimated limit of error.

The NRC staff applied the guidance in RG 1.105, Revision 3, to confirm independently whether adequate margins are provided for instrument channel performance uncertainty between the ALs and the NTSPs and associated AVs. The NRC staff independently calculated the margin percent (%) as the ratio of AV margin to NTSP margin (for the Unit No. 2 4.16 kV Emergency Bus Undervoltage function), and the calculation results are shown in Figure 2 below.

**Figure 2:** NRC Staff's Independent Calculation of AV Margin and NTSP Degraded Voltage Margin for Proposed DVR Buses (Note: LAT = Leave Alone Tolerance)



Based on its review of the information in Attachment 4 of the LAR, as summarized, in part, in Figure 2 above, the NRC staff has determined the following with respect to the proposed AVs for Function 2.a in TS Table 3.3.8.1-1:

- (1) DVR settings were set such that offsite power will be automatically disconnected and transferred to onsite power during an extended degraded grid condition, i.e., any voltage dip having a longer duration than evaluated for transients expected during normal or accident conditions.
- (2) The MRV values were calculated based on a "bottom up" approach, as discussed in NRC RIS 2011-12. All voltage requirements for the safety-related equipment are preserved by the proposed DVR settings. The licensee's evaluation includes the minimum voltage required during steady-state or pre-start individual or group motor starting at the safety-related 4160 V buses. The DVR setpoints provide reasonable assurance that adequate voltage is available for operation (starting and running) of all safety-related loads.
- (3) The licensee's analysis showed that motors would be able to successfully start during design basis accident conditions with pre-start voltage values at the MRV. The licensee's analysis also included verification of minimum pickup and operating voltages for Motor Control Center (MCC) contactors.
- (4) The DVR setpoints include loop inaccuracies and tolerances to ensure that voltage dropout value will be above the MRV value.
- (5) The licensee's approach in the calculation of the analytical limits identified the most limiting component for each train and the corresponding MRV at the component level, and included starting and running voltage requirements.
- (6) The margin percentages between the NTSP and AV Margins are 56% and are adequate to ensure that the trip setpoints have been chosen such that a trip or safety actuation will occur significantly before the measured variable reaches the Lower Analytical Limit.
- (7) The resulting Lower ALs are higher than the MRV values (as indicated in Rows 10 and 11 of Figure 2) and are reasonable. The MRVs are calculated from the ETAP simulation for each Unit No. 2 4160 V emergency bus and assumed the worst case loading conditions, which ensures the ALs are not exceeded, consistent with the HNP safety analysis.
- (8) The DVR 4160 V bus voltage reset value, including tolerances, was set below the MEV to avoid spurious trips.
- (9) The NTSPs (including their respective LATs) are acceptable higher values than the Lower AV to ensure that the trip signals will be initiated before the AV value is reached.

Furthermore, the proposed AVs for the Unit No. 2 4.16 kV Emergency Bus Undervoltage (Degraded Voltage) for buses 2E, 2F, and 2G (revised Function 2.a in Unit No. 2 TS Table 3.3.8.1-1) are greater than the AVs of the current TS Unit No. 2 4.16 kV Emergency Bus Undervoltage (Annunciation) AVs of Function 3.a in TS Table 3.3.8.1-1, which are  $\geq 3825$  V. The NRC staff agrees that the proposed AVs of Function 2.a will make the existing Function 3.a AVs for Unit No. 2 emergency buses unnecessary, which justifies their removal from Unit No. 2 TS Table 3.3.8.1-1. It is therefore acceptable to eliminate the current manual actions as part of the HNP Unit No. 2 degraded voltage protection scheme.

Based on its review and the above evaluation, the NRC staff finds that the proposed degraded voltage settings (ALs, AVs and NTSPs) for the Unit No. 2 4160 V emergency buses are reasonable and provide a high confidence level that safety-related equipment will be adequately protected against a degraded voltage condition. These changes further satisfy the requirements of GDCs 13 and 17. Therefore, these proposed changes are acceptable.

5. Function 2, 4.16 kV Emergency Bus Undervoltage (Degraded Voltage), Item b, Time Delay, is revised to explicitly list the new calculated Allowable Value for the time delay associated with the new degraded voltage relays for the Unit No. 2 required emergency buses ( $\leq 9.8$  seconds). The current AV for the time delay is retained for the Unit No. 1 existing relays and their associated buses ( $\leq 21.5$  seconds).

In Section 3.3 of Attachment 4 of the LAR, the licensee provided the calculation acceptance criteria, calculation assumptions, and methodology overview for the proposed Unit No. 2 4.16 kV Emergency Bus Undervoltage (Degraded Voltage) – Time Delay AVs. The licensee used the ETAP Version 12.6.0N software package to develop the HNP electrical power system computer model. This model was used for the HNP Unit No. 2 station auxiliary system and 4160 V emergency bus transfer analyses. The results of these analyses were used as design inputs in the degraded voltage time delay calculations.

Table 3.3-1, "Unit No. 2 LOCA Group Motors Overcurrent Trip Times," of Attachment 4 of the LAR provided the LOCA group motor overcurrent trip times for Unit No. 2 safety-related components.

In addition to steady state cases, the licensee developed dynamic motor starting cases using the modified HNP electrical system configuration. The LOCA group motor start study case was re-analyzed as a dynamic motor starting case to determine the LOCA motor starting transient time for each safety-related 4160 V emergency bus. The LOCA motor starting transient time was calculated as the minimum time for the LOCA group motors to start and reach steady-state with the 4160 V emergency bus pre-start voltage below the MRV. Motor protection settings were analyzed during the time period for which the voltage dropped below the MRV but remained above the loss of power alarm relay setpoint.

The licensee also stated that the 230 kV source was used to model the grid voltage along with a Thevenin equivalent grid impedance of 100 megavolt amperes (MVA) base. This source voltage feeds the 230 kV swing bus "system" and was set to 92% to obtain the desired voltage below the MRV at the 4160 V emergency bus being studied for each case. The licensee evaluated the effects of degraded voltage conditions on large 4160 V motors such as low pressure coolant injection pump and core spray pump motors to verify that these motors will start and operate without actuating an overcurrent trip prior to a DVR trip. To account for higher starting current during degraded voltage conditions, the licensee adjusted the locked rotor amperes (LRA) associated with each LOCA group motor to a value expected at the MRV for the respective electrical bus. Each starting motor was conservatively assumed to stall continuously at this current until the time at which the overcurrent relay would trip. The licensee's analysis showed that motor operated valve (MOV) motors (less than 10 horsepower (HP)), including five LOCA group MOVs, will not be damaged during degraded voltage conditions. Other safety-related equipment is assumed to have a full load ride-through capability at a bounding voltage of 75% of nameplate rating for a minimum duration of 30 seconds. Below 75%, the loss of voltage relay is set to protect the safety-related equipment. Control power fuses associated with MOVs were also evaluated to ensure that they will not blow before the DVR trips. From the LOCA group motor transient plots, the motors are shown to be capable of starting and reaching full speed within 2.00 seconds. The licensee has evaluated worst-case motor starting time and has concluded that a minimum DVR time delay of 2.00 seconds will preclude spurious separation from offsite power and automatic transfer of the loads to the DGs.

Table 3.3-2, "Allowable Values and Nominal Setpoints (Time Delay Function)," of Attachment 4 of the LAR provided the calculated analytical limits, AVs, NTSP, and LAT for the determination

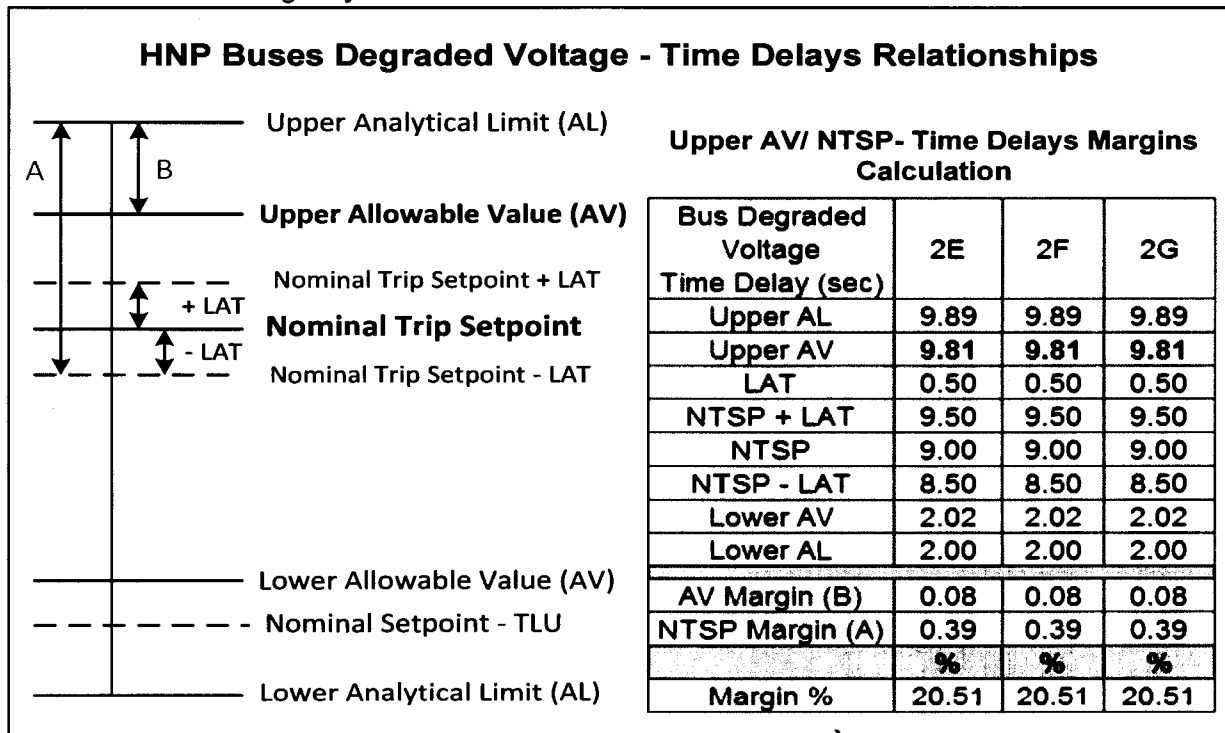


of the time delay associated with the new Unit No. 2 4.16 kV Emergency Bus degraded voltage relays.

The NRC staff applied the guidance of RG 1.105, Revision 3, to independently confirm whether there are adequate margins for instrument channel performance uncertainty between the ALs and NTSPs and between the NTSPs and their associated AVs for the proposed time delay value of Function 2.b in Unit No. 2 TS Table 3.3.8.1-1.

The NRC staff calculated the margin percent (%) between AV margins and NTSP margins applicable to the Unit No. 2 4.16 kV Emergency Buses – Time Delay function. The calculation results and the proposed 4.16 kV Emergency Buses Degraded Voltage Time Delays are illustrated in Figure 3 below.

**Figure 3: NRC Staff's Independent Calculation of AV and NTSP Time Delay Margins for HNP Unit No. 2 Emergency Buses with New DVRs**



The proposed time delay settings for the new DVRs are  $\leq 9.8$  sec.

As summarized in Figure 3 above, the NRC staff verified that:

- (1) The margin percentages between AV Margins and NTSP Margins of time delays, in the worst case, are greater than 20%, which is an acceptable margin. These margins reflect that the time delays of the trip setpoints have been chosen to assure that a trip or safety actuation will occur significantly before the measured process variable reaches the Lower Analytical Limit.
- (2) The proposed time delay ( $\leq 9.8$  sec) is acceptable because it is: (a) the **shortest** time of the Unit No. 2 LOCA Group Motors Overcurrent Trip Times in Table 3.3-1 of Attachment 4 of the LAR, and (b) consistent with the time delay range of the

replacement DVRs (ABB Single Phase Voltage Relays with tolerances  $\pm 10\%$  fall in the range from 9 sec to 11 sec).

- (3) This minimum time delay satisfies the minimum time required for the replacement DVRs (ABB Single Phase Voltage Relays, Type 27N). The proposed time delay varies from 2 sec to 2.02 sec, and is the minimum time to avoid unnecessary automatic transfer of the loads to the DGs.
- (4) The proposed time delay ( $\leq 9.8$  sec) is sufficient because it is less than the current time delay of Function 3, "4.16 kV Emergency Bus Undervoltage (Annunciation)," ( $\leq 65$  sec). The proposed time delay ensures that automatic action will occur well before annunciation and manual actions, and therefore provides a reasonable basis for removing Function 3 requirements from TS Table 3.3.8.1-1 for Unit No. 2.

The NRC staff also made the following determinations in its evaluation of the proposed DVR time delay allowable values:

- (1) For a pre-start voltage at or below the MRV, the LOCA motor starting transient time was less than the DVR time delay setting of  $\leq 9.8$  seconds, including tolerances, which will preclude spurious trips for the Unit No. 2 safety-related buses.
- (2) The DVR time delay setting ( $\leq 9.8$  seconds), including tolerances, was less than the DG start time of 12 seconds assumed in accident analyses. This setpoint provides reasonable assurance that the response times for emergency core cooling systems assumed in the accident analyses are not exceeded during extended degraded grid conditions.
- (3) The DVR time delay setting, including tolerances, was less than the minimum overcurrent relay trip time. This prevents inadvertent tripping of safety-related equipment during allowable degraded voltage conditions

Based on the above, the NRC staff finds that the proposed time delay ( $\leq 9.8$  sec) for the new HNP Unit No. 2 4160 V emergency bus degraded voltage relays, inclusive of uncertainties, will enable the relays to perform their required actions for the protection of safety-related equipment, and is therefore acceptable.

### 3.4 NRC Staff Conclusion

The NRC staff has reviewed the licensee's proposed changes to the Unit No. 2 Renewed Operating License and to the HNP TS for both units, and the supporting documentation related to the electrical power system modifications affecting the LOP instrumentation for HNP Unit No. 2. The current TS allowable values associated with the Unit No. 1 4160 V emergency bus LOP instrumentation are not modified, and the current Unit No. 1 annunciator requirements are retained, as discussed in the LAR. The proposed license amendment is an interim license change to support implementation of the Unit No. 2 portion of the electrical power system modification at the Hatch Nuclear Plant. Based on the above, the NRC staff has determined that the proposed changes to the HNP TS will provide reasonable assurance that automatic actuation of the degraded voltage relays will ensure proper equipment performance during postulated design basis events. The NRC staff has concluded that the proposed changes meet the requirements of GDC 13 and 17, 10 CFR 50.55(h)(2), and 10 CFR 50.36. Therefore, the staff finds the proposed changes acceptable.

#### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Georgia State official was notified of the proposed issuance of the amendments on December 14, 2018, and the State official had no comments.

#### 5.0 ENVIRONMENTAL CONSIDERATION

The amendments change requirements with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve 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 amendments involve no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on September 11, 2018 (83 FR 45987).

Accordingly, the amendments meet 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 amendments.

#### 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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: H. Vu, NRR  
R. Mathew, NRR

Date: January 28, 2019

**SUBJECT: EDWIN I. HATCH NUCLEAR PLANT, UNIT NOS. 1 AND 2 – ISSUANCE OF AMENDMENTS TO REVISE TECHNICAL SPECIFICATION 3.3.8.1, "LOSS OF POWER (LOP) INSTRUMENTATION" (EPID L-2018-LLA-0069) DATED JANUARY 28, 2019**

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