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

April 18, 2019

Mr. Fadi Diya
Senior Vice President and
Chief Nuclear Officer
Ameren Missouri
Callaway Energy Center
8315 County Road 459
Steedman, MO 65077

SUBJECT: CALLAWAY PLANT, UNIT NO. 1 - ISSUANCE OF AMENDMENT RE: ADDITION OF NEW TECHNICAL SPECIFICATION 3.7.20, "CLASS 1E ELECTRICAL EQUIPMENT AIR CONDITIONING (A/C) SYSTEM" (EPID L-2018-LLA-0062)

Dear Mr. Diya:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 219 to Renewed Facility Operating License No. NPF-30 for the Callaway Plant, Unit No. 1 (Callaway). The amendment consists of changes to the technical specifications (TSs) based on your application dated March 9, 2018, as supplemented by letters dated January 23, February 8, and March 7, 2019.

The amendment adds new TS 3.7.20, "Class 1E Electrical Equipment Air Conditioning (A/C) System," including (1) a Limiting Condition for Operation (LCO) statement; (2) an Applicability statement, during which the LCO must be met; (3) Actions to be applied when the LCO is not met, including Conditions, Required Actions, and Completion Times; and (4) Surveillance Requirements with a Frequency to demonstrate that the LCO is met for Class 1E electric equipment A/C system trains at Callaway.

The addition of TS 3.7.20 would enhance the capability of one Class 1E electrical equipment A/C train to provide adequate area cooling for both trains of Class 1E electrical equipment during normal and accident conditions. The amendment also revises TS 5.5.11, "Ventilation Filter Testing Program (VFTP), Part "e," wherein the value specified for the heat to be added by the heater in each control room pressurization train will be reduced.

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

Sincerely,

DDM for LJK

L. John Klos, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosures:
1. Amendment No. 219 to NPF-30
2. Safety Evaluation

cc: Listserv

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

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT NO. 1

DOCKET NO. 50-483

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 219
License No. NPF-30

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

   A. The application for amendment by Union Electric Company (UE, the licensee), dated March 9, 2018, as supplemented by letters dated January 23, 2019, February 8, 2019, and March 7, 2019, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's 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.

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-30 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan*

The Technical Specifications contained in Appendix A, as revised through Amendment No. 219 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

The license is further amended by changes indicated in the attachment to this license amendment, and paragraph 2.C.(18) of Renewed Facility Operating License No. NPF-30 is hereby added to read as follows.

(18) Implementation Actions for New Technical Specification 3.7.20

The planned plant modifications and emergency operating procedure changes described as commitments in Attachment 5 of Ameren Missouri letter ULNRC-06477, "Supplement to License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated January 23, 2019, shall be completed prior to implementation of the license amendment requested per Ameren Missouri letter ULNRC-06401, "License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated March 9, 2018, as supplemented by the noted January 23, 2019 letter (ULNRC-06477) and Ameren Missouri letter ULNRC-06491, "Additional Supplement to License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated March 7, 2019. Completion of the planned plant modifications means physical completion, including completion of the post-modification testing.

3. This amendment is effective as of its date of issuance and shall be implemented within 120 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert J. Pascarelli, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility
Operating License No. NPF-30 and
Technical Specifications

Date of Issuance: April 18, 2019

ATTACHMENT TO LICENSE AMENDMENT NO. 219

CALLAWAY PLANT, UNIT NO. 1

RENEWED FACILITY OPERATING LICENSE NO. NPF-30

DOCKET NO. 50-483

Replace the following pages of the Renewed Facility Operating License No. NPF-30 and Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Renewed Facility Operating License

REMOVE	INSERT
-3-	-3-
-9-	-9-
-10-	-10-

Technical Specifications

REMOVE	INSERT
TOC page 3	TOC page3
---	3.7-48
---	3.7-49
5.0-16	5.0-16

(3) UE, 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;

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

(5) UE, 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.

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

UE is authorized to operate the facility at reactor core power levels not in excess of 3565 megawatts thermal (100% power) in accordance with the conditions specified herein.

(2) Technical Specifications and Environmental Protection Plan*

The Technical Specifications contained in Appendix A, as revised through Amendment No. 219 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Environmental Qualification (Section 3.11, SSER #3)**

Deleted per Amendment No. 169.

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* Amendments 133, 134, & 135 were effective as of April 30, 2000 however these amendments were implemented on April 1, 2000.

** The parenthetical notation following the title of many license conditions denotes the section of the Safety Evaluation Report and/or its supplements wherein the license condition is discussed.

1. In order to ensure that the threads for RPV closure stud hole No. 18 can perform their intended function throughout the period of extended operation, UE shall remove stuck stud No. 18. If repair of stud hole No. 18 is required following removal of the stud, the repair plan shall include inspection of the stud hole prior to and after the completion of the repair.

2. In order to ensure that RPV stud holes with damaged threads can continue to perform their intended function throughout the period of extended operation, UE shall perform a laser inspection for the threads of repaired RPV stud hole location Nos. 2, 4, 5, 7, 9, and 53. If inspection of these RPV stud holes reveals that there is additional degradation in any of these stud holes, the condition will be entered in the Corrective Action Program for evaluation and corrective action, and UE shall also inspect the remaining repaired RPV stud hole locations (Nos. 13, 25, 39 and 54).

(18) Implementation Actions for New Technical Specification 3.7.20

The planned plant modifications and emergency operating procedure changes described as commitments in Attachment 5 of Ameren Missouri letter ULNRC-06477, "Supplement to License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated January 23, 2019, shall be completed prior to implementation of the license amendment requested per Ameren Missouri letter ULNRC-06401, "License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated March 9, 2018, as supplemented by the noted January 23, 2019 letter (ULNRC-06477) and Ameren Missouri letter ULNRC-06491, "Additional Supplement to License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated March 7, 2019. Completion of the planned plant modifications means physical completion, including completion of the post-modification testing.

D. An Exemption from certain requirements of Appendix J to 10 CFR Part 50, are described in the October 9, 1984 staff letter. This exemption is authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest. Therefore, this exemption is hereby granted pursuant to 10 CFR 50.12. With the granting of this exemption the facility will operate, to the extent authorized herein, in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission.

E. UE shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification, and safeguards contingency plans including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822) and to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The combined set of plans, which contain Safeguards Information protected under 10 CFR 10 CFR 73.21, are entitled: "Callaway Security Plan, Training and Qualification Plan, and Safeguards Contingency Plan, Revision 0" submitted by letter dated October 20, 2004, as supplemented by the letter May 11, 2006.

UE shall fully implement and maintain in effect all provisions of the Commission-approved cyber security plan (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The Callaway Plant Unit 1 CSP was approved by License Amendment No. 203, as supplemented by changes approved per License Amendment No. 214.

F. Deleted per Amendment No. 169.

G. UE shall have and maintain financial protection of such type and in such amounts as the Commission shall require in accordance with Section 170 of the Atomic Energy Act of 1954, as amended, to cover public liability claims.

H. This renewed license is effective as of the date of issuance and shall expire at Midnight on October 18, 2044.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

William M. Dean, Director
Office of Nuclear Reactor Regulation

Attachments/Appendices:
1. Attachment 1 (Deleted per Amendment No. 169)
2. Attachment 2 (Deleted per Amendment No. 169)
3. Appendix A - Technical Specifications (NUREG-1058, Revision 1)
4. Appendix B - Environmental Protection Plan
5. Appendix C - Additional Conditions

Date of Issuance: March 6, 2015

3.7 PLANT SYSTEMS

3.7.20 Class 1E Electrical Equipment Air Conditioning (A/C) System

LCO 3.7.20 Two Class 1E electrical equipment A/C trains shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One Class 1E electrical equipment A/C train inoperable.	A.1	Initiate action to implement mitigating Actions.	Immediately
	AND		
	A.2	Verify room area temperatures ≤ 90° F.	1 hour AND Once per 4 hours thereafter
	AND		
	A.3	Restore Class 1E electrical equipment A/C train to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE 5.	36 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Two Class 1E electrical equipment A/C trains inoperable.	C.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.20.1	Verify each Class 1E electrical equipment A/C train actuates on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.20.2	Verify each Class 1E electrical equipment A/C train has the capability to remove the assumed heat load.	In accordance with the Surveillance Frequency Control Program

5.5 Programs and Manuals

5.5.11 Ventilation Filter Testing Program (VFTP) (continued)

e. Demonstrate at least once per 18 months that the heaters for each of the ESF systems dissipate the value specified below when tested in accordance with ANSI 510-1975 and corrected to design nameplate voltage settings.

ESF Ventilation System	Wattage
Control Room Pressurization	5 ± 1 KW
Emergency Exhaust System	37 ± 3 KW

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the VFTP test frequencies.

5.5.12 Explosive Gas and Storage Tank Radioactivity Monitoring Program

This program provides controls for potentially explosive gas mixtures contained in the Gaseous Radwaste System, the quantity of radioactivity contained in gas storage tanks and the quantity of radioactivity contained in unprotected outdoor liquid storage tanks. The gaseous radioactivity quantities shall be determined following the methodology in Branch Technical Position (BTP) ETSB 11-5, "Postulated Radioactive Release due to Waste Gas System Leak or Failure, Revision 0". The liquid radwaste quantities shall be determined in accordance with Standard Review Plan, Section 15.7.3, "Postulated Radioactive Release due to Tank Failures, Revision 2".

The program shall include:

a. The limits for concentrations of hydrogen and oxygen in the Gaseous Radwaste System and a surveillance program to ensure the limits are maintained. Such limits shall be appropriate to the system's design criteria (i.e., whether or not the system is designed to withstand a hydrogen explosion);

b. A surveillance program to ensure that the quantity of radioactivity contained in each gas storage tank is less than the amount that would result in a whole body exposure of ≥ 0.5 rem to any individual in an unrestricted area, in the event of an uncontrolled release of the tanks' contents; and

c. A surveillance program to ensure that the quantity of radioactivity contained in the outdoor liquid radwaste tanks listed below that are not

(continued)

UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 219 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-30

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT NO. 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By application dated March 9, 2018 (Reference 1), as supplemented by letters dated January 23, February 8, and March 7, 2019 (References 2, 3, and 4, respectively), Union Electric Company, dba Ameren Missouri (the licensee) requested changes to Renewed Facility Operating License No. NPF-30 for the Callaway Plant, Unit No. 1 (Callaway).

The proposed amendment would revise the Callaway Technical Specification (TSs) to add TS 3.7.20, "Class 1E Electrical Equipment Air Conditioning (A/C) System," including (1) a Limiting Condition for Operation (LCO) statement; (2) an Applicability statement, during which the LCO must be met; (3) Actions to be applied when the LCO is not met, including Conditions, Required Actions, and Completion Times; and (4) Surveillance Requirements (SRs) with a Frequency to demonstrate that the LCO is met for Class 1E electric equipment A/C system trains at Callaway. Specifically, the proposed change would enhance the capability of one Class 1E electrical equipment A/C train to provide adequate area cooling for both trains of Class 1E electrical equipment during normal and accident conditions.

In addition, the proposed amendment would revise Part "e" of TS 5.5.11, "Ventilation Filter Testing Program (VFTP), wherein the value specified for the heat to be added by the heater in each control room pressurization train will be reduced.

The supplemental letters dated January 23, February 8, and March 7, 2019, 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 or the Commission) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on July 3, 2018, (83 FR 31194).

1.1 Background

In the current configuration, each Class 1E electrical equipment train is designed to cool its associated electrical equipment room. The licensee is implementing two Plant Modifications: (1) MP 16-0024, which involves the installation of recirculation fans and ducts to promote the

circulation of cool air from one Class 1E electrical equipment A/C train to the rooms/areas of both Class 1E electrical equipment trains; and (2) MP 17-0024, which will reduce the heat generation required of the charcoal heaters in the pressurization trains associated with the control room ventilation system. The proposed plant modifications include heating, ventilation, and air conditioning (HVAC) testing, heater wattage, verification, and procedurally controlled manual actions to facilitate circulation of cool air from each of the Class 1E electrical equipment A/C system trains to the electrical equipment rooms associated with the opposite Class 1E electrical equipment A/C train, which are considered necessary for the implementation of the proposed TS 3.7.20. These plant modifications are addressed further in Section 3.10 of this safety evaluation (SE).

The proposed amendment would remove the need to declare the associated electrical TS not met upon the determination of a Class 1E electrical equipment A/C train inoperable, as well as allow more time to restore the inoperable A/C train. Additionally, the new equipment together with the procedurally controlled manual actions are necessary to implement the required mitigating actions in the new TS 3.7.20. The second modification reduces heat added into the control room pressurization train which, in effect, lowers the cooling load in the Class 1E electrical equipment rooms. This modification requires a change to TS 5.5.11.e, and when the modification is complete, it is permanent and complies with the design input to the supporting analysis performed for TS 3.7.20, but will have no part in the mitigating actions required by new TS 3.7.20. These technical elements of the change are discussed in Section 3.4 of this SE.

2.0 REGULATORY EVALUATION

2.1 System Descriptions

2.1.1 Class 1E Electrical Equipment A/C System

The Class 1E electrical equipment A/C trains at Callaway provide a suitable environment for the Class 1E electrical equipment. These A/C trains (i.e., SGK05A (Train A) and SGK05B (Train B)) provide temperature control for the engineered safety features (ESF) switchgear (SWGR) room components, direct current (DC), switchboard (SWBD) room components, and 125-volts direct current (VDC) battery room components. The Class 1E electrical equipment A/C system services the control building 2016 feet (2016') elevation and 2000 feet (2000') elevation, respectively. The specific rooms, with room numbers supplied by the Class 1E electrical equipment A/C trains, are shown below:

SGK05A Train A	SGK05B Train B
SWBD ROOM (RM) NO. 1 (3408)	SWBD RM NO. 4 (3404)
SWBD RM NO. 3 (3414)	SWBD RM NO. 2 (3410)
Battery RM NO. 1 (3407)	Battery RM NO. 4 (3405)
Battery RM NO. 3 (3413)	Battery RM NO. 2 (3411)
ESF SWGR RM NO. 1 (3301)	ESF SWGR RM NO. 2 (3302)

The Class 1E electrical equipment A/C trains are independent trains such that each train provides cooling of recirculated air in the rooms associated with one train of Class 1E electrical equipment. Each train consists of a prefilter, self-contained refrigeration system using normal service water or essential service water (ESW) as a heat sink, and also includes centrifugal fans, instrumentation, and controls to provide for electrical equipment room temperature control. The Class 1E electrical equipment A/C trains have emergency operation functions and also

operate during normal plant operations. Each train is normally aligned to cool only the equipment associated with its emergency load group. The Class 1E electrical equipment A/C trains are operated in a continuous recirculation mode to maintain the ESF switchgear room, the 125-VDC battery rooms, and the DC switchboard rooms to a temperature of less than or equal to 90 degrees Fahrenheit (°F) as discussed in the Callaway Final Safety Analysis Report (FSAR), Chapter 9, "Auxiliary Systems," Section 9.4.1.2.3, "System Operation" Revision OL-22, (Reference 5).

The design basis of the Class 1E electrical equipment A/C system is to maintain temperature in the Class 1E electrical equipment rooms to assure operability of associated electrical equipment. The Class 1E electrical equipment A/C system is designed so that the single failure of component coincident with a loss of offsite power (LOOP) will not impair the ability of the supported systems powered by the electrical equipment to fulfill their safety functions as discussed in Callaway FSAR Section 9.4.1.1.1, "Safety Design Basis." The licensee stated in its supplement to the license amendment request (LAR) dated January 23, 2019 (Reference 2), that components of the original Class 1E equipment A/C system (SGK05) are classified as safety-related. Accordingly, Class 1E power sources are utilized for the equipment, and the components are classified as Seismic Category I (designed and built to withstand design-basis earthquake stresses).

2.1.2 Control Room Pressurization Trains

In the LAR dated March 9, 2018 (Reference 1), the licensee stated that the control room emergency ventilation system (CREVS) provides a pressurized and protected environment from which operators can control the unit following an uncontrolled release of radioactivity.

The CREVS consists of two independent, redundant trains that pressurize, recirculate, and filter the control room air. Each CREVS train consists of a filtration system train and a pressurization system train. The CREVS is an emergency system that may also operate during normal unit operations. Upon receipt of the actuating signal, normal air supply and exhaust to the control room envelope is isolated, a portion of the ventilation air is recirculated through the recirculation system filter trains, and the pressurization system is started.

Each pressurization system train consists of a fan, a moisture separator, an electric heater, a high-efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a second HEPA filter that follows the adsorber section to collect carbon fines. The Class 1E electrical equipment A/C system interacts with the CREVS within the overall control building ventilation envelope. Due to this interaction, the heat generated by the electric heater is partially reflected as cooling load on the Class 1E electrical equipment A/C system. The LAR is proposing is reduce the required heat from the electrical heaters in the pressurization filter trains.

2.2 Reason for Proposed New TS

2.2.1 Class 1E Electrical Equipment A/C Trains

The TSs contain LCO requirements for the Class 1E electrical equipment. However, there is no TS LCO for the Class 1E electrical equipment A/C system. Therefore, using the TS definition of "OPERABILITY" requires that the associated electrical equipment be declared "not met" when it is determined that a Class 1E electrical equipment A/C train is nonfunctional. The licensee stated in its LAR dated March 9, 2018, that the short completion times (CTs) for equipment,

such as inverters and batteries, does not provide sufficient time to restore the Class 1E electrical equipment A/C train to a functional status. The proposed TS 3.7.20 will allow one operable Class 1E electrical equipment A/C train to provide adequate area cooling for both trains of Class 1E electrical equipment during normal and accident conditions. The proposed CTs will allow sufficient time to restore a nonfunctional A/C train to an operable status time in a reasonable time while maintaining defense-in-depth with redundant trains of electrical equipment.

The Class 1E electrical equipment A/C trains have emergency operation functions and also operate during normal plant operations. Each train is normally aligned to cool only the equipment associated with its emergency load group. The Class 1E electrical equipment A/C trains are operated in a continuous recirculation mode to maintain the ESF switchgear room, 125-VDC battery rooms and the DC switchboard rooms to a temperature of less than 90 °F. There is no independent/redundant A/C train for each cooling train that can provide backup cooling in the event of a Class 1E electrical equipment A/C train failure, or when taking a Class 1E electrical equipment A/C train out of service for planned maintenance.

In its LAR, the licensee provided a brief history of the Callaway TSs, with reasons for not including the Class 1E electrical equipment A/C trains in the TSs. In 2001, a specification for the Class 1E electrical equipment A/C system was incorporated into Chapter 16 of the Callaway FSAR (Reference 6). Callaway FSAR Section 16.7.13, "Class 1E Electrical Equipment Air - Conditioning (A/C)," is utilized as a technical requirement manual (TRM) by specifying and including operability and SRs to include TS information (i.e., any related LCOs, applicability, actions and SRs) for that section. With one Class 1E electrical equipment A/C train nonfunctional in Modes 1 through 4, FSAR Section 16.7.13 allows up to a 7-day delay period before (a) declaring the supported Class 1E electrical equipment inoperable (in the area served by the A/C train) and (b) entering the applicable conditions and required actions of the following three TS sections: TS 3.8.4, "DC Sources – Operating"; TS 3.8.7, "Inverters – Operating"; and TS 3.8.9, "Distribution Systems – Operating" (see Reference 7). Callaway FSAR Section 16.7.13 also contains elements related to mitigating actions, such as opening doors with the verification of area temperatures.

In September 2010, NRC staff identified and resolved several issues within the proposed amendment regarding the requirements specified in FSAR Section 16.7.13. Those items addressed when one of the two Class 1E electrical equipment A/C trains are nonfunctional. These include (1) operability definition for non-TS support systems, the application of TS LCO 3.0.6 and the Safety Function Determination Program; and (2) a temporary waiver of the single failure criterion while operating under a TS Condition.

Operability Definition and TS 3.0.6:

Based on the definition of "OPERABILITY," in Section 1.1, "Definition," of the Callaway TSs, the support system (Class 1E electrical equipment A/C trains) functionality is tied to the related system (Class 1E electrical equipment) "OPERABILITY," except as provided per TS 3.0.6.

The provisions of TS LCO 3.0.6 provide that when TS-required actions are initiated for support system inoperability, actions for the system or systems it support (the "supported system") are not necessarily required to be initiated:

> When a supported system LCO is not met solely due to a support system LCO not being met, the Conditions and Required Actions associated with

the supported system are not required to be entered. Only the support system LCO ACTIONS are required to be entered. This is an exception to LCO 3.0.2 for the supported system. In this event, an evaluation shall be performed in accordance with Specification 5.5.15, "Safety Function Determination Program (SFDP)." If a loss of safety function is determined to exist by this program, the appropriate Conditions and Required Actions of the LCO in which the loss of safety function exists are required to be entered.

Inherent in LCO 3.0.6 is the presumption that the support system is covered by its own LCO within the TSs (i.e., non-TS support systems are not governed by LCOs). The addition of a TS for the support system function performed by the Class 1E electrical equipment A/C trains will allow LCO 3.0.6 to be applied such that supported system inoperability can be dealt within the conditions and required actions of the support system TS.

Single Failure Criterion:

Per NRC Generic Letter 80-30, "Clarification of the Term 'Operable' as it Applies to Single Failure Criterion for Safety Systems Required by TS" (Reference 8), the temporary relaxation of the single failure criterion when a TS LCO is not met, indicates that such relaxation applies only when operating pursuant to a TS condition and associated TS required action(s). It does not apply when addressing a condition solely through provisions specified in a licensee-controlled document that is outside the scope of the TSs, such as a TRM or a plant procedure.

Proposed TS 3.7.20 would include the necessary provisions to be met when one Class 1E electrical equipment A/C train is inoperable for a limited period of time, as specified in the TSs. The proposed TS would allow LCO 3.0.6 to be applied such that support system inoperability is addressed in the conditions and required actions of TS 3.7.20. This removes the requirement for the licensee to take actions that would otherwise be required for the support system(s), provided safety function has not been lost.

The provisions for addressing the inoperability of one Class 1E electrical equipment A/C train under proposed LCO 3.7.20 include allowing the other Class 1E electrical equipment A/C train to provide adequate area cooling for both trains of Class 1E electrical equipment during normal and accident conditions, with mitigating actions as required. This capability is supported by the planned modifications described in more detail in Section 3.3 of this SE.

2.2.2 Control Room Pressurization Trains

The design function of the electric heaters in the control room pressurization system filter train is to reduce the relative humidity of the air entering the charcoal filter beds from design ambient conditions of 100 percent relative humidity to 70 percent relative humidity. The original design specified a heater with a rating of 15 kilowatts (kW or KW) ± 2 kW to meet this functional requirement. The licensee stated that a review of' associated design-basis calculations indicates that a minimum of 3.16 kW is adequate to meet the functional requirement.

The licensee has determined that reducing the heater capacity from 15 kW ± 2 kW to 5 kW ± 1 kW will provide sufficient operating margin and meet design basis requirements for the CREVS. The reduction in heat output from the heater will reduce heat input to the control building during emergency conditions, thus increasing the margin between the cooling capacity of the system air conditioning units and the building heat load under accident conditions when

the mitigating actions are in place under the new TS 3.7.20, Action A.1 (i.e., one Class 1E electrical equipment train inoperable). This change to the value for the heater wattage requires revision of TS 5.5.11.e.

2.3 Proposed Change to the TSs

2.3.1 Proposed New TS 3.7.20, "Class 1E Electrical Equipment Air Conditioning (A/C) System"

The proposed change would add a new TS 3.7.20, "Class 1E Electrical Equipment Air Conditioning (A/C) System," to Callaway TS Section 3.7 "Plant Systems." The new TS and associated SRs are as follows:

3.7 PLANT SYSTEMS

3.7.20 Class 1E Electrical Equipment Air Conditioning (A/C) System

LCO 3.7.20 Two Class 1E electrical equipment A/C trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One Class 1E electrical equipment A/C train inoperable.	A.1 Initiate action to implement mitigating actions. AND A.2 Verify room area temperatures ≤ 90 °F. AND A.3 Restore Class 1E electrical equipment A/C train to OPERABLE status.	Immediately 1 hour AND Once per 4 hours thereafter 30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours
C. Two Class 1E electrical equipment A/C trains inoperable.	C.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.20.1	Verify each Class 1E electrical equipment A/C train actuates on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.20.2	Verify each Class 1E electrical equipment A/C train has the capability to remove the assumed heat load.	In accordance with the Surveillance Frequency Control Program

2.3.2 Proposed Change to TS 5.5.11, "Ventilation Filter Testing Program"

The proposed change to TS 5.5.11.e, will reduce the control room pressurization heater wattage from 15 kW ± 2 kW to 5 kW ± 1 kW. The proposed TS change is shown below.

5.5.11 Ventilation Filter Testing Program

e. Demonstrate at least once per 18 months that the heaters for each of the ESF systems dissipate the value specified below when tested in accordance with ANSI 510-1975 and corrected to design nameplate voltage settings.

ESF Ventilation System	Wattage
Control Room Pressurization	5 ± 1 KW
Emergency Exhaust System	37 ± 3 KW

2.4 Design Modifications that Supports Proposed Technical Specifications

2.4.1 Design Modifications that Support Proposed New Technical Specification 3.7.20

Plant Modification MP 16-0024

This modification involves design changes and installation of new equipment such as recirculation fans, ducts, control (isolation) dampers, fire dampers, and flow transfer grills in doors. The modification will allow circulation of cool air from either of the Class 1E electrical equipment A/C system trains to the electrical equipment rooms associated with both Class 1E electrical equipment room A/C trains. This single-train configuration will be implemented only when the plant is in TS 3.7.20, Condition A (i.e., One Class 1E electrical equipment A/C train inoperable). The details of the design modifications are described in Section 3.1 of this SE. In addition, a new proposed FSAR Section 16.7.13, "Class 1E Electrical Equipment Air Conditioning (A/C) Supplemental Cooling Subsystem," is further described in Section 3. 7 of this SE.

2.4.2 Design Modification that Supports Proposed Change to Technical Specification 5.5.11

Plant Modification MP 17-0024

The electric heaters in the control room pressurization system filter trains will be modified such that their wattage (heat added) will be reduced. This will reduce the heat load to be accounted for in the Class 1E electrical equipment A/C trains since these two systems interact with each other within the overall control building ventilation envelope.

2.5 Applicable Regulatory Requirements/Guidance

The NRC staff identified the following regulatory requirements and guidance as applicable to the proposed amendment.

2.5.1 Regulatory Requirements

Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.36(a)(1), requires an applicant for an operating license to include proposed TSs in the application in accordance with the requirements of 10 CFR 50.36, "Technical specifications." The regulation at 10 CFR 50.36(a)(1) requires in part,

> A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the technical specifications.

As required by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are "the lowest functional capability or performance levels of equipment required for safe operation of the facility." When an LCO is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the [TSs] until the condition can be met.

The regulation at 10 CFR 50.36(c)(2)(ii) requires licensees to establish TS LCOs for items meeting Criterion 3. Criterion 3 states:

> A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

The regulation at 10 CFR 50.36(c)(3), "Surveillance requirements," requires TSs to include SRs, which 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."

The Commission's regulatory requirements related to the content of the alternating current (AC) power and station blackout (SBO) are set forth in 10 CFR 50.63, "Loss of all alternating current power." This regulation requires, in part,

> (1) Each light-water-cooled nuclear power plant licensed to operate under this part . . . must be able to withstand for a specified duration and recover from a station blackout as defined in § 50.2. The specified station blackout duration shall be based on the following factors:

(i) The redundancy of the onsite emergency ac power sources;
(ii) The reliability of the onsite emergency ac power sources;
(ii) The expected frequency of loss of offsite power; and
(iv) The probable time needed to restore offsite power.

(2) The reactor core and associated coolant, control, and protection systems, including station batteries and any other necessary support systems, must provide sufficient capacity and capability to ensure that the core is cooled and appropriate containment integrity is maintained in the event of a station blackout for the specified duration. The capability for coping with a station blackout of specified duration shall be determined by an appropriate coping analysis. Licensees are expected to have the baseline assumptions, analyses, and related information used in their coping evaluations available for NRC review.

The regulation at 10 CFR 50.36(c)(5), "Administrative Controls," requires TSs to include Administrative Controls, which are "the provisions relating to organization and management, procedures, recordkeeping, review and audit, and reporting necessary to assure operation of the facility in a safe manner."

Section 50.55a, "Codes and standards," of 10 CFR requires that the protection systems meet Institute of Electrical and Electronics Engineers (IEEE) 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations." Section 4.2 of IEEE 279-1971 discusses the general functional requirement for protection systems to assure they satisfy the single failure criterion, and Section 4.6 of IEEE 279-1971 discusses channel independence and physical separation.

As described in 10 CFR 50.92, "Issuance of amendment," paragraph (a), "In determining whether an amendment to a license . . . will be issued to the applicant, the Commission will be guided by the considerations which govern the issuance of initial licenses . . . to the extent applicable and appropriate." The general considerations that guide the Commission include, as stated in 10 CFR 50.40(a), how the TSs provide reasonable assurance the health and safety of the public will not be endangered. Also, to issue an operating license, of which TSs are a part, the Commission must make the findings of 10 CFR 50.57, including finding the 10 CFR 50.57(a)(3)(i) finding that there is reasonable assurance "that the activities authorized by the operating license can be conducted without endangering the health and safety of the public."

As stated in Callaway's FSAR, Section 3.1 (Reference 9), "Conformance with NRC General Design Criteria," the design criteria for safety-related plant structures, systems, and components is in accordance with 10 CFR Part 50, Appendix A, "General Design Criteria [GDC] for Nuclear Power Plants." The following GDC apply to the Class 1E Electrical Equipment A/C System and is stated in Section 3.1 of the Callaway FSAR, as follows:

Criterion (GDC) 2, "Design Bases for Protection against Natural Phenomena," states that:

> Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without the loss of the capability to perform their safety functions. The design bases for these structures, systems,

and components shall reflect: (1) appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena, and (3) the importance of the safety functions to be performed.

GDC 4, "Environmental and Missile Design Bases," states that:

> Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.

GDC 13, "Instrumentation and Control," states 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, "Electrical Power Systems," states that:

> An onsite electric power system and an offsite electric power system shall be provided to permit the 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, 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.
>
> Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights of way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A switchyard common to both circuits is acceptable. Each of these circuits shall be designed to be available in

sufficient time following a loss of all onsite alternating current power supplies and the other offsite electric power circuit, to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded. One of these circuits shall be designed to be available within a few seconds following a loss-of-coolant accident to assure that core cooling, containment integrity, and other vital safety functions are maintained.

Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.

GDC 19 "Control Room" states, in part, that:

A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem [roentgen equivalent man] whole body, or its equivalent to any part of the body, for the duration of the accident.

2.5.2 Regulatory Guidance

The NRC staff identified the following regulatory guidance documents as being applicable to the proposed amendment.

- NUREG-1431, Revision 4.0, "Standard Technical Specifications: Westinghouse Plants, Volume 1, Specifications and Volume 2, Bases (References 10 and 11, respectively).

- Regulatory Guide (RG) 1.22, Revision 0, "Periodic Testing of Protection System Actuation Functions" (Reference 12).

- RG 1.52, Revision 1, "Design, Testing, and Maintenance Criteria for Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants" (Reference 13).

- RG 1.93, Revision 1, "Availability of Electrical Power Sources" (Reference 14).

- RG 1.27, Revision 2, "Ultimate Heat Sink for Nuclear Power Plants" (Reference 15).

- The NRC staff's guidance for review of TSs is in Chapter 16, Revision 3, "Technical Specifications," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition" (Reference 16).

- The NRC staff reviews the human performance aspects of this LAR, utilizing the review guidance in NUREG-0800, Chapter 18, Revision 3, "Human Factors

Engineering" (Reference 17), and NUREG-1764, Revision 1, "Guidance for the Review of Changes to Human Actions" (Reference 18). NUREG-1764, Revision 1, Appendix A, Table A.2, "Generic PWR [Pressurized-Water Reactor] Human Actions That Are Risk-Important," lists human actions associated with the recovery of emergency alternating current (AC) or offsite power as potentially risk-important.

3.0 TECHNICAL EVALUATION

The licensee proposes to implement two design modifications to provide the capability for one cooling train to provide adequate cooling for both trains of Class 1E electrical equipment during normal and accident conditions, if the other Class 1E electrical equipment room A/C train is inoperable.

To support its review of the proposed amendment, the NRC staff conducted a regulatory audit of the supporting calculations as they related to the requested TS changes. The onsite audit occurred on September 26 to September 27, 2018, at Callaway. The remainder of the audit was conducted by the NRC staff via teleconference calls between the NRC staff and the licensee, ending on November 26, 2018. The results of the audit are documented in an audit summary, which was issued on January 4, 2019 (Reference 19).

Subsequent to the audit, the licensee supplemented its LAR (Reference 1) by letter dated January 23, 2019 (Reference 2), and provided a response to a request for additional information (RAI) by letter dated February 8, 2019 (Reference 3).

3.1 Elements of Plant Modifications that Support TS 3.7.20

As described in Section 3.3, "Planned Modifications," of the application, as supplemented by letter dated January 23, 2019, the licensee provided detailed elements associated with the design modifications that support the LAR.

3.1.1 Plant Modification MP 16-0024, Supplemental Cooling System

1. Fans, Dampers, and Penetrations in Battery Rooms and Switchboard Rooms (Plant Elevation 2016 Feet (2016'))

   Two recirculation fans (with isolation dampers), two wall and two ceiling penetrations (with fire dampers) and six door penetrations (i.e., grills) will be installed in the battery and switchboard rooms. One fan and two isolation dampers will be aligned with each SGK05 cooling train (i.e., "A" Train and "B" Train). Recirculation fans will be placed in Battery Rooms 2 and 3 and each fan will discharge into a combined common duct . The remainder of the circulating air flow travels from room to room through a series of door penetrations and wall penetrations equipped with fire dampers. A return duct between Battery Rooms 1 and 4 carries the warm air back to Battery Room 1 or 4 (depending on which SGK05 train is functioning). Air is then mixed within the 2016' elevation and HVAC duct for the functional SGK05 cooling train.

   Upon failure of an SGK05 cooling train or during pre-planned preventive maintenance, the recirculation fans associated with the functional SGK05 cooling train will be manually started locally by field operators. Specific field operator actions are described in Section 3.8.4.2, "Human Action Analysis," of this SE. In this configuration, the recirculation fan transports cool air from the functional SGK05 cooling train to both

Class 1E electrical equipment rooms. In this manner, either SGK05A or SGK05B cooling train is capable of cooling both trains of Class 1E equipment rooms. In the LAR, the licensee provided a description of the circulating air flow paths on Plant Elevation 2016' and schematics depicting the air flow pattern when either A/C system is used to cool redundant electrical trains.

2. Fans, Dampers, and Penetrations in ESF Switchgear (Plant Elevation 2000 Feet (2000'))

Four recirculation fans with control dampers will be installed in the ESF switchgear rooms. Depending on the cooling train that is in operation, manual field operator actions will be required (per TS 3.7.20, Required Action A1) to start the two recirculation fans. (There are two fans associated with each cooling train). One recirculation fan is positioned to circulate cool air from the switchgear room with the operating cooling train to the switchgear room with the nonfunctioning cooling train. The second recirculation fan is positioned to draw warm air from the switchgear room with the nonfunctioning cooling train to the operating cooling train. Air is then mixed within the 2010' elevation and HVAC duct for the functional SGK05 cooling train.

Schematics of the circulating air flow path, on Plant Elevation 2000' that is created depending on the train of recirculation fans in service, are described in the LAR.

Schematics of the circulating air flow path, on Plant Elevations 2016' and 2000' that are created depending on the train of recirculation fans in service, are described in Attachment 1 of the supplement dated January 23, 2019.

For both 2000' and 2016' elevations, components of the supplemental cooling system are classified as safety-related, which correlates with the classification of the original Class 1E Equipment A/C System (SGK05). Accordingly, the supplemental cooling system is classified as safety-related, utilizing Class 1E power sources. In addition, the supplemental cooling system and equipment are designated as Seismic Category I (designed and built to withstand design-basis earthquake stresses). Supplemental fan system components will be subjected to safety-related testing per the requirements of 10 CFR Part 50, Appendix B. The design specification for the supplemental cooling system fans requires that the fan housings are capable of containing any internally-generated missiles. The fan supplier has qualified the fan housing as part of the seismic qualification calculation.

For the 2016' elevation, steel doors will have a passive opening with a grill to allow the passage of cooling system airflow. These doors are classified as nonsafety-related, Seismic Category II/I. After installation, post-modification testing will be performed to validate that the system is operating properly and that the total system flow and individual air flow through the electrical equipment rooms satisfy the minimum airflow required by the GOTHIC analysis. The HVAC duct and flexible connections, control panel, and control systems are all classified as safety-related, Seismic Category I.

3.1.1.1 Flooding and Fire Protection Analysis, Plant Modification MP 16-0024, Supplemental Cooling System

Flooding

Related to the modified fire doors with new grills, in the supplement dated January 23, 2019 (Reference 2), the licensee stated that the existing drain system is more than sufficient to accommodate the water flow from postulated pipe breaks associated with the rooms on either side of the doors, in which the grills are proposed to be installed. The flood height in the rooms is 0 inches. For each affected door, the grill is inserted in the lower half of the door but does not impact the bottom 6 inches of the door (which remains solid). Therefore, no new flooding concerns are created due to the use of grills in the doors.

Fire Protection

In Attachment 2, Section 3.3, "Fire Protection," of the LAR dated March 9, 2018, as supplemented by letter dated January 23, 2019, the licensee stated that the new HVAC duct work passing through fire-rated fire protection barriers is provided with rated fire dampers. New conduits and cables passing through fire-rated fire protection barriers are provided with rated fire barrier penetration seals. Where modified, fire doors and walls are designed to maintain the fire rating of the barriers. Fire doors are not part of the fan structure. On the 2000' elevation, an existing double-leaf fire door is being converted to a single-leaf door. The area from the other door leaf is being converted into a stationary wall section designed as a 3-hour fire barrier with HVAC penetrations. This new wall section consists of safety-related steel framing to support the fire dampers and ventilation duct, and is enclosed in a Durasteel fire barrier to establish its fire rating.

The licensee stated that the actuation logic for the supplemental cooling fans and air isolation dampers is tied with the fire area detection systems so that the fans shut off and the dampers isolate in the event of a fire. In the Halon protected areas, within Fire Areas C-9 and C-10 (i.e., the two switchgear rooms), the fans shut off and air isolation dampers close in response to a Halon system actuation signal. The fans and air isolation dampers for the DC switchgear and battery rooms also shut down in response to a Halon system actuation signal. The fan motors are sized such that they do not meet ignition source criteria, so no new ignition sources are being added.

The licensee stated that the power supply breakers for the supplemental cooling system will be maintained open when the system is not in use. This will reduce the probability of spurious actuations related to the system.

The licensee stated that the walls and doors internal to the fire areas, where the grills in the fire doors are located, are not rated fire barriers. Therefore, a fire damper is not required for these specific doors. The licensee performed fire modeling, which demonstrated that the grills, when installed, have no adverse impact on the fire modeling assumptions or results for associated fire areas.

The licensee stated that the supplemental cooling equipment and circuits are not required or credited to meet the Nuclear Safety Performance Criteria discussed in the Callaway National Fire Protection Association (NFPA) 805 program; however, they have been analyzed for impact on credited equipment and plant fire risk. The resultant change in plant fire risk falls within the limits for self-approval.

In summary, the design modifications have no adverse impact on fire assumptions and associated fire areas, nor do these modifications create any new flooding concerns.

3.1.2 Plant Modification MP 17-0024, Electric Heater, Control Room Pressurization System Filter Train

The licensee stated that Plant Modification MP 17-0024 involves a physical change to the charcoal heaters in the pressurization trains associated with the control room ventilation system, to reduce the wattage of these heaters. This will be implemented by installation of permanent jumpers in each heater to bypass selected heater elements. The heaters are in the control building at the 2016' elevation and, as such, are within the control building ventilation envelope.

The licensee has performed design calculations in support of this Plant Modification MP 17-0024 to demonstrate that the reduced wattage of the pressurization filter charcoal heaters will maintain the design requirement of reducing the relative humidity of the control building air supply to 70 percent. The 70 percent limit on relative humidity is in accordance with TS 5.5.11.c and RG 1.52, Revision 1 (Reference 13).

3.1.3 Design Modification and Test Plan

In the LAR dated March 9, 2018, as supplemented by letter dated January 23, 2019 (References 1 and 2, respectively), the licensee stated that testing would be performed for the following:

Heaters, Control Room Pressurization Filter Train

1) Validate the adequacy of the proposed design by demonstrating that the heater will dissipate 5 ± 1 kW when tested in accordance with American National Standards Institute (ANSI) N510-1975, "Testing of Nuclear Air-Cleaning Systems," and corrected to design nameplate voltage settings.

2) Operate from the Control Room for a minimum time of 15 continuous minutes with flow through the HEPA filters and charcoal beds, with the heater circuits in the filter train energized.

Proposed Supplemental Fans

1) Supplemental fan system components will be subjected to safety-related testing to verify compliance to specification requirements.

Proposed Supplemental Cooling System

1) Post-modification testing will be performed to validate that the system is operating properly, and that the supplemental fans are supplying the minimum airflow required by the GOTHIC analysis.

2) Verification of each Class 1E Electrical Equipment A/C Supplemental Cooling system train actuates and provides recirculation air flow.

3) Verification of fans shut off and the air isolation dampers close in response to a Halon system actuation signal.

Proposed TS 3.7.20 Class 1E Electrical Air Conditioning System

1) Verification that each Class 1E electrical equipment A/C train actuated on an actual or simulated actuation signal.

3.2 Class 1E Electrical Equipment - Environmental Conditions

In Section 3.1, "Normal and Design Basis Accident Environmental Conditions," of the LAR dated March 9, 2018 (Reference 1), the licensee stated, in part,

> The Class 1E electrical equipment A/C trains are operated in a continuous recirculation mode to maintain the ESF switchgear room, the 125-VDC battery rooms, and the switchboard rooms to a temperature of ≤ [less than or equal to] 90 °F, as discussed in FSAR Section 9.4.1.2.3.
>
> FSAR Section 3.11(B) "Environmental Design of Mechanical and Electrical Equipment," provides information on the environmental conditions and design bases for which the mechanical, instrumentation, and electrical portions of the engineered safety features, the reactor protections systems, and other safety related systems are designed to ensure acceptable performance during normal and design basis accident environmental conditions.

The environmental conditions during normal operating and accident conditions, as listed in FSAR Tables 3.11(B)-1 and 3.11(B)-2, respectively, were provided in Table 2, Section 3.1 of the licensee's LAR.

The operating and accident environmental conditions for the Class 1E electrical equipment rooms are 90 °F (normal) and 104 °F (accident) with a relative humidity of 70 percent.

In Section 3.1 of the LAR, the licensee further stated,

> FSAR 16.7.4. "Area Temperature Monitoring," provides requirements in regard to temperature monitoring and limits in areas/rooms containing safety-related equipment. Table 16.7-2 lists the area temperature limits applicable during normal operation for specific locations in various buildings. The temperature limits are related to the expected thermal life for the equipment that operates in the areas where the temperatures are monitored and controlled. The temperature limits established for the Class 1E electrical equipment rooms is ≤ 87 °F (since the temperature limits include an allowance for instrument error of ± 3 °F).
>
> The normal operating temperature of the Class 1E electrical equipment rooms, as specified in the FSAR, remains below the 90 °F maximum. Normally, the temperatures in the Class 1E electrical equipment rooms are maintained between 68 °F and 75 °F, and during normal equipment operation . . . the room temperatures are assured to remain below 90 °F. A single functional Class 1E electrical equipment A/C train providing area cooling for both electrical equipment trains concurrent with accident condition (LOCA [loss-of-coolant accident]) heat

> loading will maintain the equipment room temperatures less than the 104 °F maximum for accident/faulted environmental conditions.

In the supplement dated January 23, 2019, the licensee provided clarification concerning room monitoring, and stated that the wall-mounted temperature sensors in the rooms provide input to control room annunciators and plant computer alarms. The computer points do not display the temperature; rather, they only read out as HI or NOT-HI. The alarm setpoints are currently set at 85 °F for the ESF Switchgear Rooms (CB 2000'), and 88 °F for the CB 2016' rooms. The licensee also stated that the alarm setpoints on these sensors will be lowered to 83 °F. The power for the indicators is from nonsafety-related sources. If the plant computer loses power, then the individual display stations will display "Time Not Updating." Depending on the failure mode, a control room annunciator may also be in alarm.

In Attachment 1 of the supplement dated January 23, 2019, the licensee stated, in part, that "[a]n attachment will be added to the normal operating procedure for the control building ventilation system to record room temperatures in the first hour after the supplemental cooling system is started, and once per 4 hours thereafter. A calibrated handheld temperature indicator will be utilized if local indication is not available."

3.3 GOTHIC Calculations - Single Train Operating

In the LAR and its supplement (References 1 and 2, respectively), the licensee described that Calculation NAI-1719-004, Revision 1, "Callaway Control Building with Control Room Loss of Class 1E A/C GOTHIC Room Heat Up With Installed Fans and Louvers," evaluates the capability of one train of the Class 1E electrical equipment A/C system to supply adequate cooling for both trains of the Class 1E electrical equipment, when the plant is in proposed TS 3.7.20, Condition A, Required Action A.1.

The methodology utilized for this calculation, including important elements and assumptions associated with the methodology, as well as design inputs and overall results, are presented or described as follows.

Two analyses were completed: Case 1 with SGK05A in operation and Case 2 with SGK-05B in operation.

3.3.1 Calculations - Methodology

In Attachment II, Section 3.2.1, "Methodology," of the LAR, the licensee stated,

> The GOTHIC models were developed for Callaway by Numerical Applications (NAI). GOTHIC Version 8.0 (QA) thermal-hydraulic analysis software package was used to develop the Callaway Control Building models developed in Calculation NAI-1719-004. GOTHIC is an integrated, general purpose thermal-hydraulics software package for design, licensing, safety and operating analysis of nuclear power plant containments and other confinement buildings. GOTHIC Version 8.0(QA) has been qualified under the NAI Quality Plan that complies with 10 CFR [Part] 50, Appendix B. ...
>
> The GOTHIC models use a subdivided volume approach for modeling rooms in the Callaway Control Building 2000', 2016', 2032' and 2073.5' elevations. Due to the large number of rooms in the Control Building, a subdivided volume

> represents a floor level or levels. Rooms are represented with a group of cells, and the average temperature is assumed to be representative of the entire room. Grouping of cells (nodes) are created for every room/area in the Control Building, but only certain rooms are explicitly modeled.

Additional details include control volumes (room and ductwork), flow paths, heat sinks, heat loads, components, boundary conditions, outdoor air temperatures, and flow networks. Details of the GOTHIC modeling are described in Section 3.2.1 of the LAR.

3.3.2 Calculations - Inputs and Assumptions

In the LAR, the licensee described that the calculations detail the ability of a single Class 1E electrical equipment A/C train to maintain the Class 1E equipment rooms below the maximum design temperature of 90 °F during normal operations and below 104 °F during accident conditions, with mitigating actions under the proposed TS 3.7.20, Required Action A.1, in effect. In order to provide this cooling capability, recirculation fans and other required equipment must be manually started to circulate the cool air from the operating cooling train to the rooms of the out-of-service cooling train and return the heated air to be cycled through the train to be cooled. The licensee stated in Section 3.2.2, "Design Inputs,"

> The site outdoor ambient design dry-bulb and wet-bulb temperatures used for this analysis are the 0.4% cooling design values provided for Columbia, MO, USA per the ASHRAE [American Society of Heating, Refrigerating and Air-Conditioning Engineers] Handbook. Data for Columbia, MO, USA were used since it is the closest weather station to the Callaway site provided by ASHRAE. The mean daily temperature range for the hottest month of June was used to develop the diurnal temperature profile. In summary, the values used were as follows: a maximum dry-bulb temperature of 94.7 °F, a corresponding nighttime low temperature of 75.2 °F, a corresponding wet-bulb temperature of 75.7 °F, and a diurnal style relative humidity.

3.3.3 Calculations - Room-to-Room Differential Pressure

In the supplement dated January 23, 2019, the licensee stated that the maximum wall differential pressure between any two adjacent rooms calculated in the GOTHIC analysis is 4.5 pounds per square foot differential (psfd). Specifically, with the "A" Train operating, the calculated differential pressure is 4.42 psfd between rooms 3411 and 3412. The block walls in the control building are structurally qualified via analysis for 6.25 psfd applied air pressure, and the GOTHIC analysis results showed that applied wall pressures between rooms are well below this analyzed limit.

3.3.4 Calculations - Hydrogen Generation and Concentrations

In the LAR and its supplemental letter dated January 23, 2019 (References 1 and 2, respectively), the licensee stated that the calculations demonstrated that post-accident hydrogen peak concentrations will remain well below the 2 percent limit currently described in the Callaway FSAR.

The GOTHIC analysis utilizes hydrogen generation rates provided by the battery vendor as a function of room temperature, and the concurrently applied maximum charging voltage of 2.33 volt/cell. The battery manufacturer memorandum documented in the H_2 discharge

calculation provides the basis for hydrogen generation rates used in the GOTHIC analysis. The maximum charging voltage that is applied to the batteries represents the worst-case charging conditions with a malfunctioning charger (that continues to provide charging current even when batteries are fully charged).

The GOTHIC analysis incorporates maximum hydrogen generation rates with the supplemental fan system in service, and outside air only being provided by the control room pressurization system. The maximum calculated concentration for any room within the control building was 0.0224 percent for Case 1 (Battery Room 1 at 331 hours into the event) and 0.0229 percent for Case 2 (Battery Room 4 at 124 hours into the event). In both cases, the hydrogen concentration remains well below the regulatory limit of 2 percent by volume.

3.3.5 Calculations - Temperature Results

In Table 4, "Maximum Room Temperature Summary," of the LAR and its January 23, 2019, supplement (References 1 and 2, respectively), the licensee provided a summary of the "30-day post-LOCA operation temperature," "maximum LOCA temperature," and "time to maximum LOCA temperature (hours)" for each room with either a SGK05A train or SGK05B train out of service. The room temperature summary was based on incorporating electrical heat load input discussions held with NRC staff during the audit (Reference 19).

In summary, the "30-day post-LOCA operation temperature" was 101.69 °F (ESF Switchgear Room 2 (RM 3302)) and for the maximum temperatures for the post-LOCA cases, the maximum temperatures varied from 92.53 °F (Battery Room 3 (RM 3413) to 103.32 °F (RM 3302)). Specifically, all room temperatures remain below 104 °F, which is the maximum room temperature listed in the design specifications for the Class 1E electrical equipment and is the maximum post-accident room temperature listed in the Callaway FSAR.

3.4 NRC Staff Evaluation - Supporting Analysis and Calculations

As stated in Section 3.3 of this SE, the licensee evaluated single train operations with the design modification operational. Calculations were used to analyze single train operations. Calculation methodology, inputs/assumptions, room-to-room differential pressures, hydrogen generation/concentrations, and temperature results were reviewed by the NRC staff.

Calculation NAI-1719-004 was developed by the licensee to evaluate the capability of one train of the Class 1E electrical equipment A/C system to supply adequate cooling for both trains of the Class 1E electrical equipment.

In the LAR, the licensee states,

> Heat loads were added to the model using heated conductors. Heated conductors were used to allow spanning the heat loads across multiple cells. Most equipment is located in the lower elevations of each room; therefore, the equipment heat conductors were placed in the lower half cells for the rooms. Most lights and cable trays are found in the upper region of the rooms; therefore, heat conductors representing lighting and cable trays, if any are specified, were located in the upper half cells for the rooms. For a room modeled and set to a constant temperature, the heated conductors were spanned throughout the room with a large surface area.

There are wall-mounted area heaters in the control building. The assumption in the GOTHIC model is that the heaters are off when TS 3.7.20 is in effect. The normal operating procedure for the control building ventilation systems will be revised to verify that the wall-mounted heaters are off as part of the TS 3.7.20 mitigating actions.

As stated in Section 3.0 of this SE, the NRC staff conducted an onsite audit to gain a better understanding of the licensee's calculations and other aspects of the LAR. During the audit, the NRC staff discussed calculations, computer-modeling of HVAC systems (GOTHIC) and electrical power systems, and human performance considerations. In the license's response to a request for additional information (RAI) in its supplement dated February 8, 2019 (Reference 3), the licensee provided clarification to revised heat loading variations during LOOP, non-LOOP, SBO, and LOCA conditions.

During the audit, the NRC staff discussed assumptions and inputs considered in the development of revised Calculation NAI-1719-004, Revision 1. Specifically, the staff discussed the methodology and factors that could impact the flow of current in electrical equipment during normal operation and postulated accident conditions.

Control Room Emergency Ventilation System Heater Sizing Calculations

The LAR proposes an amendment to Part "e" of Callaway TS 5.5.11, "Ventilation Filter Testing Program (VFTP)." The value specified for the wattage required to be input into each control room pressurization train is proposed to be changed from 15 ± 2 kW to 5 ± 1 kW. In its LAR, the licensee stated:

> The design function of the control room pressurization system filter adsorber unit heater is to reduce the relative humidity of the air entering the charcoal filter beds from design ambient conditions (i.e., 100% relative humidity) to 70% relative humidity. The original design specified a heater with a rating of 15 kW ± 2 kW to meet this functional requirement. However, as further described in section 3.3, review of' associated design basis calculations indicates that this system requires only 3.16 kW to meet the functional requirement.
>
> It has been determined that reducing the heater capacity from 15 kW ± 2 kW to 5 kW ± 1 kW will still provide sufficient operating margin and still meet design basis requirements for CREVS.

The power output of electric heaters is a function of voltage at the terminals of the equipment. During the site audit, the NRC staff requested information on parameters for evaluating the adequacy of a heater with nominal rating of 5 kW ± 1 kW to provide 3.16 kW of power during varying plant voltage conditions. In Attachment 1 of the supplement dated January 23, 2019, the licensee stated that the heater is rated to operate at 460 volts ± 10 percent. An allowable minimum of 414 volt was assumed at the heater terminals for evaluation of the heat output requirements. This voltage is below the minimum voltage of 427 volts in the 480-volt system expected during degraded voltage conditions at the plant buses with the 4160-volt buses operating at 3720 volts.

The NRC staff noted that TS SR 3.8.1.2 verifies that each emergency diesel generator (EDG) starts from standby conditions and achieves steady state voltage greater than or equal to (≥) 3740 volts and ≤ 4320 volts, and frequency ≥ 58.8 hertz (Hz) and ≤ 61.2 Hz. The ability of the CREVS to reduce humidity is a function of the heating element output and air flow rates. The

staff requested information on the effectiveness of CREVS when supplied by the EDG operating at the lower end of the allowable voltage, which reduces heater output and lower end of frequency range, which reduces fan speed and affects flow rates. In Attachment 1 of the LAR's supplement, the licensee stated that the degraded voltage relay setpoint of 3720 volts at the 4160-volt bus bounds the 3740-volt low limit when the EDG is supplying the buses. The licensee further stated, "[t]he impact of steady state diesel frequency and voltage variations on pump and fan flowrates is recognized as an industry-wide issue and is being analyzed at Callaway through implementation of NRC approved WCAP-17308-NP Rev. 0. The WCAP implementation project will culminate with a License Amendment Request to update the TS 3.8.1 allowable frequency and voltage bands. In the interim, Callaway has compensatory measures in place to ensure that steady state DG [diesel generator] frequency is maintained between 60.0 Hz and 61.2 Hz."

The NRC staff reviewed the assumptions and inputs associated with calculations performed to determine the wattage (heat) required to reduce the humidity of air in CREVS to 70 percent. The licensee has stated that the adequacy of the heaters will be tested to:

1) Validate the adequacy of the proposed design by demonstrating that the heaters will dissipate 5 ± 1 kW when tested in accordance with ANSI N510-1975, "Testing of Nuclear Air Cleaning Systems," and corrected to design nameplate voltage settings.

2) Operate from the Control Room for a minimum time of 15 continuous minutes with flow through the HEPA filters and charcoal beds, with the heater circuits in the filter train energized.

Based on the information provided by the licensee, the NRC staff concludes that the nominally rated 5 kW heater will provide the calculated minimum required heat output of 3.16 kW and the administrative controls established by the licensee provide reasonable assurance that fan flow rates are not adversely impacted when CREVS is supplied by EDGs operating at the lower end of administratively controlled frequency band.

Electrical Heat Load Calculations

During the site audit, the NRC staff discussed calculations developed to evaluate the heat contribution from electrical conductors and operating equipment required to mitigate consequences of an accident. Specifically, the staff requested information on minimum bus voltages, temperatures used to calculate conductor resistances, motor and pump loading criteria, and types of events/accidents considered for maximum heat load contribution. In the supplement dated January 23, 2019 (Reference 2), the licensee stated cable resistances were calculated assuming a conductor temperature of 90 degrees Centigrade (°C). The electrical loads are based on the worst loading for the driven load (i.e., maximum flow, maximum loading, runout, etc.). Large emergency core cooling system (ECCS) injection pumps were assumed to be operating at the maximum flow rates to obtain the maximum brake horsepower loading point for the pump motors. Other pumps and fans were assumed to operate at their maximum design load operating point for their system requirements.

The NRC staff requested additional information concerning plant loading conditions and duration of operation of large motors that are major contributors of heat in the electrical equipment rooms. In response to the RAI, in its supplement dated February 8, 2019 (Reference 3), the licensee provided additional clarification on the bounding conditions that

were considered for evaluating heat loads. The licensee stated that the maximum heat load contribution occurs when a large break LOCA (LBLOCA) is considered:

> In regard to the analysis of electrical heat loads during an LBLOCA sequence of events, the electrical heat load calculation used conservative assumptions to maximize the heat produced in the rooms. Low bounding voltages were used for the operating equipment to maximize the running current and thereby increase the I^2R heat losses from the current-carrying equipment (breakers, bus work transformers cables [*sic*], etc.). The electrical loads are based on the worst loading for the driven load (i.e. maximum flow, maximum loading, runout, etc.) The bounding electrical heat load case is based on a LBLOCA with safety injection and containment spray actuation signals occurring. Assuming no loss of off-site power is conservative in this case.

In Attachment 1 of the supplement dated January 23, 2019 (Reference 2), the licensee identified some large pumps that have flow control valves or orifices, and therefore, may not be operating at runout conditions at the onset of an event. In response to RAI Question 1, the licensee also provided a tabulated listing with descriptive names of large loads (greater than 50 brake horsepower) that are operating at the onset of the event with the duration of operation of each load. The licensee has considered three time periods (0 to 24 hours, 24 hours to 7 days, and 7 days to 30 days), for step changes in plant loads. The NRC staff reviewed the reasoning for bounding events and the summary of electrical loads assumed to be operating for mitigating the consequences of a LBLOCA, and finds the rationale is acceptable for worst case heat loading profile.

Load shedding and plant shutdown with one ECCS Train operation

Attachment 2 of the LAR dated March 9, 2018 (Reference 1), the licensee proposed a new TS 3.7.20 with an action to restore an inoperable Class 1E electrical equipment A/C train to an operable status within 30 days. In Attachment 1 of the LAR, the licensee stated, in part, "New TS 3.7.20 in conjunction with planned plant modifications, would allow one operable Class 1E electrical equipment A/C train to provide adequate area cooling for both trains of Class 1E electrical equipment during normal and accident conditions (with minimal actions required)." However, during the site audit, the NRC staff observed that one complete train of ESF equipment was secured 7 days post-accident. The licensee supplemented its LAR by letter dated January 23, 2019 (Reference 2), to clarify the basis for securing one train of safe shutdown equipment.

In the supplement, the licensee stated that in order to preserve the ultimate heat sink (UHS) pond inventory over the required 30 days, it is necessary to have one train of ESW and associated UHS cooling tower fans secured within 7 days, assuming that both ESW trains are actuated and are operating in response to an accident signal. This mode of operation was addressed in Amendment No. 208 (Reference 20) for the UHS, and the licensee has developed emergency operating procedures (EOPs) to provide guidance to plant operators.

In order to develop an understanding of events that would require securing of one train of ESF equipment when one safety-related A/C train is operating, the NRC staff requested additional information on accidents, events, and anticipated operational occurrences discussed in the FSAR that would require one train of ESF equipment to be secured. In the licensee's response to RAI Question 3 in its supplement dated February 8, 2019 (Reference 3), the licensee stated "at least one train of ESF equipment would be expected to remain available for plant shutdown

during the 30-day, post-event period (as discussed in Callaway FSAR, Section 9.2.5, Reference 5, and Reference 15.). The action taken within 7 days (post-event) to shut down one train of ESF equipment (for supporting the UHS cooling pond function in accordance with provisions described in Amendment No. 208) would be for the train associated with the initially inoperable Class 1E electrical equipment A/C train. Assuming no additional failures, the other ESF train would remain available to effect or maintain plant shutdown."

The NRC staff notes that in Amendment No. 208, the licensee requested securing of one train of the ESW system when significant evaporative losses, resulting from an event (LBLOCA) coupled with a single failure of safety-related UHS tower bypass valve, were evaluated. For a GDC 2 event involving protection against natural phenomena, the licensee stated in its supplement dated February 8, 2019 (Reference 8), that "no deterministic, bounding detailed or analyzed sequence of events (like what is presented for design-basis accidents) is given in the FSAR." A GDC 2 event can result in a LOOP and loss of nonsafety-related equipment not designed to withstand such events. Therefore, plant shutdown can be accomplished using safety-related equipment. A UHS inventory makeup requires use of nonsafety-related equipment, which may not be functional. Since recovery of nonsafety-related equipment or offsite power is not assured within 7 days, the NRC staff considers it reasonable to secure one train of safe-shutdown equipment after 7 days to preserve UHS inventory. Therefore, for the 30-day proposed CT and 30-day mission time of UHS, the staff concludes that Callaway will rely on one train of onsite power system and an ESF system to maintain safe shutdown conditions.

In the licensee's response to RAI Question 4, in its supplement dated February 8, 2019 (Reference 8), the licensee provided information on ESF equipment that would be available if an anticipated operational occurrence or accident, as described in Chapter 15 of the Callaway FSAR (Reference 21), occurred with one Class 1E electrical equipment A/C train inoperable. The response discussed four classifications of plant conditions described in the Callaway FSAR:

a. Condition I: Normal operation and operational transients
b. Condition II: Faults of moderate frequency
c. Condition III: Infrequent faults
d. Condition IV: Limiting faults

The licensee also stated in the response that seismic Category I, Class 1E, and IEEE qualified equipment, instrumentation, and components are used in the ultimate mitigation of the consequences of Conditions II, III, and IV events.

The licensee stated that "Condition I events do not result in the plant entering the EOP network. Therefore, a discussion of the UHS 30-day heat rejection time period and the preplanned shutdown of one train of ESF equipment within 7 days following the initiation of a postulated accident sequence would not be applicable to Condition I events." The NRC staff concludes that for Condition I events, redundant trains of ESF equipment (excluding one inoperable A/C train) will be available for plant shutdown, and defense-in-depth features of the plant design will be maintained for the 30-day mission time.

Condition II events may result in a reactor trip. For this condition, the licensee stated that these events are not expected to result in fuel rod failures or reactor coolant system or secondary system over-pressurization. The ESF equipment available to mitigate the event would be dependent upon the operating mode of the plant. For Condition II events, the licensee stated that nonsafety-related supplemental cooling systems coupled with one train of HVAC operating will maintain both trains of Class 1E electrical equipment rooms within an acceptable

temperature range such that both trains of ESF equipment would remain available to mitigate a Condition II event throughout a postulated 30-day mission time. The NRC staff notes that Condition II events include loss of non-emergency AC power to the station auxiliaries. The licensing basis of Callaway states that it contains a case of LOOP concurrent with postulated events. Further, those cases contain a condition where a the loss of non-emergency AC power is not a result of a catastrophic equipment failure, and radiation release to the environment is minimal, the staff considers it reasonable that operator actions can be taken and nonsafety-related supplemental cooling systems will be available 7 days after an event to maintain cooling for redundant systems of ESF equipment, and defense-in-depth features of the plant design will be maintained for the 30-day mission time of UHS and 30-day CT proposed for TS 3.7.20 in this LAR.

Condition III and Condition IV events involve faults that may occur very infrequently, but involve fuel damage and extended outage time. Prior to restoration of nonsafety-related systems and offsite power sources, system walkdown and support from external sources may be required. For Condition III events, the licensee stated in its supplement dated February 8, 2019, that "[t]he release of radioactivity will not be sufficient to interrupt or restrict public use of those areas beyond the exclusion radius." For Condition IV events, the release of radioactivity to the environment is expected to cover a wider area. The licensee's response to RAI Question 4 in its supplement dated February 8, 2019 (Reference 8), stated, "it should be noted that the supplemental cooling system would ensure that the remaining train of HVAC operating in conjunction with the supplemental cooling system would maintain both trains of Class 1E electrical equipment rooms within an acceptable temperature range such that both trains of ESF equipment would remain available to mitigate a Condition IV event throughout a postulated 30-day mission time (assuming no additional failure)."

Based on the current licensing basis of Callaway, and as described in the safety evaluation issued with Amendment No. 208 (Reference 20), the NRC staff concludes that Category I, Class 1E, and IEEE qualified equipment, instrumentation, and components are available for mitigation of the consequences for Condition III and IV events. In the event that only one Class 1E HVAC train (SGK05A or SGK05B) is being maintained, redundant trains of ESF electrical equipment will be cooled by one operable HVAC train for the first 7 days of the accident. After 7 days, plant procedures provide guidance for operators to secure one ESF train of equipment to preserve UHS inventory. The current licensing basis of Callaway assumes a single failure coupled with a LOOP for mitigating the consequences of postulated events, which leaves one train of ESF equipment for safe shutdown of the plant. Since an additional single failure is not postulated during the period when one Class 1E HVAC system is being maintained, the NRC staff concludes that securing one train of ESF train to maintain UHS inventory, per Reference 20, is reasonable for the 30-day duration UHS mission time considered in the current licensing basis of the plant and 30-day CT for TS 3.7.20 proposed in this LAR.

Battery Room Temperatures

During the audit, the NRC staff observed that the LAR considered consequences of maximum room temperatures, but there was no discussion on minimum room temperatures during a planned 30-day CT with minimum heat load from operating equipment. Information on battery room temperatures, based on the following observations from the plant's licensing basis, are:

- Callaway FSAR Section 1.2.1.8 "Meteorology" (Reference 22), states, in part that "[t]he climate of the Callaway site is temperate continental with cold snowy winters

and warm, humid summers. Based on climatological data from nearby weather stations, the normal annual average temperature is 55 °F at Columbia, Missouri. Extreme temperatures for the area are 116 °F for Fulton, Missouri, and -26 °F for Fulton, Missouri."

- Callaway TS SR 3.8.6.3 (Reference 7), states, "Verify average electrolyte temperature of representative cells is ≥ 60°F."

- Callaway FSAR, Section 9.4.1.2.3 (Reference 5), states, in part that "[t]he ambient temperature in the battery rooms, under any mode of operation, will be between 60 °F and 90 °F."

In Attachment 1 of the supplement dated January 23, 2019 (Reference 2), the licensee supplemented information on this subject and stated,

> A Station Blackout (SBO) or Extended Loss of All AC Power (ELAP) event represents the limiting scenario for minimum battery room temperatures due to the minimal equipment heat loads present. The minimum control building heat loads during an SBO/ELAP event conservatively bound the minimum heat loads present during any postulated Design Basis Accident (DBA), including a Loss of Offsite Power (LOOP) or events that extend beyond assumed offsite power restoration at 7 days.

The evaluation for battery room temperatures assumes a minimum battery temperature of 60 °F at the start of an event and demonstrates that the temperatures do not drop below 60 °F over the course of the event. The licensee stated that battery room temperatures steadily increase over the course of the 12-hour analysis and would continue to increase until an equilibrium temperature point is reached during the course of a longer 30-day event.

The NRC staff concludes that the methodology for evaluating the battery room temperatures is reasonable and the Class 1E battery system will not be adversely impacted during minimum temperature experienced by the plant site during extreme winter conditions.

Conclusion

The NRC staff concludes that based on the conservatism used in various calculations (heat loads GOTHIC analysis) and the resulting calculated margins obtained, this approach is acceptable, and that there is adequate margin for Class 1E electrical equipment A/C system in single train operation, assuming the Class 1E electrical equipment A/C recirculation subsystem is functional. Specifically, the NRC staff finds reasonable assurance that the Class 1E electrical equipment A/C recirculation subsystem will adequately support TS LCO 3.7.20, Required Action A.1 (part of TS mitigating actions) to provide adequate cooling to the opposite electrical trains for the 30-day CT.

In addition, calculations confirm that the charcoal filters for the control room emergency ventilation system heater will still be able to meet their required level of performance with the charcoal heater output (wattage) reduced to the new value to be specified in TS 5.5.11.e.

3.5 Proposed TSs

3.5.1 Proposed New TS 3.7.20

The licensee proposed new TS 3.7.20 for Modes 1, 2, 3, and 4 so that LCO 3.0.6 could be applied when one train of the class 1E electrical equipment A/C system becomes inoperable. By applying LCO 3.0.6, entry into the relatively short term CTs for LCOs 3.8.4, 3.8.7, and 3.8.9 could be avoided since LCO 3.0.6 requires only the support system LCO actions to be entered. The licensee stated that the new LCO will meet Criterion 3 of 10 CFR 50.36(c)(2)(ii) for inclusion into the TS. The proposed LCO 3.7.20 requires two Class 1E electrical equipment A/C trains be operable. The LCO applicability includes Modes 1, 2, 3, and 4. The applicability for the proposed LCO reflects the applicability of TS 3.7.8 and its associated TS Bases, "Essential Service Water (ESW) System," the safety-related heat sink for the Class 1E electrical equipment A/C trains during post-accident operation, and is also consistent with the applicability of the supported system TSs 3.8.4, 3.8.7, and 3.8.9.

Proposed TS 3.7.20 provides conditions and required actions for one Class 1E electrical equipment A/C train inoperable. Required Action A.1 of Condition A requires the immediate initiation of action to implement mitigating actions. Required Action A.2 requires verifying room area temperatures are ≤ 90 °F within 1 hour. The actions of Required Actions A.1 and A.2 assure that the initial conditions of Callaway's Calculation NAI-1719-004 Revision 1, "Callaway Control Building with Control Room Loss of Class 1E A/C GOTHIC Room Heat Up with Installed Fans and Louvers," are met.

The mitigating actions as stated in the proposed TS Bases (B 3.7.20) include opening the associated single train recirculating fans discharge damper, and starting the fans associated with the operable Class 1E electrical equipment A/C train.

Required Action A.2 of Condition A requires verifying the Class 1E electrical equipment room area temperatures are ≤ 90°F. This verification is required to be performed within 1 hour and once per 4 hours thereafter. The 4-hour CT is reasonable based on operating experience to verify room area temperatures and the minimal increase in room temperatures during this time period.

Required Action A.3 of Condition A requires the Class 1E electrical equipment A/C train to be restored to operable status in 30 days. The 30-day CT is based on the capability of the remaining operable Class 1E electrical equipment A/C train to provide adequate area cooling for both trains of electrical equipment during normal and accident conditions (with mitigating actions implemented) and the low probability of an event/accident occurring during this time. Calculation NAI-1719-004 demonstrates that with one Class 1E electrical equipment A/C train cooling both trains of Class 1E electrical equipment, post-accident room temperatures would remain below the 104 °F post-accident temperature limit specified in the Callaway FSAR. Based on this, there would be no loss of safety function for any of the supported Class 1E electrical equipment if an accident were to occur with Condition A in effect, assuming no additional failures.

The staff notes that the proposed 30-day CT for restoration of the inoperable Class 1E electrical equipment A/C train is similar to current Callaway TS 3.7.11, "Control Room Air-Conditioning System (CRACS)," which also includes a 30-day CT for restoration of an inoperable CRACS train to operable status. Additionally, with Condition A of proposed TS 3.7.20 in effect (including its associated mitigating actions), there is no loss of safety function. Both Class 1E electrical

equipment trains would remain within their FSAR-described licensing basis room temperatures. That is, both trains of electrical safety equipment would remain capable of performing at the level credited in the plant's safety analyses and meeting the mission times credited therein. However, because there is a reduction in redundancy at the support system level, plant operation is only allowed to continue for a limited period of time (based on the allowed CT and shutdown time specified per the proposed required actions).

Based on the history of maintenance activities that have been required on the Class 1E electrical equipment A/C trains at Callaway, a CT of 30 days for restoration from Condition A of TS 3.7.20 reasonable and will allow maintenance activities (e.g., chiller compressor replacements) to be completed without requiring unnecessary plant transients.

If the required action and associated CT of Condition A cannot be met, Condition B would require a plant shutdown to Mode 3 within 6 hours and to Mode 5 within 36 hours. If two Class 1E electrical equipment A/C trains are inoperable, LCO 3.0.3 would be entered immediately under Condition C. This ensures that the plant is placed in a Mode that minimizes accident risk.

TS 3.7.20 Surveillance Requirements

Proposed new SR 3.7.20.1 would state:

> Verify each Class 1E electrical equipment A/C train actuates on an actual or simulated actuation signal.

The actuation signals include the control room ventilation isolation signal (CRVIS) and actuations driven by the LOCA and shutdown sequencers. A CRVIS is generated by the inputs described in the LCO Bases for TS 3.3.7, "CREVS Actuation Instrumentation." Surveillance Procedure OSP-SA-2413 A/B, "Train A/B Diesel Generator and Sequencer Testing," verifies that the A/B Class 1E electrical equipment A/C train is load shed from its associated 4.16 kV safety bus and then properly sequenced back onto the bus under a simulated ESF actuation signal.

In the supplement dated January 23, 2019 (Reference 2), the licensee clarified that the actuation signals that will be tested under the proposed SR 3.7.20.1 will only include the CRVIS actuation signal. The actuations driven by the LOCA and shutdown sequencers have been and are currently surveillance tested in accordance with SR 3.8.1.12, and it is desired to keep the LOCA and shutdown sequencer testing defined by SR 3.8.1.12. This would be consistent with how the scope of CREVS TS SR 3.7.10.3 is defined or described in the Bases for that SR, given the similarity of that SR to proposed SR 3.7.20.1.

The frequency for SR 3.7.20.1 would be specified as, "In accordance with the Surveillance Frequency Control Program" (SFCP), consistent with nearly all of the periodically required SRs in the Callaway TSs. The SFCP will specify a frequency of once per 18 months for this surveillance, consistent with many other similar SRs and their frequencies for ESF components that receive actuation signals.

Proposed new SR 3.7.20.2 would state:

> Verify each Class 1E electrical equipment A/C train has the capability to remove the assumed heat load.

The approach for performing this surveillance would be similar to that taken for CRACS (SGK04 A/B) per SR 3.7.11.1. The surveillance would use a combination of monitoring and inspection methods, which would include (1) verifying the heat removal capability of the condenser heat exchanger by water flow measurement, pressure loss monitoring, and visual inspection; (2) visual inspection monitoring of the evaporator heat exchanger coils; (3) ensuring the proper operation of major components in the refrigeration cycle; (4) verification of unit air flow capacity; and (5) verification that the tube plugging limits are met.

The frequency for SR 3.7.20.2 would be specified as, "In accordance with the Surveillance Frequency Control Program" (SFCP), consistent with nearly all of the periodically required SRs in the Callaway TSs. An initially specified frequency of once per 18 months for this surveillance under the SFCP is appropriate since significant degradation of the Class 1E electrical equipment A/C trains is not expected during this interval. This interval/frequency is also consistent with what is currently specified in the SFCP for CRACS SR 3.7.11 .1.

3.5.2 Proposed Change to TS 5.5.11

The proposed change to TS 5.5.11.e, will reduce the control room pressurization heater wattage.

Current TS 5.5.11.e states:

ESF Ventilation System	Wattage
Control Room Pressurization	15 ± 2 KW
Emergency Exhaust System	37 + 3 KW

Proposed TS 5.5.11.e would state:

ESF Ventilation System	Wattage
Control Room Pressurization	5 ± 1 KW
Emergency Exhaust System	37 + 3 KW

The proposed revision to TS 5.5.11.e is needed to reflect the design modification to be implemented for the electric heaters in the control room pressurization trains in order to support the capability of a single Class 1E Electrical Equipment A/C train to provide area cooling for both trains of Class 1E electrical equipment.

The basis for the original 15 ± 2 KW is provided in Calculation M-GK-01-C, Revision 1, "Control Room Pressurization Filtration Unit Heater." The calculation documents that there is a range for the heat load provided by the heaters in order to meet the specified humidity level and temperature limit downstream of the heating coil ("off coil" temperature).

The heat generated by the charcoal heater(s) is within a maximum and minimum limit. The maximum limit ensures the "off coil" temperature limit is not exceeded (for charcoal protection). At the same time, the minimum heat level had to be evaluated to ensure that a humidity level of no more than 70 percent would be maintained for the charcoal, even at the minimum heater output level. This analyzed temperature range, from the lower to the upper limit, allows the

charcoal to remain capable of performing its function without any adverse consequences on the charcoal filters.

In summary, the calculations confirm that the charcoal filters will still be able to meet their required level of performance, as discussed in Section 2.2.2 above, with the charcoal heater output (wattage) reduced to the new value to be specified in TS 5.5.11.e.

3.6 Credited Manual Operator Actions Associated with Proposed TS 3.7.20

Per Section 3.3, "Credited Manual Operator Actions," of Attachment 2 of the licensee's LAR (Reference 1), manually restarting the system during or at the onset of an event/accident involving a LOOP is the credited manual operator action associated with the new Class 1E supplemental cooling recirculation fan system. The electrical load for the supplemental cooling recirculation fan system will be automatically shed from the safety-grade electrical buses upon a LOOP and will not be automatically restarted. When operation of the supplemental cooling recirculation fan system is needed or desired in this circumstance, a manual operator action is credited to restart the system within 30 minutes.

Additionally, per Attachment 1, Item 32, of the licensee's supplement dated January 23, 2019 (Reference 2), the 30-minute action time will be controlled in accordance with the Callaway procedure designated for Significant Operator Response Timing. Procedural direction to perform this credited manual operator action will be specified in EOP Attachment A, "Automatic Action Verification."

The credited manual operator action as described above is evaluated in Section 3.8.4 of this SE.

3.7. Proposed Changes to FSAR 16.7.13

For the proposed supplemental cooling system, there are no proposed new TS; however, SRs will be added within the Callaway FSAR Section 16.7.13, "Class 1E Electrical Equipment Air Conditioning (A/C)" as discussed in Section 2.2.1, above. In the supplement dated January 23, 2019 (Reference 2), the licensee proposed the following:

16.7.13 CLASS 1E ELECTRICAL EQUIPMENT AIR CONDITIONING (A/C) SUPPLEMENTAL COOLING SYSTEM

16.7.13.1 LIMITING CONDITION FOR OPERATION

Two Class 1E Electrical Equipment A/C Supplemental Cooling trains shall be FUNCTIONAL.

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

ACTIONS:

With the above requirements not satisfied:

a. With one Class 1E Electrical Equipment A/C Supplemental Cooling train nonfunctional, restore the Class 1E A/C Supplemental Cooling train to FUNCTIONAL status within 30 days.

b. With two Class 1E Electrical Equipment A/C Supplemental Cooling trains nonfunctional, restore one Class 1E Electrical Equipment A/C Supplemental Cooling train to FUNCTIONAL status within 7 days.

c. With Action A or B not met, enter Section 16.0.1.3.

16.7.13.1.1 SURVEILLANCE REQUIREMENTS

a. Verify each Class 1E Electrical Equipment A/C Supplemental Cooling system train is available at least once per 30 days.

b. Verify each Class 1E Electrical Equipment A/C Supplemental Cooling system train actuates and provides recirculation air flow at least once per 18 months.

3.8 NRC Staff Evaluation - Proposed Technical Specifications, Design Modifications and Testing, and Operations Actions

3.8.1 NRC Staff Evaluation of Proposed Technical Specification 3.7.20

3.8.1.1 NRC Staff Evaluation of Proposed TS LCO 3.7.20 and Actions

The requested changes would add a new TS to address the operation of the Class 1E Electrical Equipment A/C System.

Proposed LCO 3.7.20 would state:

Two Class 1E electrical equipment A/C trains shall be OPERABLE.

Proposed LCO 3.7.20 APPLICABILITY would state:

MODES 1, 2, 3, and 4.

The Class 1E electrical equipment A/C trains consist of two independent trains that provide cooling of recirculated air in the rooms associated with that train. Each train consists of a prefilter, self-contained refrigeration system (using normal service water or ESW as a heat sink), centrifugal fans, and instrumentation and controls to provide for electrical equipment room temperature control.

The specific rooms supplied by the Class 1E electrical equipment A/C trains are:

SGK05A	SGK05B
SWBD RM NO. 1 (3408)	SWBD RM NO. 4 (3404)
SWBD RM NO. 3 (3414)	SWBD RM NO. 2 (3410)
Battery RM NO. 1 (3407)	Battery RM NO. 4 (3405)
Battery RM NO. 3 (3413)	Battery RM NO. 2 (3411)
ESF SWGR RM NO. 1 (3301)	ESF SWGR RM NO. 2 (3302)

In Modes 1, 2, 3, and 4, both trains of the Class 1E electrical equipment A/C system are normally operating. Both trains must be operable to ensure that the temperature in the protected rooms will not exceed equipment design limits.

ACTIONS

The proposed Condition A states that if one Class 1E electrical equipment A/C train is inoperable, initiate action to implement mitigating actions immediately, and verify room area temperatures ≤ 90 °F within 1 hour and once per 4 hours thereafter, and restore Class 1E electrical equipment A/C train to operable status within 30 days.

The proposed Condition B states that if the required action and associated CT of Condition A is not met be in Mode 3 within 6 hours and be in Mode 5 within 36 hours.

The proposed Condition C states that if two Class 1E electrical equipment A/C trains inoperable, enter TS LCO 3.0.3 immediately.

The NRC staff reviewed the proposed TS LCO 3.7.20 and Actions and finds them acceptable based on the actions taken to mitigate a loss of one train of Class 1E electrical equipment A/C subsystem (30 days) or two trains of Class 1E electrical equipment A/C subsystem (plant shutdown).

With the unit in TS 3.7.20 Condition A, while in Modes 1, 2, 3, or 4, with one Class 1E electrical equipment A/C train inoperable, action must be initiated immediately to implement mitigating actions. The mitigating action taken with one Class 1E electrical equipment A/C train inoperable (Required Action A.1) includes placing into service the Class 1E electrical equipment A/C supplemental cooling system to provide additional recirculation capability, as initiated via operator action. With one Class 1E electrical equipment A/C train inoperable, the overall reliability of the cooling function is reduced. However, as described in Section 3.3 of this SE, the remaining operable train can provide the required cooling function if these mitigating actions are taken, assuming the operable Class 1E electrical equipment A/C train is capable of operating at full capacity. The Class 1E electrical equipment A/C supplemental cooling system is further described in proposed FSAR Section 16.7.13 in Section 3.7 of this SE.

Proposed Required Action A.2 requires verification that all affected room temperatures are ≤ 90 °F with a CT of 1 hour. After this initial 1-hour action, Action A.2 also requires verification that room temperatures remain ≤ 90 °F once per 4 hours until the inoperable train is restored. The room area temperature limit of 90 °F is based on the normal operating maximum steady state environmental condition, and a plant-specific calculation for a single Class 1E electrical equipment A/C train maintaining both Class 1E electrical equipment train rooms at a temperature of < 104 °F during DBA conditions. The plant-specific calculation assumes affected room temperatures to be 90 °F at the onset of the DBA. If the room area temperatures are not within limits (as verified per Action A.2), then Condition B must be entered. The 4-hour CT for verification of the room area temperatures, following the initial 1-hour verification, is reasonable based on the minimal expected increase in room temperatures during this time period.

Required Action A.3 requires the Class 1E electrical equipment A/C train must be restored to operable status within 30 days. The 30-day CT is based on the capability of the remaining operable Class 1E electrical equipment A/C train to provide adequate area cooling for both

trains of electrical equipment during normal and accident conditions (with mitigating actions implemented) and the low probability of an event/accident occurring during this time.

With the unit in TS 3.7.20 Condition B, Required Action and in its associated CT of Condition A not met in (Modes 1, 2, 3, and 4), the unit must be placed in a Mode that minimizes accident risk. To achieve this status, the unit must be placed in Mode 3 within 6 hours and in Mode 5 within 36 hours. The allowed CTs are reasonable based on operating experience to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

With the unit in TS 3.7.20 Condition C, two Class 1E electrical equipment A/C trains inoperable in Modes 1, 2, 3, and 4, the Class 1E electrical equipment A/C system may not be capable of performing its intended function. Therefore, LCO 3.0.3 must be entered immediately.

Based on the discussion above, the NRC staff has evaluated the proposed TS change and determined that the proposed TS LCO correctly specifies the lowest functional capability or performance levels of equipment required for safe operation of the facility in accordance with 10 CFR 50.36(c)(2), and the proposed ACTIONS table prescribes appropriate remedial actions to be taken for the conditions addressed. There is reasonable assurance that the required actions to be taken when the proposed TS LCO is not met can be conducted without endangering the health and safety of the public.

3.8.1.2 NRC Staff Evaluation of Proposed TS SR 3.7.20

The requested changes would add new TS SRs to address the operation of Class 1E electrical equipment A/C trains.

The proposed TS SR 3.7.20.1 includes verification that each Class 1E electrical equipment A/C train starts and operates on an actual or simulated actuation signal. The actuation signal includes the CRVIS. The SR also verifies that a CRVIS will be received by the LOCA sequencer to enable an automatic start of the diesel generator loads that are associated with a CRVIS. Verification that these loads will start and operate at the appropriate step in the LOCA sequencer, and that other auto-start signals for these loads will be inhibited until the LOCA sequencer is reset, is accomplished under SR 3.8.1.12. The surveillance frequency is based on industry operating experience, equipment reliability and plant risk, and is controlled under the SFCP.

The proposed TS SR 3.7.20.2 includes testing of the Class 1E electrical equipment A/C system condenser heat exchangers by verifying that the heat removal capability of the A/C units is adequate to remove the heat load assumed in the Class 1E electrical equipment A/C rooms during DBAs. This SR consists of verifying (1) verifying the heat removal capability of' the condenser heat exchanger by water flow measurement, pressure loss monitoring, and visual inspection; (2) visual inspection monitoring of the evaporator heat exchanger coils; (3) ensuring the proper operation of major components in the refrigeration cycle; (4) verification of unit air flow capacity; and (5) verification that the tube plugging limits are met.

This SR is performed in the same manner as SR 3.7.11.1 (CRACS). The SR frequency is in accordance with the existing Callaway SFCP, and is based on operating experience which has shown that significant degradation of Class 1E electrical equipment A/C typically occurs gradually and in a self-revealing manner.

NUREG-1431, Revision 4 (References 10 and 11), represents the evolution of the NRC staff's guidance on how to meet the requirements in 10 CFR 50.36 for Westinghouse plants. Licensees can deviate/depart from staff guidance as long as they provide acceptable justification.

The NRC staff has determined that the proposed TSs deviate or depart from the guidance of NUREG-1431 because this new proposed TS 3.7.20 does not exist or have a comparable TS section relative to it as provided in NUREG-1431. However, the licensee's justification for this deviation or departure is that the lack of an existing STS section should not be a barrier to a proposal for a TS license amendment but only subject to the criteria found in 10 CFR 50.36 (see Reference 1, Attachment 2). The staff has reviewed the licensee's deviation and justification for the proposed change and found that it meets the acceptance criteria of 10 CFR 50.36 and is adequate.

The NRC staff evaluated the proposed SR associated with the proposed new LCO 3.7.20 and concluded it is appropriate for ensuring the operability of the equipment. Specifically, the licensee will verify with appropriate testing or has verified by calculation that Class 1E electrical equipment A/C system trains will actuate on an actuation signal and will provide adequate heat removal capability. Both SR frequencies are adequate and consistent with other HVAC systems controlled in TSs. The design heat loads and heat removal capacity are not expected to change over this time period since one division is always operating and is in service in Modes 1, 2, 3, and 4.

Based on the discussion above, the NRC staff concludes that the proposed SR 3.7.20.2 is acceptable since it meets the requirements of 10 CFR 50.36(c)(3) for surveillances. SR 3.7.20.2 provides assurance that the necessary quality of systems and components will be maintained and the LCO will be met.

3.8.2 NRC Staff Evaluation of Proposed TS 5.5.11

The proposed change to TS 5.5.11.e will reduce the Control Room Pressurization heater wattage from 15 kW ± 2 kW to 5 kW ± 1 kW.

The proposed revision to TS 5.5.11.e will reflect the design modification MP-17-0024 to be implemented for the charcoal heaters in the control room pressurization trains in order to support the capability of a single Class 1E Electrical Equipment A/C train to provide area cooling for both trains of Class 1E electrical equipment. The calculations confirm that the charcoal filters will still be able to meet their required level of performance with the charcoal heater output (wattage) reduced to the new value to be specified in TS 5.5.11.e.

Based on the above, the NRC staff finds the proposed revision to TS 5.5.11 to the Callaway TS provides reasonable assurance of the continued availability of the required electrical power to shut down the reactor, and to maintain the reactor in a safe condition after an anticipated operational occurrence or a postulated DBA when in Condition A of the proposed TS 3.7.20. Modification MP-17-0024 and this associated TS change are needed in order to reduce the heat load within the control building to support the new proposed TS 3.7.20. Furthermore, the staff concludes that the proposed TS changes requested is in accordance with 10 CFR 50.36; therefore, the staff finds the proposed changes acceptable.

3.8.3 NRC Staff Evaluation of the Design Modifications and Testing

The licensee stated in its LAR and its supplement (References 1 and 2, respectively), that design modifications installing the following safety-related components are proposed in the support of proposed TS 3.7.20:

- Recirculation fans (four fans on the plant 2000' level and two fans on the plant 2016' level)
- Eight isolation dampers
- Fire dampers
- Six door grills
- HVAC ductwork with supports
- Associated power supplies (fans and dampers)
- Power and control cables

Several normally-open penetrations already exist between rooms but are not large enough to provide sufficient cooling capacity when used with the supplemental fan system; therefore, the modification adds additional free area with the installation of flow transfer grills. The GOTHIC analysis models all open penetrations between rooms as well as the HVAC supply and return flowrates.

Since the installation of the additional cooling capability is a safety-related design modification, newly installed components will be powered by appropriate Class 1E power and the licensee will ensure equipment is appropriately qualified.

The licensee has developed a post-design modification test plan, which is part of the design change for the installation of the recirculation fans and associated equipment (Class 1E Electrical Equipment A/C Supplemental Cooling System train). The post-design modification test plan includes testing of each train of the Class 1E electrical equipment A/C system with a recirculation fan subsystem in service. This testing will verify that air flows and damper operations in the operable cooling train, and air flows from the recirculation fans for the inoperable cooling train, meet the acceptance criteria determined in the associated GOTHIC calculations. The post-design modification test plan also includes the verification of proper operation of the new dampers and controls related to the fan and air flow control circuits upon the initiation of a halon trip signal.

This design modification does not impact the normal system air flow balance of the control building ventilation. The existing Class 1E equipment A/C system operates at neutral balance; it is designed to return and supply equal quantities of air from each individual room.

The proposed configuration of the Class 1E electrical equipment A/C supplemental system will provide adequate cooling to the electrical equipment rooms during all modes of operation. The design provides automatic damper actuation and prevents air short cycling between rooms. In addition, the dampers provide adequate train separation in the event of a fire.

The NRC staff reviewed elements of the plant configuration provided in the LAR and its supplements (References 1, 2 and 3). Coupled with the TS LCO 3.7.20, Required Action A.1, NRC staff concluded that there is reasonable assurance that the completed Class 1E electrical equipment A/C recirculation subsystem will provide adequate cooling for redundant electrical trains to support safe shutdown of the plant in support of new TS 3.7.20.

3.8.4 NRC Staff Evaluation of Proposed Associated Operations Actions

NRC staff reviewed the human actions associated with operator actions for this amendment and performed a Level II human factors review per the guidance in Section 4 of NUREG-1764, Revision 1 (Reference 18).

3.8.4.1 General Deterministic Review

Attachment 2 of the licensee's supplement dated January 23, 2019 (Reference 2), Change No. 4, "Change to description of modification MP 16-0024," describes new wall and ceiling penetrations that will allow air-flow communication between the two independent trains of Class 1E electrical equipment rooms. The plant modifications completed in support of this LAR include the components that will be used for operator actions to manually initiate operation of the supplemental cooling recirculation fan system and cool both Class 1E electrical equipment trains with one Class 1E electrical equipment A/C system. In Attachment 1, Item 10 of the supplement also states that the components of the supplemental cooling recirculation fan system, including control (isolation) dampers and fire dampers, are classified as safety-related, Seismic Category 1, and utilize Class 1E power sources.

In Attachment 2 of the supplement dated January 23, 2019, the licensee states that fire dampers are installed in the through-wall penetrations between trains. The licensee also stated in Attachment 2 of the LAR dated March 9, 2018 (Reference 1), that the actuation logic for the supplemental cooling recirculation fans and air isolation dampers receives a signal from the fire area detection systems so that in the event of a fire, the fans shut off and the dampers isolate, including in those areas equipped with a Halon fire suppression system. Therefore, the existing plant design is configured so as to maintain train isolation and independence from the effects of fire.

In Attachment 1, Item 22, of the supplement dated January 23, 2019, the licensee confirmed that the proposed through-wall penetrations located in the Class 1E electrical equipment rooms will be located high enough to prevent adverse impacts from flooding. A partial exception to this is two floor penetrations in the Lower Cable Spreading Room. However, floor drain capacity in this room is sufficient such that the design-basis flood does not result in accumulation of water above the floor.

In Attachment 1, Item 28, of the supplement dated January 23, 2019, the licensee stated that historical temperature data demonstrated that the supplemental cooling recirculation fan system will be effective to maintain both Class 1E electrical equipment trains below the 90 °F room temperature limit. Specifically, temperature data collected over a three-year period showed that the peak room temperature was recorded as 87.5 °F. These data were collected during implementation of current compensatory measures, which achieve cross-train cooling by opening the doors of the Class 1E electrical equipment rooms to provide a pathway for buoyancy-driven natural circulation airflow between the two sets of rooms. Therefore, use of the supplemental cooling recirculation fan system with the forced air recirculation that it provides, is reasonably expected to be more effective than the current compensatory actions and will maintain the Class 1E electrical equipment rooms below the 90 °F TS limit.

In Attachment 2 of the supplement dated January 23, 2019, the licensee performed calculations to demonstrate that post-accident hydrogen concentrations, with only a single train of Class 1E cooling operating, will remain well below the 2 percent limit currently described in the Callaway

FSAR. In addition, in Attachment 1, Item 22, of the supplement, the licensee confirmed that the new supplemental cooling recirculation fan system will not adversely affect the control building pressure boundary or control building pressure boundary functions.

3.8.4.2 Human Action Analysis

The operator actions required to place the supplemental cooling recirculation fan system in service are described in Attachment 1, Item 26 of the supplement dated January 23, 2019. The operator actions described for the operations technician (OT), once dispatched from the control room by the reactor operator, are summarized as follows:

- proceeds to the ESF switchgear room;
- closes three breakers associated with the recirculation fans;
- places the hand switch for the supplemental cooling recirculation fan system in the start position;
- verifies that the indication lights confirm correct position for the associated dampers;
- verifies that the indication lights for the three recirculation fans indicate "running"; and
- verifies air flow from recirculation fans in the ESF switchgear rooms and DC equipment rooms.

The above operator actions will be listed as contingency actions in the normal operating procedure for the control building HVAC system.

As detailed in Section 3.6 above, restarting the supplemental cooling recirculation fan system during or at the onset of an event or accident involving a LOOP will be a credited manual operator action. Restart of the supplemental cooling recirculation fan system is required since the electrical load for the system will be automatically shed from the safety-grade electrical buses upon a LOOP, and will not be automatically restarted. When operation of the supplemental cooling recirculation fan system is needed or desired in this circumstance, a manual operator action is credited to restart the system within 30 minutes. In Attachment 1, Item 32 of the supplement dated January 23, 2019, the licensee stated that a 30-minute action time will be controlled in accordance with the Callaway procedure designated for Significant Operator Response Timing. Procedural direction to perform this credited manual operator action will be specified in EOP Attachment A, "Automatic Action Verification."

In Attachment 1, Item 6, of the supplement dated January 23, 2019, the licensee stated that wall-mounted sensors are located in various Class 1E electrical equipment rooms, which provide local indication of temperature and provide binary input to control room annunciators and plant computer alarms (i.e., HI or NOT-HI). The alarm setpoints are currently set at 85 °F and will be lowered to 83 °F to provide additional margin to the 90 °F TS limit. An attachment will be added to the normal operating procedure for the control building ventilation system to require an operator to locally record room temperatures in the first hour after the supplemental cooling recirculation fan system is started and once per 4 hours thereafter. A calibrated hand-held temperature indicator will be utilized if local indication is not available.

In Attachment 1, Item 30, of the supplement dated January 23, 2019, the licensee stated that the multiple indications of recirculation fan start are available to the OT. These indications include damper and recirculation light indication, recirculation fan noise, and verification of air flow. In addition, if a Class 1E electrical equipment A/C unit loses control voltage, or a hand switch is placed in pull-to-lock, an audible alarm and annunciator will be actuated on the respective train's ESF Status Panel in the control room.

Also, in Attachment 1, Item 30, the licensee provided an evaluation of the feasibility of the operator actions to place the supplemental cooling recirculation fan system in service. The evaluation notes that there are no obstructions present in the pathway to the switchgear required to start the system, and the entire pathway and switchgear area are well lit. The OT is not required to enter a radiological control area or any hazardous atmosphere. The rooms containing the associated hand switches and indication lights are also well ventilated and well lit. The hand switches and lights associated with the supplemental cooling recirculation fan system are of a type that is familiar to the operators and will not require an excessive amount of training. The switchgear is labeled with train-designated color coding and all fan breakers and damper position indications are on one side of the associated cabinet to help mitigate against human error.

As described above, the operator actions required to access and start the supplemental cooling recirculation fan system are non-complex and will be directed by plant procedure. In addition, control room annunciation of elevated Class 1E equipment room temperatures is provided and the temperature setpoints for these instruments are being lowered to provide additional margin to the TS limit of 90 °F. Therefore, based on the evaluation above, the NRC staff finds that the operator actions proposed in the LAR are feasible and describe adequate and appropriate administrative controls to alert and direct the operators to perform the required actions within the associated time limitations.

3.8.4.3 Design of Human System-Interfaces, Procedures and Training

As described above, the licensee will implement procedures that direct operators to the appropriate equipment control locations and provide instructions for operation of the supplemental cooling recirculation fan system. Specifically, the operator actions required to place the system in service will be listed as contingency actions identified in the normal operating procedure for the control building HVAC system. An attachment will be added this procedure to record room temperatures in the first hour after the supplemental cooling recirculation fan system is started, and once per 4 hours thereafter. Procedural direction to perform the credited manual operator action to restart the supplemental cooling recirculation fan system following a LOOP related event, will be specified in EOP, Attachment A, "Automatic Action Verification." The plant procedures, as described, will provide sufficient detail and direction to enable operators to place the supplemental cooling recirculation fan system in service and implement the associated room temperature monitoring.

The equipment and controls to be operated consist of three switchgear breakers and one hand switch to start the recirculation fans. In Attachment 2 of the supplement dated January 23, 2019, the licensee stated that only repositioning of the recirculation fan switch will be required to place the supplemental cooling recirculation fan system in service should operation be lost during a LOOP related event where the supplemental cooling recirculation fan system electrical loads were automatically load-shed. The components (breakers and hand switches) operated to place the supplemental cooling recirculation fan system in service are not novel and do not require unusual human system-interfaces (HSIs). In addition, as noted above, the switchgear is

labeled with train-designated color coding and all fan breakers and damper position indications are on one side of the associated cabinet to help mitigate against human error.

In Attachment 1, Item 27 of the supplement dated January 23, 2019, the licensee stated that operations staff were trained, prior to modification installation, on operation of the supplemental cooling recirculation fan system during normal conditions. This training was identified as a licensed operator "common knowledge item" that will be taught in initial training and continuing training on a 54-month frequency. A Job Task Analysis will be taught in the initial OT training, and a "course enhancement" has been initiated to update initial training programs once the supplemental cooling recirculation fan system modification has been finalized. In Attachment 1, Item 29, the licensee stated that a training request will be processed, and the operations training department will perform a Job Task Analysis on the actions required to place the supplemental cooling recirculation fan system in service under accident/event conditions to determine associated operator training requirements.

Based on the evaluation above, the NRC staff finds that the design of HSIs, procedures, and operator training have been adequately considered.

3.8.4.4 Human Action Verification

As discussed above, control room annunciation of elevated Class 1E electrical equipment room elevated temperatures is provided, and the alarm setpoints are being lowered. This will provide additional margin to the TS limit of 90 °F in order to alert and enable operations staff to perform the required operator actions within the associated time limitations.

In Attachment 1, Item 30 of the supplement dated January 23, 2019, the licensee stated that the validation of the operator actions required to restart the supplemental cooling recirculation fan system was performed by simulation. Operations personnel performed the verification runs; the times recorded for the runs were approximately 15 minutes from the event start time to the time when the supplemental cooling recirculation fans were started. The sequence of operator actions used for the verification sample run is bounding for the applicable EOP scenarios. The timed verifications were documented using Callaway Form CA2647, "Operator Response Time Verification Form."

Based on the evaluation above, the NRC staff finds that the licensee has verified and validated that plant operators can identify the inoperability of the Class 1E electrical equipment A/C system and implement the specified mitigating actions within the time constraints associated with proposed TS 3.7.20, Required Actions A.1 and A.2.

3.9 NRC Staff Technical Conclusion and Summary

The regulation at 10 CFR 50.36(a)(1) states, in part, "A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the technical specifications." In accordance with this requirement, the licensee provided TS Bases changes in the proposed LAR. The NRC staff notes that the TS Bases changes provided describe the basis for the affected TSs and follow the "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors" (July 22, 1993; 58 *FR* 39132); however, the NRC staff does not approve the LAR TS Bases, which have been submitted as information only.

3.9.1 Proposed new TS 3.7.20

Based on its review of the licensee's submittals (References 1, 2, and 3), the NRC staff concludes that proposed TS 3.7.20 is acceptable. The proposed TS LCO 3.7.20 contains requirements for operability of two Class 1E electrical equipment A/C trains, which provide for the lowest functional capability or performance level of equipment required for safe operation of the facility, and therefore, meets the LCO requirements of 10 CFR 50.36(c)(2)(i).

The proposed TS for the Class 1E electrical equipment A/C trains satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii), which states in part that a TS LCO must be provided for a "structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier." The Class 1E electrical equipment A/C trains provide essential cooling to components important to safety such as AC electrical buses, DC batteries, and DC buses.

Further, the proposed TS 3.7.20 SRs are acceptable since they meet the requirements of 10 CFR 50.36(c)(3) that the SR provide assurance that the function of the systems will be maintained.

The NRC staff evaluated the proposed Callaway changes to the TSs against each of the unit-applicable design requirements listed in Section 2.5.1 of this SE. The NRC staff finds that the proposed changes for Modes 1, 2, 3, and 4 operations, as controlled by TS 3.7.20, remain consistent with GDC 2, 4, 13, and 17 of 10 CFR Part 50, Appendix A, as they relate to the Callaway design requirements. The results of the NRC staff evaluations specific to each GDC follow:

- The NRC staff finds the above discussion acceptable to meet GDC 2 since the proposed new TS 3.7.20 utilizes existing installed equipment for the Class 1E electrical equipment A/C system. The installed Class 1E electrical equipment A/C system meets the GDC 2 requirements for protection against natural phenomena specified in the Callaway FSAR. In addition, the proposed supplemental cooling system meets GDC 2 requirements since it will be installed to safety-related and Seismic I requirements. Callaway FSAR Section 9.4.1.1.1, "Safety Design Bases" (Reference 5) states that Class 1E air-conditioning system is safety related and American Nuclear Standard safety-class 3, per FSAR Table 3.2-1, "Classifications of Structures, Components, and Systems (15)," (Reference 9), and is required to function following a DBA and to achieve and maintain the plant in a safe shutdown condition.

  In addition, the Class 1E electrical equipment A/C system is protected from the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, floods, and external missiles (GDC 2). The proposed modifications to several steel doors will install passive grills, which are classified as nonsafety-related; however, the existing doors meet the requirements of Seismic Category II/I, which are seismically analyzed to prevent damage to safety-related equipment.

- The NRC staff finds the above discussion acceptable to meet GDC 4 since the proposed new TS 3.7.20 utilizes existing installed equipment for the Class 1E electrical equipment A/C system. The installed Class 1E electrical equipment A/C system meets the GDC 4 requirements for environmental and dynamic effects

specified in the Callaway FSAR. The proposed supplemental cooling fans are being procured under a design specification developed for this project that requires that the fan housing contain no internally-generated missiles. The fan supplier has qualified the fan housing as part of the seismic qualification calculation. This equipment is designed as safety-related and will meet Seismic Category I requirements. Callaway FSAR Section 3.1.3 (Reference 9), states that the safety-related structures, systems, and components are designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs. These structures, systems, and components are appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.

- The NRC staff finds the above discussion acceptable to meet GDC 13. Instrumentation and controls related to proposed new TS 3.7.20 would include existing instrumentation related to monitoring of Class 1E Electrical Equipment A/C System variables and area room temperatures. No new instrumentation and controls are being added with respect to this proposed TS addition.

- Based on the evaluation above, the NRC staff finds the proposed changes to the Callaway TS provide reasonable assurance of the continued availability of the required electrical power to shut down the reactor and to maintain the reactor in a safe condition after an anticipated operational occurrence or a postulated DBA, when in Condition A of the proposed TS 3.7.20. Furthermore, the staff concludes that the TS changes requested meet the intent of GDC 17.

Additionally, the proposed TS changes were reviewed for technical clarity and consistency with the existing Callaway requirements for customary terminology and formatting. The NRC staff found that the proposed changes were consistent with Chapter 16 of NUREG-0800 (Reference 16).

The NRC staff finds that operator actions are needed in support of this proposed TS. The NRC staff finds reasonable assurance that with these operator actions, as discussed above, the Class 1E electrical equipment A/C recirculation subsystem will adequately support the TS LCO 3.7.20.

Upon the issuance of the proposed TS, the exception to LCO 3.0.2 allowed by LCO 3.0.6 can be applied in a situation when one subsystem of the Class 1E electrical equipment A/C trains is inoperable.

3.9.2 Proposed Revision to TS 5.5.11.e

The proposed change to TS 5.5.11, "Ventilation Filter Testing Program (VFTP)," part "e," will reduce the control room pressurization heater wattage from 15 ± 2 kW to 5 kW ± 1 kW. The proposed revision to TS 5.5.11.e is needed to reflect the design modification to be implemented for the charcoal heaters in the control room pressurization trains.

Based on its review of the licensee's LAR submittals (References 1 through 4), the NRC staff concludes that proposed change to TS 5.5.11.e is acceptable. The proposed change to TS 5.5.11 e. is in accordance the regulation at 10 CFR 50.36(c)(5) which requires TSs to include Administrative Controls. In this case, the VFTP for the ESF Ventilation System –

Control Room Pressurization is revised with reduced wattage that creates a lower heat load for the control building, in support of the proposed new TS 3.7.20. The calculations confirm that the charcoal filters will still be able to meet their required level of performance with the charcoal heater output (wattage) reduced to the new value specified in proposed TS 5.5.11.e.

Based on the evaluation above, the NRC staff concludes that the proposed TS changes are in accordance with 10 CFR 50.36(c)(5); therefore, the staff finds that the proposed changes are acceptable.

3.10 License Conditions

Planned modifications are in process to achieve the capability for one Class 1E electrical equipment A/C train to provide adequate cooling for both trains of electrical equipment during normal and accident conditions. The planned modifications include the following:

- Computer points are currently used to verify the DC switchboard rooms and ESF switchgear room temperatures are less than 87 °F, and provide an alarm to alert Control Room personnel if this setpoint is exceeded. The alarm setpoint on the associated temperature indicators will be lowered to 83 °F.

- Two circulating fans with isolation dampers, associated ductwork, and six door penetrations (grills), will be installed on the 2016' elevation of the Control Building in the battery and switchboard rooms.

- Four recirculation fans with isolation dampers and associated ductwork will be installed in the ESF switchgear rooms on the 2000' elevation of the Control Building.

- The wattage of the Control Room Pressurization train heaters will be reduced to 5 ± 1 kW. This modification must be completed before the declaration of TS 3.7.20 Operability since this modification reduces the heat input into the rooms.

The licensee will revise the Callaway EOPs to provide instructions for restarting the supplemental cooling system for the case when operation of the supplemental cooling system is desired or needed due to the inoperability of a Class 1E electrical equipment A/C train during or at the onset of an event/accident involving a LOOP.

The NRC staff has determined that the completion of the commitments and implementation of the amendment's modifications are essential to the operability and performance of the modified equipment. Therefore, the commitments, which are listed above (also in Attachment 5 of Reference 2) are now elevated to a license condition as part of this amendment. These items will become License Condition 2.C.(18) as documented in the licensee's supplement dated March 7, 2019 (Reference 4), to its license amendment request.

License Condition 2.C.(18) will state:

> Implementation Actions for New Technical Specification 3.7.20
>
> The planned plant modifications and emergency operating procedure changes described as commitments in Attachment 5 of Ameren Missouri letter ULNRC-06477, "Supplement to License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated January 23, 2019, shall be completed prior to implementation of the license amendment requested per Ameren Missouri letter ULNRC-06401, "License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated March 9, 2018, as supplemented by the noted January 23, 2019 letter (ULNRC-06477) and Ameren Missouri letter ULNRC-06491, "Additional Supplement to License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated March 7, 2019. Completion of the planned plant modifications means physical completion, including completion of the post-modification testing.

3.11 Summary

Based on the evaluation above, the NRC staff concludes that the proposed TS changes are in accordance with 10 CFR 50.36, 10 CFR 50.63, 10 CFR 50.55a, and 10 CFR 50.92 and meets the intent of requirements specified by GDC 2, 4, 13, and 17. Therefore, the staff finds that the proposed changes are acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Missouri State official was notified of the proposed issuance of the amendment on March 13, 2019. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes SRs. 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 *Federal Register* on July 3, 2018, (83 FR 31194). 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.

7.0 REFERENCES

1. Wink, R. C., Ameren Missouri, letter to U.S. Nuclear Regulatory Commission, "Docket Number 50-483, Callaway Plant Unit 1, Union Electric Co., Renewed Facility Operating License NPF-30, License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System' (LDCN 16-0013)," dated March 9, 2018 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML18068A685).

2. Wink, R. C., Ameren Missouri, letter to U.S. Nuclear Regulatory Commission, "Docket Number 50-483, Callaway Plant Unit 1, Union Electric Co., Renewed Facility Operating License NPF-30, Supplement to License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System,' (LDCN 16-0013)," dated January 23, 2019 (ADAMS Package Accession No. ML19024A469).

3. Abel, S. L., Ameren Missouri, letter to U.S. Nuclear Regulatory Commission, "Docket Number 50-483, Callaway Plant Unit 1, Union Electric Co., Renewed Facility Operating License NPF-30, Response to Request for Additional Information Pertaining to License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System,' (LDCN 16-0013)," dated February 8, 2019 (ADAMS Package Accession No. ML19039A352).

4. Wink, R. C., Ameren Missouri, letter to U.S. Nuclear Regulatory Commission, "Docket Number 50-483, Callaway Plant Unit 1, Union Electric Co., Renewed Facility Operating License NPF-30, Additional Supplement to License Amendment Request for Addition of New Technical Specification 3.7.20, 'Class 1E Electrical Equipment Air Conditioning (A/C) System,' (LDCN 16-0013)," dated March 7, 2019 (ADAMS Accession No. ML19066A314).

5. Union Electric Company (dba Ameren Missouri), Callaway Plant, Unit 1, Final Safety Analysis Report, Chapter 9.0, "Auxiliary Systems," Revision OL-22, dated November 10, 2016 (ADAMS Accession No. ML17061A204).

6. Union Electric Company (dba Ameren Missouri), Callaway Plant, Unit 1, Final Safety Analysis Report, Chapter 16.0, "Technical Specifications," Revision OL-22, dated November 10, 2016 (ADAMS Accession No. ML17090A165).

7. U.S. Nuclear Regulatory Commission, "Callaway, Unit 1, Current Facility Operating License NPF-30, Tech Specs, (ADAMS Accession No. ML053110040).

8. U.S. Nuclear Regulatory Commission, Generic Letter 80-30, "Clarification of the Term 'Operable' as It Applies to Single Failure Criterion for Safety Systems Required by TS (Generic Letter 80-30)", dated April 10, 1980 (https://www.nrc.gov/reading-rm/doc-collections/gen-comm/gen-letters/1980/gl80030.html).

9. Union Electric Company (dba Ameren Missouri), Callaway Plant, Unit 1, Final Safety Analysis Report, Chapter 3.0, "Design of Structures, Components, Equipment, and Systems," Revision OL-22, dated November 10, 2016 (ADAMS Accession No. ML17067A360).

10. U.S. Nuclear Regulatory Commission, "Standard Technical Specifications: Westinghouse Plants, NUREG-1431, Revision 4, Volume 1, "Specification," dated April 2012 (ADAMS Accession No. ML12100A222).

11. U.S. Nuclear Regulatory Commission, "Standard Technical Specifications: Westinghouse Plants, NUREG-1431, Revision 4, Volume 2, "Bases", dated April 2012 (ADAMS Accession No. ML12100A228).

12. U.S. Nuclear Regulatory Commission, "Periodic Testing of Protection System Actuation Functions," Regulatory Guide 1.22, Revision 0, dated February 1972 (ADAMS Accession No. ML083300530).

13. U.S. Nuclear Regulatory Commission, "Design, Testing, and Maintenance Criteria for Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants," Regulatory Guide 1.52, Revision 1, dated July 1976 (ADAMS Accession No. ML13350A197).

14. U.S. Nuclear Regulatory Commission, "Availability of Electrical Power Sources," Regulatory Guide 1.93, Revision 1, dated March 2012 (ADAMS Accession No. ML090550661).

15. U.S. Nuclear Regulatory Commission, "Ultimate Heat Sink for Nuclear Power Plants," Regulatory Guide 1.27, Revision 2 (ADAMS Accession No. ML003739969).

16. U.S. Nuclear Regulatory Commission, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," NUREG-0800, Section 16.0, "Technical Specifications," Revision 3, dated March 2010 (ADAMS Accession No. ML100351425).

17. U.S. Nuclear Regulatory Commission, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," NUREG-0800, Section 18.0, "Human Factors Engineering," Revision 3, dated December 2016 (ADAMS Accession No. ML16125A114).

18. U.S. Nuclear Regulatory Commission, "Guidance for the Review of Changes to Human Actions," NUREG-1764, Revision 1, dated September 2007 (ADAMS Accession No. ML072640413).

19. Klos, L. J., U.S. Nuclear Regulatory Commission, letter to Mr. Fadi Diya, Ameren Missouri, "Callaway Plant, Unit No. 1 – Regulatory Audit Summary Regarding License Amendment Request to Incorporate a New Technical Specification 3.7.20 (EPID L-2018-LLA-0062), dated January 4, 2019," dated January 4, 2019 (ADAMS Accession No. ML18353B016).

20. Rankin, J., for Lyon, C. F., U.S. Nuclear Regulatory Commission, letter to Mr. Fadi Diya, Ameren Missouri, "Callaway Plant, Unit 1 – Issuance of Amendment Re: Technical Specification 3.7.9, 'Ultimate Heat Sink (UHS)' (TAC No. MF0378)," dated June 17, 2014 (ADAMS Accession No. ML14149A164).

21. Union Electric Company (dba Ameren Missouri), Callaway Plant, Unit 1, Final Safety Analysis Report, Chapter 15.0, "Accident Analysis," Revision OL-22, dated November 10, 2016 (ADAMS Accession No. ML17065A090).

22. Union Electric Company (dba Ameren Missouri), Callaway Plant, Unit 1, Final Safety Analysis Report, Chapter 1.0, "Introduction and General Description of the Plant," Revision OL-22, dated November 10, 2016 (ADAMS Accession No. ML17048A157).

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Date: April 18, 2019

SUBJECT: CALLAWAY PLANT, UNIT NO. 1 - ISSUANCE OF AMENDMENT RE: ADDITION OF NEW TECHNICAL SPECIFICATION 3.7.20, "CLASS 1E ELECTRICAL EQUIPMENT AIR CONDITIONING (A/C) SYSTEM" (EPID L-2018-LLA-0062) DATED APRIL 18, 2019

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ADAMS Accession No. ML19073A001 ***by email**

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