



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

January 4, 2019

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

**SUBJECT: 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)**

Dear Mr. Diya:

By letter dated March 9, 2018 (Agencywide Documents Access and Management System Accession No. ML18068A685), Union Electric Company (the licensee, dba Ameren Missouri), submitted a license amendment request (LAR) requesting approval for a new Technical Specification (TS) related to room cooling for essential electrical equipment for Callaway Plant, Unit No. 1 (Callaway).

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

In addition, this proposed amendment for Callaway also requires revision of TS 5.5.11.e, "Ventilation Filter Testing Program (VFTP)," wherein the wattage value for moisture dissipation by the heater in each control room's pressurization train is proposed to be changed from 15 ± 2 kilowatts (kW) to 5 ± 1 kW.

To support its review of the amendment, the U.S. Nuclear Regulatory Commission (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 purpose of this regulatory audit was to enhance the NRC staff's technical understanding of the LAR and determine if planned design modifications and calculations performed by the licensee would support the bases for the proposed changes to the TSs. The areas of focus during the audit were the calculation methodologies, assumptions, and results used to reach conclusions in the LAR.

F. Diya

- 2 -

The NRC regulatory audit summary, list of participants, and list of documents reviewed during the audit are enclosed.

If you have any questions, please contact me at 301-415-5136 or via e-mail at John.Klos@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'L. John Klos', written over the word 'Sincerely,'.

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

Docket No. 50-483

Enclosure:
Regulatory Audit Summary

cc: Listserv

OFFICE OF NUCLEAR REACTOR REGULATION
REGULATORY AUDIT SUMMARY
OF THE LICENSE AMENDMENT REQUEST
TO INCORPORATE NEW TECHNICAL SPECIFICATION 3.7.20
UNION ELECTRIC COMPANY
CALLAWAY PLANT UNIT NO. 1
DOCKET NO. 50-483

1.0 BACKGROUND

By letter dated March 9, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18068A685), Union Electric Company (the licensee, dba Ameren Missouri), submitted a license amendment request (LAR) requesting approval for a new Technical Specification (TS) related to room cooling for essential electrical equipment for Callaway Plant, Unit No. 1 (Callaway).

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

In addition, this proposed amendment for Callaway also requires revision to TS 5.5.11e, "Ventilation Filter Testing Program (VFTP)," wherein the wattage value for moisture dissipation by the heater in each control room's pressurization train is proposed to be changed from 15 ± 2 kilowatts (kW) to 5 ± 1 kW.

As part of the U.S. Nuclear Regulatory Commission (NRC) staff's review of the LAR, and due to the complexity of the proposed TS changes, which included its supporting calculations, and computer-based modeling, the NRC staff determined that a face-to-face audit, including field walkdowns with the licensee's staff, would enhance the NRC staff's technical review. Hence, the NRC staff planned a regulatory audit in accordance with the Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No. ML082900195), for the NRC staff to gain a better understanding of the licensee's calculations and other aspects of the LAR. Thereby, the audit improved the efficiency of the review and minimized the need, and number, of requests for additional information (RAIs). The NRC staff issued the audit plan by letter dated June 19, 2018 (ADAMS Accession No. ML18156A404).

2.0 AUDIT DATES AND LOCATION

The onsite portion of the regulatory audit was held at Callaway from September 26 to September 27, 2018. The NRC staff, via teleconference calls with the licensee, conducted the remainder of the audit, and informed the licensee that the audit was closed on November 26, 2018, via the completion of Table 1, below.

Tables 2 and 3, below, provide the list of attendees in the entrance and status briefing meetings held onsite. This resulted in numerous closed items with only one item to be issued as an RAI, while the remaining items would be placed on the docket via a supplemental letter.

3.0 AUDIT TEAM MEMBERS (NRC STAFF)

The onsite audit team consisted of the following:

- Larry Wheeler, Audit Team Lead, Containment and Plant Systems Branch, Technical Reviewer
- Gurcharan Matharu, Electrical Engineering Operating Reactor Branch, Technical Reviewer
- John Klos, Callaway Project Manager, Plant Licensing Branch IV

Support staff and management from NRC headquarters consisted of the following:

- Shaun Anderson, Containment and Plant Systems Branch, Branch Chief
- Nageswara Karipineni, Containment and Plant Systems Branch, Technical Reviewer
- Pete Snyder, Technical Specifications Branch, Technical Reviewer
- John Hughey, Human Factors Branch, Technical Reviewer

4.0 AUDIT SUMMARY

The purpose of this regulatory audit was to enhance the NRC staff's technical understanding of the LAR and to determine if planned design modifications and calculations performed by the licensee, support the bases for the proposed changes to the TSs. The areas of focus during the audit were the calculation methodologies, assumptions, and results used to reach conclusions in the LAR.

Callaway opened the audit on September 26, 2018, with a power point presentation, which highlighted the progress made since the LAR was submitted on March 9, 2018. A walkdown of the Callaway control building room (where the Class 1E equipment is located) was conducted during the visit to help the NRC staff better understand the electrical room configuration associated with the heating, ventilation, and air conditioning (HVAC) system. The licensee also presented superimposed illustrations to demonstrate the existing and proposed configurations of planned hardware changes needed to support TS changes.

Table 1 provides a list of open items identified during the audit, with a short summary description of how these items were addressed.

The following key documents were reviewed during the audit:

- Calculation No. NAI-1719-004, Revision 1, "Callaway Control Building with Control Room Loss of Class 1E A/C GOTHIC Room Heat Up Installed Fans and Louvers."
- Calculation No. GK-11, Revision 4, "Electrical Heat Loads in the Control Building during Normal and ESFAS [Engineered Safety Features Actuation System] Conditions."
- Calculation No. BO-07, Revision 12, "Control Room SBO [Station Blackout] and Normal/LOCA [Loss-of-Coolant Accident] Electrical Heat Load Calculation."
- Calculation M-GK-370, Revision 1, "Post-Accident Battery Room H2 Concentration Levels."
- Calculation M-GK-01-C, Revision 1, "Control Room Pressurization Filtration Unit Heater."
- Drawings, "Duct General Assembly Drawings," M-2H3300 and 3400 series.
- Drawings, MP16-0024 and MP17-0024 series (proposed design modification drawings).
- Drawings, M-22GK03 and GK04 series, Piping and Instrumentation Drawings.
- Physical arrangement drawings of the areas of the Class 1E Electrical Equipment AC System and associated areas of cooling.
- Document regarding: Supplemental Fan System for Class 1E Cooling.

In summary, the audit enhanced the NRC staff's understanding of the Class 1E configuration, existing HVAC systems, calculations, and computer-based model (GOTHIC) used in support of the LAR.

Table 1
Items Identified During the Audit Review

Item #	Description	Status	Supplement. RAI, or Closed
1	<p>NRC staff needs to determine that the GOTHIC model documents the air flow patterns necessary to support the LAR's related design modifications.</p> <p>Specifically, do the air flow patterns utilizing the new fans/ducts provide appropriate and complete air flow to the back of the Motor Control Centers?</p>	<p>The licensee presented the Gothic calculation to the NRC staff for review, and the staff reviewed the calculation for the representation of proper and complete air flow patterns.</p> <p>This item is closed based on the NRC staff review.</p>	Closed
2	<p>The licensee's LAR proposes to change TS 5.5.11, "Ventilation Filter Test Program (VFTP)," lowering control room HVAC heater wattage from 15 ± 2 kW to 5 ± 1 kW. NRC staff needs to understand the basis for change from the original 15 kW heater and the consequences, if any, on the charcoal filters.</p> <p>NRC staff questions:</p> <ol style="list-style-type: none"> 1. Please provide a copy of the original calculation to support this proposed change. 2. The calculation reviewed during the audit documents that 414 volts are the minimum allowable voltage at the bus. Assuming a 2-3 percent voltage drop from the bus to the terminals of the heater produces a heat output of less than the 3.16 kW. Please provide a discussion related to the adequacy of the proposed heater size and TS range based on limiting voltage at the heater terminals. 3. Please provide a discussion on the adequacy of the proposed heater size when the 4160-volt bus is operating at 3740 volts and 58.8 hertz (Hz). 	<p>The licensee stated in the audit that:</p> <ol style="list-style-type: none"> 1. The supportive original calculation was supplied and reviewed by NRC staff, which discusses the upper and lower limits supplied by the heater to the system and how charcoal function is maintained. 2. A change in voltage to the heater terminals was addressed in the related calculation provided to the NRC staff for review of adequate system margins and proper system protections. 3. Voltage load flow cases/diagrams for the system related to the heater's sizing were presented and discussed with NRC staff. 4. Reduced heater wattage testing methods and testing standards were discussed and presented to the NRC staff for review. <p>The information provided was reviewed by the NRC staff, and the licensee plans to supplement the application</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
	<p>4. Please discuss how the proposed filtration configuration with the reduced heater size will be tested to validate the adequacy of proposed design modification.</p>		
3	<p>Typically the cables in the cable trays have a conductor temperature of 90 degrees Centigrade (°C). The NRC staff needs to understand the LAR's assumptions related to the electrical conditions of the following:</p> <p>1. What temperature (conductors and other electrical equipment) was used to evaluate heat input into the rooms?</p> <p>The major contributors to heat load are transformers and cables where heat generated is calculated as I^2R with I, current, and R, resistance. Here, R increases as temperature increases.</p> <p>Cables are designed to operate at 90 °C with room temperatures approaching 100 degrees Fahrenheit (°F), or more, the cables may be operating at or above design temperature of 90 °C. Hence the "R" value of cables should be computed at appropriate conductor temperature.</p> <p>With the onset of an event, such as a LOCA, the pressures in the reactor cooling system may be low and pumps may operate at runout conditions. Hence, the motors associated with the pumps may be operating above nominal rating resulting in higher current.</p> <p>Please provide details on how the large loads were considered at the onset of an event and the first few initial hours.</p>	<p>The licensee addressed these engineering issues with the NRC staff and provided detailed information related to assumptions, and conservative considerations made to cable temperatures and transformer loads.</p> <p>The information provided was reviewed by the NRC staff at the audit and the licensee plans to supplement the amendment, via letter submission, with the detailed technical information concerning this question.</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
	<p>2. The corresponding load on the transformers need to be confirmed. The current in the transformer should account for maximum load plus losses.</p> <p>In addition, please provide details on the calculation that was developed to evaluate tray fill and any diversity factor used for heat loss calculations.</p>		
4	<p>Callaway's Final Safety Analysis Report (FSAR), Revision OL-22, Chapter 1, "Introduction and General Description of the Plant," Section 1.2.1.8, "Meteorology" (ADAMS Accession No. ML17048A157), states, in part that "The 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."</p> <p>Callaway's TS, Facility Operating License NPF-30, Technical Specifications (ADAMS Accession No. ML053110040), SR 3.8.6.3 states: "Verify average electrolyte temperature of representative cells is ≥ [greater than or equal to] 60 °F."</p> <p>FSAR, Revision OL-22, Chapter 9, Section 9.4.1.2.3, "System Operation," states, in part: "The ambient temperature in the battery rooms, under any mode of operation, will be between 60 °F and 90 °F"</p> <p>The batteries have minimum and maximum operating temperature limits. The battery will give the best results when working in a room temperature between 60 °F and 80 °F, but will function when operating in temperatures</p>	<p>The licensee, during the audit period, discussed in detail with the NRC staff the procedures and protocols concerning normal, cold, and accident conditions related to the monitoring, control of minimum battery room temperatures.</p> <p>The discussions specifically addressed plant operations during those periods of concern while applying the plant heating system, battery room historical operating experience, and the proposed amendment's calculations associated with battery room temperatures.</p> <p>The licensee's technical documents and discussions stated the adequacy of batteries to perform, subject to the conditions above, for the proposed amendment.</p> <p>The information provided was reviewed by the NRC staff at the audit, and the licensee plans to supplement the LAR, via letter submission, with the detailed technical information concerning this question.</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
	<p>outside the allowable band. High temperatures increase the performance, but decrease the life of the cells; low temperatures reduce the performance.</p> <p>The NRC staff needs clarification on the values associated with the Minimum Vital Battery Room Temperatures during an Extended Loss of Alternating Current Power Event calculation, and to understand the consequences of extreme winter temperatures and battery room temperatures that were evaluated during minimum heat load conditions.</p> <p>The NRC staff's concern is related to a planned or unplanned 30-day outage, which may be in the middle of winter when the outside temperature is -26 °F.</p> <p>Please consider the following scenario and related questions:</p> <ol style="list-style-type: none">1. The plant is online, then the Emergency Core Cooling System (ECCS) is not operating and heat load in the areas of concern may be minimal. Please provide a discussion on any corrective actions that may be needed to maintain battery operability.2. If an accident occurs 24 hours or 7 days later, the load shedding reduces heat input into the rooms. Please provide a discussion related to the operability of the batteries after a few days into the event. The accident could also occur at any time during the 30-day outage.3. Assuming a SBO event occurs following an extended loss of offsite power event anytime during the proposed 30-day LCO, please provide a discussion related to the operability of battery for the required coping duration.		

Item #	Description	Status	Supplement. RAI, or Closed
	<p>4. Please provide a discussion on the low end design temperature related to operability of the SR batteries.</p> <p>5. How will this be controlled during the proposed completion time?</p> <p>6. Do the battery room temperatures drop below 60 °F?</p>		
5	<p>Maximum hydrogen (H₂) discharge occurs during battery charging/discharging cycles. At the onset of an event, the battery supply maximum direct current loads would be close to their maximum load capability within the first few minutes and then would require recharge when power is restored.</p> <p>The licensee's LAR did not present data related to the calculated of the H₂ discharge for such a postulated scenario.</p> <p>NRC staff questions:</p> <ol style="list-style-type: none"> 1. The licensee needs to confirm that a H₂ discharge calculation was utilized for this LAR. 2. It is not clear to the NRC staff how the proposed amendment's GOTHIC calculation considered H₂ generation during battery charging and the licensee needs to present how H₂ is distributed within the rooms when the HVAC is in recycle mode only. 	<p>During the audit, the licensee presented and discussed with the NRC staff the H₂ calculation and its use and application with the GOTHIC analysis for the LAR.</p> <p>The information provided was reviewed by the NRC staff and the licensee plans to supplement the application.</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
6	<p>During the NRC staff walkdown, the following questions were developed:</p> <ol style="list-style-type: none"> 1. Several Class 1E rooms have wall mounted temperature indications. Do these read-out in the main control room (MCR) or display out on the plant computer? 2. Are these temperature indications also alarms points? 3. If these temperature indications are nonsafety-related powered to the plant computer, how does the plant computer indicate loss of power? 4. Are there procedures in place to monitor the battery room temperatures since there is no wall mounted thermocouple? <p>How will monitoring be performed for the proposed TS actions related to battery room temperatures, locally, every 4 hours or shift?</p>	<p>The licensee addressed these observations and presented to the NRC staff detailed information concerning the temperature indicators and their alarms, readout points/setpoints, operator actions, procedures changes, power sources, inputs/outputs to the plant computer system, and their relationship to monitoring of battery room temperatures.</p> <p>The information provided was reviewed by the NRC staff at the audit, and the licensee plans to supplement the LAR, via letter submission, with the detailed technical information concerning this question</p>	Supplement
7	<p>The diesel generator (DG) frequency, as stated in SR 3.8.1.11, Item c.4, documents that that value may be as low as 58.8 Hz. The proposed amendment's calculation needs to use air flow rates to calculate room temperatures for the DG.</p> <p>The NRC staff has the following questions:</p> <ol style="list-style-type: none"> 1. Does the proposed amendment's GOTHIC analysis use ECCS pump runout conditions, or some other condition? 	<p>The licensee, during the audit period, discussed with the NRC staff information related to the LAR's analysis, DG frequency, ECCS conditions related to pump configuration, and the fan flow rates to these questions.</p> <p>The information provided was reviewed by the NRC staff and the licensee plans to supplement the application.</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
	<p>2. Please identify which large pumps (greater than 50 horsepower) are assumed to have flow control or orifices.</p> <p>3. Please provide details on changes in flow rates and any impact on room heatup calculations if the DG frequency is at 58.8 Hz.</p>		
8	<p>The proposed TS Bases in Attachment 5 of the LAR (ADAMS Accession No. ML18068A691), states that mitigating actions are to be taken with the starting of recirculating fans to limit Class 1E room heat up less than (<) 90 °F. Room temperature monitoring is proposed in the TS required actions.</p> <p>It is not clear to the NRC staff how the elements of a surveillance requirement to support proper MCR temperatures would be accounted for in this LAR.</p> <p>1. Should the following elements be part of the LCO related to this amendment;</p> <ul style="list-style-type: none"> a. room temp < 90 °F; b. the 10 room numbers for cooling; and c. mitigating actions. 	<p>The licensee stated in the audit that:</p> <p>a: The 90 °F temperature limit serves as an initial condition in the room temperature analysis when a single train of Class 1E air conditioning is cooling both trains of Class 1E electrical equipment rooms. When both trains of Class 1E air conditioning are available, it is not necessary to impose an initial condition temperature limit to demonstrate acceptable room temperatures over the 30-day mission time for the Class 1E electrical equipment. Room temperature limits and monitoring requirements are not included as an LCO or SR in the Improved Standard Technical Specifications. Room temperature limits and monitoring requirements that are applicable when not in a Required Action, have been relocated to FSAR Section 16.7.4, "Area Temperature Monitoring." Based on this, it would not be appropriate to impose the < 90 °F room temperature limit when both trains of Class 1E electrical equipment are operable.</p> <p>b: The 10 room numbers are listed in the proposed Technical Specification Bases. This will provide the detailed information regarding which specific rooms are covered while maintaining a concise Technical Specification.</p> <p>c: The mitigating actions are not applicable when both trains of Class 1E air conditioning equipment are operable. Therefore, it would not be appropriate to list the mitigating</p>	Closed

Item #	Description	Status	Supplement. RAI, or Closed
		<p>actions in the LCO. Required Action A.1 of proposed Technical Specification 3.7.20 was developed using Required Action B.1 of Technical Specification 3.7.10 as the model. As was previously discussed in this item, imposing the 90 °F temperature limit of Required Action A.2 as a SR applicable at all times, or as an LCO limit, would have no bases in the analyses for the condition of both trains of Class 1E Electrical Equipment Air Conditioning operable.</p> <p>This item is closed based on the NRC staff's review.</p>	
9	<p>The LAR's proposed completion time for this proposed TS change should primarily be selected based on the maintenance component for the duration selected.</p> <p>It is not clear to the NRC staff what were the additional factors and considerations that accounted for the LAR's proposed completion time of 30 days.</p> <p>NRC staff question:</p> <p>Justify why the proposed 30 days TS completion time is needed for normal maintenance of the chiller/HVAC system related to this proposed TS change?</p>	<p>The licensee discussed, at the audit, all the factors that were considered to support the final duration of this TS change. The other factors included the components involved, the qualitative review of risk significance, and elements of redundancy.</p> <p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
10	<p>The proposed LAR design modifications omitted technical equipment and specification details.</p> <p>NRC staff question:</p> <p>Please provide missing information such as equipment safety class, 1E Power supply, seismic classification, and component testing for the design modifications that support this LAR.</p>	<p>The licensee presented to the NRC staff at the audit information related to equipment classification and power sources.</p> <p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
11	Deleted by NRC staff – not used.	N/A	N/A
12	<p>The LAR's proposal to shut down a complete train of Engineered Safety Feature (ESF) equipment (after 7 days), with one HVAC train unavailable prior to an event, may complicate plant safety considering significant equipment in one train (with inoperable HVAC) may not be available for an extended period.</p> <p>It is not clear to the NRC staff how the detailed combinations of events and plant conditions were considered for heat load calculations related to the proposed amendment.</p>	<p>The licensee discussed this item with the NRC staff during the audit.</p> <p>The NRC plans to formally submit a detailed RAI on this topic to the licensee, which would allow a fully developed and detailed technical response to be submitted by the licensee.</p>	RAI
13	Deleted by NRC staff – not used.	N/A	N/A
14	Deleted by NRC staff – not used.	N/A	N/A
15	<p>NRC staff question:</p> <ol style="list-style-type: none"> 1. Are there any wall mounted control building area heaters? 2. If so, are these heaters part of the GOTHIC heat load calculations? How are these area room heaters controlled? 	The information provided was reviewed by the NRC staff at the audit and the licensee plans to supplement the LAR, via letter submission, with the detailed technical information concerning this question.	Supplement
16	Deleted by NRC staff – not used.	N/A	N/A
17	Deleted by NRC staff – not used.	N/A	N/A

Item #	Description	Status	Supplement. RAI, or Closed
18	<p>NRC staff question:</p> <p>Please describe the safety classification of the existing Class 1E electrical HVAC trains and reference any FSAR sections and tables, as appropriate?</p>	<p>The information provided was reviewed by the NRC staff at the audit and the licensee plans to supplement the LAR, via letter submission, with the detailed technical information concerning this question.</p>	Supplement
19	Deleted by NRC staff – not used.	N/A	N/A
20	<p>The TS bases for SR 3.7.20.2 state that this SR verifies that the heat removal capability of the A/C units is adequate to remove the heat load assumed in the control room during design basis accidents.</p> <p>NRC staff question:</p> <p>Please clarify if the intent was to state that this SR verifies that the heat removal capability of the A/C units is adequate to remove the heat load assumed in the Class 1 E Electrical area during design basis accidents.</p>	<p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
21	<p>NRC staff question:</p> <p>1. It is not clear to the technical staff if:</p> <p style="padding-left: 40px;">a. A new technical requirements manual (TRM) associated with the recirculation subsystem will be created, including its associated SRs.</p> <p>Additionally, will FSAR Section 16.7.13, "Class 1E Electrical Equipment Air Conditioning (A/C)," be revised or deleted, as appropriate, to support this LAR?</p>	<p>The licensee presented to the NRC staff at the audit, the intended "TRM like document" and use for FSAR Chapter 16.7.13.</p> <p>The licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
22	<p>The licensee's LAR dated March 9, 2018, includes information regarding potential cross-train impacts related to fire protection and hydrogen gas buildup.</p>	<p>The licensee, during the audit period, discussed with the NRC staff information related to the hydrogen gas accumulation, fire protection, room penetrations, radiological</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
	<p>NRC staff question:</p> <p>Please provide or summarize evaluations that address maintaining train independence, redundancy and separation when opening a communication pathway between the Operable and Inoperable redundant Class 1E trains for any other applicable hazard or any requirements to maintain negative pressure in the affected areas for HVAC/radiological control issues. This question considers if the proposed operator action creates a condition that adversely impacts plant system independence, redundancy or separation relative to NUREG-1764, "Guidance for the Review of Changes to Human Actions," Revision 1, Section 4, "Level II Review Guidance" (ADAMS Accession No. ML072640413).</p>	<p>control (control room habitability) and the separation distance between trains to address this question.</p> <p>The information provided was reviewed by the NRC staff and the licensee plans to supplement the application.</p>	
23	<p>NRC staff question:</p> <p>Describe the administrative controls that alert control room operators during normal operations of the need to start the Class 1E room recirculation fan system within 1 hour of a Class 1E AC train being Inoperable and to initiate mitigating actions.</p>	<p>The licensee discussed this item with the NRC staff during the audit.</p> <p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
24	<p>NRC staff question:</p> <p>Will the associated dampers automatically align when the Class 1E recirculation fan system is started or will the operator align dampers and start recirculation fans as separate actions?</p>	<p>The licensee discussed this item with the NRC staff during the audit.</p> <p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
25	<p>NRC staff question:</p> <p>Please describe the operator actions required to place the recirculation fans/dampers into service.</p>	<p>The licensee discussed this item with the NRC staff during the audit.</p> <p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
		amendment, via a letter submission, with the detailed technical information concerning this question.	
26	<p>NRC staff question:</p> <p>Describe the specific operator actions required to place the new Class 1E recirculation fan system in service during normal operating conditions. Describe the administrative controls associated with manually placing the recirculation fans in service during normal operating conditions. Identify operator actions that will be proceduralized, or are already in procedures, or describe other applicable administrative controls.</p>	The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.	Supplement
27	<p>NRC staff question:</p> <p>Describe the training (and frequency of training) that will be provided regarding identifying the need to place the Class 1E recirculation fan system in service under normal operating conditions as well as the training that will be provided regarding the specific actions required to place the Class 1E recirculation fan system in service under normal operating conditions.</p>	The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.	Supplement
28	<p>NRC staff question:</p> <p>The licensee's LAR dated March 9, 2018, describes a maximum post-accident room temperature limit of 104 °F. A normal operating temperature of less than or equal to (\leq) 90 °F is maintained to ensure that post-accident room temperatures will not exceed the 104 °F limit. However, the LAR does not appear to include analyses or other technical justification confirming the ability of one train of Class 1E A/C to cool both trains of Class 1E equipment under the heat loading of normal operation to the \leq 90 °F TS temperature limit requirement. (The heat load during</p>	The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
	<p>normal conditions is greater than the heat load during accident conditions since no load shedding is performed during normal conditions.) Also, the planned design modifications described in Attachment 2, Section 3.3 of the LAR (ADAMS Accession No. ML18068A688), do not indicate that ≤ 90 °F temperature limit can be maintained for both trains of Class 1E equipment using only 1 train of Class 1E A/C.</p> <p>Attachment 2, Section 3.1, "Normal and Design Basis Accident Environmental Conditions," of the LAR states in part: "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 1 E electrical equipment rooms are maintained between 68 °F and 75 °F, and during normal equipment operation (with both SGK05A or SGK05B units in service) the room temperatures are assured to remain below 90 °F. A single functional Class 1 E electrical equipment A/C train providing area cooling for both electrical equipment trains concurrent with accident condition (LOCA) heat loading will maintain the equipment room temperatures less than the 104 °F maximum for accident/faulted environmental conditions."</p> <p>NRC staff question:</p> <p>Please provide the historical data since it does not appear that operation of the new recirculation fan system can support both Class 1E trains ≤ 90 °F, under normal operating conditions, with only one Class 1E AC train operable (this may indicate that the proposed design modification cannot support the new proposed TS 3.7.20 Required Action A.2 of the LAR).</p>		

Item #	Description	Status	Supplement. RAI, or Closed
29	<p>Attachment 2 in Section 3.3 subsection, "Credited Manual Operator Actions," of the LAR, discusses crediting operator manual actions associated with the new Class 1E recirculation fan system. This subsection only addresses accident/event initiation and states that operators are trained on revisions to the Emergency Operating Procedures.</p> <p>NRC staff question:</p> <p>Describe the training (and frequency of training) that will be provided regarding identifying the need to place the Class 1E recirculation fan system in service under accident/event conditions, as well as the training that will be provided regarding the specific actions required to place the Class 1E recirculation fan system in service under accident/event conditions.</p>	<p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
30	<p>NRC staff question:</p> <ol style="list-style-type: none"> Describe the validation that has been performed to demonstrate that the manual operator action credited in the GOTHIC calculation to restart the recirculation fans within 30 minutes of accident/event initiation is feasible and reliable? How was this validation demonstration activity documented? 	<p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
31	<p>NRC staff question:</p> <ol style="list-style-type: none"> Describe the validation that has been performed that demonstrates that the required load shed described in Attachment 2, in Section 3.3 subsection ("Credited Manual Operator Actions"), of the LAR, regarding 	<p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
	<p>credited operator manual actions can be reliably completed within the 30-minute credited timeframe in addition to all actions required to place the recirculation fans in service within the same 30-minute timeframe.</p> <p>2. How was this validation demonstration activity documented?</p>		
32	<p>NRC staff question:</p> <p>1. Is the 30-minute action time, discussed in Attachment 2, in Section 3.3 of the LAR, regarding credited operator manual actions, being controlled or should it be controlled as a time critical operator action?</p> <p>2. What is the time margin available to place the Class 1E recirculation fan system in service under accident/event conditions?</p>	<p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
33	<p>NRC staff question:</p> <p>1. Describe all mitigating actions (referred to on page 40 of Attachment 2, Section 4.2, "Precedent," of the LAR) involving operator actions being relied on by Callaway to fulfill the requirements of Required Actions A.1 and A.2 under proposed TS 3.7.20 when utilizing the supplemental cooling system to fulfill the required actions.</p> <p>2. Provide the human factors evaluations that justify the feasibility and reliability of the mitigating operator actions, and the validation performed to verify the feasibility and reliability of these actions.</p>	<p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
34	<p>Callaway proposed to utilize the Surveillance Frequency Control Program for SRs 3.7.20.1 and 3.7.20.2 frequencies as shown in Attachment 3 of the LAR (ADAMS Accession No. ML18068A689).</p> <p>NRC staff question:</p> <ol style="list-style-type: none"> 1. Please provide an initial SR frequency and basis for each SR below. <ol style="list-style-type: none"> a. Verify action on an actually or simulated signal and ensure the capability to remove the assumed heat load. 	<p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
35	Deleted by NRC staff – not used.	N/A	N/A
36	<p>The LAR does not document room to room delta pressures, nor room H₂ generation/concentrations.</p> <p>NRC staff question:</p> <p>Please provide this data that supports room pressures and room H₂ concentrations.</p>	<p>The information discussed at the audit was reviewed by the NRC staff and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	Supplement
37	<p>NRC staff question:</p> <p>Please provide a copy, via supplemental letter, of the Piping and Instrumentation Diagram (P&ID) for the control building HVAC system.</p>	<p>The information was discussed at the audit with the NRC staff, and the licensee plans to supplement the LAR, via a letter submission, the detailed P&ID(s) to address this question.</p>	Supplement
38	<p>NRC staff question:</p> <p>Please provide, via supplemental letter, any and all updated documents for the final version of this LAR's design modifications.</p>	<p>Licensee response:</p> <p>The request was discussed at the audit with the NRC staff, and the licensee plans to supplement the LAR, via a letter submission, the detailed documents for the final version of the LAR's design modifications.</p>	Supplement

Item #	Description	Status	Supplement. RAI, or Closed
39	<p>Attachment 2, Section 3.3, "Planned Modifications," of the LAR, page 24 states, in part, "...wall and door penetrations equipped with fires dampers..."</p> <p>NRC staff question:</p> <p>Describe the technical basis for the acceptability of the grills in the fires doors (without fire dampers).</p>	<p>The information discussed at the audit was reviewed by the NRC staff, and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	<p>Supplement</p>
40	<p>NRC staff question:</p> <p>For the proposed amendment, are there any new flooding concerns with the modified fire door related to the new grills?</p>	<p>The information discussed at the audit was reviewed by the NRC staff, and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	<p>Supplement</p>
41	<p>NRC staff question:</p> <p>1. While reviewing the LAR's proposed Class 1E Recirculation System Piping and Instrumentation Diagram, the NRC staff observed the following discrepancies:</p> <ul style="list-style-type: none"> a. Arrows that appear to incorrectly indicate A versus B train operation. (Note: The arrows as provided show only A train is in service, but B trains fans are showing flow arrows.) b. Areas on the P&IDs, between ESF SG 1 and 2 indicate as open space where it should indicate a wall exists. c. Please describe why there are 36-inch versus 30-inch openings between battery rooms. d. Please document if a fan blade missile analyses 	<p>The information discussed at the audit was reviewed by the NRC staff and closed for questions 1.a, b and c for this item.</p> <p>Concerning question 1.d, the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	<p>Supplement to letter of question 1)d.</p>

Item #	Description	Status	Supplement. RAI, or Closed
	for the new proposed fans were developed to support the LAR.		
42	<p>The NRC staff reviewed the GOTHIC calculation during the audit and found the following items.</p> <ol style="list-style-type: none"> 1. No approval signatures or dates? 2. The GOTHIC calculation data stated that room 3101 has at a maximum temperature of 120 °F. That appears to be an editorial error on that page of the calculation. Please confirm. 3. Attachment 2, Section 3.2.3, "Results." Table 4, "Maximum Room Temperature Summary," of the LAR, and the listed GOTHIC calculations room temperatures are not consistent by a value of 0.01. Please discuss. 4. Room delta pressures provided in the calculation show color blocking of green, red, and blue. There is no legend associated with these colors. <p>NRC staff question:</p> <ol style="list-style-type: none"> 1. Please provide the revised, final, signed calculation for audit review. 2. Described why this temperature is acceptable. 3. Provided a correction to the LAR table, as appropriate. 4. Described the color legion for this section of the calculation. 	<p>The information discussed at the audit was reviewed by the NRC staff and closed for questions 1., 2., and 4. for this item.</p> <p>Concerning Question 3. - The licensee plans to supplement the LAR and provide corrections to the LAR table in Attachment 2, as appropriate, via a letter submission.</p>	<p>Supplement to letter Question 3 of this item.</p>

Item #	Description	Status	Supplement. RAI, or Closed
43	<p>Fire doors are modified with new fans</p> <p>NRC staff question:</p> <p>Describe if the fire doors are part of the fan structure.</p>	<p>The information discussed at the audit was reviewed by the NRC staff, and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	<p>Supplement</p>
44	<p>Attachment 2, Section 3.3 subsection "Fire Protection Evaluation," of the LAR, on page 29, references the Halon fire system, but during the NRC staff walkdown, it was noted that the halon is removed from certain elevations of the control building.</p> <p>NRC staff question:</p> <p>Please update the LAR with correct information, and a P&ID drawing since the drawing references Halon control panel.</p>	<p>The request was discussed at the audit with the NRC staff, and the licensee plans to supplement the LAR, via a letter submission, the detailed P&ID(s) to address this question.</p>	<p>Supplement</p>
45	<p>Open grating is added to the LAR's six fire doors.</p> <p>NRC staff questions:</p> <ol style="list-style-type: none"> Does this affect the normal air flow balance (path of least resistance) when not in proposed TS 3.7.20 actions? Describe why this is acceptable, and is this air flow balance accounted for in the GOTHIC analysis? 	<p>The information discussed at the audit was reviewed by the NRC staff, and the licensee plans to supplement the LAR, via a letter submission, with the detailed technical information concerning this question.</p>	<p>Supplement</p>

Table 2
NRC Audit - Attendees
September 26, 2018

L. Wheeler	NRC-NRR	Technical Reviewer
G. Matharu	NRC-NRR	Technical Reviewer
J. Klos	NRC-NRR	Project Manager
D. Bradley	NRC-NRR	Sr. Resident Inspector
S. Janicki	NRC-NRR	Resident Inspector
J. Cordz	Union Electric Company dba Ameren Missouri	Safety Analysis
J. Little	Ameren Missouri	Licensing Engineer
B. Richardson	Ameren Missouri	Supervisor of Safety Analysis
J. Fortman	Ameren Missouri	Supervisor of Regulatory Affairs
R. Pohlman	Ameren Missouri	Licensing
J. Kovar	Ameren Missouri	Licensing Engineer
M. Covey	Ameren Missouri	Manager, Operations
M. Fletcher	Ameren Missouri	Fire Protection Engineer
M.D. Haag	Ameren Missouri	Principal Design Engineer
M. Lutz	Ameren Missouri	Design Engineer
J. Claunch	Ameren Missouri	Supervisor of Engineering Programs
R. Lutz	Ameren Missouri	Project Manager
A. Alley	Ameren Missouri	Supervisor Engineer
S. Abel	Ameren Missouri	Director, Engineering Design a Projects
R. Wink	Ameren Missouri	Regulatory Affairs Manager
T. Elwood	Ameren Missouri	Regulatory Affairs Supervisor
L. Krooswyk	Burns & McDonnell	Design/Project Engineering
J. King	Zachry	Engineer

Table 3
NRC Audit -Attendees
September 27, 2018

L. Wheeler	NRC-NRR	Technical Reviewer
G. Matharu	NRC-NRR	Technical Reviewer
J. Klos	NRC-NRR	Project Manager
S. Janicki	NRC-NRR	Resident Inspector
T. Herrmann	Union Electric Company dba Ameren Missouri	Site Vice President
S. Banker	Ameren Missouri	Vice President Engineering
B. Cox	Ameren Missouri	Assistant Site Vice President
F. Bianco	Ameren Missouri	Sr. Director Nuclear Operations
D. Farnsworth	Ameren Missouri	Director, Nuclear Operations
S. Ewins	Ameren Missouri	Project Engineer
D. Waller	Ameren Missouri	Supervisor Project
J. Kosky	Ameren Missouri	Regulatory Affairs
J. Cordz	Ameren Missouri	Safety Analysis
J. Little	Ameren Missouri	Licensing Engineer
B. Richardson	Ameren Missouri	Supervisor Safety Analysis
R. Pohlman	Ameren Missouri	Licensing
J. Kovar	Ameren Missouri	Licensing Engineer
R. Lutz	Ameren Missouri	Project Manager
R. Wink	Ameren Missouri	Regulatory Affairs Manager
T. Elwood	Ameren Missouri	Regulatory Affairs Supervisor
L. Krooswyk	Burns & McDonnell	Design/Project Engineering
J. King	Zachry	Engineer

SUBJECT: 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

DISTRIBUTION:

PUBLIC

PM File Copy

RidsACRS_MailCTR Resource

RidsNrrDorLpl4 Resource

RidsNrrPMCallaway Resource

RidsNrrLAPBlechman Resource

RidsRgn4MailCenter Resource

RidsNrrDssScpb Resource

RidsNrrDssStsb Resource

RidsNrrDeEeob Resource

RidsNrrDeEicb Resource

RidsNrrDraAphb Resource

LWheeler, NRR

GMatharu, NRR

PSnyder, NRR

JHughey, NRR

HAKhavannik, NRR

NKaripineni, NRR

ADAMS Accession No.: ML18353B016***by e-mail**

OFFICE	NRR/DORL/LPL4/PM	NRR/DORL/LPL4/LA	NRR/DSS/SCPBC/BC*	NRR/DORL/LPL4/BC	NRR/DORL/LPL4/PM
NAME	JKlos	PBlechman	SAnderson	RPascarelli	JKlos
DATE	1/3/19	12/20/18	12/19/2018	1/3/19	1/4/19

OFFICIAL RECORD COPY