



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

January 9, 2023

Dr. Gregory Piefer
Chief Executive Officer
SHINE Technologies, LLC
3400 Innovation Court
Janesville, WI 53546

**SUBJECT: SHINE TECHNOLOGIES, LLC REGULATORY REPORT ON THE AUDIT OF
CHAPTER 8, "ELECTRICAL POWER SYSTEMS," AS DESCRIBED IN
OPERATING LICENSE APPLICATION (EPID NO. L-2019-NEW-0004)**

Dear Dr. Piefer:

By letter dated July 17, 2019 (Agencywide Documents Access and Management System Accession No. ML19211C044), SHINE Medical Technologies, LLC (SHINE) submitted its application for an operating license.

Enclosed is a report on the regulatory audit conducted by staff of the U.S. Nuclear Regulatory Commission (NRC) in connection with its review of the application, in addition to the review of chapter 8, "Electrical Power Systems," of the SHINE Medical Technologies, LLC operating license application. This regulatory audit was held to close technical gaps identified during the review of chapter 8.

The audit report does not make any licensing conclusions or findings, but it is part of the administrative record of the NRC staff's review of the application and may provide information supporting the NRC staff's safety evaluation report (SER). The audit followed the plan provided by letter dated May 7, 2020 (ML20126G522), unless otherwise noted in the enclosed report. This report constitutes the final report on the audit. The closure of the audit items are documented in the NRC staff SER.

If you have any questions, please contact me at (301) 415-1053, or by email to Holly.Cruz@nrc.gov.

Sincerely,



Signed by Cruz, Holly
on 01/09/23

Holly D. Cruz, Senior Project Manager
Non-Power Production and Utilization
Facility Licensing Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Docket No. 50-608
Construction Permit No. CPMIF-001

Enclosure:
As stated

cc: See next page

SHINE Medical Technologies, LLC

Docket No. 50-608

cc:

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SUBJECT: SHINE TECHNOLOGIES, LLC REGULATORY REPORT ON THE AUDIT OF
CHAPTER 8, "ELECTRICAL POWER SYSTEMS," AS DESCRIBED IN
OPERATING LICENSE APPLICATION (EPID NO. L-2019-NEW-0004) DATED:
JANUARY 9, 2023

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ADAMS Accession No.: ML22308A233**NRR-106**

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REGULATORY AUDIT REPORT

REGARDING CHAPTER 8,

“ELECTRICAL POWER SYSTEMS”

OPERATING LICENSE APPLICATION

SHINE TECHNOLOGIES, LLC

DOCKET NO. 50-608

Location: Virtual

Dates: May 11, 2020, from 9:30am to 5:00pm (Central Time)
May 12, 2020, from 8:00am to 5:00pm (Central Time)
May 13, 2020, from 8:00am to 5:00pm (Central Time)
May 14, 2020, from 8:00am to 5:00pm (Central Time)
May 15, 2020, from 8:00am to 5:00pm (Central Time)

Audit Team Members: Jorge Cintron-Rivera (NRR/DEX) – Audit Team Leader
Sheila Ray (NRR/DEX) – Technical Reviewer
Michael Balazik (NRR/DANU), et.al.

Licensee Representatives: Jeff Bartelme, SHINE Technologies, LLC (SHINE), et al.

Background

By letter dated July 17, 2019 (Agencywide Documents Access and Management System Accession No. ML19211C044), SHINE submitted its application for an operating license. This report summarizes the regulatory audit conducted by staff of the U.S. Nuclear Regulatory Commission (NRC) on May 11, 2020 – May 15, 2020, and provides a closure path for the Audit Questions.

This audit was conducted in connection with the NRC staff's review of the application. The audit report does not make any licensing conclusions or findings, but it is part of the administrative record of the NRC staff's review of the application and may provide information supporting the NRC staff's SER. The audit followed the plan provided by letter dated May 7, 2020 (ML20126G522), unless otherwise noted in this report.

Regulatory Bases for the Audit

The purpose of the audit was to close technical gaps identified during the review of chapter 8, “Electrical Power Systems.” The licensee’s proposed electrical power systems are being reviewed in accordance with the applicable regulatory requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities,” and applicable guidance provided in NUREG-1537, “Guidelines for Preparing and

Enclosure

Reviewing Applications for the Licensing of Non-Power Reactors,” Part 1, “Format and Content,” and Part 2, “Standard Review Plan and Acceptance Criteria” (ML042430055 and ML042430048, respectively). Additionally, the SHINE electrical power systems, as described in the SHINE operating license application, are being evaluated using the following regulations:

- Section 50.34, “Contents of applications; technical information,” paragraph (b) of 10 CFR states, in part, that the final safety analysis report shall include information that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components and of the facility as a whole. As part of presenting its design bases, SHINE has established the following principal design criteria relevant to its electrical power systems:

- Criterion 4 – Environmental and dynamic effects

Safety-related SSCs are designed to perform their functions with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents. These SSCs are appropriately protected against dynamic effects and from external events and conditions outside the facility.

- Criterion 27 - Electric power systems

An on-site electric power system and an off-site electric power system are provided to permit functioning of safety-related SSCs. The safety functions are to provide sufficient capacity and capability to assure that:

- 1) target solution design limits and primary system boundary design limits are not exceeded as a result of anticipated transients, and
- 2) confinement integrity and other vital functions are maintained in the event of postulated accidents.

The on-site uninterruptible electric power supply and distribution system has sufficient independence, redundancy, and testability to perform its safety functions assuming a single failure.

Provisions are included to minimize the probability of losing electric power from the uninterruptible power supply as a result of or coincident with, the loss of power from the off-site electric power system.

- Criterion 28 - Inspection and testing of electric power systems

The safety-related electric power systems are designed to permit appropriate periodic inspection and testing of important areas and features, such as wiring, insulation, connections, and switchboards, to assess the continuity of the systems and the condition of their components. The systems are designed with a capability to test periodically:

- 1) the operability and functional performance of the components of the systems, such as on-site power sources, relays, switches, and buses; and

- 2) the operability of the systems as a whole and, under conditions as close to design as practical, the full operation sequence that brings the systems into operation, including operation of applicable portions of the protection system, and the transfer of power among the on-site and off-site power supplies.
- Section 50.34(b)(2) of 10 CFR requires a description and analysis of the structures, systems, and components of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which such requirements have been established, and the evaluations required to show that safety functions will be accomplished. The description shall be sufficient to permit understanding of the system designs and their relationship to safety evaluations.
 - Section 50.34(b)(2)(ii) of 10 CFR states, in part, that for facilities other than nuclear reactors, such items as the ... electrical systems ... shall be discussed insofar as they are pertinent.

Regulatory Scope

The NRC staff reviewed the SHINE final safety analysis report (FSAR), technical specification requirements, and supporting reference documentation related to the SHINE electrical power systems. This audit provided information necessary to complete the NRC staff's evaluation of the SHINE operating license application. The regulatory audit identified additional information that was required to be docketed to support the basis of the NRC's licensing decision. Some information related to the design of the electrical power systems is still under development, therefore, those items will be verified during the readiness inspection to ensure the design is commensurate with the licensing basis. The NRC staff reviewed documentation uploaded to SHINE's electronic reading room and participated in virtual discussions with the applicant.

Audit Activities

The following activities were performed during the audit:

1. Entrance Meeting

At the entrance meeting on May 7, 2020, the NRC staff explained the scope and desired outcomes for the audit. The NRC staff stated that after completion of the audit, an audit report will be prepared and sent to SHINE.

2. Review of Audit Questions

This audit was held to: (1) gain a better understanding of information underlying the application in the area of the chapter of chapter 8 (2) identify specific information that will require docketing to support the basis of the licensing or regulatory decision; and (3) close open technical items or identify a closure path for the audit questions identified in this audit plan.

The audit addressed updates to the SHINE FSAR in of chapter 8. The audit also addressed additional information and FSAR revisions provided for other systems. Therefore, any additional information identified from the audit that is needed to address a regulatory finding has been documented in this audit report.

As discussed in the audit plan, the NRC staff conducted document reviews using the electronic reading room as part of the audit. The following list comprises the documents the NRC staff reviewed as a part of this audit. The NRC staff did not review any additional documents in the electronic reading room beyond those listed.

a. Summary of Reference Document Review

At the time of the audit, NRC staff reviewed the following documents as provided in the SHINE electronic reading room:

- DCD-NPSS-0001, Rev. 2, "Normal Power Supply System Design Criteria Document"
- DCD-UPSS-0001, Rev.3, "Uninterruptible Power Supply System Design Criteria Document"
- DCD-SGS-0001, Rev. 3, "Standby Generator System Design Criteria Document."
- DCD-FGLP-0001, Rev. 1, "Facility Grounding and Lightning Protection System"
- TECRPT-2018-0058, Rev.3, "UPSS Load List"
- TECRPT-2018-0064, Rev. 1, "SGS Load List"
- SPEC-UPSS-0001, DRAFT, "Specification for the Uninterruptible Power Supply System (UPSS) - UPS/Battery Charger"
- SPEC-UPSS-0002, DRAFT, "Specification for the Uninterruptible Power Supply System (UPSS) - Batteries"
- DWG-UPSS-0001, DRAFT, "One-Line Diagram Uninterruptible Electrical Power Supply System (UPSS)"
- DWG-FSTR-1103, Rev.1, "Ground Floor Plan,"
- DWG-FSTR-1800, Rev. 1, "Embedded Conduit Key Plan, Areas 1-4"
- DWG-FSTR-1803, Rev. 0, "Embedded Conduit Key Plan, Area 3, El. 0'-0" to El. -4'-6""
- CALC-2019-0010, Rev. 0, "Control Room Heat-up Calculation"

The following documents were updated or provided later during the review of the operating license application:

- TECRPT-2018-0058, Rev. 6, "UPSS Load List" (replacing TECRPT-2018-0058, Rev. 4 and 5 previously uploaded)
- CALC-2020-0021, Rev. 0, "UPSS Sizing Calculation"
- CALC-2020-0023, Rev. 1, "ETAP AC/DC Power Analysis for NPSS, SGS and UPSS"
- CALC-2020-0024, Rev. 1, "Breaker Protection, Coordination and Arc Flash for NPSS, SGS and UPSS"
- CALC-2020-0025, Rev. 0, "Harmonic Analysis for NPSS, SGS, and UPSS"

During the review, the NRC staff found that some of the design documentation was not available. SHINE staff explained that the electrical design was not complete and some of the calculations and studies would be provided once SHINE completes the design.

b. Audit Topics

Audit Topic 1

The NRC staff requested SHINE provide the calculations studies of its electrical power

systems design to ensure that the on-site uninterruptible electric power supply and distribution system has sufficient independence, redundancy, testability, capacity, and capability to perform its safety functions. The purpose of reviewing the calculations is to confirm that the final design and functional characteristics are commensurate with the design bases. Below is a discussion of the calculations requested.

Load Flow/Voltage Regulation Studies and Under/Overvoltage Protection

The NRC staff reviewed SHINE documents related to Load Flow/Voltage Regulation Studies and Under/Overvoltage Protection. At the start of the audit, SHINE did not have design documents related to load flow and voltage regulations available for NRC staff review. SHINE also stated that they are not required to provide Overvoltage protection studies. As a result, the NRC staff issued RAI 8-1 (ML21011A241) to discuss why SHINE is not required to have overvoltage protection studies. In response to RAI 8-1, SHINE stated that "Under/overvoltage protection studies are not performed by SHINE, as there is no explicit requirement for SHINE to perform such studies. Undervoltage and overvoltage protection is provided as described in Subsection 8a2.1.3 of the FSAR."

SHINE later provided CALC-2020-0023, Rev. 1, "ETAP AC/DC Power Analysis for NPSS, SGS and UPSS."

Short-Circuit Studies (Alternating Current (AC) and Direct Current (DC) systems), including faults on cables in the penetrations to ensure that confinement integrity is maintained

SHINE is performing short-circuit and breaker protection and coordination studies for the Normal Electrical Power Supply System (NPSS) and emergency electrical power systems. At the start of the audit, SHINE did not have design documents related to short-circuit studies available for NRC staff review. The NRC staff issued RAI 8-1 requesting a response to whether SHINE will be performing short-circuit studies for AC and DC systems. In response to RAI 8-1, SHINE stated that, "SHINE is performing short-circuit and breaker protection and coordination studies for the NPSS and emergency electrical power systems. Cables in penetrations are sized to accommodate the load and to be capable of withstanding short circuit conditions, which prevents the possibility of a damaged cable impacting the seal and, thus, will ensure confinement integrity is maintained." Later in the review, SHINE also provided CALC-2020-0023, Rev. 1, "ETAP AC/DC Power Analysis for NPSS, SGS and UPSS" and CALC-2020-0024, Rev. 1, "Breaker Protection, Coordination and Arc Flash for NPSS, SGS and UPSS."

From its review of CALC-2020-0023, the NRC staff noted that the calculation provides recommendations for AC and DC load flow, AC and DC Short Circuit, DC Load Flow, and Motor Starting. The NRC staff requested SHINE confirm that the recommendations have been implemented in the acceptance criteria of CALC-2020-0023. SHINE confirmed that the recommendations provided in CALC-2020-0023 will be included in the design of the electrical power system.

Equipment Sizing Studies

The NRC staff reviewed SHINE documents related to equipment sizing of the electrical equipment. Specifically, the NRC staff reviewed the following documents on sizing of onsite ac and dc power systems: Normal Power Supply System Design Criteria Document, Uninterruptible Power Supply System Design Criteria Document, Standby Generator

System Design Criteria Document, UPSS Load List, SGS Load List, and Specification for the Uninterruptible Power Supply System (UPSS) - UPS/Battery Charger. The NRC staff reviewed the assumptions, methodology and summary of results, to verify that the design is in alignment with the recommended practices of National Fire Protection Association (NFPA) 70-2017 and that the power generation and distribution equipment are appropriately sized and are capable of performing its intended function.

During the audit, SHINE stated that equipment sizing studies are not required for their design. SHINE performed equipment sizing based on wire and bus sizing minimums established in NFPA 70-2017. The NRC staff reviewed documents related to the load list and technical specifications and issued RAI 8-1 to confirm that the equipment sizing is in accordance with NFPA 70-2017. In its response, SHINE confirmed that the equipment sizing is in accordance with NFPA 70-2017 and committed to follow applicable portions of Institute of Electrical and Electronics Engineers (IEEE) Standard 485-2010, "Recommended Practice for Sizing Lead-Acid Batteries for Generating Stations," for battery sizing.

Equipment Protection and Coordination Studies

The NRC staff requested SHINE provide documents related to equipment protection and coordination studies of the electrical system. SHINE stated during the audit that they will be performing equipment protection and coordination studies for the NPSS and emergency power systems. SHINE provided CALC-2020-0023, Rev. 1, "ETAP AC/DC Power Analysis for NPSS, SGS and UPSS" and CALC-2020-0024, Rev. 1, "Breaker Protection, Coordination and Arc Flash for NPSS, SGS and UPSS."

The NRC staff reviewed the documents provided as part of the audit and noted CALC-2020-0024 provides recommendations for breaker protection and coordination. The NRC staff requested SHINE confirm that the recommendations have been implemented the acceptance criteria. SHINE confirmed that the recommendations provided in CALC-2020-0024 will be included in the design of the electrical power system.

Insulation Coordination (Surge and Lightning Protection)

The NRC staff requested SHINE provide documents related to surge and lightning protection studies. At the time of the review, SHINE stated that surge and lightning protection studies are not required to be performed by SHINE. The NRC staff issued RAI 8-1 to provide justification on why SHINE is not required to perform the studies. In response to RAI 8-1, SHINE stated that, "surge and lightning protection studies are not performed by SHINE, as there is no explicit requirement for SHINE to perform such studies. The local utility provides for lightning protection on the supply transformers. Surge protection is provided at the incoming connection to the utility as a part of the low voltage switchgear. SHINE provides a facility grounding and lightning protection system that provides intentional low impedance conductive paths between facility SSCs and earth."

Power Quality Limits (Harmonic Analysis)

The NRC staff requested SHINE provide documents related to power quality limits. During the audit, SHINE indicated that the harmonic analyses for the NPSS and emergency power systems will be performed. SHINE provided CALC-2020-0025, Rev. 0, "Harmonic Analysis for NPSS, SGS, and UPSS." The NRC staff reviewed the document and noted that it provides instances of harmonic distortion in excess of the acceptance criteria described in

CALC-2020-0025 and discusses potential solutions. The NRC staff requested the path forward to ensure the acceptance criteria are met and provide documentation that the harmonic analysis acceptance criteria are met.

In response, SHINE stated that they will meet the acceptance criteria described in CALC-2020-0025. The NRC staff will verify that SHINE meets the harmonic analysis acceptance criteria during the readiness inspection.

Grounding Grid Studies

The NRC staff requested SHINE provide documents related to grounding grid studies. SHINE stated during the audit that grounding and grid studies are not required to be performed. The NRC staff requested in RAI 8-1 to provide justification on why SHINE is not required to perform grounding grid studies. In response to RAI 8-1, SHINE stated that, "grounding grid studies are not being performed by SHINE, as there is no explicit requirement for SHINE to perform such studies. Grounding grid studies are associated with a generation facility or substation facility."

Grid Stability Studies

The NRC staff requested SHINE provide documents related to grid stability studies. SHINE stated during the audit that grid stability studies are not required to be performed and is only required for nuclear power plants. The NRC staff requested in RAI 8-1 to provide justification on why SHINE is not required to perform grid stability studies. In response to RAI 8-1, SHINE states that, "Grid stability studies are not being performed by SHINE, as there is no explicit requirement for SHINE to perform such studies."

Electromagnetic Interference and Radiofrequency Interference (EMI/RFI) Studies

The NRC staff requested SHINE provide documents related to EMI/RFI studies. SHINE stated during the audit that EMI/RFI studies are not required to be performed and is only required for nuclear power plants. The NRC staff requested in RAI 8-1 to provide justification on why SHINE is not required to perform EMI/RFI studies. In response to RAI 8-1, SHINE states that, "Calculations and studies relating to EMI/RFI are not being performed by SHINE, as there is no explicit requirement for SHINE to perform such studies. EMI/RFI is being addressed as described above. The regulatory positions of Regulatory Guide 1.180, "Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems" (Reference 21) are specific to nuclear power plants, and not applicable to non-power production and utilization facilities."

Open Items at the Completion of the Audit

At the completion of the virtual audit, SHINE stated that the electrical design calculations were not completed. SHINE stated that they will have 90 percent of the electrical design completed by August 2020. SHINE committed to provide the following studies and calculations: load flow/voltage regulation studies for the NPSS and emergency power systems; short-circuit and breaker protection and coordination studies for the NPSS and emergency electrical power systems; equipment sizing studies for the UPSS; equipment protection and coordination studies for the NPSS and emergency power systems; and harmonic analyses for the NPSS and emergency power systems. On September 9, 2021, SHINE provided the following calculations to address these items: CALC-2020-0021, Rev.

0, "UPSS Sizing Calculation"; CALC-2020-0023, Rev. 1, "ETAP AC/DC Power Analysis for NPSS, SGS and UPSS"; CALC-2020-0024, Rev. 1, "Breaker Protection, Coordination and Arc Flash for NPSS, SGS and UPSS"; and CALC-2020-0025, Rev. 0, "Harmonic Analysis for NPSS, SGS, and UPSS."

The NRC staff provided questions regarding the studies and calculations provided. Some of the questions are provided below:

- DCD-UPSS-0001, the document states that the quality UPSS cabling is not explicitly stated in the FSAR and not evaluated to determine the safety classification. The NRC staff requested SHINE confirm that all UPSS cables and subcomponents will be classified as safety related (ML22075A336). SHINE confirmed that all UPSS cables and subcomponents will be classified as safety related (ML22084A030).
- TECRPT-2018-0058 - the NRC staff requested information on the use of margin values associated with the UPSS equipment including runtime, reserve, capacity, and aging factors. The NRC staff requested SHINE confirm that all margin values have been considered for the sizing of the UPSS and if temperature correction factors has been considered. SHINE updated the document to confirm all margins has been considered.
- CALC-2020-0025 –provides instances of harmonic distortion in excess of the acceptance criteria and discusses potential solutions. The NRC staff requested the path forward to ensure the acceptance criteria are met. The NRC staff will confirm this information during the readiness inspections prior to the startup of the facility.
- CALC-2020-0023 – provides recommendations for AC and DC load flow, AC and DC Short Circuit, DC Load Flow, and Motor Starting. The NRC staff requested SHINE confirm that the recommendations have been implemented the acceptance criteria. SHINE revised the document to reflect the recommendations has been implemented.

At the completion of this audit, SHINE communicated that some of the calculations from the electrical design are to be completed at a later time. The specific documents and calculations will be provided and reviewed during the inspections prior to the startup of the facilities.

Audit Topic 2

The NRC staff requested that the applicant provide more information on safety-related protection breakers and the non-safety related equipment. This includes the neutron driver assembly system (NDAS), the vacuum transfer system (VTS), the molybdenum extraction and purification system (MEPS), and the radiological ventilation zone (RVZ) 1 and 2. During audit discussions, SHINE stated that the safety functions performed by the safety-related breakers are to prevent actions that could initiate or increase the consequences of an accident and the equipment tied to these breakers does not perform an active safety function. The NRC staff issued RAI 8-2 (ML21011A241) to provide additional information on safety-related protection breakers use for non-safety related equipment. In response to RAI 8-2 (ML21011A241), SHINE stated that "the safety functions performed by the safety-related breakers specified in Subsection 8a2.1.3 of the FSAR are related to preventing actions that could initiate or increase the consequences of an accident. The equipment tied to these breakers does not perform an active safety function."

Audit Topic 3

The NRC staff stated that Section 8a2.2.2, "Uninterruptible Electrical Power Supply System Codes and Standards," provides the list of standards used for the design of the UPSS. However, SHINE does not provide standards used for the maintenance, testing, installation and qualification for the safety-related batteries used in the DC system. In addition, for the battery chargers, maintenance, testing, and qualification is not addressed in the FSAR. Describe the standards and/or methodologies used to perform maintenance, testing, installation, and qualification for the safety-related batteries in the DC system used in the UPSS. In addition, Describe the maintenance, testing, and qualification of the battery chargers.

SHINE stated during the audit that they follow the guidance provided in NFPA 70-2017 for the design of the SGS and the UPSS. They also specified that the FSAR will be revised to incorporate the standards used for the maintenance, testing, installation and qualification for the safety-related batteries and battery chargers used in the DC system. The NRC staff issued RAI 8-3 (ML21011A241) to ensure the applicable standards are incorporated into the FSAR. In response to RAI 8-3 (ML21029A103), the applicant revised FSAR to include specific portions of IEEE Standard 946-2004, "IEEE Recommended Practice for the Design of DC Auxiliary Systems for Generating Stations," IEEE Standard 485-2010, "Recommended Practice for Sizing Lead-Acid Batteries for Generating Stations," IEEE Standard 484-2002, "IEEE Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications," and IEEE Standard 450-2010, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead- Acid batteries for Stationary Applications."

The NRC staff reviewed TECRPT-2018-0058, "UPSS Load List" (Rev. 4, Rev. 5 and Rev. 6 of the document), CALC-2020-0021, Rev. 0, "UPSS Sizing Calculation," SPEC-UPSS-0002, DRAFT, "Specification for the Uninterruptible Power Supply System (UPSS) - Batteries," and DCD-UPSS-0001, Rev.3, "Uninterruptible Power Supply System Design Criteria Document" to ensure that the emergency electrical power systems are designed in accordance with the applicable portions of IEEE Std. 384-2008. Also, the NRC staff reviewed the documentation to ensure that the UPSS is designed to provide the capacity and capability to perform its intended safety function.

Audit Topic 4

The NRC staff requested SHINE provide information describing how it will apply its design criterion 4 for the environmental qualification of electrical equipment and provide a list of equipment that will be qualified. The request also indicated to include any methodologies and standards used for the environmental qualification of electrical equipment.

SHINE stated that safety-related SSCs associated with the electrical power systems are located in a mild environment (i.e., are not subject to harsh environmental conditions). SHINE stated that specific sections of the IEEE Standard 323-2003, "IEEE Standards for Qualifying Class 1E Equipment for Nuclear Power Generating Stations" in the design and qualification of safety-related electrical equipment will be used to meet Criterion 4.

The NRC staff issued RAI 8-4 (ML21011A241) to ensure that Criterion 4 is addressed in the FSAR. In response to RAI 8-4, SHINE confirmed that the electrical equipment is located in mild environments and applied the guidance in Sections 4.1, 5.1, 6.1, and 7 of the IEEE Standard 323-2003, "IEEE Standards for Qualifying Class 1E Equipment for Nuclear Power Generating Stations" to ensure electrical equipment conforms with Criterion 4.

Audit Topic 5

The NRC staff requested SHINE to provide additional information on how SHINE considered the impact of open phase conditions on the safe operation of its facility, including clarification as to whether the loss of phase protection relays are on the high side of the transformer and whether there is an alarm in the control room to indicate an open phase condition.

In response to the NRC staff's questions, SHINE stated that protection of phase reversal, sustained high and under voltage, and open phase would trigger an alarm in the control room. The NRC staff requested SHINE provide the information on the docket and issued RAI 8-5 (ML21011A241) to ensure Open Phase Condition is considered for the operation of the facility. In response to RAI 8-5 (ML21011A241), SHINE stated that they monitor for loss of phase, for all three phases, at the line side of the incoming breakers using a negative sequence relay.

c. Development of Requests for Additional Information

At the time of the audit was conducted, the design of the SHINE electrical systems was not complete. In order to complete the review of the application, the NRC staff issued RAIs to support the review of the SHINE application. SHINE completed addressing Audit topics 2-5 through responses to RAIs and later documented this information in SER input. For audit topic 1, SHINE will be completing the final design documents prior to the startup of the facility. The NRC staff will verify through inspection the final design calculations and studies to ensure the electrical design meets the regulatory basis.

3. Exit Briefing

An exit briefing was held on May 15, 2020. During this exit briefing, the audit team restated the purpose of the meeting, recapped the closure paths of the audit items, and highlighted areas where additional information may be warranted. It was noted that during the audit, SHINE had stated that it would provide supplemental information on the docket to address additional information needs identified by the NRC staff. Portions of the calculations and studies were provided on September 9, 2021, February 17, 2022, July 27, 2022, and August 6, 2022. These calculations are not anticipated to impact the FSAR or the NRC staff's SER and will be available for inspection prior to startup of the facility. No disagreements with this audit summary were noted by the licensee during the exit briefing.