

May 01, 2024

Docket No. 52-050

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information
No. 009 (RAI-10106) on the NuScale Standard Design Approval Application

REFERENCE: NRC letter to NuScale, "Request for Additional Information
No. 009 (RAI-10106-R1)," dated November 11, 2023

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) response to the referenced NRC Request for Additional Information (RAI).

The enclosure to this letter contains the NuScale responses to the following RAI questions from NRC RAI-10106:

- 9.5.3-1
- 9.5.3-2
- 9.5.3-3

This letter makes no regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions, please contact Jim Osborn at 541-360-0693 or at josborn@nuscalepower.com.

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 01, 2024.

Sincerely,



Mark W. Shaver
Director, Regulatory Affairs
NuScale Power, LLC

Distribution: Mahmoud Jardaneh, NRC
Getachew Tesfaye, NRC
Greg Cranston, NRC

Enclosure 1: NuScale Response to NRC Request for Additional Information RAI-10106, nonproprietary

Enclosure 1:

NuScale Response to NRC Request for Additional Information RAI-10106, nonproprietary

Response to Request for Additional Information Docket: 052000050

RAI No.: 10106

Date of RAI Issue: 11/11/2023

NRC Question No.: 9.5.3-1

REGULATORY BASIS

There are no general design criteria or other requirements that directly apply to the normal and emergency or supplementary plant lighting systems. However, 10 CFR 50.34(f)(2)(iii) states that an application shall provide a control room design that reflects state-of-the-art, human-factor principles before committing to the fabrication or revision of fabricated control room panels and layouts. A control room design includes lighting for operators to perform actions, and NUREG-0700 provides detailed acceptance criteria for human factors engineering design attributes, including lighting.

NUREG-0800, section 9.5.3, "Lighting Systems" recommends that the lighting systems have adequate illumination levels and conform to the illumination levels recommended in NUREG-0700, "Human System Interface Design Review Guidelines," Revision 3.

ISSUE

NuScale SDAA FSAR section 9.5.3.2.3, "Normal and Emergency Main Control Room Lighting," states:

The MCR lighting system provides artificial illumination under operating, maintenance, testing, and emergency conditions. Normal and emergency illumination levels are in accordance with the applicable lighting levels for a computer-based control room specified in NUREG-0700, Revision 3. Two divisions of the common augmented direct current power system, described in Section 8.3.2, "Direct Current Power Systems," provide power to the light fixtures in the MCR. In the event of a loss of normal AC power, the common augmented direct current power system batteries supply power to the MCR lights. The batteries are capable of maintaining the MCR emergency lighting at an average illumination level of 10 foot-candles at workstations in the main operating area for a minimum of 72 hours.

NUREG-0700, Revision 3, section 12.1.2.3-1, “General Illumination Levels,” recommends 1) an overall general illuminance levels on worksurfaces in the control room where paperwork is required should be in the range of 200–750 lux (18.6–69.7 foot-candles (fc)), and 2) if visual display devices are used at the workstation, as in computer-based control rooms, the maximum illuminance should be 500 lux (46.5 fc). In addition, NUREG-0700, Revision 3, Table 12.1, “Nominal Illumination Levels For Various Tasks And Work Areas,” provides illumination levels for tasks and work areas in the control room including an illuminance of 100 fc (1080 lux) for seated operator stations, handwritten reading, writing and data recording in the control room.

In NuScale SDAA FSAR section 9.5.3.2.3, it appears that NuScale does not discuss 1) the illuminance levels for the MCR normal lighting system under operating, maintenance, and testing conditions, and 2) if the batteries supply power to the MCR normal and emergency lighting systems under operating, maintenance, testing, and emergency conditions.

INFORMATION REQUESTED

a- Provide the illumination levels for the MCR normal lighting system for the tasks and work areas that are provided in NUREG-0700, Revision 3, section 12.1.2.3-1 and Table 12.1 under the operating, maintenance, and testing conditions. If the illumination levels for MCR normal lighting fixtures for the tasks and work areas in the MCR are not consistent with the illumination levels provided in NUREG-0700, Revision 3, section 12.1.2.3-1 and Table 12.1, explain how the MCR normal lighting system conforms to the applicable lighting levels for a computer-based control room specified in NUREG-0700, Revision 3, during normal operations.

b- Clarify if both the MCR normal and emergency lighting fixtures are powered by the two divisions of the common augmented direct current power system under operating, maintenance, testing, and emergency conditions.

NuScale Response:

To provide greater clarification of normal and emergency lighting in the main control room, Sections 9.5.3.2.2 and 9.5.3.2.4 are revised.

Impact on US460 SDA:

FSAR Section 9.5 has been revised as described in the response above and as shown in the markup provided in this response.

9.5.3 Lighting Systems

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2

The plant lighting system (PLS) provides artificial illumination for buildings, rooms, spaces, and outdoor areas of the plant. The PLS provides illumination under plant operating conditions, including normal (Sections 9.5.3.2.1 and 9.5.3.2.2), transient (Section 9.5.3.2.3), fire (Section 9.5.3.2.3), accident (Section 9.5.3.2.3), ~~transient, fire, accident, and station blackout~~. The PLS includes the following lighting functions:

- normal plant lighting
- ~~emergency plant lighting~~ normal main control room (MCR) lighting
- emergency plant lighting
- ~~normal and emergency main control room (MCR)~~ lighting
- security lighting

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Audit Question A-9.5.3-2
RAI 9.5.3-1

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Exterior plant lighting within the protected area is part of security lighting and receives power from the security power system. Section 13.6, Security, provides additional discussion on physical security.

9.5.3.1 Design Bases

Normal and emergency plant lighting are not required to function in response to a design-basis accident. The PLS is not essential for reactor shutdown, containment isolation, or containment and reactor heat removal. The PLS is not essential in preventing release of radioactive material to the environment. Failure of normal and emergency lighting does not compromise automatic actuation of nuclear safety-related systems, nor does it prevent safe shutdown of the reactor. Therefore, normal and emergency plant lighting are nonsafety-related, not risk-significant, and non-Class 1E. Table 9.5.3-1 identifies SSC classifications for PLS.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

The PLS includes lighting transformers which receive power from the 480V AC Electrical Low Voltage System (ELVS). The secondary side of the lighting transformer is the 120V AC that provides 120V AC to the lighting fixtures in the plant.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

The plant illumination levels provided by the PLS are in accordance with the applicable lighting levels specified in NUREG-0700, Revision 3, Section 12.1.2.4-4 and Table 12.8 in Section 12.2.2.3-1. The emergency lighting system conforms with applicable guidance of Regulatory Guide 1.189.

Lighting fixtures in the MCR and areas containing safety-related structures, systems, and components are mounted to meet Seismic Category II requirements.

9.5.3.2 System Description

9.5.3.2.1 Normal Plant Lighting

Normal plant lighting provides artificial illumination for outdoor areas outside the protected area and within the owner controlled area, and for plant buildings.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

The low voltage alternating current (AC) electrical distribution system, described in Section 8.3.1, Alternating Current Power Systems, provides power to the lighting panel boards that feed the plant's light fixtures, with the exception of ~~MCR and~~ security lighting. Normal plant lighting provides lighting for normal, operation, maintenance, and testing conditions.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

9.5.3.2.2 Normal MCR Lighting

The PLS cabinets provide 120V AC power to the normal lighting fixtures during normal, operating, maintenance, and testing conditions. The 120V AC power provides the normal lighting fixtures to the required illumination levels as stated in Revision 3 of NUREG-0700, Sections 12.1.2.3-1 through 12.1.2.3-4. In the event, that AC power is not available, the normal MCR lighting fixtures will no longer provide illumination.

9.5.3.2.3 Emergency Plant Lighting

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Emergency lighting fixtures, outside of the MCR, have self-contained batteries that are powered from the low voltage AC electrical distribution system. Upon a loss of AC power to the plant, the batteries provide power to their associated fixtures. The PLS provides ~~two types of~~ emergency lighting outside ~~of~~ the MCR. Emergency egress light fixtures have a 1.5-hour battery backup for exiting the area. The Post-fire Safe Shutdown Analysis concludes that no credit is taken for operator actions in the station blackout analysis and provides no post-fire safe shutdown activities (i.e. operator manual actions) that would require operation of safe-shutdown equipment. Therefore, the design does not require 8-hour battery pack lighting fixtures. Emergency lighting (both inside and outside the MCR) provides lighting for accident, fire and transient conditions. ~~Emergency operating light fixtures have an 8-hour battery backup to support fire suppression actions and safe shutdown operations during a station blackout, including access and egress pathways to safe shutdown areas during a fire event as required by Regulatory~~

~~Guide 1.189. Emergency lighting that provides illumination for post fire safe shutdown activities provides at least 1 foot candle of illumination in accordance with National Fire Protection Association 804 (Reference 9.5.3-1).~~

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

9.5.3.2.4

~~Normal and Emergency Main Control Room Lighting~~ Emergency MCR Lighting

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

~~The MCR lighting system provides artificial illumination under operating, maintenance, testing, and emergency conditions. Normal and e~~Emergency illumination levels are in accordance with the applicable lighting levels for a computer-based control room specified in Section 12.1.2.4-4 of NUREG-0700, Revision 3.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Two divisions of the common augmented direct current power system, described in Section 8.3.2, Direct Current Power Systems, provide power to the emergency lighting fixtures in the MCR. ~~In the event of a loss of normal AC power, the common augmented direct current power system batteries supply power to the MCR lights. The batteries are capable of maintaining the MCR emergency lighting at an average illumination level of 10 foot candles at work stations in the main operating area for a minimum of 72 hours. Power circuits to individual lighting fixtures are staggered to ensure that MCR lighting is maintained after the loss of one circuit.~~ Emergency lighting fixtures in the MCR are continuously on during normal, operation, maintenance, testing, transient, and emergency conditions. Upon loss of AC power, the MCR emergency lighting fixtures will continue to be supplied power (125V DC) via EDAS-C batteries. The EDAS-C batteries in either division can maintain the MCR emergency lighting at the required illumination of 10-foot candles as stated in NUREG-0700 Revision 3 for a minimum of 72 hours.

9.5.3.3

References

- 9.5.3-1 National Fire Protection Association, "Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants," National Fire Protection Association 804, 2020 Edition, Quincy, MA.

Response to Request for Additional Information Docket: 052000050

RAI No.: 10106

Date of RAI Issue: 11/11/2023

NRC Question No.: 9.5.3-2

REGULATORY BASIS

There are no general design criteria or other requirements that directly apply to the normal and emergency or supplementary plant lighting systems.

NUREG-0800, section 9.5.3, recommends that the lighting systems provide adequate emergency lighting in all areas, required for firefighting, control and maintenance of equipment used for implementing safe shutdown of the plant during all plant operating conditions, and the access routes to and from these areas.

ISSUE

NuScale SDAA FSAR section 9.5.3.2.2, "Emergency Lighting System," discusses the emergency lighting fixtures outside of the MCR that are provided for existing areas and for supporting fire suppression actions and safe shutdown operation during SBO events.

However, it appears that NuScale SDAA, section 9.5.3.2.2 does not discuss emergency operating light fixtures in areas needed for control and maintenance of safe shutdown equipment outside of the MCR during other conditions of the plant (e.g., accident conditions).

INFORMATION REQUESTED

Clarify if NuScale requires emergency light fixtures in areas needed for control and maintenance of safe shutdown equipment outside of the MCR during other plant operating conditions such as transients and accident conditions and provide the illumination levels for the emergency lighting in those areas. If not, please explain why not or provide justification for not needing emergency light fixtures in those areas.

NuScale Response:

Section 9.5.3.1 of the SDAA addresses the NRC's concerns about events other than post safe shut down.

The Post-fire Safe Shutdown Analysis also concludes that the NuScale design does not require operator manual actions for post-fire safe shutdown functions. There are no safe shutdown activities, or other required actions, outside of the MCR for the 72-hour station blackout duration, including the first 8 hours and the remaining 64 hours.

For egress, the emergency lighting conforms to NFPA 101. The availability of battery-powered portable hand lights will be completed with the issuance of the Fire Protection Program per Table 13.4-201.

Sections 9.5.3, 9.5.3.2.1, 9.5.3.2.2, and 9.5.3.2.3 provide additional clarification on plant lighting conditions such fire, transient, accident, and station blackout conditions.

Impact on US460 SDA:

FSAR Section 9.5 has been revised as described in the response above and as shown in the markup provided in this response.

9.5.3 Lighting Systems

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2

The plant lighting system (PLS) provides artificial illumination for buildings, rooms, spaces, and outdoor areas of the plant. The PLS provides illumination under plant operating conditions, including normal (Sections 9.5.3.2.1 and 9.5.3.2.2), transient (Section 9.5.3.2.3), fire (Section 9.5.3.2.3), accident (Section 9.5.3.2.3), ~~transient, fire, accident, and station blackout~~. The PLS includes the following lighting functions:

- normal plant lighting
- ~~emergency plant lighting~~ normal main control room (MCR) lighting
- emergency plant lighting
- ~~normal and emergency main control room (MCR)~~ lighting
- security lighting

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Audit Question A-9.5.3-2
RAI 9.5.3-1

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Exterior plant lighting within the protected area is part of security lighting and receives power from the security power system. Section 13.6, Security, provides additional discussion on physical security.

9.5.3.1 Design Bases

Normal and emergency plant lighting are not required to function in response to a design-basis accident. The PLS is not essential for reactor shutdown, containment isolation, or containment and reactor heat removal. The PLS is not essential in preventing release of radioactive material to the environment. Failure of normal and emergency lighting does not compromise automatic actuation of nuclear safety-related systems, nor does it prevent safe shutdown of the reactor. Therefore, normal and emergency plant lighting are nonsafety-related, not risk-significant, and non-Class 1E. Table 9.5.3-1 identifies SSC classifications for PLS.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

The PLS includes lighting transformers which receive power from the 480V AC Electrical Low Voltage System (ELVS). The secondary side of the lighting transformer is the 120V AC that provides 120V AC to the lighting fixtures in the plant.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

The plant illumination levels provided by the PLS are in accordance with the applicable lighting levels specified in NUREG-0700, Revision 3, Section 12.1.2.4-4 and Table 12.8 in Section 12.2.2.3-1. The emergency lighting system conforms with applicable guidance of Regulatory Guide 1.189.

Lighting fixtures in the MCR and areas containing safety-related structures, systems, and components are mounted to meet Seismic Category II requirements.

9.5.3.2 System Description

9.5.3.2.1 Normal Plant Lighting

Normal plant lighting provides artificial illumination for outdoor areas outside the protected area and within the owner controlled area, and for plant buildings.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

The low voltage alternating current (AC) electrical distribution system, described in Section 8.3.1, Alternating Current Power Systems, provides power to the lighting panel boards that feed the plant's light fixtures, with the exception of ~~MCR and~~ security lighting. Normal plant lighting provides lighting for normal, operation, maintenance, and testing conditions.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

9.5.3.2.2 Normal MCR Lighting

The PLS cabinets provide 120V AC power to the normal lighting fixtures during normal, operating, maintenance, and testing conditions. The 120V AC power provides the normal lighting fixtures to the required illumination levels as stated in Revision 3 of NUREG-0700, Sections 12.1.2.3-1 through 12.1.2.3-4. In the event, that AC power is not available, the normal MCR lighting fixtures will no longer provide illumination.

9.5.3.2.3 Emergency Plant Lighting

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Emergency lighting fixtures, outside of the MCR, have self-contained batteries that are powered from the low voltage AC electrical distribution system. Upon a loss of AC power to the plant, the batteries provide power to their associated fixtures. The PLS provides ~~two types of~~ emergency lighting outside ~~of~~ the MCR. Emergency egress light fixtures have a 1.5-hour battery backup for exiting the area. The Post-fire Safe Shutdown Analysis concludes that no credit is taken for operator actions in the station blackout analysis and provides no post-fire safe shutdown activities (i.e. operator manual actions) that would require operation of safe-shutdown equipment. Therefore, the design does not require 8-hour battery pack lighting fixtures. Emergency lighting (both inside and outside the MCR) provides lighting for accident, fire and transient conditions. ~~Emergency operating light fixtures have an 8-hour battery backup to support fire suppression actions and safe shutdown operations during a station blackout, including access and egress pathways to safe shutdown areas during a fire event as required by Regulatory~~

~~Guide 1.189. Emergency lighting that provides illumination for post fire safe shutdown activities provides at least 1 foot candle of illumination in accordance with National Fire Protection Association 804 (Reference 9.5.3-1).~~

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

9.5.3.2.4

~~Normal and Emergency Main Control Room Lighting~~ Emergency MCR Lighting

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

~~The MCR lighting system provides artificial illumination under operating, maintenance, testing, and emergency conditions. Normal and e~~Emergency illumination levels are in accordance with the applicable lighting levels for a computer-based control room specified in Section 12.1.2.4-4 of NUREG-0700, Revision 3.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Two divisions of the common augmented direct current power system, described in Section 8.3.2, Direct Current Power Systems, provide power to the emergency lighting fixtures in the MCR. ~~In the event of a loss of normal AC power, the common augmented direct current power system batteries supply power to the MCR lights. The batteries are capable of maintaining the MCR emergency lighting at an average illumination level of 10 foot candles at work stations in the main operating area for a minimum of 72 hours. Power circuits to individual lighting fixtures are staggered to ensure that MCR lighting is maintained after the loss of one circuit.~~ Emergency lighting fixtures in the MCR are continuously on during normal, operation, maintenance, testing, transient, and emergency conditions. Upon loss of AC power, the MCR emergency lighting fixtures will continue to be supplied power (125V DC) via EDAS-C batteries. The EDAS-C batteries in either division can maintain the MCR emergency lighting at the required illumination of 10-foot candles as stated in NUREG-0700 Revision 3 for a minimum of 72 hours.

9.5.3.3

References

- 9.5.3-1 National Fire Protection Association, "Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants," National Fire Protection Association 804, 2020 Edition, Quincy, MA.

Response to Request for Additional Information Docket: 052000050

RAI No.: 10106

Date of RAI Issue: 11/11/2023

NRC Question No.: 9.5.3-3

REGULATORY BASIS

There are no general design criteria or other requirements that directly apply to the normal and emergency or supplementary plant lighting systems.

NUREG-0800, section 9.5.3 recommends that the lighting systems have adequate illumination levels conform to the illumination levels recommended in NUREG-0700.

NUREG-0700, Revision 3, Table 12.8, "Range of Recommended Illuminances," provides illumination levels for the normal lighting in inspection/ assembly and in-plant areas.

ISSUE

In SDAA FSAR section 9.5.3, NuScale states that the plant illumination levels provided by the plant lighting systems are in accordance with the applicable lighting levels specified in NUREG-0700. NuScale states that the normal plant lighting provides artificial illumination for outdoor areas outside the protected area and within the owner-controlled area, and for plant buildings. However, NuScale did not provide illumination levels for the normal lighting system in any areas of the plant.

INFORMATION REQUESTED

Clarify if the normal plant lighting system outside of the MCR provides illumination levels that are consistent with the illumination levels in the inspection/assembly and in-plant areas identified in NUREG-0700, Revision 3, Table 12.8. If not, provide the illumination levels for the normal lighting in inspection/ assembly and in-plant areas listed in Table 12.8, and explain how NuScale meets NUREG-0700, Revision 3, with respect to illumination levels for the normal lighting in those areas.

NuScale Response:

Second Response:

The NuScale plant lighting system design provides illumination levels that are in accordance with the applicable lighting levels specified in NUREG-0700, Revision 3, Section 12.1.2.4-4 and Table 12.8 in Section 12.2.2.3-1.

First Response:

Section 9.5.3.1 states that the plant illumination levels are in accordance with the applicable lighting levels specified in NUREG-0700, Revision 3.

Impact on US460 SDA:

FSAR Section 9.5 has been revised as described in the response above and as shown in the markup provided in this response.

9.5.3 Lighting Systems

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2

The plant lighting system (PLS) provides artificial illumination for buildings, rooms, spaces, and outdoor areas of the plant. The PLS provides illumination under plant operating conditions, including normal (Sections 9.5.3.2.1 and 9.5.3.2.2), transient (Section 9.5.3.2.3), fire (Section 9.5.3.2.3), accident (Section 9.5.3.2.3), ~~transient, fire, accident, and station blackout~~. The PLS includes the following lighting functions:

- normal plant lighting
- ~~emergency plant lighting~~ normal main control room (MCR) lighting
- emergency plant lighting
- ~~normal and emergency main control room (MCR)~~ lighting
- security lighting

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Audit Question A-9.5.3-2
RAI 9.5.3-1

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Exterior plant lighting within the protected area is part of security lighting and receives power from the security power system. Section 13.6, Security, provides additional discussion on physical security.

9.5.3.1 Design Bases

Normal and emergency plant lighting are not required to function in response to a design-basis accident. The PLS is not essential for reactor shutdown, containment isolation, or containment and reactor heat removal. The PLS is not essential in preventing release of radioactive material to the environment. Failure of normal and emergency lighting does not compromise automatic actuation of nuclear safety-related systems, nor does it prevent safe shutdown of the reactor. Therefore, normal and emergency plant lighting are nonsafety-related, not risk-significant, and non-Class 1E. Table 9.5.3-1 identifies SSC classifications for PLS.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

The PLS includes lighting transformers which receive power from the 480V AC Electrical Low Voltage System (ELVS). The secondary side of the lighting transformer is the 120V AC that provides 120V AC to the lighting fixtures in the plant.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

The plant illumination levels provided by the PLS are in accordance with the applicable lighting levels specified in NUREG-0700, Revision 3, Section 12.1.2.4-4 and Table 12.8 in Section 12.2.2.3-1. The emergency lighting system conforms with applicable guidance of Regulatory Guide 1.189.

Lighting fixtures in the MCR and areas containing safety-related structures, systems, and components are mounted to meet Seismic Category II requirements.

9.5.3.2 System Description

9.5.3.2.1 Normal Plant Lighting

Normal plant lighting provides artificial illumination for outdoor areas outside the protected area and within the owner controlled area, and for plant buildings.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

The low voltage alternating current (AC) electrical distribution system, described in Section 8.3.1, Alternating Current Power Systems, provides power to the lighting panel boards that feed the plant's light fixtures, with the exception of ~~MCR and~~ security lighting. Normal plant lighting provides lighting for normal, operation, maintenance, and testing conditions.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

9.5.3.2.2 Normal MCR Lighting

The PLS cabinets provide 120V AC power to the normal lighting fixtures during normal, operating, maintenance, and testing conditions. The 120V AC power provides the normal lighting fixtures to the required illumination levels as stated in Revision 3 of NUREG-0700, Sections 12.1.2.3-1 through 12.1.2.3-4. In the event, that AC power is not available, the normal MCR lighting fixtures will no longer provide illumination.

9.5.3.2.3 Emergency Plant Lighting

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Emergency lighting fixtures, outside of the MCR, have self-contained batteries that are powered from the low voltage AC electrical distribution system. Upon a loss of AC power to the plant, the batteries provide power to their associated fixtures. The PLS provides ~~two types of~~ emergency lighting outside ~~of~~ the MCR. Emergency egress light fixtures have a 1.5-hour battery backup for exiting the area. The Post-fire Safe Shutdown Analysis concludes that no credit is taken for operator actions in the station blackout analysis and provides no post-fire safe shutdown activities (i.e. operator manual actions) that would require operation of safe-shutdown equipment. Therefore, the design does not require 8-hour battery pack lighting fixtures. Emergency lighting (both inside and outside the MCR) provides lighting for accident, fire and transient conditions. ~~Emergency operating light fixtures have an 8-hour battery backup to support fire suppression actions and safe shutdown operations during a station blackout, including access and egress pathways to safe shutdown areas during a fire event as required by Regulatory~~

~~Guide 1.189. Emergency lighting that provides illumination for post fire safe shutdown activities provides at least 1 foot candle of illumination in accordance with National Fire Protection Association 804 (Reference 9.5.3-1).~~

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

9.5.3.2.4

~~Normal and Emergency Main Control Room Lighting~~ Emergency MCR Lighting

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

~~The MCR lighting system provides artificial illumination under operating, maintenance, testing, and emergency conditions. Normal and e~~Emergency illumination levels are in accordance with the applicable lighting levels for a computer-based control room specified in Section 12.1.2.4-4 of NUREG-0700, Revision 3.

Audit Question A-9.5.3-2
RAI 9.5.3-1, RAI 9.5.3-2, RAI 9.5.3-3

Two divisions of the common augmented direct current power system, described in Section 8.3.2, Direct Current Power Systems, provide power to the emergency lighting fixtures in the MCR. ~~In the event of a loss of normal AC power, the common augmented direct current power system batteries supply power to the MCR lights. The batteries are capable of maintaining the MCR emergency lighting at an average illumination level of 10 foot candles at work stations in the main operating area for a minimum of 72 hours. Power circuits to individual lighting fixtures are staggered to ensure that MCR lighting is maintained after the loss of one circuit.~~ Emergency lighting fixtures in the MCR are continuously on during normal, operation, maintenance, testing, transient, and emergency conditions. Upon loss of AC power, the MCR emergency lighting fixtures will continue to be supplied power (125V DC) via EDAS-C batteries. The EDAS-C batteries in either division can maintain the MCR emergency lighting at the required illumination of 10-foot candles as stated in NUREG-0700 Revision 3 for a minimum of 72 hours.

9.5.3.3

References

- 9.5.3-1 National Fire Protection Association, "Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants," National Fire Protection Association 804, 2020 Edition, Quincy, MA.