
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 204-8237
SRP Section: 09.05.03 – Lighting Systems
Application Section:
Date of RAI Issue: 09/08/2015

Question No. 09.05.03-5

NUREG-0800, Section 9.5.3 states: “The emergency lighting system(s) is acceptable if the integrated design of the system(s) will 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.” In Section 9.5.3.2 of the DCD Tier 2, the applicant provided the following areas where the emergency AC [alternating current] lighting system is provided: the main control room, radwaste control room, emergency technical support center, operational support center, remote shutdown room, emergency diesel generator room, Class 1E battery room, Class-1E switchgear room, and their access aisles for the safety-related equipment. The staff determined that the applicant may not have identified all areas where the emergency lighting systems should be provided.

Please identify any other 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, where the emergency lighting system will be provided.

Response

In addition to the areas indicated in DCD Tier 2, Subsection 9.5.3.2, the emergency ac lighting system is provided in safety cooling equipment cubicles, fuel handling areas, reactor containment building, ESW intake structure and pump house, and other ESF equipment areas. The emergency dc lighting system is provided in all the areas where the emergency ac lighting system is provided, as stated in DCD Tier 2, Subsection 9.5.3.2.

DCD Tier 2, Subsection 9.5.3.2 will be revised to include the additional locations where emergency lighting will be used.

Impact on DCD

DCD Tier 2, Subsection 9.5.3.2 will be revised as shown in the Attachment.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

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The emergency lighting system is located in operating areas to perform emergency operations and provide safe personnel access and egress pathways when the normal lighting system is lost. The emergency lighting system is subdivided into 2 categories as follows.

1) Emergency ac lighting system

The emergency ac lighting system is always turned on and combines with the normal lighting to provide adequate illumination levels that support operation and maintenance activities during normal plant operation. The emergency ac lighting system is provided in the MCR, radwaste control room, emergency TSC, OSC, RSR, EDG room, Class 1E battery room, Class-1E SWGR room, and their access aisles for the safety-related equipment. Emergency ac lighting system is energized from Class 1E 480 Vac bus backed up by the Class 1E EDG and the non-Class 1E AAC source to provide reasonable assurance that the emergency lighting ac system is available during a LOOP. Emergency ac lighting provides more than 10 foot-candles of illumination at the above designated areas.

safety cooling equipment cubicles, fuel handling areas, reactor containment building, ESW intake structure and pump house, and other ESF equipment areas

2) Emergency dc lighting system

The emergency dc lighting consists of emergency dc lighting fixtures fed from 8 hour rated non-Class 1E 125 Vdc station batteries and self-contained battery pack lighting fixtures fed from receptacles for normal or emergency ac lighting.

The emergency dc lighting fixtures are powered by the non-Class 1E 125 Vdc station batteries upon loss of emergency ac lighting power and are provided to the areas where emergency ac lights are provided.

The emergency dc lighting powered from the station batteries provides more than 10 foot-candles of illumination.

The self-contained battery lighting fixtures are provided in areas needed for operation of safe-shutdown equipment and for access and egress route thereto.

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DCD Tier 2, Section 9.5.3.2 states: “The security lighting is powered from offsite and backed up by the AAC source upon loss of offsite power. The COL applicant is to provide offsite power for the security lighting system.” However, DCD Tier 2, Section 1.8.1, Table 1.8-2, COL 9.5(14) states: “The COL applicant is to provide electric power for the security lighting system.”

Please modify the statement “electric power” in Table 1.8-2 to indicate that the power source for the security lighting system is “offsite power,” as stated in section 9.5.3.2.

Response

The term “electric power” used in DCD Tier 2, Table 1.8-2 and Subsection 9.5.10 for COL 9.5(14) will be changed to “offsite power.”

Impact on DCD

DCD Tier 2, Table 1.8-2 and Subsection 9.5.10 will be revised as shown in the Attachment.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

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Table 1.8-2 (16 of 29)

Item No.	Description
COL 9.5(7)	The COL applicant is to provide the fire brigade radio systems.
COL 9.5(8)	The COL applicant is to provide the LAN and VPN system.
COL 9.5(9)	The COL applicant is to provide the emergency offsite communication system including dedication hotline, local law enforcement radio equipment, and wireless communication system.
COL 9.5(10)	The COL applicant is to specify that adequate and acceptable sources of fuel oil are available, including the means of transporting and recharging the fuel storage tank, following a design basis accident.
COL 9.5(11)	The COL applicant is to provide a description of the offsite communication system that interfaces with the onsite communication system, including type of connectivity, radio frequency, normal and backup power supplies, and plant security system interface.
COL 9.5(12)	The COL applicant is to provide the security radio system that consists of a base unit, mobile units, and portable units.
COL 9.5(13)	The COL applicant is to provide the local law enforcement communications including dedicated conventional telephone and radio-transmitted two-way communication system.
COL 9.5(14)	The COL applicant is to provide electric power for the security lighting system.
COL 9.5(15)	The COL applicant is to provide the system design information of AAC GTG building HVAC system including flow diagram, if offsite GTG building requires the HVAC system.
COL 10.2(1)	The COL applicant is to identify the turbine vendor and model.
COL 10.2(2)	The COL applicant is to identify how the functional requirements for the overspeed protection system are met and provide a schematic of the TGCS and protection systems from sensors through valve actuators.
COL 10.2(3)	The COL applicant is to provide a description of how the turbine missile probability analysis conforms with Subsection 10.2.3.6 to ensure that requirements for protection against turbine missiles (e.g., applicable material properties, method of calculating the fracture toughness properties per SRP Section 10.2.3 Acceptance Criteria, preservice inspections) will be met.
COL 10.3(1)	The COL applicant is to provide operating and maintenance procedures including adequate precautions to prevent water (steam) hammer and relief valve discharge loads and water entrainment effects in accordance with NUREG-0927 and a milestone schedule for implementation of the procedure.
COL 10.3(2)	The COL applicant is to establish operational procedures and maintenance programs as related to leak detection and contamination control.
COL 10.3(3)	The COL applicant is to provide a description of the FAC monitoring program for carbon steel portions of the steam and power conversion systems that contain water or wet steam and are susceptible to erosion-corrosion damage. The description is to address consistency with GL 89-08 and NSAC-202L-R3 and provide a milestone schedule for implementation of the program.

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- COL 9.5(10) The COL applicant is to specify that adequate and acceptable sources of fuel oil are available, including the means of transporting and recharging the fuel storage tank, following a design basis accident.
- COL 9.5(11) A COL applicant is to provide a description of the offsite communication system that interfaces with the onsite communication system, including type of connectivity, radio frequency, normal and backup power supplies, and plant security system interface.
- COL 9.5(12) The COL applicant is to provide the security radio system that consists of a base unit, mobile units, and portable units.
- COL 9.5(13) The COL applicant is to provide the local law enforcement communications including dedicated conventional telephone and radio transmitted two-way communication system.
- COL 9.5(14) The COL applicant is to provide ~~electric~~ power for the security lighting system.
- COL 9.5(15) The COL applicant is to provide the system design information of AAC GTG building HVAC system including flow diagram, if the AAC GTG building requires the HVAC system.



offsite

9.5.11 References

1. SECY-90-016, "Evolutionary Light Water Reactor (LWR) Certification Issues and Their Relationship to Current Regulatory Requirements," U.S. Nuclear Regulatory Commission, January 12, 1990.
2. SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs." U.S. Nuclear Regulatory Commission, April 2, 1993.
3. NUREG-0800, Standard Review Plan, Section 9.5.1.1, "Fire Protection Program," U.S. Nuclear Regulatory Commission, February 2009.

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Question No. 09.05.03-7

DCD Tier 2, Section 9.5.3.3 stated that the self-contained battery lighting located in Class 1E equipment areas meets seismic Category I requirements. The staff determined that other lighting fixtures located in the vicinity of safety-related equipment may not be supported so that the fixtures may adversely impact the safety-related equipment when subjected to seismic loading of a safe shutdown earthquake.

Please provide the seismic category classification for all other lighting fixtures (normal, emergency AC, and emergency direct current (DC) lighting systems) located in the vicinity of safety-related equipment.

Response

As shown in DCD Tier 2, Table 3.2-1 (39 of 86), the lighting system equipment, including normal, emergency ac, and emergency dc lighting fixtures located in safety-related areas, meets seismic Category II requirements not to impact safety-related equipment when subjected to seismic loading of a safe shutdown earthquake. Lighting system equipment in other areas is classified as seismic Category III.

DCD Tier 2, Subsection 9.5.3.3 will be revised to incorporate the correct information provided above.

Impact on DCD

DCD Tier 2, Subsection 9.5.3.3 will be revised as shown in the Attachment.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

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- d. For firefighting, the self-contained battery lightings provide emergency lighting for safe movement of the personnel to the access and egress routes.
- e. ~~The self-contained battery lightings located in Class 1E equipment areas meet seismic Category I requirements. The self-contained battery lightings located in all other areas meet seismic Category II requirements.~~
- f. The emergency ac lighting powered from the Class 1E sources is classified as non-Class 1E circuits. Lighting circuits are electrically isolated from Class 1E circuits by the use of isolation devices and separation distance as indicated in IEEE Std. 384-1992.
- g. Lamps with mercury content are not to be installed in the fuel handling areas and inside the containment.

The lighting system equipment located in safety-related areas meets seismic Category II requirements not to impact safety-related equipment when subjected to seismic loading of a safe shutdown earthquake. Lighting system equipment in other areas is classified as seismic Category III.

9.5.3.4 Inspection and Testing Requirements

The lighting system is inspected and tested prior to plant operation. Preoperational testing on the lighting systems is performed during initial startup as described in Subsections 14.2.12.1.80 and 14.2.12.1.81.

The normal lighting circuits are normally energized and require no periodic testing. The emergency lighting is inspected and tested periodically.

9.5.3.5 Instrumentation Requirements

There is no specific instrumentation associated with the lighting systems.

9.5.4 Emergency Diesel Engine Fuel Oil System

The emergency diesel engine fuel oil system (EDEFOS) provides for the required storage capacity and continuous supply of fuel oil to each of the four Class 1E emergency diesel generators (EDGs) to safely shut down the plant and maintain a safe shutdown condition following a design basis accident (DBA) concurrent with a loss of offsite power (LOOP) by supplying power to essential loads. Diesel fuel for each emergency diesel generator is supplied by fuel oil transfer pumps from a fuel oil storage tank to a fuel day tank.