
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.: 245-8292
SRP Section: 09.05.02 – Communication Systems
Application Section: 9.5.2
Date of RAI Issue: 10/14/2015

Question No. 09.05.02-1

Clarify whether COL information items referenced in the APR 1400 FSAR Tier 2, Section 9.5.2, are correctly identified.

10 CFR 50, Appendix E, “Emergency Planning and Preparedness for Production and Utilization,” Part IV, E(9) states, in part, “At least one onsite and one offsite communications system; each system shall have a backup power source. All communication plans shall have arrangements for emergencies, including titles and alternates for those in charge at both ends of the communication links and the primary and backup means of communication.” APR 1400 FSAR, Tier 2, Section 9.5.2.1, “Design Bases,” states in part, “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 13.3(1)).” However, in Table 1.8-2, “Combined License Information Items,” the description provided in Section 9.5.2.1 falls under COL 9.5(11). Similarly, APR 1400 FSAR, Tier 2, Section 9.5.2.1.b., “10 CFR 50.34 (f)(2)(xxv), Emergency response facilities,” states, “The COL applicant is to address the emergency response facilities (COL 13.1(1)).” However, in Table 1.8-2, the description provided in Section 9.5.2.1.b. falls under COL 9.5(6).

Clarify whether COL Item 13.1(1) referenced in the APR 1400 FSAR Tier 2, Section 9.5.2, is the correct identifier.

Response

The current COL Item number 13.3(1) referenced in DCD Tier 2, Subsection 9.5.2.1 will be corrected to 9.5(11).

In addition, COL Item COL 13.1(1), stated in Subsection 9.5.2.1.b will be removed and the following sentence will be added in lieu of the removed COL Item: “Details for the features that

are related to the design of emergency response facilities are described in Section 13.3.”

Impact on DCD

DCD Tier 2, Subsection 9.5.2.1 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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Respiratory protection devices may be required in fire and radiological events. Communication equipment used in conjunction with respiratory equipment is designed and selected consistent with the guidelines provided in Electric Power Research Institute (EPRI) NP-6559 (Reference 61).

The communication systems are normally powered from a permanent non-safety (PNS) bus backed up by the AAC source during a LOOP, and from one of the two dedicated 16 hour rated non-safety-related batteries (normal and standby) in case of either AAC GTG failure during a LOOP or SBO condition.

Communication systems are based on meeting the relevant requirements of the following regulations:

- a. Appendix E to 10 Part 50, Emergency Planning and Preparedness for Production and Utilization Facilities

Emergency facilities and equipment include at least one onsite and one offsite communications system with each system having a backup power source in accordance with 10 CFR Part 50, Appendix E, Part IV, E(9) (Reference 56).

The wireless communication system, paging phone system, alarm address system, telephone system, and sound powered telephone system provide onsite communications. The onsite communications systems have a backup power source.

Offsite communication consists of communication subsystems to provide emergency communication links from the emergency operation facility (EOF) to the onsite MCR and technical support center (TSC) as well as to the NRC, offsite local law enforcement or military agencies and other federal, state, and local government agencies. A backup power source is provided for the offsite communication systems. 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 ~~13.3(1)~~).

↖ 9.5(11)

- b. 10 CFR 50.34(f)(2)(xxv), Emergency Response Facilities

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The emergency response facilities include the technical support center (TSC), the operational support center (OSC), and the emergency operations facility (EOF) in accordance with 10 CFR 50.34(f)(2)(xxv) (Reference 57). ~~The COL applicant is to address the emergency response facilities (COL 13.1(1)).~~

- c. 10 CFR 50.47(a)(8), Equipment and Facilities to Support Emergency Response

Adequate emergency facilities and equipment to support the response are provided and maintained in accordance with 10 CFR 50.47(b)(8) (Reference 58). The COL applicant is to provide details of emergency response facilities and associated communication capabilities (COL 9.5(6)).

Details for the features that are related to the design of emergency response facilities are described in Section 13.3.

- d. 10 CFR Part 50 Appendix A – General Design Criteria

GDC 1, 2, 3, and 4 apply to structures, systems, and components important to safety. The communication systems are classified as non-Class 1E systems, and therefore serve no safety-related functions. GDC 19 requires equipment at appropriate locations outside the MCR to be provided for prompt hot shutdown of the reactor with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures. While there is communication equipment located in the remote shutdown room, the communication equipment is not required to function for hot or cold shutdown of the reactor.

However, communication systems are selected and designed in accordance with the guidance provided in 10 CFR Part 50 Appendix A, GDC 1, GDC 2, GDC 3, GDC 4, and GDC 19 (Reference 38) to provide reasonable assurance that the facility can operate without undue risk to the health and safety of the public.

- e. 10 CFR 73.55(j), Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Radiological Sabotage – Communications Requirements.

Security communication measures are included as part of the site's communication systems as required by 10 CFR 73.55(j) to support the following functions:

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Application Section: 9.5.2
Date of RAI Issue: 10/14/2015

Question No. 09.05.02-2

Clarify how the communication system complies with the requirements of 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 2, GDC 3, and GDC 4.

10 CFR Part 50, Appendix A, GDC 2, states, in part, "Structures, systems and components important to safety are designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions." GDC 3, states, "Structures, systems and components important to safety to be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room." GDC 4, states, "Structures, systems and components important to safety to accommodate the effects of and to be compatible with the environmental conditions associate with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant-accidents."

APR 1400 FSAR, Tier 2, Section 9.5.2.1, "Design Bases," states, in part, "However, communication systems are selected and designed in accordance with the guidance provided in 10CFR Part 50 Appendix A, GDC 1, GDC 2, GDC3, GDC 4, and GDC 19 (Reference 38) to provide reasonable assurance that the facility can operate without undue risk to the health and safety of the public." The staff was notable to locate information that discusses how the GDC's would be met. Describe how the communication systems comply with the requirements of 10 CFR Part 50, Appendix A, GDC 2, GDC 3, and GDC 4. Update the FSAR documents accordingly.

Response

The APR1400 communication systems do not perform safety function(s), so they are classified as non-Class 1E and non-safety related (NSR).

As described in DCD Tier 2, Sections 3.2 and 17.4, the APR1400 includes risk-significant SSCs, that are “NSR but important to safety (ITS)”; however, none of the communication system SSCs are classified as a risk-significant SSC.

Therefore, the communication systems are not necessarily required to comply with 10 CFR Part 50, Appendix A, GDC1, GDC 2, GDC 3, GDC 4, and GDC 19. The conformance description related to the application of 10 CFR Part 50, Appendix A, GDC 1, GDC 2, GDC 3, GDC 4 and GDC 19 to the communication systems will be deleted from DCD Tier 2, Subsection 9.5.2.1.

However, the main equipment of the communication system is located at 12.75 meters (41.83 feet) above ground level so that it provides a means of communication between operators during accidents such as a flood or tsunami to aid in the mitigation of the accidents. This design feature of the communication systems will be added in DCD Tier 2, Subsection 9.5.2.1.

Impact on DCD

DCD Tier 2, Subsection 9.5.2.1 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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Data communications are addressed in Section 7.9.

9.5.2.1 Design Bases

The communication systems and components are selected and designed to operate within the following environments, as applicable:

- a. Extremely noisy locations, up to 115 dB sound pressure level
- b. Ambient temperatures ranging from -30 °C to + 70 °C (-22 °F to + 158 °F)
- c. Humid and oily locations
- d. Hazardous areas ~~(10 CFR Part 50, Appendix A, GDC 4)~~
- e. Outdoors (where indicated)
- f. Indoor areas with thick concrete walls or other obstructions Add
- g. With personal wearing protective equipment
- h. Areas having constant vibration

Main equipment of the communication system is located at 12.75 meters (41.83 feet) above ground level so that it provides a means of communication between operators during accidents such as a flood or tsunami to aid in the mitigation of the accidents.

The communication systems are classified as non-safety-related. Each communication system provides an independent mode of communication. These various communication systems are independent of each other to provide effective communications. A failure of one system does not affect the other systems.

Each communication system is designed in accordance with applicable codes and standards regarding environmental conditions, such as weather, moisture, noise level, electromagnetic interference (EMI), and radio frequency interference (RFI). In areas of high noise levels, acoustic booths and visual alerting are used. The communication systems equipment are qualified for their application using the guideline of EPRI NP-5652 (Reference 63), “Guideline for the Utilization of Commercial-Grade Items in Nuclear Safety-Related Applications” and EPRI TR-106439 (Reference 64), “Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications.”

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The emergency response facilities include the technical support center (TSC), the operational support center (OSC), and the emergency operations facility (EOF) in accordance with 10 CFR 50.34(f)(2)(xxv) (Reference 57). The COL applicant is to address the emergency response facilities (COL 13.1(1)).

c. 10 CFR 50.47(a)(8), Equipment and Facilities to Support Emergency Response

Adequate emergency facilities and equipment to support the response are provided and maintained in accordance with 10 CFR 50.47(b)(8) (Reference 58). The COL applicant is to provide details of emergency response facilities and associated communication capabilities (COL 9.5(6)).

d. 10 CFR Part 50 Appendix A – General Design Criteria

GDC 1, 2, 3, and 4 apply to structures, systems, and components important to safety. The communication systems are classified as non-Class 1E systems, and therefore serve no safety-related functions. GDC 19 requires equipment at appropriate locations outside the MCR to be provided for prompt hot shutdown of the reactor with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures. While there is communication equipment located in the remote shutdown room, the communication equipment is not required to function for hot or cold shutdown of the reactor.

~~However, communication systems are selected and designed in accordance with the guidance provided in 10 CFR Part 50 Appendix A, GDC 1, GDC 2, GDC 3, GDC 4, and GDC 19 (Reference 38) to provide reasonable assurance that the facility can operate without undue risk to the health and safety of the public.~~

e. 10 CFR 73.55(j), Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Radiological Sabotage – Communications Requirements.

Security communication measures are included as part of the site's communication systems as required by 10 CFR 73.55(j) to support the following functions:

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Question No. 09.05.02-3

Verify that communication systems will be compatible with the electromagnetic interference (EMI) and radio-frequency interference (RFI) environment of the plant and that design measures have been taken such that there will be no interference between wireless communications systems and other plant equipment.

10 CFR Part 50, Appendix A, GDC 4, states, “Structures, systems and components important to safety to accommodate the effects of and to be compatible with the environmental conditions associate with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant-accidents.” Regulatory Guide 1.180, “Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems,” identifies electromagnetic environment operating envelopes, design, installation, and test practices acceptable to the staff for addressing the effects of EMI, RFI, and power surges on I&C systems and components important to safety. NUREG-0800, Section 9.5.2, states in part that while non-safety systems are not part of Regulatory Guide 1.180, control of EMI/RFI from these systems is necessary to ensure that safety-related I&C systems can continue to perform properly in the nuclear power plant environment. When feasible, the emissions from non-safety-related systems should be held to the same levels as those from safety related systems. Describe how the communication systems will be compatible with the EMI and RFI environment of the plant and that design measures have been taken such that there will be no interference between wireless communications systems and other plant equipment. How will the applicant ensure that the communication equipment will perform its intended functions in an EMI/RFI environment? Also, verify which applicable codes and standards would be adhered to, in the design of the communication systems.

Response

As stated in the response to Question 09.05.02-2 of this RAI, since the communication systems are not classified as important to safety, they are not necessarily required to comply with 10 CFR Part 50, Appendix A, GDC 4.

However, the wireless communication system is designed and tested to ensure that safety-related I&C systems are not negatively affected by EMI/RFI from the wireless communication system. EMI/RFI emissions of the wireless communication system are tested in accordance with NRC RG 1.180.

DCD Tier 2, Subsection 9.5.2.2.1.8 will be revised to incorporate the design requirements of RG 1.180 for the wireless communication system.

Impact on DCD

DCD Tier 2, Subsection 9.5.2.2.1.8 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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equipment. Antennas and amplifiers are distributed throughout the plant to enable seamless radio coverage. Repeaters are used to allow seamless radio coverage throughout the plant. Antennas and cables interconnecting the repeaters to the base station equipment are located in a manner to facilitate improved radio signal penetration into areas that are not properly served by the primary antenna. Radio coverage is provided throughout the plant, although radio usage in certain instrumentation and control (I&C) areas is restricted due to potential EMI and RFI considerations. These areas have posted warning signs. The wireless communication system is designed, installed, and tested so that I&C system circuits are not adversely impacted by EMI and RFI from transmitting sources.

The transmitters, receivers, antennas, amplifiers, and radio base station equipment are robust, highly reliable, and capable of withstanding the harsh environment of the facility. Physical separation of the cabinets increases protection against a single accident or fire from affecting multiple modes of communication throughout the plant.

Add

Communication equipment used for fire protection activities are protected from exposure to fire damage in accordance with NRC RG 1.189 (Reference 20). The fire brigade radio communication system is in accordance with NRC RG 1.189 (Reference 20). The fire brigade radio system consists of a base unit, mobile units, and portable units in the site specific. The COL applicant is to provide the fire brigade radio system (COL 9.5(7)). The security radio system consists of a base unit, mobile units, and portable units. The COL applicant is to provide the security radio system which consists of a base unit, mobile units, and portable units (COL 9.5(12)).

Wireless communications equipment used with respiratory protective equipment conforms with the requirements in NRC RG 8.15 (Reference 62) and the guidance provided in EPRI NP-6559 (Reference 61).

9.5.2.2.2 Offsite Communication System

EMI and RFI emissions of the wireless communication system are tested in accordance with NRC RG 1.180 (Reference 40).

9.5.2.2.2.1 Commercial Telephone

Plant-to-offsite communication during normal operation is through a commercial telephone system, with extensions installed at a limited number of locations throughout the plant. The system provides direct dialing to locations outside the plant and also between extensions within the plant.