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## 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.:** 548-8822  
**SRP Section:** 09.05.02 – Communication Systems  
**Application Section:**  
**Date of RAI Issue:** 05/22/2017

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### **Question No. 09.05.02-7**

10 CFR 52.47, requires that information submitted for a design certification must include performance requirements and design information sufficiently detailed to permit the reparation of acceptance and inspection requirements by the NRC, and procurement specifications and construction and installation specifications by an applicant. 10 CFR 52.47(b)(1) requires that the application must contain proposed inspections, tests, analyses, and acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations.

10 CFR 52.47(b)(1) compels an applicant to identify applicable COL items and articulate why those items are sufficient to meet the requirements. No applicable COL items were identified by the applicant. More detail is required within the communication systems ITAAC and acceptance criteria descriptions in Table 2.6.9-1 for the staff to ensure compliance. In RAI 491-8613, Question 09.05.02-05, the staff informed the applicant that the procedures to ensure that each communication subsystem is capable of performing its intended function must be supplemented to address this concern. The applicant's response (ML16211A158) stated that the COL item for the initial test program of the plant and offsite communication system is addressed in DCD Tier 2, Subsection 14.2.13 as COL 14.2(11). The test procedures for security communication are provided in DCD Tier 2, Subsection 14.2.12.1.146 per the response of RAI 197-8176 Question No. 14.03.12-7 (MKD/NW-15-0252L). COL 14.2(11) will be revised that "The COL applicant is to prepare the site specific preoperational and startup test specification and test procedure and/or guideline for plant and offsite communication system."

The applicant's proposed revision would defer the preoperational and initial startup tests and Communication Systems ITAAC that are described in Tier 1, Section 2.6.9, ITAAC Table 2.6.9.1 to the COL applicant. The communication systems included in the APR1400 standard design DC is not site-specific. In order for the staff to make a regulatory finding for the reasonable assurance that the communication systems are available as needed must therefore be based

on sufficient information provided on docket of the APR-1400 and cannot be based on information that will be provided in the future or be based on a COL information item which defers information to a COL applicant. RAI 491-8613, Question 09.05.02-05, has been closed as unresolved.

Staff requests the applicant to:

- (1) Provide a detailed description of the applicant's Initial Test Program (ITP) in either Section 14.2 or 14.3 for all the communication subsystems and not just the ones needed for security communications. This should include individual pre-operational tests and initial startup test specifications for all communication subsystems which are described in Tier 1, Section 2.6.9 and Communication System ITAAC identified in Table 2.6.9.1.
- (2) Explain the backup/secondary power system for powering both onsite and offsite communication systems and also explain the tests conducted to ensure that the communication systems are able to perform their intended functions once normal power to the systems is lost and they are powered by the backup or secondary power system. This cannot be deferred to the COL applicant as stated by COL item 9.5(11). The applicant also needs to describe how EMI/RFI from the wireless communication system or any other communication system does not negatively impact safety-related I&C systems are not negatively affected in their preoperational testing procedure.
- (3) Provide more detailed ITAAC items addressing all of the communication subsystems to ensure that the subsystems are capable of performing their functions when called upon to do so. Provide detail of individual inspection, tests and analyses for each communication subsystem for the 3 Communication Systems ITAAC identified in Tier 1, Table 2.6.9.1. Provide acceptance criteria for each communication subsystem.
- (4) There is inconsistency regarding COL Item 14.2(11) in the response provided by the applicant in RAI 491-8613, Question 09.05.02-05 versus the response for RAI 197-8176, Question No. 14.03.12-7. One response states that the COL Item will be deleted while the other response states that the COL Item will be revised. Resolve this inconsistency.
- (5) The applicant's response to RAI 491-8613, Question 09.05.02-05, stated that the "communication system configuration" is described in subsection 2.6.9.1 of DCD Tier1. Subsection 2.6.9.1 only discusses what communication subsystems there are and the overall locations of communications systems. Define the phrase "communication system configuration" or remove it from subsection 2.6.9.1 and Table 2.6.9-1. Update all FSAR documents accordingly.

## **Response**

The following provides a response to each item of the staff's request above.

- (1) The descriptions of preoperational tests for all the communication subsystems which are described in Tier 1, Subsection 2.6.9 are shown in attachment. DCD Tier 2, Subsection 14.2.12.1, Table 14.2-1, and 14.2-7 will be revised to add the attachment.

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- (2) The normal power supply for all communication subsystems has access to a non-Class 1E onsite standby from AAC source in the event of LOOP, with independent UPS for the communication power systems with 1 hour capacity in normal operation. Particularly, PABX for telephone system has independent battery chargers and 16-hour batteries for each PABX node. Wireless communication system is supplied from the dedicated emergency UPS with 16-hour capacity during BDEEE.
  - (3) As described in the response to RAI 245-8292, Question 09.05.02-3 and DCD Rev.1 Tier 2, Subsection 9.5.2, 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. Also I&C systems are designed, tested, qualified, and installed to conform with the requirements and guidance specified in NRC RG 1.180, as described in DCD Tier 2, Subsections 7.1.2.5.3, 7.2.2.8, 7.3.2.8, and 7.9.2.11.
  - (3) To describe more detailed ITAAC addressing all of the communication subsystems, DCD Tier 1, Subsection 2.6.9 and Table 2.6.9-1 will be revised as the attachment.
  - (4) As described in the response to RAI 197-8176, Question 14.03.12-7, COL 14.2(17) was deleted. In response to RAI 491-8613, Question 09.05.02-5, COL 14.2(17) was created. In response to RAI 548-8822, Question 09.05.02-7, COL 14.2(17) has been revised as shown in the attachment. DCD Tier 2, Subsection 14.2.13 and Tables 1.8-2 and 14.2-7 will be revised to incorporate the attachment.
  - (5) For clarification, all the statements regarding the phrase 'functional arrangement' will be deleted and the more detailed description of APR1400 communication systems will be added DCD Tier 1, Subsection 2.6.9.1. DCD Tier 1, Subsection 2.6.9 and Table 2.6.9-1 will be revised to incorporate these as shown the attachment.
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### **Impact on DCD**

DCD Tier 1, Subsection 2.6.9, Table 2.6.9-1, Tier 2 Subsections 14.2.12.1, 14.2.13, Tables 1.8-2, 14.2-1, and 14.2-7 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 on impact on any Technical, Topical, or Environmental Report.

**APR1400 DCD TIER 1**

- e. Telephone system
- f. Plant time synchronizing system
- g. LAN and VPN system
- h. Wireless communication system

The various subsystems of the plant communication system are as stated in Subsection 2.6.9.

- ~~1 The communication system configuration is as described in the Design Description of Subsection 2.6.9.1.~~
- ~~2 Communication systems provide communication facilities between plant buildings and offsite areas, including the load dispatching center and emergency facilities, during both normal and emergency operations.~~
- ~~3 Communication systems are provided to ensure a means of intra plant communication.~~

#### 2.6.9.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.6.9-1 describes the inspections, tests, analyses, and associated acceptance criteria for the communication systems.

1. Paging phone system provides page and party communications between MCR, RSR, and other areas.
2. Sound powered telephone system provides communications between MCR, TSC, refueling areas, turbine-generator operating deck, RSR, electrical and I&C equipment areas, and other high maintenance active areas.
- 3.a Evacuation alarm address system provides alarm for radiation and fire accidents throughout the plant.
- 3.b Public address system provides broadcasting throughout the plant.
- 3.c Telephone system provides communication throughout the plant.
- 3.d Plant time synchronizing system provides standard time information throughout the plant.
- 3.e LAN and VPN systems provide network throughout the plant.
- 3.f Wireless communication system provides a stand-alone method of plant-wide communication throughout the plant.

**APR1400 DCD TIER 1**

Table 2.6.9-1

Communication Systems ITAAC

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The communication system configuration is as described in the Design Description of Subsection 2.6.9.1.	1. Inspection of the as-built communication systems will be performed.	1. The as-built communication systems conform with the functional arrangement as described in the Design Description of Subsection 2.6.9.1.
2. Communication systems provide communication facilities between plant buildings and offsite areas, including the load dispatching center and emergency facilities, during both normal and emergency operations.	2. Test of the as-built communication systems between plant buildings and offsite areas will be performed.	2. The as-built communication systems between plant buildings and offsite areas have been established.
3. Communication systems are provided to ensure a means of intra-plant communication.	3. Test of the as-built communication systems between plant buildings (intra-plant communications) will be performed.	3. The as-built communication systems between plant buildings (intra-plant communications) have been established.

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1. Paging phone system provides page and party communications between MCR, RSR, and other areas.	1. Test of the as-built paging phone system between MCR, RSR, and other areas will be performed.	1. The as-built paging phone system provides page and party communications between MCR, RSR, and other areas.
2. Sound powered telephone system provides communications between MCR, TSC, refueling areas, turbine-generator operating deck, RSR, electrical and I&C equipment areas, and other high maintenance active areas.	2. Test of the as-built sound powered telephone system between MCR, TSC, refueling areas, turbine-generator operating deck, RSR, electrical and I&C equipment areas, and other high maintenance active areas will be performed.	2. The as-built sound powered telephone system provides communications between MCR, TSC, refueling areas, turbine-generator operating deck, RSR, electrical and I&C equipment areas, and other high maintenance active areas.
3.a Evacuation alarm address system provides alarm for radiation and fire accidents throughout the plant.	3.a Tests of the as-built evacuation alarm address system throughout the plant will be performed.	3.a The as-built evacuation alarm address system provides alarm for radiation and fire accidents throughout the plant.
3.b Public address system provides broadcasting throughout the plant.	3.b Tests of the as-built public address system throughout the plant will be performed.	3.b The as-built public address system provides broadcasting throughout the plant.
3.c Telephone system provides communication throughout the plant.	3.c Tests of the as-built telephone system throughout the plant will be performed.	3.c The as-built telephone system provides communication throughout the plant.
3.d Plant time synchronizing system provides standard time information throughout the plant.	3.d Tests of the as-built plant time synchronizing system throughout the plant will be performed.	3.d The as-built plant time synchronizing system provides standard time information throughout the plant.
3.e LAN and VPN systems provide network throughout the plant.	3.e Tests of the as-built LAN and VPN systems throughout the plant will be performed.	3.e The as-built LAN and VPN systems provide network throughout the plant.
3.f Wireless communication system provides a stand-alone method of plant-wide communication throughout the plant.	3.f Tests of the as-built wireless communication system throughout the plant will be performed.	3.f The as-built wireless communication system provides a stand-alone method of plant-wide communication throughout the plant.

## APR1400 DCD TIER 2

Table 1.8-2 (32 of 38)

Item No.	Description
COL 14.2(11)	The COL applicant is to provide a schedule for the development of plant procedures, as well as a description of how, and to what extent, the plant operating, emergency, and surveillance procedures are use-tested during the initial test program.
COL 14.2(12)	The COL applicant that references the APR1400 design certification is to identify the specific operator training to be conducted as part of the low-power testing program related to the resolution of TMI Action Plan Item I.G.1, as described in (1) NUREG-0660 – NRC Action Plans Developed as a Result of the TMI-2 Accident, Revision 1, August 1980 and (2) NUREG-0737 – Clarification of TMI Action Plan Requirements.
COL 14.2(13)	The COL applicant is to develop a sequence and schedule for the development of the plant operating and emergency procedures should allow sufficient time for trial use of these procedures during the Initial Test Program. The sequence and schedule for plant startup is to be developed by the COL applicant to allow sufficient time to systematically perform the required testing in each phase.
COL 14.2(14)	The COL applicant is to perform the appropriate interface testing of the gaseous PERMSS monitors with ERDS.
COL 14.2(15)	The COL applicant is to prepare the preoperational test of cooling tower and associated auxiliaries, and raw water and service water cooling systems.
COL 14.2(16)	The COL applicant is to develop the test program of personnel monitors, radiation survey instruments, and laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations.
COL 14.2(17)	The COL applicant is to prepare the site-specific preoperational and startup test specification and test procedure and/or guideline for <del>plant and</del> offsite communication system.
COL 14.2(18)	The COL applicant is to prepare the pre-operational test of ultimate heat sink pump house.
COL 14.2(19)	The COL applicant is to prepare the testing and verification of ultimate heat sink cooling chains.
COL 14.3(1)	The COL applicant is to provide the ITAAC for the site-specific portion of the plant systems specified in Subsection 14.3.3.
COL 14.3(2)	The COL applicant is to provide a design ITAAC closure schedule for implementing the V&V design ITAAC as addressed in Subsection 14.3.2.9.
COL 14.3(3)	The COL applicant is to provide the proposed ITAAC for the facility's emergency planning not addressed in the DCD in accordance with RG 1.206.
COL 14.3(4)	The COL applicant is to provide the proposed ITAAC for the site specific facility's physical security hardware not addressed in the DCD in accordance with RG 1.206.
COL 15.0(1)	The COL applicant is to perform the radiological consequence analysis using site-specific $\chi/Q$ values, unless the $\chi/Q$ values used in the DCD envelop the site-specific short-term or long-term $\chi/Q$ values of the DCD, and to show that the resultant doses are within the guideline values of 10 CFR 50.34 for EAB and LPZ and that of 10 CFR Part 50, Appendix A, GDC 19 for the MCR and TSC.
COL 16.1(1)	The choice of units is a COL information to be resolved by COL applicant

**APR1400 DCD TIER 2**

1.2 Verify that the alarm annunciation at the CAS and SAS indicates the type of alarm.

**2.0 PREREQUISITES**

2.1 Construction activities on the intrusion alarms system and CAS and SAS are completed..

2.2 Security intrusion alarm system has been checked for function and is operational.

**3.0 TEST METHOD**

3.1 Initiate several different types of alarms in the intrusion detection system to observe the displayed information within the CAS and SAS.

3.2 Initiate a tamper alarm and an interruption of a transmission line alarm to observe if the system displays the alarm and distinguishes the type of alarm.

**4.0 DATA REQUIRED**

4.1 Drawings showing intrusion detection alarm devices, tamper devices, and transmission line supervision devices.

**5.0 ACCEPTANCE CRITERIA**

5.1 The initiated alarm is displayed in both the CAS and SAS.

5.2 The alarm information displayed indicates the type of alarm being generated.

**6.0 SPECIAL PRECAUTIONS**

6.1 The drawings will be SRI or SGI depending on the level of detail contained on the drawing so they will need to be protected in accordance with appropriate requirements.

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## B

14.2.12.1.154 Plant Communication Systems

## 1.0 OBJECTIVES

- 1.1 To verify the communication systems provide reliable and effective interplant communications and plant-to-offsite communications.

## 2.0 PREREQUISITES

- 2.1 Construction activities on paging phone system, evacuation alarm address system, public address system, sound powered telephone system, telephone system, plant time synchronizing system, LAN and VPN systems, and wireless communication system have been completed.
- 2.2 Communication system equipment is operational.

## 3.0 TEST METHOD

- 3.1 Verify the proper operation of the paging phone system.
- 3.2 Verify the proper operation of the evacuation alarm address system.
- 3.3 Verify the proper operation of the public address system.
- 3.4 Verify the proper operation of the sound powered telephone system.
- 3.5 Verify the proper operation of the telephone system.
- 3.6 Verify the proper operation of the plant time synchronizing system.
- 3.7 Verify the proper operation of the LAN and VPN systems.
- 3.8 Verify the proper operation of the wireless communication system.
- 3.9 Verify the proper operation of equipment expected to function under abnormal conditions including loss of power.

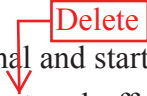
## 4.0 DATA REQUIRED

- 4.1 None

## 5.0 ACCEPTANCE CRITERIA

- 5.1 The plant communication systems function as described in Subsection 9.5.2.

**APR1400 DCD TIER 2**

- COL 14.2(15) The COL applicant is to prepare the preoperational test of cooling tower and associated auxiliaries, and raw water and service water cooling systems.
- COL 14.2(16) The COL applicant is to develop the test program of personnel monitors, radiation survey instruments, and laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations.
- COL 14.2(17) The COL applicant is to prepare the site-specific preoperational and startup test specification and test procedure and/or guideline for ~~plant and~~ offsite communication system. 
- COL 14.2(18) The COL applicant is to prepare the pre-operational test of ultimate heat sink pump house.
- COL 14.2(19) The COL applicant is to prepare the testing and verification of ultimate heat sink cooling chains.

**14.2.14**      References

1. 10 CFR Part 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” U.S. Nuclear Regulatory Commission.
2. Regulatory Guide 1.28, “Quality Assurance Program Requirements (Design and Construction),” Rev. 4, U.S. Nuclear Regulatory Commission, June 2010.
3. Regulatory Guide 1.68, “Initial Test Programs for Water-Cooled Nuclear Power Plants,” Rev. 4, U.S. Nuclear Regulatory Commission, June 2013.
4. Regulatory Guide 1.68.2, “Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water-Cooled Nuclear Power Plants, U.S. Nuclear Regulatory Commission, April 2010.
5. Regulatory Guide 1.68.3, “Preoperational Testing of Instrument and Control Air Systems,” U.S. Nuclear Regulatory Commission, September 2012.
6. Regulatory Guide 1.79, “Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors, U.S. Nuclear Regulatory Commission, October 2013.

**APR1400 DCD TIER 2**

Table 14.2-1 (6 of 6)

Subsection	Test
14.2.12.1.136	RCP vibration monitoring system
14.2.12.1.137	NSSS integrity monitoring system (pre-core)
14.2.12.1.138	Core protection calculator system test
14.2.12.1.139	Diverse indication system test
14.2.12.1.140	Pre-core pressurizer surge line stratification test
14.2.12.1.141	Local of vital equipment
14.2.12.1.142	Access to vital equipment
14.2.12.1.143	Equipment to permit observation of abnormal presence or activity of persons or vehicles
14.2.12.1.144	Vehicles barrier system to protect against the design basis threat vehicle bombs
14.2.12.1.145	Vital areas with active intrusion detection systems
14.2.12.1.146	Security alarm annunciation and video assessment information
14.2.12.1.147	Location and equipment of the central and secondary alarm stations
14.2.12.1.148	Secondary security power supply system
14.2.12.1.149	Intrusion detection and assessment systems
14.2.12.1.150	Equipment and emergency exits
14.2.12.1.151	Security communication systems
14.2.12.1.152	Bullet-resisting barriers
14.2.12.1.153	Security alarm devices and transmission lines

Add	14.2.12.1.154	Plant communication systems
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## APR1400 DCD TIER 2

Table 14.2-7 (11 of 18)

RG 1.68 APP. A	Subsection #	Individual Test
1.o.3	14.2.12.1.74 14.2.12.1.76	Chilled water system test Component cooling water system test
1.o.4	14.2.12.1.13	Reactor makeup subsystem test
1.o.5	14.2.12.1.52 14.2.12.1.83	Pre-core reactor coolant and secondary water chemistry data Process sampling system test
1.o.6	14.2.12.1.7 14.2.12.1.66	Chemical and volume control system charging subsystem test Steam generator blowdown system test
1.o.7	14.2.12.1.85	Fire protection system test
1.o.8	14.2.12.1.7	Chemical and volume control system charging subsystem test
1.o.9	14.2.12.1.10 14.2.12.1.103	Equipment drain tank subsystem test Liquid waste management system test
1.o.10	14.2.12.1.5	Chemical and volume control system letdown subsystem test
1.o.11	14.2.12.1.82	Compressed air system test
1.o.12	14.2.12.1.15	Boric acid concentrator subsystem test
1.o.13 <span style="border: 1px solid red; padding: 2px;">14.2.12.1.154</span> →		<del>Exception</del> <span style="border: 1px solid red; padding: 2px;">Plant communication systems test</span> The COL applicant is to prepare the site-specific preoperational and startup test specification and test procedure and/or guideline for plant and offsite communication system (COL 14.2(17)) <span style="border: 1px solid red; padding: 2px;">Delete</span> ↗
1.o.14.a	14.2.12.1.132	Auxiliary building controlled area HVAC system test
1.o.14 .b	14.2.12.1.93 14.2.12.1.94	Reactor containment building HVAC system test Reactor containment purge HVAC system test
1.o.14 .c	14.2.12.1.131	Electrical and I&C equipment room area HVAC systems test
1.o.14 .d	14.2.12.1.97	Emergency diesel generator area HVAC system test
1.o.14 .e	14.2.12.1.93 14.2.12.1.94 14.2.12.1.96 14.2.12.1.99 14.2.12.1.133	Reactor containment building HVAC system test Reactor containment purge HVAC system test Turbine generator building HVAC system test Compound building HVAC system test Auxiliary building clean area HVAC system test
1.o.14 .f	14.2.12.1.95 14.2.12.1.100	Control room area HVAC system test Balance of control room area HVAC system test