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.: **515-8681**

SRP Section: **14.02 – Initial Plant Test Program**

Application Section: **14.2.12.1.86**

Date of RAI Issue: **08/12/2016**

Question No. 14.02-68

In RAI 191-8210, Question 14.02-12, the staff asked for additional information on DCD Tier 2 Section 14.2.12.1.86, “EDG mechanical system test.” For preoperational testing, the applicable regulatory requirements are GDC 17, which requires that onsite and offsite power systems provide sufficient capacity and capability and GDC 18, which requires the testing of electrical power systems.

In part G of RAI 8210, Question 14.02-12, the staff asked for confirmation that demonstrating capability of 35 consecutive starts was 35 consecutive starts without failure. In its response on June 28, 2016 (ADAMS Accession No. ML16180A269), the applicant revised the pre-operational test to 25 consecutive starts instead of 35. Furthermore, the applicant stated in letter dated June 28, 2016 that “to demonstrate an acceptable level of reliability of the EDG starting, reliability tests are performed by ensuring 25 consecutive tests without failures in accordance with IEEE 387, ‘Standard for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations.’ “Section 7.3, “Pre-operational testing” of IEEE Std. 387-1995 states that “reliability tests shall demonstrate that an acceptable level of reliability has been achieved to place the new diesel-generators into operation. This shall be achieved by a minimum of 25 valid start and load tests without failure on each installed diesel-generator” [Emphasis added]

Please confirm that 25 consecutive tests without failures is 25 start and load tests, as in accordance with IEEE Std. 387-1995 and confirm that the load tests are in accordance with IEEE Std. 387-1995, Section 7.2.1.3, “Rated Load Test.” Please revise the DCD as needed.

Response

KHNP confirms that the previously specified EDG mechanical system test of 25 consecutive start tests without failures will include a load in accordance with IEEE 387-1995 Section 7.3 which pertains to pre-operational testing. The rated load test performed in accordance with Section 7.2.1.3 will be performed during site acceptance testing and is not applicable to Section

14.2.12.1.86. DCD Tier 2 Section 14.2.12.1.86 will be clarified to state 25 valid start and load-run tests.

Impact on DCD

DCD Tier 2 Subsection 14.2.12.1.86 will be revised as indicated 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.

14.2.12.1.86 Emergency Diesel Generator Mechanical System Test

1.0 ~~OBJECTIVE~~OBJECTIVES

1.1 To demonstrate the emergency diesel generator (EDG) mechanical system operates reliably

2.0 PREREQUISITES

2.1 Construction activities on the diesel generator system have been completed.

2.2 EDG system instrumentation has been calibrated.

2.3 Support systems required for operation of the EDG system are complete and operational.

2.4 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Demonstrate that each EDG can be started from the control room and its local panel in automatic and manual.

3.2 Demonstrate that the following mechanical and electrical trips are operable and function as described in Subsection 8.3.1 (includes protective trips bypass tests).

3.2.1 Engine overspeed

3.2.2 Generator differential protection

3.2.3 Low-low lube oil pressure

3.2.4 Generator voltage-controlled overcurrent

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14.2.12.1.86 Emergency Diesel Generator Mechanical System Test

1.0 OBJECTIVES

1.1 To demonstrate performance characteristics of the emergency diesel generators (EDGs) and associated auxiliaries, and verify that each diesel reaches rated speed within the required time.

1.2 To verify the operational capability of control circuits associated with the EDG and diesel auxiliaries, including the control circuit response to safety signals.

1.3 To demonstrate the reliability of each diesel generator by means of 25 consecutive ~~valid tests.~~ valid start and load-run tests.

1.4 To demonstrate the capability of each air storage tank to provide five diesel cranking cycles without being recharged.

1.5 To demonstrate the continuous operation of each diesel generator for 24 hours of full power, 2 hours at load equivalent to the short time rating, and 22 hours at load equivalent to the continuous rating.

1.6 To demonstrate the fuel oil consumption of the EDG while operating at the continuous load rating.

2.0 PREREQUISITES

2.1 Construction activities on the diesel generator system have been completed.

2.2 Required electrical power supplies and control circuits are operational.

2.3 EDG system instrumentation has been calibrated.

2.4 Test instrumentation is available and calibrated.

2.5 The component cooling water system is available to supply cooling water to the diesel engine heat exchanger.

2.6 The fuel oil system, cooling water system, starting air system, lubrication system, and combustion air intake and exhaust system are available.

3.0 TEST METHOD

3.1 Start the EDGs and record the time required to reach rated speed.

3.2 Evaluate performance characteristics of the EDGs and associated auxiliaries.

3.3 Evaluate the operational capability of all control circuits associated with the EDG including the control circuit response to safety signals.

3.4 Evaluate the ability of each diesel generator by means of 25 consecutive ~~valid tests.~~ valid start and load-run tests.

3.5 Evaluate the ability of each air storage tank to provide five diesel cranking cycles without being recharged.

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3.6 Evaluate the fuel oil consumption is monitored with EDG operating at the continuous load rating.

3.7 Evaluate the continuous operation of each diesel generator for 24 hours of full power, 2 hours at load equivalent to the short time rating, and 22 hours at load equivalent to the continuous rating.

4.0 DATA REQUIRED

4.1 EDG and associated auxiliaries operating parameters

4.2 EDG engine consecutive starts data

4.3 Set points of EDG trips

4.4 EDG governor operating data

4.5 Set points at which alarms and interlocks occur

4.6 EDG starting air volume parameters after consecutive starts

5.0 ACCEPTANCE CRITERIA

5.1 The required time for each EDG to reach rated speed is in accordance with Subsection 8.3.1.1.2.4.

5.2 Performance characteristics of the EDGs and associated auxiliaries are within design requirements.

5.3 Each EDG starts automatically on receipt of a safety injection actuation signal, containment spray actuation signal, auxiliary feedwater actuation signal, or 4.16 kV bus under-voltage signal.

5.4 Each EDG trips automatically on receipt of signals for automatic trip conditions described in Subsection 8.3.1.1.3.

5.5 The alarm, interlocks, controls, and operation of the EDG and associated auxiliaries are as described in Subsection 8.3.1.1.3, 9.5.5, 9.5.6, 9.5.7, and 9.5.8.

5.6 Each diesel generator completes 25 consecutive ~~valid tests~~ valid start and load-run tests.

5.7 Each air storage tank is capable of providing five diesel cranking cycles without being recharged.

5.8 The EDG engine cooling water system operates as described in Subsection 9.5.5.

5.9 The EDG engine starting air system operates as described in Subsection 9.5.6.

5.10 The EDG engine lubrication system operates as described in Subsection 9.5.7.

5.11 The EDG engine combustion air and exhaust system operates as described in Subsection 9.5.8.