# RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**APR1400 Design Certification**

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

**Docket No. 52-046**

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| **RAI No.:** | **501-8635** |
| **SRP Section:** | **09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System** |
| **Application Section:** | **09.05.09** |
| **Date of RAI Issue:** | **07/01/2016** |

## Question No. 09.05.04-15

The inspections, tests, analyses statement for design commitment 8.a in DCD Tier 1, Table 2.6.6-1, “Alternate AC Source ITAAC,” indicates that “an analysis and test of each fuel oil transfer pump will be performed to determine the maximum demand at gas turbine generator (GTG) continuous rated load while simultaneously increasing day tank level.” The acceptance criteria for the design commitment is as follows: a report exists and concludes that the size and flow rate of each as-built GTG fuel oil transfer pump bounds the analysis.

In response to a number of issues with ITAAC submittals, the NRC staff issued Regulatory Issue Summary 2008-05, Revision 1, “Lessons Learned to Improve Inspections, Tests, Analyses, and Acceptance Criteria Submittal” (ADAMS Accession No. ML102500244). Two examples of the issues identified in the RIS are:

- Applicants should ensure that design commitments and ITAAC are consistent, i.e., the language and details of the ITAAC should agree with the language of the design commitment.
- Applicants should avoid expanding the ITAAC for functional arrangement of a system beyond the definition of functional arrangement as a physical arrangement of SSCs (it does not include testing, qualification, and analytical attributes).

The use of the expression “a report exists” is not sufficient for verification that the “as-built” (as installed) alternate AC (AAC) GTG fuel oil pumps meet the design commitment, as the acceptance criteria does not verify the specific design commitment. By extension, performance of the ITAAC as written may not provide reasonable assurance that the AAC GTG would be able to perform its function for the duration of the required station blackout (SBO) coping time, given that the fuel oil day tank contains enough fuel oil for only 60 minutes of continuous operation at GTG rated load. The acceptance criteria use of a “report exists” would provide confirmation that the components and system are properly sized and designed to meet its demand; however, the

use of a report would not verify that the actual installed components and system would perform its SBO function for the coping time determined by the applicant (specifically, that at continuous rated AAC GTG load, the fuel oil day tank level will rise with each fuel oil transfer pump running). Additionally, the ITA for design commitment 8.a does not specify that the testing and analysis are performed on the as-built fuel transfer pumps.

The applicant is requested to describe the specific inspections or tests in DCD Tier 1, Table 2.6.6-1 to verify that the “as-built” AAC GTG meets the design and performance commitments following the completion of its installation at its final location at the plant site.

## Response

The inspections, tests, analyses statement and the acceptance criteria for design commitment 8.a in DCD Tier 1, Table 2.6.6-1, “Alternate AC Source ITAAC,” will be revised to specify that the testing and analysis are performed on the as-built fuel oil transfer pumps.

Also, new ITAAC will be added as item 11 to provide reasonable assurance that the AAC GTG would be able to perform its function for the duration of the required station blackout (SBO) coping time, given that the fuel oil day tank contains enough fuel oil for only 60 minutes of continuous operation at GTG rated load.

DCD Tier 1 Subsection 2.6.6.1 and Table 2.6.6-1 will be revised to reflect above description.

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**Impact on DCD**

DCD Tier 1 Subsection 2.6.6.1 and Table 2.6.6-1 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.

8.a Each fuel oil transfer pump is capable of transferring oil from the fuel oil storage tank to its corresponding day tank at sufficient pressure and flow to cover the maximum demand at GTG continuous rated load while simultaneously increasing day tank level.

8.b The fuel oil transfer pumps have sufficient net positive suction head (NPSH).

9. One fuel oil transfer pump is designed to automatically supply fuel oil from the storage tank to the day tank prior to actuation of low level alarm and stops automatically on a fuel oil day tank high-level signal.

10. The air intakes for the GTG combustion are separated from the GTG exhaust ducts.

2.6.6.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.6.6-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the AAC source.

11. Each day tank provides fuel oil for at least 60 minutes plus a minimum additional margin of 10 percent at GTG rated load.

Table 2.6.6-1 (2 of 3)

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 6. The GTG has sufficient fuel oil storage capacity to supply power to the required SBO loads for 24 hours. | 6.a Analyses will be performed to determined the required GTG fuel oil storage tank capacity needed to supply power to the required SBO loads for 24 hours. | 6.a A report exists and concludes the required GTG fuel oil storage tank capacity needed to supply power to the required SBO loads for 24 hours. |
| | 6.b Inspection of the GTG fuel oil storage tank will be performed to verify that the capacity bounds the analysis. | 6.b The as-built GTG fuel oil storage tank capacity bounds the analysis. |
| 7. The GTG fuel oil system is non safety-related and independent from that of the Class 1E EDGs. | 7. Inspections will be performed of the as-built GTG fuel oil system. | 7. The as-built GTG fuel oil system is independent and separated from that of the EDG. |
| 8.a Each fuel oil transfer pump is capable of transferring oil from the fuel oil storage tank to its corresponding day tank at sufficient pressure and flow to cover the maximum demand at GTG continuous rated load while simultaneously increasing day tank level. | ~~8.a An analysis and test of each fuel oil transfer pump will be performed to determine the maximum demand at GTG continuous rated load while simultaneously increasing day tank level.~~ | ~~8.a A report exists and concludes that the size and flow rate of each as-built GTG fuel oil transfer pump bounds the analysis.~~ |
| 8.b The fuel oil transfer pumps have sufficient net positive suction head (NPSH). | 8.b Test to measure the as-built fuel oil transfer pump suction pressure will be performed. Inspection and analyses to determine NPSH available to each pump will be performed based on test data and as-built data. | 8.b A report exists and concludes that the as-built calculated NPSH available exceeds each fuel oil transfer pump's NPSH required. |

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| 8.a.i Analysis of each fuel oil transfer pump will be performed to determine the required flow rate to support the maximum demand of the GTG at continuous rated load while simultaneously increasing day tank level. | 8.a.i A report exists and concludes that each as-built fuel oil transfer pump is sized to transfer fuel oil from the fuel oil storage tank to its corresponding day tank, at a flow rate to support the maximum demand of the GTG at continuous rated load while simultaneously increasing day tank level. |
| 8.a.ii Test of each fuel oil transfer pump will be performed to verify that the fuel oil transfer pump flow rate bounds the analysis. | 8.a.ii A report exists and concludes that each as-built GTG fuel oil transfer pump flow rate bounds the analysis. |

Table 2.6.6-1 (3 of 3)

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 9. One fuel oil transfer pump is designed to automatically supply fuel oil from the storage tank to the day tank prior to actuation of low level alarm and stops automatically on a fuel oil day tank high-level signal. | 9. Tests will be performed on the as-built fuel oil transfer pump by providing a test signal of a simulated fuel oil day tank level. | 9. The as-built fuel oil transfer pump starts automatically to supply fuel oil from the storage tank to the day tank prior to actuation of low level alarm and stops automatically on a fuel oil day tank high-level signal. |
| 10. The air intakes for the GTG combustion are separated from the GTG exhaust ducts. | 10. Inspection and analysis of the as-built GTG air intakes and air exhaust will be performed. | 10. The air intake and air exhaust are separated by analyzed distance and orientation. |
| 11. Each day tank provides fuel oil for at least 60 minutes plus a minimum additional margin of 10 percent at GTG rated load. | 11. a Analyses will be performed to determin day tank capacities and GTG fuel consumption. | 11. a A report exist and concludes that each day tank's capacity is sufficient to provide fuel oil for at least 60 minutes plus a minimum additional margin of 10 percent at GTG rated load. |
| | 11. b Inspections will be performed to verify that each as-built day tank capacity bounds the analysis. | 11. b Each as-built day tank's capacity bounds the analysis. |