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## REVISED 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.:** 355-8438  
**SRP Section:** 09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System  
**Application Section:** 9.5.4  
**Date of RAI Issue:** 12/28/2015

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### **Question No. 09.05.04-12**

The KHNP response on November 13, 2015 (ADAMS Accession Number ML15317A521) to Action Item Nos. AI 9-45.3 and AI 9-45.5, proposes revisions to FSAR Subsection 9.5.4. These revisions would state that fuel in the storage tanks and day tanks will be sampled periodically according to the Fuel Oil Testing Program in Section 5.5.13 of the Technical Specifications (TS), and that sediment and moisture are removed in accordance with TS Surveillance Requirement (SR) 3.8.3.5. The staff requests clarification on the following: (1) TS 5.5.13 does not appear to include a provision for sampling fuel from the day tanks, (2) SR 3.8.3.5 as written does not apply to day tanks, and (3) SR 3.8.3.5 does not apply to sediment.

### **Response – (Rev.1)**

- (1) The Fuel Oil Testing Program in Section 5.5.13 of the TS is implemented for both new fuel oil and stored fuel oil. Stored fuel oil means fuel oil in storage tanks and day tanks. Section 5.5.13 will be revised to clarify.
- (2) SR for checking and removing accumulated water from each day tank is provided in DCD Tier 2, TS SR 3.8.1.5. DCD Tier 2, Subsection 9.5.4.5 will be revised.
- (3) SR 3.8.1.5 and 3.8.3.5 are provided for eliminating the necessary environment for bacterial survival by removing water from the day tanks and storage tanks, respectively. NRC RG 1.137, Rev.2, Position 13.4 and 13.5 only expresses concerns about accumulated water in the tanks. Also, the TS bases for each SR expresses concerns about the accumulated water in the tanks, not sediment, which is based on NUREG-1432, Standard Technical Specifications.

Since an accumulation of sediment in fuel oil can (a) obstruct the flow of oil from the tank to the combustor and (b) it is difficult to remove only accumulated water excluding sediment in the tank, ASTM D975 provides the properties including sediment.

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Therefore, accumulated water and sediment are removed periodically with the sediment being filtered through the duplex basket strainer that that is described in the APR1400 design. SR 3.8.1.5 and 3.8.3.5 will be revised to clarify.

In the Attachment, a typo in the pointer to surveillance requirements 3.8.1.5 and 3.8.3.5 will be revised.

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### **Impact on DCD**

DCD Tier 2, Subsection 9.5.4.5 will be revised as shown in the Attachment.

### **Impact on PRA**

There is no impact on the PRA.

### **Impact on Technical Specifications**

DCD Tier 2, TS SR 3.8.1.5 and 3.8.3.5 and Subsection 5.5.13 will be revised as indicated in the Attachment.

### **Impact on Technical/Topical/Environmental Reports**

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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.5	<div style="border: 1px solid blue; padding: 2px; display: inline-block;">water and sediment</div> Check for and remove accumulated water from each day tank and engine mounted tank.	31 days
SR 3.8.1.6	Verify fuel oil transfer system operates to automatically transfer fuel oil from storage tank to the day tank.	92 days
SR 3.8.1.7	<p>----- NOTE -----</p> <ol style="list-style-type: none"> <li>1. EDG loadings may include gradual loading as recommended by the manufacturer.</li> <li>2. Momentary transients outside the load range do not invalidate this test.</li> <li>3. This Surveillance shall be conducted on only one EDG at a time.</li> <li>4. This SR shall be preceded by and immediately follow without shutdown a successful performance of SR 3.8.1.2 or SR 3.8.1.7.</li> </ol> <p>-----</p> <p>Verify each EDG starts from standby condition and achieves:</p> <ol style="list-style-type: none"> <li>a. In <math>\leq 17</math> seconds, voltage <math>\geq 3,744</math> V and frequency <math>\geq 58.8</math> Hz and</li> <li>b. Steady stage voltage <math>\geq 3,744</math> V and <math>\leq 4,576</math> V, and frequency <math>\geq 58.8</math> Hz and <math>\leq 61.2</math> Hz.</li> </ol>	184 days

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SURVEILLANCE REQUIREMENTS (continued)

AI 09-45.3\_9.5.4\_#5

SURVEILLANCE		FREQUENCY
SR 3.8.3.4	Verify each DG air start receiver pressure is $\geq 40.77$ kgf/cm <sup>2</sup> G (580 psig) psig.	31 days
SR 3.8.3.5	Check for and remove accumulated water from each fuel oil storage tank.	31 days

water and sediment

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## 5.5 Programs and Manuals

AI 09-45.3\_9.5.4\_#5

5.5.13 Diesel Fuel Oil Testing Program

A diesel fuel oil testing program to implement required testing of both new fuel oil and stored fuel oil shall be established. The program shall include sampling and testing requirements, and acceptance criteria, all in accordance with applicable ASTM Standards. The purpose of the program is to establish the following:

- a. Acceptability of new fuel oil for use prior to addition to storage tanks by determining that the fuel oil has:
  1. An API gravity or an absolute specific gravity within limits,
  2. A flash point and kinematic viscosity within limits for ASTM 2D fuel oil, and
  3. A clear and bright appearance with proper color or a water and sediment content within limits.
- b. Within 31 days following addition of the new fuel oil to storage tanks, verify that the properties of the new fuel oil, other than those addressed in a., above, are within limits for ASTM 2D fuel oil, and
- c. Total particulate concentration of the fuel oil is <10 mg/l when tested every 31 days.

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the Diesel Fuel Oil Testing Program test frequencies.

stored fuel oil in storage tanks and day tanks

5.5.14 Technical Specifications (TS) Bases Control Program

This program provides a means for processing changes to the Bases of these TS.

- a. Changes to the Bases of the TS shall be made under appropriate administrative controls and reviews.
- b. Licensees may make changes to Bases without prior NRC approval provided the changes do not require either of the following:
  1. A change in the TS incorporated in the license or
  2. A change to the updated DCD TIER 2 or Bases that requires NRC approval pursuant to 10 CFR 50.59.

## APR1400 DCD TIER 2

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9.5.4.5 Inspection and Testing Requirements

The EDEFOS is tested prior to initial startup. Preoperational testing is described in Section 14.2. The EDEFOS is tested periodically along with the complete EDG system. This test demonstrates the performance, and structural and leaktight integrity, of each system component.

Inservice inspection of piping is performed in accordance with the requirements of ASME Section XI (Reference 50).

The operability of EDEFOS may be demonstrated during tests of the emergency diesel generator, or testing may be performed by operation of the system in recirculation mode (bypassing day tank) and sending fuel through the recirculation line back to the fuel oil storage tank.

The fuel oil in the storage tank and day tanks is periodically sampled to verify quality as defined in the EDG fuel sampling and testing program. Prior to addition of new fuel oil into the storage tanks, samples will be tested for specific gravity, cloud point, viscosity, and water and sediment content in accordance with ASTM D975 (Reference 55) limits. Accumulated moisture and sediment are removed ~~periodically~~, via the sump drain, to minimize degradation of the fuel oil.

in accordance with Surveillance Requirement 3.8.3.5,

3.8.1.5  
3.8.3.1 and 3.8.3.5,

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(10)).

Equipment and components are readily available for inspection and maintenance. Provisions are made to pressure test portions of the system. The EDEFOS can be tested independently of each EDG by draining the day tanks to the levels that automatically start the pumps. The pump flow rate is verified by monitoring the day tank level indicators.

The exterior surfaces of the fuel oil storage tanks and day tanks are painted with a primer and finish coat system for corrosion protection. The inspection on the interior surfaces of the tanks is done when the tanks are emptied and cleaned. Buried fuel oil system piping is inspected by means of a visual examination at each end of the buried piping for evidence of leakage.