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.:	**152-8006**
SRP Section:	**09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System**
Application Section:	**09.05.04**
Date of RAI Issue:	**08/10/2015**

Question No. 09.05.04-1

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

DCD Tier 2, Section 9.5.4.6 describes the instrumentation requirements for a self-cleaning fuel oil filter.

The staff is unable to find any description of these filters in DCD Tier 2, Section 9.5.4 or their location in Figure 9.5.4-1.

The applicant is requested to define the fuel oil filters and their use, and update the DCD and Figure 9.5.4-1 accordingly.

Response

The function of the fuel oil filter is to filter fuel oil for each diesel engine. The fuel oil filter is installed in the diesel engine enclosure, and located between the engine-driven fuel oil feed pump and the engine.

The diesel engine manufacturer will provide the diesel engine with fuel oil filter.

DCD Tier 2, Figure 9.5.4-1 will be revised to show the filter location.

Impact on DCD

DCD Tier 2, Subsection 9.5.4.2.2, 9.5.4.6, and Figure 9.5.4-1 will be revised as indicated on the attached markup.

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.

A sampling connection is provided to the bottom of each tank for periodic sampling of the fuel oil for quality and for drawing off any accumulated condensation and sediment. The exterior surfaces of the day tanks are painted for corrosion protection.

Instrumentation is provided as described in Subsection 9.5.4.6. When the setpoint level is reached, fuel oil is automatically added to the day tank by the transfer pump from the diesel storage tank.

Each diesel fuel oil day tank has the external connections to supply fuel oil for portable equipment.

9.5.4.2.2.6 Piping and Valves

Piping for the EDEFOS is safety Class 3, seismic Category I, except for a portion of the piping leading to vents, fills, and drains, which is seismic Category II or III, and is made of carbon steel. The exterior surfaces of the piping are painted for corrosion protection. The fuel oil storage tank is interconnected to the day tank through the overflow line of day tank.

There are provisions in the design to prevent entrance of water into the diesel oil storage tank during adverse environmental conditions, including maximum expected flood conditions. These include a vent line with a flame arrester, which is goose-necked downward, and the fill connections that are capped and penetrate building walls at elevations well above the flood level.

The maximum probable flood level does not exceed the elevations of the vent and fill connections, which are not subject to flood conditions. Any connections do not allow the entry of water into the system during adverse environmental conditions.

9.5.4.2.2.7 Flame Arrestors

Flame arresters are installed in the vent lines at the fuel oil storage and day tanks to prevent potentially explosive mixtures from igniting and also insects from flying or crawling into the vent piping and fouling the fuel in the tanks during standby and operating modes.

9.5.4.2.2.8 Fuel Oil Filter

The fuel oil filter is installed in the diesel engine enclosure, and located between the engine-driven fuel oil feed pump and the engine. The fuel oil to be filtered is pumped through the filter and towards the engine.

9.5.4.6 Instrumentation Requirements

Each diesel engine is provided with sufficient instrumentation to monitor the operation of the fuel oil system. Alarms are separately annunciated on the local control panel, which also signals an EDG common trouble alarm in the MCR and RSR. The fuel oil system is provided with the following instrumentation and alarms:

a. Fuel oil storage tanks

1) Low-level and high-level alarm

2) Low-low-level alarm

3) Level indication, 0 to 100 percent

b. Fuel oil day tank

1) High-high-level alarm

2) Low-level alarm

3) Low-low-level alarm

c. Fuel oil strainers

1) High differential pressure alarm – Alerts the operator to take corrective action by manually switching over to the alternate clean strainer.

2) Inlet and outlet pressure indication

d. ~~Fuel oil filter~~ Fuel oil filter (Diesel engine enclosure)

1) High differential pressure alarm – automatic self-cleaning

2) Differential pressure indication

DFOT PUMP : DIESEL FUEL OIL TRANSFER PUMP

EDG : EMERGENCY DIESEL GENERATOR

TRAIN	MOBILE EQUIPMENT (VALVE NO.)
A&B	MOBILE GTG (V2202A,B) AF FLEX PUMP (V2203A,B) PRIMARY HIGH HEAD FLEX PUMP (V2204A,B) PRIMARY LOW HEAD FLEX PUMP (V2205A,B) SFP MAKEUP FLEX PUMP (V2206A,B) SFP SPRAY FLEX PUMP (V2207A,B) ECSBS FLEX PUMP (V2208A,B)

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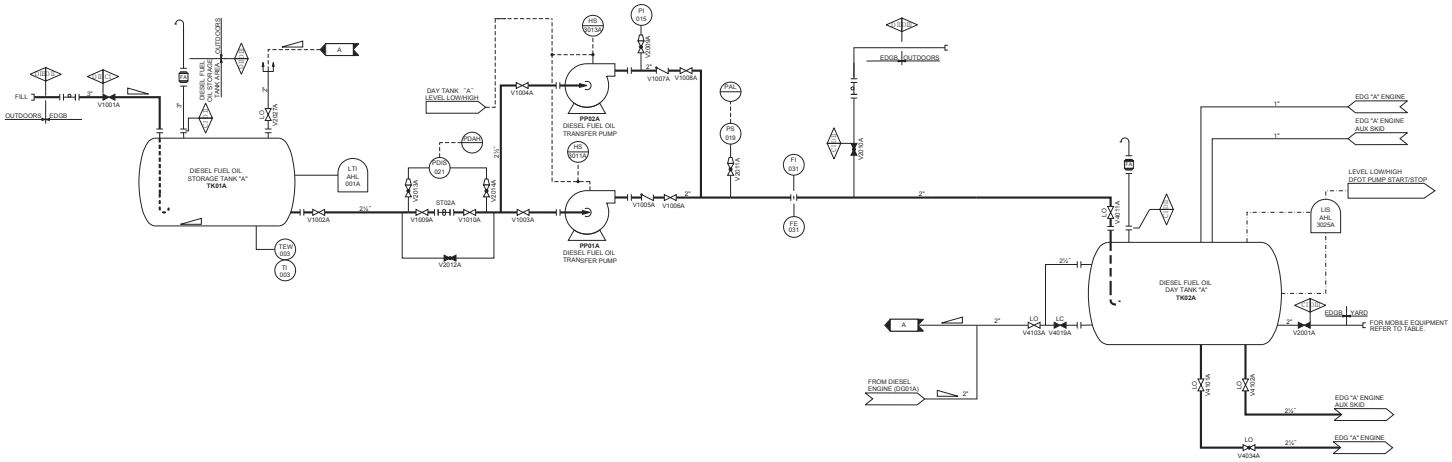
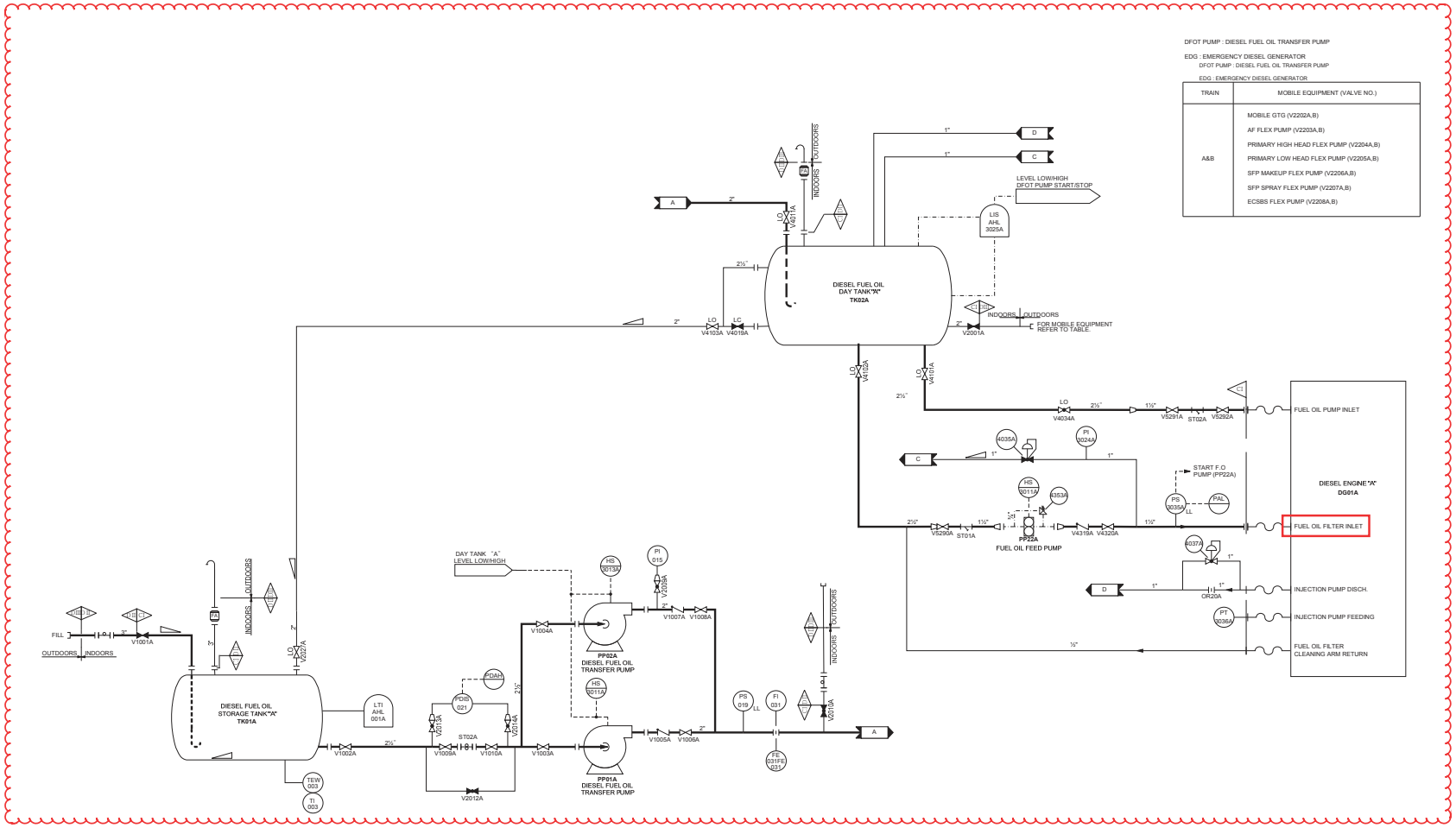


In APR1400 DC, there are four trains, A, B, C and D.
Train A is indicated as being representative of train B, C and D.

Figure 9.5.4-1 Diesel Fuel Oil Transfer System Flow Diagram

APR1400 DCD TIER 2



In APR1400 DC, there are four trains, A, B, C and D.
Train A is indicated as being representative of train B, C and D.

Figure 9.5.4-1 Diesel Fuel Oil Transfer System Flow Diagram

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.:	**152-8006**
SRP Section:	**09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System**
Application Section:	**09.05.04**
Date of RAI Issue:	**08/10/2015**

Question No. 09.05.04-2

In accordance with NUREG-0800, SRP 9.5.4, GDC 5 prohibits the sharing of SSCs important to safety among nuclear power units unless such sharing can be demonstrated not to significantly impair their ability to perform safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.

DCD Tier 2, Figure 9.5.4-1 shows two main inlet and two outlet connections to the diesel fuel oil day tank for supplying diesel fuel to emergency diesel generator (EDG) engine and EDG engine auxiliary skid.

The staff is unable to find any description of the “EDG “A” engine aux skid” referenced on Figure 9.5.4-1 to verify that GDC 5 is met.

The applicant is requested to define the aux skid connection, and update the DCD accordingly.

Response

DCD Tier 2, Subsection 4.5.4.1.f states that “Each EDEFOS is designated as safety related and is not shared by other diesel generators.” Each EDG of APR1400 DC has an independent EDEFOS.

DCD Tier 2, Figure 9.5.4-1 will be revised to show the route from the diesel fuel oil storage tank “A” to the emergency diesel engine “A”. Train A is indicated as being representative of trains B, C, and D.

Impact on DCD

DCD Tier 2, Figure 9.5.4-1 will be revised as indicated on the attached markup.

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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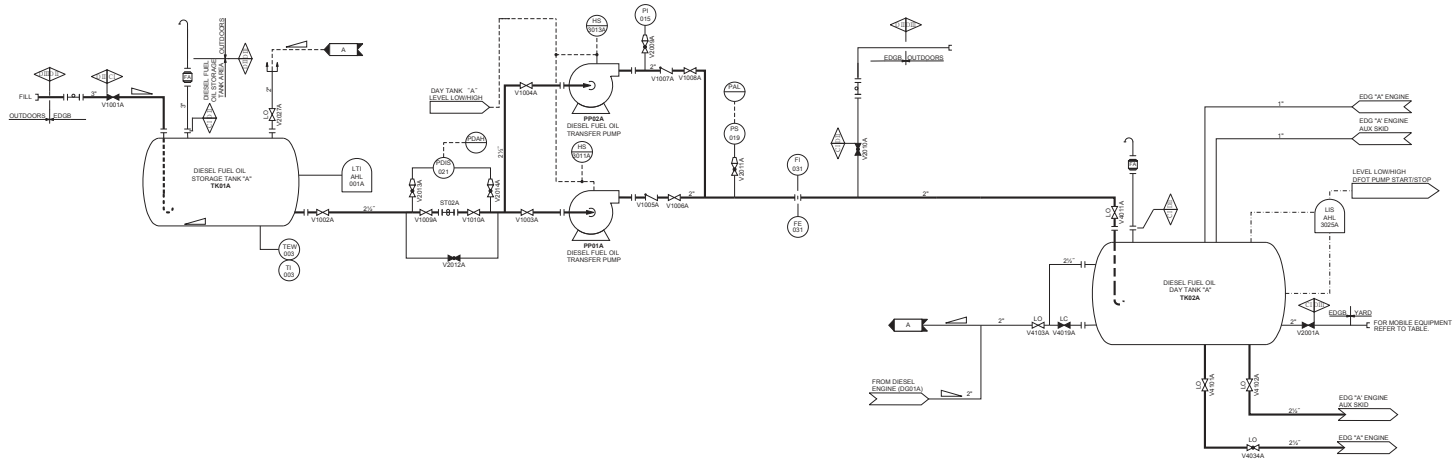
DFOT PUMP : DIESEL FUEL OIL TRANSFER PUMP

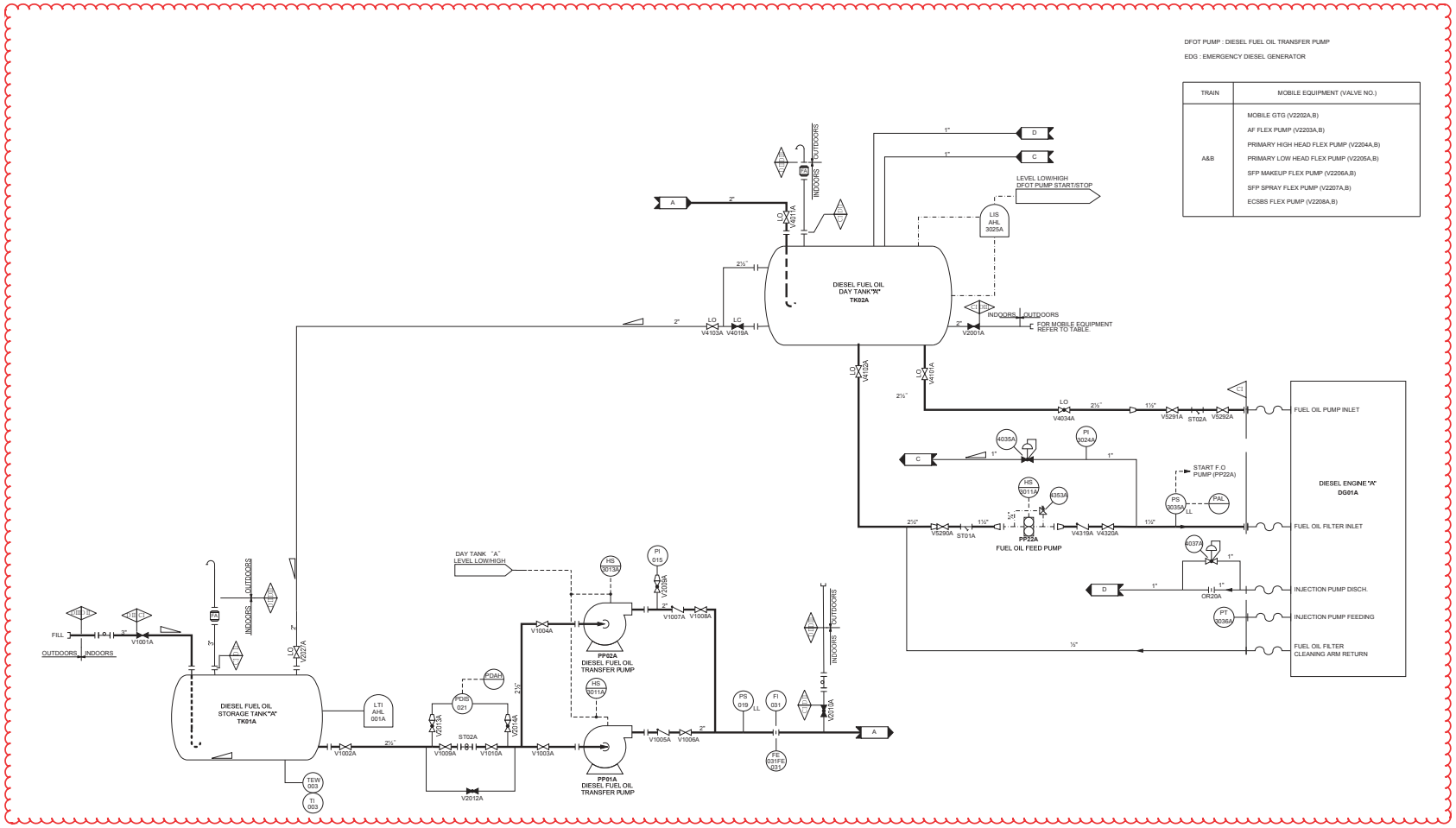
EDG : EMERGENCY DIESEL GENERATOR

TRAIN	MOBILE EQUIPMENT (VALVE NO.)
A&B	MOBILE GTG (V2202A,B) AF FLEX PUMP (V2203A,B) PRIMARY HIGH HEAD FLEX PUMP (V2204A,B) PRIMARY LOW HEAD FLEX PUMP (V2205A,B) SFP MAKEUP FLEX PUMP (V2206A,B) SFP SPRAY FLEX PUMP (V2207A,B) ECSBS FLEX PUMP (V2208A,B)



In APR1400 DC, there are four trains, A, B, C and D.
Train A is indicated as being representative of train B, C and D.

Figure 9.5.4-1 Diesel Fuel Oil Transfer System Flow Diagram



In APR1400 DC, there are four trains, A, B, C and D.
Train A is indicated as being representative of train B, C and D.

Figure 9.5.4-1 Diesel Fuel Oil Transfer System Flow Diagram

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.:	**152-8006**
SRP Section:	**09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System**
Application Section:	**09.05.04**
Date of RAI Issue:	**08/10/2015**

Question No. 09.05.04-3

In accordance with NUREG-0800, SRP 9.5.4, the SAR is reviewed to verify whether the EDEFSS description and related diagrams clearly indicate all modes of system operation, including the means for indicating, controlling, and monitoring fuel oil level, temperature, and pressure as required for uninterrupted operation. NUREG-0800, SRP 14.2 provides additional guidance on review of the acceptability of the pre-operational and startup tests.

DCD Tier 2, Section 9.5.4.5, “Inspection and Testing Requirements,” for the emergency diesel engine fuel oil system (EDEFOS) states that “[t]he 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.” In addition, DCD Tier 2, Section 14.2.12.1.88 contains an operability test to demonstrate the operation of the fuel oil recirculation system.

The staff is unable to locate any description of this recirculation mode or system in DCD Tier 2, Section 9.5.4 or Figure 9.5.4-1.

The applicant is requested to describe the recirculation system and mode, and update the DCD accordingly.

Response

“Recirculation system” in DCD Tier 2, Subsection 14.2.12.1.88 will be changed to “recirculation mode.”

DCD Tier 2, Subsection 9.5.4.5 will be revised as follows:

Current description : 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.

Revised description : 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 (using the day tank overflow line) and sending fuel through the recirculation line back to the fuel oil storage tank.

The day tank overflow line is described in the DCD Tier 2, Subsection 9.5.4.3.3 as follows:

> "In the event that the operating transfer pump fails to stop at day tank 'high' level, the flow rate delivered by the transfer pump is greater than the fuel consumption rate of the diesel generator, so that the surplus diesel fuel oil is returned to the diesel fuel oil storage tank by gravity through a day tank overflow line."

Impact on DCD

DCD Tier 2, Subsections 9.5.4.5 and 14.2.12.1.88 will be revised as indicated on the attached markup.

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.

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.

(using the day tank overflow line)

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.

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.

2.4 Test instrumentation is available and calibrated.

2.5 The EDGs are available for a loaded run to measure fuel consumption and to perform consecutive starts.

3.0 TEST METHOD

3.1 Demonstrate the operation of the fuel oil automatic transfer feature from the storage tanks to the day tank.

3.2 Demonstrate the operation of the fuel oil and day tank level alarms.

3.3 Demonstrate that the day tank can be filled manually.

3.4 Demonstrate the operation of the fuel oil transfer pump.

3.5 Demonstrate the operation of the fuel oil recirculation ~~system~~ mode.

3.6 Demonstrate, by performing a loaded run of the EDG with its day tank filled to its low-level alarm point, that the day tank provides sufficient fuel for at least 72 minutes of EDG operation with the EDG supplying the power requirements of the most limiting design basis accident.

3.7 Demonstrate, by performing a loaded run of the EDG and analysis of EDG fuel storage capacity, that each EDG has sufficient fuel storage capacity to operate for a period of no less than 7 days with the EDG supplying the power requirements of the most limiting design basis accident.

3.8 Demonstrate the operation of the EDG cooling water system to keep the pump warm.

3.9 Demonstrate the operation of EDG cooling system heaters.

3.10 Demonstrate the operation of the EDG cooling system alarms.

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.:	**152-8006**
SRP Section:	**09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System**
Application Section:	**09.05.04**
Date of RAI Issue:	**08/10/2015**

Question No. 09.05.04-4

NUREG-0800, SRP Section 9.5.4, Paragraph 9.5.4 I.1.G specifies that the design include the capability to detect and control system leakage, including isolating system portions in the event of excessive leakage or component malfunction.

DCD Tier 2, Section 9.5.4.1 regarding the emergency diesel engine fuel oil system (EDEFOS) specifies that “[t]he EDEFOS is designed to be capable of detecting and controlling system leakage by putting appropriate monitors and confining fuel oil leaks and spills in and around the system, components and structures.” No further information is provided regarding the design, qualification, and location for these monitors.

The applicant is requested to describe the “appropriate monitors” responsible for leakage detection and control.

Response

Each diesel fuel oil storage tank room has a dedicated sump with level switch. Leakage from the components of EDEFOS collects in the sump. As the leaked fuel oil enters the sump, the sump level rises. Upon reaching the setpoint level, an alarm will be activated in the MCR to alert the operator. Therefore, the EDEFOS can be monitored continuously.

Impact on DCD

There is no impact on the DCD.

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.

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.:	**152-8006**
SRP Section:	**09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System**
Application Section:	**09.05.04**
Date of RAI Issue:	**08/10/2015**

Question No. 09.05.04-5

As required by 10 CFR 52.47(b)(1), the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) 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.

According to NUREG-0800, SRP Section 14.3, the term “as-built” means the physical properties of the structure, system, or component (SSC) following the completion of its installation or construction activities at its final location at the plant site.

The acceptance criteria for design commitment 9 in DCD Tier 1, Table 2.6.2-3 (ITAAC) indicates that a report exists and concludes that each EDG has fuel storage capacity to operate the EDG for seven days with the EDG supplying power during the most limiting design basis event. The table indicates this will be done by inspection and analyses. However, DCD Tier 2, Table 9.5.4-1 already provides a tank capacity of 363,360 L (96,000 gal), which has been derived for DCD design.

The use of the expression “report exists” may not be sufficient for verification that the “as-built” SSCs are meeting their safety function. The acceptance criteria use of a “report exists” (i.e., design calculations, etc…) would provide confirmation that the components and system is 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 safety function.

The applicant is requested to justify how the use of “report exists” in DCD Tier 1, Table 2.6.2-3 will be sufficient to verify an “as-built” SSC design, following the completion of its installation or construction activities at its final location at the plant site.

Response

Values of the following items in DCD Tier 2, Table 9.5.4-1 will be based on fuel consumption rate provided by the EDG supplier.

- Fuel consumption rate at continuous rated load of the fuel oil storage tank
- Capacity of the fuel oil storage tank
- Capacity of the fuel oil transfer pump
- Fuel consumption rate at continuous rated load of the fuel oil day tank
- Capacity of the fuel oil day tank

Therefore, these values will be deleted in DCD Tier 2, Table 9.5.4-1.

Impact on DCD

DCD Tier 2, Table 9.5.4-1 will be revised as indicated on the attached markup.

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.

Table 9.5.4-1 (1 of 2)

Emergency Diesel Engine Fuel Oil System Component Data

Fuel Oil Storage Tank	
Quantity	4
Type	Horizontal, Cylinder
~~Fuel Consumption Rate at Continuous Rated Load~~	~~31.5 L/min (8.32 gpm)~~
~~Capacity (usable volume)~~	~~363,360 L (96,000 gal)~~
Operating Pressure/Temperature	Atmosphere/Ambient
Material of Construction	Coated Carbon Steel (does not contain Cu or Zn)
Interior Coating	N/A
Design Pressure/Temperature	ATM/ 65 °C (150 °F)
Design Code	ASME Section III, Class 3
Seismic Category	I
Fuel Oil Transfer Pumps	
Quantity	8
Type	Horizontal, centrifugal
~~Capacity (each pump)~~	~~64.3 L/min (17 gpm)~~
Total Differential Head	21.3 m (70 ft)
Net Positive Suction Head	Flooded Suction
Material	-
Casing	Stainless Steel
Impeller	Bronze
Pump Shaft	Stainless Steel
Design Code	ASME Section III, Class 3
Driver	Electrical Motor
Horse Power	3 HP @ 1800 RPM
Power Supply	460 V, 60 Hz, 3-Phase, Class 1E safety motor control center
Seismic Category	I

Delete

Table 9.5.4-1 (2 of 2)

Fuel Oil Day Tanks	
Quantity	4
Type	Horizontal, Cylinder
~~Fuel Consumption Rate at Continuous Rated Load~~	~~31.5 L/min (8.32 gpm)~~
~~Capacity (usable volume)~~	~~2,078 L (549 gal)~~
Operating Pressure/Temperature	Atmosphere/Ambient
Design Pressure/Temperature	4.6 kg/cm^2 G (65 psig) / 65 °C (150 °F)
Material of Construction	Coated Carbon Steel (does not contain Cu or Zn)
Interior Coating	N/A
Design Code	ASME Section III, Class 3
Seismic Category	I
Piping, Fittings, and Valves	
Design Pressure	3.5 kg/cm^{2}G (50 psig)
Design Temperature	65 °C (150 °F)
Material	Carbon Steel
Design Code (Safety-related Portion)	ASME Section III, Class 3
Seismic Category	I
Non-safety-related Portions	ASME B31.1
Flame Arrestors (Storage and Day Tanks)	Manufacturer's Standards

Delete

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.:	**152-8006**
SRP Section:	**09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System**
Application Section:	**9.5.4**
Date of RAI Issue:	**08/10/2015**

Question No. 09.05.04-6

As required by 10 CFR 52.47(b)(1), the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) 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.

As shown in DCD Tier 1, Table 2.6.2-3 (1 of 7), the Item 1 ITAAC contains a design commitment to perform inspection of the as-built functional arrangement of the emergency diesel generator (EDG) system as described in DCD Tier 1, Subsection 2.6.2.1 and in Tables 2.6.2-1 and 2.6.2-2. Acceptance criteria for Item 1 ITAAC requests confirmation that the functional arrangements are in accordance with Subsection 2.6.2.1. However, Subsection 2.6.2.1 does not contain any functional arrangement information and the design details of Subsection 2.6.2.1 are already verified by use of other items in the ITAAC. In addition, Tables 2.6.2-1 and 2.6.2-2 contain information related to seismic category and ASME classification and do not include functional arrangement information.

In addition, the emergency diesel engine cooling water system (EDECWS) is not referenced in Tier 1 or ITAAC; which results in the current DCD not requiring any verification of the functional arrangement of the safety-related EDECWS.

The staff is unclear how the acceptance criteria to verify as-built functional arrangement can be achieved with the current Tier 1 content. In addition, Tier 1 information does not contain any figures showing the functional arrangement to inspect or verify. (This RAI also applies to other EDG support system Section 9.5.5, 9.5.6, 9.5.7, and 9.5.8 containing similar content)

The applicant is requested to provide functional arrangement information and/or the corresponding figures to allow acceptable closure of the ITAAC design commitment.

Response

DCD Tier 1, Subsection 2.6.2.1 defines the EDG support system. Items listed in DCD Tier 1, Tables 2.6.2-1 and 2.6.2-2 are essential portions of the EDG support system to provide its safety function. In addition, a schematic flow diagram of the EDG support system will be added to DCD Tier 1, Subsection 2.6.2 as Figure 2.6.2-1. Also, DCD Tier 1, Table 2.6.2-1 and 2.6.2-2 will be revised.

The emergency diesel engine cooling water system (EDECWS) provides cooling water to its associated emergency diesel engine. The heat exchangers of the EDECWS are designed to transfer heat from the emergency diesel engine to the component cooling water (CCW) system for maintaining the temperature of the diesel engine within an optimum operating range.

Design description and ITAAC related to the EDECWS will be added to DCD Tier 1, Subsection 2.6.2.1 and Table 2.6.2-3, respectively, as indicated on the attached markup.

Impact on DCD

DCD Tier 1, List of Figures, Subsection 2.6.2.1, and Tables 2.6.2-1, 2.6.2-2, and 2.6.2-3 will be revised as indicated on the attached markup.

DCD Tier 1, Figure 2.6.2-1 will be added as indicated on the attached markup.

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.

Figure 2.6.2-1 Emergency Diesel Generator Mechanical System

Figure 2.2.6-2 Upper Guide Structure Assembly 2.2-52
Figure 2.2.7-1 Configuration of ICI Guide Tube System 2.2-57
Figure 2.4.1-1 Reactor Coolant System 2.4-17
Figure 2.4.1-2 Reactor Coolant System (Pressurizer) 2.4-18
Figure 2.4.2-1 In-containment Water Storage System 2.4-33
Figure 2.4.3-1 Safety Injection System 2.4-52
Figure 2.4.4-1 Shutdown Cooling System 2.4-68
Figure 2.4.5-1 Reactor Coolant Gas Vent System 2.4-80
Figure 2.4.6-1 Chemical and Volume Control System 2.4-95
Figure 2.6.1-1 AC Electrical Power Distribution System 2.6-13
Figure 2.6.3-1 Class 1E DC Power System 2.6-37
Figure 2.6.4-1 Instrumentation and Control Power System 2.6-45
Figure 2.7.1.2-1 Main Steam System 2.7-21
Figure 2.7.1.4-1 Condensate and Feedwater System 2.7-35
Figure 2.7.1.5-1 Auxiliary Feedwater System 2.7-52
Figure 2.7.1.8-1 Steam Generator Blowdown System 2.7-66
Figure 2.7.2.1-1 Essential Service Water System 2.7-80
Figure 2.7.2.2-1 Component Cooling Water System 2.7-99
Figure 2.7.2.3-1 Essential Chilled Water System 2.7-112
Figure 2.7.2.5-1 Equipment and Floor Drainage System 2.7-125
Figure 2.7.2.6-1 Process and Post-accident Sampling System 2.7-139
Figure 2.7.3.1-1 Control Room HVAC System 2.7-154
Figure 2.7.3.2-1 Fuel Handling Area HVAC System 2.7-166
Figure 2.7.3.3-1 Auxiliary Building Clean Area HVAC System 2.7-174
Figure 2.7.3.5-1 Emergency Diesel Generator Area HVAC System 2.7-196
Figure 2.7.3.5-2 Electrical and I&C Equipment Area HVAC System 2.7-197
Figure 2.7.3.5-3 Auxiliary Building Controlled Area HVAC System 2.7-198
Figure 2.7.4.3-1 Spent Fuel Pool Cooling and Cleanup System 2.7-219
Figure 2.7.5.2-1 Fire Protection System 2.7-237
Figure 2.7.6.1-1 Liquid Waste Management System 2.7-244
Figure 2.7.6.2-1 Gaseous Radwaste System 2.7-252

20. When the Class 1E EDG is started by an ESF actuation signal, all Class 1E EDG protection systems, except for overspeed and generator differential current, are automatically bypassed.

21. The moderate-energy piping systems are reconciled with pipe rupture hazards analyses report to ensure that the safety-related SSCs are protected against or are qualified to withstand the environmental effects associated with postulate failures of these piping systems.

22. The heat exchangers of the EDG cooling water system have the capacity to transfer heat from the diesel engine to the component cooling water system for maintaining the temperature of the diesel engine within an optimum operating range.

2.6.2.2 Inspection, Test, Analyses, and Acceptance Criteria

Table 2.6.2-3 specifies the inspections, tests, analyses, and associated acceptance criteria for the EDG system.

Table 2.6.2-1 (2 of 2)

Piping Name	Location	ASME Section III Class	Seismic Category
EDG starting system over speed air rack outlet lines up to EDG	EDG/Aux. Building	3	I
EDG starting system over speed air receiver inlet lines from starting air receiver	EDG/Aux. Building	3	I
EDG starting system starting air receiver discharge lines up to air starting valve	EDG/Aux. Building	3	I
EDG lubrication system lube oil/LT water heat exchanger inlet lines from EDG	EDG/Aux. Building	3	I
EDG lubrication system lube oil/LT water heat exchanger outlet lines up to three-way thermostat valve	EDG/Aux. Building	3	I
EDG lubrication system three-way thermostat valve outlet lines up to EDG	EDG/Aux. Building	3	I
EDG combustion air intake and exhaust system piping	EDG/Aux. Building	N/A	I
Lube oil/Preheating HT water heat exchanger outlet lines from check valve up to three-way thermostat valve	EDG/Aux. Building	3	I
Prelube oil engine inlet line from check valve	EDG/Aux. Building	3	I
Prelube oil engine outlet line up to prelube oil pump inlet isolation valve	EDG/Aux. Building	3	I

Fuel oil storage tank fill valves	DO-GV1001 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	Open/Close	-

Table 2.6.2-2 (1 of 3)

Emergency Diesel Generator System Components List

Component Name	Item No. (1), (2)	Location (2)	ASME Section Class	Seismic Category	Class 1E/Qual. for Harsh Envir.	Display/ Control at MCR	Display/ Control at RSR	Active Safety Function	Position at Loss of Motive Power
EDG Engines and Generators	DG-DG01 A/B/C/D	EDG/Aux. Building	3	I	Yes/No	Yes/Yes	Yes/Yes	Start	-
EDG fuel oil storage tanks	DO-TK01 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
EDG fuel oil transfer pumps 01	DO-PP01 A/B/C/D	EDG/Aux. Building	3	I	Yes/No	No/No	No/No	Start	-
EDG fuel oil transfer pumps 02	DO-PP02 A/B/C/D	EDG/Aux. Building	3	I	Yes/No	No/No	No/No	Start	-
EDG fuel oil day tanks	DO-TK02 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
EDG fuel oil transfer pump discharge line check valves	DO-CV-1005 A/B/C/D DO-CV-1007 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
HT water expansion tanks	DG-TK01 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
HT/CC water heat exchangers	DG-HE03 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
HT water thermostat valves	DG-3W-4217 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	Open/Close	-
LT water expansion tanks	DG-TK10 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-

EDG fuel oil feed pumps	DG-PP22 A/B/C/D	EDG/Aux. Building	3	I	Yes/No	No/No	No/No	Start	-

Preheating HT water pump inlet isolation valves	DG-GV-4230 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	Open/Close	Close
HT water inlet isolation valves	DG-CK-4231 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-

Table 2.6.2-2 (2 of 3)

Component Name	Item No. (1), (2)	Location (2)	ASME Section Class	Seismic Category	Class 1E/Qual. for Harsh Envir.	Display/ Control at MCR	Display/ Control at RSR	Active Safety Function	Position at Loss of Motive Power
LT/CC water heat exchangers	DG-HE02 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
LT water thermostat valves	DG-3W-4250 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	Open/Close	-
Lube oil/LT water heat exchangers	DG-HE30 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
Lube oil/LT water heat exchanger thermostat valves	DG-3W-4114 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	Open/Close	-
Starting Air receiver inlet check valves	DG-CV-4022 A/B/C/D DG-CV-4030 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
Starting air receivers	DG-TK40 A/B/C/D DG-TK41 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
Starting Air receiver relief valves	DG-RV-5023 A/B/C/D DG-RV-5031 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	Open	-
Starting Air receiver discharge line isolation valves	DG-GV-4048 A/B/C/D DG-GV-4049 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	Open/Close	-
Overspeed air receiver inlet check valves	DG-CV-~~4043~~ 4316 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-

Table 2.6.2-2 (3 of 3)

Component Name	Item No. (1), (2)	Location	ASME Section Class	Seismic Category	Class 1E/Qual. for Harsh Envir.	Display/ Control at MCR	Display/ Control at RSR	Active Safety Function	Position at Loss of Motive Power
Overspeed air receivers	DG-TK42 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-(3)	-
Overspeed air receiver relief valves	DG-RV-4041 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	Open	-
Air intake filters	DG-FT50 A/B/C/D	EDG/Aux. Building	N/A	I	-/No	No/No	No/No	-	-
Air intake silencers	DG-SL01 A/B/C/D	EDG/Aux. Building	N/A	I	-/No	No/No	No/No	-	-
Air exhaust silencers	DG-SL03 A/B/C/D	EDG/Aux. Building	N/A	I	-/No	No/No	No/No	-	-
Prelube oil pump inlet isolation valves	DG-GV-4232 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	Open /Close	Close
Prelube oil engine inlet check valves	DG-CV-4109 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-
Lube oil/Preheating HT water heat exchanger outlet check valves	DG-CV-4111 A/B/C/D	EDG/Aux. Building	3	I	-/No	No/No	No/No	-	-

(1) The column "Item No." is information only (not part of certified design).

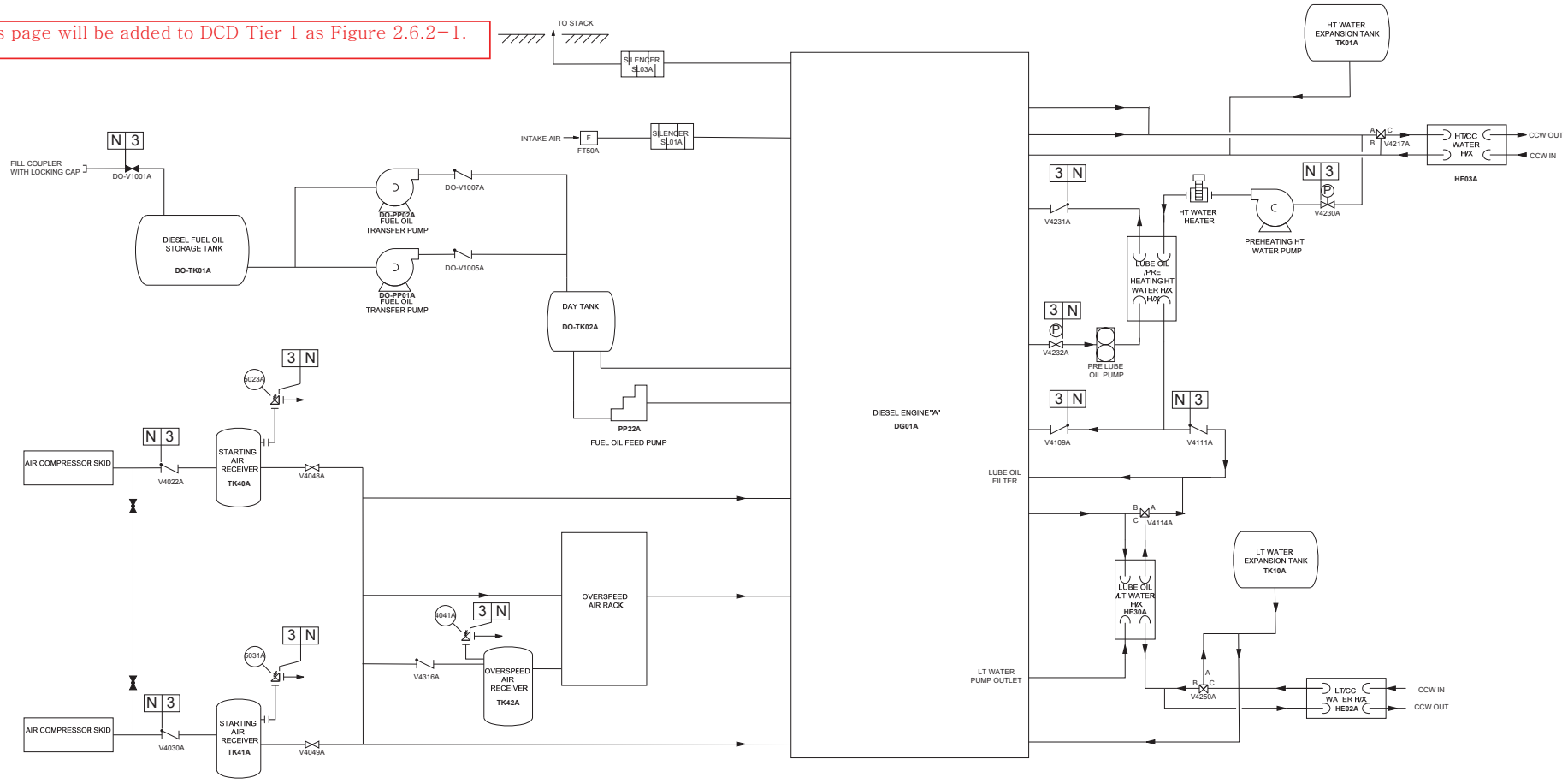
(2) Train A and B are located in EDG building.
Train C and D are located in Auxiliary building.

(3) Dash(-) indicates not applicable.

Table 2.6.2-3 (7 of 7)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
18. When running ina test mode, an EDG is capable of responding to an automatic start signal.	18. Tests will be performed with each EDG in a test mode configuration. An automatic start signal will be simulated.	18. When running in a test mode, each EDG resets to its automatic control mode upon receipt of a simulated automatic start signal.
19. Each Class 1E EDG is designed and sized to supply power to its train's safety-related loads after a LOOP or a LOOP concurrent with LOCA conditions.	19.a Analyses will be performed to verify that each Class 1E EDG is capable of supplying power to its train safety-related loads after a LOOP or a LOOP concurrent with LOCA conditions.	19.a A report exists and concludes that each Class 1E EDG is designed and sized to supply power to its train's safety-related loads after a LOOP or a LOOP concurrent with LOCA conditions.
	19.b Inspections will be performed to verify that the rating of each as-built Class 1E EDG is in accordance with the size requirements of the analysis.	19.b The rating of each Class 1E EDG bounds the size requirements of the analysis.
20. When the Class 1E EDG is started by an ESF actuation signal, all Class 1E EDG protection systems, except for overspeed and generator differential current, are automatically bypassed.	20. Tests will be performed to verify the as-built Class 1E EDG protection systems.	20. A report exists and concludes that the as-built Class 1E EDG protection systems, except for overspeed and generator differential current, are automatically bypassed when the Class 1E EDG is started by an ESF actuation signal.
21. The moderate-energy piping systems are reconciled with pipe rupture hazards analyses report to ensure that the safety-related SSCs are protected against or are qualified to withstand the environmental effects associated with postulate failures of these piping systems.	21. Inspections and analyses of the as-built moderate-energy piping and safety-related SSCs will be performed.	21. Pipe rupture hazard analysis report exits and concludes that the as-built safety-related SSCs are protected against or are qualified to withstand the effects of postulated pipe failures of the as-built moderate-energy piping system.
22. The heat exchangers of the EDG cooling water system have the capacity to transfer heat from the diesel engine to the component cooling water system for maintaining the temperature of the diesel engine within an optimum operating range.	22. Analysis will be performed to demonstrate the capability of the heat exchangers of the EDG cooling water system to transfer heat from the diesel engine to the component cooling water system for maintaining the temperature of the diesel engine within an optimum operating range.	22. A report exists and concludes that the heat exchangers of the EDG cooling water system have the capacity to transfer heat from the diesel engine to the component cooling water system for maintaining the temperature of the diesel engine within an optimum operating range.

This page will be added to DCD Tier 1 as Figure 2.6.2−1.



TRAIN A IS INDICATED AS REPRESENTATIVE OF TRAINS B, C, AND D.

Figure 2.6.2-1 Emergency Diesel Generator Mechanical System

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.:	**152-8006**
SRP Section:	**09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System**
Application Section:	**09.05.04**
Date of RAI Issue:	**08/10/2015**

Question No. 09.05.04-7

NUREG-0800, SRP Section 9.5.4, "Emergency Diesel Engine Fuel Oil Storage and Transfer System," Revision 3, paragraph 9.5.4.III.6.A, specifies that each storage tank has a stick gauge connection for determining its fuel level.

Based on its review of the DCD, the staff is unable to verify that each storage tank has a stick gauge connection for determining its fuel level.

The applicant is requested to update the DCD accordingly.

Response

As stated in DCD Tier 2, Subsection 9.5.4.2.2.1, “Fittings are provided for tank level instrumentation for each diesel fuel oil storage tank.”

DCD Tier 2, Figure 9.5.4-1 shows the level indicator which is located at the tank. Therefore, diesel fuel oil tank level can be monitored at the tank by the operator without a stick gauge.

Impact on DCD

There is no impact on the DCD.

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.