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.:	**140-8139**
SRP Section:	**09.05.01 – Fire Protection Program**
Application Section:	**09.05.01**
Date of RAI Issue:	**08/07/2015**

Question No. 09.05.01-32

GDC3, “Fire Protection,” states, in part, that “[s]tructures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions.

Regulatory Guide 1.189, “Fire Protection for Nuclear Power Plants,” Section 7.4, “Diesel Fuel Oil Storage Areas,” states that diesel fuel oil tanks with a capacity greater than 4,164 L (1,100 gal) should not be located inside buildings containing equipment important to safety.

DCD Tier 2, Table 9.5.1-1, “Fire Protection Program Conformance with NRC RG 1.189,” sheet (31 of 34) item 7.4, “Diesel Fuel Oil Storage Areas,” states that the APR1400 design conforms with the requirement that “diesel fuel oil tanks with a capacity greater than 4,164 L (1,100 gal) should not be located inside buildings containing equipment important to safety.”

DCD Tier 2, Table 9.5.1-2, “APR1400 Fire Protection Program Conformance with NFPA 804,” sheet (66 of 70) item 10.10, “Diesel Fuel Storage and Transfer Areas,” states that the APR1400 design conforms with the NFPA 804 requirement that “diesel fuel oil storage tanks shall not be located inside buildings containing other nuclear safety-related equipment.”

However, in DCD Tier 2, Section 9.5.4, “Emergency Diesel Engine Fuel Oil System (EDEFOS),” the applicant states that “[t]he emergency diesel engine fuel oil system EDEFOS has four diesel fuel storage structures, two in the auxiliary building (AB) …” DCD Tier 2, Table 9.5.4-1, “Emergency Diesel Engine Fuel Oil System Component Data,” indicates that each emergency diesel fuel oil storage tank has a capacity of 96,000 gallons.

The staff finds the above assertions contradictory since the auxiliary building houses safety-related equipment required to provide safe shutdown capability.

The applicant is requested to reconcile the above noted discrepancies. If applicable, the applicant is requested to provide justification for having two emergency diesel fuel oil system

storage tanks, each with a capacity greater than 1100 gallons, located inside a building that houses safety-related equipment required to provide safe shutdown capability.

Response

The emergency diesel engine fuel oil system (EDEFOS) has four diesel fuel storage structures, two beside the auxiliary building (AB) and the other two beside the emergency diesel generator building (EDGB). The areas containing the diesel fuel storage tanks are separated by 3-hour rated fire barriers from the AB and the EDGB. The locations of these structures are shown in DCD, Tier 2, Figures 1.2-10 and 1.2-13.

DCD Tier 2, Subsection 9.5.4.2.1 will be revised as follows:

Current description : The EDEFOS has four diesel fuel storage structures, two in the auxiliary building (AB) and the other two in emergency diesel generator building (EDGB). The EDEFOS is located in a seismic Category I building, which provides protection from the effects of natural phenomena and missiles.

Revised description : The EDEFOS has four diesel fuel storage structures, two beside the auxiliary building (AB) and the other two beside the emergency diesel generator building (EDGB). The EDEFOS is located in a seismic Category I building, which provides protection from the effects of natural phenomena and missiles. Each diesel fuel storage structure is separated by 3-hour rated fire barriers from the AB and the EDGB, respectively.

Impact on DCD

DCD Tier 2, page 9.5-43 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.

h. The 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.

i. The EDEFOS is capable of being filled with fuel oil from an external source within 7 days following a DBA, without interruption of diesel engine operations.

9.5.4.2 System Description

9.5.4.2.1 General Description

Each diesel fuel storage structure is separated by 3-hour rated fire barriers from the AB and the EDGB, respectively.

The EDEFOS is shown in Figure 9.5.4-1. The system is intended to operate during and after a DBA and is designated as safety Class 3, seismic Category I, and electrical Class 1E. The EDEFOS and components conform with the requirements of NFPA 30 (Reference 53) and 37 (Reference 54) for fire protection.

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The EDEFOS has four diesel fuel storage structures, two ~~in~~ the auxiliary building (AB) and the other two ~~in~~ emergency diesel generator building (EDGB). The EDEFOS is located in a seismic Category I building, which provides protection from the effects of natural phenomena and missiles.

Each diesel fuel storage structure is a reinforced, missile-protected underground vault separated into an oil storage bay and an equipment area. The oil storage bay is separated from the equipment area by 3-hour rated fire barriers to the height of oil spill upon tank rupture. The oil storage bay contains a diesel fuel oil storage tank and necessary piping.

The diesel fuel storage structure is designed to allow personnel access for maintenance, inspection, and testing of components located within the structure during various modes of plant operation.

Each diesel fuel oil storage tank has a fill connection with a locking cap that is locked to prevent entry of moisture. The fill connection terminates in a box allowing replenishment of diesel fuel from outside supply sources without stopping operation of diesel generators. The fill connection is located above flood level to prevent floodwater from entering the EDEFOS.

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Question No. 09.05.01-33

10 CFR 52.47(b)(1) requires, in part, a DC application to contain "{t}he 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; …"

Regulatory Guide 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," Section A-1.o, "Auxiliary and Miscellaneous Systems," lists the fire protection systems, including manual and automatic operation of fire detection, alarm, suppression and smoke control systems as well as the types of systems for which performance should be demonstrated by testing.

In DCD Tier 2 Section 9.5.1.4, "Inspection and Testing Requirements," the applicant states:

> "Preoperational testing is described in Section 14.2."

The staff reviewed DCD Tier 2, Section 14.2.12.1.85, "Fire Protection System Test," Item 1.0, "OBJECTIVES," and finds that the only objective is to demonstrate the ability of the fire protection system to provide water at acceptable flows and pressure to protected areas. The staff also finds that the items listed under Section 14.2.12.1.85, Item 3.0, "TEST METHOD," do not refer to any method of testing. These items refer to demonstration and verification of different fire protection systems.

The applicant is requested to:

1. Move the 7 items listed under DCD Tier 2 Section 14.2.12.1.85, “Fire Protection System Test,” Item 3.0, “TEST METHOD,” to Item 1.0, “OBJECTIVES.”

2. Under Item 3.0, “TEST METHOD,” state that the initial fire protection systems’ testing will be in accordance with the criteria in the codes and standards referenced in DCD Tier 2 Section 9.5.1, “Fire Protection Program.”

Response

Tier 2, Subsection 14.2.12.1.85 will be revised to move the seven items listed under Tier 2, Subsection 14.2.12.1.85, "Fire Protection System Test," Item 3.0, "TEST METHOD," to Item 1.0, "OBJECTIVES" and underItem 3.0, "TEST METHOD," to the following statement will be added: "Demonstrate that the initial fire protection system testing is in accordance with the criteria in the codes and standards referenced in DCD Tier 2, Subsection 9.5.1, ‘Fire Protection Program.’”

Impact on DCD

DCD Tier 2, Subsection 14.2.12.1.85 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.

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

2.4 Test instrumentation is available and calibrated.

2.5 Electrical power supply available.

3.0 TEST METHOD

3.1 Produce simulated variations of temperature signals and verify the automatic on-off switching of heaters within the system.

3.2 Demonstrate the operation of controls and alarms.

1.2 To demonstrate the proper operation of the fire detection system

1.3 To demonstrate the head and flow characteristics of the fire water pumps, and the operation of all auxiliaries

1.4 To verify control logic

1.5 To verify flow rates in the various flow paths of the fire protection water distribution system

1.6 To verify sprinkler and deluge spray patterns where possible

1.7 To verify alarms, indicating instruments, and status lights are functional

1.8 To verify proper operation of smoke control and fire dampers under the design air flow condition

14.2.12.1.85 Fire Protection System Test

1.0 OBJECTIVE

1.1 To demonstrate the ability of the fire protection system (FPS) to provide water at acceptable flows and pressures to protected areas

2.0 PREREQUISITES

2.1 Construction activities on the FPS have been completed.

2.2 FPS instrumentation has been calibrated

3.1 Demonstrate that the initial fire protection system testing is in accordance with the criteria in the codes and standards referenced in DCD Tier 2 Subsection 9.5.1, "Fire Protection Program."

2.4 Test instrumentation is available and calibrated.

3.0 TEST METHOD

~~3.1 Demonstrate the proper operation of the fire detection system.~~

~~3.2 Demonstrate the head and flow characteristics of the fire water pumps, and the operation of all auxiliaries.~~

~~3.3 Verify control logic.~~

~~3.4 Verify flow rates in the various flow paths of the fire protection water distribution system.~~

~~3.5 Verify sprinkler and deluge spray patterns where possible.~~

~~3.6 Verify alarms, indicating instruments, and status lights are functional.~~

~~3.7 Verify proper operation of smoke control and fire dampers under the design air flow conditions.~~

4.0 DATA REQUIRED

4.1 Setpoints under which alarms and interlocks occur

4.2 Sprinkler and deluge spray patterns

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Question No. 09.05.01-34

GDC3, “Fire Protection,” states, in part, that “[s]tructures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions.

Regulatory Guide 1.189, “Fire Protection for Nuclear Power Plants,” Section 4.2, “Passive Fire-Resistive Features,” states that fire barriers are those components of construction (walls, floors, and their supports), including beams, joists, columns, penetration seals or closures, fire doors, and fire dampers that are rated by approving laboratories in hours of resistance to fire and are used to prevent the spread of fire.

In DCD Tier 2, Section 9.5.4, “Emergency Diesel Engine Fuel Oil System,” the applicant states

> “The oil storage bay is separated from the equipment area by 3-hour rated fire barriers to the height of oil spill upon tank rupture. The oil storage bay contains a diesel fuel oil storage tank and necessary piping.”

The applicant is requested to justify how a 3-hour rated fire barrier to the height of oil spill will prevent the spread of fire.

Response

Each diesel fuel storage structure consists of an oil storage bay and an equipment area. The oil storage bay is separated from the equipment area by a wall to the height of oil spill upon tank rupture.

DCD Tier 2, Subsection 9.5.4.2.1 will be revised as follows:

Current description : The oil storage bay is separated from the equipment area by 3-hour rated fire barriers to the height of oil spill upon tank rupture.

Revised description : The oil storage bay is separated from the equipment area by a wall to the height of oil spill upon tank rupture.

Impact on DCD

DCD Tier 2, Subsection 9.5.4.2.1 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.

h. The 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.

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9.5.4.2 System Description

9.5.4.2.1 General Description

The EDEFOS is shown in Figure 9.5.4-1. The system is intended to operate during and after a DBA and is designated as safety Class 3, seismic Category I, and electrical Class 1E. The EDEFOS and components conform with the requirements of NFPA 30 (Reference 53) and 37 (Reference 54) for fire protection.

The EDEFOS has four diesel fuel storage structures, two in the auxiliary building (AB) and the other two in emergency diesel generator building (EDGB). The EDEFOS is located in a seismic Category I building, which provides protection from the effects of natural phenomena and missiles.

Each diesel fuel storage structure is a reinforced, missile-protected underground vault separated into an oil storage bay and an equipment area. The oil storage bay is separated from the equipment area by ~~3-hour rated fire barriers~~ a wall to the height of oil spill upon tank rupture. The oil storage bay contains a diesel fuel oil storage tank and necessary piping.

The diesel fuel storage structure is designed to allow personnel access for maintenance, inspection, and testing of components located within the structure during various modes of plant operation.

Each diesel fuel oil storage tank has a fill connection with a locking cap that is locked to prevent entry of moisture. The fill connection terminates in a box allowing replenishment of diesel fuel from outside supply sources without stopping operation of diesel generators. The fill connection is located above flood level to prevent floodwater from entering the EDEFOS.