
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.: 186-8009
SRP Section: 09.05.07 – Emergency Diesel Engine Lubrication System
Application Section: 09.05.07
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Question No. 09.05.07-1

APR-1400 DCD Tier 2 Section 9.5.7.2.1 states that, while in standby, the motor-driven prelube oil pump draws oil from the engine sump tank and delivers it through the lube oil/preheating water heat exchanger and the full-flow filter to the engine. DCD Tier 2 Section 9.5.7.2.1 states that, while in standby, the motor-driven prelube oil pump draws oil from the engine sump tank and delivers it through the lube oil/preheating water heat exchanger and the full-flow filter to the engine.

NUREG/CR-0660, “Enhancement of Onsite Emergency Diesel Generator Reliability,” cautions against pre-lube periods exceeding 5 minutes unless approved by the diesel manufacturer. NUREG-0800, SRP 9.5.7, Section III.3.F and G, which is based on NUREG/CR-0660, state similar caution.

The applicant is requested to justify the emergency diesel engine lubrication system (EDELS) compliance with the guidelines presented in NUREG/CR-0660, and revise the DCD accordingly to clarify compliance with the above guidelines.

Response

NUREG/CR-0660 states that,

“It is recommended that pre-lube periods for general engine lubrication of a maximum of approximately 3 to 5 minutes be required preceding all engine starts except for an actual or simulated emergency start.”

The motor-driven prelube oil pump continuously delivers oil to the engine, while in standby mode for actual start.

Also, NUREG-0800, SRP 9.5.7, Section III.3.F states that,

“The prelube time interval prior to manual starting of the engine should be limited to three to five minutes unless otherwise recommended by the diesel engine manufacturer.”

In APR1400, the Emergency Diesel Generators (EDGs) are started in the following modes:

- a. Automatic start by Engineered Safety Feature Actuation Signal (ESFAS)
- b. Normal manual start by local switch actuation in EDG control room
- c. Emergency manual start by the emergency start and stop pushbuttons in the MCR and RSR

During the normal operation of the plant, the EDGs are in standby mode for automatic start, not for manual start.

For manual start, the prelube time interval will be described in the DCD Tier 2, Subsection 9.5.7.2.2.

Impact on DCD

DCD Tier 2, Subsection 9.5.7.2.2 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.

APR1400 DCD TIER 2

A pressure-regulating valve on the oil header maintains proper oil pressure by relieving excess oil back to the lube oil sump tank.

In standby mode, the motor-driven prelube oil pump draws oil from the engine sump tank and delivers it through the lube oil/preheating water heat exchanger and the full-flow filter to the engine. The lube oil/preheating water heat exchanger keeps the lubricating oil warm. During engine operation, the prelube oil pump is shut down. Prelubrication of the engine with warm lubricating oil provides reasonable assurance of rapid, reliable starting and load capability while minimizing bearing wear.

The diesel engine crankcase is vented to the atmosphere through the roof of the building via a lube oil separator. The engine lube oil sump tank is vented to the atmosphere through the roof. The crankcase is equipped with blowout panels to prevent high pressures from damaging the diesel engine.

Lubricating oil leakage is detected by routine surveillance, low-level alarm in the lube oil sump tank, and low engine inlet pressure and alarm. System leakage into the lube oil system through the lube oil/LT water heat exchanger is minimized by the normal operating pressure of the lube oil being higher than the LT water pressure. Oil leakage from the diesel engine is collected in a sump in the EDG room. Corrections are made in accordance with applicable operating and maintenance procedures.

Makeup to the engine lube oil sump tank by gravity is manually initiated from the lube oil makeup tank. The oil feed line from the lube oil makeup tank is raised above the makeup tank floor to prevent any accumulated water from entering the diesel engine lube oil sump tank.

The three-way thermostat valve splits the lube oil flow so only as much water passes through the heat exchanger as needed to maintain the proper lube oil outlet temperature. The remainder bypasses the heat exchanger and returns directly to the water pump so that the total lube oil flowing through the pump and engine remains essentially constant regardless of the ambient temperature of engine loading.

9.5.7.3 Safety Evaluation

The prelube time interval prior to manual starting of the EDG is limited to three to five minutes unless otherwise recommended by the diesel engine manufacturer.

The portions of the EDELS that are required for the performance of its safety function are classified as safety-related, seismic Category I, safety Class 3. The EDELS is designed to