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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.: 61-7984  
SRP Section: 08.03.01 – AC Power Systems (Onsite)  
Application Section: 8.3.1  
Date of RAI Issue: 07/06/2015

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### **Question No. 08.03.01-5**

In Section 8.3.1.1, page 8.3.1-1, of the DCD Tier 2, the applicant states that “The COL applicant is to provide and to design a mobile generator and its support equipment (COL 8.3.1).” The staff notes that approximate sizing information of certain major equipment is provided. It appears that the sizing criteria for the mobile generator equipment and determining the design details are left for the Combined Operating License (COL) applicants to decide based on site specific information. However, the applicant has not provided any design aspects, including physical location, connection configuration, the method of transferring the source to safety buses, specification of the equipment, details of support equipment, and the methodology to determine the capacity of the mobile generator for its intended function during loss of all AC power in the scenario of a beyond design basis external event.

Provide a summary of the design aspects of the mobile generator, including anticipated physical location, connection configuration, the method of transferring the source to safety buses, specification of the equipment, details of support equipment.

Please discuss the methodology to determine the capacity of the mobile generator to show it can complete its intended function during loss of all AC power in the scenario of a beyond design basis external event.

### **Response – (Rev. 1)**

The following provides a summary of design aspects of [the mobile generators](#) and the methodology to determine the capacity of [the mobile generators](#).

The APR1400 engages two types of mobile [generators](#) to cope with each phase of mitigation strategies for beyond-design-basis external events (BDBEEs). Two redundant (N+1 requirement) 480V [mobile gas turbine generators \(GTGs\)](#) and one 4.16 kV mobile [generator](#) are credited to power the Class 1E load center (LC) and switchgear (SWGR), respectively.

The details of the mitigation strategies for BDBEEs are provided in DCD Tier 2, Section 19.3 and Technical Report APR1400-E-P-NR-14005-P, Evaluations and Design Enhancements to Incorporate Lessons Learned from Fukushima Dai-Ichi Nuclear Accident.

In DCD Tier 2, each related section of Chapter 8 will be revised as shown in the attachment to describe the details of the mitigation strategies for BDBEEs.

#### Anticipated physical location of the mobile generators

As mentioned in DCD Tier 2, Subsection 19.3.2.3.4, details of the storage location for FLEX, including mobile generators, are to be addressed by the COL applicant (COL 19.3(4)).

The 480V mobile GTGs are located onsite and the 4.16 kV mobile generator is mobilized from offsite.

The storage location of the 480V mobile GTGs will consider probable flooding levels at the site in the event of natural flooding due to rainfall or breakdown of a nearby dam, or tsunamis as applicable. The flood requirements for wet sites are also to be addressed by the COL applicant (COL 19.3(2)).

As stated in DCD Tier 2, Subsection 8.3.1.1, connection boxes are provided for each connection between the mobile generators and the Class 1E LC or SWGR buses in the entry and exit of the auxiliary building; hence, the mobile generators will operate near the connection boxes.

The storage location of the 480V mobile GTGs will also consider accessibility (i.e., moving routes) to the connection box.

#### Connection configuration

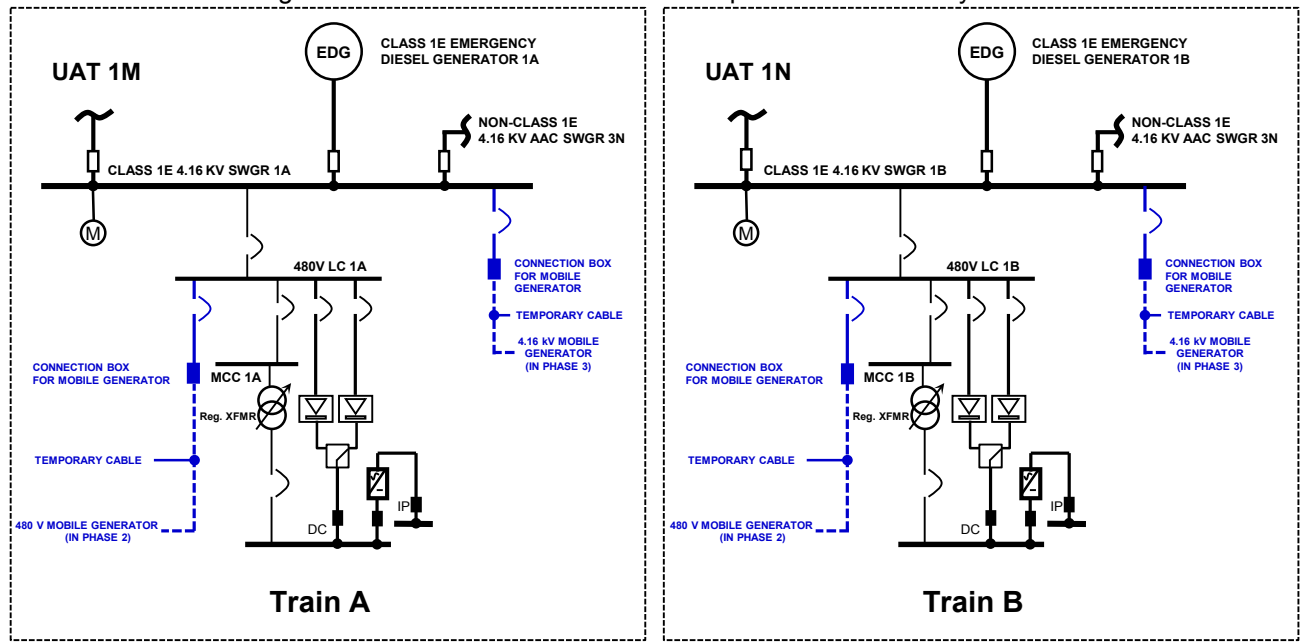
Class 1E loads are divided into two redundant load groups (Divisions I and II). Each division has two independent subsystem trains: trains A and C (Division I) and trains B and D (Division II). The mobile generators are connected to the Class 1E power system train A or B at each phase of the mitigation strategies for BDBEEs.

- Phase 2 : 480V mobile GTG connected to the LC bus
- Phase 3 : 4.16 kV mobile generator connected to the SWGR bus

The mobile generators supply power to the Class 1E bus through connection boxes. Power cables between the connection boxes and the incoming circuit breakers of the Class 1E buses are permanent installations. Connections between the mobile generators and the connection boxes are implemented by temporary cabling.

To illustrate the preceding, a simplified single-line diagram is provided below.

< The mobile generators are connected to Class 1E power distribution system train A or B.>



### Method of transferring the source to safety buses

Transfer of each mobile generator to a Class 1E bus (480V LC or 4.16 kV SWGR) is implemented in the following manner:

- 1) Connection of loads
  - Shed all connected loads at the bus and then connect the loads to be supplied from the mobile generator.
- 2) Transport of mobile generator and temporary cables
  - Transport the mobile generator and temporary cables near the connection box located in the entry and exit of the auxiliary building
- 3) Connection of temporary cables and ground cables
  - Connect temporary cables to the connection box and ground cables to the ground pad near or inside auxiliary building
- 4) Starting mobile generator
  - Place the starting switch to the "START" position at the local control panel of the mobile generator
  - Verify the generator rated output voltage ( $\pm 10\%$ ) and frequency ( $\pm 2\%$ ) at the local control panel of the mobile generator

- 5) Closing output breaker of mobile generator and incoming circuit breaker (CB) of Class 1E buses
  - Place the output breaker switch to the "CLOSE" position at the local control panel of the mobile generator
  - Close the incoming CBs to the Class 1E buses
  - Verify the buses voltage ( $\pm 10\%$ ) and frequency ( $\pm 2\%$ ) at the MCR

A detailed procedure will be established by the COL applicant in the framework of mitigation strategies for BDBEEs which are addressed by COL 19.3(9).

#### Specification of the equipment and details of support equipment

As stated in COL item 8.3(1), detailed design of the 4.16 kV mobile generator and the 480V mobile GTGs including support equipment (fuel oil transfer, cooling, lubrication, starting equipment, etc.) and specification of the equipment is in the scope of the COL applicant.

The COL applicant may choose state-of-the-art technologies and technical specifications suitable for the site conditions and the parameters and required function of the mobile generators.

Fuel oil supplied to the mobile generators is provided from existing onsite EDG fuel oil storage tanks.

#### Methodology to determine the capacity of the mobile generators

As described in DCD Tier 2, Section 19.3, two types of mobile generators are considered for mitigation strategies for BDBEEs as follows:

- To cope with Phase 2 of mitigation strategies for BDBEEs, two 480V mobile GTGs are provided.
- To cope with Phase 3 of mitigation strategies for BDBEEs, one 4.16 kV mobile generator is provided.

DCD Tier 2, Subsection 19.3.2.3.1.1 (full-power operation) describes the scenario of a loss of offsite power (LOOP) with concurrent loss of all ac power and loss of normal access to the ultimate heat sink (LUHS).

Under this operation scenario, two redundant 480V mobile GTGs are each credited to power the Class 1E 480V load center loads during Phase 2 and the 4.16 kV mobile generator is credited to power the Class 1E switchgear loads during Phase 3.

Considering the required loads during Phase 2 and Phase 3, loading of the 480V mobile GTGs and the 4.16 kV mobile generator was evaluated as shown in Table 5-4 of the Technical Report APR1400-E-P-NR-14005-P (Rev. 2). Selected ratings of the 480V mobile GTGs and the 4.16 kV mobile generator are 1,000 kW and 5,000 kW, respectively.

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A detailed breakdown of the electrical loading of the 480V mobile GTGs and the 4.16 kV mobile generator is provided in Appendix C of Technical Report APR1400-E-P-NR-14005-P.

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**Impact on DCD**

The changes that were proposed in the original response to this RAI have been incorporated into Revision 2 of the DCD.

The pages containing proposed changes (DCD Tier 2, Figure 8.1-1, Subsections 8.3.1.1, 8.3.3, and Figure 8.3.1-1) as a result of Revision 1 of this response are included in the response to RAI 420-8482 Question 19.03-36 Rev.1.

**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.