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.:	**420-8482**
SRP Section:	**19.03 – Beyond Design Basis External Event (APR1400)**
Application Section:	**DCD 19.3, Ch. 8, Ch. 9**
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Question No. 19.03-32

NRC Commission paper SECY-12-0025 stated that the NRC staff expected new reactor design certification applications to address the Commission-approved Fukushima actions in their applications to the fullest extent practicable. In performing its review of the APR1400 design certification application, the NRC staff followed the guidance for satisfying the Commission directives regarding BDBEE mitigation strategies in Japan Lesson-Learned Project Directorate JLD-ISG-2012-01, Revision 0, which endorsed with clarifications the methodologies described in NEI 12–06, Revision 0. The guidance in JLD-ISG-2012-01 describes one acceptable approach for satisfying the Commission directives regarding BDBEE mitigation strategies (i.e., Order EA-12-049). TR APR1400-E-P-NR-14005-P, Rev. 0 provides details regarding mitigating strategies and design enhancements to meet Near-Term Task Force (NTTF) recommendations, NRC orders, and agency guidance related mitigation strategy during Beyond Design Basis External Events (BDBEE).

TR, APR1400-E-P-NR-14005-P, Revision 0, Section 5.1.2.6.1.2, “DC Power” states in part that during Phase 2, a 480 V mobile GTG is connected to either Train A or Train B of the Class 1E load center to supply power and recharge respective batteries to fully charged condition. During battery charging in Phase 2, forced ventilation of battery rooms or racks may be required to prevent an unacceptable buildup of hydrogen released during the charging process. Ventilation of battery rooms may be needed to maintain an acceptable temperature for long-term battery operation. NRC Regulatory Guide 1.128, states that each ventilation system of the Class 1E battery rooms limits hydrogen accumulation to less than 1 percent of the total volume of the battery area. DCD Section 8.3.2.2.2, “Conformance with NRC Regulatory Guides,” states in part that each ventilation system of the Class 1E battery rooms limits hydrogen accumulation to less than 1 percent of the total volume of the battery area. TR, APR1400-E-P-NR-14005-P, Revision 0 does not identify considerations related to the need for battery room ventilation.

1. Explain how APR1400 design mitigation strategies will address ventilation requirements in support of battery charging and operation.

2. Provide a discussion on the hydrogen gas exhaust pathway. Also provide a discussion on how hydrogen concentration in the battery rooms will be maintained below the limits established by national standards and codes (i.e., less than 1% according to the National Fire Code and Regulatory Guide 1.128, “Installation Design and Installation of Vented Lead-Acid Storage Batteries for Nuclear Power Plants,” which endorses IEEE Standard 484, “IEEE Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications,” with exceptions) when the batteries are being recharged during Phase 2. Specifically address considerations related to preventing unacceptable buildup of hydrogen and need for ventilation to maintain an acceptable temperature range for long-term battery operation.

3. Explain whether only Train A or Train B Class 1E batteries are recharged or whether there is charging done to the Train C or Train D Class 1E batteries during Phase 2.

Response

1. The battery room supply fans, battery room exhaust fans, and battery room electrical duct heater (EDH) in Train A or B are powered from the 480V mobile gas turbine generator (GTG) during Phase 2. The battery room supply fan supplies filtered outside air to the battery room and the air in the battery room is exhausted by the battery room exhaust fan to maintain hydrogen gas concentration at less than one (1) percent by volume in the battery room.

2. There is no hydrogen generation from the Train C or D Class 1E battery, because the Train C or D Class 1E battery is not recharged during the coping phases (Phases 1, 2, and 3). Hydrogen is generated by the Train A or B Class 1E battery, which is recharged during Phase 2. To maintain hydrogen gas concentration at less than one (1) percent by volume within the battery room according to Regulatory Guide 1.128, air in the battery room in Train A or B is exhausted by operating the battery room exhaust fan to the atmosphere through the exhaust duct. The hydrogen gas exhaust pathway is as follows:

   A) Train A battery room (100-A11A): The air in the room is exhausted to the HVAC chase (078-A16C) through the exhaust duct. The HVAC chase is connected to the atmosphere at the roof of the auxiliary building.

   B) Train B battery room (100-A11B): The air in the room is exhausted to the HVAC chase (078-A16D) through the exhaust duct. The HVAC chase is connected to the atmosphere at the roof of the auxiliary building.

   According to IEEE 484-2002, extreme ambient temperatures should be avoided because low temperatures decrease battery capacity, while prolonged high temperatures shorten battery life. During normal operation, the battery room is maintained in the temperature range of 65°F to 85°F by operating the safety-related battery room cooler and hydrogen gas concentration in the battery room is maintained at less than one (1) percent by volume by operating the supply fan and exhaust fan. However, the cooler for the battery room does not perform the cooling function, because chilled water from the essential chiller is not supplied to the cooler during Phase 2. Therefore, the temperature of the battery room is maintained around the

temperature of the outside air supplied by the battery room supply fan during summer season (100°F), because heat generation from the battery is less than 0.2 kW. The battery's ability to be operable at 113°F during 72 hours provides power for vital loads. Also, the minimum temperature of the battery room, 65°F, is maintained by operating the electric duct heater to preserve battery capacity.

3. Since a 480V mobile GTG is connected to the 480V Class 1E power system Train A or B during Phase 2, either Train A or B Class 1E batteries are recharged during Phase 2. The Train C or D Class 1E batteries are not recharged during the coping phases (Phases 1, 2, and 3).

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.