
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.: 297-8309
SRP Section: 19.03 – Beyond Design Basis External Event
Application Section: 19.3
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Question No. 19.03-1

NRC Commission paper SECY-12-0025 (February 17, 2012), “Proposed Orders and Requests for Information in Response to Lessons Learned from Japan’s March 11, 2011, Great Tohoku Earthquake and Tsunami,” stated that the NRC staff expected new reactor design certification or license applications (e.g., construction permit, operating license, and combined license) not yet then-submitted to address the Commission-approved Fukushima actions in their applications, prior to submittal, to the fullest extent practicable. In SECY-12-0025, the NRC staff outlined a three-phase approach regarding mitigation strategies to respond to beyond-design-basis external events (BDBEES). The initial phase involved the use of installed equipment and resources to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling without alternating current power. The transition phase involved providing sufficient, portable, onsite equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from offsite. The final phase involved obtaining sufficient offsite resources to sustain those functions indefinitely.

The NRC staff provided guidance for satisfying the Commission directives regarding BDBEE mitigation strategies in Japan Lesson-Learned Project Directorate (JLD)-ISG-2012-01, Revision 0, “Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” (ADAMS Accession No. ML12229A174). JLD-ISG-2012-01 endorsed with clarification the methodologies described in the industry guidance document Nuclear Energy Institute (NEI) 12–06, Revision 0, “Diverse and Flexible Coping Strategies (FLEX) Implementation Guide,” (ADAMS Accession No. ML12242A378). The guidance in JLD-ISG-2012-01 describes one acceptable approach for satisfying the Commission directives regarding BDBEE mitigation strategies.

APR1400 DCD Tier 2, Section 19.3, “Beyond Design Basis External Event,” describes the mitigation strategies to manage and mitigate external events that are beyond the design basis of the APR1400 nuclear power plant. This section in the DCD addresses the conformance of the APR1400 design with SECY-12-0025 and Commission Order EA-12-049, and other related documents.

The NRC staff requests that the APR1400 design certification applicant describe the performance requirements as part of the mitigation strategies (including initial full-power operation and mid-loop operation) to ensure core cooling, containment function, and spent fuel pool cooling capabilities during a BDBEE at an APR1400 nuclear power plant as follows:

- a) All safety-related installed pumps, valves, and dynamic restraints that will be used at the APR1400 plant as part of the mitigation strategies for an extended loss of ac power event;
- b) All non-safety related installed pumps, valves, and dynamic restraints that will be used at the APR1400 plant as part of the mitigation strategies for an extended loss of ac power event; and
- c) All portable or FLEX flow systems (including pumps, valves, and dynamic restraints) that will be used at the APR1400 plant as part of the mitigation strategies for an extended loss of ac power event.

Response – (Rev. 2)

- a) A summary of safety-related installed pumps and valves that will be used as part of the mitigation strategies for an extended loss of ac power event will be added to Technical Report, [Evaluations and Design Enhancements to Incorporate Lessons Learned from Fukushima Daichi Nuclear Accident \(APR1400-E-P-NR-14005-P/NP\)](#) as indicated in Attachment 1. Because the performance requirements of these pumps and valves are described in various chapters and sections of the DCD Tier 2, the added table provides cross references to the respective DCD chapters and sections for the performance requirements for this safety related pumps and valves.

Please note that mitigating strategies to address BDBEE does not include any dynamic restraints (snubbers) in the piping design, hence, they are not identified within the technical report.

- b) The installed non-safety related valves for the Spent Fuel Pool external makeup and spray water, and Emergency Containment Spray Backup System (ECSBS) are identified in the Technical Report APR1400-E-P-NR-14005-P/NP, Section 6.2.3 for SFP and Section 5.1.2.5.3 for ECSBS respectively. Further, Figure 6-3 and Table 6-1 of the Technical Report depict the installed non-safety related valves in the SFP external makeup and spray lines. DCD Tier 2, Figure 6.2.2-1 identifies the installed valves in the ECSBS.

Both of these systems have installed valves that are non-safety related (Quality Group D) but are qualified to Seismic Category I. Since these are in-line on/off valves, there is no specific regulating performance requirement for these components.

Please note that there are no installed non-safety related pumps and/or snubbers in the scope of the APR1400 design to mitigate BDBEE on core cooling, containment functions, and SFP cooling.

- c) The following are the performance requirements for the portable or FLEX equipment utilized to mitigate the BDBEE as discussed in Technical Report APR1400-E-P-NR-14005-P/NP:

Items	Performance Requirements	Reference (TeR)
Primary side high-head FLEX Pump	To supply makeup water to RCS when ACP is not available. Design flowrate of 50 gpm at operating pressure of 1,500 psia	Sections 5.1.2.3.1.2.2 & 6.2.2.2
Primary side low-head FLEX Pump	To supply makeup water to RCS. Design flowrate of 750 gpm at TDH of 525 ft	Sections 5.1.2.3.3.2 & 6.2.2.2
Secondary side FLEX Pump	To supply cooling water to associated SG when TDAFWP is not available. Design flowrate of 310 gpm at a TDH of 525 ft	Sections 5.1.2.3.1.2.2 & 6.2.5.2
SFP Makeup FLEX Pump	To supply makeup water to SFP. Design flowrate of 500 gpm at a discharge pressure head of 105 ft	Sections 5.1.2.4.1.2 & 6.2.3.2
SFP Spray FLEX Pump	To supply makeup water to SFP. Design flowrate of 200 gpm at a discharge pressure head of 107 ft	Sections 5.1.2.4.1.2 & 6.2.3.2
SFP Isolation Valves at makeup and spray connections	Primary and secondary piping connections with proper fittings are provided with isolation valves.	Section 6.2.3.1 & Table 6-1
ECSBS FLEX Pump	To prevent containment over-pressurization. Design flowrate of 750 gpm at a discharge pressure head of 656 ft	Section 5.1.2.5.2.3 & Figure 5-2 & 5-3
480 V mobile GTG	To supply the power to Class 1E 480 V load centers, and etc. in Train A or B in Phase 2. Capacity of 1,000 kW	Sections 5.1.2.6.1.1 & 6.2.6.1; Table 5-5
4.16 kV mobile generator	To supply the power to 4.16 kV switchgear, etc. in Train A or B during Phase 3. Capacity of 5,000 kW	Sections 5.1.2.6.1.1 & 6.2.6.1; Table 5-5
Fuel Oil Supply Isolation Valves on DFODT A and B	In-line valves to supply fuel oil to the 4.16 kV mobile generator or 480V mobile GTGs and FLEX pumps	Table 6-1
Raw Water Supply Isolation Valves	In-line valves to supply raw water to the FLEX pumps	Figure 6-2

The COL applicant is responsible for determining the final FLEX pump design head considering site conditions. The COL 19.3(5) in DCD Tier 2, Subsections 19.3.2.3.4 will be revised to clarify the scope of COL for the FLEX pumps as indicated in Attachment 2.

Also, Technical Report APR1400-E-P-NR-14005-P/NP will be revised to clarify the performance requirements for the FLEX equipment and the requirements for COL applicant as indicated in the Attachment 2.

The section and figure numbers for references related to ECSBS FLEX Pump are changed since that information was previously changed in the revised response to RAI 393-8432, Question 19.03-13, Rev.1. Therefore, the performance requirement of ECSBS FLEX Pump will be clarified in the revised response of RAI 393-8432, Question 19.03-13, Rev.2.

Impact on DCD

The changes that were proposed in the revised response (Rev.1) to this RAI have been incorporated into Revision 2 of 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

The changes that were proposed in the revised response (Rev.1) to this RAI have been incorporated into Revision 2 of the Technical Report APR1400-E-P-NR-14005-P/NP.