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.:	**401-8402**
SRP Section:	**19.03 – Fukushima**
Application Section:	**19.3**
Date of RAI Issue:	**02/08/2016**

Question No. 19.03-22

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.

Technical Report, APR1400-E-P-NR-14005-P, Section 5.1.2.5.3 credits the Raw Water Tank (RWT) as an on-site water source used to maintain containment capabilities. However, the RWT and its associated structures and systems (i.e., flow path) relied upon to deliver water to the suction of a FLEX pump are not described in the DCD or the Technical Report. The staff requests that the applicant provide appropriate information in the DCD on the design of the

RWT water source and its associated flow path (structures, piping, components, and connections) to deliver water to support the containment mitigating strategy and assess if the RWT water source and its associated flow path to the suction of FLEX pump are robust with respect to seismic events, floods, high winds, and associated missiles.

Response – (Rev. 1)

The design of the raw water system including the raw water tank is not involved in the DC phase. To design the raw water tank and its associated flow path (structures, piping, components, and connections), the site specific design data (water demand, site location, raw water tank location, raw water source supply location, etc.) will be determined during the COL phase.

Therefore, the detailed design of the raw water tank related with site specific data is the responsibility of COL applicant. The COL applicant will confirm the specific design of raw water tank including associated instrument, capacity, location, flow path to the on-site, the valve pit connected to FLEX equipment, and so on. Also, the COL applicant will confirm that the RWT and flow path to the FLEX equipment (structures, piping, components, and connections) are designed to be robust with respect to seismic events, floods, high winds, and associated missiles. The COL items will be added as below.

> "COL 19.3(12) The COL applicant is to confirm, satisfy or fulfill the specific design functional requirements of raw water tank including the associated instrument, capacity, location, flow path to on-site, the valve pit connected to FLEX equipment, and any other design features as described in DCD Section 19.3 in support of BDBEE mitigation strategies.
>
> "COL 19.3(13) The COL applicant is to confirm and ensure that the raw water tank and flow path to the FLEX equipment (structures, piping, components, and connections) are designed to be robust with respect to applicable hazards (e.g.,seismic events, floods, high winds, and associated missiles)."

DCD Tier 2, Subsection 19.3.2.3.4 and Technical Report, APR-E-P-NR-14005-P, Subsection 5.1.2.6.2 will be revised to reflect the above information.

Impact on DCD

DCD Tier 2, Table 1.8-2 (29 of 29), Subsection 19.3.2.3.4 and 19.3.4 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

APR1400-E-P-NR-14005-NP, Subsection 5.1.2.6.2 will be revised as indicated on the attached markup.

Table 1.8-2 (29 of 29)

Item No.	Description
COL 19.3(1)	The COL applicant is to perform site-specific seismic hazard evaluation and seismic risk evaluation as applicable in accordance with NTTF Recommendation 2.1 as outlined in the NRC RFI.
COL 19.3(2)	The COL applicant is to address the flood requirements for wet sites
COL 19.3(3)	The COL applicant is to develop the details for offsite resources.
COL 19.3(4)	The COL applicant is to address the details of storage location for FLEX equipment.
COL 19.3(5)	The COL applicant is to address site-specific strategies to mitigate BDBEEs as specified in the NRC Order EA-12-049.
COL 19.3(6)	The COL applicant is to address SFP level instrumentation maintenance procedure development and perform training as specified in NRC Order EA-12
COL 19.3(7)	The COL applicant is to address development of EOPs, SAMGs, and EDMGs that incorporate lessons learned from TEPCO's Fukushima Dai-Ichi nuclear power plant accident as addressed in SECY-12-0025.
COL 19.3(8)	The COL applicant is to address enhancement of the offsite communication system as specified in the NRC Request for Information pertaining to NTTF Recommendation 9.3.
COL 19.3(9)	The COL applicant is to address staffing for large-scale natural events as specified in the NRC RFI pertaining to NTTF Recommendation 9.3.
~~COL 19.3(10)~~	~~The COL applicant is to confirm the specific design of raw water tank including the associated instrument, capacity, location, flow path to on-site, the valve pit connected to FLEX equipment, and any other design features.~~
COL 19.3(11)	The COL applicant is to confirm that the raw water tank and flow path to the FLEX equipment (structures, piping, components, and connections) are designed to be robust with respect to seismic events, floods, high winds, and associated missiles.

Replace with next page

Replacement

COL 19.3(12)	The COL applicant is to confirm, satisfy, or fulfill the specific design functional requirements of raw water tank including the associated instrument, capacity, location, flow path to on-site, the valve pit connected to FLEX equipment, and any other design features as described in DCD Section 19.3 in support of BDBEE mitigation strategies.
COL 19.3(13)	The COL applicant is to confirm and ensure that the raw water tank and flow path to the FLEX equipment (structures, piping, components, and connections) are designed to be robust with respect to applicable hazards (e.g., seismic events, floods, high winds, and associated missiles).

COL applicant is to address details of the storage location for FLEX equipment (COL 19.3(4)).

Insert A in page 5 of 5

Replace with A (7 of 8)

Also, the COL applicant is to address site-specific strategies to mitigate BDBEEs as specified in NRC Order EA-12-049 (COL 19.3(5)), including but not limited to the following:

a. Evaluation of site-specific external hazards

b. Determination and protection of portable equipment

c. Providing means for acquisition, staging, and installation of equipment

d. Establishing means for maintaining and testing of portable equipment

e. Establishing procedures and guidance on mitigation of BDBEEs

f. Establishing training of personnel to the developed strategies and procedures

19.3.2.4 Recommendation 7.1 – Reliable Spent Fuel Pool Instrumentation

The APR1400 employs reliable indication of the water level in the SFP capable of supporting identification of the following pool water level conditions:

a. Level that is adequate to support operation of the normal fuel pool cooling system

b. Level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck

c. Level at which fuel remains covered and actions to implement makeup water addition should no longer be deferred

The APR1400 SFP water level instrumentation is consistent with the guidelines addressed in NRC EA-12-051, NEI 12-02 (Reference 8), and JLD-ISG-2012-03 (Reference 9).

The primary instrument channel provides level indication through the use of guided wave radar (GWR) technology using the principle of time domain reflectometry (TDR).

COL 19.3(3) The COL applicant is to develop the details for offsite resources.

COL 19.3(4) The COL applicant is to address the details of storage location for FLEX equipment.

COL 19.3(5) The COL applicant is to address site-specific strategies to mitigate BDBEEs as specified in the NRC Order EA-12-049.

COL 19.3(6) The COL applicant is to address SFP level instrumentation maintenance procedure development and perform training as specified in NRC Order EA-12-051.

COL 19.3(7) The COL applicant is to address development of EOPs, SAMGs, and EDMGs that incorporate lessons learned from TEPCO's Fukushima Dai-Ichi nuclear power plant accident as addressed in SECY-12-0025.

COL 19.3(8) The COL applicant is to address enhancement of the offsite communication system as specified in the NRC Request for Information pertaining to NTTF Recommendation 9.3.

COL 19.3(9) The COL applicant is to address staffing for large-scale natural events as specified in the NRC RFI pertaining to NTTF Recommendation 9.3.

19.3.5 References

Insert B in page 5 of 5

Replace with B (8 of 8)

1. SECY-12-0025, “Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami,” U.S. Nuclear Regulatory Commission, February 2012.

2. Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” U.S. Nuclear Regulatory Commission, March 12, 2012.

3. Order EA-12-051, “Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,” U.S. Nuclear Regulatory Commission, March 12, 2012.

after the onset of BDBEE, the capacities of all the batteries are sufficient to provide dc power to all essential loads necessary to perform their safety duties.

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.

Battery Qualification

The safety-related batteries that are extended for use longer than 8 hours, with reduced discharge rate through load shedding, are not required to be additionally qualified for FLEX profiles since the NRC endorsed the NEI White Paper with clarifications in September 2013 (References 10 and 11).

5.1.2.6.1.3 Emergency Lighting

Emergency lighting in areas such as the MCR and technical support center (TSC) / operational support center (OSC) is provided from the Class 1E batteries during Phase 1, and from the mobile GTG during Phases 2 and 3.

Access to manual valves requires lighting, and access to instrumentation monitoring or equipment operation also requires lighting. Under this adverse condition, the APR1400 is designed to provide portable lighting (e.g., flashlights or headlamps) as necessary to perform essential functions.

5.1.2.6.1.4 Communications

Design features are incorporated into onsite plant communication system to enhance emergency preparedness for BDBEEs associated with simultaneous LUHS. These are described below.

The APR1400 communication subsystems provide an independent and diverse mode of communications. A failure of one subsystem does not affect the capability to communicate using the other system.

Electric power is provided to the communications subsystems from the non-Class 1E uninterruptible power system (UPS) with 1-hour capacity in normal operation. The wireless communication system is supplied from the dedicated emergency UPS with 16-hour capacity.

However, normal communications may be lost or hampered during an ELAP. In this condition, portable communication devices are provided to support interaction between personnel in the plant and those providing overall command and control. Communication gear (satellite phones and radios) are also provided for onsite and offsite communications. This system provides an alternate communication path for outside connections. The satellite telephone equipment includes a roof-mounted antenna and transceiver.

5.1.2.6.2 Water Supply System

The primary source of water for the core cooling function is the AFWST for the first 72 hours, and the RWT can be used thereafter for up to 12 days, if required (Table 5-2).

For the SFP makeup and spray function, the RWT is the source of water.

Insert C in page 5 of 5

5.1.2.6.3 Fuel Oil Supply System

EDG fuel oil day tank and the underground 7-day fuel oil storage tanks are used for running the diesel-driven FLEX pumps. During Phase 3, fuel oil is provided from an offsite source. Table 5-6 provides a summary of the fuel oil demands during the three phases of this event.

Replace with C (8 of 8)

The existing onsite EDG fuel oil storage tanks and associated diesel fuel oil day tanks have a capacity of

A

~~The COL applicant is to confirm the specific design of raw water tank including the associated instrument, capacity, location, flow path to on-site, the valve pit connected to FLEX equipment, and any other design features (COL 19.3(10)). The COL applicant is to confirm that raw water tank and flow path to the FLEX equipment (structures, piping, components, and connections) are designed to be robust with respect to seismic events, floods, high winds, and associated missiles (COL 19.3(11)).~~

Replace with A (7 of 8)

B

~~COL 19.3(10) The COL applicant is to confirm the specific design of raw water tank including the associated instrument, capacity, location, flow path to on-site, the valve pit connected to FLEX equipment, and any other design feature.~~

~~COL 19.3(11) The COL applicant is to confirm that the raw water tank and flow path to the FLEX equipment (structures, piping, components, and connections) are designed to be robust with respect to seismic events, floods, high winds, and associated missiles.~~

Replace with B (8 of 8)

C

~~The detailed design of the RWT related with site specific data is the responsibility of COL applicant. The COL applicant will confirm the associated instrument, capacity, location, flow path to on-site, the valve pit connected to FLEX equipment, and any other design features. Also, the COL applicant will confirm that the RWT and flow path to the FLEX equipment(structures, piping, components, and connections) are designed as seismic Category I to be robust with respect to seismic events.~~

Replace with C (8 of 8)

Replacement A

All permanent installed, safety related equipment (pumps, valves, etc.) that is utilized in the mitigation strategies for BDBEE are housed inside the reactor containment building, auxiliary building, essential service water/component cooling water heat exchanger building, emergency diesel generator building. All of these structures are safety related and are designed for seismic, flood, high wind and missile. The specific location, function, and classification of these structures are described in DCD Tier 2, Table 3.2-1.

The specific tanks (AFWST, IRWST, SIT, EDG fuel oil storage tank, EDG fuel oil day tank, BAST) are utilized in the mitigation strategies. All of these tanks are safety related, seismic Category I, and Quality Group C. DCD Tier 2, Table 3.2-1 provides the location, function, and safety classifications for these tanks. Additionally, RWT is utilized for mitigating strategies and is designed to seismic Category I and Quality Group D. It will remain functional for the mitigating strategies.

The detailed design of the raw water tank related with site specific data is the responsibility of COL applicant. The COL applicant is to confirm, satisfy, or fulfill the specific design functional requirements of raw water tank including the associated instrument, capacity, location, flow path to on-site, the valve pit connected to FLEX equipment, and any other design features as described in DCD Section 19.3 in support of BDBEE mitigation strategies (COL 19.3(12)). The COL applicant is to confirm and ensure that the raw water tank and flow path to the FLEX equipment (structures, piping, components, and connections) are designed to be robust with respect to applicable hazards (e.g., seismic events, floods, high winds, and associated missiles) (COL 19.3(13)).

Replacement B

COL 19.3(12) The COL applicant is to confirm, satisfy, or fulfill the specific design functional requirements of raw water tank including the associated instrument, capacity, location, flow path to on-site, the valve pit connected to FLEX equipment, and any other design features as described in DCD Section 19.3 in support of BDBEE mitigation strategies.

COL 19.3(13) The COL applicant is to confirm and ensure that the raw water tank and flow path to the FLEX equipment (structures, piping, components, and connections) are designed to be robust with respect to applicable hazards (e.g., seismic events, floods, high winds, and associated missiles).

Replacement C

The detailed design of the RWT related with site specific data is the responsibility of COL applicant. The COL applicant will confirm, satisfy, or fulfill the specific design functional requirements of raw water tank including the associated instrument, capacity, location, flow path to on-site, the valve pit connected to FLEX equipment, and any other design features as described in DCD Section 19.3 in support of BDBEE mitigation strategies. Also, the COL applicant will confirm and ensure that the RWT and flow path to the FLEX equipment (structures, piping, components, and connections) are designed to be robust with respect to applicable hazards (e.g., seismic events, floods, high winds, and associated missiles).