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.:	**424-8532**
SRP Section:	**19.05 – Aircraft Impact Assessment**
Application Section:	**19.5**
Date of RAI Issue:	**03/01/2016**

Question No. 19.05-2

In accordance with 10 CFR 50.150(a)(1), each applicant listed in paragraph (a)(3) shall perform a design-specific assessment of the effects on the facility of the impact of a large, commercial aircraft. Using realistic analyses, the applicant shall identify and incorporate into the design those design features and functional capabilities to show that, with reduced use of operator actions:

(i) The reactor core remains cooled, or the containment remains intact; and

(ii) Spent fuel cooling or spent fuel pool integrity is maintained.

In addition, 10 CFR 50.150(b) requires that the FSAR contain a description of the design features and functional capabilities and how the design features and functional capabilities meet the assessment requirements.

To ensure compliance with 10 CFR 50.150, the staff requests that the applicant address the following:

a. DCD Tier 2, Section 19.5.4.1, lists key components inside containment; however, it neither adequately describes the design features and functional capabilities nor, alternately, references the associated DCD section. The applicant is requested to ensure that the design features are adequately described in DCD Tier 2, Section 19.5, or a reference to the associated DCD section exists.

b. DCD Tier 2, Section 19.5.4.2, item d, states the properties of concrete and reinforcement bars protect key design features in the auxiliary building; however, it does not discuss other buildings or structures which are also credited for protecting key design features (e.g. emergency diesel generator building). The applicant is requested to verify and confirm that the DCD contains a complete list of structures or buildings credited for protecting core cooling equipment, or spent fuel pool integrity.

c. DCD Tier 2, Section 19.5.4.2, item e, states that the location of the AAC GTG, as shown on Figure 1.2-1, is a key design feature for limiting the loss of electrical power to key safety systems; however, Figure 1.2-1 is a high-level sketch of the site arrangement and does not provide an accurate representation of the separation distance required to protect the AAC GTG. The applicant is requested to provide a description, in the DCD, of the separation distance necessary to protect the AAC GTG and its components.

   DCD Tier 2, Section 19.5.4.4, lists the AAC GTG as a key design feature for providing power to various equipment; however this system is neither adequately described nor, alternately, references the associated DCD section. The applicant is requested to ensure that this non-class 1E power source is adequately described in DCD Tier 2, Section 19.5, or a reference to the associated DCD section exists.

d. DCD Tier 2, Section 19.5.4.4, describes support equipment and systems necessary to maintain core cooling; however, it is not clear to the staff whether the essential chilled water system, the ultimate heat sink, or others are missing from DCD Tier 2, Section 19.5.4.4. The applicant is requested to verify and confirm that the DCD contains a complete list of key design features credited for core cooling.

e. NEI 07-13 states that the effects of smoke can greatly affect the ventilation systems and diesel generators. It is not clear to the staff whether the AIA included the effects of smoke on ventilation, diesel generators, or other components such as cooling towers, as discussed in NEI 07-13. The applicant is requested to confirm that the AIA accounted for these smoke effects and the DCD is appropriately revised.

Response – (Rev. 2)

a. Section 19.5.4.4 states that the design of the SI and SC systems(DCD section 6.3 and 5.4.7), AFW systems(DCD section 10.4.9), MSSVs(DCD section 10.3.2.2.3), MSADVs(DCD section 10.3.2.2.4), and charging and auxiliary charging pumps(DCD section 9.3.4) are key design features, including reference to applicable DCD sections to describe those systems. This includes portions of those systems within the RCB. Section 19.5.4.4 will be revised to add the following statement to include the RPV and associated reactor coolant system components within the RCB: “The design of the RPV and associated reactor coolant system components located in the RCB as described in Sections 5.3 and 5.4 are key design features."

b. The emergency diesel generator building and the auxiliary building are the two buildings of concern credited for protecting key design features. Section 19.5.4.2 Item b states that the EDGB location and design as described in Section 3.8.4 are key design features. The minimum structure requirements as shown in Table 3-2 of NEI 07-13 are presented with the existing AB by adding EDGB in Section 19.5.4.2. Turbine Building and Compound Building were considered into AIA. These buildings were excluded from the structures which require a detailed AIA since these structures do not contain any key safety feature and are not of sufficient reinforced concrete construction, as described in section 6.2 of AIA report. CCW HX and ESW buildings were also considered into AIA because these buildings have key safety features. These buildings do not require further analysis since these are separated from each division

by distance and at least one division still has a safety function such as decay heat removal in the event of aircraft impact, as described in section 6.1.4 of AIA report.

c. A statement will be added to Section 19.5.4.2 item e to state that the AAC GTG building will be located at least 100 yards from the auxiliary building. The AAC GTG is described in DCD section 8.4.1.3.

d. The essential chilled water system (ECWS) including the pipe routing, the ultimate heat sink (UHS) and cables routing between “A” & “B” I&C equipment and RCC are required for maintaining core cooling.

   The design and physical separation of these systems and equipment which have redundancy concept is credited to core cooling in the event of any aircraft strike.

   Thus, DCD Section 19.5.4.4 will be revised to add key design features as attachment.

e. The separation between the electrical divisions is adequate to preclude the failure of both electrical divisions due to smoke or other AIA impacts. This will be added to Section 19.5.4.2.

Impact on DCD

The DCD changes from the previous responses to this RAI have been incorporated into Revision 1 of the DCD; therefore, only the pages containing changes as a result of Revision 2 of this response are included in the Attachment.

The DCD will be revised as indicated on the Attachment.

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 theTechnical Report of Loss of Large Area Analysis.

dampers and penetration seals, are credited for 5 psid. These 5 psid barriers are identified on Figures 19.5-1 through 19.5-10. These key design features ensure at least one complete train of secondary heat removal equipment and necessary support systems to include cooling water, electrical power supply and distribution, and instrument and control within the AB and EDGB is available to provide core cooling following the impact of a large commercial aircraft.

The piping layout of safety - related cooling water system is to be designed so that piping failure from an aircraft impact shall not cause the total loss of cooling capability.(COL 19.5(2))

19.5.4.4 Core Cooling Features

The design and physical separation (by fire barriers as described in Section 9.5A) of the safety injection and shutdown cooling system (described in Sections 6.3 and 5.4.7), of the auxiliary feedwater system (described in Section 10.4.9), of the main steam safety valves and main steam atmospheric dump valves (described in Sections 10.3.2.2.3 and 10.3.2.2.4) and of the charging pumps and auxiliary charging pump (described in Section 9.3.4) are key system design features for assuring core cooling following a reactor trip in response to an aircraft impact event. The design of the RPV and associated reactor coolant system components located in the RCB as described in Sections 5.3 and 5.4 are key design features.

~~The design and physical separation of the component cooling water system (CCWS) (described in Section 9.2.2), of those portions of the essential service water system located in the ESW Building (described in Section 9.2.1),~~ of the Class 1E electrical power supply and distribution system (described in Section 8.3), and of the safety-related instrumentation and control system (described in Chapter 7) including the physical separation between the MCR, RSR and the RCC and the ability to power the SI pumps, charging pumps, CS pumps and SC pumps from the AAC GTG (described in section 8.4.1.3) are key supporting system design features for assuring core cooling following a reactor trip in response to an aircraft impact event. The action of tripping or shutting down the reactor ensures that the fuel in the reactor is kept subcritical.

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Following shutdown from power operation, core cooling is maintained by the auxiliary feedwater system as described in Section 10.4.9. Primary system is maintained at operating pressure and temperature by adjusting auxiliary feedwater flow to match the decay heat rate from the reactor core. Heat is discharged to the atmosphere using the main steam safety valves or main steam atmospheric dump valves. Under these conditions, additional boration is unnecessary to maintain subcriticality.

Cables between channel "A" & "B" I&C equipment and RCC shall be routed via each of division I & II areas through the embedded conduits and this design is also one of key supporting system design features.

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The design and physical separation of those portion of the essential service water system (ESWS)(described in section 9.2.1), the component cooling water system (CCWS) (described in section 9.2.2), and the ultimate heat sink (UHS)(described in section 9.2.5), the essential chilled water system (ECWS)(described in section 9.2.7),

19.5.6 Combined License Information

COL 19.5(1) When the reactor head is untensioned and before the refueling pool is flooded up, administrative controls will be in place to ensure that no trains of SI and shutdown cooling, including the necessary power and cooling water support systems are out of service for maintenance.

19.5.7 References

1. NEI 07-13, "Methodology for Performing Aircraft Impact Assessments for New Plant Designs," Revision 8, April 2011.

COL 19.5(2) When the piping layout of essential chilled water system on auxiliary building FL EL. 174'-0" is designed, at least their piping of one train in the corridor should be survived from effect of an aircraft impact.