

## KHNPDCDRAIsPEm Resource

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**Sent:** Wednesday, February 17, 2016 10:39 AM  
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**Cc:** Li, Chang; Dias, Antonio; Steckel, James; Lee, Samuel  
**Subject:** APR1400 Design Certification Application RAI 407-8447 (19.03 Beyond Design Basis External Event (APR1400))  
**Attachments:** APR1400 DC RAI 407 SPSB 8447.pdf

KHNP,

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs.

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

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**Hearing Identifier:** KHNP\_APR1400\_DCD\_RAI\_Public  
**Email Number:** 458

**Mail Envelope Properties** (3b20057542d04cbeab1b949da19db943)

**Subject:** APR1400 Design Certification Application RAI 407-8447 (19.03 Beyond Design Basis External Event (APR1400))  
**Sent Date:** 2/17/2016 10:39:24 AM  
**Received Date:** 2/17/2016 10:39:26 AM  
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<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>
MESSAGE	498	2/17/2016 10:39:26 AM
APR1400 DC RAI 407 SPSB 8447.pdf		106434
image001.jpg	5040	

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**Priority:** Standard  
**Return Notification:** No  
**Reply Requested:** No  
**Sensitivity:** Normal  
**Expiration Date:**  
**Recipients Received:**

## REQUEST FOR ADDITIONAL INFORMATION 407-8447

Issue Date: 02/17/2016  
Application Title: APR1400 Design Certification Review – 52-046  
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.  
Docket No. 52-046  
Review Section: 19.03 Beyond Design Basis External Event (APR1400)  
Application Section:

### QUESTIONS

19.03 Beyond Design Basis External Event (APR1400)-25

#### Acceptance Criteria:

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

In SECY 12-0025, the staff provided the Commission with proposed orders requiring mitigation strategies for beyond-design-basis external events to be issued to all power reactor licensees and holders of construction permits. In the paper, the staff indicated that for New Reactors that are currently under active staff review, the staff plans to ensure that the Commission-approved Fukushima recommended actions are addressed prior to licensing. On March 12, 2012, the NRC issued Orders EA-12-049 requiring operating nuclear plants to develop and implement strategies that will allow them to cope without ac power for an indefinite amount of time. The strategies must ensure that the reactor core and spent fuel pool are adequately cooled, and containment function is maintained.

DCD Tier 2, Section 19.3.2.3 and the technical report (TR), APR1400-E-P-NR-14005-P, "Evaluations and Design Enhancements to Incorporate Lessons Learned from Fukushima Dai-ichi Nuclear Accident," describe the details of the proposed mitigation strategies. The applicant performed analyses to demonstrate the capability of the proposed mitigation strategies for core and SFP cooling, and containment function. The proposed acceptance criteria are as follows:

- Core Cooling – Appendix A, Section A.3 of the TR states that the acceptance criteria for core cooling are (1) core cooling being maintained, (2) no fuel failures.
- Spent Fuel Pool Cooling – Appendix B, Section B.1 of the TR states that the acceptance criterion for SFP cooling is that fuel in the SFP remains water covered.
- Containment Function – DCD Tier 2, Section 19.3.2.3.3 states that the containment pressure is controlled within the ultimate pressure capacity (UPC) limit.

NEI 12-06, Section 3.2.1.1 states that, for core cooling in a PWR, the requirement is to keep the fuel in the reactor covered. In Table 5-9 Item 3.2.1.1 of the TR, the applicant indicates that APR1400 complies with NEI guidance. However, the staff found that the applicant's criteria for core cooling are inconsistent with the NEI guidance regarding keeping the fuel covered.

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The applicant is requested to:

- a) Explain the inconsistency and justify the deviation in regards to the criteria for maintaining core cooling.
- b) Confirm the acceptance criterion for the containment function.

The NRC staff believes that the above acceptance criteria for the mitigation strategies are part of the licensing bases for APR1400 design and should be documented in the DCD instead of being captured in a technical report.

The applicant is requested to include the acceptance criteria for mitigation strategies in the DCD.

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Connections:

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

In SECY 12-0025, the staff provided the Commission with proposed orders requiring mitigation strategies for beyond-design-basis external events to be issued to all power reactor licensees and holders of construction permits. In the paper, the staff indicated that for New Reactors that are currently under active staff review, the staff plans to ensure that the Commission-approved Fukushima recommended actions are addressed prior to licensing. On March 12, 2012, the NRC issued Orders EA-12-049 requiring operating nuclear plants to develop and implement strategies that will allow them to cope without ac power for an indefinite amount of time. The strategies must ensure that the reactor core and spent fuel pool are adequately cooled, and containment function is maintained.

NEI 12-06, Section 3.2.2 states that the portable fluid connections for core and SFP cooling functions are expected to have a primary and an alternate connection. Both the primary and alternate connection points do not need to be available for all applicable hazards, but the location of the connection points should provide reasonable assurance of at least one connection being available.

The staff reviewed the information in APR1400-E-P-NR-14005-P, "Evaluations and Design Enhancements to Incorporate Lessons Learned from Fukushima Dai-Ichi Nuclear Accident," Section 5.1.2.4.1.2, comparing it with the NEI guidance. It is not clear whether the connections being used in the proposed mitigation strategies for SFP cooling are consistent with the guidance that the location of the connection points should provide reasonable assurance of at least one connection being available for all applicable external hazards.

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The applicant is requested to clarify how the APR1400 design for connections to the FLEX equipment is consistent with the NEI guidance.

### 19.03 Beyond Design Basis External Event (APR1400)-27

RWT Level Instrument:

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

In SECY 12-0025, the staff provided the Commission with proposed orders requiring mitigation strategies for beyond-design-basis external events to be issued to all power reactor licensees and holders of construction permits. In the paper, the staff indicated that for New Reactors that are currently under active staff review, the staff plans to ensure that the Commission-approved Fukushima recommended actions are addressed prior to licensing. On March 12, 2012, the NRC issued Orders EA-12-049 requiring operating nuclear plants to develop and implement strategies that will allow them to cope without ac power for an indefinite amount of time. The strategies must ensure that the reactor core and spent fuel pool are adequately cooled, and containment function is maintained.

DCD Tier 2, Section 19.3.2.3.2 states that, in Phase 2 and Phase 3, makeup water will be taken from raw water tank (RWT) using a portable pump. It is not clear in the DCD whether there is a level instrument for the RWT being included in the design.

The applicant is requested to explain the design of RWT level instrument, or justify its elimination.

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Makeup Water:

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

In SECY 12-0025, the staff provided the Commission with proposed orders requiring mitigation strategies for beyond-design-basis external events to be issued to all power reactor licensees and holders of construction permits. In the paper, the staff indicated that for New Reactors that are currently under active staff review, the staff plans to ensure that the Commission-approved Fukushima recommended actions are addressed prior to licensing. On March 12, 2012, the NRC issued Orders EA-12-049 requiring operating nuclear plants to develop and implement strategies that will allow them to cope without ac power for an indefinite amount of time. The

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strategies must ensure that the reactor core and spent fuel pool are adequately cooled, and containment function is maintained.

Table B-3 of APR1400-E-P-NR-14005-P provides information on the required makeup volume and available water source. The NRC staff reviewed the table and found some error. In the table, Column 2 is for Mode 1 to 6 (with no full core offload) and Column 3 is for Mode 6 (with no full core offload). Total coping time for Modes 5 and 6 is 6.4 days in Column 2, and the total coping time for Mode 6 is 15.1 days in Column 3.

The applicant is requested to explain the differences between these two columns (6.4 days vs. 15.1 days) for Mode 6 both with no full core offload or correct the error, if any.

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N+1 Guidance:

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

In SECY 12-0025, the staff provided the Commission with proposed orders requiring mitigation strategies for beyond-design-basis external events to be issued to all power reactor licensees and holders of construction permits. In the paper, the staff indicated that for New Reactors that are currently under active staff review, the staff plans to ensure that the Commission-approved Fukushima recommended actions are addressed prior to licensing. On March 12, 2012, the NRC issued Orders EA-12-049 requiring operating nuclear plants to develop and implement strategies that will allow them to cope without ac power for an indefinite amount of time. The strategies must ensure that the reactor core and spent fuel pool are adequately cooled, and containment function is maintained.

The applicant states in DCD Tier 2, Section 19.3.2.3.4, that the design approach meets the NEI 12-06 guidance of the N+1 approach for the FLEX equipment. It is not clear to the staff how many primary low-head FLEX pumps, which are used for core cooling in low modes Phase 2 operation (see APR1400-E-P-NR-14005-P Table 5-6), are in the design to satisfy the N+1 guidance.

The applicant is requested to clarify how many primary low-head pumps are proposed in the design.



**U.S.NRC**

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